

# 19<sup>TH</sup> ANNUAL PRESENTATION SYMPOSIUM

FRIDAY, APRIL 17TH

9 A.M. - 6 P.M.

ISAT/CS AND HHS BUILDINGS

## 2015 SENIOR CAPSTONE PROJECT PRESENTATION SYMPOSIUM

DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY • BSISAT, GEOGRAPHIC SCIENCE, AND INTELLIGENCE ANALYSIS PROGRAMS



# Thank YOU!

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Many people have contributed to the ISAT Department in many different ways. Our sincerest gratitude goes out to all of those who have helped enhance our educational experience.

We'd like to take a moment here to specifically thank those who have given their financial support to the **ISAT Student Project Fund**. The Senior Symposium is made better by their contributions.

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Karim Altaii  
Dan Attard  
Chris Bachmann  
George Baker  
Michael Barnes  
Andrew Boyd  
Heather Buck  
Tony Chen  
Patrick Cushing  
Nana Darko  
Kai Degner  
Paul Goodall  
Anne Henriksen  
Michael Hill  
Thomas Hillhouse  
Bob Kolvoord  
Mikhail Kolyadov  
JMU Alumni Association

Eric Maslen  
Carole Nash  
Steven Obal  
Zachary Peterson  
Corinn Pope  
Ryan Powanda  
Drew and Kristen Rodgers  
Joseph Rudmin  
Glenn Shellenberger  
Kevin Shifflett  
Andrew Spurr  
Anthony Teate  
Renee Teate  
Jason Vaughan  
Joy Ferenbaugh  
Nicole Radziwill  
Gene Tucker  
BRG Machinery Consulting, LLC

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**Please consider adding your name to this list.**

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*"The ISAT program is one of the contributing factors to my success after college, and I think it is important to give back to something you love."*

*- Steven Obal, ISAT '07*

# ISAT Alumni Panel

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How to make the most of your education and succeed in life beyond graduation

11:00 a.m. – 12:00 p.m. nTelos Room (ISAT 259)

**Chelsea Jenkins:** Chelsea is a 2005 graduate of JMU's ISAT program, with a triple concentration in Energy, Environment and Transportation. After completing her honors thesis on the sustainable production and growth of biodiesel, Chelsea co-authored a book with an ISAT adjunct professor titled "Exploring Sustainable Biodiesel." In 2006, Chelsea began a new career path with Hampton Roads Clean Cities. Chelsea served as a Coordinator, Manager and as Executive Director until 2011 and helped grow the organization into a statewide non-profit, Virginia Clean Cities, focused on managing multi-state alternative fuel deployment programs. In 2011, Chelsea joined ROUSH CleanTech, where she manages the southern region. Chelsea also works on alternative fuel and advanced technology consulting projects periodically through a company she started with several former Clean Cities colleagues. In her spare time, she enjoys running, snowboarding, surfing and being outdoors.

**Aaron Lawlor:** Aaron is a 1999 graduate of JMU's ISAT and Honors programs, with a double concentration in Biotechnology and Environmental Science. He received his JD from UVA Law in 2003, and began his legal career as a litigation associate at an Am Law 100 Firm in Tysons Corner, VA. In 2007, he co-founded Aphelion Legal Solutions, an e-discovery and legal process outsourcing company that grew to include 50+ employees working from offices in Washington, D.C.; Houston, Texas; and Chennai, India. Aphelion was acquired in June 2013 by UnitedLex, an 1,800 employee litigation support, cyber security, and advisory services organization. In his current role at UnitedLex, Aaron partners with in-house and outside counsel at the world's leading corporations and law firms to deploy the right blend of service and technology.

**Brian Riggs:** Brian graduated from ISAT in 2009 with a concentration in Biotechnology. After school he worked for PPD, a contract research organization, in Richmond in the quality assurance department. Brian then joined a small start-up pharma company (Kaleo – formerly Intelliject). Since then we have successfully launched two products Auvi-Q and Evzio, including the first FDA approved auto-injector of Naloxone (one of the World Health Organization's Essential Medicines). Brian works closely with all of the operations teams including Drug and Device Development, Regulatory Affairs, Clinical, Manufacturing, and Supply Chain.

**Jess Fox** – Jess completed her undergraduate degree in 2011 with a dual concentration in Energy and Biotechnology. She continued with graduate studies in Sustainable Environmental Resource Management in Malta and developed a Best Practices Manual for the Wind for Schools Program. Currently, she works as a Systems Engineer with L-3 Communications Telemetry East, a leading manufacturer of missile and aircraft flight test instrumentation used aboard spacecraft, aircraft, missiles, guided weapons, targets, and UAVs.

**Michael Barnes** – Mike graduated in 2005 with a double concentration in IKM & telecommunications. Starting his career at Accenture in the global business solutions practice he was trained in what is now Oracle-Peoplesoft Human Capital applications. In 2011 as a program manager at Northrop Grumman, Mike saw the potential to independently own and help others grow and prosper outside of corporate America by co-founding BluePrint IT Solutions. BluePrint IT offers solutions that large companies do not have the in depth and intimate knowledge of the ERP software to support the ever growing and evolving need of Federal and commercial customers. In 2009, Mike worked with several partners to purchase a restaurant they worked at when they were young. Since then, they've grown the business to 4 locations grossing approximately \$10M and employing over 200 people in the northern Virginia area

**Peter Kim** - Peter graduated in 2004 with a double concentration in Energy and Instrumentation & Measurements. He is an accomplished software engineer and engineering manager leading the development of J2EE and BPM-based applications for large federal clients. He has managed and led a number of complex multi-million dollar engagements for a variety of application solutions. He is now a technical manager in the BPM Practice at Horizon Industries. He's been married to Jane (another ISAT major) for the past 6 wonderful years.

**Jane Kim** - Jane graduated in 2005 with a double concentration in Biotechnology and Engineering & Manufacturing. She started her career with International Business Machines (IBM) supporting various federal agencies and then while supporting the Department of Defense was asked to join the government. She became one of the youngest GS-13 in her agency and holds the highest government security clearance. She has managed Financial Acquisition programs to Nuclear Treaty Monitoring programs. She is currently managing her hardest clients yet, her 2 children.

# **YOU** can **MAKE** a **DIFFERENCE** for a JMU ISAT student. Please consider **GIVING** to the **ISAT Student Projects Fund**

Singular solutions almost never wholly solve the problems that people face. So ISAT students don't study in traditional ways. They address issues and solve problems like energy, or the environment – that's their curriculum.

Your gift to the Department of Integrated Science and Technology enables seniors to undertake capstone projects that bring to bear a broad range of sciences and technologies and solve real-world problems.

By giving to the department, you encourage innovation and help students fully consider the technical issues and ensure that their solutions will be embraced by society.

With their capstone projects, ISAT students have:

- Designed and built a wireless, remote-controlled lawnmower for people with disabilities
- Designed a harvesting strategy for algae-based biofuels, transforming a problem into a solution
- Analyzed the relationship between Beaver Creek Reservoir water quality and Starr Hill Brewery product quality
- Designed, implemented and analyzed a variety of biochar applications for real-world and real-time use
- Developed an affordable, working solar cooker for Third World nations
- Developed a flat-plate solar thermal collector to heat farm structures
- Designed and tested an ocean thermal energy conversion prototype system

With your gift to underwrite the costs of these innovative projects, both the student and society benefit.

Together, by combining our talents and vision in the Department of Integrated Science and Technology, we can produce Madison graduates who will continue to address problems and innovate solutions for issues that affect society. That's how the national model of the Engaged University operates. Your gift makes it possible.

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## **YES! I would like to make a difference for a JMU ISAT student by giving to the ISAT Department Student Projects Fund (14530).**

I would like to make a recurring credit card gift of \$\_\_\_\_\_ monthly/quarterly/yearly (choose one – min \$5.00).

I would like to make a one time gift of \$\_\_\_\_\_ (President's Council gifts are \$1,000 or more annually, \$500 for graduates of the past 6-10 years and \$200 for graduates of the past 1-5 years.)

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Address: \_\_\_\_\_

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Phone: \_\_\_\_\_ Email: \_\_\_\_\_

### **Select payment option:**

Enclosed is my CHECK made payable to the JMU Foundation

Please charge my CREDIT CARD (circle one): American Express MasterCard Visa Discover

Credit Card No: \_\_\_\_\_ Exp. Date: \_\_\_\_\_ CSV: \_\_\_\_\_

Signature: \_\_\_\_\_

I will make a gift online at [www.jmu.edu/give](http://www.jmu.edu/give).

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**BSISAT PROGRAM – Presenters Listed by Last Name**

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Allison	Corey	3:15-3:40pm	ISAT/CS Room 148	Dr. Jonathan Miles
Andersen	Susan	3:15-3:40pm	ISAT/CS Room 348	Dr. Carole Nash
Arzaga	Nicklas	3:30-3:55pm	ISAT/CS Room 346	Dr. Tony Chen
August	Jessanna	9:00-9:40am	ISAT/CS Room 348	Dr. Thomas Benzing
Bell	Tyler	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Bolen	Robert	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Borg	Devin	9:30-9:55am	ISAT/CS Room 346	Dr. Ronald Raab
Brooks	Colin	4:45-5:10pm	ISAT/CS Room 350	Dr. Louise Temple
Buchanan	Cody	3:00-3:40pm	ISAT/CS Room 350	Dr. Christopher Bachmann
Campbell	Benjamin	10:30-11:10am	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
Campbell	Collin	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Carter	Brandon	4:15-4:40pm	ISAT/CS Room 350	Dr. Louise Temple
Chamberlain	Alexander	9:00-9:40am	ISAT/CS Room 337	Dr. Emil Salib
Chance	Dylan	9:45-10:25 am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Cline	Christian	10:45-11:10am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Cotting	Ashleigh	2:15-2:40pm	ISAT/CS Room 148	Mr. Paul Goodall
Dawkins	Reyna	4:45-5:10pm	ISAT/CS Room 346	Dr. Jennifer Coffman

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
DeGutis	Erin	3:15-3:40pm	ISAT/CS Room 136	Dr. Anthony Teate
Dewey	Kyle	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Driscoll	Willie	9:45-10:10am	ISAT/CS Room 350	Dr. Geoffrey Egekwa
Edwards	Brody	10:15-10:40am	ISAT/CS Room 348	Dr. Robert Brent
Ellingworth	Ross	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Falterman	Seraphim D.	10:45-11:10am	ISAT/CS Room 136	Dr. Karim Altaï
Fencil	James	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Foster	Benjamin	9:45-10:10am	ISAT/CS Room 348	Dr. Thomas Benzing
Galvan	Hector	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Guthrie	Sara	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Hart	Derek	3:00-3:40pm	ISAT/CS Room 350	Dr. Christopher Bachmann
Hasselquist	Anders	11:15-11:40am	ISAT/CS Room 136	Dr. Karim Altaï
Healey	Ian	9:00-9:40am	ISAT/CS Room 337	Dr. Emil Salib
Herbold	Thomas	2:00-2:40pm	ISAT/CS Room 346	Dr. Tony Chen
Heyn	Nathan	3:45-4:20pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Hoy	Andrew	4:25-4:50pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Johnson	Codey	9:00-9:25am	ISAT/CS Room 346	Dr. Ronald Raab
Kacsmar	Lindsey	4:00-4:40pm	ISAT/CS Room 346	Dr. Jennifer Coffman



Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Kearney	John	9:00-9:25am	ISAT/CS Room 346	Dr. Ronald Raab
Kugler	Joshua	4:30-5:10pm	ISAT/CS Room 348	Dr. Wayne Teel
Labriola	Cody	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Lacey	Chris	2:30-2:55pm	ISAT/CS Room 350	Dr. Abdelrahman Rabie
Langouet-Astrie	Christophe	3:45-4:10pm	ISAT/CS Room 350	Dr. Louise Temple Dr. Timothy Bloss Dr. Amanda Biesecker
Liao	Joseph	2:45-3:10pm	ISAT/CS Room 148	Mr. Paul Goodall
Linden	Louis	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaii
Lucas, III	Donald	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
MacLeish	Maggie	2:00-2:25pm	ISAT/CS Room 350	Dr. Abdelrahman Rabie
Major	Connor	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Martin	Alex	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Mateo	Deisy	2:30-3:10pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Mathias	Andrew	10:00-10:25am	HHS Room 3022	Dr. Emil Salib
Merrick	James	3:45-4:10pm	ISAT/CS Room 148	Dr. Maria Papadakis
Mihalkovic	Christopher	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Minor	Cameron	4:45-5:25pm	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Moellers	Cassidy	9:45-10:25am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Morra	Nathaniel	2:40-3:10pm	ISAT/CS Room 136	Dr. Eric Pappas
Mulcahy	Kevin	4:30-5:10pm	ISAT/CS Room 348	Dr. Wayne Teel
Nguyen	Michael	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Nguyen	Tina	5:15-5:40pm	ISAT/CS Room 346	Dr. Shannon Conley and Dr. Morgan Benton
Nichols	Jonathan	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaï
Palamone	Jordan	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Peebles	Shannon	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaï
Phelan	Matthew	2:30-3:10pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Ponn	Allyson	2:45-3:10pm	ISAT/CS Room 348	Dr. Mary Handley
Schechtel	Hannah	10:45-11:10am	ISAT/CS Room 348	Dr. Robert Brent
Sheehan	Colin	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Shellenberger	Glenn	4:45-5:25pm	ISAT/CS Room 148	Dr. Maria Papadakis & Dr. Carole Nash
Shipman	Caitlin	9:00-9:40am	ISAT/CS Room 348	Dr. Thomas Benzing
Simmons	Jonathan	10:00-10:40am	ISAT/CS Room 346	Dr. Ronald Raab
Spinosa	Robert	9:45-10:25am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Sutton	Jarod	5:15-5:40pm	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Tanner	Christian	10:15-10:40am	ISAT/CS Room 350	Dr. Geoffrey Egekwu and Mr. Mark Showalter

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Torres	Martin	11:45-12:25pm	ISAT/CS Room 136	Dr. Karim Altaii
Townsend	Zachary	4:45-5:25pm	ISAT/CS Room 148	Dr. Maria Papadakis & Dr. Carole Nash
Vaughan	Christopher	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Vaughan	Jonathan	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Virga	Justin	4:45-5:25pm	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu
Walisko	Eric	10:30-11:10am	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
White	Brandon	5:15-5:40pm	ISAT/CS Room 348	Dr. Wayne Teel
Whitlock	Andrew	4:15-4:40pm	ISAT/CS Room 148	Dr. Maria Papadakis
Wilkes	Leah	4:00-4:40pm	ISAT/CS Room 346	Dr. Jennifer Coffman
Wong	Serena	3:45-4:20pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Wood	Joshua	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Wos	Adrian	11:45-12:25pm	ISAT/CS Room 136	Dr. Karim Altaii

**INTELLIGENCE ANALYSIS PROGRAM – Presenters Listed by Last Name**

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Ambrogi	Michael	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Barton	Sidney	1:35-1:55pm	HHS Room 1208	Dr. Stephen Marrin
Baxter	Austin	1:10-1:30pm	HHS Room 1208	Dr. Noel Hendrickson and Dr. Stephen Marrin
Bodenheimer	Michael	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Bourgon	JP	11:00-11:40am	HHS Room 1208	Dr. Jeffrey Tang and Dr. Geoffrey Egekwu
Carr	Christina	10:35-10:55am	HHS Room 1208	Dr. Edna Reid and Dr. Jeffrey Tang
Checknita	Gary	4:30-4:55pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
Choi	Christine	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Christensen	Sarah	9:30-9:55am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
Clowser	Justin	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Colwell	Tyler	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Cracknell	Stephen	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Creech	Lewis	3:15-3:35pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Derr	Nicholas	9:05-9:25am	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Dickey	Katelyn	9:55-10:15am	HHS Room 1208	Dr. Noel Hendrickson and Dr. Jeffrey Tang
Evans	Benjamin	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Fialdini	Kristen	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Fraser	Ryan	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Galante	Karlyn	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Graupp	Sarah	9:00-9:25am	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
Hughes	Garrett	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Hussey	Katherine	2:00-2:20pm	HHS Room 1208	Dr. Stephen Marrin and Dr. Noel Hendrickson
Jenner	Rachael	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
Johnson	Tanner	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Larson	Ryan	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Liddell	Scott	4:30-4:55pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
Mahoney	Kaitlyn	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
Mai	Vivi	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
McEvoy	Kevin	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Meek	Morgan	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Panozo	Jorge	4:05-4:25pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Pelzer	LeeAnne	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Piccininni	Mia	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Poole	Jacob	9:30-9:50am	HHS Room 1208	Dr. Jeffrey Tang
Restivo	Ryan	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Schaeufele	Emily	9:30-9:55am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
Silva	Justen	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Smith	Savannah	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Smith, II	Pat	9:00-9:25am	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
Troxel	David	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Wood	Tyler	3:40-4:00pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Woollums	Kayla	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin

**GEOGRAPHIC SCIENCE PROGRAM – Presenters listed by Last Name**

Student Last Name	Student First Name	Presentation Time	Presentation Room Number	Capstone Advisor
Bishop	Katherine	1:30-1:55pm	HHS Room 1202	Dr. Amy Goodall and Dr. Ian Muehlenhaus
Burdick	Kellie	11:00-11:30am	HHS Room 1202	Dr. Mace Bentley
Doescher	Kyle	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel
Foery	Joshua	10:15-10:55am	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash
Franks	John	12:00-12:25pm	HHS Room 1202	Dr. Mace Bentley
Gibb	Nicholas	11:35-11:55am	HHS Room 1202	Dr. Mace Bentley
Horrocks	Ryan	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel
Mlcoch	Jesse	3:00-3:25pm	Poster Presentation HHS Room 1202	Dr. Henry Way
Nemeth	Kevin	2:30-2:55pm	Poster Presentation HHS 1202	Dr. Amy Goodall
Smith	Allison	2:00-2:25pm	HHS Room 1202	Dr. Ian Muehlenhaus
Sonnenfeld	Casey	11:00-11:30am	HHS Room 1202	Dr. Mace Bentley
Spohn	Colin	1:00-1:25pm	HHS Room 1202	Dr. Helmut Kraenzle
Stickman, Jr.	Ralph	9:00-9:25am	HHS Room 1202	Dr. Wayne Teel
Sturm	Philip	10:15-10:55am	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash
Wallace	Anne	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel

**BSISAT PROGRAM - Presentations Listed by Room Number**

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
ISAT/CS Room 136	10:00-10:40am	Peebles Nichols Linden	Shannon Jonathan Louis	MillerCoors Administrative Building Energy Model
ISAT/CS Room 136	10:45-11:10am	Falterman	Seraphim Daniel	Hermitage of the Holy Cross, a monastic community of the Russian Orthodox Church Abroad
ISAT/CS Room 136	11:15-11:40am	Hasselquist	Anders	Installation of a Photovoltaic Lighting System and Energy Monitors at Punta Leona Hotel and Club
ISAT/CS Room 136	11:45-12:25pm	Torres Wos	Martin Adrian	NatuRain: Inverted Sprinkler System
ISAT/CS Room 136	2:40-3:10pm	Morra	Nathaniel	An Analysis of Air Quality In Harrisonburg, Virginia
ISAT/CS Room 136	3:15-3:40pm	DeGutis	Erin	Development of an Application for Optimizing and Economizing Photovoltaic Systems for Small Scale Consumers
ISAT/CS Room 136	3:45-4:20pm	Heyn Wong	Nathan Serena	Isolation and Symbiosis-Associated Genotyping of Native <i>Bradyrhizobium japonicum</i> Strains
ISAT/CS Room 136	4:25-4:50pm	Hoy	Andrew	Development of a Citizen Science Approach to Isolate Native <i>Bradyrhizobium japonicum</i> Strains
ISAT/CS Room 148	2:15-2:40pm	Cotting	Ashleigh	A Net Zero Greenhouse Gas Emissions Feasibility Study for Green Fence Farm
ISAT/CS Room 148	2:45-3:10pm	Liao	Joseph	Business Model: Retrofitting Commercial Hot Water Systems with Solar Thermal Systems
ISAT/CS Room 148	3:15-3:40pm	Allison	Corey	Life Cycle Analysis as Applied to the Design of a Micro-wind Turbine
ISAT/CS Room 148	3:45-4:10pm	Merrick	James	An Energy Audit and Recommendations for the Historical Emmanuel Episcopal Church
ISAT/CS Room 148	4:15-4:40pm	Whitlock	Andrew	Intermodal Operations and the Roadrailer: A Feasibility Study
ISAT/CS Room 148	4:45-5:25pm	Townsend Glenn	Zachary Shellenberger	Rehabilitation Options for the James Madison University Farm
ISAT/CS Room 337	9:00-9:40 am	Chamberlain Healey	Alexander Ian	Integrating a Cloud Computing Environment into JMU's Educational Resources
ISAT/CS Room 337	9:45-10:25 am	Chance Moellers Spinosa	Dylan Cassidy Robert	"Zome": An Interactive Art Piece
ISAT/CS Room 337	10:30-11:10am	Campbell Wallisko	Benjamin Eric	Mobile Activity Recognition System
ISAT/CS Room 337	2:30-3:10pm	Phelan Mateo	Matthew Deisy	Simulation of the Capabilities of the Yellow Flashing Arrow Traffic Signal and Driver Response
ISAT/CS Room 337	3:15-3:55pm	Ellingworth Nguyen Sheenan	Ross Michael Colin	Online Textbook Exchange for James Madison University Students and Faculty



**BSISAT PROGRAM - Presentations Listed by Room Number**

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
ISAT/CS Room 337	4:00-4:40pm	Bolen Fencil Major	Robert James Connor	ISAT Alumni Connect
ISAT/CS Room 337	4:45-5:25pm	Minor Virga	Cameron Justin	AirClock: The Wireless Whistle Game Clock Controller
ISAT/CS Room 346	9:00-9:25am	Johnson Kearney	Codey John	Lacritin Site-Directed Mutagenesis
ISAT/CS Room 346	9:30-9:55am	Borg	Devin	Destabilizing Tuberculosis: Structure Function Analysis of Mycobacterium tuberculosis Gyr A and Gyr B DNA coiling proteins
ISAT/CS Room 346	10:00-10:40am	Simmons	Jonathan	Continued Development and Expansion of Hospital Emergency Response Team at Rockingham Memorial Hospital
ISAT/CS Room 346	2:00-2:40pm	Herbold Karadsheh	Thomas Bassel	Solarized Backpack
ISAT/CS Room 346	2:45-3:25pm	Campbell Dewey Labriola	Collin Kyle Cody	Detailed Energy Survey and Analysis of a Residential Building in Harrisonburg, VA
ISAT/CS Room 346	3:30-3:55pm	Arzaga	Nicklas	Solar Hot Air System
ISAT/CS Room 346	4:00-4:40pm	Kacsmar Wilkes	Lindsey Leah	Can Rockingham County Feed Rockingham County?
ISAT/CS Room 346	4:45-5:10pm	Dawkins	Reyna	Sustainability in the Maasai Household
ISAT/CS Room 346	5:15-5:40pm	Nguyen August Shipman	Tina Jessanna Caitlin	Using Case Study Methodology in Teaching Social Context
ISAT/CS Room 348	9:00-9:40am	Foster	Benjamin	Health Risk Associated with Toxins in Chesapeake Bay Seafood
ISAT/CS Room 348	9:45-10:10am	Edwards	Brody	Evaluation of the Northern Snakenhead as an Invasive Fish Species in the Potomac River
ISAT/CS Room 348	10:15-10:40am	Schechtel	Hannah	Performance Testing of University Park Stormwater Treatment System
ISAT/CS Room 348	10:45-11:10am	Galvan Mihalkovic Palamone	Hector Christopher Jordan	Geographic Information System and Spatial Analysis of Algae Growth in The Shenandoah River, North River and South River
ISAT/CS Room 348	2:00-2:40pm	Ponn	Allyson	Assessment of a Biomass Thermal Water Heating System at New Community Project in Harrisonburg, VA
ISAT/CS Room 348	2:45-3:10pm	Andersen	Susan	"The National Farm to School Network and James Madison University: The Potential for a Large-Scale Local Food Purchasing Initiative"
ISAT/CS Room 348	3:15-3:40pm	Kugler Mulcahy	Joshua Kevin	East Campus Meadow Soil Health Survey
ISAT/CS Room 348	4:30-5:10pm			Use of Biochar as a Soil Amendment

**BSISAT PROGRAM - Presentations Listed by Room Number**

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
ISAT/CS Room 348	3:45-4:25pm	Guthrie Lucas, III Vaughan Vaughan	Sara Donald Christopher Jonathan	Design and Implementation of a Sustainable Aquaponics System
ISAT/CS Room 348	5:15-5:40pm	White	Brandon	Variation in the Design of a Top-Lit UpDraft Stove for Biochar
ISAT/CS Room 350	9:00-9:40 am	Bell Martin Wood	Tyler Alex Joshua	Visual Management Techniques for Processing Plants
ISAT/CS Room 350	9:45-10:10am	Driscoll	Willie	Preventing Head Injuries in Baseball: An Assessment
ISAT/CS Room 350	10:15-10:40am	Tanner	Christian	"GEET Fuel Processor" - Powering an Internal Combustion Engine with Used Motor Oil
ISAT/CS Room 350	10:45-11:10am	Cline	Christian	Pulse Jet Efficiency
ISAT/CS Room 350	2:00-2:25pm	MacLeish	Maggie	Improving Consumer Complaint Management Systems in the Food Processing Industry
ISAT/CS Room 350	2:30-2:55pm	Lacey	Chris	The Impacts of E85 in Small Engines
ISAT/CS Room 350	3:00-3:40pm	Buchanan Hart	Cody Derek	Optimizing for Ethanol Blending in Gasoline: Better Fuel Efficiency, Fewer Emission, and more power
ISAT/CS Room 350	3:45-4:10pm	Langouet-Astrie	Christophe	Tricistronic Lenti-Viral Vector Construction using Scar-less DNA Assembly Methods and Web-based Software JS to Help Study GRK4
ISAT/CS Room 350	4:15-4:40pm	Carter	Brandon	Addressing the Black Box Phenomenon of Genome Sequencing and Assembly
ISAT/CS Room 350	4:45-5:10pm	Brooks	Collin	Analyzing Transduction Levels of the <i>meaA</i> gene within <i>Staphylococcus aureus</i> via Wastewater and Environmental Samples Containing bacteriophage DNA
ISAT/CS Room 350	5:15-5:40pm	Sutton	Jarod	The Status of RFID Applications in the U.S. Healthcare Industry – Diffusion Challenges and Drivers
HHS Room 3022	10:00-10:25am	Mathias	Matthew	Proxy Mobile IPv6: Practical IPv6 Implementation for a Modern Mobile Network

## INTELLIGENCE ANALYSIS PROGRAM - Presentations Listed by Room Number

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
HHS Room 1208	9:05-9:25am	Derr	Nicholas	Commercial Aviation Security: Threats, Their Costs, and Improving
HHS Room 1208	9:30-9:50am	Poole	Jacob	Blizzard Entertainment and Low-Tech Cyber Attacks: A Kill Chain Analysis
HHS Room 1208	9:55-10:15am	Dickey	Katelyn	From Civil Unrest to Radicalized Social Movements: Extrapolating Trends from the "Arab Spring" Movements
HHS Room 1208	10:35-10:55am	Carr	Christina	How to Stay Current with the Technological Changes and Cyber Security Threats
HHS Room 1208	11:00-11:40am	Bourgon Jenner Mahoney Mai Pelzer	JP Rachael Kaitlyn Vivi LeeAnne	RFID in the Healthcare Industry
HHS Room 1208	1:10-1:30pm	Baxter	Austin	Current and Future Threats to the Internet of Things
HHS Room 1208	1:35-1:55pm	Barton	Sidney	Scenarios for the End of ISIL
HHS Room 1208	2:00-2:20pm	Hussey	Katherine	The Assessment of Methods Used to Conduct Security Breaches on Multinational Corporations
HHS Room 1208	3:15-3:35pm	Creech	Lewis	US/Europe Intelligence Study
HHS Room 1208	3:40-4:00pm	Wood	Tyler	Snack Food Industry Analysis for PepsiCo
HHS Room 1208	4:05-4:25pm	Panozo	Jorge	Assessing the Significance of the Republic of Kosovo's Developing and Independent State Recognition
ISAT/CS Room 259	9:00-9:25am	Graupp Smith, II	Sarah Patrick	The Sovereign Citizens Movement - "The Spread of Vigilantism"
ISAT/CS Room 259	9:30-9:55am	Christensen Schaeufele	Sarah Emily	Disease Detection through Social Media
ISAT/CS Room 259	10:00-10:35am	Larson Silva Smith Woollums	Ryan Justen Savannah Kayla	Assessing the Feasibility and Implications of a Caliphate Founded Upon Terrorism
ISAT/CS Room 259	12:35-1:05pm	Ambrogi Clowser McEvoy	Michael Justin Kevin	Indicators of Hezbollah's Global Infiltration and Their Potential Presence in Mexico
ISAT/CS Room 259	2:00-2:30pm	Bodenheimer Colwell Johnson	Michael Tyler Tanner	Data Fusion: A Methodology Development

**INTELLIGENCE ANALYSIS PROGRAM - Presentations Listed by Room Number**

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
ISAT/CS Room 259	2:35-3:10pm	Choi	Christine	What Role Will Banks Have in 2045?
		Galante	Karlyn	
		Hughes	Garrett	
		Piccinni	Mia	
ISAT/CS Room 259	3:15-3:45pm	Evans	Benjamin	The Intergration of the Internet of Things into the Federal Workforce
		Meek	Moran	
		Restivo	Ryan	
ISAT/CS Room 259	3:50-4:25pm	Cracknell	Stephen	Model of Instability Metrics for US Decision Making Support
		Fialdini	Kristen	
		Fraser	Ryan	
		Troxel	David	
ISAT/CS Room 259	4:30-4:55pm	Checknita Liddell	Gary Scott	Bitcoin: Potential Future Regulation Towards Crypto-Currencies

### GEOGRAPHIC SCIENCE PROGRAM - Presentations Listed by Room Number

Presentation Room Number	Presentation Time	Student Last Name	Student First Name	Capstone Title
HHS Room 1202	9:00-9:25am	Stickman, Jr.	Ralph	Sustainable Agriculture
HHS Room 1202	9:30-10:10am	Wallace Horrocks Doescher	Anne Ryan Kyle	JMU Car-Free Commute Week
HHS Room 1202	10:15-10:55am	Foery Sturm	Joshua Philip	Mapping Soil Erosion Risk and Safety Factors of the Massanutten Trail System
HHS Room 1202	11:00-11:30am	Burdick Sonnenfeld	Kellie Casey	An Analysis of Cloud-to-Ground Lightning Hotspots in Nashville, Tennessee
HHS Room 1202	11:35-11:55am	Gibb	Nicholas	Lightning Outbreaks in Nashville, Tennessee Due to Urban Heat Island Effect
HHS Room 1202	12:00-12:25pm	Franks	John	Spatial analysis of lightning characteristics within derecho producing thunderstorm complexes
HHS Room 1202	1:00-1:25pm	Spoehn	Colin	Creation of Weighted Thiessen Polygons using Python
HHS Room 1202	1:30-1:55pm	Bishop	Katherine	Internet based mapping for analyzing spatial patterns of stray cats and dogs
HHS Room 1202	2:00-2:25pm	Smith	Allison	Mapping Virginia Wineries and Wine Trails
Poster Presentation HHS 1202	2:30-2:55pm	Nemeth	Kevin	Invasive Species at Multiple Scales
Poster Presentation HHS Room 1202	3:00-3:25pm	Mlcoch	Jesse	Mapping Urban Spaces of Absence: Applications of Counter Cartography in Local Urban Sustainability Studies

**PRESENTATIONS LISTED BY TIME**

<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
9:00-9:25am	Johnshon	Codey	31	ISAT/CS Room 346	Dr. Ronald Raab
9:00-9:25am	Kearney	John	31	ISAT/CS Room 346	Dr. Ronald Raab
9:00-9:25am	Graupp	Sarah	69	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
9:00-9:25am	Smith, II	Patrick	69	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
9:00-9:25am	Stickman, Jr.	Ralph	77	HHS Room 1202	Dr. Wayne Teel
9:00-9:40am	August	Jessanna	40	ISAT/CS Room 348	Dr. Thomas Benzing
9:00-9:40 am	Bell	Tyler	50	ISAT/CS Room 350	Dr. Geoffrey Egekwu
9:00-9:40am	Chamberlain	Alexander	23	ISAT/CS Room 337	Dr. Emil Salib
9:00-9:40am	Healey	Ian	23	ISAT/CS Room 337	Dr. Emil Salib
9:00-9:40 am	Martin	Alex	50	ISAT/CS Room 350	Dr. Geoffrey Egekwu
9:00-9:40am	Shipman	Caitlin	40	ISAT/CS Room 348	Dr. Thomas Benzing
9:00-9:40 am	Wood	Joshua	50	ISAT/CS Room 350	Dr. Geoffrey Egekwu
9:05-9:25am	Derr	Nicholas	62	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
9:30-9:50am	Poole	Jacob	62	HHS Room 1208	Dr. Jeffrey Tang
9:30-9:55am	Borg	Devin	32	ISAT/CS Room 346	Dr. Ronald Raab
9:30-9:55am	Christensen	Sarah	70	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
9:30-9:55am	Schaeufele	Emily	70	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
9:30-10:10am	Doescher	Kyle	78	HHS Room 1202	Dr. Wayne Teel
9:30-10:10am	Horrocks	Ryan	78	HHS Room 1202	Dr. Wayne Teel
9:30-10:10am	Wallace□	Anne	78	HHS Room 1202	Dr. Wayne Teel

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<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
9:45-10:10am	Driscoll	Willie	51	ISAT/CS Room 350	Dr. Geoffrey Egekwu
9:45-10:10am	Foster	Benjamin	41	ISAT/CS Room 348	Dr. Thomas Benzing
9:45-10:25 am	Chance	Dylan	24	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
9:45-10:25am	Moellers	Cassidy	24	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
9:45-10:25am	Spinosa	Robert	24	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
9:55-10:15am	Dickey	Katelyn	63	HHS Room 1208	Dr. Noel Hendrickson and Dr. Jeffrey Tang
10:00-10:25am	Mathias	Andrew	61	HHS Room 3022	Dr. Emil Salib
10:00-10:35am	Larson	Ryan	71	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
10:00-10:35am	Silva	Justen	71	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
10:00-10:35am	Smith	Savannah	71	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
10:00-10:35am	Woollums	Kayla	71	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
10:00-10:40am	Linden	Louis	10	ISAT/CS Room 136	Dr. Karim Altaï
10:00-10:40am	Nichols	Jonathan	10	ISAT/CS Room 136	Dr. Karim Altaï
10:00-10:40am	Peebles	Shannon	10	ISAT/CS Room 136	Dr. Karim Altaï
10:00-10:40am	Simmons	Jonathan	33	ISAT/CS Room 346	Dr. Ronald Raab
10:15-10:40am	Edwards	Brody	42	ISAT/CS Room 348	Dr. Robert Brent
10:15-10:40am	Tanner	Christian	52	ISAT/CS Room 350	Dr. Geoffrey Egekwu and Mr. Mark Showalter
10:15-10:55am	Foery	Joshua□	79	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash
10:15-10:55am	Sturm	Philip	79	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash

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<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
10:30-11:10am	Campbell	Benjamin	25	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
10:30-11:10am	Walisko	Eric	25	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
10:35-10:55am	Carr	Christina	64	HHS Room 1208	Dr. Edna Reid and Dr. Jeffrey Tang
10:45-11:10am	Cline	Christian	53	ISAT/CS Room 350	Dr. Geoffrey Egekwu
10:45-11:10am	Falterman	Seraphim D.	11	ISAT/CS Room 136	Dr. Karim Altaï
10:45-11:10am	Schechtel	Hannah	43	ISAT/CS Room 348	Dr. Robert Brent
11:00-11:30am	Burdick□	Kellie□	80	HHS Room 1202	Dr. Mace Bentley
11:00-11:30am	Sonnenfeld	Casey	80	HHS Room 1202	Dr. Mace Bentley
11:00-11:40am	Bourgon	JP	64	HHS Room 1208	Dr. Jeffrey Tang and Dr. Geoffrey Egekwu
11:00-11:40am	Jenner	Rachael	64	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
11:00-11:40am	Mahoney	Kaitlyn	64	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
11:00-11:40am	Mai	Vivi	64	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
11:00-11:40am	Pelzer	LeeAnne	64	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
11:15-11:40am	Hasselquist	Anders	12	ISAT/CS Room 136	Dr. Karim Altaï
11:35-11:55am	Gibb	Nicholas	81	HHS Room 1202	Dr. Mace Bentley
11:45-12:25pm	Torres	Martin	13	ISAT/CS Room 136	Dr. Karim Altaï
11:45-12:25pm	Wos	Adrian	13	ISAT/CS Room 136	Dr. Karim Altaï
12:00-12:25pm	Franks	John	82	HHS Room 1202	Dr. Mace Bentley
12:35-1:05pm	Ambrogi	Michael	72	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin



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<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
12:35-1:05pm	Clowser	Justin	72	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
12:35-1:05pm	McEvoy	Kevin	72	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
1:00-1:25pm	Spohn	Colin	83	HHS Room 1202	Dr. Helmut Kraenzle
1:10-1:30pm	Baxter	Austin	65	HHS Room 1208	Dr. Noel Hendrickson and Dr. Stephen Marrin
1:30-1:55pm	Bishop	Katherine	84	HHS Room 1202	Dr. Amy Goodall and Dr. Ian Muehlenhaus
1:35-1:55pm	Barton	Sidney	66	HHS Room 1208	Dr. Stephen Marrin
2:00-2:20pm	Hussey	Katherine	66	HHS Room 1208	Dr. Stephen Marrin and Dr. Noel Hendrickson
2:00-2:25pm	MacLeish	Maggie	54	ISAT/CS Room 350	Dr. Abdelrahman Rabie
2:00-2:25pm	Smith	Allison	85	HHS Room 1202	Dr. Ian Muehlenhaus
2:00-2:30pm	Bodenheimer	Michael	73	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
2:00-2:30pm	Colwell	Tyler	73	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
2:00-2:30pm	Johnson	Tanner	73	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
2:00-2:40pm	Galvan	Hector	44	ISAT/CS Room 348	Dr. Steve Frysinger
2:00-2:40pm	Herbold	Thomas	34	ISAT/CS Room 346	Dr. Tony Chen
2:00-2:40pm	Karadsheh	Bassel	34	ISAT/CS Room 346	Dr. Tony Chen
2:00-2:40pm	Mihalkovic	Christopher	44	ISAT/CS Room 348	Dr. Steve Frysinger
2:00-2:40pm	Palamone	Jordan	44	ISAT/CS Room 348	Dr. Steve Frysinger
2:15-2:40pm	Cotting	Ashleigh	17	ISAT/CS Room 148	Mr. Paul Goodall
2:30-2:55pm	Lacey	Chris	55	ISAT/CS Room 350	Dr. Abdelrahman Rabie

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<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
2:30-2:55pm	Nemeth	Kevin	86	Poster Presentation HHS 1202	Dr. Amy Goodall
2:30-3:10pm	Mateo	Deisy	27	ISAT/CS Room 337	Dr. Samy El-Tawab
2:30-3:10pm	Phelan	Matthew	27	ISAT/CS Room 337	Dr. Samy El-Tawab
2:35-3:10pm	Choi	Christine	73	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
2:35-3:10pm	Galante	Karlyn	73	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
2:35-3:10pm	Hughes	Garrett	73	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
2:35-3:10pm	Piccininni	Mia	73	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
2:40-3:10pm	Morra	Nathaniel	14	ISAT/CS Room 136	Dr. Eric Pappas
2:45-3:10pm	Liao	Joseph	18	ISAT/CS Room 148	Mr. Paul Goodall
2:45-3:10pm	Ponn	Allyson	45	ISAT/CS Room 348	Dr. Mary Handley
2:45-3:25pm	Campbell	Collin	35	ISAT/CS Room 346	Dr. Tony Chen
2:45-3:25pm	Dewey	Kyle	35	ISAT/CS Room 346	Dr. Tony Chen
2:45-3:25pm	Labriola	Cody	35	ISAT/CS Room 346	Dr. Tony Chen
3:00-3:25pm	Mlcoch	Jesse	87	Poster Presentation HHS Room 1202	Dr. Henry Way
3:00-3:40pm	Buchanan□	Cody	56	ISAT/CS Room 350	Dr. Christopher Bachmann
3:00-3:40pm	Hart	Derek	56	ISAT/CS Room 350	Dr. Christopher Bachmann
3:15-3:35pm	Creech	Lewis	67	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
3:15-3:40pm	Allison	Corey	19	ISAT/CS Room 148	Dr. Jonathan Miles
3:15-3:40pm	Andersen	Susan	46	ISAT/CS Room 348	Dr. Carole Nash

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<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
3:15-3:40pm	DeGutis	Erin	26	ISAT/CS Room 136	Dr. Anthony Teate
3:15-3:45pm	Evans	Benjamin	74	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
3:15-3:45pm	Meek	Morgan	74	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
3:15-3:45pm	Restivo	Ryan	74	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
3:15-3:55pm	Ellingworth	Ross	28	ISAT/CS Room 337	Dr. Samy El-Tawab
3:15-3:55pm	Nguyen	Michael	28	ISAT/CS Room 337	Dr. Samy El-Tawab
3:15-3:55pm	Sheehan	Colin	28	ISAT/CS Room 337	Dr. Samy El-Tawab
3:30-3:55pm	Arzaga	Nicklas	36	ISAT/CS Room 346	Dr. Tony Chen
3:40-4:00pm	Wood	Tyler	67	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
3:45-4:10pm	Langouet-Astrie	Christophe	57	ISAT/CS Room 350	Dr. Louise Temple Dr. Timothy Bloss Dr. Amanda Biesecker
3:45-4:10pm	Merrick	James	20	ISAT/CS Room 148	Dr. Maria Papadakis
3:45-4:20pm	Heyn	Nathan	15	ISAT/CS Room 136	Dr. Stephanie Stockwell
3:45-4:20pm	Wong	Serena	15	ISAT/CS Room 136	Dr. Stephanie Stockwell
3:45-4:25pm	Guthrie	Sara	47	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
3:45-4:25pm	Lucas,III	Donald	47	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
3:45-4:25pm	Vaughan	Christopher	47	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
3:45-4:25pm	Vaughan	Jonathan	47	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
3:50-4:25pm	Cracknell	Stephen	75	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
3:50-4:25pm	Fialdini	Kristen	75	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin

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3:50-4:25pm	Fraser	Ryan□	75	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
3:50-4:25pm	Troxel	David	75	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
4:00-4:40pm	Bolen	Robert	29	ISAT/CS Room 337	Dr. Samy El-Tawab
4:00-4:40pm	Fencil	James	29	ISAT/CS Room 337	Dr. Samy El-Tawab
4:00-4:40pm	Kacsmar	Lindsey	37	ISAT/CS Room 346	Dr. Jennifer Coffman
4:00-4:40pm	Major	Connor	29	ISAT/CS Room 337	Dr. Samy El-Tawab
4:00-4:40pm	Wilkes	Leah	37	ISAT/CS Room 346	Dr. Jennifer Coffman
4:05-4:25pm	Panozo	Jorge	68	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
4:15-4:40pm	Carter	Brandon	58	ISAT/CS Room 350	Dr. Louise Temple
4:15-4:40pm	Whitlock	Andrew	21	ISAT/CS Room 148	Dr. Maria Papadakis
4:25-4:50pm	Hoy	Andrew	16	ISAT/CS Room 136	Dr. Stephanie Stockwell
4:30-4:55pm	Checknita	Gary	76	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
4:30-4:55pm	Liddell	Scott	76	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
4:30-5:10pm	Kugler	Joshua	48	ISAT/CS Room 348	Dr. Wayne Teel
4:30-5:10pm	Mulcahy	Kevin	48	ISAT/CS Room 348	Dr. Wayne Teel
4:45-5:10pm	Brooks	Colin	59	ISAT/CS Room 350	Dr. Louise Temple
4:45-5:10pm	Dawkins	Reyna	38	ISAT/CS Room 346	Dr. Jennifer Coffman
4:45-5:25pm	Glenn	Shellenberger	22	ISAT/CS Room 148	Dr. Maria Papadakis and Dr. Carole Nash

**PRESENTATIONS LISTED BY TIME**

<b>Presentation Time</b>	<b>Student Last Name</b>	<b>Student First Name</b>	<b>Abstract Page Number</b>	<b>Presentation Room Number</b>	<b>Capstone Advisor</b>
4:45-5:25pm	Minor	Cameron	30	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu
4:45-5:25pm	Townsend	Zachary	22	ISAT/CS Room 148	Dr. Maria Papadakis and Dr. Carole Nash
4:45-5:25pm	Virga	Justin	30	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu
5:15-5:40pm	Nguyen	Tina	39	ISAT/CS Room 346	Dr. Shannon Conley and Dr. Morgan Benton
5:15-5:40pm	Sutton	Jarod	60	ISAT/CS Room 350	Dr. Geoffrey Egekwu
5:15-5:40pm	White	Brandon	49	ISAT/CS Room 348	Dr. Wayne Teel

**BSISAT PROGRAM – Presenters Listed by Abstract Page Number and Last Name**

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Allison	Corey	19	3:15-3:40pm	ISAT/CS Room 148	Dr. Jonathan Miles
Andersen	Susan	46	3:15-3:40pm	ISAT/CS Room 348	Dr. Carole Nash
Arzaga	Nicklas	36	3:30-3:55pm	ISAT/CS Room 346	Dr. Tony Chen
August	Jessanna	40	9:00-9:40am	ISAT/CS Room 348	Dr. Thomas Benzing
Bell	Tyler	50	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Bolen	Robert	29	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Borg	Devin	32	9:30-9:55am	ISAT/CS Room 346	Dr. Ronald Raab
Brooks	Colin	59	4:45-5:10pm	ISAT/CS Room 350	Dr. Louise Temple
Buchanan	Cody	56	3:00-3:40pm	ISAT/CS Room 350	Dr. Christopher Bachmann
Campbell	Benjamin	25	10:30-11:10am	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
Campbell	Collin	35	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Carter	Brandon	58	4:15-4:40pm	ISAT/CS Room 350	Dr. Louise Temple
Chamberlain	Alexander	23	9:00-9:40am	ISAT/CS Room 337	Dr. Emil Salib
Chance	Dylan	24	9:45-10:25 am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Cline	Christian	53	10:45-11:10am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Cotting	Ashleigh	17	2:15-2:40pm	ISAT/CS Room 148	Mr. Paul Goodall
Dawkins	Reyna	38	4:45-5:10pm	ISAT/CS Room 346	Dr. Jennifer Coffman

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
DeGutis	Erin	26	3:15-3:40pm	ISAT/CS Room 136	Dr. Anthony Teate
Dewey	Kyle	35	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Driscoll	Willie	51	9:45-10:10am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Edwards	Brody	42	10:15-10:40am	ISAT/CS Room 348	Dr. Robert Brent
Ellingworth	Ross	28	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Falterman	Seraphim D.	11	10:45-11:10am	ISAT/CS Room 136	Dr. Karim Altaï
Fencil	James	29	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Foster	Benjamin	41	9:45-10:10am	ISAT/CS Room 348	Dr. Thomas Benzing
Galvan	Hector	44	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Guthrie	Sara	47	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Hart	Derek	56	3:00-3:40pm	ISAT/CS Room 350	Dr. Christopher Bachmann
Hasselquist	Anders	12	11:15-11:40am	ISAT/CS Room 136	Dr. Karim Altaï
Healey	Ian	23	9:00-9:40am	ISAT/CS Room 337	Dr. Emil Salib
Herbold	Thomas	34	2:00-2:40pm	ISAT/CS Room 346	Dr. Tony Chen
Heyn	Nathan	15	3:45-4:20pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Hoy	Andrew	16	4:25-4:50pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Johnson	Codey	31	9:00-9:25am	ISAT/CS Room 346	Dr. Ronald Raab
Kacsmar	Lindsey	37	4:00-4:40pm	ISAT/CS Room 346	Dr. Jennifer Coffman

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Karadsheh	Bassel	34	2:00-2:40pm	ISAT/CS Room 346	Dr. Tony Chen
Kearney	John	31	9:00-9:25am	ISAT/CS Room 346	Dr. Ronald Raab
Kugler	Joshua	48	4:30-5:10pm	ISAT/CS Room 348	Dr. Wayne Teel
Labriola	Cody	35	2:45-3:25pm	ISAT/CS Room 346	Dr. Tony Chen
Lacey	Chris	55	2:30-2:55pm	ISAT/CS Room 350	Dr. Abdelrahman Rabie
Langouet-Astrie	Christophe	57	3:45-4:10pm	ISAT/CS Room 350	Dr. Louise Temple Dr. Timothy Bloss Dr. Amanda Biesecker
Liao	Joseph	18	2:45-3:10pm	ISAT/CS Room 148	Mr. Paul Goodall
Linden	Louis	10	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaï
Lucas, III	Donald	47	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
MacLeish	Maggie	54	2:00-2:25pm	ISAT/CS Room 350	Dr. Abdelrahman Rabie
Major	Connor	29	4:00-4:40pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Martin	Alex	50	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Mateo	Deisy	27	2:30-3:10pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Mathias	Andrew	61	10:00-10:25am	HHS Room 3022	Dr. Emil Salib
Merrick	James	20	3:45-4:10pm	ISAT/CS Room 148	Dr. Maria Papadakis
Mihalkovic	Christopher	44	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Minor	Cameron	30	4:45-5:25pm	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu



Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Moellers	Cassidy	24	9:45-10:25am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Morra	Nathaniel	14	2:40-3:10pm	ISAT/CS Room 136	Dr. Eric Pappas
Mulcahy	Kevin	48	4:30-5:10pm	ISAT/CS Room 348	Dr. Wayne Teel
Nguyen	Michael	28	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Nguyen	Tina	39	5:15-5:40pm	ISAT/CS Room 346	Dr. Shannon Conley and Dr. Morgan Benton
Nichols	Jonathan	10	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaï
Palamone	Jordan	44	2:00-2:40pm	ISAT/CS Room 348	Dr. Steve Frysinger
Peebles	Shannon	10	10:00-10:40am	ISAT/CS Room 136	Dr. Karim Altaï
Phelan	Matthew	27	2:30-3:10pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Ponn	Allyson	45	2:45-3:10pm	ISAT/CS Room 348	Dr. Mary Handley
Schechtel	Hannah	43	10:45-11:10am	ISAT/CS Room 348	Dr. Robert Brent
Sheehan	Colin	28	3:15-3:55pm	ISAT/CS Room 337	Dr. Samy El-Tawab
Shellenberger	Glenn	22	4:45-5:25pm	ISAT/CS Room 148	Dr. Maria Papadakis & Dr. Carole Nash
Shipman	Caitlin	40	9:00-9:40am	ISAT/CS Room 348	Dr. Thomas Benzing
Simmons	Jonathan	33	10:00-10:40am	ISAT/CS Room 346	Dr. Ronald Raab
Spinosa	Robert	24	9:45-10:25am	ISAT/CS Room 337	Dr. Nicole Radziwill and Dr. Morgan Benton
Sutton	Jarod	60	5:15-5:40pm	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Tanner	Christian	52	10:15-10:40am	ISAT/CS Room 350	Dr. Geoffrey Egekwu and Mr. Mark Showalter

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Torres	Martin	13	11:45-12:25pm	ISAT/CS Room 136	Dr. Karim Altaii
Townsend	Zachary	22	4:45-5:25pm	ISAT/CS Room 148	Dr. Maria Papadakis & Dr. Carole Nash
Vaughan	Christopher	47	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Vaughan	Jonathan	47	3:45-4:25pm	ISAT/CS Room 348	Dr. Wayne Teel and Dr. Joy Ferenbaugh
Virga	Justin	30	4:45-5:25pm	ISAT/CS Room 337	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu
Walisko	Eric	25	10:30-11:10am	ISAT/CS Room 337	Dr. Morgan Benton and Dr. Nicole Radziwill
White	Brandon	49	5:15-5:40pm	ISAT/CS Room 348	Dr. Wayne Teel
Whitlock	Andrew	21	4:15-4:40pm	ISAT/CS Room 148	Dr. Maria Papadakis
Wilkes	Leah	37	4:00-4:40pm	ISAT/CS Room 346	Dr. Jennifer Coffman
Wong	Serena	15	3:45-4:20pm	ISAT/CS Room 136	Dr. Stephanie Stockwell
Wood	Joshua	50	9:00-9:40 am	ISAT/CS Room 350	Dr. Geoffrey Egekwu
Wos	Adrian	13	11:45-12:25pm	ISAT/CS Room 136	Dr. Karim Altaii

**INTELLIGENCE ANALYSIS PROGRAM – Presenters Listed by Abstract Page Number and Last Name**

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Ambrogi	Michael	72	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Barton	Sidney	66	1:35-1:55pm	HHS Room 1208	Dr. Stephen Marrin
Baxter	Austin	65	1:10-1:30pm	HHS Room 1208	Dr. Noel Hendrickson and Dr. Stephen Marrin
Bodenheimer	Michael	73	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Bourgon	JP	64	11:00-11:40am	HHS Room 1208	Dr. Jeffrey Tang and Dr. Geoffrey Egekwu
Carr	Christina	64	10:35-10:55am	HHS Room 1208	Dr. Edna Reid and Dr. Jeffrey Tang
Checknita	Gary	76	4:30-4:55pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
Choi	Christine	73	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Christensen	Sarah	70	9:30-9:55am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
Clowser	Justin	72	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Colwell	Tyler	73	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Cracknell	Stephen	75	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Creech	Lewis	67	3:15-3:35pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Derr	Nicholas	62	9:05-9:25am	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Dickey	Katelyn	63	9:55-10:15am	HHS Room 1208	Dr. Noel Hendrickson and Dr. Jeffrey Tang
Evans	Benjamin	74	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Fialdini	Kristen	75	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Fraser	Ryan	75	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Galante	Karlynn	73	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Graupp	Sarah	69	9:00-9:25am	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
Hughes	Garrett	73	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Hussey	Katherine	66	2:00-2:20pm	HHS Room 1208	Dr. Stephen Marrin and Dr. Noel Hendrickson
Jenner	Rachael	64	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
Johnson	Tanner	73	2:00-2:30pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Jeffrey Tang, and Dr. Anthony Teate
Larson	Ryan	71	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Liddell	Scott	76	4:30-4:55pm	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin and, Dr. Timothy Walton
Mahoney	Kaitlyn	64	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
Mai	Vivi	64	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang
McEvoy	Kevin	72	12:35-1:05pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Stephen Marrin
Meek	Morgan	74	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Panozo	Jorge	68	4:05-4:25pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Pelzer	LeeAnne	64	11:00-11:40am	HHS Room 1208	Dr. Geoffrey Egekwu and Dr. Jeffrey Tang

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Piccininni	Mia	73	2:35-3:10pm	ISAT/CS Room 259	Dr. Michael Deaton and Dr. Jeffrey Tang
Poole	Jacob	62	9:30-9:50am	HHS Room 1208	Dr. Jeffrey Tang
Restivo	Ryan	74	3:15-3:45pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Schaeufele	Emily	70	9:30-9:55am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Stephen Marrin and, Dr. Timothy Walton
Silva	Justen	71	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Smith	Savannah	71	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin
Smith, II	Pat	69	9:00-9:25am	ISAT/CS Room 259	Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin
Troxel	David	75	3:50-4:25pm	ISAT/CS Room 259	Dr. Noel Hendrickson and Dr. Stephen Marrin
Wood	Tyler	67	3:40-4:00pm	HHS Room 1208	Dr. Jeffrey Tang and Dr. Timothy Walton
Woollums	Kayla	71	10:00-10:35am	ISAT/CS Room 259	Dr. Michael Deaton, Dr. Noel Hendrickson and, Dr. Stephen Marrin

**GEOGRAPHIC SCIENCE PROGRAM – Presenters listed by Abstract Page Number and Last Name**

Student Last Name	Student First Name	Abstract Page Number	Presentation Time	Presentation Room Number	Capstone Advisor
Bishop	Katherine	84	1:30-1:55pm	HHS Room 1202	Dr. Amy Goodall and Dr. Ian Muehlenhaus
Burdick	Kellie	80	11:00-11:30am	HHS Room 1202	Dr. Mace Bentley
Doescher	Kyle	78	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel
Foery	Joshua	79	10:15-10:55am	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash
Franks	John	82	12:00-12:25pm	HHS Room 1202	Dr. Mace Bentley
Gibb	Nicholas	81	11:35-11:55am	HHS Room 1202	Dr. Mace Bentley
Horrocks	Ryan	78	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel
Mlcoch	Jesse	87	3:00-3:25pm	Poster Presentation HHS Room 1202	Dr. Henry Way
Nemeth	Kevin	86	2:30-2:55pm	Poster Presentation HHS 1202	Dr. Amy Goodall
Smith	Allison	85	2:00-2:25pm	HHS Room 1202	Dr. Ian Muehlenhaus
Sonnenfeld	Casey	80	11:00-11:30am	HHS Room 1202	Dr. Mace Bentley
Spohn	Colin	83	1:00-1:25pm	HHS Room 1202	Dr. Helmut Kraenzle
Stickman, Jr.	Ralph	77	9:00-9:25am	HHS Room 1202	Dr. Wayne Teel
Sturm	Philip	79	10:15-10:55am	HHS Room 1202	Dr. Zachary Bortolot and Dr. Carole Nash
Wallace	Anne	78	9:30-10:10am	HHS Room 1202	Dr. Wayne Teel

## BSISAT Program

### Presentation Room: ISAT/CS Room 136

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Time: 10:00-10:40 am  
Presenters: Shannon Peebles, Louis Linden, and Jonathan Nichols  
Concentration: Energy  
Capstone Advisor: Dr. Karim Altaï  
Capstone Title: MillerCoors Administrative Building Energy Model

#### **Abstract:**

This project was undertaken to model energy consumption within the Administrative Building at MillerCoors Manufacturing Plant in Elkton, VA. Using eQuest® software and information gathered from the MillerCoors facility, a model for energy consumption was created. It was determined that the building has an annual electricity consumption of approximately 1008 MWh, with 40% of the electric consumption from heating, 17% from cooling and 20% from lighting. Alternate scenarios of plant operations were modelled to determine energy savings opportunities. Parameters changed for alternative scenarios include cooling temperature setpoints, heating temperature setpoints, variable frequency drives, nighttime setback, and alternate zoning. After completion of this project MillerCoors will have a fully functional energy consumption model that can be run to analyze any future energy saving measures.



## BSISAT Program

### Presentation Room: ISAT/CS Room 136

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Time: 10:45-11:10am  
Presenter: Seraphim Daniel Falterman  
Concentration: Energy, Agriculture, Environment and Sustainability  
Capstone Advisor: Dr. Karim Altai  
Sponsor: Hermitage of the Holy Cross  
Title: Hermitage of the Holy Cross, a monastic community of the Russian Orthodox Church Abroad

#### **Abstract:**

Hermitage of the Holy Cross is a men's monastery of the Russian Orthodox Church Outside of Russia located near Wayne, West Virginia. This remote location is geographically removed from much of modern life. The monastery is currently growing quickly with many people attracted to



the monastic life of prayer and repentance. The monks work very hard, earning money through their crafts and saving it by doing much of the labor at the monastery themselves. There is no room for waste at the monastery. The purpose of this project is to help the monastery reduce their physical energy use and reduce their monthly bills. Physical energy use was assessed using direct metering of equipment, modeling of buildings and thermal imaging. Metering was done using KILL-A-WATT<sup>®</sup>, Watts-Up<sup>®</sup> and TED<sup>®</sup> meters. Modeling was done with Excel<sup>®</sup>. BEopt<sup>®</sup> and eQuest<sup>®</sup> are currently being used to develop more complex models of a particular building. A FLIR E-40 camera was used for thermal imaging of buildings. A billing analysis was also performed to gain insight into how energy used by the monastery is metered and then charged. This analysis provided insight into possible alternative billing arrangements as cost reduction measures. These tools were used to gather information and construct an understanding of the monastery's workings in terms of energy. This understanding was used to match the identified energy saving opportunities and to energy saving measures appropriate for the atypical monastic stakeholders at Hermitage of the Holy Cross.



## BSISAT Program

### Presentation Room: ISAT/CS Room 136

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Time: 11:15-11:40am  
Presenter: Anders Hasselquist  
Concentration: Applied Biotech, Energy, Environment  
Capstone Advisor: Dr. Karim Altaï  
Sponsor: Mr. Joe Calderon - Punta Leona Hotel and Club  
Capstone Title: Installation of a Photovoltaic Lighting System and Energy Monitors at Punta Leona Hotel and Club

#### **Abstract:**

Beginning in the spring of 2014, students of James Madison University worked closely with Punta Leona Hotel and Club. In a three week program, several projects were completed focusing around creating a more sustainable environment. Punta Leona is a resort taking up several acres located on the western coast of Costa Rica. For years this partnership has led to the development of several projects that Punta

Leona uses to not only reduce their impact on the environment, but to educate their employees, guests, and visitors. Costa Rica has been a leader in renewable energy for years. According to the CIA World Factbook, 67.6% of their electricity generation comes from renewable sources. During the first trip, a 120 Watt



photovoltaic (PV) system was designed, fabricated, and installed to power fluorescent lights in the resort's sustainable butterfly garden. Several energy monitoring devices were installed including an eMonitor® at the reception building and a three-phase TED® at the main breaker for El Leon Marino area. Since the trip, several of the projects have been worked on and completed. Three TEDs that were previously installed were fixed and put back online. A virtual private network (VPN) was then created to allowed access to these monitors outside of the resort. An eMonitor that was previously installed experienced failure in the subpanel and was replaced. All of these energy monitoring devices were compiled together and displayed on a touch screen monitor in the reception building. This monitor was placed in the manager's office for easy access to building energy consumption in an effort to find ways to reduce electricity usage.

## BSISAT Program

### Presentation Room: ISAT/CS Room 136

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Time: 11:45-12:25pm  
Presenters: Martin Torres and Adrian Wos  
Concentration: Energy, Engineering and Manufacturing  
Capstone Advisor: Dr. Karim Altaii  
Capstone Title: NatuRain: Inverted Sprinkler System

#### **Abstract:**

Gardening is becoming an increasingly popular hobby amongst Americans, as evident by the growth of the food gardening industry from \$2.5 billion to \$3.5 billion between 2009 and 2014. The purpose of this project was to improve the design, construct, and optimize an inverted sprinkler system based on Dr. Karim Altaii's patent. This system must be portable in that it can be easily moved between gardens by the average consumer. The support system must have a high degree of customization to ensure comparability with a large variety of garden shapes and sizes. Automation is accomplished through the use of a moisture sensor and timer built-in to the system. Besides constructing a prototype, this project also aimed to create a business plan for our product to enter the irrigation industry. Alexa Cassetta, a Hospitality major, and Adam Crum, a Finance major, joined our team during the completion of MGT 472: Venture Creation. This class guided us through the customer identification, market research, and finances required for our business plan. Dr. Altaii and the team will seek to create a relationship with a manufacturer if this plan proves that our product is economically feasible.



## BSISAT Program

### Presentation Room: ISAT/CS Room 136

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Time: 2:40-3:10pm  
Presenter: Nathaniel Morra  
Concentration: Applied Biotech  
Capstone Advisor: Dr. Eric Pappas  
Capstone Title: An Analysis of Air Quality In Harrisonburg, Virginia

#### **Abstract:**

Studies have shown that indoor air can be as much as six times more toxic to human health than outdoor air can be, and this project aimed to analyze the quality of both indoor and outdoor air and compare the two. Four geographically diverse locations across Harrisonburg, Virginia were chosen with care in an effort to obtain air quality readings from a residential area in a neighborhood, a rural residential area, a commercial area, and a location with proximity to Interstate 81. Using a Sensidyne BD XII Abatement Air Sampler and Draeger Tubes, the samples were taken at each location (indoor and outdoor) and recorded. They were later analyzed, and although there was an extremely small amount of each toxin in the air, it was discovered that thirty out of the thirty-two tests supported the previously done research saying that indoor air is more toxic to human health than outdoor air.



## BSISAT Program

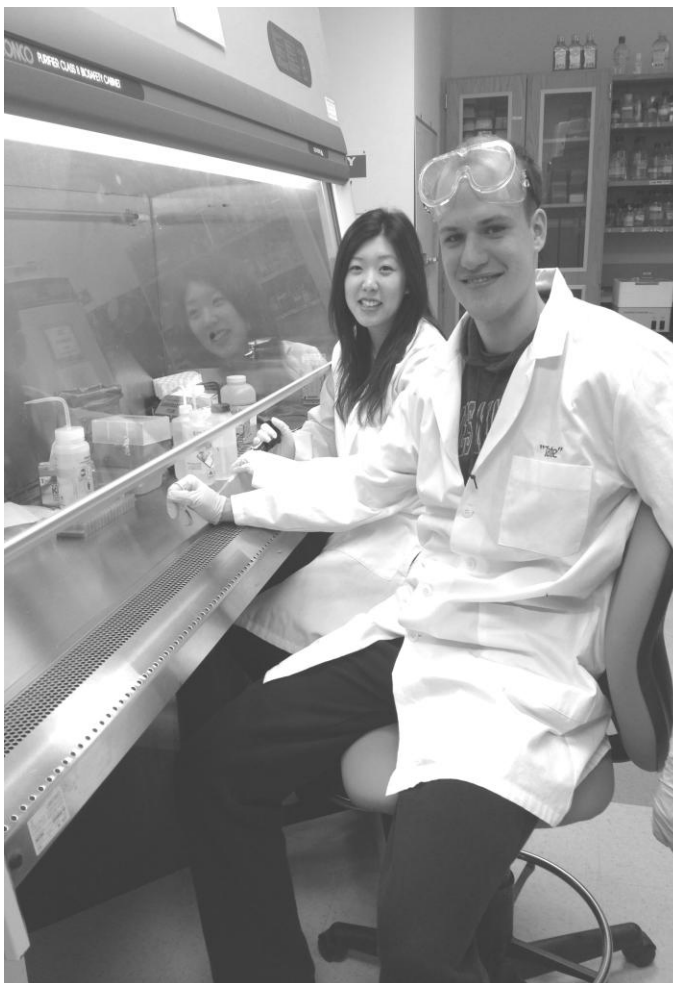
### Presentation Room: ISAT/CS Room 136

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Time: 3:45-4:20pm  
Presenters: Nathan Heyn and Serena Wong  
Concentration: Applied Biotech  
Capstone Advisor: Dr. Stephanie Stockwell  
Capstone Title: Isolation and Symbiosis-Associated Genotyping of Native *Bradyrhizobium japonicum* Strains

#### **Abstract:**

Topical use of ammonia fertilizers in agriculture can overcome nitrogen deficiency in soil; however, the problem with this approach is excess ammonia running off into local streams and waterways. To avoid these negative consequences, the symbiosis between soybean and the nitrogen fixing bacterium, *Bradyrhizobium japonicum*, can be used for soil nitrogen enrichment. In order to optimize the symbiosis, the molecular underpinnings of the plant-microbe interaction must first be understood. Ongoing studies of two *B. japonicum* lab strains have identified divergent plant signaling pathways, FegA in strain 61A152 and FhuA/EcfS in strain USDA110. This descriptive study aimed to obtain and genotype environmental isolates to provide a more accurate and thorough understanding of plant signaling pathways. Strains of *B. japonicum* were collected from agriculturally associated soil in the Harrisonburg, VA area and genotyped via polymerase chain reaction and Southern blot. Five new isolates were recovered from 20 soil samples and analyzed. Continual effort in the collection of isolates is required to accurately characterize genotype variation. Understanding genome variations will help guide genetic enhancement of the symbiosis to mitigate the need for applied fertilizers.



## BSISAT Program

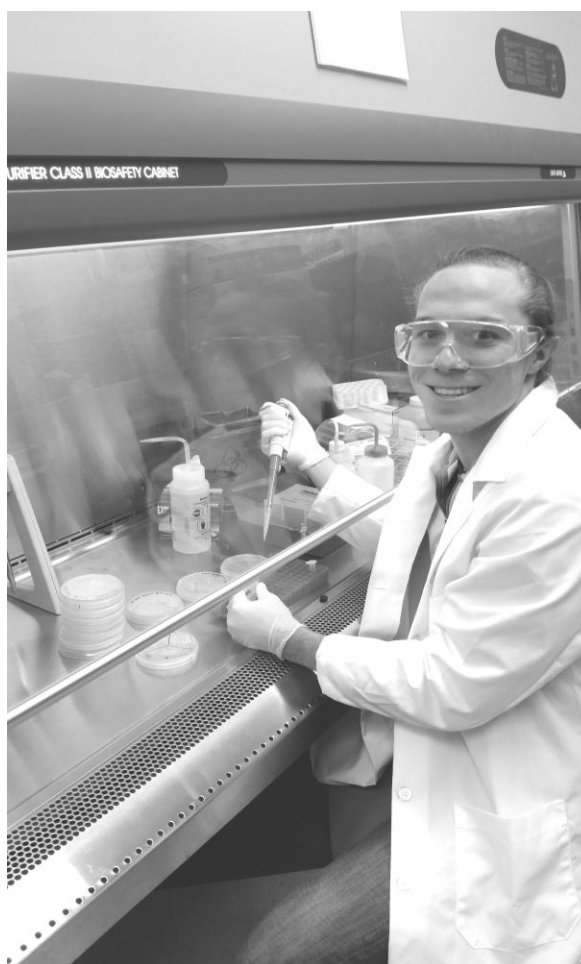
### Presentation Room: ISAT/CS Room 136

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Time: 4:25-4:50pm  
Presenter: Andrew Hoy  
Concentration: Applied Biotech  
Capstone Advisor: Dr. Stephanie Stockwell  
Capstone Title: Development of a Citizen Science Approach to Isolate Native *Bradyrhizobium japonicum* Strains

#### **Abstract:**

*Bradyrhizobium japonicum* is a Gram negative soil bacterium that is involved in a symbiotic relationship with soybean. This relationship results in useable nitrogen for the plant and enrichment of the soil to support crop rotation. Ongoing work has involved the collection of environmental *B. japonicum* strains for the genetic analysis of key symbiotic factors. To date, seven new strains have been isolated and characterized from soil samples collected from Maryland and Virginia. This process is relatively simple, yet time consuming. In order to collect the quantity of data needed to make a credible claim about the symbiotic features found in native strains, a “citizen science” approach for this study was developed. Citizen Science is the collaboration of scientists and non-scientists working towards a common goal. For this project, we partnered with 10th grade biology students from Harrisonburg High School’s STEM Academy to collect new *B. japonicum* strains from local soils. In doing so, students were exposed to and involved in inquiry-based science through firsthand, wet lab research experience. A video introduction to the project was created which included a tour of the ISAT Biomanufacturing Lab as well as tutorials of protocols modified to suit the high school lab setting. Site-visits to the high school further supported the collaborative work. By entrusting the collection phase of the project to the high school students, undergraduate researchers are now able to focus their efforts on the molecular verification and genetic analysis needed to guide the development of genetically-optimized *B. japonicum* strains.



**BSISAT Program****Presentation Room: ISAT/CS Room 148**

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Time: 2:15-2:40pm

Presenter: Ashleigh Cotting (Honors Capstone)

Concentration: Applied Biotech, Energy, Environment

Capstone Advisor: Mr. Paul Goodall

Capstone Title: A Net Zero Greenhouse Gas Emissions Feasibility Study for Green Fence Farm

**Abstract:**

The purpose of this project is to assess the ability of Green Fence Farm, a 17 acre sustainable farming operation located in Greenville, VA, to become a net zero greenhouse gas farm operation. This project was conducted in three phases. First, the types and quantities of emissions were determined using a greenhouse gas inventory of farm operations. Next, a renewable energy resource assessment was performed to determine how much solar and wind energy is available on site. Finally, sampling and calculations were used to determine the carbon sequestration capabilities of the soil and trees on the farm.

All of this information was used to develop a comprehensive plan for how Green Fence Farms can reach net zero greenhouse gas emissions through changes in farming practices, energy conservation and efficiency measures, fuel switching, and increasing carbon sequestration. The plan includes suggested steps to take, as well as cost benefit analyses for each recommendation. This project was used to create a greenhouse gas emissions reduction manual targeted so that other small farm owners may evaluate their operations as well.

This project is of global significance because agriculture is one of the world's leading sources of annual greenhouse gas emissions. Meeting the food and fiber needs of the world's growing population will require the agricultural sector to grow. However, given that the effects of global climate change continues to worsen, it is imperative that while the agricultural sector grows, its emissions do not. Reducing the greenhouse gas emissions of small farming operations is one way to lessen the global impact of the agricultural sector.

**BSISAT Program****Presentation Room: ISAT/CS Room 148**

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Time: 2:45 – 3:10 pm  
Presenter: Joseph Liao  
Concentration: Energy, Business and Technology  
Capstone Advisor: Mr. Paul Goodall  
Capstone Title: Business Model: Retrofitting Commercial Hot Water Systems with Solar Thermal Systems

**Abstract:**

The purpose of this project is to assess the ability of Green Fence Farm, a 17 acre sustainable farming operation located in Greenville, VA, to become a net zero greenhouse gas farm operation. This project was conducted in three phases. First, the types and quantities of emissions were determined using a greenhouse gas inventory of farm operations. Next, a renewable energy resource assessment was performed to determine how much solar and wind energy is available on site. Finally, sampling and calculations were used to determine the carbon sequestration capabilities of the soil and trees on the farm.

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## BSISAT Program

**Presentation Room: ISAT/CS Room 148**

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Time: 3:15-3:40pm  
Presenter: Corey Allison  
Concentration: Application of Sustainable Energy Technology  
Capstone Advisor: Dr. Jonathan Miles  
Capstone Title: Life Cycle Analysis as Applied to the Design of a Micro-wind Turbine

### **Abstract:**

A sub-category of wind turbine technology is that of micro-wind, or wind turbines generating a maximum of 1000 Watts (W). On the James Madison University (JMU) campus, the Engineering Department capstone team, "Aerodynamics and Rotors" (A&R), set out to develop and prototype a micro-turbine with an output of 10 W. In coordination with A&R, this Integrated Science and Technology (ISAT) capstone project assesses the feasibility, impacts, and potential for implementation of the turbine on the JMU campus by way of life cycle assessment (LCA). The assessment was undertaken in an effort to produce added value for the A&R design project and all associated stakeholders. Using SimaPro 7 LCA software, the turbine, its components, manufacturing processes, end-of-life disposals, and input energy requirements were assessed for total environmental and human health impacts. The turbine LCA was then compared to conventional fossil fuel energy production to determine the overall feasibility of the A&R micro-turbine and whether its implementation would prove beneficial and cost-effective on the JMU campus. Alternative turbine materials and processes were identified, assessed, and compared with the goal of optimizing overall turbine performance on and positive impacts for the JMU community. Focus was placed on the environmental and human health impact sub-categories as directly affecting the greater JMU community. Hypothetical scenarios were also created to determine the immediate costs and benefits for using and developing one turbine, multiple turbines, and an optimal number of turbines on the JMU campus versus conventional fossil fuel power. Based on the findings from this capstone project, recommendations were made to the A&R capstone team with the intention of potentially assisting in the optimization of the micro-turbine design.





**BSISAT Program****Presentation Room: ISAT/CS Room 148**

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Time: 3:45-4:10pm  
Presenter: James Merrick  
Concentration: Energy  
Capstone Advisor: Dr. Maria Papadakis  
Capstone Title: An Energy Audit and Recommendations for the Historical Emmanuel Episcopal Church

**Abstract:**

The purpose of this project was to apply modern techniques of energy auditing and conservation to a heritage structure. The building under study was the Emmanuel Episcopal Church located in Staunton, VA. Given the historical nature of the undertaking, it was crucial to achieve a balance between preservation and sustainability throughout its duration. To begin, an extensive energy audit was performed and 20 years of past energy usage data was analyzed to identify the structures greatest shortcomings and generate a breakdown of its energy load profile. Using this information, various avenues of potential energy saving options were explored and assessed to determine the most cost effective alternatives to be implemented. In conclusion, a comprehensive energy report was prepared for the churches caretakers to ensure they make informed decisions on their future investments.



**BSISAT Program****Presentation Room: ISAT/CS Room 148**

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Time: 4:15-4:40pm  
Presenter: Andrew Whitlock  
Concentration: Energy  
Capstone Advisor: Dr. Maria Papadakis  
Capstone Title: Intermodal Operations and the Roadrailer: A Feasibility Study

**Abstract:**

This research is designed to assess the feasibility of the RoadRailer<sup>®</sup>, an intermodal technology. The RoadRailer<sup>®</sup> is a trailer that is manufactured to operate on both road and rail; with its patented air-ride suspension system and detachable rail bogies, this technology provides a safe, reliable, and fuel-saving method of freight transportation. The RoadRailer<sup>®</sup>, has been around for decades, but has failed to make a large impact in the intermodal industry; this research is intended to determine why there has been a lack of interest in this technology and if there are potential growth opportunities. The assessment will include an overview of the RoadRailer<sup>®</sup>, technology and the intermodal market. Within this report, a brief history of the RoadRailer<sup>®</sup>, is presented, highlighting changes in ownership along with its many successes and failures. Its operation will be compared to other intermodal technologies that are commonly used in freight shipping to gain perspective on its usage. The forces that drive the industry along with key statistics will be presented. The technology's, benefits, barriers, and opportunities for freight shipping will be assessed. Observations and opinions of the RoadRailer<sup>®</sup>, by industry leaders will be discussed. This research is intended to provide insight on the impact of the RoadRailer<sup>®</sup>, as a viable intermodal technology.

## BSISAT Program

### Presentation Room: ISAT/CS Room 148

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Time: 4:45-5:25pm  
Presenters: Glenn Shellenberger and Zachary Townsend  
Concentration: Energy and Biotechnology  
Capstone Advisors: Dr. Maria Papadakis and Dr. Carole Nash  
Capstone Title: Rehabilitation Options for the James Madison University Farm

#### **Abstract:**

This project proposes environmentally conscious, energy efficient, and historically sensitive energy systems for Hooke House at the James Madison University Farm. Hooke House was built in the 1800s, and was acquired by JMU from the Hooke family in August 1929. The farm is located 13 miles east from the James Madison University campus on the North River. The 30-acre property consists of a 3-story Greek Revival style home, a picnic pavilion, a wood fired kiln, a 5 acre lawn, and a 25 acre forest. The farm home has had very few modifications made since its original acquisition by JMU in 1929, and is potentially eligible for the Virginia Landmarks Register and the National Register of Historic Places. The home is currently boarded up to prevent vandalism and is not a functioning building. The University has been researching the rehabilitation of the home for use by JMU as a public events space; our project proposes options for building energy systems, materials, and equipment that achieve high levels of energy performance but that are also suitable for a historic building of this kind and the types of uses being considered by JMU.



**BSISAT Program****Presentation Room: ISAT/CS Room 337**

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Time: 9:00 – 9:40 am

Presenters: Alexander Chamberlain and Ian Healey

Concentration: Information and Knowledge Management, Telecommunications

Capstone Advisor: Dr. Emil Salib

Capstone Title: Integrating a Cloud Computing Environment into JMU's Educational Resources

**Abstract:**

Today people are looking for easier, simpler, and cheaper access to their computing resources. Students are one of the many audiences that are searching for a solution to this problem and they need access to major-specific software that is often only available in a single lab on-campus. This is inconvenient and often very frustrating when students are working on a lab for a multitude of hours. Universities also bear overwhelming IT costs by constantly maintaining thousands of desktops on a day-to-day basis and also by upgrading hundreds of desktops on a yearly basis.

All of these problems can be easily solved by integrating a private cloud computing environment into JMU's educational resources. The project goal was to implement this solution and give students access to the specific software that JMU provides in its lab environments through any personal computing device. Teachers would have the ability to create a base virtual machine specific to their class or lab and administrators would be able to clone, administer, monitor, and maintain the virtual machines in a more efficient and practical manner than is currently done.

During the two years spent working on this project, a private cloud computing environment has been created and implemented within JMU's educational resources. This was accomplished using the VMware Horizon View software suite. This software suite allows student's access to cloud based virtual machines (i.e. Windows Desktops) from anywhere, either on campus or from their homes using JMU's VPN service. The implementation, thus far, has given a small number of students the ability to use their assigned cloud virtual machine anywhere at any time.

## BSISAT Program

### Presentation Room: ISAT/CS Room 337

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Time: 9:45-10:25am

Presenters: Cassidy Moellers, Dylan Chance, and Robert Spinoso (Honors Capstone)

Concentration: Information and Knowledge Management, Telecommunications, Design for User Experience

Capstone Advisors: Dr. Nicole Radziwill and Dr. Morgan Benton

Capstone Title: "Zome": An Interactive Art Piece

#### **Abstract:**

As our communities expand rapidly, both physically and digitally, we can lose our sense of connection and togetherness. Participatory art interventions cultivate community by provoking engagement in unexpected areas. In this project, an interactive zonohedral dome (or “zome”) was designed and constructed to engage participants within the art, to creating feelings of connection with the technology and with each other. A zome is a structure that supports itself solely due to its geometry. No nails or glue are used in the construction. The participative nature of the structure emerges from sensors that detect occupancy, with music and lights automatically



responding to the pattern of people entering and leaving the zome. Many technologies were combined to create this experience, including SketchUp (to design the components), Makerbot Replicator II (to build the structure), Arduino (to detect occupancy via phototransistors), LightShowPi (to generate Fast Fourier transforms of music files and control the frequency and amplitude of audio communicated via LEDs), and RaspberryPi (a microcomputer to run LightShowPi and translate the signals from the Arduino to play audio at pre-designated decibel levels). Please be aware of elevated decibel levels and flashing lights if you attend this presentation.

**BSISAT Program****Presentation Room: ISAT/CS Room 337**

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Time: 10:30-11:10am  
Presenters: Benjamin Campbell and Eric Walisko  
Concentration: Information and Knowledge Management, Software Entrepreneurship  
Capstone Advisors: Dr. Morgan Benton and Dr. Nicole Radziwill  
Capstone Title: Mobile Activity Recognition System

**Abstract:**

Staying active is an effective strategy for maintaining and improving overall health. Because sensors like accelerometers, gyroscopes and GPS receivers are now being manufactured small enough to be embedded into portable electronic devices, new wearable electronics can help users keep track of their fitness and activity levels. There are many wearables on the market that provide assistance in tracking activity data, however, they typically have additional costs and are a hassle to install and use. The Mobile Activity Recognition System (MARS) is a proof-of-concept Android application that enables its users to track their activity levels throughout the day, automatically classifying the activity types into four categories: walking, running, sitting and laying. MARS was written in Java and XML using Android Studio, and implements the Dynamic Time Warping algorithm for normalizing activity profiles, and K-Nearest Neighbors for activity classification.

**BSISAT Program****Presentation Room: ISAT/CS Room 136**

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Time: 3:15-3:40pm  
Presenter: Erin DeGutis  
Concentration: Smart Technologies and Sustainable Energy Development  
Capstone Advisor: Dr. Anthony Teate  
Capstone Title: Development of an Application for Optimizing and Economizing Photovoltaic Systems for Small Scale Consumers

**Abstract:**

Excessive consumption of energy is one of the largest problems facing the United States and the world today. As the world's population continues to grow and finite resources continue to be depleted, the utilization of renewable fuel will become more and more imperative to meet global energy demand. The development of comprehensive tools that ease the capacity of individuals and businesses to make more sustainable choices is imperative to encourage sustainability and improve the outlook on our future. The integration of mobile phones and tablets into daily living means that applications can transmit information very effectively without the same adoption barriers present in other forms of technology. The purpose of this project is to build a mobile application that can compute potential power output for small-scale photovoltaic systems. Functionality attempted includes the insolation and some basic economic analysis of proposed systems. This application is built utilizing the Kivy Python library for Android tablets. This project was designed and implemented in response to literature that suggests a major barrier in the small-scale adoption of renewable technologies is due in part to a lack of compiled technical and financial information available to non-technical audiences. The goal of this application therefore is not to educate individuals about options in renewable energy technologies but to facilitate the diffusion of otherwise difficult to obtain information so to encourage adoption.

**BSISAT Program****Presentation Room: ISAT/CS Room 337**

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Time:	2:30-3:10pm
Presenters:	Deisy Mateo and Matthew Phelan
Concentration:	Engineering and Manufacturing, Information and Knowledge Management
Capstone Advisor:	Dr. Samy El-Tawab
Capstone Title:	Simulation of the Capabilities of the Yellow Flashing Arrow Traffic Signal and Driver Response

**Abstract:**

About half of all car collisions in the United States of America occur at intersections and a third of these crashes that result in fatalities take place at signalized intersections. To reduce crashes at signalized intersections, it is necessary to investigate traffic signal phasing for safer alternatives in comparison to the current models. The yellow flashing arrow (YFA) is becoming more widely implemented across the country for protective/permissive left turn phasing, a function most commonly associated with the combination of a green arrow and circular green light (GA/CG). With well-designed research and implementation, the YFA could potentially make signalized intersections more safe and efficient.

In order to model the YFA in our senior project, we use AORTA Traffic Simulator, which is a city-scale traffic simulator, to observe and analyze its handling of left turn phasing at signalized intersections in different traffic flow conditions (Sparse, Normal and Congested - also known as traffic jam). We conduct a survey to gauge people's understanding of the YFA and other traffic signals. We then develop a simulation to study the ability of traffic to handle different types of left turn signals. In addition, we explore its capabilities with scenarios regarding timers, signal sequence and combinations of lanes. The data collected from the simulation will be used to analyze the efficiency of the YFA versus the GA/CG and flashing red arrow models.



**BSISAT Program****Presentation Room: ISAT/CS Room 337**

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Time: 3:15 – 3:55 pm

Presenters: Ross Ellingworth, Colin Sheehan, and Michael Nguyen

Concentration: Information and Knowledge Management

Advisor: Dr. Samy El-Tawab

Capstone Title: Online Textbook Exchange for James Madison University Students and Faculty

**Abstract:**

Over the last 50 years, textbook prices for college students have risen faster than college tuitions. From interviews and micro-qualitative analysis at JMU, studies show that students are overpaying for their resource materials, and compensating at the cost of increasing student loans, prioritizing job work in order to pay for their higher education, or having their parents bear this burden. Of the \$16.3 Trillion of national debt in the United States, over \$1 Trillion accounts for student debt and still rising. For a textbook bought on campus, the JMU Bookstore has already marked up the price by 47.5%, with the remaining cost deviated anywhere between 5-15% for royalties and the rest going to the publisher. In spite of the fact that students already have to pay for the cost of tuition, rent, food, etc. students continue to show that the price they pay for textbooks is too excessive, and long-term financial pressures only continue to accumulate. The separation of the purchasing decision and responsibility for payment created an unusual competitive dynamic that many believed was primarily responsible for the rapid rise in the price of textbooks. In response to this issue, JMU Textbook Exchange plans to address this social-economic problem by creating a mobile friendly web application to replace the textbook wholesalers with a service that connects potential buyers directly with sellers. Implementation of this development will be created via online interface which gives access to James Madison University students and faculty unambiguous peer-to-peer contact. The interface will be established by means of an online web application, connected to a central database for user connection and informational storage of textbook content.



## BSISAT Program

### Presentation Room: ISAT/CS Room 337

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Time: 4:00 – 4:40 pm

Presenters: Robert Bolen, James Fencil, and Connor Major

Concentration: Information and Knowledge Management

Advisor: Dr. Samy El-Tawab

Capstone Title: ISAT Alumni Connect

#### Abstract:

Alumni Connect is a mobile app as well as a website that will be utilizing an Apache web server, Laravel 5 PHP framework, MySQL Open Source Database, and Titanium Studio by Appcelerator. The major problem we look to solve is the connection between the ISAT alumni community with ISAT undergraduate students as well as faculty/staff. The idea came to our team while attending the alumni panels during the 20th Anniversary of the ISAT department. The alumni on these panels were really excited to give back to the ISAT community, but we realized there were not many ways for them to do

so. The website and the mobile application give users the opportunity to open up lines of communication that was hard to do before, hopefully leading to a more involved student body. The website will allow users to login using their personal Facebook and Google accounts using an OAuth (RESTful) API making registration quick and easy. The key component of our website and mobile application is to allow ISAT alumni to post events that students of related majors can



attend in order to give back what they have learned since graduating from JMU. *The users will also have the ability to post jobs pertaining to students of certain skills to inform students of any job openings available at their companies.* This will allow a more direct connection between alumni and students instead of having faculty/staff to be the middleman in providing this information.

## BSISAT Program

### Presentation Room: ISAT/CS Room 337

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Time:	4:45 – 5:25 pm
Presenters:	Cameron Minor and Justin Virga
Concentration:	Engineering and Manufacturing, Telecommunications
Advisors:	Dr. Samy El-Tawab and Dr. Geoffrey Egekwu
Capstone Title:	AirClock: The Wireless Whistle Game Clock Controller

#### **Abstract:**

In sporting events with a game clock where fractions of seconds may decide the outcomes of games the inherent delay in communication between officials may sway the outcome of the match. As such, the

purpose of this project was to design and build a device that allows for complete, near instant control of the game clock by a single or even multiple officials thereby eliminating the delay between signaling and clock stoppage. Through the lenses of both Manufacturing Engineering and Telecommunications we reached our goal of creating game clock controlled wirelessly through a



whistle. This was achieved through attaining a Raspberry Pi and incrementally introducing python scripts that would allow the whistle to react to a high frequency whistle input stimulus and relay a Wi-Fi signal triggering a receiver scripted to pause and un-pause the game clock. The micro processing unit was fitted with a battery pack and seated inside a CAD drawn 3D printed casing to maintain a discrete, secure and safe device that retained a low profile. With higher capital investment this product could become slimmer and more suited to its intended job. For the purpose of this project initial investment costs were minimized with an emphasis instead placed on establishing practical and desirable function.

**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 9:00-9:25am  
Presenters: Codey Johnson and John Kearney  
Concentration: Applied Biotech, Energy, Environment  
Capstone Advisor: Dr. Ronald Raab  
Capstone Title: Lacritin Site-Directed Mutagenesis

**Abstract:**

Lacritin is a prosecretory mitogen in tears that promotes basal tearing and lacrimal gland secretion. As a tear protein, it has potential use in the treatment of dry eye. Various mutagenic strategies were implemented to alter the stability and solubility of lacritin. Site-directed mutagenesis of lacritin DNA in the plasmid "pLACSL" was performed to create four mutants: L65A, K66A, S67A, and K66A - E70A, which were cloned for further studies. An experiment on the stability of the double mutant, which involves a proposed salt bridge, was conducted. In addition, the two other single mutations, K66A and S67A were studied, while L65A was not found to be a favorable candidate. Experimentation dealt with observing effects caused by both individual site mutations of S67A and K66A as well as a double mutation of K66A - E70A. From these studies, the K66A and K66A - E70A mutations were found to be insoluble in water and the S67A soluble. The positive results received from the S67A mutation will lead to further study of its characteristics.

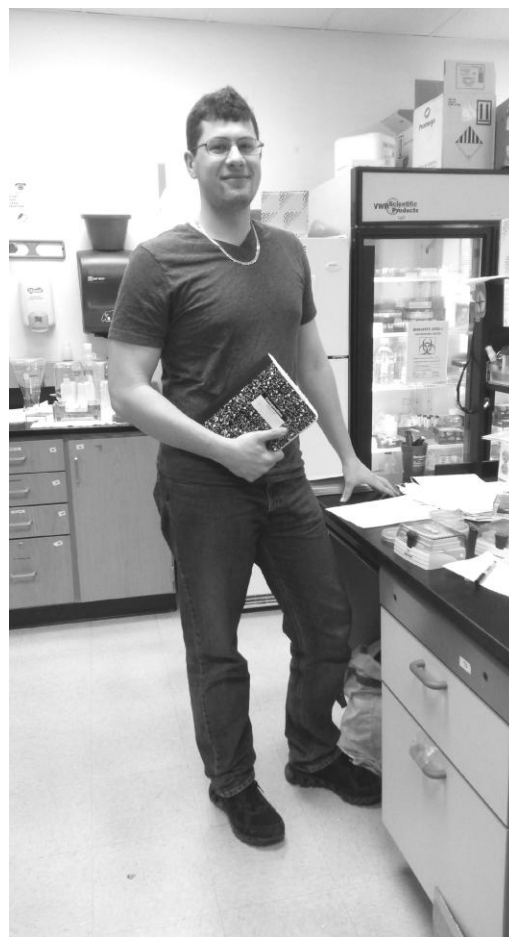
**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 9:30-9:55am  
Presenter: Devin Borg  
Concentration: Applied Biotech, Energy  
Capstone Advisor: Dr. Ronald Raab  
Capstone Title: Destabilizing Tuberculosis: Structure Function Analysis of Mycobacterium tuberculosis Gyr A and Gyr B DNA coiling proteins

**Abstract:**

Tuberculosis is a disease caused by Mycobacterium tuberculosis, a bacterium that continues to kill millions of people. Also known as consumption, scrofula, and white plague it is feared because of its mortality rate and because it is an airborne pathogen. As described by the World Health Organization (WHO) Tuberculosis is considered to be the second greatest killer worldwide as a single infectious agent under HIV/AIDS, as in 2013 9 million people were infected and 1.5 million died from it. Today there is another reason to be fearful, and that is the discovery of super forms of Tuberculosis that are antibiotic resistant such as multidrug resistant TB and extensive drug resistant TB. As antibiotics are the primary response in treating TB, it is hopeful that this research can discover another treatment. In order to find a possible new treatment this project used site directed mutagenesis of gyr A and gyr B proteins from M. Tuberculosis coiling DNA and worked to destabilize the complex to make it more open to other methods and treatments. Each of the mutants were cloned, expressed, and purified from E. coli. Super coiling assays were then carried out on the wild type and mutant variants to determine structure function relationship in the future. Although the number of people falling ill with TB each year is declining slowly, it is hopeful that this project will lead to a more permanent treatment or vaccine for the future.



**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 10:00-10:40am

Presenter: Jonathan T. Simmons

Concentration: Environment, Health & Safety

Capstone Advisor: Dr. Ronald Raab

Sponsor: Chief (Ret) Robbie Symons, Emergency Coordinator at Sentara  
Rockingham Memorial Hospital

Capstone Title: Continued Development and Expansion of Hospital Emergency Response Team at Rockingham Memorial Hospital

**Abstract:**

Hospitals provide the population a safe place to seek treatment and relief for any situation involving medical care. Under ordinary conditions this process is painless and patients easily find the care they need with no conflicts. In some situations however, such as mass casualty incidents, incidents involving chemical, radiological, and biological agents as well as events involving highly contagious illnesses there exists an obstacle that must be overcome before the patient may be treated. Contamination from any of the mentioned hazards can result in a shutdown of the hospital. To prevent this from occurring the assembly of a specialized team, The Hospital Emergency Response Team (HERT), with unique abilities and equipment will ensure the safe transition of these patients into the hospital environment. The HERT is an interdisciplinary team consisting of employees who come together to deliver a specialized service such as decontamination, triage, and advanced protective equipment interventions. The objective of this project was the continued development and training of



the HERT at Sentara Rockingham Memorial Hospital as well as the incorporation the local volunteer fire and rescue agency, Hose Company #4. HC4 will serve to assist the hospital in an effort to increase the size of the team as well as the effectiveness. Utilization of trained firefighters for decontamination and of emergency medical providers for triage will allow for the doctors and nursing staff to focus on other areas of the intake process. This objective was met by continuing to train and equip the existing team as well as providing certification courses from the Center for Domestic Preparedness to Hose Company #4. This project is a continuation of a previously established connection between the Emergency Coordinator of Sentara RMH and James Madison University's Integrated Science and Technology Department.

## BSISAT Program

### Presentation Room: ISAT/CS Room 346

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Time: 2:00 – 2:40 pm

Presenters: Thomas Herbold and Bassel Karadsheh

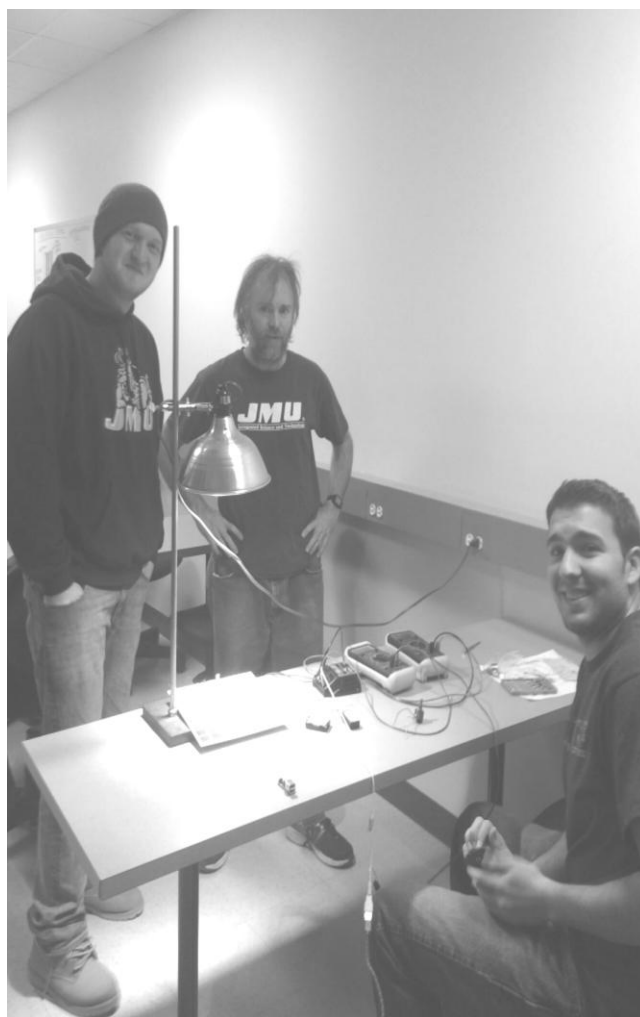
Concentration: Energy, Engineering and Manufacturing

Advisor: Dr. Tony Chen and Mr. Joe Rudmin

Capstone Title: Solarized Backpack

#### **Abstract:**

In today's modern society, we see an increased push toward renewable energy to power our everyday devices. Cars, planes, and houses are beginning to integrate solar energy as an alternative power supply. This is just the beginning of the effort to improve our quality of life and to curb the increasing dependency on fossil fuels. Solar power, although not as effective as fossil fuels for transportation, can be implemented as a replacement for generating electricity. This technology can be used by students of all educational levels and socioeconomic statuses, hikers, and retail stores. Children are growing up with increased access to technological devices as a source of entertainment and education, such as smart phones, tablets, etc. All which can be powered through a simple USB port, this allows for an expanded range of audiences. Our target devices require a minimum of 5 volts and a relatively low input current to begin charging. Our solar panel uses twenty two monocrystalline silicon cells set in series. As sunlight hits the silicon semiconductor, energy is absorbed from the light causing electrons to be knocked loose, allowing them to be directed to the circuit as usable electricity. We will also try to integrate thermoelectric and piezoelectric transducers to supplement the batteries with additional power.



**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 2:45 – 3:25 pm

Presenters: Collin Campbell, Kyle Dewey, and Cody Labriola

Concentration: Energy

Advisor: Dr. Tony Chen

Sponsor: Mr. Paul Henriksen

Capstone Title: Detailed Energy Survey and Analysis of a Residential Building in Harrisonburg, VA

**Abstract:**

The energy efficiency of a home can be the largest burden on the monthly utility bill. The scope of this project is to analyze the efficiency of a residential home in Harrisonburg, Va. to show how simple changes can significantly reduce the energy cost and improve the quality of life of the clients. A



complete Excel® spreadsheet for calculating the UA value of the house and monthly electricity consumption was generated as baseline for a high level residential building energy audit. Simulations of the home performance were modeled in eQUEST® (Quick Energy Simulation Tool) and BEopt® (Building Energy Optimization) as well as in RETScreen® (Renewable Energy and Energy Technologies). These are common software programs used in the residential energy audit sector to get a better picture of what aspects of the home are consuming the most energy depending on geographic orientation and a variety of other internal factors of the home. An evaluation was completed assessing the viability of the software to correctly model the energy profile of the home. A comparison was also completed to help better understand the benefits and disadvantages of the using one software over another.



**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 3:30 – 3:55 pm  
Presenter: Nicklas Arzaga  
Concentration: Energy  
Advisor: Dr. Tony Chen  
Capstone Title: Solar Hot Air System

**Abstract:**

The objectives of this senior project were to develop and analyze a solar hot air system utilizing eight evacuated heat-pipe solar collectors, as well as, increase the Energy curricula by applying these unused heat-pipes to a real world application. A wooden rack was constructed in order to support the eight heat-pipes as they were placed at an angle on the side of a residential garage. A manifold enclosed the top of the rack in order to direct hot air through a window into the unconditioned garage space. Data collection tools were used to calculate the power and efficiency of the solar hot air system. The project concluded that solar hot air systems are viable alternative source of energy to heat residential spaces and decrease a homeowners heating load during the cold seasons.



**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 4:00-4:40pm  
Presenters: Lindsey Kacsmar and Leah Wilkes (Honors Capstone)  
Concentration: Investigations of Sustainability in Agriculture  
Advisor: Dr. Jennifer Coffman  
Sponsor: Mr. Radell Schrock  
Capstone Title: Can Rockingham County Feed Rockingham County?

**Abstract:**

Food is an essential part of every person's life each day. However, most Americans do not consider how or where the food in their grocery stores is produced. In the United States, intensive, large-scale



agribusiness supplies vast and predictable amounts of food across the country, but there are indeed a variety of social and environmental costs. "Sustainable agriculture" has been proposed by many as the solution to the woes of agribusiness, but the very concept of sustainability is amorphous. The purpose of this project is to formulate a plan to analyze whether the geopolitical region of Rockingham County, Virginia, can feed the people who inhabit Rockingham County in a sustainable way, and in doing so, to attempt to help clarify what sustainability could encompass with regard to food production in Rockingham County.

This project stemmed from the researchers' goals to better understand whether an area's inhabitants can support themselves sustainably from the land on which they live. Because it is home to James Madison

University and a variety of different sized farms, Rockingham County will serve as the area for this feasibility study. Collaboration with local farmers has allowed us to collect and analyze crop data for Caloric models. From these models, it appears that Rockingham County can indeed produce enough food to feed its population. The data collected have also enabled the researchers to conceptualize various models of sustainability. This project has stemmed from an agricultural internship through ISAT 473 and a mutual passion for local, sustainable agriculture.

**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 4:45– 5:10 pm

Presenter: Reyna Dawkins

Concentration: Energy, Information and Knowledge Management

Capstone Advisor: Dr. Jennifer Coffman

Capstone Title: Sustainability in the Maasai Household

**Abstract:**

Sustainability is a term used to describe development around the world. Recently, this concept (and the domains it entails) has become closely related to—if not inseparable from—the idea of renewable energy and its operation; however, there are other domains that constitute sustainability. While not all these are of paramount concern to service or post-industrial economies, developing communities may be concerned with the whole of sustainability. And so, the question becomes what technologies can be applied to comply with sustainable development. Maasai people in Kajiado County, Kenya, provide an example of a rural community undergoing significant change. As a result, a once pastoral lifestyle is becoming increasingly stationary. This transition has begun to have an impact on the housing situation, which is based on a semi-permanent design due to previously nomadic behavior. Houses thus evolve to maintain sustainable living in the region. In order to determine what kinds of housing might be viable for some Maasai, housing options were developed and compared to Maasai traditional housing using four aspects of sustainability: economical, environmental, human, and social. Though it is difficult to determine which housing option is ideal for the Maasai, an "in-between" design appears to be a viable option that could serve as a transition between the traditional, semi-permanent design and an "ideal" housing option.

**BSISAT Program****Presentation Room: ISAT/CS Room 346**

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Time: 5:15-5:40pm  
Presenter: Tina Nguyen  
Concentration: Information and Knowledge Management  
Advisors: Dr. Shannon Conley and Dr. Morgan Benton  
Capstone Title: Using Case Study Methodology in Teaching Social Context

**Abstract:**

This project presents a case study which is used as an educational tool to make information relevant to an intended audience. The problem being investigated is to see if students have an understanding of factors related to social context issues, such as perception, communication, ethics and how it related to science, technology and society. Presented as a case study pilot-module in the ISAT 131 course, students participate in the case involving an individual who faces challenges from others questioning if the individual's knowledge is credible. A qualitative analysis will be conducted from transcribed written notes taken by students during the case. The goal of this intervention is to assess whether or not students' change their perception of others when faced with similar social themes presented in this case.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 9:00-9:40am

Presenters: Jessanna August and Caitlin Shipman (Honors Capstone)

Concentration: Environment

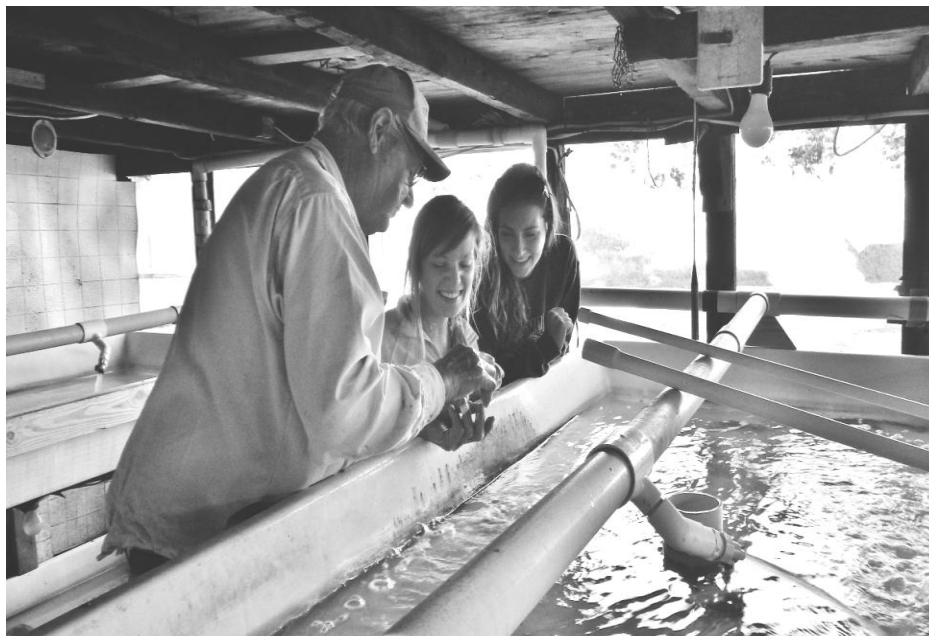
Advisor: Dr. Thomas Benzing

Sponsor: Whitescarver Natural Resources Management, LLC  
George Ohrstrom with Friends of Shenandoah River  
Joe McCue with Friends of Middle River

Capstone Title: Health Risk Associated with Toxins in Chesapeake Bay Seafood

**Abstract:**

According to the 2014 State of the Bay report, over 70% of the Chesapeake Bay is impaired due to the presence of toxins. These toxins include polychlorinated biphenyls (PCBs), mercury, and lead. Seafood harvested from the pollutant-laden Bay may pose a significant risk for



prolonged human consumption. Shellfish live on the Bay floor where they are exposed to high levels of toxins that can bioaccumulate. Finfish experience tissue contamination as a result of their habitat and diet. In this study, blue crab samples were collected from James Madison University's Chesapeake Bay shore property, Bluff Point, and sent to a commercial laboratory for analysis. The resulting tissue concentrations, as well as data from Virginia's Department of Environmental Quality's Fish Tissue Monitoring Program, were analyzed to evaluate risk of regular consumption. The subsequent assessment presents a lead-exposure risk from oyster consumption and an increased risk of cancerous tumor development from PCBs found in blue crab, oyster, and striped bass.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 9:45 -10:10 am

Presenter: Ben Foster

Concentration: Environment

Advisor: Dr. Tom Benzing

Sponsor: Virginia Department of Game and Inland Fisheries

Capstone Title: Evaluation of the Northern Snakehead as an Invasive Fish Species in the Potomac River

**Abstract:**

In 2004, Northern Snakehead (*Channa argus*) were found in the Potomac River system. These fish from Asia raised concerns about the potential for biological and ecological impacts on native and naturalized fish populations. Since its arrival, the snakehead has garnered media attention due to misleading information. In the ten years since its introduction to the Potomac, the Virginia Department of Game and Inland Fisheries as well as other resource management agencies have conducted research to better understand whether snakeheads are invasive. Using this research, a review of the migration, diet, co-occurrence with top predators (particularly Largemouth Bass), and habitat was completed to evaluate whether these data provide evidence of invasiveness. With geospatial tools such as ArcGIS 10.2.2, geospatial analysis was completed, providing a better understanding of snakeheads ecological interactions within the Potomac River. In 10 years the population of the Northern Snakehead has spread to occupy an area of about 324,000 acres, close to the mouth of the Potomac. The snakehead has even spread into the Rappahannock River and nearby reservoirs. Co-occurrence between Largemouth Bass and Northern Snakehead was found to be 100% by mapping locations in a Potomac River tributary, suggesting similar habitat and forage patterns among the species. Their co-occurrence could lead to competition if prey is limiting. While this study finds no evidence that snakeheads are threatening bass prevalence in the Potomac River, the ecology of Northern Snakeheads should continue to be studied to evaluate invasiveness.



**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 10:15 – 10:40 am

Presenter: Brody Edwards

Concentration: Environment

Capstone Advisor: Dr. Robert Brent

Sponsor: JMU Facilities

Title: Performance Testing of University Park Stormwater Treatment System

**Abstract:**

Blacks Run was initially placed on Virginia's 303(d) list of impaired waters in 1996 for violations of the fecal coliform bacteria water quality standard and the General Standard for aquatic life. A major factor contributing to these impairments is urban stormwater runoff and the pollutants that it brings. Sixty-five percent of Blacks Run runs through urban areas of Harrisonburg. In order to reduce the impacts of urban runoff from the JMU campus, JMU installed a seven million dollar stormwater treatment system at the University Park fields in 2011. This treatment facility was designed to store and treat stormwater runoff from the surrounding roads and parking lots by passing the runoff through a series of sand filters. While this facility should theoretically improve stormwater quality, this assumption has never been tested. The goal of this project was to measure the treatment efficiency of this facility during actual storm events. Flow monitoring devices were placed at the entrance and exit of the facility to measure pressure, temperature, and flow. Flow parameters were measured in 25 rain events over a 2-year period. In addition to monitoring flow, three events were sampled for water quality parameters including nitrogen, phosphorus, and suspended solids. The US Environmental Protection Agency's Watershed Assessment of River Stability and Sediment Supply methodology was also used to estimate the impact of flow retention on downstream habitat and sediment loads. While additional studies may be needed to fully characterize the treatment efficiency of the University Park stormwater treatment facility, this study demonstrated that the facility is reducing peak flow conditions into Blacks Run, thereby reducing downstream erosion and sediment loads.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 10:45 – 11:10 am

Presenter: Hannah Schechtel

Concentration: Environment

Capstone Advisor: Dr. Robert Brent

Sponsor: Shenandoah RiverKeeper

Title: Geographic Information System and Spatial Analysis of Algae Growth In The Shenandoah River, North River and South River

**Abstract:**

The Virginia Department of Environmental Quality (VADEQ) has listed the Shenandoah River, North River, and South River as impaired due to an excess amount of nutrients and its effect on aquatic life. This excess of nutrients leads to eutrophication. Eutrophication is the gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in an aquatic ecosystem which causes an excess of algae growth. There are other factors that affect algae growth such as the amount of sunlight available, the type of substrate, depth and flow conditions, etc. The Shenandoah RiverKeeper conducted a study on the algae growth on the Shenandoah, North and South Rivers to determine the extent of algal growth and possibility determine factors controlling growth in these rivers. Transects were established in 1/4 mile increments, along a five mile stretch, on preselected sections of each of the three rivers. At each transect, plant type and percentage, the effect of algae on plants, algae type and percentage, average stream depth, shading and sunlight, as well as type and percent of substrate were measured. These data were summarized in a geographic information system (GIS) to spatially display the coverage of algae on these rivers.



**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 2:00 2:40 pm

Presenters: Hector Galvan, Christopher Mihalkovic, and Jordan Palamone

Concentration: Applied Biotech, Energy, Environment

Capstone Advisor: Dr. Steven Frysinger

Sponsor: Mr. Tom Benevento, New Community Project

Title: Assessment of a Biomass Thermal Water Heating System at New Community Project in Harrisonburg, VA

**Abstract:**

Biomass is a promising and abundant energy source. This project explores biomass as a heating option through the natural decomposition of a large compost mound consisting mainly of wood chips and manure. Two essential elements found in wood chips and manure – carbon, nitrogen – are needed for microbial decomposition of the pile. The biomass pile will serve to heat water from a common household valve. Polyethylene piping was coiled inside of the biomass mound with water input and output sections protruding at opposite ends. Cold water from the valve enters the input end and exits the pile as warm water for a shower and sink. A heavy duty compost thermometer was used to examine the pile's heat output. This water-heating option is inexpensive, sustainable and generates minimal environmental impacts.



**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 2:45 – 3:10 pm

Presenter: Allyson Ponn

Concentration: Environment, Food and Agriculture Systems

Capstone Advisor: Dr. Mary Handley

Title: “The National Farm to School Network and James Madison University:  
The Potential for a Large-Scale Local Food Purchasing Initiative”**Abstract:**

In the United States, the movement to eat locally is working its way into many different food systems, including school and university dining services. The promotion to eat healthier and provide fresher foods to students is gaining support from all stakeholder levels, ranging from the small-scale farmer to the White House. James Madison University’s Dining Services, which caters to a population of approximately 18,000 students during the regular academic year, is part of a complex system, purchasing from suppliers to provide thousands of meals each week. Twenty-five of these suppliers are local farmers whose products are used in the dining halls on a daily basis. Aramark, the JMU Dining Services provider, incorporates local purchasing into its environmental stewardship responsibility as a food services provider. While local products currently account for a small percentage of the overall food purchased by the University, this solid beginning provides the opportunity to investigate local food sourcing on a larger scale. The National Farm to School Network is program that works with school districts and their distributors to help increase local purchasing within the existing dining structure. Their resources connect local farmers with these schools, in order to increase education and awareness towards healthier meal options. This project analyzes current JMU Dining purchases in the context of the Farm to School movement and provides an outline for greater involvement in the Network.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 3:15 – 3:40 pm

Presenter: Susan Andersen

Concentration: Environmental Science and Biotechnology in Agriculture

Capstone Advisor: Dr. Carole Nash

Title: East Campus Meadow Soil Health Survey

**Abstract:**

This study provides an analysis of the soil quality of the East Campus Meadow, four years after the beginning of a naturalization project, to determine whether there have been positive changes in soil health that may be attributable to changes in vegetation. Initiated in 2011, the East Campus Hillside Naturalization Project was created to convert a manicured lawn into an interactive environmental ‘outdoor classroom’ for JMU students, as well as establish deeply-rooted vegetation that would help to contain runoff from East Campus, reintroduce biodiversity onto campus and improve overall soil quality. In order to determine nutrient content changes, soil samples taken at roughly 25-foot intervals in October 2014 were tested by A&L Laboratories in Richmond, Virginia and compared to the results of similar testing done by the same lab in 2010 from samples taken prior to the naturalization. Control samples were taken in 2014 from mowed paths that were retained between sections of meadow plantings. Results were used to create distribution maps in ArcGIS to show concentrations of Phosphorus (P), Calcium (Ca), and Magnesium (Mg). Also mapped were the soil pH and percent change of the concentration of P, Ca, Mg, and soil pH between 2010 and 2014. Results indicate a decrease in soil pH, an increase in P, and a decrease in Ca and Mg since 2010. Spatial analysis was undertaken to correlate these changes with variation in edaphic variables (slope, soil series) and management choices. The maps and data generated from this project will be compiled with materials from earlier studies into one central document for access by future researchers.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 3:45 – 4:25 pm

Presenters: Sara Guthrie, Donald Lucas, III, Christopher Vaughan, and Jonathan Vaughan

Concentration: Environment

Capstone Advisors: Dr. Wayne Teel and Dr. Joy Ferenbaugh

Sponsor: Community Project

Capstone Title: Design & Implementation of a Sustainable Aquaponics System

**Abstract:**

Current industrial agricultural systems are characterized by high-energy and nutrient inputs, which have environmental impacts on local ecosystems. An emphasis on local and sustainable production is a focus for the future of agriculture. Aquaponics is an alternative farming method that limits the need for high-energy inputs and creates a closed-system that requires minimal inputs to thrive. An aquaponics system combines hydroponics with aquaculture to form a symbiotic environment. In the system, water from a fish tank is pumped up to plant grow beds where byproducts from the fish are broken down by bacteria and taken up by plants as nutrients. The resulting clean water is then circulated back to the fish tank. We designed and built a system that will be used by New Community Project (NCP) in downtown Harrisonburg, where it will also serve as an educational tool. The system is located in a geothermal subterranean greenhouse to provide consistent temperatures and is powered by photovoltaic solar panels. Blue Nile Tilapia fish were chosen due to their tolerance of fluctuating conditions. Green leafy vegetables grown include arugula, spinach, pak choi, kale, and swiss chard. Herbs such as basil, watercress, parsley, and lemon grass were also included. Other vegetables grown were peppers, tomatoes, beans, and cucumbers. This system will further explore the benefits of biochar and its role in water filtration and nitrogenous bacteria colonization. Worm castings produced from vermiculture were used as a nutrient rich fertilizer in the grow beds. This system will serve as an educational tool at NCP while providing fresh fish and vegetables to the local community.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 4:30 – 5:10 pm

Presenters: Josh Kugler and Kevin Mulcahy

Concentration: Environment

Capstone Advisor: Dr. Wayne Teel

Capstone Title: Use of Biochar as a Soil Amendment

**Abstract:**

The purpose of this project is to investigate the effectiveness of biochar and vermicompost as a soil amendment in the agricultural process. Biochar is a biomass burned at relatively low temperatures in a low oxygen environment and with added nutrients, such as vermicompost, can be used to improve soil conditions. Our biochar was made in a pyrolysis unit at Dr. Wayne Teel's home in Keezletown, VA, inside the greenhouse where we grew our crops. The pyrolysis unit served not only to make the biochar, but to also heat the greenhouse during harsh weather. The greenhouse was split into four blocks and each plant received a one square foot plot to create a grid system. The plants were randomized by hand to reduce bias of plant growth inside the grid. The crops we chose to study were all chosen for their ability to grow during the winter months; Swiss chard, kale and lettuce. Plants were labeled on tongue depressors with a number, the plant type and the amount of treatment applied, either 0, low or high. The 0 treatment was our control, the low treatment was 1 cup of biochar/vermicompost mix and the high treatment was 2 cups of mix. Our measurements consisted of plant length, leaf count and weight of yield. Our experiment was to investigate the effectiveness of the biochar/vermicompost mix, but there were factors that had contributed to the uncertainty of growth. Temperature was one of the biggest factors affecting our crops, with some night's outdoor temperatures reaching below 0° F. The greenhouse being located on Dr. Teel's property also allowed his pet cats to roam around and dig up seeds and adolescent plants. The last major factor was the areas of limited sunlight in the greenhouse. Results are pending as data collection is still occurring.

**BSISAT Program****Presentation Room: ISAT/CS Room 348**

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Time: 5:15 – 5:40 pm

Presenter: Brandon White

Concentration: Engineering and Manufacturing

Capstone Advisor: Dr. Wayne Teel

Capstone Title: Variation in the Design of a Top-Lit UpDraft Stove for Biochar

**Abstract:**

Developing countries have a high need for cheap and efficient cook stoves that emit very little smoke and particulates. The women and children who use these stoves spend countless hours collecting fuel and cooking to have one family meal each day. This can have a large impact on the family's health and productivity. A well designed TLUD (Top-lit updraft) stove offers solutions to cooking efficiency, while leaving the user with a product that can be useful as an environmentally friendly soil amendment. Biochar is produced through the process of pyrolysis, in which a fuel source burns using a controlled oxygen flow and then quenched before it is burnt to ash. Biochar sequesters carbon to help reduce the effects of global warming while also holding water and nutrients to aid the growing of crops. To the stove owners, the most important design features involve cooking, rather than the biochar product. By varying height, width, and airflow in TLUD's, we can determine the features most suitable for cooking. Five different stoves were designed and built to compare these specific features. The ovens were tested by heating a large pot of water with



thermocouples placed inside the fuel chamber and in the pot of water to observe the pyrolysis process and also the amount of heat that gets to the cooking pot. Each stove creates biochar, but the process in some of the stoves may burn too quickly to cook a meal with traditional fuels. The larger stoves are better for cooking with a less dense fuel, while a more dense fuel should be used in the smaller stoves.

## BSISAT Program

### Presentation Room: ISAT/CS Room 350

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Time:	9:00 -9:40 am
Presenters:	Tyler Bell, Alex Martin, and Joshua Wood
Concentration:	Engineering and Manufacturing, Information and Knowledge Mgt.
Capstone Advisor:	Dr. Geoffrey Egekwu
Sponsor:	Cerro Fabricated Products, PennAluminum
Capstone Title:	Visual Management Techniques for Processing Plants

#### **Abstract:**

Japan has become a pioneer in revolutionizing how manufacturing plants operate in terms of operations, logistics, engineering, and management. Management technique is an ever-developing area of study, and there is no cure-all, canned management system that fits the needs of every manufacturing environment. In recent years, Japanese management experts have created new methodologies that tackle issues of efficiency on the manufacturing floor. One discrete method that has shown effectiveness is known as the Gemba Walk. Gemba is the Japanese word for “at the site,” or where the diagnoses of operational inefficiencies occur in a manufacturing environment. Gemba walks help close the distance between the plant floor and the conference room to provide holistic solutions to inefficiency, by creating face-to-face communication between machine operators and operational oversight. As part of our senior capstone project, we have teamed up with Cerro Fabricated Products (CFP), a native Harrisonburg manufacturing company. CFP uses machining and assembly processes to make unique bronze, copper, brass, and aluminum parts for many different companies across the country. With firms such as these, it is vital that the machining and assembly processes are conducted efficiently, in respect to time, cost, and material usage. After visiting CFP’s sister company, PennAluminum, we used data and observations taken on their visual management methods to write a report, discussing the benefits and uses of the Gemba process, as well as any other recommendations we can make. Our goal in doing this is to help CFP improve their manufacturing standards, as well as offer the project the opportunity to work with a real world applications of manufacturing principles.



**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 9:45 – 10:10 am  
Presenter: Willie Driscoll  
Concentration: Engineering and Manufacturing  
Capstone Advisor: Dr. Geoffrey Egekwu  
Capstone Title: Preventing Head Injuries in Baseball: An Assessment

**Abstract:**

Over the past couple of years, head injury and concussion prevention has been a growing focus in sports. In the sport of baseball in particular, the focus has been on protecting pitchers from line drives hit back to the mound. Because of this, numerous designs of protective baseball caps have been introduced to help prevent head injuries. These available designs have shown to not be very popular among current players. Many of the complaints from the new designs have been about their bulky size and lack of breathability. This report contains a study of the current models being used as well as possible alternatives. The design flaws are exposed and possible solutions to these flaws are introduced. The



willingness of the players to wear the cap is vital to preventing head injuries. If the design of the cap can meet the players and performance specifications, then the occurrence of these head injuries has the potential to decrease dramatically.



**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 10:15 – 10:40 am

Presenter: Christian Tanner

Concentration: Engineering and Manufacturing

Capstone Advisors: Dr. Geoffrey Egekwu and Mr. Mark Showalter

Capstone Title: “GEET Fuel Processor” - Powering an Internal Combustion Engine with Used Motor Oil

**Abstract:**

Our reliance on non-renewable resources and the environmental impacts associated with them have created a high demand for energy conservation and alternative energy sources. Paul Pantone’s “GEET” fuel processor is an apparatus that is claimed to allow internal combustion engines to run on alternative fuels, and to reduce pollution. The goal of this project was to build and test a replica of Paul Pantone’s patented “GEET fuel pre-treater apparatus” or ‘fuel processor.’ It acts as a heat exchanger between the exhaust and the ingoing fuel in order to make the alternative fuel combustible. It is claimed that the apparatus works with a variety of alternative fuels, including crude oil, waste motor oil and battery acid. For this project we designed and built a “GEET,” according to Paul Pantone’s published plans that are available for free on the internet, and tested it on a single-cylinder engine with waste motor oil as fuel. The experiment was unsuccessful and inconclusive. The “GEET” worked with gasoline, however it did not work with waste motor oil. This project explains the social implications of the technology, design, some theory, the experimental test design, possible reasons for failure and possible improvements.

**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 10:45 – 11:10 am

Presenter: Christian Cline

Concentration: Engineering and Manufacturing

Capstone Advisor: Dr. Geoffrey Egekwu

Capstone Title: Pulse Jet Efficiency

**Abstract:**

The purpose of this project is to build a proto type of a valve less pulse jet and do an efficiency analysis on the engine. The lower development and manufacturing cost of this pulse jet engine makes the pulse jet a cheap alternative to high cost traditional jet engines. With the emergence of the drone market in the past several years, application of pulse jet engines can reduce operating cost, simplify traditional engines, and become more prevalent in the drone market. This project is a continued study from a senior project by Cory Kerr and James Renolds of the California Polytechnic State University. The design of the pulse jet is a Lady Anne Focus Wave Engine VIII Twin Stack model, which produced 4 pounds of thrust with propane as fuel. The pulse jet was handmade and welded using twenty gauge mild steel sheet metal, according to specs provided. Quarter inch copper tubing was assembled to supply fuel from a ten pound propane tank. Operation data was gathered from the test and subsequently analyzed. Temperature, sound, and thrust were recorded to determine engine efficiency. With this study recommendations for future study and improvements are included.

**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 2:00 – 2:25 pm

Presenter: Maggie MacLeish (Honors Capstone)

Concentration: Engineering and Manufacturing

Capstone Advisor: Dr. Abdelrahman Rabie

Sponsor: Nestlé

Capstone Title: Improving Consumer Complaint Management Systems in the Food Processing Industry

**Abstract:**

The food processing industry must meet consumers' highest quality expectations at the lowest cost. The objective of the project is to improve the current consumer complaint approach of the quality department, which aimed to improve product quality. To improve the total quality of the system, this project established a defensive method of addressing consumer complaints. Some technologies used to improve the current Consumer Complaint Management System (CCMS) include Quality Functional Deployment (QFD), fuzzy logic, Kano's methods, Voice of the consumer (VOC) and Go-See-Think-Do (GSTD). These strategies are all related, but have not previously been used collaboratively. The joined force of these methods will better satisfy the consumer, improve quality, and decrease overall error.

During a 2014 summer internship with the Nestlé, Little Chute, plant, a work-study was conducted on the DiGiorno pizza line. All relevant data, regarding the existing process and consumer complaints were collected and recorded in order to identify the areas in need of change. The application of multiple quality strategies was researched throughout the fall of 2014. These strategies were then blended to best suit the DiGiorno pizza line. The result was a consumer complaint management system that provided a methodical approach to addressing consumers' complaints and correcting the associated manufacturing component. The new system will be incorporated into the Nestlé plant in the future.

**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 2:30 – 2:55 pm

Presenter: Chris Lacey

Concentration: Engineering and Manufacturing

Capstone Advisor: Dr. Abdelrahman Rabie

Capstone Title: The Impacts of E85 in Small Engines

**Abstract:**

The goal of this senior project was to find the best way to run E85 fuel through a small engine. According to theoretical calculations, using E85 in common household tool, a lawn mower, has the potential of saving large amount of gasoline. However, small engines are not designed nor built to run on such a high concentration of Ethanol, while so low a concentration of gasoline. The goal was to achieve a theoretical running lawn mower engine with newly designed parts and better working materials that remained affordable to manufacturers and consumers. The failing parts had to be examined and improved. Numerous materials are available for each failing component of the engine. These parts are mainly within the fuel system and are directly, in contact with ethanol which is a corrosive fuel High concentration of ethanol raise the risk of part failure. In addition, the fuel jet will also be considered and increased in size to allow enough E85 to flow through and combust. In addition to the fuel flow, this will also impact the amount of air drawn in for combustion. A cost model was then created to determine if these potential solutions can be viable solutions and used in the real world.

## BSISAT Program

### Presentation Room: ISAT/CS Room 350

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Time: 3:00 – 3:40 pm

Presenters: Cody Buchanan and Derek Hart

Concentration: Biotechnology

Capstone Advisor: Dr. Christopher Bachmann

Capstone Title: Optimizing for Ethanol Blending in Gasoline: Better Fuel Efficiency, Fewer Emission, and more power

#### **Abstract:**

Blending ethanol into gasoline is common practice in the United States as part of a government initiative to reduce dependency on foreign oil, reduce environmental impact, and reduce the cost of fuel. Unfortunately, most internal combustion engines are not properly tuned to run on ethanol or ethanol



blends. This creates a significant waste of energy. The objective of this study was 1. to quantify the fuel-losses incurred with 10% ethanol blends (E10) and 2. to see if it is possible to improve energy efficiency and decrease vehicle emissions by re-tuning the vehicles on-board computer. Tests were carried out using a modern, fuel-injected 2011 Harley Davidson Sportster engine. Results were measured using a 5-gas analyzer and Dynojet 250i

dynamometer. The electronic control unit (ECU) was reprogrammed to advance spark ignition timing and adjust O<sub>2</sub> sensor target voltages using a Dynojet Powervision tuner. It was found that with an un-tuned, stock engine running on E10 the fuel economy of the bike was 5-6.5% lower compared to pure gasoline. This is consistent with previously published results. Optimizing the engine for E10 (10% ethanol) by reprogramming the ECU yielded 5% increase in fuel efficiency compared to stock tuning. This 5% fuel savings measured in the laboratory were confirmed with on-road testing. Additionally, a significant reduction in harmful exhaust emissions was measured in the lab using a 5-gas analyzer, yielding 38% less CO<sub>2</sub>, 66% less CO, and 22% less NO<sub>x</sub> (compared to the stock tune). These optimizations were made by reprogramming the engine's electronic control unit and can be easily replicated and applied to other fuel-injected, spark ignition vehicles. If applied throughout Virginia and nationwide, this simple re-tuning strategy would yield significant fuel savings and substantial reductions in harmful exhaust gas emissions.

**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 3:45 – 4:10 pm

Presenter: Christophe Langouet-Astrie

Concentration: Biotechnology (Honors Capstone)

Capstone Advisors: Dr. Louise Temple, Dr. Timothy Bloss, Dr. Amanda Biesecker

Sponsor: University of Virginia, Department of Pathology

Capstone Title: Tricistronic Lenti-Viral Vector Construction using Scar-less DNA Assembly Methods and Web-based Software j5 to Help Study GRK4

**Abstract:**

Hypertension affects about one third of the world's population, though clinical diagnosis does not distinguish salt sensitive from salt resistant hypertension. Research has shown that salt sensitivity varies based on genetic variations, one of which associated with hypertension and salt sensitivity is G protein-coupled receptor kinase 4 (GRK4) that regulates dopamine receptor in kidney proximal tubules. Being able to measure the activity of GRK4 and other variants can be used as a diagnosis and treatment for salt sensitivity. To help study GRK4



expression in varying salt conditions, lenti viral delivery systems were constructed to measure its expression in vivo. To construct the vectors, scar-less DNA assembly methods allow for simpler and multipart construction while web-based software j5 was developed to optimize cost, time efficiency, and reduce construction difficulty. For quantification, commonly used bicistronic vectors allow for indirect measurement of protein synthesis via fluorescence. Developing tricistronic vectors allow for introduction of a protein with two modes of measurement separated by 2A self-cleaving peptide sequences that allow for protein autonomy. Bicistronic vectors, pLVX-GZ and pLVX-GC were constructed containing for utility and to establish a protocol for constructing tricistronic vectors. A tricistronic vector pLVX-GZC has been constructed containing GRK4, zeocin resistance, and a fluorescence protein with P2A and T2A, though it has not been harvested for viruses. Construction of tricistronic vectors can be a platform in constructing libraries containing different genetic factors associated with hypertension and salt sensitivity in a timely and cost-effective manner to help develop an assay for detecting salt sensitivity.

## BSISAT Program

### Presentation Room: ISAT/CS Room 350

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Time: 4:15 – 4:40 pm  
Presenter: Brandon Carter (Honors Capstone)  
Concentration: Applied Biotech  
Capstone Advisor: Dr. Louise Temple  
Capstone Title: Addressing the Black Box Phenomenon of Genome Sequencing and Assembly

#### **Abstract:**

With the tremendous popularity of the human genome project in the 1990s, the field of bioinformatics leapt to the forefront of the scientific community. As the field continues to progress, there is increasing interest in the areas of DNA sequencing and assembly. Despite the growing popularity in this field, there are



surprisingly few professors who utilize software designed to assemble and analyze DNA sequences. There are over 70 universities who actively participate in the Science Education Alliance Phage Hunters Advancing Genomics and Evolutionary Science (SEA-PHAGES) program. Their mission is to further research in the field of bacteriophage genomics while training undergraduate students in original research. However, there are many professors in this program who do not delve into the technological side of genomics due to multiple barriers. The most daunting of these barriers is the technological disconnect that exists between those who create these software and the professors who use them. This concept, coupled with a general lack of understanding of how to fully comprehend and best utilize raw sequence data has led to a "black box" phenomenon where the inner workings connecting raw data input and finished output are not well understood. In an effort to ameliorate this issue, a manual was created that takes a user from the input of the black box (raw data from a sequencing instrument) to the output (finished assembly of a viral genome that can be fully analyzed). The creation of this manual aims primarily to further the knowledge and understanding of DNA sequencing and assembly to map the genomes of biological organisms, especially among undergraduate students. The manual is currently being piloted by faculty and students in several of the SEA-PHAGES institutions.

**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 4:45-5:10pm  
Presenter: Colin Brooks  
Concentration: Applied Biotech  
Capstone Advisor: Dr. Louise Temple  
Capstone Title: Analyzing Transduction Levels of the *mecA* gene within *Staphylococcus aureus* via Wastewater and Environmental Samples containing bacteriophage DNA

**Abstract:**

*Staphylococcus aureus* is a common bacterium residing within our bodies and the external environment with the ability to infect both humans and animals and cause irritating and harmful effects and serious infections. Methicillin resistant *Staphylococcus aureus* (MRSA) is a strain of *S. aureus* containing the *mecA* gene, which provides a resistance mechanism against certain antibiotics such as penicillin. This is a problem because our society primarily uses these common antibiotics to combat bacterial infections, and as these drugs lose efficacy, new, more expensive antibiotics are required. Bacteria exchange genetic material via conjugation, transformation, or transduction. Studies have shown that the primary method by which methicillin resistance is transferred between bacteria is transduction, in which bacteriophages, or viruses that infect bacteria, transfer genetic information from one host to another. The goal of this experiment was to isolate and extract bacteriophage DNA from environmental samples and then identify and analyze the prevalence of the *mecA* resistance gene within the phage DNA. To do this, liquid samples were taken from the nearby wastewater treatment plant, as well as from nearby streams with agricultural influence during periods of high runoff. These samples were treated, filtered, precipitated, centrifuged, and sterile filtered to obtain concentrated phage. DNA was then extracted by two different methods, followed by DNA amplification, and gel electrophoresis for analysis. Obtaining optimal phage DNA concentrations was challenging, so different methods within this experiment were tried, tested, and analyzed for efficiency. Tests for inhibitors in the samples that block polymerase chain reaction (PCR) amplification of DNA were also performed, and inhibitors were found within several of our experimental samples. Out of six different sample preparations using several combinations of different methods, no positive results were found. Previous work has shown samples with greater than 10% yield, but these were from solid matter samples. In future experimentation, I suggest that our optimized procedures be performed on solid matter samples, and that students continue to address the factors that affect phage yield during procedures and procedure development.



**BSISAT Program****Presentation Room: ISAT/CS Room 350**

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Time: 5:15-5:40pm  
Presenter: Jarod Sutton  
Concentration: Engineering and Manufacturing  
Capstone Advisor: Dr. Geoffrey Egekwu  
Capstone Title: The Status of RFID Applications in the U.S. Healthcare Industry – Diffusion Challenges and Drivers

**Abstract:**

This project focuses on the current adoption of RFID systems within the healthcare system of the United States – including asset tracking, tracing and tracking pharmaceuticals, patient and staff monitoring. There is the possibility that this research could assist in meeting a need expressed by Rockingham Memorial Hospital, which is to determine the critical areas within their operations that would benefit most from RFID technology. This research could also serve as a “white paper,” which can be used as a guide for readers to gain further knowledge about the subject. The paper will act as a tool for companies who are interested in implementing an RFID system in a healthcare environment to understand pricing, the proper type of transducer technology, and understanding the plethora of applications within the healthcare field. In the long run the “white paper” will lead to higher rates of efficiency for determining uses for RFID systems within the healthcare field as well as reduce future project costs due to the research that has already been conducted. Projects that involve implementing and determining applications for RFID technology in the healthcare industry could also use results of this study as a stepping-stone for a specialized analysis of their unique needs.

**BSISAT Program****Presentation Room: HHS 3022**

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Time: 10:00-10:25am  
Presenter: Andrew Mathias  
Concentration: Telecommunications  
Capstone Advisor: Dr. Emil Salib  
Capstone Title: Proxy Mobile IPv6: Practical IPv6 Implementation for a Modern Mobile Network

**Abstract:**

In the world we live in, smart-phones as well as other mobile Internet connected devices have become ubiquitous. At the time its inception, the internet protocol version 4 only accounted for a limited number of IP addresses. As we move forward the pool of IPv4 addresses to draw from becomes smaller and eventually we will run out. The solution has been IPv6, which along with a number of other technical advantages compared to IPv4, extends the address pool to choose from.

The purpose of this project is to explore a practical solution to problems that will be faced in implementing Internet Protocol version 6 into mobile networks. Currently, many of the devices connected to mobile networks are not capable of IPv6 and equally incapable of performing mobility within the IPv6 network. As a solution for network service providers, IPv6 can be implemented while accommodating these users' needs through the use of proxy servers. Proxy servers run the software needed for users running older devices to be connected to the new IPv6 infrastructure. Also, as mobility implies, the network must be capable of seamless hand-offs in order to maintain a high quality of service when roaming between networks. This seamless mobility allows users to carry calls or other time sensitive services between areas of service without dropping this connection.

This project implements and analyzes this type of proxy based mobile network through the use of the Linux computing environment as well as making use of a number of open source tools. The proxy mobile IPv6 network implementation analyzed is the open source, OpenAir Interface package. The network implemented is examined and compared to its enacting protocol.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 9:05-9:25am  
Presenter: Nicholas E. Derr  
Capstone Advisors: Dr. Jeffrey Tang and Dr. Timothy Walton  
Capstone Title: Commercial Aviation Security: Threats, Their Costs, and Improving Efficiency

**Abstract:**

The commercial aviation industry remains a high-value target for terrorist attacks despite a substantial decrease in the number of successful attacks since 9/11. With over 30,000 flights a day in the U.S. alone and the number growing every year, keeping our skies safe and terrorists away from aircraft may be difficult. This project examines and profiles the current threats to commercial aviation and what strategies are in place to combat those threats through a risk and vulnerability assessment. It also considers the cost of these threats and how they may be more efficiently handled at a lower cost to the government, airlines, and passengers through systems analysis. The growing demand for airline travel combined with existence of new methods for terrorism create a need for adjustment to current security and screening systems in place in order to sustain a clean safety record and increase passenger satisfaction.

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Time: 9:30-9:50am  
Presenter: Jacob Poole  
Capstone Advisor: Dr. Jeffrey Tang  
Capstone Title: Blizzard Entertainment and Low-Tech Cyber Attacks: A Kill Chain Analysis

**Abstract:**

This capstone project looks to create a breakdown of what a cyber-attacker targeting a high-profile video game company would look like, and how they would go about planning, as well as launching an attack. This is done through the use of Vulnerability Analysis and Cyber Kill Chain Analysis with the assumption that phishing attacks and socially-engineered Trojans would be the two largest cyber-threats to the company. These methodologies are used to locate steps in a hypothetical attack prior to the attack actually being implemented, so that a company would be able to present road blocks.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 9:55-10:15am

Presenter: Katelyn Dickey

Capstone Advisor: Dr. Noel Hendrickson and Dr. Jeffrey Tang

Sponsor: National Intelligence University (Barry Zulauf)

Capstone Title: From Civil Unrest to Radicalized Social Movements:  
Extrapolating Trends from the “Arab Spring” Movements

**Abstract:**

From anywhere in the world, social movements can be followed as they progress through posts on social media, like teens live tweeting from rocket-bombarded Gaza or viral videos of mass riots in Ferguson, Missouri. But can these online posts help to predict when a social movement is escalating from civil unrest to full-blown revolutionary radicalization? Through the use of trend extrapolation, this project identifies trends found in social media use throughout the “Arab Spring” movements in Egypt and Tunisia. The signs and indicators found within extrapolated trends are applied to hypothetical scenarios to determine how analysts might utilize the trends. Pinpointing when social movements might escalate and radicalize has major implications for both national security and competitive business intelligence communities, such as determining when an authoritarian regime might be overthrown or assessing the risk of outsourcing business to a region of the world facing civil unrest.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 10:35-10:55am  
Presenter: Christina Carr  
Capstone Advisors: Dr. Edna Reid and Dr. Jeffrey Tang  
Sponsors: Dawn Cliffe, Business Development Specialist at Zavda Technologies, LLC  
Capstone Title: How to Stay Current with the Technological Changes and Cyber Security Threats

**Abstract:**

The financial stability of a business is contingent upon the secure functionality of critical infrastructure. Cybersecurity threats exploit the internal vulnerabilities of critical infrastructure systems, placing businesses, consumers and the economy at risk. This project will address the greatest cyber security threats to small businesses and provide opportunities for technological expansion and cyber protection.

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Time: 11:00-11:40am  
Presenters: JP Bourgon, Rachael Jenner, Kaitlyn Mahoney, Vivi Mai, and LeeAnne Pelzer  
Capstone Advisors: Dr. Geoffrey Egekwu and Dr. Jeffrey Tang  
Capstone Title: RFID in the Healthcare Industry

**Abstract:**

Do you ever wonder how hospitals track patients, equipment, and medicine? Radio Frequency Identification (RFID) technology can provide significant benefits to the healthcare industry, however, there exists the potential for serious consequences to arise. This project thoroughly assesses both the benefits and the drawbacks of RFID technology for the healthcare industry. Using PEST and SWOT analyses, we evaluated the evolving external and internal environments affecting RFID implementation in the industry. We then generated and assessed four distinct future scenarios that identify successful implementation and mitigation strategies. The results of our project can guide healthcare facilities in strategic decision making.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 1:10-1:30pm  
Presenter: Austin Thaddeus Baxter  
Capstone Advisors: Dr. Noel Hendrickson and Dr. Stephen Marrin  
Sponsor: Toffler Associates  
Capstone Title: Current and Future Threats to the Internet of Things

**Abstract:**

Criminal and foreign government entities are highly likely to infiltrate systems surrounding the Internet of Things (IoT) due to the inherent vulnerabilities of small internet-connected devices. This could have a major impact on the consumers who use the IoT, as well as the producers of IoT devices. The IoT is an emerging technology that uses internet-connected sensors and devices to automate systems in our environment, ranging from temperature, humidity, and gyroscopic sensors to radio frequency identification (RFID) and near field communication (NFC) chips. These sensors are typically used to help monitor and regulate other internet-connected devices. Under the paradigm of the IoT, all of these devices and sensors will play a role in simplifying processes. This simplification will offer consumers greater convenience and efficiency in their daily lives, but may leave them more vulnerable to hackers. This analysis determines the IoT systems that are most vulnerable to hacking threats. This capstone also explores the various consequences and ramifications of the penetration of these systems. A holistic view of the future threats to the IoT is provided through the combination of these methodologies.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 1:35-1:55pm  
Presenter: Sidney Barton  
Capstone Advisor: Dr. Stephen Marrin  
Capstone Title: Scenarios for the End of ISIL

**Abstract:**

Historical precedent plays a key part in understanding how and why a terrorist organization functions—and in predicting how it can end. This project seeks to identify the most plausible end for ISIL within the context of historical precedent, via causal analysis, scenario generation, and an external academic framework. This external academic framework is borrowed from Audrey Kurth Cronin's *How Terrorism Ends*, and aids in the establishment of historical precedent and the conception of futures scenarios. Altogether, this project will identify the internal and external causal forces affecting ISIL, conceptualize seven distinct futures scenarios illustrating ISIL's potential ends (in accordance with historical precedent), and pinpoint which of these scenarios is most plausible given the causal factors and current trends.

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Time: 2:00-2:20pm  
Presenter: Katherine Hussey  
Capstone Advisor: Dr. Stephen Marrin and Dr. Noel Hendrickson  
Sponsor: Toffler Associates  
Capstone Title: The Assessment of Methods Used to Conduct Security Breaches on Multinational Corporations

**Abstract:**

This capstone project evaluates how hackers and terrorist groups threaten multinational corporations through the use of systematic causal analysis and scenario generation. With security breaches of corporations on the rise, this project seeks to determine the methods that would most likely be utilized by hacker and terrorist groups to conduct a security breach. The generated hypothetical scenarios incorporate different multinational corporations to serve as examples to demonstrate what would occur if these breaching methods were implemented. Furthermore, this project will discuss the implications of the scenarios and provide precautionary measures that could be taken in an effort to protect the corporations and the secure information they possess.

**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 3:15-3:35pm  
Presenter: Lewis Creech  
Capstone Advisors: Dr. Jeffrey Tang and Dr. Timothy Walton  
Capstone Title: US/Europe Intelligence Study

**Abstract:**

This project provides an in depth look at the United States and select European nations' intelligence organizations to derive meaningful conclusions. Through a political framework, potential lessons and improvements to the United States infrastructure are explored with historical causal trends to explain the development of various approaches to intelligence. The perspective of comparing organization and capability with allies, instead of adversaries, provides insight that can strengthen each system the nations have developed for the greater good. Each country's political efficiency is essential to the overall potential effectiveness of intelligence.

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Time: 3:40-4:00pm  
Presenter: Tyler Wood  
Capstone Advisors: Dr. Jeffrey Tang and Dr. Timothy Walton  
Capstone Title: Snack Food Industry Analysis for PepsiCo

**Abstract:**

What will happen to the snack food market as consumer tastes begin to change? My project aims to help the CEO of PepsiCo anticipate any future market shift(s) to help maintain market dominance 15-20 years in the future. I draw upon past sales, obesity rates, Congressional laws enacted against snack food companies, eating habits of the U.S. population, and futures research already conducted to anticipate the most likely market shift. My project also elaborates on the most likely and most significant scenarios to develop.



**Intelligence Analysis Program – Individual Presentations****Presentation Room: HHS Room 1208**

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Time: 4:05-4:25pm  
Presenter: Jorge Panozo  
Capstone Advisors: Dr. Jeffrey Tang and Dr. Timothy Walton  
Capstone Title: Assessing the Significance of the Republic of Kosovo's  
Development and Independent State Recognition

**Abstract:**

This project will focus on the U.S. benefits of rebuilding Kosovo and supporting its state recognition. After the Kosovo War, Kosovo inherited a damaged economy and struggled to find recognition in the international community. Currently, the main problems Kosovo faces are: independent state recognition, a low economic growth rate, and drug trafficking within its borders. It would be advantageous for the U.S. to utilize Kosovo's geographic location. This includes: improved relations with Islamic states, a decline in Islamic state hostility, a decrease in Russia's influence over the Balkan region, using Kosovo as a geographic stronghold, utilizing the drug trafficking operation in Kosovo as a model for the U.S., and the U.S. gaining international business partners. The goal of this project is to provide evidence of future scenarios in which the U.S. can set strategic directions to pursue its interests. Even with financial aid being given to Kosovo from the U.S. and other states, Kosovo's economy is not growing to the desired rate. The desired rate is one that will allow Kosovo to become more involved in the international community, allowing their economy to flourish, and attain enough respect from states to recognize Kosovo. This project will analyze the potential benefits of speeding up Kosovo's development and how the U.S. would achieve this.

Location:

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 9:00-9:25am

Presenters: Sarah Graupp and Pat Smith, II

Capstone Advisors: Dr. Robert Kolvoord, Dr. Noel Hendrickson, and Dr. Stephen Marrin

Capstone Title: The Sovereign Citizens Movement - “The Spread of Vigilantism”

**Abstract:**

Our project answers the question “Do political and economic factors play a role in the recent increase in violence of the Sovereign Citizens Movement?” The Sovereign Citizens Movement has become the top domestic terrorist threat in the United States, according to the FBI. This group poses a threat to law enforcement and government officials on a daily basis through their random acts of violence. We will geographically visualize the violent and potential violent attacks of the movement and the political and economic factors from the years 2000-2014 to identify any correlation(s). The goal of our project is to open the doors for future analysts to find the specific causation of the movement’s reason for violence.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 9:30-9:55am  
Presenters: Sarah Christensen and Emily Schaeufele  
Capstone Advisors: Dr. Michael Deaton, Dr. Stephen Marrin, and Dr. Timothy Walton  
Sponsor: Toffler Associates  
Capstone Title: Disease Detection through Social Media

**Abstract:**

The purpose of our project is to conceptualize new ways to gather disease-related data from social media to identify and predict the spread of infectious diseases prior to an outbreak. With the recent trend of individuals not vaccinating their children, the risk of an outbreak within densely populated areas, such as New York City and Chicago, is increasingly becoming a threat. Without vaccinations, lesser-known diseases such as measles and dengue fever pose a significant threat to society due to the decreased willingness of individuals to use vaccines. The unlikely presence of such diseases in the United States makes social media a more valuable tool for the long-term health of society. This analysis provides insight into the workings of social media, as well as how social media can enhance surveillance of health concerns both in the United States and in other areas of the world.

Through the use of a systems analysis, we are better able to understand how the different types of users are driving social media use in the United States. Based on the behavioral drivers of the types of users, we developed criteria to evaluate how people use social media to identify the most effective options for tracking the spread of infectious diseases. These options will help to understand how information posted on social media can be extracted and synthesized to provide trends to predict future outbreaks. The best options were then forecasted to three years in the future to evaluate the applicability to the United States. Finally, the options were evaluated for India, a developing country that is a hot spot for outbreaks of infectious diseases, to understand if the proposed methods were applicable and beneficial to India.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 10:00-10:35am

Presenters: J. Ryan Larson, Justen Silva, Savannah Smith, and Kayla Woollums

Capstone Advisors: Dr. Michel Deaton, Dr. Noel Hendrickson and Dr. Stephen Marrin

Capstone Title: Assessing the Feasibility and Implications of a Caliphate Founded Upon Terrorism

**Abstract:**

This project answers the question of “What conditions would have to be met for the establishment and sustainability of a Caliphate founded upon terrorism?” Our particular analysis draws examples from the following: Islamic State of Iraq and the Levant (ISIL), Al-Shabaab, and Boko Haram. The project involves three sequentially-structured analytic components: (1) a systems’ dynamics model identifying key causal variables leading to the establishment of a terrorist-run Caliphate, (2) a counterfactual method (which includes a “What If,” “Low Probability/High Impact,” and a “Post-Mortem” analysis) exploring potential ways in which establishment could occur and evolve into a sustainable Caliphate, and (3) a threat/vulnerability assessment highlighting points of disruption at both the establishment and sustainability stages. Thus far, analysis has indicated that the establishment of such a Caliphate requires territorial span of control, ideological support, and financial self-sustainability. Successful campaigns in all three of these areas is foundational to effective governance under a terrorist organization. At this point in time, it appears that the likelihood of sustainability is directly correlated to the terrorist organization’s ability to counteract and overcome the negative effects of their actions.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 12:35-1:05pm

Presenters: Michael Ambrogi, Justin Clowser, and Kevin McEvoy

Capstone Advisors: Dr. Michael Deaton and Dr. Stephen Marrin

Sponsor: National Intelligence University (Barry Zulauf)

Capstone Title: Indicators of Hezbollah's Global Infiltration and Their Potential Presence in Mexico

**Abstract:**

Our capstone project will focus on case studies of Hezbollah's international outreach and how that may be applied to their current presence in Mexico. Through the identification of key variables we will pinpoint particular factors that would alert us to Hezbollah's potential presence in Mexico as well as the long term sustainability of such a relationship. To do this we will examine Hezbollah's previous infiltration in Europe and in the Tri-Border Area of South America. These case studies will then be applied to our assessment of the current underlying dynamics which allowed for the cartels to rise to power in Mexico. The result of this analysis will be three causal loop diagrams that we anticipate will provide indications of Hezbollah's tendencies and preferences when seeking beneficial international partnerships. Due to the fact that the reporting on Hezbollah's presence in Mexico has failed to yield concrete evidence we have framed our project in a way that will ultimately tell us if the environment in Mexico is conducive to Hezbollah's operational agenda. Through analysis of the factors that led to Hezbollah's rise in Europe and South America we ideally will be able to integrate this knowledge with what we currently see in Mexico. This project will not only speak to the likelihood of Hezbollah in Mexico. It will also serve as a means to project the potential, or lack thereof, for a continuous relationship between the cartels and the Lebanese terror organization. The ultimate value provided by this analysis will be found in the synthesis of fragmented information that has not been previously done. By the end of the presentation our consumer will have a better understanding of the magnitude of the relationship between these entities.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 2:00-2:30pm  
Presenters: Michael Bodenheimer, Tyler Colwell, and Tanner Johnson  
Capstone Advisors: Dr. Michael Deaton, Dr. Anthony Teate, and Dr. Jeffrey Tang  
Sponsor: Mr. Shaun Hydock - Black Willow, Inc.  
Capstone Title: Data Fusion: A Methodology Development

**Abstract:**

Data fusion is the integration of multiple data sources in order to represent information in a more meaningful way. Several fields utilize data fusion, ranging from traffic to weather to city planning. Our team developed a methodology to determine the applicability of data fusion to any given industry. To demonstrate our methodology, we applied it to hospital emergency rooms to see if and/or how data fusion could assist healthcare practitioners in decision-making.

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Time: 2:35-3:10pm  
Presenters: Christine Choi, Karlyn Galante, Garrett Hughes, and Mia Piccininni  
Capstone Advisors: Dr. Michel Deaton and Dr. Jeffrey Tang  
Sponsor: Toffler Associates  
Capstone Title: What Role Will Banks Have in 2045?

**Abstract:**

This analysis explores the overarching themes implicating US banks and what they might look like in the future. In order for US banks to survive and remain profitable, they need to adjust to the evolving market and consumer demands. Traditional banking models face challenges such as: the democratization of the movement of money, restrictive regulatory obligations, shifting consumer expectations, and evolving criminal activity. This project takes a creative analytical approach to illustrate possible future market environments and propose strategies to adapt and maximize profits. Our analysis is not limited to providing strategies for banking executives but also offers insight into the emergence of self-reliant individual financial practices.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 3:15-3:45pm

Presenters: Benjamin R. Evans, Moran T. Meek, and Ryan M. Restivo

Capstone Advisors: Dr. Noel Hendrickson and Dr. Stephen Marrin

Sponsor: Toffler Associates

Capstone Title: The Integration of the Internet of Things into the Federal Workforce

**Abstract:**

The purpose of this analysis is to assess the threats and security vulnerabilities of the “Internet of Things” (IoT) and how it will interact with the federal workforce over the next 20 years. The IoT is also known as ubiquitous computing, where a broad range of electronic devices are all operating in centralized or decentralized networks. These networks interact to make a seamless transition of information across all networks involved. The first phase of this project is identifying hypotheses of how the IoT is going to develop over the next 20 years. The second phase is identifying threats that the IoT presents to the federal workforce as it develops. The third phase is the development of scenarios that could arise based upon two causal factors, security and convenience. The final phase is conducting of a counterfactual assessment where we identified outlying scenarios, the triggers of those scenarios, and the intermediate states for the federal government to monitor in order to be prepared to deal with the outlying scenarios. To conclude our analysis we will present the implications of our findings and offer recommendations that maximize government utility and mitigate threats.

**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 3:50-4:25pm

Presenters: Kristen Fialdini, Stephen Cracknell, Ryan Fraser, and David Troxel

Capstone Advisors: Dr. Noel Hendrickson and Dr. Stephen Marrin

Sponsor: National Intelligence University (Barry Zulauf)

Capstone Title: Model of Instability Metrics for US Decision Making Support

**Abstract:**

This project creates a model of metrics that determines if a country is becoming more or less stable. It does this by applying multiple analytic techniques with the purpose of providing a valuable, strategic-level intelligence product to US decision-makers. It adapts previous research on the causes of instability into observable factors, referred to as metrics, and determines whether those metrics are presently indicating instability for individual countries within a geographic region (the case study for this project being West Africa). This project intends to capture all major factors within a country and avoid any critical oversights by utilizing the STEEPM (Social, Technological, Economic, Environmental, Political, and Military) analytic framework to organize the metrics. Findings are then organized first by country, then by STEEPM factor, and presented in a three-layered report of increasing levels of detail. The three layers are: an at-a-glance assessment of the whole region, brief reports on each country, and the analyses of all major factors within each country. This should allow decision-makers focused on a specific field (e.g. a military commander or an economic adviser) or with a specific priority (e.g. the ambassador to Ghana) to quickly absorb any and all information they need, in the level of detail they desire.



**Intelligence Analysis Program – Group Presentations****Presentation Room: nTelos Room – ISAT/CS Room 259**

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Time: 4:30-4:55pm  
Presenters: Gary Checknita and Scott Liddell  
Capstone Advisors: Dr. Michael Deaton, Dr. Noel Hendrickson, Dr. Stephen Marrin, and Dr. Timothy Walton  
Sponsor: Toffler Associates  
Capstone Title: Bitcoin: Potential Future Regulation Towards Crypto-Currencies

**Abstract:**

The aim of this project seeks to determine if the U.S. can enact policies to disrupt and deter criminal and terrorist organizations from using crypto-currencies, such as Bitcoin. Bitcoin is a relatively new technology that was introduced in 2009. Bitcoin allows users to engage in financial transactions without the need of traditional third party financial institutions, such as banks and money transmittal services (e.g. Western Union), and provides pseudo-anonymity features to conceal the identities of the receiver and issuer by using disassociated public-keys. With the benefits of lower transaction costs and anonymity comes disadvantages as well. The disadvantages include the fact that criminal organizations have been using this system for money laundering and the buying and selling of illegal goods and services, while terrorist organizations use this system for illicit fund raising. Our goal in this project is to assess ways that the U.S. can implement policies to hamper and disrupt these organizations using such systems without hindering innovation by stakeholders that are using these systems in a legal manner.

The methodologies used include four structured analytical techniques to help us forecast scenarios involving crypto-currencies into the future. These structured techniques include chronologies and timelines, concept mapping, causal analysis, and scenarios generation. The benefit of doing this analysis is that it allows our consumers to visualize possible future scenarios involving this new technology incorporating various types of regulation, along with associated sign-posts and indicators. This allows agencies and companies to better situate themselves for changes in the global financial environment.

## Geographic Science Program

**Presentation Room: HHS Room 1202**

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Time: 9:00 – 9:25 am  
Presenter: Ralph Aaron Stickman, Jr.  
Concentration: Environmental Conservation, Sustainability and Development  
Capstone Advisor: Dr. Wayne Teel  
Sponsor: Stickman Farms  
Capstone Title: Sustainable Agriculture

### **Abstract:**

The sustainable agriculture project looks at a farm that currently is using conventional farming practices and determines ways for the farm to become sustainable. When assessing the farm's condition prior to the project's start, several factors were explored including:

- Percentage of land used for production purposes
- Soil quality (soil samples were taken and tested)
- Compaction of the soil
- Condition of the pasture
- Wasteful practices

Each of the factors were addressed to determine the cause of any issues and then to consider options for making sustainable changes. An overall plan was then developed to start the transformation toward sustainable production methods and processes. It was determined that there was a significant amount of land that was not being used for production purposes. To address this issue, new plans for fences were drawn up in order to allow for more land to be used for grazing purposes. Additionally, poor soil quality along with over grazing of the pastures resulted in poor grass quality for livestock. It was also found that some of the farm's fields had high soil bulk density. To resolve this issue, experimental tillage practices were applied to four test plots with controls to determine a way to decrease the density. There was an active, but weak, composting program set up on the farm. In order to increase the effectiveness of the composting system it was expanded to include household food scraps, as well as yard waste and other biodegradable products.



## Geographic Science Program

**Presentation Room: HHS Room 1202**

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Time: 9:30 – 10:10 am

Presenters: Anne Wallace, Kyle Doescher, and Ryan Horrocks

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

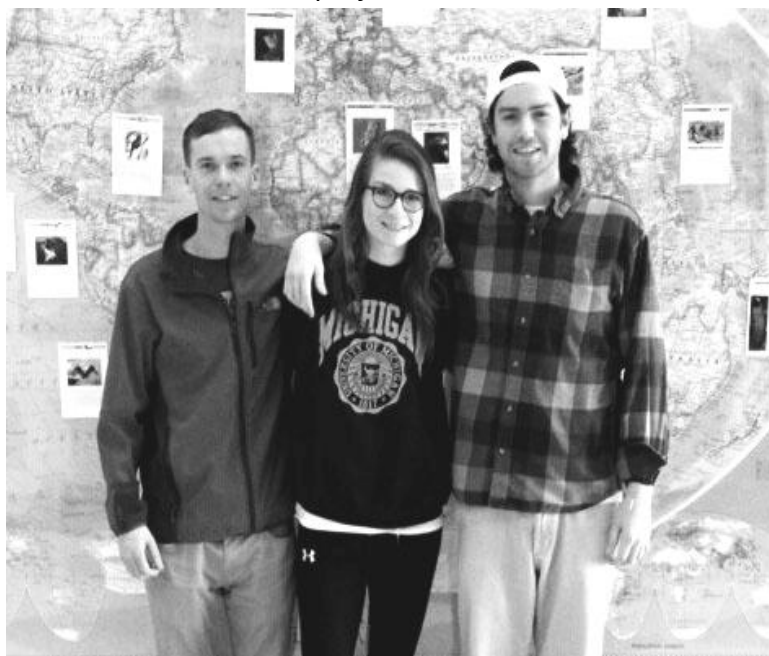
Capstone Advisor: Dr. Wayne Teel

Sponsor: Geography Club, E.A.R.T.H. Club, Lee Eshelman

Capstone Title: JMU Car-Free Commute Week

### **Abstract:**

Improving ecological and personal sustainability around the JMU community. In the past, JMU has organized a “Car Free Day,” but we believe a full week without driving could make a difference in peoples’ perception of the environment and the impacts of our daily actions. Car-Free Commute Week will take place March 23rd to the 27th with comparison data collection taking place the week before, March 16th to the 20th. Techniques for data collection involve various technologies including road strip counters, aerial photography, bus ridership counters, parking deck data, and manual counting methods. This data will be analyzed to compare the number of cars during Car-Free Commute Week to a normal week. The benefits of this project are not restricted to the JMU Community. During Car-Free Commute Week, a screening of “Years of Living Dangerously” will be hosted by the Car-Free Commute team and all proceeds will go to the Utooni Development Organization. The UDO constructs sand dams in Eastern-Africa to provide a reliable water source for people living in those communities. This project will give every student at JMU the ability to come together, make a difference, and become a part of our school motto, “Be the Change You Wish to see in the World.”



## Geographic Science Program

**Presentation Room: HHS Room 1202**

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Time: 10:15 – 10:55 am

Presenters: Joshua Foery and Philip Sturm (Honors Capstone)

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisors: Dr. Zachary Bortolot and Dr. Carole Nash

Sponsor: Shenandoah Valley Bicycle Coalition (SVBC)

Capstone Title: Mapping Soil Erosion Risk and Safety Factors of the Massanutten Trail System

### **Abstract:**

Public mountain biking and hiking trails can pose challenges to trail-user safety. The purpose of this project is to improve the overall safety factors on the Massanutten Western Slope, in eastern Rockingham County, Virginia, where a 15-plus mile trail system has been made available to a broad range of users. Owned by Massanutten Resort, the trail system is in a remote, forested area frequented by local off-road cyclists, runners, hikers, as well as seasonal tourists and is maintained by the Shenandoah Valley Bicycle Coalition (SVBC). This multifaceted project, which integrates ESRI ArcGIS, Trimble Pathfinder, USDA SSURGO soils data, and the National Land Cover Database (NLCD), has the common goal of increasing the overall safety of the trail system through assessing both environmental impact in trail construction and use, as well as accessibility for first responders. Trail erosion risk was modeled in ArcGIS based on the variables outlined in the Revised Universal Soil Loss Equation (RUSLE). The factors of soil erodibility, slope, and vegetation cover type were used to assess erosion risk and identify areas where current trails are likely to erode and where future construction should be avoided by SVBC. Field collection of GPS locational data using a survey-grade field rover was undertaken to update trail marker signage, provide accurate locational maps for rescue efforts, and test the validity of the erosion model through ground-truthing. Cellular strength data was collected to identify areas along the trails where cellular coverage may be weak. Ultimately, first responders will be provided with maps of the trail system labeled with geographic coordinates and that identify access points.



## Geographic Science Program

Presentation Room: HHS Room 1202

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Time: 11:00 – 11:30 am

Presenters: Kellie Burdick and Casey Sonnenfeld

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Mace Bentley

Capstone Title: An Analysis of Cloud-to-Ground Lightning Hotspots in  
Nashville, Tennessee

### **Abstract:**

Urban cloud-to-ground lightning studies focusing on medium-sized cities in the US are underdeveloped. Examination of flash activity for a region surrounding Nashville, Tennessee will aid understanding of urban land use correlated to lightning flashes, the distribution of thunderstorms, flash activity in the Southeastern US, and the spatial patterns of lightning. Cloud-to ground lightning occurring under conditions related to surface heating and air mass instability correspond more closely to urban land use



and underlying terrain; therefore the warm season, when the vast majority of lightning occurs, will be the focus of this investigation. This case study will integrate urban land use and spatial data to identify and analyze lightning flash activity corridors and hotspots in a region surrounding Nashville and including portions of Kentucky, Indiana, Tennessee, Alabama, and Georgia. A GIS will be developed including lightning flashes from 2002-2014, land cover, terrain, and population density. Additionally, the temporal distribution will examine the months and days that thunderstorms are most prevalent in the region. Lightning flash

activity will be identified through the computation of heat maps, and hotspots using spatial analysis tools in ArcGIS and QGIS. The study period and region contains over 20 million flashes to be incorporated into the GIS for the analysis. Evidence suggests that land cover is an important variable in controlling the location and distribution of warm season lightning flash activity and that terrain may even overwhelm urbanization in focusing warm season flash activity hotspots. This case study will assist meteorologists, city planners, and emergency management officials in better determining where lightning activity clusters in order to evaluate the potential hazards to population and infrastructure.

Key Words: Lightning flashes, thunderstorms, ArcGIS, urban land use, Nashville.

## Geographic Science Program

Presentation Room: HHS Room 1202

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Time: 11:35 – 11: 55am

Presenter: Nicholas Gibb

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Mace Bentley

Capstone Title: Lightning Outbreaks in Nashville, Tennessee Due To  
Urban Heat Island Effect

### **Abstract:**

Anthropogenic climate change occurs on multiple scales. Atmospheric effects from urbanization increase temperatures, alter the content of aerosols and augment thunderstorm activity. Increasing temperatures on a regional and global scale will likely strengthen moist convection and further enhance thunderstorms, increase lightning and other associated thunderstorm hazards. Evidence



suggests, lightning and thunderstorm augmentation due to urbanization is currently ongoing in larger cities throughout the Southeastern United States. However, to date, few studies have investigated lightning outbreaks surrounding medium sized cities. By controlling for larger scale processes producing thunderstorms such as stronger winds aloft and the proximity of fronts and surface low pressure systems, insights into the role of urbanization on lightning enhancement can occur. An examination of the lightning distribution during synoptically-benign (i.e. weak forcing) warm season days when at least 1,000 flashes occurred within the Nashville, TN Metropolitan Statistical Area (MSA) was conducted. The flashes for these events were combined and incorporated into a GIS for visual and analytic determination of lightning activity hotspots as well as for comparison to the underlying land cover. The aim of this investigation is to further yield insights into the role of land cover in enhancing deep moist convection leading to high lightning activity when larger scale atmospheric processes are controlled. Nashville, TN is located in an ideal location for this investigation as the warm, humid conditions in the warm season lead to many thunderstorm days and the city is sufficiently far from localized forcing factors such as orography and land-sea interactions.

## Geographic Science Program

Presentation Room: HHS Room 1202

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Time: 12:00-12:25pm

Presenter: John Franks

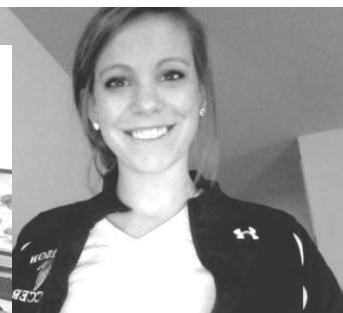
Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Mace Bentley

Capstone Title: Spatial analysis of lightning characteristics within derecho producing thunderstorm complexes.

### **Abstract:**

The National Oceanic and Atmospheric Administration (NOAA) defines a derecho as “a widespread, long-lived wind storm associated with bands of rapidly moving thunderstorms variously known as bow echoes, squall lines, or quasi-linear convective systems.” These weather events are known to sweep spatial regions of more than 240



damaging and severe quickly across large miles (400 kilometers).

They also produce high wind speeds of up to 75 mph (121 kph) and a high volume of lightning strikes across the storm's swath. Although extensive research concerning derechos already exists, there has been no formal investigation of the lightning associated with the parent thunderstorm complex. This study analyzes twenty (20) derecho events between 2003 and 2013 during the warm season (May through August) in an effort to further understand the lightning characteristics of these weather events. The area of interest encompassed the continental United States east of the Rocky Mountains (no events occurred further west). Data used in the study include cloud-to-ground lightning flash data derived from the National Lightning Detection Network (NLDN) lightning database, radar data showing the parent thunderstorm complex from the University Corporation for Atmospheric Research (UCAR), and damaging wind report data obtained from the Storm Prediction Center (SPC). A spatial analysis was conducted by incorporating these data into a geographic information system (GIS) in order to determine the size, shape, and lightning characteristics of each derecho. Primary foci of this research include 1) finding the approximate size of the lightning activity region for individual and combined event(s); 2) determining the intensity of each event by examining the density and polarity of lightning flashes; 3) locating areas of highest lightning flash density per event; and 4) to provide a baseline lightning climatology that outlines the temporal and spatial distribution of flash activity for particularly strong derecho producing thunderstorm complexes.

## Geographic Science Program

### Presentation Room: HHS Room 1202

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Time: 1:00-1:25pm

Presenter: Colin Spohn (Honors Capstone)

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Helmut Kraenzle

Capstone Title: Creation of Weighted Thiessen Polygons using Python

#### **Abstract:**

This project is an exploration into creating and manipulating Thiessen polygons. Thiessen polygons are zones created around points to show the area closer to each point than any other point in the set. Thiessen polygons are used to extend climate data from individual stations across areas. After creating the new procedure applications of the algorithm were considered. The manipulation explored in the project focused on allowing the borders of traditional Thiessen polygons to be shifted based on values among the points. These manipulated Thiessen polygons have been dubbed weighted Thiessen



polygons. These weighted Thiessen polygons were created using the Python programming language and ESRI ARCMAP software. Each edge of weighted Thiessen polygons gets shifted so that points with higher values get larger zones proportional to other points. In order to demonstrate how weighted Thiessen polygons work a set of points corresponding to teams from the National Football League were weighted based on team wins and playoff success over

ten year increments starting from the 1966 season that marked the first Superbowl. These results were used to estimate fan bases among teams and shifts over time.



## Geographic Science Program

Presentation Room: HHS Room 1202

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Time: 1:30-1:55pm

Presenter: Katherine Bishop

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Amy Goodall and Dr. Ian Muehlenhaus

Capstone Title: Internet based mapping for analyzing spatial patterns of stray cats and dogs

### **Abstract:**

Since fall 2012, the JMU Geographic Science (GS) Program has collaborated with the Anicura Veterinary Center (formerly the Shenandoah Valley Spay & Neuter Clinic) to study spatial distributions of stray cats and dogs. The veterinary center supplied the data and GS faculty and students analyzed the information. Students benefitted from working with real data and results are being used to understand how to help solve stray animal issues. In spring 2014, it was agreed that the next step should involve the development of guidelines for use of an internet-based mapping system so that the veterinary center could analyze data on their own, especially as they received new data. This project focuses on the process to find an appropriate web mapping source for use by clinic personnel, as well as the development of user-friendly guidelines appropriate for use in stray animal research, tests of the utility and completeness of the guidelines, and feedback from the veterinary clinic about the use of the web mapping guidelines. Based on the success of the guideline utility, the project was taken further to create an undergraduate laboratory assignment so that students can use the same web-based mapping system for studying patterns in stray cat distributions. This presentation involves interaction with the audience.



**Geographic Science Program****Presentation Room: HHS Room 1202**

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Time: 2:00 – 2:25 pm

Presenter: Allison K. Smith (Honors Capstone)

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

Capstone Advisor: Dr. Ian Muehlenhaus

Sponsor: Virginia Economic Development Partnership Michael Kolonay Angela Oakes

Capstone Title: Mapping Virginia Wineries and Wine Trails

**Abstract:**

The purpose of this project is to provide spatial visualization of wine trails in Virginia working in conjunction with the College of Integrated Science and Engineering (CISE) at James Madison University (JMU) and the Virginia Economic Development Partnership (VEDP). Wineries and wine trails in the state of Virginia will be geocoded and developed into spatial data files and then displayed cartographically using a variety of tools and resources. The goal of this project is to create a product that is useful for clients of VEDP and anyone interested in Virginia wine.

**POSTER PRESENTATIONS****Geographic Science Program****Presentation Room: HHS Room 1202**

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Time: 2:30-2:55pm  
Presenter: Kevin Nemeth  
Concentration: Environmental Conservation, Sustainability and Development  
Capstone Advisor: Dr. Amy Goodall  
Capstone Title: Invasive Species at Multiple Scales

**Abstract:**

This study examined the impact of invasive plant species on three geographic dimensions: global, national, and state/local scales. Invasive plant species are becoming more of a pervasive issue because native plants species are being encroached upon in various ecosystems. The global and national dimensions were assessed using an extensive peer-reviewed literature approach. The findings provided insight into the dispersal of these various invasive plant species, along with best practice approaches for future management and containment. The state/local scale was observed through aerial imagery dating back to the 1930's and examined the introduction of invasive plant species and how they altered the terrain over a period of time. Two different properties were analyzed on the state/local dimensions; one, where the property was neglected over the years, compared to that of a property which is maintained and actively rid the invasive plants where they exist. The results produced from this study illustrate the detrimental impact of specific invasive plant species and how they have the potential to overtake an entire ecosystem. While the study examined the invasive plant species on a variety of scales, it highlights the need for improvement in how we manage this potentially critical problem and the necessity for further study on this topic.



*Keywords: invasive plant species, global, regional, national, spread, impact, habitat degradation, decline*

**POSTER PRESENTATIONS****Geographic Science Program****Presentation Room: HHS Room 1202**

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Time: 3:00-3:25pm

Presenter: Jesse E. Mlcoch (Honors Capstone)

Concentration: Environmental Conservation, Sustainability and Development  
Applied Geographic Information Science

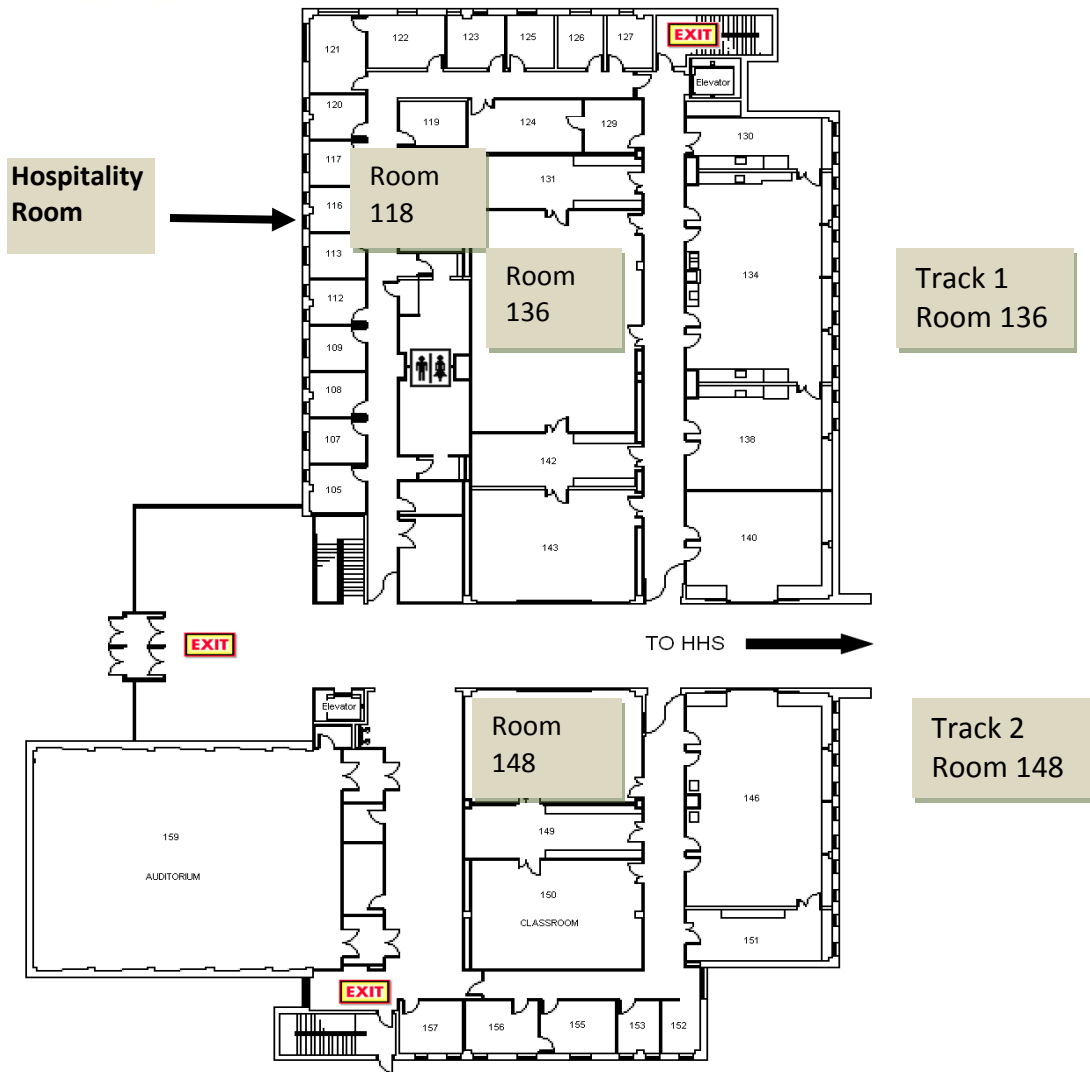
Capstone Advisor: Dr. Henry Way

Capstone Title: Mapping Urban Spaces of Absence; Applications of Counter Cartography in Local Urban Sustainability Studies

**Abstract:**

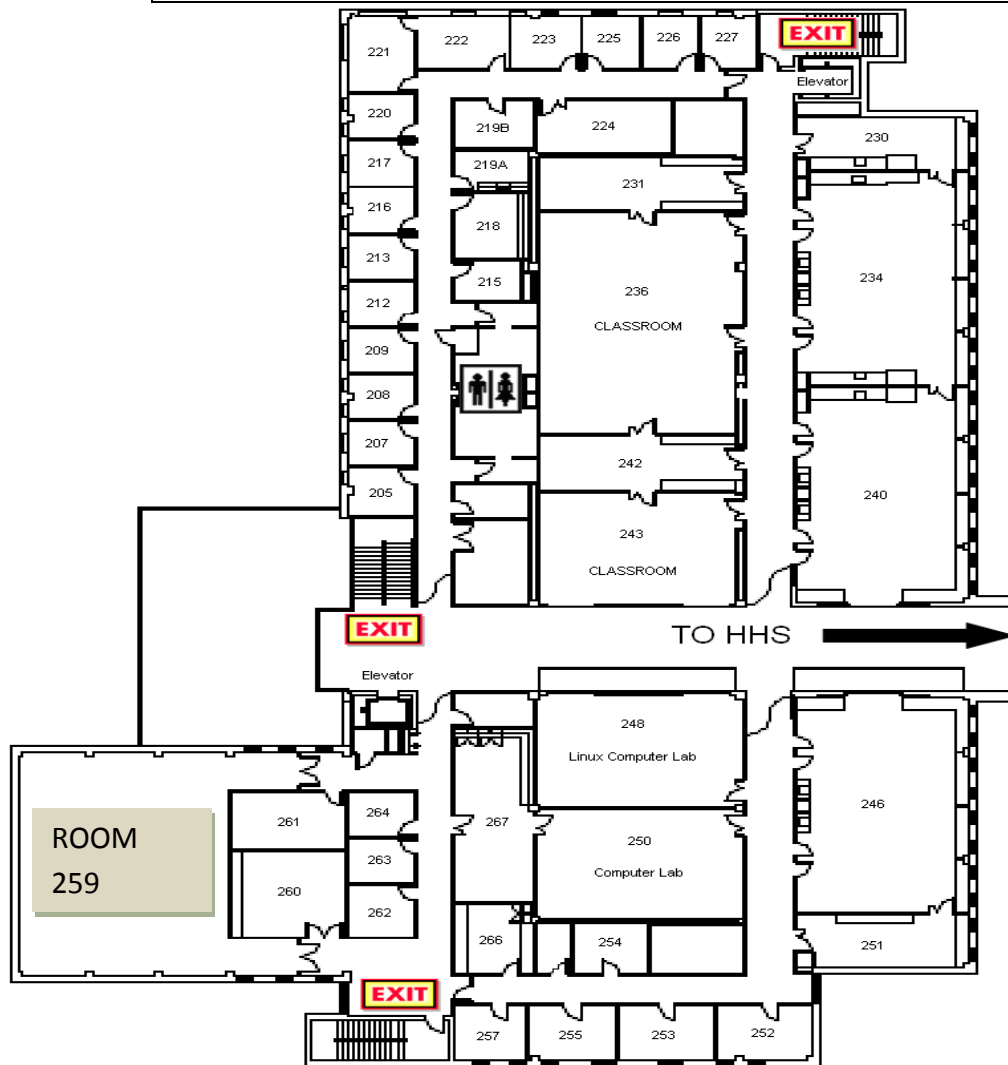
This work focuses on the themes of environmental responsibility in urban landscapes and the assessment of unutilized urban space. These research themes align with the topics of urban geography, urban sustainability, and more broadly human geography and studies in geospatial technology. The overall intent of this work is to map urban spaces of absence – undeveloped small scale spaces – in order to highlight the importance of and the potential for these spaces, which tend to be masked by the complexities that exist in urban development. The case study for this research takes place along Grace Street in Harrisonburg, Virginia, and the methods for completing this work are comprised of three different parts. The first of these methods is to utilize cartography and design and to explore the use of “counter cartography” techniques to create maps, which then highlight urban spaces of absence. The second is to observe and interview students and city residents that currently interact with and utilize these spaces and provide a detailed analysis of this information. The third part is to put to use elements of cartography and geographical analysis to make suggestions that promote sustainable alternative uses in these underutilized spaces. It is the intent of this study to create guidelines for the best application of cartographic techniques (counter or otherwise) for local urban sustainability studies.

**ISAT/CS Building – FIRST FLOOR Presentations**



**BSISAT Presentations – Rooms 136 & 148**

**ISAT/CS Building –2nd FLOOR Presentations**



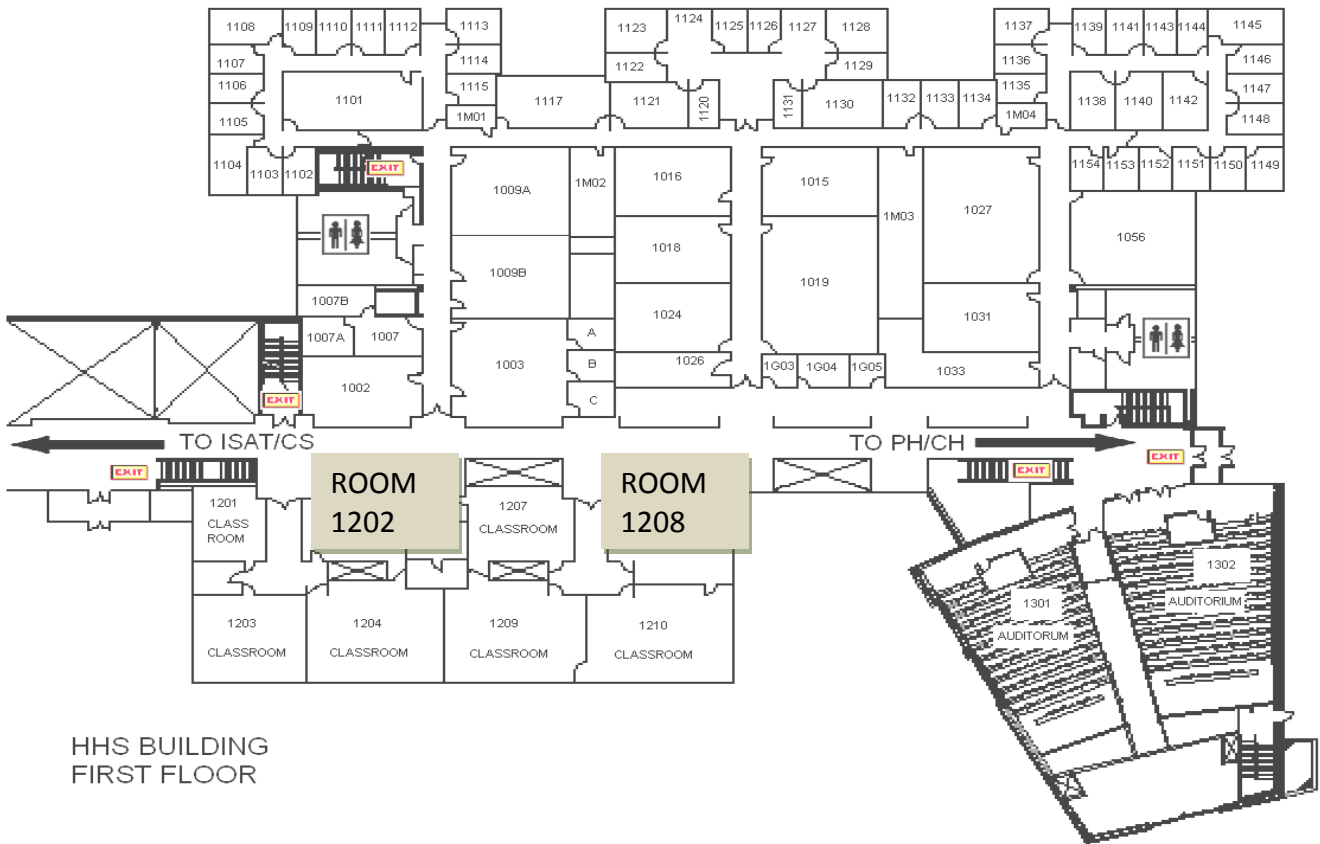
**INTELLIGENCE ANALYSIS PROGRAM - PRESENTATIONS – ROOM 259**

**ISAT/CS Building –THIRD FLOOR Presentations**



**BSISAT Presentations – Rooms, 337, 346, 348, and 350**

**HHS Building FIRST FLOOR – Presentations**

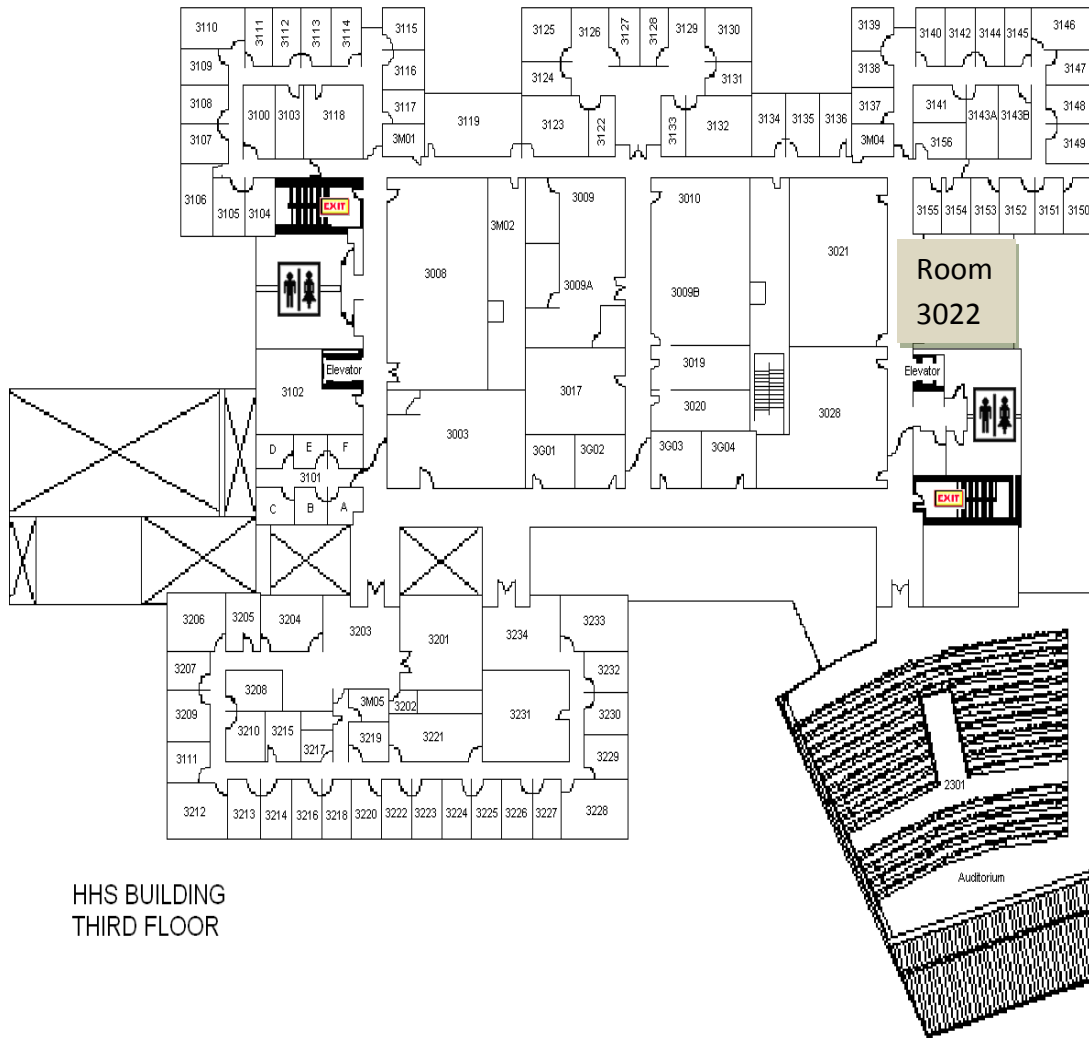


HHS BUILDING  
FIRST FLOOR

GEOGRAPHIC SCIENCE PRESENTATIONS – ROOM 1202  
INTELLIGENCE ANALYSIS PRESENTATIONS – ROOM 1208



**HHS Building –3<sup>rd</sup> FLOOR Presentation**



HHS BUILDING  
THIRD FLOOR

**BSISAT PROGRAM - PRESENTATION – ROOM 3022**