



Undergraduate Summer Research Academy

Project Details

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| Research Project Title: | <u>Project 1</u> Omni-Channel Supply Chain: Optimal Locker Location under Nested Logit Demand Function |
| Research Professor: | Dr. Sang Ho Shim , Engineering Department, SEMS |
| Research Project Title: | <u>Project 2</u> A Study of Corrosion Mitigation for Laser Marking on Stainless Steel |
| Research Professor: | Dr. Benjamin Campbell , Engineering Department, SEMS |
| Research Project Title: | <u>Project 3</u> New Directions in Multi-User Immersive Experience Design: Challenges and Opportunities in Full Dome Animation and Games |
| Research Professor: | Dr. Timothy Jones , Academic Media Center/Arts & Humanities, SIHSS |
| Research Project Title: | <u>Project 4</u> The Experience of Developing & Delivering Multicultural Patient Education Sessions for Nursing Students. |
| Research Professor: | Dr. Jessica Kamerer , Nursing SNEHS |
| Research Project Title: | <u>Project 5</u> Understanding Employee Depression and Coping Strategies |
| Research Professor: | Dr. Hongguo Wei , Management Department, Rockwell RSBUS |
| Research Project Title: | <u>Project 6</u> Ukraine Turns to Soft Power During Conflict. A Study of Ukraine's Soft Power Use After the Russian Invasion |
| Research Professor: | Dr. Judit Trunkos , Social Science Department, SIHSS |

Application Deadline
March 27, 2023



Project 1 of 6

Research Project Title: Omni-Channel Supply Chain: Optimal Locker Location under Nested Logit Demand Function

Research Project Summary: One innovative solution to the last-mile delivery problem is the self-service locker system. Motivated by a real case in Pittsburgh, we consider an e-commerce firm who operates a set of POP-stations and wishes to improve the last-mile delivery by opening new locker facilities. We develop a quantitative approach to determine the optimal locker location with the objective to maximize the overall service provided by the firm. Customer's choices regarding the use of facilities will be explicitly considered. They will be predicted by a nested logit model which is known to be more accurate than a multinomial logit model.

Student Research Objectives:

1. Understand the definition and the application of the logistic regression (logit) function
2. Understand how to develop a quantitative model of a location problem using the logit function.
3. Understand how to realize the logit model in Python code.
4. Understand how to solve the location problem using mathematical programming solver such as GUROBI and CPLEX.
5. Develop an approximation algorithm to solve a large-scale location problem.

Skills Required:

1. Students must take at least one statistics course.
2. Knowledge in linear algebra and Python programming are not required but recommended.
3. Taking Optimization Techniques, Operations Research 1, or Management Science is a Big plus.

Expected Student Research Outcomes:

1. Six (6) pages of report summarizing the summer research and a poster.
2. Possibly, one B- or A- level Publication with Advisor in the field of supply chain analytics.

Research Professor: Dr. Sang Ho Shim, Engineering Department, SEMS



Project 2 of 6

Research Project Title: A Study of Corrosion Mitigation for Laser Marking on Stainless Steel

Research Project Summary: The laser company, MECCO has a process to produce color laser marks on stainless steel, but they often lead to corrosion of the marked area. MECCO would like a student to produce various color laser marks on stainless steel with a variety of carbon contents and then use a saltwater bath to accelerate rusting and corrosion to determine which types of marks and metals are least likely to corrode. The student would also research anti-rust treatments and processes that could be applied after a laser mark to preserve the finish of the marked steel and propose post-processing options.

Student Research Objectives:

1. Student will perform a literature search and find relevant information to assist in the refinement of the test plan.
2. Student will learn how to operate a laser marking system.
3. Student will produce test sample and oversee a process for systemic corrosion testing.
4. Student will use metrology devices to assess and record the levels of corrosion over time.
5. Student will make recommendations on optimal processing conditions and treatment

Skills Required:

- High grade in Engineering Materials preferred.
- Student must be willing to occasionally travel to MECCO located in Cranberry, PA to work in their applications lab for training and to produce the laser marked samples.
- Ability to conduct the corrosion test at RMU and use metrology available at RMU to assess and record images of the marks over time under different corrosion scenarios.
- Ability to conduct literature search and processing of data remotely.

Expected Student Research Outcomes:

The student will gain experience in laser marking, materials testing, experimentation, Metrology, and business professional communication. MECCO will gain data on the long term effects of color marks on various stainless steel samples to assist in their ability to market the process to manufacturers.

Research Professor: Dr. Benjamin Campbell, Engineering Department, SEMS



Project 3 of 6

Research Project Title: New Directions in Multi-User Immersive Experience Design: Challenges and Opportunities in Full-Dome Animation and Games.

Research Project Summary: Since the 2019 launch of the Oculus/Meta Quest, an explosion of content for virtual reality (VR) consumption has primarily focused on the immersive digital virtual worlds experienced by users wearing head-mounted displays (HMDs) with the result that most VR users are isolated in their own discrete virtual environments, even when participating in a multi-user experience in the same physical space as others. The relative lack of attention paid to alternate immersive experience technologies-especially full-dome displays and multi-user Cave Automatic Virtual Environment (CAVEs)-presents a unique opportunity for new creative and critical approaches, and undergraduate research in particular.

Two obvious 'low hanging fruit' approaches are conspicuously absent from both recent research and commercial VR development 1. Non-digital approaches to multi-user VR such as full-dome stop-motion animation; and 2. Multi-user game experience that can be played together in the dome. Students will examine the gaps in existing immersive experiences, prototype their own (animation and/or game-like) creative/critical responses, document their results in the form of best practices and self-guided learning materials that can be shared with other student and faculty users of the AMC labs, and form the basis for further publishable research. This project is a continuation of the successful "Reframing Material" Inclusive Animation Labs grant initiative funded by the ASIFA-Hollywood Animation Educator Forum, July 2021 through May 2022. This effort also takes advantage of economies of scale possible additional undergraduate experiential learning opportunities through the Saitama, Japan & Pittsburgh, USA Sumer Camp 2023-Animation Camp.

Student Research Objectives:

1. Literature review of multi-user full-dome experiences.
2. Prototype multi-user full-dome stop-motion or game experience.
3. Instructional materials and exploration guides for AMC Full-Dome Display
4. Submission of Peer-reviewed Research case study (poster or paper).

Skills Required:

1. All majors are welcome and no specific knowledge of animation production or game design tools are required. Academic and/or work experience related to media tools, user experience and/or inclusion preferred.
2. Interest in accessibility, experience design, instructional design, and prototyping.
3. Strong problem solving and time management skills. Ability to work within deadlines.
4. Ability to communicate and collaborate with a wide variety of project stakeholders.

Expected Student Research Outcomes:

1. Literature review of the best practice from other media spaces (e.g. EDIT Media and the AACU-Diversity Inclusion Framework) informing best practices documentation for:
Producing and exhibiting multi-user stop-motion animation in a full-dome environment

Research Professor: Dr. Timothy Jones, Academic Media Center/Arts & Humanities, SIHSS

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Project 4 of 6

Research Project Title: The Experience of Developing & Delivering Multicultural Patient Education Session for Nursing Students.

Research Project Summary: This research project enrolls pre-licensure Bachelor of Science (BSN) students who have participated in the development and delivery of prenatal and antepartum patient education to mothers in Uganda via remote synchronous live learning sessions. This qualitative research uses semi-structured interviews of the participants as the primary source of data. In order to respectfully and appropriately interact and care for diverse patient populations, nurses require intercultural communication skills (Majda, et al., 2021). This is especially true when providing patient teaching and education related to health concerns, medical treatment, and self care. Research on how to develop these skills in nursing students is still evolving and best practices are being determined. The purpose of this study is to identify themes related to the development of nursing skills for cultural competence and cultural humility in undergraduate nursing students after participating in a series of mentored workshops to develop, create, and deliver antenatal patient education sessions to women in Uganda.

Student Research Objectives:

1. Student will develop skills through engagement in qualitative research.
2. Student will apply confidentiality and ethical standards while participating in research.

Skills Required:

- B+ or better grades in college courses related to communications, writing and math.
- Competent with Microsoft Office and Google suite products

Expected Student Research Outcomes:

- Participant will demonstrate best practice in qualitative research methods.
- Participants will actively and accurately engage in the data collection and analysis process.
- Participant will maintain professionalism in all communication and interactions.

Research Professor: Dr. Jessica Kamerer, Nursing, SNEHS



Project 5 of 6

Research Project Title: Understanding Employee Depression and Coping Strategies

Research Project Summary: The Covid-19 pandemic has brought unprecedented changes and turmoil. Employees have experienced an enhanced degree of depression in the past few years. The severity of depression not only mitigates employees' wellbeing but buffers their job performance. This project aims to understand factors affecting employees depression and propose effective coping strategies.

Student Research Objectives:

1. Search and review research on employee depression.
2. Identify factors affecting employee depression at work
3. Conduct interviews or surveys to collect data
4. Develop coping strategies for employees suffering from depression.

Skills Required:

1. Critical thinking and academic writing skills are pre-requisite.
2. The faculty will mentor the student to develop literature review, academic reading skills, and interview/survey skills.

Expected Student Research Outcomes:

1. Student will be understand the causes and consequences of employee depression at work, and develop knowledge to cope with depression.
2. Student will develop the skills of academic reading, writing and research design.

Research Professor: **Dr. Hongguo Wei**, Management Department, RSBUS



Project 6 of 6

Research Project Title: Ukraine Turns to Soft Power During Conflict. A Study of Ukraine's Soft Power Use After the Russian Invasion

Research Project Summary: Soft power is the ability to get what you want through attraction and it is seldom used in conflict. This research evaluates Ukraine's innovative foreign policy use as they decided to fight back against Russia with soft power as well as hard power.

This mixed-methodology research evaluates whether Ukraine increased its soft power use with other countries after the attack on February 24, 2022. The quantitative analysis will analyze recoded events data from ICEWS (Integrated Early Warning Systems). The qualitative analysis will get a closer look at specific actions taken by Ukraine. Special attention will be paid to government officials' media and social media appearances such as President Zelenskyy's.

Student Research Objectives:

1. Literature Review of Soft Power articles on soft power use during conflict
2. Data analysis of new soft power data
3. Case studies of Ukraine' soft power uses
4. Content analysis of Ukrainian government's media appearances and social media posts
5. Help draft the literature review, methods, and conclusion sections of the manuscript.
6. Identify areas for future research

Skills Required:

1. Any course taken in International Relations or European History
2. Basic level of Excel skills
3. Be able to navigate Facebook, Twitter and find official government websites
4. Be able to use google translate if needed

Expected Student Research Outcomes:

1. Learn to conduct literature review
2. Learn to conduct data analysis using excel (and possibly STATA).
3. Learn to conduct content analysis of speeches and social media posts
4. Learn to draft a manuscript for peer review
5. Learn about various impact levels of peer reviewed journals

Research Professor: Dr. Judit Trunkos, Social Science Department, SIHSS