



# URSA

Undergraduate, Research,  
Scholarship and Arts.  
Benedictine University

## 2019 Oral Presentation Schedule

**April 4, 2019 ❖ 12:00-5:30 pm ❖ Goodwin Hall 317 and 321**

### **SESSION 1: Goodwin 321 (12:00-1:30 pm)**

- ◆ **Ken Karstedt, Cody Louder, Kyle Mitter, Ryan Renken**  
“Factors that Affect the Rate of Adoption for Shelter Dogs”

Our project uses data from a Kaggle competition to forecast time to adoption for shelter cats and dogs. We have developed an algorithm to assist in forecasting information. Some other methods we have used besides developing an algorithm have been running error reports and using graphs.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Charles Cwik, Zifan He, William Schoonover**  
“Crime Rates of Chicago, Boston, Houston, and Los Angeles”

Using ArcGIS, we will be comparing four different crime rates occurring in four major US cities, identifying what areas these crimes mainly happen in and whether there is a correlation between our findings.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Nate Hermsen, Belaal Latifi, Joe Stoneburner, Imad Zayed**  
“Assessing Efficiency of Member Flow at Fitness Club”

We are creating a process flow for a gym and the different departments within the gym. People who enter the gym begin with an activity of signing in and then departing to the activities associated with each department: training, weights, cardio, and amenities. We set two attributes: the heavy users are members that use multiple gym facilities and the light users are members that will only use one gym facility. Our purpose is to track usage of gym amenities and provide an efficient experience to members.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **John Louder, Ries McCue, Kaytlin Teter**  
“Top Golf Business Process Design on a Very Popular Saturday”

For our project we created the design process of a Top Golf establishment. Top Golf is a multi-level driving range with recreational mini games which tends to have a group of people playing off one or two bays. It also includes a restaurant and bar which can be accessed by the golfers and on its own. The simulation starts off with four activities

for the check-ins where customers pay for their entry. From there, two options are available which are to go straight to the bar/restaurant, or to the bays to begin playing. The bar has its own queue to wait to be seated. There is a balking feature that allows for customers to exit or visit the bar, if the queue length is too long. Customer playing time at the bays is set by a triangular distribution that decide how long an individual or a group plays for.

*Faculty sponsor: Deborah Cernauskas*

## **SESSION 2: Goodwin 317 (12:00-1:30 pm)**

- ◆ **Justin Chang, Nestory Mtweve, Bridget Rakowski, Tammy Zembol**

“The Procedures of Going Through Baggage Claim and TSA Security Screening at Midway Airport During December”

We examine the procedures of using two major airlines that go to Midway Airport, making efficient decisions about baggage claim, TSA, and security screening process. We have incorporated a "first class" line for the TSA line to improve efficiency and gain happy customers that go to Midway Airport.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Daniel Orlich, Tayseer Zayed**

“The Relationship Between Demographics, Income, and Bank Robberies in Chicago”

Our project discusses the interactions between crime rates, income level, and demographics in the Chicagoland area. We will talk about how a relatively low-income area can be more susceptible to crime. We will also compare the demographics of areas with high crime rates to areas with low crime rates. Overall the story we are going to tell is that if an area of Chicago has a high crime rate, they could have low-income levels, and certain demographics.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Saad Hazari, Wamuyu Munyiri**

“Solar-Powered Health Clinic at the Kutupalong Refugee Camp in Bangladesh”

The Kutupalong refugee camp in Bangladesh is the world’s largest refugee camp. Despite global efforts to create a habitable space for the influx of refugees, the massive population in the camp makes it challenging to meet the refugees’ energy needs. This energy vacuum necessitates an alternative and renewable energy technology, such as solar photovoltaic (PV). This project outlines a design for a PV-powered health clinic in the Kutupalong camp. Essential clinical equipment, such as electric sterilizers and vaccine refrigerators, are integrated into the design. The power is generated by solar PV panels and energy storage systems, such as batteries, are used to store the excess power. Additional components, such as charge controllers and inverters, are also integrated into the design. This PV design is in compliance with the pertinent regulatory policies, such as the local electric code at the target location. The ultimate goal of the project is to help the refugees meet their growing health and energy needs, as well as to help reduce the carbon footprint associated with electricity generated using nonrenewable energy technologies.

*Faculty sponsor: Stefan Stefanoski*

- ◆ **Ross Evans**

“Synthesis and Cycloaddition Reactivity of Nitrones: Accessing the Lycojaponicum A Core”

The synthesis of nitrones and their reaction in a cycloaddition process is reported. Three new alkaloids (Lycojaponocumins A-C) have recently been isolated, which have interesting biological activity paired with a unique bridged heterocyclic core structure. A simplified analog of the bridged heterocyclic core is targeted in order to investigate and access the bioactivity of these compounds. An intramolecular dipolar cycloaddition has been proposed as a biosynthetic route to this intricate structure. Progress toward an intramolecular substrate will be presented along with the initial investigation of conditions for the desired cycloaddition step.

*Faculty sponsor: Brooks Maki*

### SESSION 3: Goodwin 321 (1:30-3:00 pm)

- ◆ **Cody Louder, Lori Swanson, Tom Wall**

“Exploring Living Options After Graduation Based on Median Income of Major”

Our presentation analyzes median salaries of majors after graduation from Benedictine University and various living options based on income.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **David Carey, Christina Jazdzewski, Garrett Pajarillo, Thomas Wall**

“Determining the Qualities That Make a Dog Get Adopted More Quickly”

As part of our project, we wanted to take available dog adoption data to see what qualities a dog has in order to predict how fast a dog will be adopted. We wanted to look at variables such as vaccinations, hair length, and age. We also incorporated a facial recognition software to quantify “cuteness” of a dog to incorporate into our findings as well. Through these various data sets, we are able to create a model to predict adoption speed of a dog.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Nicole Jenson, Samantha Plezbert**

“Dog Grooming Simulation Model Using ExtendSim”

Our project consists of using ExtendSim software to simulate the typical dog grooming salon business cycle by breaking down the logistical sequence of bringing a dog to the groomer, selecting the requested services, boarding the dog, and then picking up the dog. Our team looks to divide the services provided by drop-off clients and walk-in clients in anticipation of the different time frame and frequency of the two types of customers. Our model takes into consideration our employees’ schedules, compensation, varying dog breed sizes, and their associated service times.

*Faculty sponsor: Deborah Cernauskas*

- ◆ **Naser Farooqui, Faizan Osmani, Garrett Pajarillo, Andrew Tran**

“Analysis of Chicago Crime Data from 2000 to 2019 Incorporating ArcGIS”

In the state of Illinois, Chicago has had a very large crime problem. When people think of Chicago, they look at the gun violence, corruption, and the gang violence. These factors include a high number of variables influencing the fluctuations in death rate in the state of Illinois. Although some argue this variability can be attributed to crime and gun violence, other groups blame factors such as accident-related deaths and the rising opioid crisis. These variations are real and heavily impact our society. Therefore, there must be a logical reason for the fluctuations in the death rate. Our group intends on exploring these fluctuations and finding out the principal cause of death within the state of Illinois. The project that our group decided to work on focuses on studying the measurements of the crime rate in Chicago. In addition to that, we want to construct a time series map to show the change in the crime rate.

*Faculty sponsor: Deborah Cernauskas*

### SESSION 4: Goodwin 317 (1:30-3:00 pm)

- ◆ **Wesley Kassaros, Anthony Leahy, Ala Dean Sahouri**

“Correlation Between Impoverished Neighborhoods and Low-Weight/Pre-Term Births”

We have chosen to focus on the adverse effects of poverty as it relates to premature and underweight birthrates. We hypothesize a positive correlation between living in an impoverished community/area and percentages of premature/underweight births. The following data sets measure percentage of premature and underweight births within the communities/neighborhoods of the city of Chicago. This data will be compared to the data set measuring socioeconomic factors of those communities in hopes of establishing a pattern between these data sets. The specific

metrics that will be analyzed will be: hardship index, percentage of pre-term/low-weight births.

*Faculty sponsor: Deborah Cernauskas*

◆ **Musa Abdin, Amreen Ahmed, Erik Stammer, Joe Stoneburner**

“Using Dog Adoption Data to Evaluate the Adoption Speed of Dogs in Malaysian Shelters”

The goal of this project is to find out what makes one dog get adopted more quickly than the other. Our data has twenty-four different variables, all of which affect the adoption speed differently. Animals are ranked from 0-4, with the pet being adopted on the same day as it was listed to no adoption after 100 days of being listed, respectively. Some variables are going to be more relevant than the others. For example, we predict that adoption speed depends on a few factors: color, age, gender, and sterilization. These are the key factors which we have looked into at this current point by using pivot tables. To further our research on finding a correlation with adoption speeds, we’re going to look into regression models and other ways to convey our results.

*Faculty sponsor: Deborah Cernauskas*

◆ **Grant Jochums, Nolan McGinn**

“Shelter Pet Time to Adoption Model”

Our team received Excel documents which have data presented that explain a number of dog’s ages, breed, gender, color, maturity size, fur length, whether they are vaccinated or not, dewormed, sterilized, their health, the fee, their adoption speed, and a description about the dog. Our job was to take this information and use it to determine an algorithm that will be able to determine the reasons why some dogs are adopted faster than others based off these factors given. By using Excel and creating functions that can separate information based off these specific criteria such as identifying positive words that stand out in their description, or if there is a fee for the dog or not, or whether the dog is sterilized, vaccinated, and dewormed we have created a formula that will help the viewers to understand why certain dogs were adopted before others and how adoption centers can speed up the process of finding a home for dogs in the future. By using pivot tables and graphs we were able to separate dogs who were adopted faster and give reasons as to why they were adopted faster.

*Faculty sponsor: Deborah Cernauskas*

◆ **Ryan Renken**

“Population Growth vs. Sports Championships”

We will be presenting an ArcGIS project that will compare the population growth in places where championship teams are located. Teams from each of the major sports leagues are located all over the United States. We think that it would be interesting to look into the population growth in the areas where teams have won a championship. For example, when the Houston Astros won the World Series in 2017, we would look at the population growth in Houston to see if there were any correlation. Other than the fact that the cities the teams are from are major cities, we think that there could be some other factors that contribute to this potential correlation. Maybe since the team is emerging as a contender, the owners will try to renovate the area around the stadium. Maybe the place is home to a baseball organization in a warm state in an area that is popular as a retirement getaway. These are just two ideas of many possible scenarios. Regardless of the motives, we would like to look at the map and the growth of both population and championships.

*Faculty sponsor: Deborah Cernauskas*

## **SESSION 5: Goodwin 321 (3:00-4:30 pm)**

◆ **Nader Adra, Franklin Demkoski, Nisaa Sarwar**

“Grocery Store Aldi Before and After Improvement Models”

Our models revolve around a revamped Aldi grocery store on a busy Friday. Our project is going to increase the efficiency of the Aldi we are modeling due to the addition of self-checkout stations. Aldi itself is a big-time

competitor in comparison to competitors, like Jewel-Osco, when comparing prices of their products; but falls short in overall efficiency. Moreover, the wait time for individuals with fewer items is inconvenient. Therefore, providing self-checkout lanes for those with few items will improve customer experience and satisfaction. Although six cashier stations exist in Aldi, only four cashiers will be working. Self-checkouts will help reduce the number of people in line. The three groups that we will be using are heavy, intermediate, and light shoppers. For this model we will have the majority of the shoppers being light and intermediate, and the minority being heavy.

*Faculty sponsor: Deborah Cernauskas*

◆ **Alegna Calderon, Dominic Dominguez, William Smith**

“Domestic Flights TSA Simulation for Chicago’s Midway International Airport”

For our project we will use Chicago’s Midway International Airport as our location. The business process that we are recreating is the airport process to board a domestic flight. We will cover checking in all the way to boarding the airplane. Our model will consist of activities and queues. The first few activities include a check in for boarding pass, self-check in, security check, and finally boarding the plane. All these activities have queues and the queues will be the lines that a person must wait for each activity. For example, after the security check there will be a queue for waiting to board the plane in a boarding gate. To improve this model we will add more TSA security check lines to help speed up the security processing time.

*Faculty sponsor: Deborah Cernauskas*

◆ **David Carey, Ryan Miller, Thomas Wall, James Wright**

“Modeling and Simplifying the Process for Entry Into Wrigley Field Using Process Modeling”

As avid baseball fans, we wanted to simplify and improve the wait times that fans have to endure before entering Wrigley Field. While acknowledging that different fans have different needs (such as handicapped fans, fans with carry-in bags, and larger crowds), we want to see if there is a more efficient way for Wrigley Field to have fans enter before games. We wanted to simulate how many fans enter at different times before the game. By adding another gate, Wrigley Field could potentially shorten the waiting time in lines before games.

*Faculty sponsor: Deborah Cernauskas*

◆ **Nisaa Sarwar, Jason Simons, Ron Smith, William Smith**

“Analyzing Robbery Rates in Local Chicago Communities”

The City of Chicago has become notorious for having one of the highest robbery rates in the nation. Parts of the city have undergone revitalization and gentrification, while other areas have experienced urban decay. In order to recognize changes in the number of robberies, we will be observing the past decade of robbery data collected by the Chicago Data Portal. Using this data, we will try and determine whether crime rates have increased or decreased in certain Chicago communities in the past decade. Moreover, we intend on exploring causes that may have influenced the change like median income, development in the community, and more.

*Faculty sponsor: Deborah Cernauskas*

## **SESSION 6: Goodwin 317 (3:00-4:30 pm)**

◆ **Jessica Georgopulos**

“BRCA2 mRNA Splicing Events and Gene Function in MCF7 and MCF10A”

Inherited mutations in the BRCA2 tumor suppressor gene are associated with an increased risk for breast or ovarian cancer. Alternate splicing of BRCA2 primary transcripts produces more than one type of mRNA transcript, indicating mutations in different exons may be associated with different levels of risk. Therefore, we sought to determine the relative levels of cytoplasmic and nuclear splice variants in cancer and non-cancer cells as an indicator of comparative translatability. Differential membrane fractionation was used to prepare nuclear and cytoplasmic fractions from MCF7 (a breast cancer cell line) and MCF10A (a non-cancerous breast cell line). Reverse transcriptase-

polymerase chain reactions were used to estimate levels of both full length BRCA2 mRNA and a splice variant lacking exon 3 (delta 3). We found that full length BRCA2 mRNA accumulated to comparable levels in the nuclei of MCF7 and MCF10A, however, the accumulation of delta 3 was lower in the cytoplasm of MCF10A. This result could be explained by a novel RNA splicing regulatory mechanism in the cell used for recognizing and processing alternate splice variants, which may be defective in cancer cells.

*Faculty sponsor: James Fackenthal*

◆ **Vanessa Hadweh Smith**

“Dark Matter and Its Influence in the Morphology of Spiral Galaxies”

The purpose of this project is to examine the rotation curves for different types of spiral galaxies, from which we will calculate the percentage of dark matter in each galaxy type using gravitational mass and luminous mass. We hypothesized that there is no significant difference in the amount of dark matter by galaxy type. While previous studies have examined at the amount of dark matter per galaxy, our approach is to determine whether there is a correlation between the percentage of dark matter in a galaxy and the galaxy morphology. To determine this correlation, we first examined the rotation curves of galaxies; then, directly following, we calculated the gravitational mass and, separately and based on an isophotal graph, the luminous mass. Thus, by dividing the total luminous mass by the total gravitational mass, we were able to calculate the percentage of dark matter per galaxy. Our results showed that, as we go from type a spiral galaxy to type m, the percentage of dark matter decreases. This is important because it could mean that the amount of dark matter in a galaxy could be determining its morphology.

*Faculty sponsors: Beth Vinkler, Tim Marin*

◆ **Allison Dickman**

“Heat Capacity Ratios Obtained Via Sound Velocity Measurements”

A sound resonance tube was used to measure the speed of sound in a selection of gases over a range of temperatures. In turn, these measurements provided information on the heat capacity ratio for each species. The data are compared to theoretical predictions from statistical thermodynamics to investigate vibrational contributions per the equipartition principle.

*Faculty sponsor: Tim Marin*

◆ **Lily Feng**

“Pyrraline Synthesis Using an Achmatowicz-Paal Knorr Method”

A biologically-inspired method to access pyrraline structures is reported using an Achmatowicz and Paal-Knorr sequence. This robust synthetic process has been used to access a variety of pyrraline structures related to naturally isolated compounds from the daylily flower (15 compounds, 30-75% yield over two steps), including the natural product pyrrolezanthine. Modification of these pyrraline products and expansion of the scope of this reaction are now under investigation. Several families of pyrrole-based natural products have recently been isolated, and these structurally related compounds have been shown to demonstrate interesting bioactive properties.

*Faculty sponsor: Brooks Maki*

## **SESSION 7: Goodwin 321 (4:30-5:30 pm)**

◆ **Jack Purcell, Isa Ranjha, Ali Sultan**

“Evolution of Echinoderm Body Sizes Throughout Their Phanerozoic History”

Knowledge of body-size evolution is less well understood for echinoderms, a major marine phyla. Here we document trends in body size evolution for 932 echinoderm genera spanning the Phanerozoic. Body size is measured in three dimensions for the metabolically active body parts for intact specimens. A taxonomically-based algorithm is used to estimate missing lengths. The three length measurements are converted to body volume using an allometric equation established for marine invertebrates. Trends in body size are analyzed using maximum

likelihood methods to test whether the trends are consistent with common evolutionary models. Throughout the Phanerozoic, body size tends to increase significantly across echinoderms, consistent with a general random walk trend. The trend is relatively unaffected by mass extinctions. The greater majority of groups tended to increase in size through their Phanerozoic history, while others decreased in size, and a small few remained consistent in size. These results suggest that the net increase in echinoderm body size throughout the Phanerozoic results from the accumulation of a diverse set of body size dynamics within individual echinoderm taxa.

*Faculty sponsor: Philip Novack-Gottshall*

◆ **Jack Purcell, Isa Ranjha, Ali Sultan**

“Ecological and Morphological Disparity Both Increase During the Early Paleozoic Diversification of Echinoderms”

Echinoderms were major components of early Paleozoic ecosystems and diversified during the Cambrian Explosion and the Great Ordovician Biodiversification Event, ushering in a large number of higher taxa. Although the pattern of taxonomic diversification is well established, it's unclear to what extent the evolutionary diversification was accompanied by ecological and morphological changes. Here, we use independent compilations of the morphology and life habits of approximately 370 early Paleozoic echinoderm genera to test how diversification influenced these complimentary dimensions of diversity. Ecological and morphological disparity increase significantly from the Cambrian to the Ordovician. The post-Ordovician sample is small, but suggests increases in morphological and ecological disparity into the Silurian and possibly Devonian. These trends are robust to sample standardization and the use of different metrics of morphological disparity and functional diversity. Disparity generally coincides with an increase in genus diversity. Individual echinoderm classes exhibit similar increases, implying a shared cause across clades rather than simple replacement of clades.

*Faculty sponsor: Philip Novack-Gottshall*

◆ **Alaina Thompson**

“Sound Waves in Seashells: A Variation of the Elongation of the Shell and Its Effects on Sound”

In this study we are attempting to understand the effect of the seashell's shape and size on the sound inside it. We use 3D printed shells as their form is easier to control and vary compared to the form of natural seashells. We vary the elongation of the shell and measure the effect of such changes on sound frequencies and decibel levels inside the shell. The goal of this study is to find a mathematical relationship between the seashells resonance frequencies and the elongation parameter of the shell. To achieve this, we record each shell's response to sounds of various frequencies and identify the peaks with highest decibel levels for each one. Applications of this research include the use of shells in music therapy, PTSD and anxiety treatments, and even lead to a better understanding of the function of the cochlea.

*Faculty sponsor: Darya Aleinikava*

## **SESSION 8: Goodwin 317 (4:30-5:30 pm)**

◆ **Nate Alaska**

“Prometheus in the Asylum: Redeeming Human Madness from Plato”

The dialectic of Plato's *Phaedrus* revolves worshipfully around the subject of erōs, treating erotic love as a divinely-inspired madness, though it also muses philosophically on its relationship to goodness and rationality, knowledge and truth, and the body and soul. My intent with this research is to illumine the meaning and function of Plato's madness, address conflicts in his framework for categorizing it, and repurpose several of his claims to affirm a series of existential objections to its formulation. I will further demonstrate that his attitudes toward art, truth, and love, in the context of divine knowledge, are deeply misguided. I maintain that his appraisal of madness, in the various kinds as he describes, is compromised in theory and that its application constitutes a systematic and spiritually oppressive censure of the human condition.

*Faculty sponsor: Martin Tracey*

◆ **David Mondero**

“Socratic Elenchus: The Elenchus’s Heuristic and Moral Significance”

Socratic elenchus—a method for refutation of false claims that relies on question and answer—has uses beyond those that Socrates himself makes of them in the dialogues of Plato; elenchus is a useful tool in determining competency. In Plato’s *Laches*, Socrates uses elenchus to expose false claims about courage advanced by two Athenian military generals who are his interlocutors. In Plato’s *Republic*, elenchus is used as a heuristic device that can determine which citizens are competent to occupy social roles within his tripartite social structure. I will discuss Socrates’ use of elenchus in those works, while also showing how this ancient philosophical technique serves as a fundamental building block within modern psychology—specifically within cognitive-behavioral therapy. Additionally, elenchus is effective in exposing a form of ignorance which I call fortified ignorance. As I will show, fortified ignorance exemplified in the *Laches* leads to devastating consequences. I argue that fortified ignorance is responsible for the failure of the Sicilian Expedition and Adolf Eichmann’s role in Nazi Germany. Given these consequences, it becomes morally necessary to philosophically inquire into one’s knowledge through the process of elenchus.

*Faculty sponsor: Martin Tracey*

◆ **Claire Boyle**

“Student Voices from Chicago: Stories of the Vietnam War Protesters from DePaul University, Elmhurst College, Loyola University Chicago and St. Procopius College”

This presentation explores the roles of student-protesters during the Anti-Vietnam War Movement on the campuses of DePaul University, Elmhurst College, Loyola University Chicago, and St. Procopius College (BenU in the 1960s). The research focused on how the students achieved personal growth because of their experiences, participation, leadership, and contributions to the Anti-War Movement on college campuses in the Chicago suburbs. Additionally, the methods by which they protested will be studied including utilizing events such as Moratorium Day (M-Day) and teach-ins; their efforts etc.; will be seen through the lenses of photographs, satire, student-run newspapers, and public demonstrations. In this thesis, I specifically focus on the protests at St. Procopius College because their work is integral to the history of Benedictine University.

*Faculty sponsor: Susan Mikula*