2018 Summer Research Project Descriptions

St. Thomas Campus

Mentor Name: Jason Lewis

Location: St. Thomas

Project Description: Cybersecurity Research (topic TBD)

Slots: 5

Student requirements: Ideal candidates are students with programming experience (CSC 117,118). I can take a mix of students with less experience (say rising freshman if CS major) as long as I have several more experienced students as well.

Mentor Name: Jennilee Beth Robinson

Location: St. Thomas

Project Description: Students will be involved in the characterization of a novel, yet-to-be-named protozoan parasite that infects blood cells of coral reef fish. This research is important because this fish parasite is somehow related to the agent of malaria. We want to know: "just how closely related is it?".

By studying this parasite in fish, our lab is developing a model system that can contribute knowledge about these types of parasites, called the Apicomplexa. Our goals are to determine how the organism is classified, map its life-cycle and host range, and determine how it affects its fish hosts. By discovering these characteristics, we will answer our question of how this fish protozoa relates to the agents of malaria and other disease-causing organisms.

Tasks include working in biotechology lab using microscopy, biochemical and molecular techniques (such as PCR to study DNA or western blots for proteins). Students who are interested and able may also work in the field (ocean) snorkeling to survey and catch reef fish.

Slots: three or more? TBD

Student requirements: some that swim/snorkel. some that have taken genetics. some that are interested in infectious disease.

Mentor Name: Stan Latesky

Location: St. Thomas

Project Description: 1) Spectrophotometric and electrochemical methods that can be used in the analysis of trace-metal transition metal and lanthanide metal solutions

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2) Cistern water analysis using a variety of different electrochemical and spectrophotometric techniques (e.g. dipping sensors, electrochemical analysis and spectrophotometric analysis using chromophore complexes)

Slots: 2-3

Student requirements: basic laboratory techniques; it would be nice if they have had at least general chemistry

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Mentor Name: Robert Stolz

Location: St. Thomas

Project Description: Summer 2018 Research Projects

1.   Grouper Tracking

Simulate using a random walk with fixed starting point,   ending point and length the probability distribution of the grouper. Can add in variable starting and ending points, currents, and variable rates of the fish velocity. Could compare with Pelle's work.

2.   Connectivity Graph

Using a random walk to simulate the diffusion, advections, and mortality equations. From this could build a connectivity graph of the various coral reef sites.

3.   Recruitment Settlement

Could study recruitment plates locally placed. Some of the plates have sponges others do not. Could do some statistical comparisons between sites.

4.   Growth Rates of Corals at different locations

 Akima George started a project like this in 2011. There is currently more data available. Can be modeled after 1984 paper. Could develop matrix population models for a fixed species at different environments. For example could look at deep reef compared to shallow reefs. One would need to then compare the dominate eigenvalues and eigenvectors.

Requires looking at the raw data to fill in the probabilities that the corrals move from the different life stages (or size categories). Would need to figure out the size categories. This could be done looking at the overall population distribution and looking for nature breaks.

Different ways to study the problems.

•   One species with different time periods.

- One species with different locations (deep vs shallow).

Recruitment rates may need to be determined from existing literature.

References

- Matrix Population models by Hal Caswell

- Primer in Ecology theory by either John or Joan Rouphgarden

5.   Cellular Automata (CA)

- A recent student has species data for (80 \% infected or 50\% or 20 \%) data across sites proportions

- Could try compare shallow verses deep corrals

- There is data on how close the distribution of the spread. Maybe be able to combine this result with the results from a recent graduate student.

- Study data across sites or proportions for type of species

- Study deep vs shallow coral sites

Student Prerequisites: Completed Calculus, not required but preferred that the student has completed Linear Algebra and has some experience programming

Slots: 1-4

Student requirements: Student Prerequisites: Completed Calculus, not required but preferred that the student has completed Linear Algebra and has some experience programming

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Mentor Name: Renata Platenberg

Location: St. Thomas

Project Description: Wildlife studies: students will use various field methods, including observation and bioacoustics, to conduct ecological studies on terrestrial species (bats, frogs, lizards, and/or birds). Project can include mapping, use of acoustic analysis software, development of outreach products, or other area of student interest.

Slots: 2-3

Student requirements: Interest in computer analysis of sound parameters (could be physics student), interest in field work, own transportation is helpful

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2018 Summer Research Project Descriptions

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Mentor Name: Edwin Cruz-Rivera

Location: St. Thomas

Project Description: 1) Ecology of invasive seagrasses, including effects on Halophila stipulacea on biodiversity, physiological limits to seagrass invasion and interactions with environmental factors.

2) Behavior in crustaceans, including feeding and decoration behavior in crabs, and studies of personality in hermit crabs.

3) Impacts of Sargassum strandings on VI beaches, including impacts on beach biodiversity and tourism

4) Use of freshwater invertebrates as indicators of watershed quality and response to environmental change.

Slots: Four

Student requirements: Ability to work using microscopes for long hours, must enjoy field research, attention to detail, some projects require students that can snorkel, preferably dive.

Mentor Name: Stephen Ratchford

Location: St. Thomas

Project Description: sea anemone and their symbiotic shrimp: movement and behavior

Slots: 2-3, more than one

Student requirements: prefer scuba divers

Mentor Name: Joseph G. Gaskin

Location: St. Thomas

Project Description: We seek to show that the set of points in the plane with the same ratio from two distinct points A, B (known as the foci) is a circle. We will then show that there is a natural map from any given circle onto a pair of points A, B (foci). We shall extend these results to provide an alternative definition of the sphere. Lastly, we shall seek to find the significance(if any) of these points known as the foci to the circles and spheres they generate.

Slots: 2

Student requirements: Any student who has successfully completed Calculus 1 and is familiar with any programming languages will be able to conduct the necessary research needed to successfully complete this challenging research project.

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