

STUDENT COLLOQUIUM

2019

DAY 1 OCT. 11

MATH & COMPUTER SCIENCE RESEARCH

EXPERIENCE FOR UNDERGRADUATES

LOCATION
SC200

4:30PM A MAGIC TRICK USING REED-SOLOMON CODES
ANGELIKA ARGAO, ALEX LEON GUERRERO, AND ABIGAIL POBRE

5:00PM A GAME-THEORETICAL APPROACH IN MODELING A POTENTIAL SARS OUTBREAK WITH MULTIPLE CONTROL STRATEGIES
REGINA-MAE DOMINGUEZ, AURIENNE CRUZ, AND BRIAN LEE

DAY 2 OCT. 18

4:30PM MAKING MAGIC WITH CODING THEORY
GINO REYES, ANGELA ZHANG

5:00PM VACCINATION AND EDUCATION TO COMBAT YELLOW FEVER: A GAME THEORETICAL APPROACH

JOVIC CAASI, JAELENE MANIBUSAN, BRIAN JOSEPH, AND HEERA KODIYAMPLAKKAL

DAY 3 OCT. 25

4:30PM AN EXPOSITION OF MONSKYS THEOREM
WILLIAM SABLAN

5:00PM INTO THE REVERIE: ANALYZING THE DREAM MARKET
DWIGHT SABLAN



COLLEGE OF NATURAL & APPLIED SCIENCES
Division of Mathematics & Computer Sciences



STUDENT COLLOQUIUM: RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

Date: Friday, October 11

Location: SC200

A MAGIC TRICK USING REED-SOLOMON CODES

Presenters: Angelika Argao¹, Abigail Pobre¹,
and Alex Leon Guerrero²

Time: 4:30pm

Abstract:

Error detecting and error correcting codes comprise one of the key areas in coding theory and can be applied to various real-life situations. Reed-Solomon codes, in particular, play a vital role in ensuring that data received via storage devices, such as CDs and DVDs, and mobile and satellite communication, is error-free. On a smaller scale, the application of these codes can be demonstrated using magic tricks. With some help from some cards, a cube, and a little bit of magic, we can guess your correct color and number! We explore how this magic trick is constructed through the use of the Galois field of 8 elements and Reed-Solomon codes to generate the correct answer.

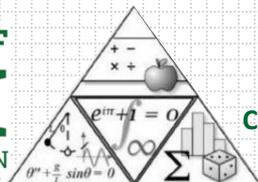
A GAME-THEORETICAL APPROACH IN MODELING A POTENTIAL SARS OUTBREAK WITH MULTIPLE CONTROL STRATEGIES

Presenters: Regina-Mae Dominguez¹, Aurienne Cruz¹,
and Brian Lee²

Time: 5:00pm

Abstract:

Severe Acute Respiratory Syndrome (SARS) is a viral respiratory disease that is caused by the coronavirus SARS-CoV. SARS is a nosocomial disease that is transferred through the air, making it highly contagious. We construct a game-theoretic model of SARS in which individuals choose whether to participate in either vaccination based on proposed vaccine data or education with quarantine against SARS in order to maximize their own benefits. We find that SARS is eliminated when the relative cost of education and vaccination with respect to their infection costs are zero, respectively. However, the optimal Nash Equilibria of education and vaccination are close to their herd immunity within 5% when the relative cost of education is allowed up to a 10% increase while the relative cost of vaccination is allowed up to a 0.6% increase.



¹ Student from University of Guam

² Student from St. John's School

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STUDENT COLLOQUIUM: RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

Date: Friday, October 18

Location: SC200

MAKING MAGIC WITH CODING THEORY

Presenters: Gino Reyes¹ and Angela Zhang²

Time: 4:30pm

Abstract:

Although coding theory is most known for its applications in technology, it can also be applied to create a magic trick. A popular example involves the use of binary numbers and Hamming Code, where a performer can guess the number an audience member secretly chooses. For our trick, we will also use Hamming Code. The main difference is that we will be implementing ternary. Instead of using binary like the previous trick, which allows an audience member to choose one of sixteen different numbers, using ternary will allow the audience member to choose one of twenty-seven numbers. In addition, we will also be presenting a second magic trick that utilizes Reed-Solomon Code instead. Furthermore, we have created models that will allow both magic tricks to run smoothly without any need to perform calculations

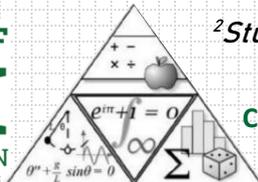
VACCINATION AND EDUCATION TO COMBAT YELLOW FEVER: A GAME THEORETICAL APPROACH

Presenters: Jovic Cassi¹, Jaelene Manibusa¹,
Heera Kodyiamplakkal³, and Brian Joseph³

Time: 5:00pm

Abstract:

Yellow fever is a vector-borne disease found in parts of South America and Africa, and had recent outbreaks occurring early 2019 in Brazil. It is transmitted by the mosquito *Aedes aegypti*. Strategies used to combat the disease include the use of a vaccine or educating the population to control the mosquito population and prevent mosquito bites. In this paper, we present a game-theoretical model to compare both vaccination and education strategies in which individuals may choose to protect against yellow fever and maximize their own benefits, effectively balancing the cost of protection and the risk of contracting yellow fever. We find critical thresholds for the costs of vaccination and education, above which no one will use the vaccine or get education. Also, we find relative cost ranges of vaccination and education with respect to the cost of infection to determine whether a single strategy is dominant over the other, or a mixed strategy involving both is viable.



¹ Student from University of Guam

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STUDENT COLLOQUIUM: RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

Date: Friday, October 25

Location: SC200

AN EXPOSITION ON MONSKY'S THEOREM

Presenters: William Sablan¹
REU at University of Chicago

Time: 4:30pm

Abstract:

Since the 1970s, the problem of dividing a polygon into triangles of equal area has been a surprisingly difficult yet rich field of study. This paper gives an exposition of some of the combinatorial and number theoretic ideas used in this field. Specifically, this paper will examine how these methods are used to prove Monsky's theorem which states only an even number of triangles of equal area can divide a square.

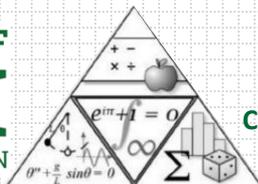
INTO THE REVERIE: ANALYZING THE DREAM MARKET

Presenters: Dwight Sablan¹
REU at Indiana University-Purdue University Indianapolis (IUPUI)

Time: 5:00pm

Abstract:

The Dark Web is an area of the internet that exists on an encrypted network where anonymity of users is preserved through the use of the Tor-Browser. This feature makes it a popular ground for users to engage in illicit activities, most notably, involvement in the online drug market. In this study, we analyze data collected from 2018-2019 on several cryptomarkets to understand contemporary darkness market at its pinnacle. We take a closer look at the goods and services being sold, behaviors in the buyer-seller network, and the economy of Dark Web marketing. Techniques in statistical analysis and data mining will be used via tools that enhance data augmentation, visualization, and comprehension (i.e. Beautiful Soup, Python, MySQL, Plotly, and Jupyter). By investigating illicit activities on these markets, we aim to provide the necessary comprehensive analysis to further promote law enforcement intervention and established policies in the cryptocurrency ecosystem.



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