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Poster Abstracts Addendum 2013

POSTER ABSTRACTS ADDENDUM

Ariel Bowman, Texas Southern University
Using actigraphy to measure sleep activity in subjects with obstructive sleep apnea

Obstructive Sleep Apnea is a disorder which partially obstructs the airway due to the narrowing in the respiratory passage during sleep. We used actigraphy watches with built-in accelerometers to monitor sleep patterns over a 3-month period. Based on the low threshold setting, these watches provided data which allowed a measure of sleep efficiency. 30 subjects with OSA and 16 healthy controls have completed the study. Two weeks after the beginning of the study, OSA subjects began using CPAP devices to treat their condition. We made comparisons between groups during the first seven days on study to measure basic differences and compared sleep efficiency during the final month versus baseline to assess differences. We found that the OSA group had less efficient sleep patterns pre-treatment and did not improve throughout the study. Our results suggest that the actigraphy watches may be an important tool in monitoring sleep patterns in OSA patients.

Jazmine Irving, Texas Southern University
Dynamics of asymmetric tent

Consider the function J:[0,1] mapped to [0,1] defined by a piecewise function: J(x)= 3x, where x is greater than or equal to 0 but less than or equal to 1/3, 3/2(1-x), where x is between 1/3 and 1. The graph of J is an asymmetric tent associated with J is a family of asymmetric tent maps J(sub alpha) defined by J(sub alpha)(x)= alpha*J(x) where alpha lies between 0 and 1. The objectives of this research are to determine the period-1, period-2, and period-3 points exist and their formulas and to investigate the graphs of J(sub alpha) and its iterates for certain values of alpha between 0 and 1.

Hanna Landrus, Pacific University
Hitches that hold

A hitch is a tangle about a pole. When climbing a hitch could save a climber's life, when sailing a hitch could prevent a persons boat from floating away. In this presentation we will present a model for determining when a hitch will hold. Then we will use this model to further explore hitches. This exploration includes hitches with a restricted number of crossings, as well as sequences of hitches.

Sasha Matthews, Florida A&M University
How low can crime go? Measuring the decline in crime and setting realistic crime reduction targets

The city of Los Angeles has experienced a steady decline in crime rates since the 1990s, to the extent that present day gures reflect historic lows. The question of whether this trend will continue is of great interest to the Los Angeles Police Department, particularly in terms of setting realistic crime reduction goals for each of the 21 policing divisions of the city. At present, these goals are set uniformly at 5 percent annually, though homogeneous expectations can be problematic since crime reduction is heavily dependent on the individual characteristics of each division. In this project, a number of forecasting methods were developed to project changes in the crime levels based on historic data with two purposes in mind: the provision of quantitative methodology to help set reduction goals, and a flexible measure of performance. In general, the accuracy of these methods indicates potential goal-setting utility at a variety of spatiotemporal scales.

Ashley Orr, Youngstown State University
Maximizing utility with mathematics
   One such way Americans are forced to utilize mathematics daily is through their financial decisions. Most recently, following the 2008 financial crisis, this skill became more valuable than ever before. Analyzing various topics of microeconomics through mathematical models, this talk will highlight the calculus and mathematics behind the theory of consumer choice, while fitting equations to budget lines and consumption curves. Looking specifically to the economic challenges faced by Americans following the great recession, this talk will highlight the lack of optimal utility when Americans are forced to live pay check to pay check. Finally using differentiation and integration it will be evident that a healthy economys consumption is smooth over a period of time. And with this in mind, we can justify the necessity of saving, dissaving, and lending; as they act as the catalyst to maximizing personal utility over a life cycle and allow for a much healthier economy.

Sara Ritchey, Youngstown State University
Modeling butanol production by *Clostridium Beijerinckii*
   Although fossil fuels are currently the most economical source of energy, alternative energy sources, such as butanol may be an excellent replacement. Bacteria in the genus Clostridium are known for their ability to produce butanol and grow in readily available and inexpensive media. Clostridium produces butanol from a variety of sugars including xylose, which is produced by plants. A mathematical model, based on the known xylose-butanol fermentation pathway and Michaelis-Menten enzyme kinetics, was developed to guide the selection of optimal parameters. Experiments were conducted to calibrate the parameters of the model. Once the model was tested against data collected from experimental runs, it was used to simulate butanol production over a range of conditions to predict optimal parameter values. Since the simulation and empirical results give parameters for maximum butanol production, this interdisciplinary approach shows great promise for the future economical production of biofuels.

Brittney Stouffer, Slippery Rock University
The Hausdorff metric on the compact subsets of the real plane
   We will discuss the basic properties of the Hausdorff metric on $\mathcal{H}(X)$, the collection of compact subsets of a complete metric space X. The Contraction Mapping Theorem states that if $T : X \rightarrow X$ is a contraction on the complete metric space X then T has a unique fixed point in X. We will show how the image generated by several well-known iterated function systems (IFS) are the fixed points of a contraction map of $\mathcal{H}(\mathbb{R}^2)$.

Linnet Vacha, Colorado College
Heirachical cluster analysis of geographic variation in medicare costs
   Medicare spending varies considerably throughout the Unites States. Several studies have suggested that regional differences in how Medicare services are used might partially explain this variation. To identify potential trends in service usage patterns, we used hierarchical agglomerative cluster analysis (HACA) to group regions into clusters based on similarity of service-usage patterns. By beginning with service-usage data, HACA uncoupled patterns of service-usage from overall patterns of cost. We found that while some Medicare services were used in a fairly consistent manner over all clusters, other services varied considerably. Variation in how frequently services are used may provide insight into practices that are particularly expensive or cost effective. The variance among the frequencies with which some services are used may point to inconsistent standards of medical practice, or to more deeply underlying geographic or demographic factors that are not necessarily reflected directly in total cost.