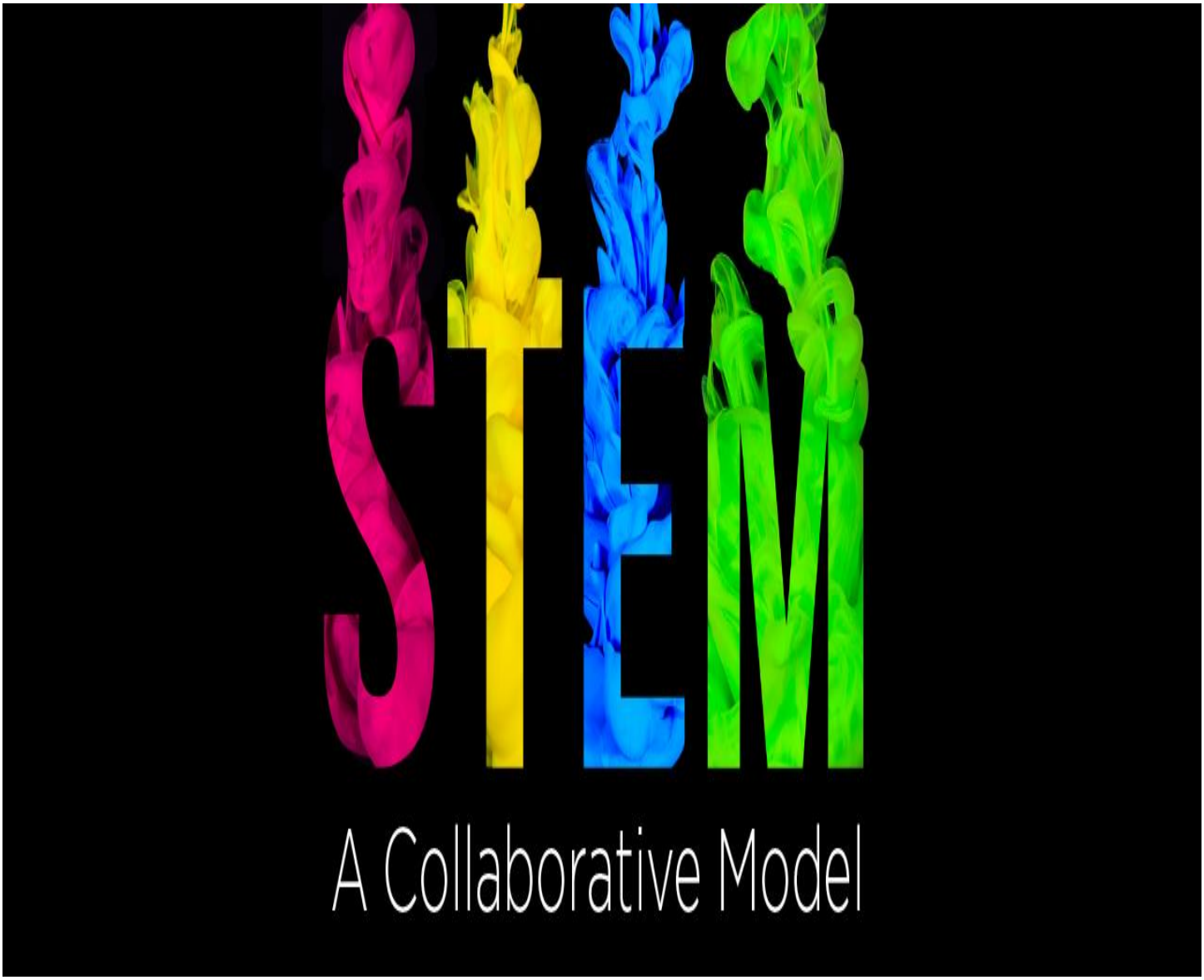
The Office of Undergraduate Research Presents

5TH ANNUAL

Texas STEM Conference 2017



Saturday, October 28, 2017

Lamar University, Beaumont, Texas

Office of Undergraduate Research
LAMAR UNIVERSITY

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We would like to acknowledge and thank everyone for their participation in making this 5th Annual Texas STEM Conference, a success.

Individuals listed have provided invaluable guidance and support throughout the development of this conference. We sincerely appreciate their time and expertise.

The Office of the Provost and Vice President for Academic Affairs

ExxonMobil
Azadeh Semien & Chartwell's Catering, Cardinal Catering
Doug Mullins, Kirksey Sprint Printing

A Special thanks to the **College of Engineering** for sponsoring the monetary awards for students.

Enjoy the Conference!
Thanks,

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The Office of Undergraduate Research

Dr. Catalina T. Castillón, Assistant Director
The Office of Undergraduate Research

Dr. Cristian Bahrim, Assistant Director
The Office of Undergraduate Research

Iheagwam Success
Graduate Assistant

Antoinette A. Henry
Administrative Associate

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DR. CRISTIAN BAHRIM
ASST. DIRECTOR

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PLENARY SPEAKER

JAMES E. BELL, JR.

Program Manager
United Launch Alliance

James Bell is a retired Program Manager at United Launch Alliance (ULA), headquartered in Denver, Colorado. ULA, a 50-50 joint venture between Lockheed Martin Corporation and The Boeing Company, is the nations most experienced and reliable launch service provider. ULA designs, manufactures, integrates, and launches Atlas and Delta launch vehicles that have successfully delivered to orbit more than 115 satellites that aid meteorologists in tracking severe weather, unlock the mysteries of our solar system, provide critical capabilities for troops in the field and enable personal device-based GPS navigation. Launch service customers include the Department of Defense, NASA, the National Reconnaissance Office, the U.S. Air Force, and commercial organizations.

In his last position before retirement, Mr. Bell was ULA's Program Manager that led a team responsible for mission integration, mission management and launch services for cargo resupply missions to the International Space Station. Prior to this role, Mr. Bell progressed through several positions of increasing responsibility including Integration Manager, Mission Manager and Program Manager for a variety U.S. Air Force and National Reconnaissance Office missions. He also held the position of Program Operations Manager for Atlas Launch Operations at Cape Canaveral Air Force Station in Florida and Vandenberg Air Force Base in California.

Mr. Bell is a native of Port Arthur, TX and a graduate of Lamar University where he earned an Associate of Applied Science degree in drafting technology in 1977 and a Bachelor of Science degree in mechanical engineering in 1984. He and his wife Jenny reside in the Denver suburb of Highlands Ranch, Colorado. In addition to tackling projects around their home and caring for their dog and two cats, the Bell's enjoy fitness training, swimming, biking, and golf at a variety of scenic courses in and around the Mile High City.

2017 TEXAS STEM CONFERENCE AGENDA

SATURDAY, OCTOBER 28TH

All events will take place in Archer Building

REGISTRATION

8:00 AM – 8:30 AM Registration (Continental Breakfast will be served)

8:30 AM – 9:00 AM POSTER SESSION - I

WELCOME
Archer-108

9:00 AM – 9:20 AM

Dr. James Marquart, *Provost and Vice President, Lamar University*

Dr. Kumer P. Das, *Director, The Office of Undergraduate Research*

Mr. Nick Vidonic, *Technical Manager, ExxonMobil Chemical Company*

KEYNOTE SPEECH
Archer-108

9:20 AM – 9:25 AM Introduction of Speaker

Dr. Cristian Bahrim, Professor of Physics and Assistant Director, *The Office of Undergraduate Research*

9:25 AM – 10:05 AM Keynote Speaker

Mr. James E. Bell, Jr.

Program Manager

United Launch Alliance

10:05AM – 10:15 AM BREAK

SESSION 1A-Oral Presentation, Archer-108

10:15 AM – 11:15 AM Chair: *Dr. Weihang Zhu, Associate Professor, Industrial Engineering*

10:15 AM-10:35 AM
Portable Myoelectric Hand Implementation
Aleksander Allen *| Electrical Engineering | Mentor: Dr. Weihang Zhu, Lamar University*

10:35 AM-10:55 AM
Characterizing Indium Zinc Oxide in Silicon Heterojunction Solar Cells – A Solar Energy Experience at Arizona State University
David Quispe and Syeda Mohsin *|Electrical Engineering & Mathematics | Mentors: Dr. Zachary Holman and Ashling Leilaeioun, Arizona State University*

10:55 AM-11:15 AM
Integration and Simulation of Nanogenerators in the Hybrid Renewable DC Nanogrids Using Matlab-Simulink Platform
Md Rakib Ur Rahman *| Electrical Engineering | Mentor: M. Reza Barzegaran, Lamar University*

SESSION 1B-Oral Presentation-Archer 107

10:15 AM – 11:15 AM Chair: *Dr. Xiangyang Lei, Associate Professor, Chemistry & Biochemistry*

10:15 AM-10:35 AM
Reusable Metal Ion-Imprinted Polymer Sponges for Selective Removal of Heavy Metals
Austin Seaux *| Chemical Engineering | Mentors: Dr. Gina Canlas and Dr. Roland Barbosa, Lamar University*

10:35 AM-10:55 AM
Navigate A Google Street View Tour with Different Map Visualizations: A User Experience Study
Guanlong Li *| Industrial Engineering | Mentor: Dr. Yueqing Li, Lamar University*

10:55 AM-11:15 AM
Analysis of Fatal Pedestrian Crashes
Uttara Roy *| Civil Engineering | Mentor: Xing Wu, Lamar University*

SESSION 1C-Oral Presentation- Archer 201

10:15 AM – 11:15 AM Chair: *Dr. Ozge Gunaydin-Sen, Assistant Professor, Chemistry & Biochemistry*

10:15 AM-10:35 AM
Damage Prediction Methodology for Electric Poles Exposed to Hurricane Winds
Md Morshedul Alam *| Industrial Engineering and Construction Management | Mentors: Dr. Berna Eren Tokgoz, Dr. Soekyon Hwang and Dr. Mahdi Safa, Lamar University*

10:35 AM-10:55 AM	*Manual Breaking System for Skateboards* ***Nirupom Paul, Uzairulhassa Syed, Kanaparthi V Sreedhar Subbarao, and Moosfika Haque Treesha*** *| Industrial Engineering | Mentor: Dr. Yueqing Li, Lamar University*
10:55 AM-11:15 AM	*An improved grey decision-making model and its application* ***Wenchao Zuo and Yuhong Wang*** *| Industrial Engineering | Mentor: Dr. Yueqing Li, Lamar University*

11:15 AM – 12:00 PM	LUNCH BREAK-Archer 110
12:00 PM	GROUP PICTURE (In Front of the Archer Physics Building in the Parking Lot)
12:15 PM – 1:00 PM	POSTER SESSION - II

SESSION 2A – Oral Presentation-Archer-108

1:05 PM – 2:05 PM Chair: *Dr. LeAnn Chisholm, Assistant Professor, Joanne Gay Dishman School of Nursing*

1:05 PM-1:25 PM	*Parasites of Mosquitofish (Gambusia affinis): Possible indicators of water quality and environmental health* ***Brody McBee and Aziz Shaaban*** *| Biology | Mentor: Dr. Randall Yoder, Lamar University*
1:25 PM-1:45 PM	*Altering gene expression of membrane proteins in Leishmania parasites using the novel CRISPR- Cas 9 technology to identify new treatment targets* ***Carlo Vanz*** *| Biology | Mentor: Dr. Ashwini Kucknoor, Lamar University*
1:45 PM-2:05 PM	*Exploring Hippotherapy as an Intervention for Children with Special Needs: A Retrospective Descriptive Study* ***Kloé Woosley*** *|Nursing | Mentor: Dr. LeAnn Chisholm and Mrs. Rose Harding, Lamar University*

SESSION 2B – Oral Presentation-Archer-107

1:05 PM – 2:05 PM Chair: *Dr. Xuejun Fan, Professor, Mechanical Engineering*

1:05 PM–1:25 PM	*The Mechanics of Metastasis: The Relationship between Cell Deformability and Metastatic Potential in Non-Small Cell Lung Cancer Cells* ***Alexus Locke*** *| Mechanical Engineering | Mentor: Dr. Ping He, Lamar University*

1:25 PM–1:45 PM	*Active Flow Control Mixed with Varying Flow Angles and Material's Heat Dissipating Properties* ***Carlos Caballero*** *| Physics | Mentor: Dr. Cristian Bahrim, Lamar University*
1:45 PM–2:05 PM	*An effective way for preventing corrosion using hydrophobic coatings* ***Divine Sebastian, Robbie Clarke and Jennifer Huang*** *| Mechanical Engineering | Mentor: Dr. Chun-Wei Yao, Lamar University*

SESSION 2C – Oral Presentation- Archer 201	
1:05 PM – 2:05 PM	Chair: *Dr. Clayton Jeffryes, Assistant Professor, Chemical Engineering*

1:05 PM-1:25 PM	*Polyphenolic Phytochemicals in the Prevention and Treatment of Alzheimer's disease* ***Amanda Warner*** *| Biology | Mentor: Dr. Maryam Vasefi, Lamar University*
1:25 PM-1:45 PM	*Fabrication of Novel Graphene Oxide-Based Nanofiltration Membranes for Water Desalination* ***Isaac Angeron, Progga Chirontoni and Jayna Patel*** *| Mechanical Engineering | Mentor: Dr. Keivan Davami, Lamar University*
1:45 PM–2:05 PM	*Comprehensive Study about Ethylene Oxide Production in Gas-Expanded Liquid Phase* ***Mhd Amjad Abou Shama*** *| Chemical Engineering | Mentor: Dr. Qiang Xu, Lamar University*

SESSION 3A – Oral Presentation-Archer-108	
2:10 PM-3:10 PM	Chair: *Dr. Sujing Wang, Assistant Professor, Computer Science*

2:10 PM-2:30 PM	*Air quality and lung cancer: Analysis via local control* ***Mithun Kumar Acharjee*** *| Mathematics | Mentor: Dr. Kumer Das, Lamar University*
2:30 PM–2:50 PM	*Converting a Security-noncompliant Software into a Security-Compliant Software* ***Suman Basyal, Kausik Kasaju, Shreejan Gauray Dahal, and Divya Yepuri*** *| Computer Science | Mentor: Dr. Stefan Andrei, Lamar University*
2:50 PM–3:10 PM	*Competitive intergenerational population dynamics with stochastic Lotka-Volterra: preliminary results* ***Tyler Evans*** *| Mathematics | Mentor: Dr. Kumer Das, Lamar University*

SESSION 3B – Oral Presentation-Archer-107	
2:10 PM – 3:10 PM	Chair: *Dr. Randall Terry, Assistant Professor, Biology*

2:10 PM–2:30 PM	*Energy Disaggregation in a Petrochemical Plant for Cyberphysical Security Monitoring* ***Sabrina Akbar*** *| Electrical Engineering | Mentor: Dr. Harley Myler, Lamar University*

Physics Outreach in SPS

2:30 PM–2:50 PM ***Zakary Noel*** | *Physics* | *Mentor: Dr. Cristian Bahrim, Lamar University*

A Perusal of the Ethics of Data Mining and Consolidation in a Network-Prevalent Society

2:50 PM-3:10 PM ***Success Iheagwam*** | *Mathematics* | *Mentor: Dr. Kumer P. Das, Lamar University*

3:20 PM – 3:45 PM **AWARD CEREMONY & CLOSING REMARKS**

Archer-108

Dr. Paul Bernazzani, Interim Associate Dean
College of Arts and Sciences

Dr. Kumer. P. Das, Director
The Office of Undergraduate Research

Dr. Catalina T. Castillón, Assistant Director
The Office of Undergraduate Research

Dr. Cristian Bahrim, Assistant Director
The Office of Undergraduate Research

Poster Session Chairs:

- **Dr. Stefan Andrei (Posters 1-8)**
- **Dr. Cristian Bahrim (Posters 9-17)**
- **Dr. Weihang Zhu (Posters 18-24)**

Poster Session I (Time 8:30 AM – 9: 00 AM)
Poster Session II (Time 12:15 PM – 1: 00 PM)

1

Real Time Facial Recognition in Unconstrained Environment
Md Manjurul Ahsan
Department of Industrial Engineering
Mentor: Dr. Yueqing Li, Lamar University

2
Deicer Chemical Effects on Pervious Concrete Phase 2
Nara Almeida and Molly Ross
Department of Civil and Environmental Engineering
Mentor: Dr. Liv Haselbach, Lamar University

3
New Clustering Approach for Spatio-temporal Data Analysis
Amar Mani Aryal
Department of Computer Science
Mentor: Dr. Sujing Wang, Lamar University

4
Catalytic Decomposition of Ammonia Borane - Polyvinylpyrrolidone Composites
Leon Bedrous, Weslynn Taylor and Ramanjaneyulu Seemaladinne
Department of Chemistry
Mentor: Ozge Gunaydin-Sen, Lamar University

5
New Social Media Sentiment Analysis Algorithm for Businesses Competition
Manideep Bollu
Department of Computer Science
Mentor: Dr. Sujing Wang, Lamar University

6
Preparation of Copper-Manganese Oxalates as Precursors of Methanol Steam Reforming Catalysts
Alec Defeo
Department of Chemistry and Biochemistry
Mentor: Dr. Roland Barbosa, Lamar University

7
Development of Noncoding Regions of the Chloroplast Genome for Assessment of Phylogenetic and Population Genetic Questions in Hesperocyparis Macrocarpa Clade
Edward Doan and Jordan Curl
Department of Biology
Mentor: Dr. Randall Terry, Lamar University

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A Hybrid framework to select Logistics Service Providers based on GANP and GRA methods

Sajad Ebrahimi and Marzieh Khakestari
Department of Industrial Engineering
Mentor: Dr. Berna Eren Tokgoz, Lamar University

9

Work in Progress: Predicting Movie Success using Data Mining Techniques

Diego Fernandez, Timothy Gonzales and Colin Smith
Department of Computer Science
Mentors: Dr. Sujing Wang and Dr. Peggy Doerschuk, Lamar University

10

Work In Progress: Programming is a Snap!: Increasing Knowledge and Interest in Computing

Diego Fernandez, Timothy Gonzales, Hannah Leleux, Timothy Holcombe, Ethan Hall, Colin Smith, Alexander Strong, Greg Yera, and Robert Monarch
Department of Computer Science
Mentor: Dr. Peggy Doerschuk and Dr. Sujing Wang, Lamar University

11

Preparation and Thermal Decomposition of Copper-Zirconium Mixed Oxalates

Sergio Figueroa
Department of Chemistry and Biochemistry
Mentor: Dr. Roland Barbosa, Lamar University

12

Spectroscopic characterization of humic substances in landfill leachates from elevated temperature landfills (ETLF)

Sailee Gawande
Department of Environmental Engineering
Mentor: Dr. Renzun Zhao, Lamar University

13

Nano Silica Applications in Maritime Ship Coatings

Scott Girdwood
Department of Mechanical Engineering
Mentor: Dr. Ramesh K. Gurduru, Lamar University

14

Design and implementation of 3D modeling for teaching abstract concepts

Ethan Hall, Diego Fernandez and Greg Yera
Department of Computer Science
Mentors: Dr. Sujing Wang, Dr. Stefan Andrei and Dr. Peggy Doerschuk, Lamar University

15

The Connection between Alzheimer's disease and Inflammation due to Infection

Han Huynh
Department of Biology
Mentor: Dr. Maryam Vasefi, Lamar University

16

Characterization of oxygen production in algal suspension cultures by dimensionless equations

Sina Kaabipour, Ali Rashidi Kouchi, Julia Lin, and Jie Lui
Department of Chemical Engineering
Mentor: Dr. Clayton Jeffryes, Lamar University

17

Simulation Based Analysis of Game Theoretic Model Using Smart Grid Solution

Md Amanullah Kabir
Department of Mechanical Engineering
Mentor: Dr. Jiang Zhou, Lamar University

18

Risk Assessment of Commonly Transported Chemicals in Ports

Ayberk Karakavuz
Department of Industrial Engineering
Mentor: Dr. Berna Eren Tokgoz, Lamar University

19

Analysis of Precise Measurements in the Near-Infrared Spectrum of C_2H_2

Nhut Nguyen
Department of Chemistry & Biochemistry
Mentor: Dr. Sylvestre Twagirayezu, Lamar University

20

"Anaerobic Digester Centrate" – A case for algae-based energy production in municipal wastewater treatment systems

Shanglei Pan
Department of Civil and Environmental Engineering
Mentor: Dr. Thinesh Selvaratnam, Lamar University

21

Trend Analysis of Aerosol Particles in Himalayan Region

Michael Penrod
Sam Houston State University
Mentors: Dr. Ram Kafle and Dr. Rudra Aryal

22

Image-Based Particulate Matter Analysis Using Deep Convolutional Neural Network

Nabin Sharma Rijal, Ravi Teja Gutta, Avijoy Chakma, and Ben Vizena
Department of Computer Science
Mentor: Dr. Jing Zhang, Lamar University

23

Asphalt Pavement Recycling

Sila Temizel Sekeryan
Department of Civil and Environmental Engineering
Mentor: Dr. Liv Haselbach, Lamar University

24

Synthesis and structural characterization of mercury (II) coordination polymers based on 1, 2, 4, 5-tetra (isopropylthio) benzene ligand

Troy Selby-Karney, Srinija Kakumanu and Joel T. Mague
Department of Chemistry and Biochemistry
Mentor: Dr. Perumalreddy Chandrasekaran, Lamar University

Abstracts

All Talks are listed alphabetically by last name of the primary presenter

Air quality and lung cancer: Analysis via local control

Mithun Kumar Acharjee, Department of Mathematics
Mentor: Dr. Kumer Das, Lamar University

The possible association between PM2.5 and lung cancer mortality can be partitioned into components, within similar observational units and across different observational units. Within units covariates are very similar and across units covariates can be, and usually are, very different. Hence, there is a need to understand the possible effect of PM2.5 on mortality taking into account within and between observational units. Our idea is to use Local Control Analysis (LCA) to estimate these two components and determined how much of the variation in estimates can be attributed to know the important covariates. For the purpose of analysis, we calculated Local Treatment Difference (LTD) for LTD approach and slope and intercept for Local Linear Regression (LLR) approach, to determine if the treatment (PM2.5) effect vary significantly across clusters. For that evaluation we used recursive partitioning. The benefit of this study is twofold. First, we use a reliable strategy (LCA) for observational data. Second and importantly, there is subgroup heterogeneity in the effect of PM2.5 on lung cancer mortality and this heterogeneity is largely explained by factors other than air quality.

Energy Disaggregation in a Petrochemical Plant for Cyberphysical Security Monitoring

Sabrina Akbar, Department of Electrical Engineering
Mentor: Dr. Harley Myler, Lamar University

This project introduces a novel application of energy disaggregation analysis in a critical national infrastructure environment to enhance cyberphysical security and to detect either intrusions or direct attacks. No security can be all encompassing for a system of highly independent critical infrastructure nodes that constitute the basis of economic vitality, but adding tools for monitoring and early warning of such systems will reduce vulnerability. These infrastructures cover many sectors including the electric power grid, oil & natural gas production facilities, transportation and distribution networks, telecommunications & information systems, water systems, the transportation network, the banking and finance industry, the chemical industry, agriculture & food systems and public health networks. Although cyberphysical security has been studied by various researchers over the last decade, the concept of energy disaggregation has not been addressed in such research. It is interesting to note that the studies regarding energy disaggregation have grown exponentially within the last two decades and in our work we have applied the technique to model monitoring systems for infrastructure systems. The main reason to integrate the topics of energy disaggregation and cyberphysical security is the ongoing transition of industrial plants towards an advanced two-way communications and control technology with the possibility of significantly improved resiliency that the field of energy decomposition offers. Our focus has been on a large petrochemical plant and we present initial designs for the protection and monitoring of such systems.

Damage Prediction Methodology for Electric Poles Exposed to Hurricane Winds

Md Morshedul Alam, Department of Industrial Engineering
Mentors: Dr. Berna Eren Tokgoz, Dr. Soekyon Hwang and Dr. Mahdi Safa Lamar University

Today's critical infrastructures are experiencing a devastating damage due to hurricane disasters. Electrical power distribution systems are among the complex critical infrastructures and very vulnerable to hurricanes. Thus, engineers constantly focus on linking the resilience philosophy to the design and operation of these infrastructures.

This research presents a framework for evaluating resilience of electric power distribution poles, and aims to increase the accuracy and rapidity of the assessment of conditions and to evaluate resilience. A three-dimensional finite element analysis is performed by ANSYS® Workbench to analyze the stress and deflection of wooden electrical distribution poles. Then, the linear deflection is converted to an angular deflection to predict the new angle of a pole caused by the lateral and gravitational forces due to hurricane winds. The finite element method is very useful to determine the critical load on a pole as well as to examine the effect of the critical load on different sections of the pole. The boundary conditions are setup for both loading and supporting positions according to the mechanical properties of the pole. This research presents a case study where multiple electric poles in Beaumont, TX are evaluated.

Portable Myoelectric Hand Implementation

Aleksander Allen, Department of Electrical Engineering
Mentor: Dr. Weihang Zhu, Lamar University

The field of automated prosthetics has many design challenges that have to be overcome in order to develop prostheses that are both effective at improving the quality of life and cost-efficiency. Our research focused primarily on refining the human-prosthetic control interface. An open-source myoelectric sensor array, Myoband, capable of reading the electric potential inside of a user's muscles within the forearm, and the OpenBionics AdaHand, were used as the research platforms. Our interface decodes the electric signals on the skin of the user's forearm, and is then able to communicate to the prosthetic limb the gesture it needs to perform. Our interface currently supports a few basic, easily differentiable gestures, the electronic signature of which is largely the same from person to person. While the focus of this research was mainly interface oriented, improvements to the design of the prosthetic hand, as well as a proprietary array of sensors focused on the particular use of controlling a prosthetic limb have been discussed and will be implemented into the future designs. Furthermore, per-user calibration will allow for more gestures, as well as precision control. The ultimate goal of this research is to develop a portable, lightweight system that can be used as a natural replacement for individuals which have undergone amputation.

Fabrication of Novel Graphene Oxide-Based Nanofiltration Membranes for Water Desalination

Isaac Angeron, Department of Mechanical Engineering
Co-Authors: Progga Chirontoni and Jayna Patel
Mentor: Dr. Keivan Davami, Lamar University

The rapid global population growth has led to the increase of water demand and aggravation of water pollution. The scarcity of freshwater resources, which represent only 0.5% of Earth's overall water resources relative to seawater (97%), has already become a worldwide problem. Considerable efforts, therefore, have been afforded to utilize low cost water purification methods to purify contaminated water as well as desalination for seawater. Fabrication of large-scale graphene oxide membranes might open doors towards a more efficient water desalination technology. In this research graphene oxide membranes were fabricated and characterized and their efficiency for water desalination was evaluated.

Converting a Security-noncompliant Software into a Security-Compliant Software

Suman Basyal, Department of Computer Science
Co-Authors: Kausik Kasaju, Shreejan Gauray Dahal, Divya Yepuri
Mentor: Dr. Stefan Andrei, Lamar University

Our goal about converting a security-noncompliant software into a security-compliant software is to build a secure software that is very hard to hack as per hacker's view. Many developers in today's world code just to get the output of a specific requirement but very few of them are concerned about maintaining their code secure. It is not enough just to get the desired output but having the code written in a non-hackable format is a real challenge to today's developer.

This project presents important guidelines that allow a developer to be very aware in order to make a code secure. It helps to be safe from the Structured Query Language (SQL) injection, cross site scripting, memory leakage, runtime errors, Lightweight Directory Access Protocol (LDAP) injection and so on. These are the coding guidelines needed in any secure application. It may be in case of dealing with a banking transaction or storing some important information or may be putting some confidential information in the database.

More recently, we have started a project that aims to write secure code for Java applications. This project gives an emphasis on generating secure codes whenever some form of non-secure code is fed as input to the software system. The project includes running various algorithms to check whether the code has been written in a secure format or not and then determines the correct way of writing the secure code.

In conclusion, our main aim is to help write code that not only produces output but also help to write them in a secure manner.

Active Flow Control Mixed with Varying Flow Angles and Material's Heat Dissipating Properties

Carlos Caballero, Department of Physics
Mentor: Dr. Cristian Bahrim, Lamar University

In this project we explore the aerodynamic drag effects of air flows pointed at various degrees towards a surface. Additionally, we analyze the extent to which changing the air flow angle affects the ability of an Active Flow Control (AFC) system to mitigate aerodynamic drag. Moreover, we will examine how the material's heat dissipating properties causes changes in the aerodynamic drag experience by the material when exposed to a continuous air flow. Materials tested include Titanium, Aluminum, Carbon Fiber, Hardboard, and Cardboard. An overview of aerodynamic drag and the governing principles behind AFC technology will be presented. Then, we will proceed with a review and discussion of the experimental data gathered in this project. We will draw conclusions based on our observations and will discuss future research in these areas and how it relates to other research interests in aerospace applications.
Acknowledgements: This work has been sponsored by the STAIRSTEP Program at Lamar University.

Competitive intergenerational population dynamics with stochastic Lotka-Volterra: preliminary results

Tyler Evans, Department of Mathematics
Mentor: Dr. Kumer Das, Lamar University

The Lotka-Volterra equations are used in population dynamics to expand the logistic growth model to interspecific competition. Previous attempts to model population evolution have been largely deterministic in character. However, it is well-documented in the biological literature that a species may, in response to environmental selection pressure, come to exchange higher fertility for higher parental investment, or investment in the modification of the environment to suit already-existing individuals and their progeny. In the present paper, the Lotka-Volterra equations are modified and expanded to accommodate such random mutations that may result in the exchange of fertility for parental investment or improved living conditions. The effects on population evolution and interspecific competition are investigated with techniques from the field of stochastic differential equations for Lotka-Volterra modified with one or two random linear terms, and by simulation and numerical solution for the full model, with several random, possibly nonlinear, terms.

A Perusal of the Ethics of Data Mining and Consolidation in a Network-Prevalent Society

Success Iheagwam, Department of Mathematics
Mentor: Dr. Kumer Das, Lamar University

In this world of fast-growing networks, data mining has become a trend leading to an exponential growth in data. A huge fraction of the world's data was generated in the last few years. The capturing of this data affects our lives regardless of our awareness. As companies and organizations seek to gather data from our everyday activities like the emails we send, the use of mobile applications, websites we visit, our posts and comments on social-media, a dust of privacy concerns has been raised.

This study aims at taking a close look and a situational analysis from a logical view-point at the ethical issues involved in the mining and consolidation of big data for future use.

Navigate A Google Street View Tour with Different Map Visualizations: A User Experience Study

Guanlong Li, Department of Industrial Engineering
Mentor: Dr. Yueqing Li, Lamar University

The last decade has witnessed a thriving expansion of Street View. Technically, Street View is an interactive design of web maps that provides users with panoramic 3D views from positions along streets within a city. The use of Street View often involves high level of human computer interaction such as changing the viewpoint or orientation, zooming in and out, re-scaling, and changing map symbols and visual variables. Nowadays, Google Street View is capable of offering a visual tour of many places of interest. However, no one has ever examined how a user would perform in a scheduled Google Street View tour with different map visualizations as totally immerses into the visual journey.

The Mechanics of Metastasis: The Relationship between Cell Deformability and Metastatic Potential in Non-Small Cell Lung Cancer Cells

Alexus Locke, Department of Mechanical Engineering
Mentor: Dr. Ping He, Lamar University

During metastasis, cancer cells are characterized by their ability to undergo mechanical alterations that allow them to escape from the primary tumor, invade into the surrounding tissue, travel through the vascular system, and ultimately settle in a secondary site. Despite the progress that has been made in the study of cancer cell motility and invasion, there is not a concrete understanding of the extent to which the correlation between mechanical properties and cancer progression stretches. In this study, a computational model was created to explore and simulate the typical mechanisms involved in non-small cell lung cancer (NSCLC) cell invasion and show results indicating that cell and microenvironment stiffness are controlling parameters that affect the invasive potential of NSCLC cells. Such an observation is understood by analyzing the depth of indentation caused by the NSCLC cell as the microenvironment or cell's Young's modulus is increased. This study displays the significant role of mechanics during invasion and can be essential to the development of targeted research done in vivo.

Parasites of Mosquitofish (Gambusia affinis): Possible indicators of water quality and environmental health

Brody McBee and Aziz Shaaban, Department of Biology
Mentor: Dr. Randall Yoder, Lamar University

This project was intended to investigate the usefulness of parasite assemblages in the mosquitofish (Gambusia affinis) as indicators of water quality. Gambusia affinis were collected from two cells in the Cattail Marsh of

Beaumont, Texas which is the final stage of the municipal water treatment system. It is a constructed wetland that uses aquatic plants to absorb the bulk of nitrogen from the water before releasing it into the environment. Two cells of the system were divided into four collection sites: two influent and two effluent. Several chemical measures of water quality were monitored throughout the study from the same sites. The most distinct in terms of pre and post treatment differences was ammonia. On average, the influent sites had 5.57 ppm, while the effluent site had 0.206 ppm. Twenty fish from each site (total = 80) were collected, necropsied, and examined for parasites in the laboratory. At least seven species of parasites, all belonging to the phylum Platyhelminthes (class Cestoidea, Trematoda, and Monogenea) were identified. Prevalence of infection (percent of infected hosts) by one or more of these species was 80% over all with 100% prevalence in fish from effluent sites (low ammonia) but only 40% in fish from influent (high ammonia) sites. Both abundance and species richness of parasites were also lower at the influent sites. Species level identification and statistical analysis are ongoing but preliminary results indicate that parasite assemblages in G. affinis may well be useful as indicators of overall water quality in this environment.

Physics Outreach in SPS

Zakary Noel, Department of Physics
Mentor: Dr. Cristian Bahrim, Lamar University

The Society of Physics Students is an organization dedicated to making the academic and philosophical spheres of physics more accessible to students, their professors, and the local public. Chapters of the SPS are actively encouraged to reach out to their communities in order to share experience and knowledge with general audiences in order to establish themselves as STEM professionals and disseminate scientific knowledge. Organizing outreach events helps legitimize SPS chapters as parts of the national organization, however, the way they decide to go about doing this is left to the discretion of the members. Recently, the national office of SPS has begun a new initiative to bring outreach ideas and opportunities to its expansive network of chapters. This new effort represents a less expensive, more widely available, and much more inclusive resource for members of SPS by providing a digital library of possible activities instead of a fixed physical quantity of demonstrations. It not only provides a range of relevant and interesting outreach ideas, but also invites collaboration and participation from chapters by encouraging submissions from members themselves. This new project has already garnered participation from individual's chapters, received feedback from a number of sources including college professors and middle school teachers, and has dramatically expanded the sustainability of nationally-maintained SPS outreach endeavors.

Manual Breaking System for Skateboards

Nirupom Paul, Department of Industrial Engineering
Co-Authors: Uzairulhassa Syed, Kanaparthi V Sreedhar Subbarao, and Moosfika Haque Treesha
Mentor: Dr. Yueqing Li, Lamar University

In late decades' skateboarding, has moved from garages and skate parks to city parks and lanes. It has extended from entertainment into a type of transportation. Skateboarding has been examined by analysts in urban plan, geology, gender studies, games conduct, injury prescription, and social ethnography. In a typical skateboard, there is no mechanical braking systems and acceleration by foot may result in speeds up to 40 mph or more. This can often lead beginners to accidents, some of which may be even fatal. To date, no successful braking gadget has been devised. This study is a comparison between a traditional skateboard and remodeled skateboard with a braking system. Result showed a significant effect of brakes on the users' performance. The research should give a different perception to safety and performance of skateboarders. The main goal is to encourage the riders to enjoy and develop this sport safely.

Characterizing Indium Zinc Oxide in Silicon Heterojunction Solar Cells – A Solar Energy Experience at Arizona State University

David Quispe and Syeda Mohsin, Quantum Energy and Sustainable Solar Technologies (QESST) Engineering Research Center
Mentors: Dr. Zachary Holman and Ashling Leilaeioun, Arizona State University

This presentation will explain my research experience at Arizona State University (ASU). Over the recent years, solar energy has been rapidly expanding in many areas of the world. In the solar energy industry, silicon heterojunction solar cells have peaked commercial interest because of their high efficiencies. In this solar cell, there is a Transparent Conductive Oxide (TCO) layer that significantly impacts the solar cell's efficiency and has optical and electrical properties. The optical characteristic refers to the absorbance of light in the bulk and the electrical characteristic refers to the conductance between the doped amorphous silicon layer and the silver contacts. Currently in these solar cells, Indium Tin Oxide (ITO) is the TCO material being used. In order to increase the diversity of TCOs, I conducted research with my partner, Syeda Mohsin, in characterizing the optical and electrical properties of Indium Zinc Oxide (IZO), a lesser studied TCO material. The experiment consisted of sputtering IZO on top of glass substrates while varying the tool parameters in order to get a range of electrical and optical characteristics. Spectrophotometric measurements were performed to determine how much light is absorbed in IZO because the more absorbent IZO is, the lesser efficient the cell will be. Measurements of Hall voltage were executed to determine IZO's sheet resistance because it influences how much current is extracted from the solar cell. We concluded that increasing oxygen concentrations (a tool parameter) led to an electrical disadvantage but there was an optical advantage with oxygen concentrations > 4%.

Integration and Simulation of Nanogenerators in the Hybrid Renewable DC Nanogrids Using Matlab-Simulink Platform

Md Rakib Ur Rahman, Department of Electrical Engineering
Mentor: M. Reza Barzegaran, Lamar University

Existing centralized power grid is currently facing problems when we need uninterrupted power, low carbon emissions, higher efficiency of power transmission, and power supply to remote areas. Generation of power near its point of consumption by utilizing the carbon neutral renewable energy resources (RES) is helping to solve these problems. Microgrids integrate these intermittent natures RES power production and enhance its use to meet the energy demands of a small area. The microgrids can be scaled down further at which level it acquires a new name called nanogrids. To characterize the nanogrids, terms 'low power' and 'less complexity' compared to microgrids can be introduced. Low power can be considered as a few Watts to 100kW. In this paper, power generation feasibility of different nanogenerators are studied and simulated by Simulink. Piezoelectric materials, Microbial fuel cells and Solid oxide fuel cells are found as a potential nanogenerators for nanogrids. These nanogenerators along with PV array, wind turbine and energy storage device has been connected to the nanogrids. Finally, Simulation results are presented to demonstrate the feasibility of nanogenerators power generation in the nanogrids.

Analysis of Fatal Pedestrian Crashes

Uttara Roy, Department of Civil Engineering
Mentor: Dr. Xing Wu, Lamar University

Pedestrian safety is now a growing concern in the USA. Identifying the factors associated with fatal pedestrian crashes plays a key role in developing efficient and effective strategies to enhance pedestrian safety. This study addresses safety issues by identifying contributory factors associated with fatal pedestrian crashes. The study uses Kansas Accident Reporting System (KARS) database to extract the number of fatal pedestrian crashes for Kansas from the year 2004 to 2008. Fatality Analysis Reporting System (FARS) database is used to get the number of fatal pedestrian crashes for USA. Results show that male pedestrians contribute to the significantly larger number of fatal pedestrian crashes than female pedestrians both for Kansas and USA. Among different age groups considered, pedestrians aged between 45 and 54, and 65+ years old are the most vulnerable groups among all age groups both

for Kansas and USA. Friday and Saturday contribute to the largest number of fatal pedestrian crashes than any other days of the week. When time of day is considered it is found that fatal pedestrian crashes occur mostly during off peak hours of the day and especially, after 6 pm. November and December are the prime months for fatal pedestrian crashes to occur. Speed limits higher than 60 mph contribute to the larger number of fatal pedestrian crashes in Kansas whereas speed limits between 30 and 40 mph contribute to the larger number of crashes in USA. Statistical analysis shows that significant relationship exists between different variables being examined by Chi-square test.

Reusable Metal Ion-Imprinted Polymer Sponges for Selective Removal of Heavy Metals

Austin Seaux, Department of Chemistry and Biochemistry
Mentors: Dr. Gina Canlas and Dr. Roland Barbosa, Lamar University

Several wastewater treatment to remove heavy metal ions that pose a great threat to aquatic life and humans are available but generally have shortcomings in the selectivity in the separation of specific ion from the ion mixtures. In this work, we attempt to resolve such drawback by producing a highly-selective material that acts as an ion sponge. Organic polymers imprinted with cadmium ions were synthesized from a self-assembled complex composed of 2,2'-bipyridyl and 4-vynylpyridine and Cd^{2+} template ion. The ion-imprinted polymers (IIP) were further customized by changing the crosslinker to monomer ratio (from 2 to 16) and by utilizing a more sterically hindered monomer (from 4-vinylpyridine to 2-vinylpyridine). These changes resulted in a very large polymer with an increased surface area that interacted more readily with the ions at a pH of 6.2. The cadmium IIPs were then observed alongside a non-imprinted polymer as reference. Using AAS, the uptake for all three polymers were observed to be roughly the same for Cd^{2+} and Pb^{2+}. However, the uptake values for Zn^{2+} had a striking difference between the two different monomers with an average value of 11391.01 μg ion/g polymer. This showcases how even though a large ion, Cd^{2+}, was used for the imprint, hence the similarities for the Cd^{2+} and Pb^{2+} uptakes, the polymer can still be selective to smaller ions like Zn^{2+}.

An effective way for preventing corrosion using hydrophobic coatings

Divine Sebastian, Department of Mechanical Engineering
Co-Authors: Robbie Clarke and Jennifer Huang
Mentor: Dr. Chun-Wei Yao, Lamar University

Corrosion is a challenge faced by mankind since the iron age. Environmental as well as economic impacts of corrosion are of great concern and thus the research on corrosion and potential preventive measures is of great interest. There are various types of corrosion process based on the mechanism by which it occurs and each case may require special controlling methods. An efficient way for controlling corrosion is arresting one or more factors that lead to the occurrence of corrosion. Hence, hydrophobic coatings are developed for metal surfaces that can partially or completely eliminate the contact between water and the metallic surface to be protected. The surface characterization of the obtained surfaces was performed using SEM images and AFM images along with the measurement of water contact angles. The surface chemistry after the modification was understood with the aid of FTIR spectroscopy. The developed coatings are capable of withstanding high temperature conditions and considerable wear resistance and durability were exhibited by the coating when tested for the same properties. Corrosion rate was estimated for coated metals and the data was compared with corrosion rate on normal surface without any modification and the degree of reduction was superior to other corrosion prevention methods in use. Current phase of this research focuses on improving the mechanical properties of coating along with improving its feasibility in application on wide range of metals.

Comprehensive Study about Ethylene Oxide Production in Gas-Expanded Liquid Phase

Mhd Amjad Abou Shama, Department of Chemical Engineering
Mentor: Dr. Qiang Xu, Lamar University

Every year about 3.4 million tons of carbon dioxide (CO^2) is emitted to atmosphere by ethylene oxide (C_2H_4O) conventional gas phase process as byproduct. Also, the C_2H_4O process is considered as one of the most hazardous chemical operating plant due to presence of very flammable gas like C_2H_4O and oxygen in high pressure and temperature reactor. The following work illustrates alternative synthesis to produce C_2H_4O in gas-expanded liquid phase with zero CO_2 emission in operation that consider safer and more secure than the old conventional gas phase process. The alternative procedure was found by The Center for Environmentally Beneficial Catalysis (CEBC) at University of Kansan and improved by Laboratory of Integrated Systems Engineering (LISE) at Lamar University. The new steady state design has been built on Aspen Plus version 8.8 simulation program, focusing on recycling excess and waste chemicals and improving the distillation and purification performance, that lead us to optimize the alternative C_2H_4O process by decreasing the manufacturing cost of C_2H_4O to 66.0 ¢/lb, the estimated fixed capital investment for the new design is about $ 66,340,00 which is evaluated by Aspen Process Economic Analyzer, and the payback period for the design is 7.3 year. For further studies on the process safety and process operation stability, a dynamic model is built in Aspen Dynamic version 8.8 simulation program. Fortunately, the updated dynamic model and used control strategy help to respond on any disturbance that is generated by upstream set point changes up to 10% of its steady state values.

Altering gene expression of membrane proteins in Leishmania parasites using the novel CRISPR- Cas 9 technology to identify new treatment targets

Carlo Vanz, Department of Biology
Mentor: Dr. Ashwini Kucknoor, Lamar University

Leishmania is a protozoan parasite that causes Leishmaniasis, a vector-borne disease which kills between 20,000 and 30,000 people every year. Leishmania species change their morphology from a motile, extracellular form inside the sand-fly to a nonmotile, intracellular form inside of the human host and “hide” from our immune system. If this transition is prevented, the parasite can be easily eliminated. This proposal is aimed at altering gene expression using novel gene targeting approach utilizing CRISPR-Cas-9 system. Four potential surface protein genes implicated in morphological transition will be targeted to analyze their role in Leishmania pathogenesis and to possibly identify new targets for drug development to disrupt the parasite’s defense mechanism.

Polyphenolic Phytochemicals in the Prevention and Treatment of Alzheimer’s disease

Amanda Warner, Department of Biology
Mentor: Dr. Maryam Vasefi, Lamar University

Neurodegenerative disease is the progressive and irreversible loss of neurons that leads to cognitive motor deficits. Inflammation and oxidative stress play important roles in the initiation and propagation of these diseases. Our research seeks to identify polyphenolic phytochemicals that can reduce inflammation and oxidative stress to prevent and treat neurodegenerative diseases. Polyphenols’ lack of side effects makes them appealing in medicine, where most treatments have significant side effects. A literature search and creative synthesis were conducted to isolate polyphenols with the desired properties. After amassing a large number of possible polyphenolic phytochemicals, they were narrowed down by only keeping the ones that are anti-oxidant, anti-inflammatory, anti-bacterial, and able to cross the blood-brain barrier. Journals, scientific books, and the library catalogue were used to obtain information. Our research indicates that there are several polyphenols that may be useful in preventing and treating neurodegenerative diseases when used in combination with each other. These polyphenols have the potential to change the way neurodegenerative diseases are prevented and treated. Polyphenols may provide the treatment not

only for neurodegenerative diseases, but also for other diseases that are caused or propagated by oxidative stress and inflammation.

Exploring Hippotherapy as an Intervention for Children with Special Needs: A Retrospective Descriptive Study

Kloé Woosley, School of Nursing
Mentor: Dr. LeAnn Chisholm and Mrs. Rose Harding, Lamar University

A retrospective descriptive study design was used to analyze demographic characteristics and physical/occupational therapy standardized assessment scores of pediatric subjects participating in hippotherapy in Southeast Texas from January 1, 2014 through December 31, 2016. Once informed consent/assent was obtained, demographic data including age, gender, ethnicity, primary diagnosis, and comorbidities was collected along with standardized assessment data, session type, time in minutes, and number of hippotherapy sessions. Data was coded and stored securely in a locked box. Demographic characteristics of this sample will be discussed along with therapy characteristics, number of sessions, prior enrollment in program, grooming time, and riding time. For each standardized test and subscale, the mean, frequency of administration, and follow-up assessment scores will be discussed. Analysis of the relationship between therapy amount and type with standardized assessment scores will be discussed. Due to the small sample size and restricted geographic location, the results are limited to this sample of pediatric clients utilizing hippotherapy. Valuable trends and information regarding the consistency of assessment and reassessment will be presented. In addition, the reason for decreases in reassessment scores could not easily be identified in the chart and may have contributed to inconsistency in the findings.The standardized assessments used to evaluate physical and emotional status of this population may not be sensitive enough to detect subtle improvement in functioning; therefore, additional tests need to be identified or developed. Longitudinal research and larger samples are needed to identify potential relationships.

An improved grey decision-making model and its application

Wenchao Zuo, Department of Industrial Engineering
Co-Author: Yuhong Wang
Mentor: Dr. Yueqing Li, Lamar University

Existing clustering algorithms need to specify the number of clusters and select initial points using human input, which lead to poorer clustering and optimisation outputs. An improved grey decision-making model based on the thought of affinity propagation algorithm and grey correlation analysis is proposed to solve these problems. According to the panel data class and the inter-class candidate points between the message dissemination for clustering, we fully mine all information contained in a multi-indicator panel dataset. Finally, a case study is used to check the improved model's validity and rationality.

Poster Abstracts

All Posters are listed alphabetically by last name of the primary presenter

Real Time Facial Recognition in Unconstrained Environment

Md Manjurul Ahsan, Department of Industrial Engineering
Mentor: Dr. Yueqing Li, Lamar University

Face detect and recognition from image/video are becoming popular in many research filed such as biometrics filed, industrial sector etc. due to its wide spread application in security and control. Almost every place like school, college, office, city road and other government/private facilities are usually having surveillance cameras for security purpose which have the significant value for safety issues. But it is still challenging task due to the variations resulting from different facial expression, pose, makeup, rotations etc. The performance of any recognition depends on several factors such as: storage capacity, computational complexity, recognition rate etc. While the existing methods shows promising results in the clean environment on the other hand performances are limited in an unconstrained environment. The primary purpose of this research is to develop a facial recognition application which will recognize a face in an unconstrained environment such as foggy, cloudy, rainy weather or low light condition with different facial expression. Primarily, in our experiment for facial detection we are using Haar cascade classifier and for recognition we are using local binary pattern histogram (LBPH), since it shows promising result in different lighting condition. A small data set of two people with 50 sample images are using for experiment. A complete solution for image/video based face detection and recognition with high accuracy will be provided based on investigation on several methods such as ANN, CNN, Deep Dream, Face Net, machine learning technique etc.

Deicer Chemical Effects on Pervious Concrete Phase 2

Nara Almeida, Department of Civil and Environmental Engineering
Co-Author: Molly Ross
Mentor: Dr. Liv Haselbach, Lamar University

Pervious concrete pavements installed in cold climate areas are subjected to deicing chemicals and freeze-thaw cycles, as with any other kind of pavement. The porous structure of the pervious concrete may allow the deicing chemicals to accumulate and infiltrated precipitation to freeze-thaw within its structure. It is not clear whether the deicing chemicals, the freeze-thaw cycles or a combination of both are responsible for the deterioration of pervious concrete in cold climates. This research focuses on the chemical impacts, and aims to further investigate the mechanical behavior of the pervious concrete when subjected to these chemicals. Split tensile tests were performed to better understand how deicers can chemically and/or physically affect specimens exposed to these deicer chemicals. The common deicing chemicals investigated include sodium chloride, magnesium chloride and calcium chloride, with water exposure as the control. Specimens had been previously subjected to these chemicals in a laboratory experiment representative of multiple applications. Split tensile testing gave inconclusive results, but chemical analysis shows that calcium leaching from the specimen is proportional to the amount of calcium in the specimen itself. Additional testing is ongoing to further understand the relationship between the strength and durability of pervious concrete and deicing treatments. A better understanding of the behavior of pervious concrete when subjected to severe winters may aid the industry in designing and installing pervious concrete that is more resistant to wintertime maintenance practices.

New Clustering Approach for Spatio-temporal Data Analysis

Amar Mani Aryal, Department of Computer Science
Mentor: Dr. Sujing Wang, Lamar University

With the development of positioning and sensing technologies, huge amounts of spatio-temporal data are generated every day. Analyzing spatio-temporal patterns from such data is an important task for knowledge discovery. We design and implement a density-based clustering algorithm for spatio-temporal data analysis. The proposed algorithm integrates spatial, temporal and other semantic attributes in the clustering process. It can find clusters of different sizes, shapes, and densities in noisy data. We demonstrate the effectiveness of the algorithm in case study involving a New York city taxi trip data and Maryland crime data. The experimental results show that the proposed algorithm can identify interesting patterns and useful information from spatio-temporal data.

Catalytic Decomposition of Ammonia Borane - Polyvinylpyrrolidone Composites

Leon Bedrous, Department Chemisty
Co-Author: Weslynn Taylor and Ramanjaneyulu Seemaladinne
Mentor: Dr. Ozge Gunaydin-Sen, Lamar University

Ammonia borane (NH_3BH_3, AB) attracts attention due to its hydrogen storage capability to be used in hydrogen fuel cells, but its application is restricted because of the slow hydrogen release and unwanted byproducts. Studies showed that addition of polymers are improving the hydrogen release features. Thermal and infrared studies were conducted on AB and its bulk composites with polyvinylpyrolidone (PVP) and magnesium chloride ($MgCl_2$) added as a catalyst to evaluate the improvements in its dehydrogenation properties. The bulk polymer composites were prepared by mixing NH_3BH_3 with PVP in different proportions and drying under vacuum. $MgCl_2$ was added to improve kinetics as well as hydrogen release at lower temperatures. High temperature decomposition studies using differential scanning calorimeter (DSC) were performed to investigate dehydrogenation kinetics of the composites with and without $MgCl_2$. Dehydrogenation experiments were carried out at different heating rates to calculate the activation energies (E_a). The composites with $MgCl_2$ had E_a lower than the pristine NH_3BH_3 and the polymer composites. Thermogravimetric studies were also conducted to bulk composites with the catalyst and AB to evaluate the percentage of weight loss. The composites were found to have lower weight loss than the neat AB. FTIR studies showed evidence for the interaction of polymeric functional group with AB, and the complex formation between N atom in AB with $MgCl_2$. These results supported the improvement of the properties of AB-PVP composites by the addition of a catalyst. Future studies involve property investigation of different polymer composites of NH_3BH_3 with $CaCl_2$ as the catalyst.

New Social Media Sentiment Analysis Algorithm for Businesses Competition

Manideep Bollu, Department of Computer Science
Mentor: Dr. Sujing Wang, Lamar University

Evolution of Web 2.0 and social media has enabled people to express their thoughts and opinions thorough various platforms such as blogs, discussion forums, tweets and other apps. Apps like Yelp and Zomato collect users' data and furnish the reviews on a particular business to help new users to make decisions. Performing sentiment analysis on such social media user data to extract their opinions and feelings on various things has been quite fruitful. This project aims to develop new social media sentiment analysis algorithm for businesses competition. We apply topical text classification on users' data from Yelp to create a model for competition analysis in the interest of business operators. Topical text classification is different from sentiment based classification since it involves collecting data on a specific item/activity which is more useful based on the user interest. The proposed algorithm considers 5 features model (Information Gain, Document Frequency, Gain Ratio, Chi Squared and Relief-F) and 3 sentiment lexicons (GI, HM and Opinion Lexicon) to analyze restaurant review corpus from Yelp Dataset. We evaluate the performance of the proposed algorithm in terms of accuracy, precision and validity.

Preparation of Copper-Manganese Oxalates as Precursors of Methanol Steam Reforming Catalysts

Alec Defeo, Department of Chemistry and Biochemistry
Mentor: Dr. Roland Barbosa, Lamar University

Copper-Manganese (CuMn) oxalates of varying metal ratios have been prepared using co-precipitation method. The thermal decomposition of these oxalates creates CuMn nanoparticles, but variation of the relative amounts of the metal precursors may affect the catalytic properties of the material. FTIR, XRD and TPD have been employed, revealing changes in the structure and coordination of the oxalate, which give rise to differences in reducibility and thermal behavior of the material. These fundamental phenomena will provide insights into rational improvement of the performance of CuMn catalysts in Methanol Steam Reforming.

Development of Noncoding Regions of the Chloroplast Genome for Assessment of Phylogenetic and Population Genetic Questions in Hesperocyparis Macrocarpa Clade

Edward Doan and Jordan Curl, Department of Biology
Mentor: Dr. Randall Terry, Lamar University

To effectively answer phylogenetic relationship and population genetic questions, DNA sequence information from gene regions of sufficient variability is required. Past studies in gymnosperms have been hindered by a scarcity of data or have required the sequencing of a large number of gene regions, which is inefficient and often still yields marginal quantities of data. In this study, we developed three new chloroplast gene regions for comparative sequencing in Hesperocyparis (New World cypresses), a group of gymnosperms found in the western US and northern Mexico. Genetic distances from candidate gene regions were identified from whole genome sequences, amplified using the polymerase chain reaction, and commercially sequenced using dideoxy chain terminators. Genetic variation was measured and used to compare the three newly developed regions to those used in past studies, and applied to population genetic and evolutionary questions in the cypresses of California, many of which are critically imperiled and at risk for extinction.

A Hybrid framework to select Logistics Service Providers based on GANP and GRA methods

Sajad Ebrahimi, Department of Industrial Engineering
Co-Author: Marzieh Khakestari
Mentor: Dr. Berna Eren Tokgoz, Lamar University

Making the decision to outsource selected supply chain functions and processes to a Third Party Logistics (3PL) company can be challenging yet rewarding to an organization. Organizations that wish to develop and improve their supply chain activities require a comprehensive, economical and practical method to assess and select logistics service providers (LSPs). The effectiveness of outsourcing logistics services helps organizations to meet the expectations and needs of their end customers. In this paper, a methodological framework comprising Gray Analytic Network Process and Gray Relational Analysis is proposed to assess and select preferred LSPs under uncertainty. In order to illustrate the capability of the proposed framework, it is applied to assess LSPs in an Iranian automotive company. Results show that among the criteria, the criterion "organizational capabilities" weighting "0.381" is of the highest importance. In addition, according to the all sub-criteria, 7th logistics service provider is selected as the most appropriate partner in outsourcing the logistics services.

Work in Progress: Predicting Movie Success using Data Mining Techniques

Diego Fernandez, Department of Computer Science
Co-Authors: Timothy Gonzales and Colin Smith
Mentors: Dr. Sujing Wang and Dr. Peggy Doerschuk, Lamar University

The critical and financial success of a movie can depend on many factors including release date, budget, actors, directors, and more. This project seeks to create a model for predicting the critical and financial success of movies by analyzing historical data of previously released movies. To carry out this research, we used a publicly hosted data set from Kaggle that contains over 4000 entries for movies, which have been scraped from the IMDb (Internet Movie Database). Attributes included in this data are language, budget, gross, main actors and their Facebook like count, director, genre, and more. Research tasks for this project include pre-processing the existing data, cross-validating, determining the most effective classification algorithm, testing the model, and computing its accuracy. Future works for this project include adding more attributes and normalizing the data to find which attributes contribute the most to a movie's success.

Work In Progress: Programming is a Snap!: Increasing Knowledge and Interest in Computing

Diego Fernandez, Department of Computer Science
Co-Authors: Timothy Gonzales, Hannah Leleux, Timothy Holcombe, Ethan Hall, Colin Smith, Alexander Strong, Greg Year, and Robert Monarch
Mentor: Dr. Peggy Doerschuk and Dr. Sujing Wang, Lamar University

This project investigates whether high school students' interest and knowledge in computing can be increased by engaging them in an hour-long hands-on game programming lab that is led by undergraduates. The undergraduates create the instructional materials, conduct the hands-on activity and participate in evaluating the effectiveness of the approach. Instructional materials include a partial game that students complete, a set of slides that explain concepts, and instruments that measure students' interest and knowledge in programming before and after the activity. As of this writing, all materials have been created and tested. They will be used and evaluated in a series of on-campus visits by high schools planned for this academic year.

Preparation and Thermal Decomposition of Copper-Zirconium Mixed Oxalates

Sergio Figueroa, Department of Chemistry and Biochemistry
Mentor: Dr. Roland Barbosa, Lamar University

Using the oxalate co-precipitation, copper-zirconium (CuZr) mixed oxalates of various metallic ratios (3:1, 1:1, 1:3) have been prepared. The obtained samples were characterized using Fourier Transform Infrared Spectroscopy (FTIR) and Differential Scanning Calorimetry (DSC). A comparison on the use of two solvents, water and acetone, and the different ratios, exhibit changes in the polymeric structure and the thermal behavior of the material. Decomposition of the oxalates produces $CuZrO_x$ with variation on the stoichiometry, oxidation states, morphology and their physicochemical properties. The goal is to be able to utilize the most efficient CuZr-catalyst for methanol steam reforming (MSR) and understand relationship of the tailored catalysts to its catalytic performance.

Spectroscopic characterization of humic substances in landfill leachates from elevated temperature landfills (ETLF)

Sailee Gawande, Department of Environmental Engineering
Mentor: Dr. Renzun Zhao, Lamar University

Leachate is the liquid formed in landfills through decomposition and moisture of organic waste. The potential impacts of leachate are ground and surface water pollution. During treatment, leachate shows bio-refractory and UV-quenching properties thereby hindering the biological degradation and UV-disinfection steps. Humic substances

(HS) (humic and fulvic acids) are identified to be mainly responsible for showing these properties. Recently elevated temperatures are reported in some landfills that has led to the formation of "aggressive leachates"; which necessitates a thorough evaluation of leachates from ETLF and especially the HS. In this study, UV- visible (UV-vis) spectroscopy and Fourier transform infrared spectroscopy (FTIR) will be used for characterization. The E4/E6 ratio (absorbance value at 465 and 665 nm respectively) measured from UV-vis for impacted and non-impacted leachate is 3.34 and 2.91 respectively indicating that the non-impacted leachate is more humified than the impacted as the degree of humification is inversely proportional to E4/E6 ratio. Humified components tend to absorb more UV-light, however, the individual absorbance at specified wavelengths is 1000 times greater for impacted leachate than non-impacted leachate which implies that the impacted leachate is 1000 times more concentrated than the non-impacted leachate. FTIR analysis will further help to determine various organic and polymeric functional groups present in ETLF leachates, allowing to interpret the chemistry of leachate after getting affected by elevated temperature. Inferences from this study can be used as an indicator of impending elevated temperature conditions and may help in the development of preventive control mechanisms to address the situation.

Nano Silica Applications in Maritime Ship Coatings

Scott Girdwood, Department of Mechanical Engineering
Mentor: Dr. Ramesh K. Gurduru, Lamar University

Modern ocean vessels have highly refined shapes to limit the parasitic drag inherent to moving through water. These sleek shapes are negatively affected by the buildup of algae and aquatic plants and animals below the waterline of the hull, which increases drag and, consequently, fuel consumption. In addition, invasive species can be transported on the skin of a ship's hull thousands of miles into previously un-invaded areas, spreading non-native species of aquatic life. It is beneficial to sensitive ecosystems and shipping company's bottom lines to reduce biofouling as much as possible. We propose that the application of silica nanoparticles through an aerosol assisted coating process will reduce or eliminate the biofouling. We will prepare our test samples on steel disks and immerse them in the Gulf of Mexico at the US Coast Guard facility on Pleasure Island. After ~6 weeks, the disks will be removed, weighed, and tested on a drag measurement device in the lab. From these observations we can deduce the effectiveness of our coatings.

Design and implementation of 3D modeling for teaching abstract concepts

Ethan Hall, Department of Computer Science
Co-Authors: Diego Fernandez and Greg Yera
Mentors: Dr. Sujing Wang, Dr. Stefan Andrei and Dr. Peggy Doerschuk, Lamar University

Many college subjects, such as computer science, have abstract concepts which can be difficult to illustrate. By using modeling software and a 3D printer however, abstract ideas can be physically represented and printed to become real-world learning aids. There are many software options available that are sufficient to achieve our goal of creating digital models. In this project, we most often use Blender, a powerful open source software for 3D creators. Once the models are made, they are exported as a digital STL (Standard Tessellation Language) file so that they can be printed. The College of Arts and Sciences at Lamar has several 3D printers that use environmental-friendly Poly-Lactic Acid (PLA) plastic extruded in consecutive layers that build up the form of the digital model provided. We are currently designing and fabricating learning tools that assist with learning in various subjects including computer science and engineering. In the future, we plan to continue developing visual aids for computer science and other departments at Lamar University.

The Connection between Alzheimer's disease and Inflammation due to Infection

Han Huynh, Department of Biology
Mentor: Dr. Maryam Vasefi, Lamar University

The chronic condition of Alzheimer's disease and its connection with systemic inflammation due to infection was reviewed in association of brain amyloidosis with pro-inflammatory gut bacteria, the risks of prolonged exposure to

chronic periodontitis, polymicrobial infections within brain tissue of Alzheimer's disease, and the expression of Alzheimer-type neurofibrillary epitopes. Studies revealed significant increased expression of pro-inflammatory cytokines, a lower abundance of anti-inflammatory GMB, and a higher abundance of pro-inflammatory gut microbial bacteria in cognitively impaired patients. In association with higher cognitive impairment and chronic periodontitis, investigations revealed that patients with prolonged chronic periodontitis exposure showed higher risk of developing Alzheimer's disease compared to unexposed groups, illustrated by increased serum levels of C-reactive protein and pro-inflammatory cytokines and decreased anti-inflammatory markers. Reports on the effects of fungal pathogens and modified transcriptions of tau were also collected to provide additional evidence for connections between inflammation due to infection and Alzheimer's disease. Alzheimer's, the most common form of dementia, impairs memory, behavior, and cognitive function, with more than 3 million cases in the US per year and affecting mainly age groups of 60 years and older. Despite the significant impact of Alzheimer's disease on the quality of life for millions of people, there is still no present cure for the progressive neurodegenerative disease. Separate experiments and a meta-analysis were reviewed to provide significant results to be presented in a conclusive public discussion that detailed the association between Alzheimer's disease and inflammatory responses due to infectious pathogens and informative encouragement for future studies.

Characterization of oxygen production in algal suspension cultures by dimensionless equations

Sina Kaabipour, Department of Chemical Engineering
Co-Authors: Ali Rashidi Kouchi, Julia Lin, and Jie Lui
Mentor: Dr. Clayton Jeffryes, Lamar University

This research models the oxygen production in algal suspension cultures by fitting experimental data to dimensionless mathematical equations. The net oxygen production rate of the culture is measured at different light intensities and different cell culture suspension concentrations. The main purpose of dimensionless equations is to describe the bioprocess using universal, dimensionless variables. These dimensionless variables give a general solution to describe oxygen production in all algal bioprocess systems, independent of algal strain or culture vessel geometry. These dimensionless equations also yield a better understanding of system parameters by grouping together the system's natural variables. Additionally, this reduces model complexity, which is why the use of dimensionless equations and parameters is ubiquitous in engineering science. The usefulness of this study will also enable the modeling of oxygen concentration newly developed systems, such as mixed phototrophic biomaterials, which can further be used in innovative therapeutic approaches, artificial tumors, regenerative medicine, as well as in wastewater treatment and the production of high-value biochemical.

Simulation Based Analysis of Game Theoretic Model Using Smart Grid Solution

Md Amanullah Kabir, Department of Mechanical Engineering
Mentor: Dr. Jiang Zhou, Lamar University

This research focuses on the efficient as well as economical electric distribution system within the context of regulatory governance. Based on the game theory with detailed payoff functions an analytical model is developed which takes into account both of general users and smart grid users in a region. In this model, smart grid users act as electric distributor. By collecting detailed data, the model is developed with the consideration of the following different factors such as, i) No. of users having renewable sources, ii) possibility of major electric breakdown, ii) Government involvement in smart distribution. A smart controller is used for the proper distribution including proportional–integral–derivative controller, adaptive control, and fuzzy Logic controller, etc., which can determine the smart distribution of electricity by considering different parameters. Finally, the model's efficiency and economic feasibility are calculated and compared with an existing model.

Risk Assessment of Commonly Transported Chemicals in Ports

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Seaports play a key role in international trade. As strong economic drivers in the Gulf of Mexico, ports in this region are predominant in the areas of oil and gas, chemicals and petrochemical operations worldwide. Because these materials are known for their harmful characteristics, Gulf of Mexico ports are vulnerable to hazardous conditions. To ensure continual and safe operations, minimizing risk in port environments is of imperative importance to government authorities. In this study, risk assessment of commonly transported chemicals will be examined for the Port of Houston, as well as different risk scenarios will be generated to evaluate hazard exposure in the event of a disaster.

Analysis of Precise Measurements in the Near-Infrared Spectrum of C_2H_2

Nhut Nguyen, Department of Chemistry & Biochemistry
Mentor: Dr. Sylvestre Twagirayezu, Lamar University

Absolute line frequencies have been measured in the Near-Infrared spectrum of acetylene using an optical frequency comb based spectrometer accessible through our collaboration with Brookhaven National Laboratory. The frequency accuracy of the measured transitions, as judged from line shape model fits is approximately better than 20kHz. This is some three orders of magnitude improvement on the accuracy and precision of previous line position estimates that were derived from the analysis of high-resolution Fourier transform infrared absorption spectra. Comparison between present data and that stored in HITRAN 2012 Database [***J. Quant. Spectrosc. Radiat. Transf.* 130 (2013) 4-50**.] revealed errors in order of MHz in magnitude. Preliminary evaluation of observed line profiles(P_{35}) as functions of sampling pressures provides insights about pressure broadening and thus enables the determination of broadening coefficient of ~10MHz/Torr.

"Anaerobic Digester Centrate" – A case for algae-based energy production in municipal wastewater treatment systems

Shanglei Pan, Department of Civil and Environmental Engineering
Mentor: Dr. Thinesh Selvaratnam, Lamar University

Municipal and agricultural waste streams contain significant amounts of chemical energy and nutrients that are not well utilized by current activated sludge-based wastewater treatment (WWT) methods. Anaerobic digestion (AD) is one of the most common methods used to recover a fraction of the energy and nutrients trapped in the produced wet biosolids-associated with WWT. AD process reduces the volume of excess sludge and biosolids while yielding biogas, digested solids (digestate), and a high-strength wastewater known as centrate. The high levels of N and P in centrate must be removed which is typically accomplished by mixing with incoming WW, thus acting as a parasitic load on the plant. Alternatively, the centrate could be diluted and treated via algae processes. In this study, we evaluated the potential of using both centrate and digestate to recover energy and nutrients through an algal-based system. We show that undiluted, nutrient-rich centrate can be treated effectively by thermo-acidophilic algae *Galdieria sulphuraria*. We then evaluated projected cost savings when centrate-derived algal biomass and AD digestate is processed using hydrothermal liquefaction (HTL) to yield bio-crude oil followed by catalytic hydrothermal gasification (CHG) or catalytic supercritical water gasification (SCWG) of the HTL water phase to yield CH_4 or H_2 respectively. Revenue projections for this proposed system were then projected using a model city, population 100,000. The results indicate the potential to annually yield: A. 2885 to 6040 barrels of biocrude; B. 121,000 to 208, 000 kg of CH_4 or 129,000 to 220,000 kg of H_2 depending on the gasification process. In addition, by eliminating the need for centrate mixing with incoming wastewater and digestate management the proposed system will yield an annual cost saving of $ 230,000 to 1,818,000.

Trend Analysis of Aerosol Particles in Himalayan Region

Michael Penrod, Mathematics
Mentors: Dr. Ram Kafle and Dr. Rudra Aryal, Sam Houston State University

AOT or Aerosol Optical Thickness represents the total column loading of aerosol particles in the atmosphere. In the region surrounding the Himalayan Mountain Range, industrial growth and fossil fuel combustion rates are increasing. The aim of this study is to understand and predict the emission in industrial cities that share common air mass with Himalayan sites and their effect in the pollution in Himalayan region. Four AERONET sites of Nepal and India are chosen to analyze and investigate monthly and seasonal trends of AOT particles. We apply Time Series models to better understand the relationship between the air quality in the Himalayan Mountains and that of surrounding cities over the time. Holt-Winters Exponential Smoothing models are used to generate a forecasting model to predict the pollution.

Image-Based Particulate Matter Analysis Using Deep Convolutional Neural Network

Nabin Sharma Rijal, Department of Computer Science
Co-Authors: Ravi Teja Gutta, Avijoy Chakma,Ben Vizena
Mentor: Dr. Jing Zhang, Lamar University

Particulate matter (PM) is one of the most common air pollutants and may cause many severe diseases. In particular, PM with diameters less than 2.5 micrometers ($PM_{2.5}$) is more harmful to human health than other air pollutants because it can penetrate into lungs and damage human respiratory system. An efficient $PM_{2.5}$ monitoring is of great benefit for human health and air pollution control. In this paper, we propose an image-based method for the estimation of $PM_{2.5}$ value. The proposed method takes RGB images as input and outputs the estimated concentration of $PM_{2.5}$ based on the visual contents of input images using deep convolutional neural network. The adopted network is a VGG-16 model pre-trained using ImageNet dataset and a transfer learning strategy is applied to fine tune the weights of the fully connected layers for $PM_{2.5}$ analysis. We evaluated our method using one synthetic dataset and two real-world datasets with total 6369 images comprehensively and the experimental results demonstrate that the proposed method can be used for image-based $PM_{2.5}$ estimation and can potentially provide an efficient and affordable way for air pollution monitoring.

Asphalt Pavement Recycling

Sila Temizel Sekeryan, Department of Civil and Environmental Engineering
Mentor: Dr. Liv Haselbach, Lamar University

Asphalt, also known as bitumen, is typically a petroleum product. It may be found naturally or may be refined. This product is primarily used as a binder in the road construction industry as asphaltic concrete pavement, in other words ‘asphalt’. Construction and maintenance of pavement systems use considerable amounts of materials and energy, which if used sustainably may decrease environmental impacts and minimize costs to reach a ‘greener’ environment. Asphalt is highly recyclable, it may be crushed, reused and recycled back into new asphalt. There are three different recycling methods for asphalt which are in-place recycling, in-plant recycling and cold planing. In-place recycling has three different applications. They are full depth reclamation, hot in-place recycling and cold recycling. Recycled asphalt is evaluated in terms of environmental and economic benefits, and its durability as compared to virgin asphalt through a literature review. Finally, guiding documents for environmental reporting, such as environmental product declarations (EPDs), are reviewed and compiled with respect to the inclusion of recycling and recyclability.

Synthesis and structural characterization of mercury (II) coordination polymers based on 1, 2, 4, 5-tetra (isopropylthio) benzene ligand

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Co-Authors: Srinija Kakumanu and Joel T. Mague
Mentor: Dr. Perumalreddy Chandrasekaran, Lamar University

Toxicological effects of mercury and its compounds are well known. Mercury species are introduced into aquatic waters by anthropogenic activities or through bioalkylation of inorganic mercury by metalloenzymes such as methycobalamin present in microorganisms. Our research goal is to convert toxic mercury compounds into least toxic inorganic mercury HgS using sacrificial ligand. In this context, we have synthesized sacrificial ligand 1,2,4,5 tetra (isopropylthio) benzene; [$C_6H_2(iPr)_4$] (L1) and its coordination chemistry with various mercury salts have been investigated in solution and solid states. Ligand L1 forms 1-D coordination polymers [H_gX_2{L1}]∞ (2, X = Cl; 3, X = Br) with $HgCl_2$ and $HgBr_2$ respectively, whereas L1 reacts with two equivalent of HgI_2 to produce dinuclear mercury complex [I_2Hg{L1}HgI_2] (4). The $Hg(ClO_4)_2$ and $Hg(OTf)_2$ salts combines with L1 in 1:1 ratio to form [$Hg(X\text{-}\kappa O)_2${L1}]∞ (5, X = ClO_4; 6, X = OTf). Ligand L1 and complexes 2-6 have been characterized by single crystal X-ray structure. The compound 2 and 3 reveals formation of coordination network in which, [X_2Hg{L1}HgX_2] (X = Cl, Br) units are bridged by L1 through two para-thioether sulfur donor. Similarly, complexes 5 and 6 show Hg bridging by L1 through two thioether sulfur donors and oxygen coordination on both ends of the Hg ion. Complexes have coordination number 4,5 and 6 depending upon the anions.

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UPCOMING EVENTS & CONFERENCES 2017-18

Grant Recipient Award Reception
Price Auditorium
Monday, November 6, 2017

Poster on the Hill 2017
Council on Undergraduate Research
Application Due: November 2, 2017

4th Annual Humanities, Arts, Social and Behavioral Sciences, Education and Business Conference
Wayne A. Reaud Honors Building
Abstract Deadline: October 30, 2017
Registration Deadline: November 4, 2017

5th Annual Undergraduate Research Expo

April, 2018

6th Annual Texas STEM Conference

See you next year!!

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