Texas Southern University

2016 COSET Research Week

Abstracts

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2016 COSET Research Week Program

The College of Science and Technology is organizing a three-day research event on March 29th-31st. The event will take place in the Sterling Student Life Center, Room 238.

SCHEDUAL

Tuesday, March 29th, Room 238 Sterling Student Life Center

12:00pm to 1:00pm	** Box Lunch **
1:00pm to 2:00pm	Invited Talk: "Revolution: In Communication; In Education", Dr. John H. Lienhard, M.D. Anderson Emeritus Professor of Technology and Culture
2:00pm to 2:30pm	"Trust Ranking of Medical Websites", Dr. Lila Ghemri, Associate Professor of Computer Science, TSU
2:30pm to 3:00pm	"Oscillations in Networks of Ordinary Differential Equations", Dr. Yunjiao Wang, Assistant Professor of Mathematics, TSU
3:00pm to 3:30pm	** Coffee Break **
3:30pm to 4:00pm	"Differentiation of natal origins (hatchery-reared vs. wild) of juvenile steelhead (Oncorhynchus mykiss) by strontium isotopes and somatic body mass growth dilution of PCBs", Dr. Hyun-Min Hwang, Associate Professor of Environmental Toxicology, TSU
4:00pm to 4:30pm	"Linear Scaling Computational Chemistry", Dr. C. J. Tymczak, Professor of Physics, TSU
4:30pm to 5:00pm	"The future of gravitational wave astronomy", Dr. Daniel Vrinceanu, Associate Professor of Physics, TSU

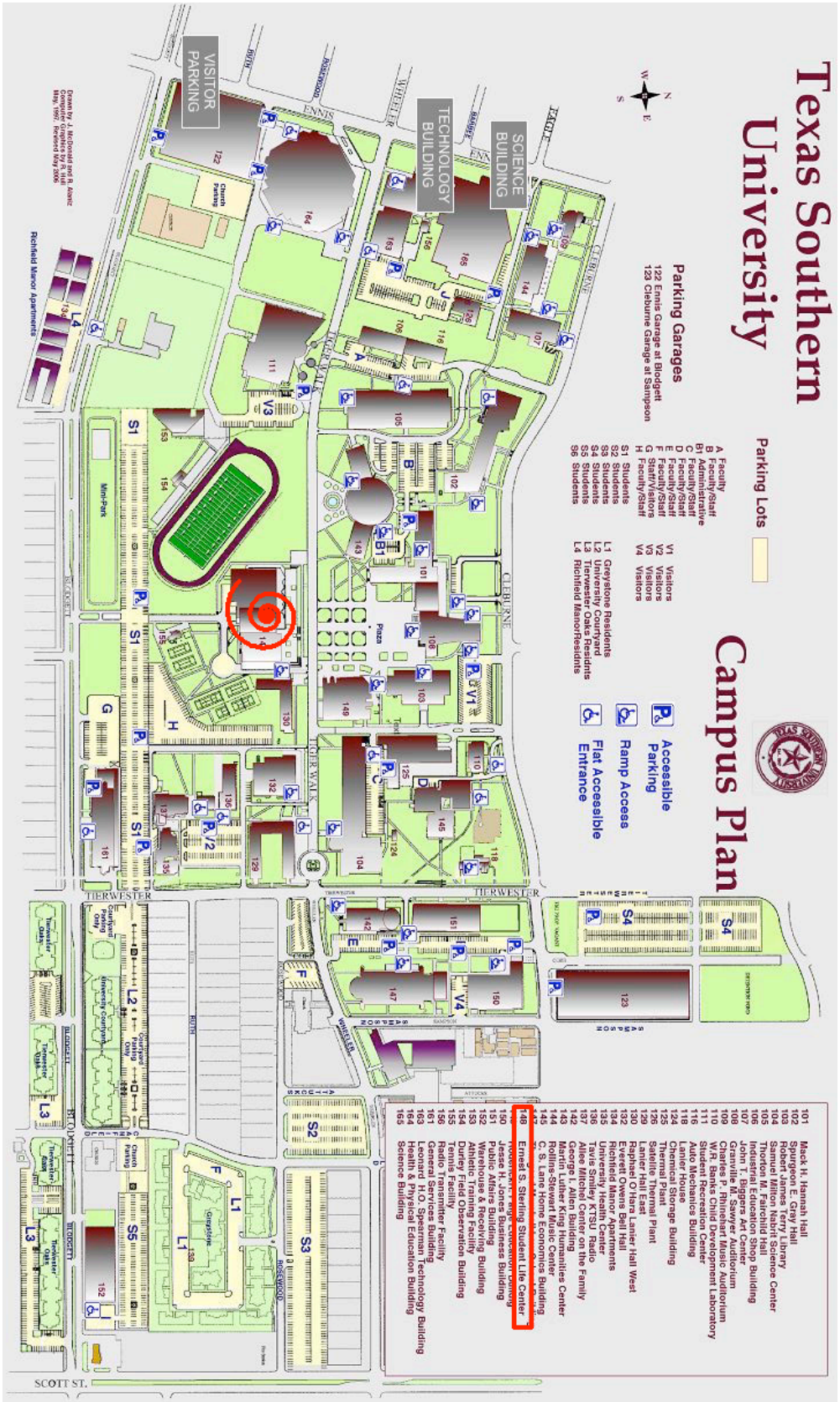
Wednesday, March 30th, Room 238 Sterling Student Life Center

1:00pm to 1:20pm	*"A Memory-less Social Network Application For Reputation Protection", Andre Parrott, Graduate Student in Computer Science, TSU*
1:20pm to 1:40pm	*"Development of Neural Network Model to Calibrate Emission Factor", Mahbuba Khan, Graduate Student in Transportation Studies, TSU*
1:40pm to 2:00pm	*"Computer Modeling of Stray Radiation Produced External to a Conventional X-Ray Therapy Room using the Geant4 Monte Carlo Toolkit", Mr. Ugochukwu O. Ezenekwe, Undergraduate Student in Physics, TSU*
2:00pm to 2:20pm	*"Are we driving on a Safe Highway System?", Qing Li, Graduate Student in Transportation Studies, TSU*
2:20pm to 2:40pm	***** Coffee Break *****
2:40pm to 3:00pm	*"Feasibility Study for Alpha-Emitting Radioisotopes in Wastewater Samples around the Texas Medical Center", Mr. Kofi Amoako, Undergraduate Student in Physics, TSU*
3:00pm to 3:20pm	*"Impact Analysis of Developing Public Transit Alternatives upon Inter-City Long-Distance Travels in U.S. -- A Case Study of Inter-City Passenger Trips between Austin and Houston Areas in Texas", Sunxiao Geng, Graduate Student in Transportation Studies, TSU*
3:20pm to 3:40pm	*"Bioaccumulation of Environ-mental Contaminates in Bear Creek, Tennessee", Torres Alexander, Graduate Student in Environmental Toxicology, TSU*
3:40 to 4:00pm	*"Examining the Impact of Eco-Driving Advising Strategies on Vehicle Emissions for Drivers Travelling within Intersection Vicinities", Peijia Tang, Graduate Student in Transportation Studies, TSU*

Thursday, March 31st, Room 238 Sterling Student Life Center

1:00pm to 1:20pm	*"Safety Evaluation of Horizontal Curves of Two-Lane Rural Highways", Boya You, Graduate Student in Transportation Studies, TSU*
1:20pm to 1:40pm	*"Emission Factors Estimation in Different Types of Freeway Weaving Area with the Consideration of Lane Changing Maneuver", Mahreen Nabi, Graduate Student in Transportation Studies, TSU*
1:40pm to 2:00pm	*"Effects of Pavement Type (asphalt vs. concrete) on Contaminants in Road Dust", Matthew Fiala, Graduate Student in Environmental Toxicology, TSU*

MAP OF EVENTS



Title: **Revolution: In Communication; In Education**
Presenter: John H Lienhard
M.D. Anderson Emeritus Professor of Technology and Culture
Time: Tuesday, March 29th
1:00pm to 2:00pm
Place: Room 238 Sterling Student Life Center

Abstract

Radical change is being demanded of engineering education today – the result of the electronic-information revolution. Other information revolutions have occurred in the past; and each has led to radical changes in education. We look at some of these, giving particular attention to the little-recognized fast-press revolution of the early 19th century. Perhaps these examples will help us to better see, and cope with, present change.

Biography

John H. Lienhard, author and voice of The Engines of Our Ingenuity, is Professor Emeritus of Mechanical Engineering and History at the University of Houston. He received BS and MS degrees from Oregon State College and the University of Washington, his PhD from the University of California at Berkeley, and he holds two honorary doctorates. He is known for his research in the thermal sciences as well as in cultural history. He is an Honorary Member of the American Society of Mechanical Engineers and a member of the National Academy of Engineering.

John H. Lienhard In addition to many awards for his technical contributions, Dr. Lienhard has received, for his work on Engines, the ASME Ralph Coates Roe Medal for contributions to the public understanding of technology, the 1991 Portrait Division Award from the American Women in Radio and Television, and the 1998 American Society of Mechanical Engineers Engineer-Historian Award, other ASME honors, and two 2005 Crystal Microphone Awards.

Title: **Trust Ranking of Medical Websites**
Presenter: Dr. Lila Ghemri,
Associate Professor of Computer Science, TSU
Time: Tuesday, March 29th, 2:00pm to 2:30pm
Place: Room 238 Sterling Student Life Center

Abstract

The use of the Web as a reference to locate and validate medical information has been growing. A recent report shows that more than 77% of internet users use general purpose search engines, such as Google or Bing, to look up specific diseases, treatments or procedures and that 67% of them believe that the online health information is reliable and trustworthy. However the internet has also become a worrisome source for the propagation of fake online pharmacies, sham hospitals and medical schools. We present a novel method for re-ranking webpages based on the website names in order to not only increase their precision but also their trustworthiness. Our re-ranking approach aims at capturing and returning only those websites that are consistently retrieved across search engines and takes advantage of the fact that the life span of fake websites is relatively short compared to legitimate ones. Preliminary testing of re-ranking results has shown that it yields more relevant websites to the user query than the general-purpose search engines.

Title: **Oscillations in Networks of Ordinary Differential Equations**

Presenter: Dr. Yunjiao Wang,
Assistant Professor of Mathematics, TSU

Time: Tuesday, March 29th, 2:30pm to 3:00pm

Place: Room 238 Sterling Student Life Center

Abstract

Networks are ubiquitous. The understanding of the networks such as biological regulatory networks will shed light on biological mechanisms and lead to novel treatments for a wide range of diseases. It is well known that network structures influence the dynamics. In this talk, I will first discuss that a network may have oscillations with rigid phase-shifts (i.e. the phase relations among the nodes are invariant under perturbations) if and only if its network structure has certain symmetry. Then I will introduce a model of rivalry network of Z_2 symmetry that aims to capture multi-stable perceptual rivalry involving inter-ocular perceptual rivalry, and will show that the rivalry behavior can be understood from the existence of the oscillations of the network system.

Biography

My research is in the area of nonlinear dynamical systems with focuses on theory on dynamics of networks of differential equations and its applications. Currently, I work on: Theory of coupled cell systems; Dynamics of network motifs; Dynamics of generalized rivalry network; Grid formation in mammalian spatial navigation systems; NF-kB signaling pathway

Title: **Differentiation of natal origins (hatchery-reared vs. wild) of juvenile steelhead (*Oncorhynchus mykiss*) by strontium isotopes and somatic body mass growth dilution of PCBs**

Presenter: Dr. Hyun-Min Hwang,
Associate Professor of Environmental Toxicology, TSU

Time: Tuesday, March 29th, 3:30pm to 4:00pm

Place: Room 238 Sterling Student Life Center

Abstract

Hatchery-reared and wild juvenile steelhead (*Oncorhynchus mykiss*) were collected at Lower Monumental Dam in the lower Snake River between April and June in 2008 to investigate possible adverse effects of PCBs and organochlorine pesticides on their health. Strontium isotope signatures imbedded in steelhead otoliths revealed that most hatchery-reared steelhead originated from two groups of hatcheries (herein referred to as groups A and B), whereas wild steelhead originated from many different tributaries of the Snake River. PCBs in group A steelhead (44.4 ± 20.4 ng/g wet wt.) were significantly higher than those in group B and wild steelhead, which is likely because they were fed hatchery feed containing high levels of PCBs. PCBs in group A steelhead exponentially decreased as body weight increased, which may be attributed mostly to somatic body mass growth dilution. *p,p'*-DDE body burdens were not significantly different between hatchery-reared and wild steelhead, indicating . PCB body residues in 11 out of 15 group A steelhead were higher than a critical body residue and DDT body residues in 62% of all steelhead exceeded a consumption guideline set to protect fish-eating birds, indicating that organic contaminants detected in juvenile steelhead may affect their health and that of fish-eating birds as well.

Title: **Linear Scaling Computational Chemistry**
Presenter: Dr. C. J. Tymczak
Professor of Physics, TSU
Time: Tuesday, March 29th, 4:00pm to 4:30pm
Place: Room 238 Sterling Student Life Center

Abstract

In this presentation we report on advances and new techniques in linear scaling computational chemistry. Computational chemistry has become an essential tool in the understanding of nano-systems. These methods and techniques are a computational microscope for studying the behavior of atoms and molecules at the very small (nano-scale). However, traditional computational chemistry methods scale as the cube of the system size, severely limiting the size of the systems which can be addressed to only a few hundred atoms. Linear scaling techniques can alleviate these issues allowing for the simulation of complex molacular systems up to several thousand atoms.

Biography

Dr. Tymczak has specialized in the identification, development, and implementation of new scientific codes for exploiting advanced computing resources impacting large scale computation in diverse areas in Many-body physics, Quantum Chemistry and ab initio Molecular Dynamics. He is an Associate Professor of Physics at Texas Southern University, Houston, where he is spearheading the integration of supercomputing resources into various STEM programs, as well as the founder and director of the Texas Southern High Performance Computing Center (TSU-HPCC). At Los Alamos National Laboratory, Dr. Tymczak is a permanent scientific associate within the FreeON initiative, involving the development of a massively parallel linear scaling quantum chemistry methods, currently under development in collaboration with Dr. Matt Challacombe (T-12) and Dr. Anders Niklasson(T-1). He is one of the first to exploit wavelet-based methods in large scale computing for understanding the electronic structure of materials. For the last four years, he has advanced the FreeON development through the exploitation of advanced data structures and advanced machine architectures. FreeON is now recognized as one of the first quantum chemical codes with demonstrable scalable parallelism within large-scale parallel clusters.

Title: **The Future of Gravitational Wave Astronomy**
Presenter: Dr. Daniel Vrinceanu
Associate Professor of Physics, TSU
Time: Tuesday, March 29th, 4:30pm to 5:00pm
Place: Room 238 Sterling Student Life Center

Abstract

In this talk I will review the significance of the recent observations that announced the detection of gravitational waves for the first since their prediction 100 years ago. Within this context, I will elaborate on recent research developments in the Department of Physics at TSU.

Biography

Dr. Vrinceanu was born and raised in Romania. As a student at the "Mihai Viteazul" High School in Ploiesti, he was awarded the bronze medal at the International Physics Olympiad held in London. This scientific competition is the equivalent of the Olympic Games for sports and considers the very best students that represent their own countries. Immediately after obtaining his University degree in Mathematical Physics, he was offered the position of Assistant Professor in the Department of Theoretical Physics at the Bucharest University. He obtained his doctoral degree in Theoretical Atomic Physics from Georgia Institute of Technology in Atlanta. The problem treated in his PhD Thesis made a significant theoretical contribution providing an elegant and efficient solution to an outstanding problem incapable of being solved for more than 40 years. In recognition, he was awarded the Sigma-Xi award of Best Ph.D Thesis 2001 and he was selected for Thesis Prize of the American Physical Society of Division of Atomic, Molecular and Optical Physics (DAMOP).

Title: **A Memory-less Social Network Application For Reputation Protection**

Presenter: Mr. Andre Parrott

Time: Wednesday, March 30th, 1:00pm to 1:20pm

Place: Room 238 Sterling Student Life Center

Abstract

Since the introduction of Facebook, the popularity of social network sites has grown exponentially over the years, encompassing millions of users. As social networks continue to grow and become more popular, users voluntarily post information without an afterthought that their information can be released to the public. The potential risk that users are taking may result in them irreparably damaging their reputation and can have dire consequences on their life. In this work, a new framework is proposed where a single user or a set of users can communicate with other users with the assurance that their reputation is protected regardless of what is being received or sent. The proposed framework uses three privacy protection mechanisms to prevent unwanted disclosure: 1) All user profiles are private; 2) All communications are restricted within closed groups and 3) an expiration mechanism to implemented to automatically delete data being transmitted within the system. The three mechanisms, we believe, give users an assurance and freedom to share data without the fear of information going into the wrong hands or being inadvertently shared with an unwanted audience.

Title: **Development of Neural Network Model to Calibrate Emission Factor**

Presenter: Mr. Mahbuba Khan
Graduate Student in Transportation Studies, TSU

Time: Wednesday, March 30th, 1:20pm to 1:40pm

Place: Room 238 Sterling Student Life Center

Abstract

Vehicular emission is one of the major contributors to the air pollution that poses high risk to both environment and lives. Emission factor (EF) is a function to quantify the relationship between pollution and the activities of the responsible pollutants. EF model development is necessary to estimate and project the emissions accurately so that assessment and prevention of pollution is possible. This paper presents a neural network model to calibrate emission factor using real world data acquired from Portable Emission Measurement System (PEMS). PEMS is a mobile unit of system that can accurately measure second-by-second gas emissions such as Carbon Dioxide (CO_2), Carbon monoxide (CO), Nitrogen Oxides (NO_x) and Hydrocarbons (HC) during the real-time use of vehicle. Data has been collected from various selected road segments consisting of 69.07 miles within the area of greater Houston. Input parameters were speed, acceleration and pavement roughness and the outputs were EFs for CO_2, CO, NO_x and HC. The learning function used here is based on Levenberg-Marquardt algorithm with the optimized node from the range of 1-25 nodes in a single hidden layer and it follows Feedforward network system. The model is supervised using 70% of the data for training, 15% for testing, and 15% for validation. This model yields emission data with more than 96-99% accuracy varying on different kind of emissions comparing with on-road data from PEMS. Considering the pavement roughness along with other vehicular activities as inputs makes this model complex but more reliable. Hence, this artificial neural network can be employed to forecast vehicular gas emissions with precision.

Title: **Computer Modeling of Stray Radiation Produced External to a Conventional X-Ray Therapy Room using the Geant4 Monte Carlo Toolkit**

Presenter: Mr. Ugochukwu O. Ezenekwe
Undergraduate Student in Physics, TSU

Time: Wednesday, March 30th, 1:40pm to 2:00pm

Place: Room 238 Sterling Student Life Center

Abstract

Over the years, conventional shield designs of radiation therapy rooms have varied in layout and structure. Therapy room designs were generally based on circular accelerator movement about the patient. To that end, primary radiation has been limited to the direction of the accelerator; whereas, produced secondary radiations freely scattered about the treatment room surfaces (e.g., floors, walls, ceiling). The purpose of this project was to calculate the energy and magnitude of scattered radiation produced external to a conventional radiation therapy room. The Geant4 Monte Carlo Toolkit (version 10.00) was used to (1) design the walls of a computer-generated radiotherapy room and (2) simulate a source of photons consistent in energy with those produced from a conventional x-ray therapy unit. The photon source was positioned at a stationary point (i.e., isocenter) within the room and aimed at a 20 X 20 cm2 water phantom. Detectors consisting of water were placed just outside the walls of the room to detect the photons attenuated by the wall. For this case, calculations were performed to assess the energy and magnitude of stray radiation penetrating the walls of the radiotherapy room layout. Our preliminary results suggest that scatter radiation is mainly produced external to the primary barrier of the radiotherapy room.

Title: **Are we driving on a Safe Highway System?**

Presenter: Qing Li
Graduate Student in Transportation Studies, TSU

Time: Wednesday, March 30th, 2:00pm to 2:20pm

Place: Room 238 Sterling Student Life Center

Abstract

Motor Vehicle Emission Simulator (MOVES) has been widely used to estimate on-road and off-road portable emissions in United States. By MOVES, 23 operating mode identification (OMID) bins were defined based on the Vehicle Specific Power (VSP), speed, acceleration, and whether the vehicle is in idling. Bin 1 indicates idling status for the speed within 1.0 mi/hr. However, an earlier version of emission model MOBILE6.2 defined the speed within 2.5 mi/hr as the boundary of idling. In fact, emission features, including idle portion, vary with vehicle feature and even roadway characteristics. This research intends to carefully study the emission characteristics of the vehicle speed close to 0 based on on-broad emission tests in the State of Texas with a total route length of 1,000 miles. The analyzed emission indexes include CO2, CO, NOx, HC, and normalized total emissions. The frequency distribution of emission and fuel consumption data were first scanned through the calculation of their respective power spectra density, which resulted in the identification of cut-off point to separate the frequency period with higher energy with that with lower energy. A Chebeshev I filter was identified to remove the high frequency part of the original data sets while keeping the slow moving trend lines to clearly observe the variations of emissions and fuel consumption at a very low speed. The vehicle speed 2.2 mi/hr was identified to separate idle and normal running portions. Such a boundary is recommended as the definition of OMID 1 for the EPA model MOVES.

Title: **Feasibility Study for Alpha-Emitting Radioisotopes in Wastewater Samples around the Texas Medical Center**

Presenter: Mr. Kofi Amoako
Undergraduate Student in Physics, TSU

Time: Wednesday, March 30th, 2:40pm to 3:00pm

Place: Room 238 Sterling Student Life Center

Abstract

The medicinal use of radioisotopes for therapeutic and diagnostic applications in hospital environments are purported to account for a noticeable fraction of man-made radionuclides in wastewater. To this end, the identification and quantification of alpha-emitting radionuclides is crucial in environmental assessments at medical facilities. The purpose of this study was to perform an analysis for natural and man-made alpha-emitting radionuclides from samples of institutional wastewater discharged at several locations around the Texas Medical Center (TMC) in Houston, TX. Of note is that we have not come across previous alpha-emitting radionuclide contaminant analysis reports at TMC facilities. Different methods are available to prepare the wastewater samples for analysis and include co precipitation, electro deposition and direct evaporation. The co-precipitation and electro deposition methods can be complicated and time consuming. Accordingly, the direct evaporation sample preparation method is being explored in the initial phase of this project to determine if any alpha-emitting radionuclide contaminants are present TMC wastewater. Radionuclide assessment will be being studied in our radiation chemistry laboratory post sample preparation using the Canberra Alpha Analyst Integrated Alpha Spectrometer bench top system. The Alpha Spectrometer system eliminates unnecessary attenuation effects; therefore, pristine detection resolution of alpha peaks in the low energy regime is also preserved in analysis.

Title: **Impact Analysis of Developing Public Transit Alternatives upon Inter-City Long-Distance Travels in U.S. -- A Case Study of Inter-City Passenger Trips between Austin and Houston Areas in Texas**

Presenter: Sunxiao Geng
Graduate Student in Transportation Studies, TSU

Time: Wednesday, March 30th, 3:00pm to 3:20pm

Place: Room 238 Sterling Student Life Center

Abstract

Transportation is a pressing issue throughout the nation, and the State of Texas has been also looking into alternatives to the automobile highway networks that currently dominate throughout the state. The paper took the inter-city passenger trips between Houston and Austin areas as case study to examine the impacts of supporting public transit alternatives upon the region. After estimating the demand of passenger trips between two major urban areas, the nested logit model were used for estimating mode shares in three scenarios. The authors employed the Texas Statewide Analysis Model (SAM) Version 2.5 as an impartment and reliable reference of mode choice modeling for the study. The explanatory variables include in-vehicle time, out-vehicle time (transfer, wait, access, egress, etc), travel cost, service reliability, and service frequency. Though the SAM V2.5 is good at estimating traffic and mode share for the entire state, the higher-density Houston and Austin areas requires specific adjustment to the original coefficient and constants. A genetic algorithm, a search heuristic that mimics the process of natural selection, was used to generate the optimized coefficients of parameters. At last, the transportation costs and social costs were estimated based on the mode share shift in three scenarios. The scenario analysis indicated that the developing public transit for the inter-city passenger travels benefit the region in terms of congestion relief, infrastructure maintenance cost decline, improved traffic safety and better environment.

Title: **Bioaccumulation of Environ-mental Contaminates in Bear Creek, Tennessee**

Presenter: Mr. Torres Alexander
Graduate Student in Environmental Toxicology, TSU

Time: Wednesday, March 30th, 3:20pm to 3:40pm

Place: Room 238 Sterling Student Life Center

Abstract

Bear Creek, a small stream that flows approximately 12.9 km inside the Oak Ridge Reservation (ORR), Tennessee (USA) is contaminated by toxins from waste management and disposal activities associated with the Y-12 National Security complex (NSC). Since the early 1940s, Mercury (Hg) waste was generated from Uranium and Plutonium processing at Y-12 which contributed to the contamination of soil, surface water, and groundwater. The Hg was a major element used in the enrichment process and at the time was not considered a hazardous material, so due to the waste management approaches utilized, large amounts of Hg was introduced into the surrounding environment along with many other radioactive substances and chemicals throughout the years. The objective of this study was to analyze historical data in order to determine a trend over the last 30 years in remediation of Hg and other environmental contaminates in the Tennessee watershed. Bear Creek historical data was obtained from Oak Ridge Environmental Information System (OREIS). OREIS, a data management system was designed to meet environmental data management, analysis, storage, and dissemination needs to comply with federal and state regulatory agreements for the DOE's facilities operated by various contractors. Bear Creek data was then organized into Microsoft Excel, spreadsheet software, and organized according to species, site collected, and date collected. The data was then plotted into graphs in order to visually see a trend in bioaccumulation of contaminates in the various sites throughout the past 30 years. Of the four fish examined in Bear Creek, Redbreast sunfish, Rock bass, Creek Chub, and Central stoneroller, there were only two fish that showed a significant bioaccumulation of Hg and CH_3Hg, the redbreast Sunfish and Rock bass. Both fish contained Hg levels higher than the Environmental Protection Agency guideline of 0.3 ppm of Hg for multiple years. This is an ongoing project and future work will include uploading all analytical data for Bear Creek into a Geographic Spatial System (GIS) database and working towards creating a GIS data base for Bear Creek.

Title: **Examining the Impact of Eco-Driving Advising Strategies on Vehicle Emissions for Drivers Travelling within Intersection Vicinities**

Presenter: Peijia Tang
Graduate Student in Transportation Studies, TSU

Time: Wednesday, March 30th, 3:40pm to 4:00pm

Place: Room 238 Sterling Student Life Center

Abstract

In order to mitigate the vehicle emissions, the pursuit of providing real-time eco-driving instructions (advice) to drivers is more urgent than before in both industry and research area. Real-time eco-driving instructions are usually provided to drivers through in-vehicle audio or visual system. However, both of the audio and visual systems could be distracting, and different frequencies of providing eco-driving instructions may influence the effectiveness of emission mitigations. Aiming at seeking the most effective eco-driving advising strategy on vehicle emissions for the vehicles travelling within the vicinity of intersections, this paper proposes a logical system of making eco-driving judgments in the intersection vicinities, and implements the logics in an in-vehicle system of a high-fidelity driving simulator. Different scenarios of real-time eco-driving advising strategies are tested in the driving simulator for each of the 31 participating drivers. The scenarios are designed for the type of eco-driving approaches and frequencies of providing instructions to vehicle drivers. The approaches include audio and visual. The frequencies of instructions include every 5 seconds, every 10 seconds, and every 15 seconds. Meanwhile, the scenario of normal driving without any instruction is considered as base. The analysis results convey that, on average, the audio eco-driving advising strategies save more emissions than the visual eco-driving advising strategies. Furthermore, the audio eco-driving scenario with frequency of every 10 seconds generates the least emissions.

Title: **Safety Evaluation of Horizontal Curves of Two-Lane Rural Highways**

Presenter: Boya You
Graduate Student in Transportation Studies, TSU

Time: Thursday, March 31th, 1:00pm to 1:20pm

Place: Room 238 Sterling Student Life Center

Abstract

The development and operation of the United States highway system has brought not only national economic development but also great convenience to the daily lives of Americans. For example, reduced travel time can frequently result from the efficient design of roadways. Simultaneously, continuing increases in the number of vehicles and the mileage driven on American roads will have environmental impacts where we live. In order to ensure high performance and excellent quality of the highway system, much attention has been applied to roadway design. According to the Geometric Design of Highways and Streets, also known as the Green Book, the key design parameters for horizontal curves include radius, length, superelevation and transition segments. Current design methods adopted by FHWA require the designer to determine the maximum design friction factor and maximum rate of superelevation to calculate the minimum design radius for a single horizontal curve. Crash data show that the horizontal curves of suburban and rural highways are associated with significant numbers of fatalities while the current design method does not take the crash rates into consideration. The objective of this study is to explore the relationship between roadway alignment design features and safety through the use of crash data to develop models. The modeling results indicate that sharper horizontal curves are likely to produce higher crash frequency. The Poisson regression modeling results provided by Python indicated that a 500-foot-radius curve will produce 10 curve-related crashes every 5 years and a 2000-foot-radius curve will produce only 2 curve-related crashes every 5 years.

Title: **Emission Factors Estimation in Different Types of Freeway Weaving Area with the Consideration of Lane Changing Maneuver**

Presenter: Mahreen Nabi
Graduate Student in Transportation Studies, TSU

Time: Thursday, March 31th, 1:20pm to 1:40pm

Place: Room 238 Sterling Student Life Center

Abstract

Motor vehicles, which can be implied as the mobile sources, are one of the primary causes of air pollution in USA. According to the US Environmental Protection Agency (EPA), there is a 0.9% increase in total emission from motor vehicles from 2013 to 2014. The basic factors of vehicle emissions are related to vehicle properties, pavement condition, roadway geometry, and especially driving behavior. With the unpredictable driving behavior, a series of acceleration and deceleration have been seen in the driving pattern while merging with and diverging from the through traffic within the weaving segments on a freeway. In addition, the traffic loads during different times of the day also significantly influence driver's lane changing behaviors and speed adaptations, which directly affect vehicular emission. The objective of this paper is to quantify and investigate the correlation between the vehicular emission and lane-changing maneuver in the weaving sections on freeways. A portable emission measurement system (PEMS) has been used to measure emissions during the actual use of an internal-combustion engine of a light-duty vehicle while driving in weaving segments of SH-288, Texas, USA. A video recorder and GPS tracker were used to document the vehicle trajectory and surrounding traffic demands. The statistical analysis showed that, with the peak-hour traffic conditions, driving pattern in weaving sections in accordance to the lane-changing behavior resulted an increase in CO_2 emission and fuel consumption compared to driving on the basic freeway segments. With further studies, the findings of this research can contribute in developing design consideration of the weaving sections in the reduction of vehicular emissions, which is a major concern for both environment and health.

Title: **Effects of Pavement Type (asphalt vs. concrete) on Contaminants in Road Dust**

Presenter: Matthew Fiala
Graduate Student in Environmental Toxicology, TSU

Time: Thursday, March 31th, 1:40pm to 2:00pm

Place: Room 238 Sterling Student Life Center

Abstract

Operation of motor vehicles is a major source of environmental contaminants, especially in urban areas. Trace metals are released through abrasive wear between brake pads and rotors; tires and road surfaces. Oil and greases are released from improperly maintained vehicles, and asphalt pavement. To investigate the effects of pavement type on the release of contaminants into the environment, road dust samples were collected on concrete and asphalt sections of Highway 59 in Houston, Texas. Upon arrival at the laboratory, samples were sieved to 250-125 µm, 125-63 µm, and <63 µm fractions and total environmental-available trace metals were quantified using ICP-MS. Trace metal concentrations increased with decreasing dust size, while trace metal mass decreased with decreasing size fraction. Although <63 µm particles contained highest trace metal concentration, 250-125 µm particles contributed the greatest overall trace metal mass. Mass weighted average concentrations of <250 µm size fraction for Co, Cd, Ni, Cu, Zn are 1.8 ppm, 3.1 ppm, 37.3 ppm, 104 ppm, and 185 ppm, respectively for concrete road dust and 2.7 ppm 4.2 ppm, 23.2 ppm, 64.4 ppm, and 265 ppm, respectively, for asphalt road dust. Trace metal concentrations are comparable to previous studies in Houston other urban areas. The results indicate a significant difference may exist in Cu and Zn concentrations between asphalt and concrete pavement. Study results may be useful for determining road construction materials that contribute less contaminants to urban air and streams.