

**Auburn University at Montgomery
College of Arts and Sciences
Undergraduate Research Symposium**

April 7, 2017

Presented by:
The Auburn University at Montgomery College of Arts and Sciences

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The Auburn Montgomery College of Arts and Sciences

Presents

The 2017 Undergraduate Research Symposium

On behalf of the faculty, staff and students of the College of Arts and Sciences, welcome to the annual Undergraduate Research Symposium! Our aim as a College is to engage students at a high level in their fields: to get them out of the classroom and producing their own knowledge or creative work. That challenge is hard for students (not to mention their professors). But like mountain climbing, achieving this goal exhilarates; there is nothing like it. I hope you will join me in congratulating these students and that you enjoy what they have produced.

Michael Burger

Dean of the College of Arts and Sciences

Undergraduate Research Committee

Ann Marie O'Neill – Biology

John Hutchison – Chemistry

Silvia Giagnoni – Communication and Theatre

Shannon Howard – English and Philosophy

Timothy Henderson – History & World Languages & Cultures

Jerome Goddard II – Mathematics and Computer Science

Bridgette Harper – Psychology

Schedule of Events

8:30 am – 9:00 am	Registration (coffee and snacks provided) Goodwyn Hall Lobby
9:00 am – 9:15 am	Opening Remarks Goodwyn Hall 109
9:15 am – 10:30 am	Oral Presentations Goodwyn Hall 109
10:30 am – 12:00 pm	Poster Session Goodwyn Hall Lobby
12:00 pm – 12:30 pm	Lunch (provided) Goodwyn Hall Lobby
12:30 pm	Awards Ceremony and Closing Remarks Goodwyn Hall 109

Oral Presentations

9:15 am Observing a change in the immune response of Cane Toads (*Rhinella marina*) after repeated exposure to DEET

Ameer Bedwan

Mentor: Chelsea Ward
Department: Biology

9:35 am Secondary educational opportunities as determinants of internal migration: Case studies in Alabama, United States

Victoria Byrne

Mentor: Pia Knigge
Department: Political Science and
Public Administration

9:55 am Effects of competition-mediated dispersal on the persistence of a population

Emily Cosgrove and Eddie Lindsey

Mentor: Jerome Goddard II
Department: Mathematics and
Computer Science

Poster Session

1. Ultrasound assisted synthesis of Cu-BTC metal-organic framework crystals

Rakia B. Butler

Mentor: Daniel Kim
Department: Chemistry

2. Metrics-based risk assessment and management of wireless devices using risk meter

Niranjan Gokul*

Mentor: Mehmet Sahinoglu
Department: Mathematics and Computer
Science

3. Metrics-based risk assessment and management of CLOUD Computing Risk Meter

Kiran Kumar Medasani*

Mentor: Mehmet Sahinoglu
Department: Mathematics and Computer
Science

4. Metrics-based risk assessment and management of bank customer service

Saketh Reddy Nomula*

Mentor: Mehmet Sahinoglu
Department: Mathematics and Computer
Science

5. Screening of soil bacteria for production of Thermostable Amylase

Ju (Jessica) Yeong Park and
Hakan Sahinoglu

Mentor: Benedict Okeke
Department: Biology

6. Quantitative metrics to assess and manage automobile risk using risk meter software

Bala Krishna Phanidapu*

Mentor: Mehmet Sahinoglu
Department: Mathematics and Computer
Science

* - denotes graduate students who are not eligible for research awards.

7. Metrics-based risk assessment and management to estimate and improve hospital credibility score of patient health care quality

Shashi Rekha Puduri*

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer
Science

8. Inhibition of Rho activation attenuated the neuronal death induced by proNGF

Jake Sustarich

Mentor: Geetha Thangiah

Department: Chemistry

* - denotes graduate students who are not eligible for research awards.

Abstracts

Observing a change in the immune response of Cane Toads (*Rhinella marina*) after repeated exposure to DEET

Lead Presenter: Ameer Bedwan

Other Authors/Presenters: Kristen Vogel, Brad Gregory, Justin Henry, Rachel Cox, Chris Swann, Ashley Bell, Victoria Creamer, and Tasha Chancey

Mentors: Chelsea Ward

Department: Biology

The active ingredient in most insect repellants is DEET. There is anecdotal evidence that DEET is harmful to amphibians by triggering an inflammatory response. It has been observed that basophil and eosinophil counts increase after initial exposure. Our goal is to observe a change in the immune response of cane toads after repeated exposure to DEET. Thirty, healthy adult cane toads (*Rhinella marina*) were housed in pairs (one male/female) in glass terraria at 23°C. Toads were randomly placed into three groups (n=10/group, control, direct exposure, and indirect exposure). The control and direct exposure groups were treated with one spray (26 µL) on the dorsum of either isopropyl alcohol (control) or OFF! Deep Woods spray with 25% DEET. For the indirect group, we sprayed an investigator's hand with OFF!, then picked up the toad by placing the hand on the venter. Each group was treated once every three weeks. For the third exposure, all groups received the direct OFF! treatment. We took blood samples of all toads before treatment. After administering treatment, we observed the toads for 5 minute intervals for 45 minutes and recorded a SCORAD (scoring atopic dermatitis). Blood samples were again taken after treatment. Blood smear slides were prepared for each sample of red to white blood cell ratios and differential white counts.

Ultrasound assisted synthesis of Cu-BTC metal-organic framework crystals

Lead Presenters: Rakia B. Butler

Other Authors/Presenters: None

Mentor: Daniel Kim

Department: Chemistry

Materials with nanoporosity have a variety of applications for the fields of gas storage, catalysis, separations, and drug delivery, etc. Metal-organic frameworks (MOFs) are considered a hot research topic because of their highly porous hybrid character built from inorganic units and organic poly-complexing linkers. Cu-BTC [$\text{Cu}_3(\text{BTC})_2(\text{H}_2\text{O})_3$, BTC=1,3,5-benzotricarboxylate] is well known material with structural diversity, geometrical control and flexibility. Conventional methods to synthesize Cu-BTC need high temperature conditions (over 120 C) with over 12 hours of long reaction times. Ultrasonic irradiation made it possible to prepare Cu-BTC MOF with uniform crystal size in less than 30 minutes of reaction at room temperature condition. The effects of solvents together with ultrasonic power conditions were compared. Ultrasonic power conditions looked effect to regulate crystal sizes. Scanning electron microprobe imaging will be applied to measure and compare the actual crystal sizes formed under different conditions.

Secondary educational opportunities as determinants of internal migration: Case studies in Alabama, United States

Lead Presenters: Victoria Byrne

Other Authors/Presenters: None

Mentor: Pia Knigge

Department: Political Science and Public Administration

Internal population migration, sometimes referred to as domestic migration, is the movement of people within the boundaries of their own country or state, and is widely studied by scholars in many fields. Researchers have offered job opportunities, amenities, and social connections as reasons for migration. This study adds another important explanation, education, and proposes that higher-quality secondary education, operationalized through high test scores, increases migration to an area. Using Alabama schools districts as case studies, school quality is compared to population increases and decreases in certain areas, to assess if heightened school quality precedes shifts in population among areas with higher quality schools

Effects of competition-mediated dispersal on the persistence of a population

Lead Presenters: Emily Cosgrove and Eddie Lindsey

Other Authors/Presenters: None

Mentor: Jerome Goddard II

Department: Mathematics & Computer Science

Dispersal of an organism plays an important role in individual fitness, population dynamics, and species distribution. In the literature, dispersal is loosely applied to movement over different spatial scales, e.g. movement between habitat patches separated in space from other areas. Recently, ecologists have found that the presence of a competitor can have a major impact on the dispersal of an organism, a phenomenon known as competition-mediated dispersal. Little is known regarding the patch-level consequences of habitat fragmentation of competing species in the presence of competition-mediated dispersal. In this talk, we will develop a patch-level model built on the reaction diffusion framework to explore effects of habitat fragmentation and competition-mediated dispersal. Our results will focus on a one-dimensional patch and methods from nonlinear analysis such as time map analysis (quadrature method) and linearized stability. We will also briefly explain the biological importance of our results.

Metrics-based risk assessment and management of wireless devices using risk meter

Lead Presenters: Niranjan Gokul*

Other Authors/Presenters: None

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer Science

In the age of ubiquitous mobile computing and subsequent threats and attacks, wireless device security is a critical topic that affects almost everyone. From government agencies and large corporations subject to cyber attacks and espionage to individual users subject to identity and financial theft, wireless device security must be urgently addressed in a scientific and quantitative manner. In this work, a software tool that facilitates assessment and management of wireless device security risk is proposed. The Wireless Device Security Risk Meter provides this critical tool for decision makers, system administrators, and individuals. Using game theory and statistically-driven methodologies, it provides objective, quantitative risk assessment, and unlike any other tool available today, guidance for allocating resources a desirable mitigation. As such, those in government, industry, and private life will be greatly aided in their efforts to achieve greater wireless device security by the use of this rational and objective tool for assessing and mitigating risk.

* - denotes graduate students who are not eligible for research awards.

Metrics-based risk assessment and management of CLOUD computing risk meter

Lead Presenter: Kiran Kumar Medasani*

Other Authors/Presenters: Dr. Beziat, Joy Johnson, and Erica Van Overloop

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer Science

The management often will not know how the receiving end or the CLOUD user evaluates the network, in addition to the numerous self-assessment efforts executed by the CLOUD providers and managers who want to deliver a good product with minimal glitches. This is why CLOUD computing risk meter (RM) as a tool is necessary to assess and manage risk, The CLOUD Risk-Meter (RM) is a robotized software tool for data gathering, looking into, researching, and sharp controlling danger. It further gives target dollar based equalization bearing, permitting the client to see where their motivations of premium will be best appropriated to lower danger to a model level. This space will look at CLOUD enrolling risk as for inadequacy orders, dangers showed up, and particular countermeasures. Risk countermeasures are utilized to direct danger and lower it to a charming level. Utilizing redirection theoretic streamlining strategies, the client will perceive how his/her budgetary asset can be, outright best circumstance spent towards a perfect assignment game-plan, to slice down the undesirable danger to an all the more sensible level. At some point starting late hopping into the CLOUD Risk Meter in a general sense, it regards quickly pack the essentials of the Security (or Risk) Meter approach. In rundown, creative quantitative danger estimations are depended on to impartially look at hazard choices and oversee dangers when showed up contrastingly in relationship with standard mystery utilizing hand number crunchers.

* - denotes graduate students who are not eligible for research awards.

Metrics-based risk assessment and management of bank customer service

Lead Presenter: Saketh Reddy Nomula*

Other Authors/Presenters: Sathvik Vontela*

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer Science

Risk assessment and management is of critical importance to modern enterprises and organizations. Bank Customer Service risk is concerned primarily with how customers of a bank rate their experience with the various aspects of banking. In the current financial conditions and competition among banks, it's easy for customers to switch if they are not satisfied. This risk-related to bank customer can be assessed by investigating various aspects of banking activities. The principal mentor has built the foundational aspects and an associated automated software tool for quantitative risk management. This software tool, the Risk-Meter (RM) will not only provide measurable risk, cost, and risk mitigation advice for vulnerabilities associated with banking, but also it will propose a road map for managing the risk optimizing bank's budgetary constraints.

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Screening of soil bacteria for production of Thermostable Amylase

Lead Presenter: Ju (Jessica) Yeong Park and Hakan Sahinoglu

Other Authors/Presenters: None

Mentor: Benedict Okeke

Department: Biology

Thermophilic microorganisms can survive high temperature. Soils and extreme environments like deserts, volcanos, and oceanic hydrothermal vents are sources of thermophilic and hyperthermophilic microorganisms. These organisms have unique physiological abilities that allow them to inhabit and survive extreme environments. For example, they use chaperonin proteins to help retain proper conformation of proteins. Disulfide bridges, aromatic interactions and hydrogen bonding also stabilize proteins. These reasons make their enzymes thermostable. Such enzymes are of immense industrial interest. Amylases hydrolyze starches into simpler saccharides (glucose, maltodextrin, modified starches); and are useful in the paper, textile, detergent (stain removal), food (baking/brewing), and pharmaceutical industries. Since the liquefaction (gelatinization) of starch prior to saccharification occurs at high temperature, it is economically efficient to use thermostable amylase in starch conversion to saccharides. In response to continuing demands for thermostable amylase for modern biotechnology processes in industries, this research attempts to isolate thermophilic soil bacteria for production of thermostable amylases. Four random soil samples were collected from various sites in Montgomery, AL and pooled together to form two composite samples. The samples were employed for isolation of thermophilic amylolytic bacteria on starch agar. Selected isolates and laboratory collection of thermophilic bacteria are under study for production of thermostable amylase in liquid culture.

Quantitative metrics to assess and manage automobile risk using risk meter software

Lead Presenter: Bala Krishna Phanidapu*

Other Authors/Presenters: None

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer Science

Automobile risk is a topic that affects almost everyone. Scientifically identifying and managing the vulnerabilities and threats that create the risk is the key to maintaining a safe and well-functioning automobile. Failure to identify and manage these sources of risk will have very real consequences ranging from being stranded on the road to bodily harm.

In this work, a software tool to facilitate assessment and management of automobile risk is proposed. Automobile vulnerabilities and threats range from physical items such as engines, tires, and keys to human factors such as negligence and criminal behavior. The consequences to motorists and insurers that fail to identify and manage vulnerabilities and risks range from the inconvenience of a non-functioning automobile to vehicle thefts to highway fatalities.

To minimize and avoid such threats and potential financial, psychological, and bodily harm, a rational, scientific approach that identifies, assesses, and manages automobile risk is required.

The identification and management of risk is a necessary aspect of maintaining a safe and well-functioning automobile. The Automobile Risk Meter (RM) tool proposed here provides a unique and objective methodology that is sorely needed. This pioneering work represents a paradigm shift in risk assessment. The Automobile Risk Meter provides a quantitative risk assessment, unlike subjective high-medium-low or red-yellow-green scales commonly seen in other assessment methodologies.

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Metrics-based risk assessment and management to estimate and improve hospital credibility score of patient health care quality

Lead Presenter: Shashi Rekha Puduri*

Other Authors/Presenters: Crystale Wright*

Mentor: Mehmet Sahinoglu

Department: Mathematics and Computer Science

This applied research poster implements a practical methodology about how to assess and improve patient-centred quality of care in the light of nationwide healthcare quality mandate to disseminate and utilize results for the “most bang for the buck”. Patient-centred quality of care risk assessment and management are inseparable aspects of healthcare in a hospital, yet both are frequently overlooked. In the State of Alabama, a 2004 study by the Kaiser Family Foundation found substantial dissatisfaction with the quality of healthcare as well as other related national reports and managing insurance companies. The primary mentor’s automated software, Risk Meter (RM), supported by a simulation analysis to verify the analytical outcomes, will provide a patient-centred metric of hospital health-care risk, and risk mitigation advice for vulnerabilities and threats associated with automated management of healthcare quality in a hospital or clinic. The RM will be demonstrated to assess and enhance quality in the case of an ambulatory or non-ambulatory patient seeking healthcare at local hospitals.

The Risk of Service (RoS) metric out of a 100% will be followed up by a remedial cost-optimized game-theoretic analysis about how to mitigate an undesirable risk to a tolerable level by determining what first priority precautions to be taken. The primary goal of this survey paper is to evaluate a random sample of 15 subjects’ questionnaires from various corners of the State of Alabama so as to indicate the practical applicability of this software with tangible results. These questionnaires have been examined by the RM automated software algorithm resulting with conclusive risk measures and what to do toward a cost-effective risk mitigation and remedial counter.

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Inhibition of Rho activation attenuated the neuronal death induced by proNGF

Lead Presenter: Jake Sustarich

Other Authors/Presenters: None

Mentor: Geetha Thangiah

Department: Chemistry

Recently we have shown that the expression of pro-nerve growth factor (proNGF) was significantly increased and NGF level was decreased in Alzheimer's disease (AD) hippocampal samples compared to control. NGF regulates cell survival and differentiation by binding TrkA and p75 receptors. ProNGF is the precursor form of NGF, binds to p75 receptor and induces cell apoptosis. Here, we show that the PC12 cells stimulated with proNGF significantly enhanced the expression of p75 receptor. The proNGF stimulation also increased the activation of RhoA kinase and JNK apoptic pathway. Intrestingly, the activation of RhoA kinase and phosphorylation of JNK was also found to be increased in post-mortem human AD hippocampus compared to control, which might be due to increased expression of proNGF and p75 receptor. The addition of RhoA kinase inhibitor Y27632 not only blocked the RhoA kinase activity but also reduced the expression of p75 receptor induced by proNGF in PC12 cells. RhoA kinase inhibitor Y27632 also inhibited the proNGF induced neuronal death. These results suggest that overexpression of proNGF in AD enhances activation of RhoA thereby leading to neuronal cell death. Supported by AUM faculty grant-in-aid.