



12th Annual Andrews University
CELEBRATION OF RESEARCH
& CREATIVE SCHOLARSHIP

Friday, October 22, 2021, Buller Hall

PROGRAM AND ABSTRACT BOOK

“At Andrews University, research is an inextricable part of the education experience. It informs our commitment to knowledge, faith and service.”

~*Andrea Luxton, President*

WELCOME



It is my distinct pleasure to welcome you to the twelfth Annual Andrews University Celebration of Research and Creative Scholarship. This year's event caps off the Andrews Research Week 2021. These 4-days of celebrations began on Tuesday evening with the John O. Waller Lectureship with Carissa Harris providing the plenary presentation. On Wednesday, Eugenia Chen was the plenary speaker at the Robert & Lillis Kingman Lecture Series on Science & Society. The celebration continued Thursday evening with the Celebration of Community Engagement, where Rachel Wade and Derrick Lea the keynote address and mission features respectively.

Our Andrews University faculty and students continue to be productive despite the many challenges associated with COVID-19. The number of research protocols is down slightly but we are encouraged by the number of new Undergraduate Research Scholar applications. The range of topics covered in today's plenary, oral, and poster presentations demonstrates the commitment to research and creative scholarship of the Andrews community.

Plenary presentations at this year's Celebration of Research will be given by three of the recipients of the 2020-21 Siegfried H. Horn Excellence in Research and Creative Scholarship Award—Anneris Coria-Navia, Gustavo Gregorutti, and S. Joseph Kidder. The fourth recipient, Chi Young Yun, will be presenting a Howard Series Recital on November 21, 2021. The Horn Award was established in 2011 to honor Siegfried H. Horn's legacy of scholarship and contribution to the field of biblical archaeology at Andrews University. The award recognizes lifetime achievement in research and creative scholarship for faculty members of Andrews University.

Anneris Coria-Navia serves as a professor of Curriculum & Instruction and the Director of the Center for Effective Teaching & Learning. Her research interests include beginning teachers' support and mentorship, current trends in public and private education, competency-based learning, and issues of social justice in education, especially concerning traditionally underrepresented and underserved populations.

Gustavo Gregorutti is a professor of Leadership and Higher Education in the Department of Leadership. Gus serves students across four continents and is one of the Leadership Department's most prolific researchers and dissertation committee members. His current research interests include community engagement paradigms, emerging models on well-rounded students, comparative studies in Latin American higher education systems, and research productivity processes.

Joseph Kidder is a professor of Pastoral Theology & Discipleship. He served the DMin program as coordinator for the Evangelism & Church Growth concentration through 2011. His involvement with the DMin program continues as he occasionally teaches the Spiritual & Theological Foundations for Ministry module, a major component of the DMin project for all DMin participants.

After the plenary session, please join us for refreshments during our poster session in the Buller hallways, followed by oral sessions. I hope you enjoy engaging the research and creative scholarship that is available through this celebration. I hope you will be encouraged to continue and expand your research and invest your creative and intellectual energy into the research. Additionally, we invite you to join us on March 11, 2022, to celebrate the accomplishments of our undergraduate students at the Honors Scholars & Undergraduate Research Poster Symposium. To learn more, please visit www.andrews.edu/research.

A handwritten signature in black ink that reads "Gary W. Burdick". The signature is written in a cursive, flowing style.

Gary. W. Burdick
Dean of Research

SCHEDULE OF EVENTS

Plenary Session (Newbold Auditorium, Buller Hall)

12:30–2:00 pm

Welcome and Introduction – **Christon Arthur**, Provost

Introduction of Speakers – **Gary Burdick**, Dean of Research

Presentations by recipients of the Siegfried H. Horn Excellence in Research and Creative Scholarship Award. See page 4 for program abstracts.

Chi Yong Yun will be featured at the Howard Series Recital on November 21, 2021.

PL-1 **Anneris Navia-Coria**, professor of Curriculum & Instruction and the Director of the Center for Effective Teaching & Learning

PL-2 **Gustavo Gregorutti**, Professor of Leadership & Higher Education

PL-3 **S. Joseph Kidder**, Professor of Pastoral Theology & Discipleship

2:00–3:00 pm

Poster Presentations (Buller Hallways)

See pages 5–13 for poster abstracts. Refreshments served.

Humanities & Social Sciences

P-01	Archaeology
P-02	Architecture
P-03	Art
P-04-06	Education
P-07	Languages
P-08	Library
P-09–14	Social & Behavioral Sciences

STEM

P-15–18	Biology
P-19	Chemistry & Biochemistry
P-20	Engineering
P-21–22	Mathematics
P-23–25	Physics

J.N. Andrews Honors Program

P-26–27 Honors Thesis Posters

3:00–4:00 pm

Oral Session I (Buller 250) See page 14 for program abstracts Library Science & Health Professionals

Oral Session II (Buller 251) See page 15 for program abstracts Religion & English

PLENARY PRESENTATIONS

- PL-1** *A Collaborative Action Research Model for Equity-Minded Professional Growth and Wellbeing*
Anneris Navia-Coria, professor of Curriculum & Instruction and the Director of the Center for Effective Teaching & Learning

This session will explore the possibilities of a collaborative action research model for higher education contexts with particular focus on improvements that lead to professional growth and wellbeing.

- PL-2** *A barking dog and an existential research journey*
Gustavo Gregorutti, Professor of Leadership and Higher Education

This presentation deals with my personal journey as a learning researcher. I map and interpret my own research productivity output and its relevance in the context of my faith and commitment to the greater mission of impacting my students, professional field and the world.

- PL-3** *Faith Based Optimism. where is the presentation going to be?*
S. Joseph Kidder, Professor of Pastoral Theology & Discipleship

No single factor alone will help your church grow—including some imaginary, ideal location where growth is automatic—and no combination of efforts or strategies will make your church grow without the Holy Spirit. But with the Holy Spirit we have every reason for optimism and enthusiasm for the future.

Of the factors that this research study identified as contributing to church growth—including effective leadership, enthusiastic involvement of the laity, utilizing the power of prayer, and inspiring and dynamic worship—none was more important than faith-based optimism.

The most important ingredient in church growth is to have a winning attitude based on faith in God. With God's power and blessing, we can win the world for Jesus.

POSTER PRESENTATIONS

HUMANITIES AND SOCIAL SCIENCES

ARCHAEOLOGY

- P-01 *Micro Remains at Khirbat Safra: A Preliminary Report.*
Paul Ray

Going beyond more traditional macro-level archaeological excavation methods, this project proposes that soil samples collected from carefully-selected stratigraphic contexts throughout the presumed domestic areas of Khirbat Safra, when run through floatation tanks, under controlled conditions, should provide archaeobotanical evidence for which laboratory analysis will likely yield added insight into the micro-level activities of daily life of the ancient people at the site.

ARCHITECTURE

- P02 *A vision for Buchanan, Michigan.*
Andrew von Maur

Graduate Architecture students work with the city of Buchanan, Michigan, to identify redevelopment solutions for the downtown and the historic north-side neighborhood.

ART

- P-03 *Horizons*
Kari Friestad

The series Horizons is an ongoing body of work that examines a meditation on landscape and the concept of place. My focus on this subject is based on imagery of coastlines, expansive skies, and personally significant locations and how they contribute to my current sense of place. I lived in Florida as a teenager, which is congested, hot, thick, quickly and constantly moving with beaches that often brimmed with tourists and crowds. The Midwest is smaller, spread out, slower, cooler and more reserved in both culture and energy. The connection I find between the two places is the similarity in the effect of great bodies of water, the ocean and Lake Michigan, on the atmosphere and the landscape. The question, “where is my place” has inundated my consciousness within all areas of life, including relationships, career, spirituality, politics, and artistic practice. The horizon and skies were a constant, especially above the ocean. These locations and universal horizons in my work reference somewhere and anywhere while being painted in a way that is both realistic yet simplified.

EDUCATION

- P-04 *Virtual Teaching Rehearsals and Repeated Teaching Simulations: Impact on Pre-Service Teachers Efficacy with High-Leverage Practices*
Lori Imasiku, and Michelle A. Bacchiocchi

High-leverage practices (HLPs) are pedagogical strategies used across content areas to effectively impact student learning. HLPs are a critical component for pre-service teachers (PTs) to practice during clinical experiences in their teacher education programs. Historically, HLPs have been practiced directly in K-12 classrooms as isolated one-time teaching experiences. Oftentimes, these experiences are spread across multiple methods courses with limited opportunity to review the PT's performance and even greater limitations for the PT to repeat their practice and make necessary improvements. This study uses a mixed-method approach to implement repeated teaching experiences in two methods courses using virtual classroom simulations. The virtual simulations allow PTs to practice selected HLPs, review and reflect on their performance before attempting the same simulation for a second time. The use of virtual classroom simulations, allows PTs to re-create the same teaching environment, in order to focus and improve practice.

P-05 - *Faith Integration Types Evident in Syllabi*

Steven Injety⁺, Dudu Khakhu⁺, Glynis Bradfield, and Duane Covrig.

We analyzed Andrews University syllabi using Azusa Pacific 10 types of faith integration. Practice-Oriented, Conceptual, Tradition-Based, Ethical, Sociological were most frequently identified; Vocational, Psychological, Relational, Pedagogical, Aesthetic, Physical Health were found to a lesser extent. Findings are discussed in reference to our larger participatory case study and the literature on course and curriculum faith integration.

P-06 *Faith Integration Approaches in Program Outcomes*

Dudu Kakhu⁺, Steven Injety⁺, Glynis Bradfield, and Duane Covrig,

We analyzed Andrews University department mission statements and program outcomes for their faith integration dimension using Azusa Pacific 10 types of faith integration. Ethical, conceptual-theoretical, vocational, psychological, and practice-oriented approaches were most frequently identified. Tradition-based, relational, pedagogical, sociological, and aesthetic approaches were occasionally found. Findings are discussed in light of our larger participatory case study and the literature on program or discipline faith integration.

LANGUAGES

P-07 *Creative writing in the Spanish classroom with Pablo Berger's Blancanieves.*

Sonia R. Badenas

The theses of Vladimir Propp already demonstrated that the subversion of the essence of stories could give them, inexhaustibly, new and surprising meanings. Along these lines, the film "Blancanieves" by Pablo Berger, based on a complete Spaniard reformulation of the classic tale, offers an interesting paradigm of literary creation for the language teacher. This dark and expressionist version of the traditional tale, at the service of a social satire of the Spain of bullfighting, and redefining the role of women, etc., seems to us to be exportable and exploitable as an example of creativity for countless exercises of rewriting stories in the language class.

LIBRARIES

P-08 *Florence Price, Blythe Owne, and Women's Musical Clubs in Twentieth-Century Chicago: A Preliminary Investigation*

Marianne Kordas, Music Materials Center

Recent years have seen a surge of interest in the life and works of African-American composer Florence Price (1887–1953), with the creation of recordings, score editions, and a music festival all focused on rehabilitating her place in our collective memory-and repertoire lists. One aspect of her life only briefly mentioned in Rae Linda Brown's highly anticipated biography, however, is Price's involvement with many women's musical clubs and sororities during her time in Chicago. These clubs provided invaluable financial, social, and professional support for Price and other female musicians in the Windy City throughout the twentieth century. The papers of Blythe Owen (1898–2000), Price's colleague and friend, hold beneficial information that can clarify their professional relationship as well as their mutual affiliation with organizations such as the Chicago Musicians Club of Women, the Chicago Club of Women Musicians, the Women's Musical Club of Chicago, the Lake View Musical Society, the International Society for Contemporary Music, and the Chicago chapters of the Mu Phi Epsilon and Sigma Alpha Iota musician's sororities. Between 1919 and 1964, Owen sent over 2,000 letters to her mother documenting her musical activities in Chicago, the persons she encountered, and her daily life as a composer, piano teacher, performer, and officer for multiple women's musical clubs. This correspondence is preserved in the Andrews University archives in Berrien Springs, MI along with scores, original musical manuscripts, photographs, concert programs, and other ephemera. These primary documents elucidate not only Owen's life and works, but also those of contemporaries such as Price. Owen's letters highlight the importance of women's musical organizations and professional networks in Chicago throughout the twentieth century.

Preliminary investigation of the letters suggests that Owen, in her roles as a club president and officer of various organizations, may have been instrumental in championing interracial integration for Price and other African-Americans into women's musical clubs during an era when segregation was normal. My project explores the life and works of Price and Owen as they intersected in the context of the milieu of women's musical clubs in Chicago during the mid-twentieth century, and suggest further avenues for research.

SOCIAL & BEHAVIORAL SCIENCES

P-09 *Executive functioning as a Predictor of Auditory Processing in Individuals Diagnosed with Neurodevelopmental Disorders*

Shanter Alexander*, D.Jaris Coles-White**, and Michael Milmine

Research is emerging about executive function and its role in audiological processing abilities. This pilot study sought to investigate the influence of executive function on auditory processing in autistic individuals. Specifically, the study sought to explore the relationship between observer-reported daily behaviors related to central auditory processing disorder (CAPD) and executive functioning, in (N=32) adolescents with autism spectrum disorder (ASD). Data was collected using the Behavior Rating Inventory of Executive Function – second edition and the Auditory Processing Domains Questionnaire (APDQ). A regression analysis was conducted with executive function and auditory processing as independent and dependent variables respectively. Findings revealed a moderate positive correlation ($r = 0.44$) between executive function and auditory processing, with executive function ($p \leq 0.05$) was shown to be a statistically significant predictor of auditory processing abilities in autistic adolescents. Overall, findings reveal that improved in executive functioning is associated with improvement in auditory processing, and contribute to the expansion of current conceptualizations of CAPD specific to co-occurring ASD.

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P-10 *Identifying Spiritual-Wellness Themes among Trained Critical Incident Stress Management*

Responders through the Proactive Resilience Component of Psychological Body Armor™.

Harvey J. Burnett, Jr., Justine Jaeger⁺, Kristen R. Witzel, Karl G. D. Baliey.

Disaster mental health responders trained in Critical Incident Stress Management (CISM) strategies and other related mental health aid are on the frontlines of providing crisis intervention services to those directly affected by traumatic events. This places these responders at-risk of vicariously developing negative stress reactions such as compassion fatigue, secondary traumatic stress and burnout. On the other hand, spiritual resilience may help to ameliorate these negative effects. Since there is limited research on specific spiritual well-being practices among CISM-trained responders, our study examined this phenomenon utilizing a qualitative design. Data was collected from 343 CISM-trained responders who reacted in writing to a structure interview question that asked them to describe in detail their spiritual wellness routines. Utilizing transcendental phenomenological analysis, 14 spiritual wellness routines were identified. In descending order prayer, reading spiritual literature, meditation and attending religious services were the most frequent routines. Our study provides preliminary insight into specific practices employed by CISM-trained responders to maintain their spiritual resilience through the proactive component of their overall psychological body armor™.

- P-11 *An exploratory study of Mathematics anxiety in Caribbean Preservice teachers*
Franka Atwell-Chin Hong⁺, Jeannie Montagano, Rudolf Bailey, Nadia Nosworthy

Correlational studies suggest that gender, attitudes to mathematics, mathematics performance, the number of college mathematics courses taken, and mathematics teacher efficacy beliefs may be related to mathematics anxiety among preservice teachers. There are exploratory studies of mathematics anxiety and teacher self-efficacy among elementary teachers in Trinidad and Tobago. However, no studies have found which combination of variables is influential in predicting mathematics anxiety among preservice teachers in the Caribbean. This exploratory study attempted to determine whether mathematics anxiety in preservice teachers in the Caribbean could be explained by a combination of gender, mathematics teacher efficacy beliefs (personal mathematics teaching skill beliefs, mathematics teaching outcome beliefs), attitudes to mathematics (motivation to do mathematics, interest in mathematics), the number of mathematics courses taken, and prior mathematics performance. Independent samples t-test, exploratory and confirmatory factor analysis and categorical regression were conducted to identify the characteristics of mathematics anxiety in Caribbean preservice teachers. 56% of Caribbean preservice teachers experience moderate or severe mathematics anxiety. Mean mathematics anxiety reported by male preservice teachers was significantly higher than mean mathematics anxiety reported by female preservice teachers. Additionally, motivation to do mathematics and personal mathematics teaching skill beliefs were significant predictors of mathematics anxiety among Caribbean preservice teachers. This study demonstrated that modified surveys for mathematics anxiety, attitudes to mathematics, and mathematics teacher efficacy beliefs can effectively measure those concepts among a Caribbean preservice teacher population. The predictors of mathematics anxiety, mathematics performance anxiety and mathematics testing anxiety among the Caribbean preservice teacher population are also presented.

- P-12 *An Examination of the Connection Between Child Maltreatment, Executive Function, & Trauma Appraisal*
Myshira Oliver⁺

Child maltreatment, sometimes referred to as child neglect or abuse, is a phenomenon that has been documented as early as the 1600s. Currently, there are four categories of child maltreatment: physical abuse, sexual abuse, emotional abuse, and neglect. This study seeks to explore differences in trauma appraisal and executive functioning based on the type of child maltreatment experienced. The findings from this study will contribute to the growing body of knowledge surrounding child maltreatment and will assist clinicians in developing treatment plans congruent with the specific needs of their individual clients based on the type of maltreatment experienced.

- P-13 *Predictors of general education teachers self-efficacy for educating students with ASD*
Renette Portecop-Prentice⁺

This study examines the influence of ASD-specific training or professional development, peer observations, feedback from consultation/collaboration and teacher attitudes on general education teacher's self-efficacy beliefs for educating students with ASD, as well as whether knowledge mediates the effect of professional development on teacher self-efficacy. It is hypothesized that the proposed theoretical model of teacher self-efficacy for educating students with ASD will fit an empirical model based on collected data. Data from 536 participants have been collected and are being analyzed. Preliminary results suggest that the hypothesized model does not fit the empirical model. However, the factors appearing to have the most influence on teacher self-efficacy are knowledge of ASD and teacher attitudes.

P-14 *Environmental Justice: Missed Opportunities*
Joel Raveloharimisy

This paper will present three interrelated elements of environmental justice: justice, evidence, and process. The framework will demonstrate the failures of the Government of Madagascar to provide fair treatment and meaningful involvement of its people to ensure sustainable development of their communities. Recommendations will be suggested to address the missed opportunities.

SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM)

BIOLOGY

P-15 *Acquisition of new function through gene duplication in the metalloprotease family*
Peter Lyons, Daniel Fajardo⁺, and Ritchie Saint Jean⁺

Changes in the genetic code occur frequently through, for example, DNA breaks and recombination events, often leading to the duplication of genes. The M14 family of metalloproteases suggests such a history of gene duplication. We investigated more recent duplication events in the M14 family of enzymes through analysis of genomic data found in the Ensembl genome database. Of the 23 M14 genes found in most vertebrates, four genes were present as two or more copies in many fish species. The AEBP1, CPXM1, and CPZ genes were duplicated in most fish with an arrangement consistent with a large-scale event such as whole-genome duplication. The CPO gene was also found duplicated in most fish species, but with copies tandemly arranged, suggestive of crossing-over errors. A close analysis of the synteny of these and nearby genes in *Xenopus tropicalis* suggested potential transposon-mediated duplication. Prediction of enzyme functions for the products of these genes showed that a greater amount of neofunctionalization was present in CPO paralogs as compared with other CPA/B enzymes; however, purifying selection to maintain function remained detectable. To further examine function of such CPO paralogs, the four paralogs found in *Xenopus tropicalis* were examined biochemically. All were expressed in HEK293T cells, but no enzymatic activity was detected. Nonetheless, subcellular distribution suggested a possible function on lipid droplets similar to that previously shown for human CPO.

P-16 *The effect of clay on mustard seed meal efficacy in suppressing velvetleaf seed germination and growth.*
Heeyun Oh⁺ and Robert Zdor

Mustard seed meal (MSM) has been studied as a biofumigant in suppressing the weed growth in an organic way. Previous studies have shown that MSM in soil with a higher sand content was highly effective in suppressing the germination of weeds, and that as clay/silt in sand content increased, MSM effectiveness decreased in suppressing seed germination. Based on these results, it was postulated that clay may have effects on MSM by inhibiting this biofumigant from suppressing the weed growth. Two different types of pure clay--kaolin and montmorillonite--were selected to test at various concentrations. Low concentration of clay in MSM does not seem to have effect on inhibiting the weed suppressive properties of MSM.

- P-17 *Variability of phonotaxis and selective processing of its underlying neural elements in the female cricket Acheta domesticus*
Jessica Rim⁺, Janelle An⁺ and Benjamin Navia

The phonotactic behavior of female cricket *A. domesticus* as observed in the lab, has been shown to vary. In response to computer-generated calls, some females are finely tuned and attracted to calls with syllable periods, which closely match those of the natural calls of the males (50 – 70 ms. Other females respond phonotactically to calls with a wider range of syllable periods (30 – 90 ms including or not the most attractive range. Therefore, lacking the ability to discriminate between attractive and unattractive calls. Factors that contribute to this variability include age, temperature and levels of JHIII. We show the presence of neurochemicals such as histamine to influence phonotaxis. Prothoracic nanoinjection of histamine, resulted in females responding phonotactically to calls with a wider range of syllable periods, compared to the same females' preferences before injections and therefore acting as a neuromodulator. Additionally, when females are exposed to males, but not allowed to mate, their ability to discriminate attractive calls is reduced. This implies factors other than mating alter the females' phonotactic behavior in ways that parallels the results reported for injection of histamine as well as lower levels of JHIII as seen in older females. Although mechanisms involved in call recognition and phonotaxis have been proposed, they do not fully explained how the factors mentioned above regulate the behavior. We evaluate the role of one identified underlying neural elements (L3 neuron involved in the control of phonotaxis. Implications of results of the study are discussed.

- P-18 *Chinese Medicinal herb Scutellaria barbata Modulates Apoptosis via Induction of Pro-apoptotic and Anti-apoptotic Proteins in MDA-MB-157, 93A, and 93B Breast Cancer Cells*
Brian YY Wong, Nathaly Manrique⁺, Yishan Jin⁺, Kristin Ferrer⁺, Joshua Li⁺, Camille Kordas⁺, Joon Seo⁺, Sung Been Han⁺, Jasmine Cha⁺, Min Seo Kang⁺

Scutellaria barbata (SB) has been used in traditional Chinese medicine for treating liver, lung, and rectal cancers. It is included in most of the herbal cancer treatment formulas in Taiwan hospitals. We previously showed that aqueous extracts of SB inhibited mutagenesis, DNA binding, and metabolism of aflatoxin B1 and benzo(a)pyrene in carcinogenesis. A fraction of it was studied in a preliminary clinical trial in breast cancer patients. Breast cancer cell lines MDA-MB-157, 93A, and 93B are drug-resistant APC-mutants. In this study, the effectiveness of SB in the modulation of apoptosis of breast cancer cell lines MDA-MB-157, 93A, and 93B was investigated. Assessments were performed using green/red/blue fluorescent Apoptosis/Necrosis Detection Kit and the Human Apoptosis Antibody Array - Membrane (43 Targets test by the Abcam cooperation. Our data demonstrated that 1-hour treatment with 2 mg aqueous extract of SB induced a statistically significant percentage of apoptosis in MDA-MB- 157 ($46.5 \pm 7.5\% > 16\% \pm 1.0\%$, $p < 0.05$; 93A ($54.5 \pm 2.5\% > 0\%$, $p < 0.05$; and 93 B ($65.5 \pm 13.5\% > 0\%$, $p < 0.05$. Similar results were obtained with the 3-hour incubation period. Modulation of various apoptosis markers such as pro-apoptotic Bad, Bax, p53; and anti-apoptotic markers Bcl-2, p21, and FasL also observed. These results suggest that SB contains phytochemicals that induce apoptosis in MDA-MB-157, 93A, and 93B by modulating these pro-apoptotic and anti-apoptotic proteins.

CHEMISTRY & BIOCHEMISTRY

P-19 *Rapid green synthesis and characterization of “Naked” Silver and Gold Nanoparticles and their antimicrobial and catalytic reactivity study.*

Sofia Erech Hanapin⁺, Tsion Getahun⁺ and Getahun Merga

The large surface-to-volume ratio and increased various noble reactivity of noble metals, particularly, silver and gold nanoparticles (Au or Ag-NPs) have greatly attracted researchers for the last three decades. Currently, applications of laboratory microwaves have provided quick and green synthesis of chemicals including NPs. In our work is established a simple and rapid synthesis of silver nanoparticles upon reduction of Silver (I oxide (Ag₂O) by molecular hydrogen (H₂) pressurized more than atmospheric pressure by using microwaves. This work will be extended to find out their antimicrobial effect and their catalytic study in producing simple organic molecules.

ENGINEERING

P-20 *Machine Learning Analysis for non-linear phenolic compound monitoring using a mobile phone based ECL sensor*

Hyun Kwon, Rodney Summerscales

Machine learning (ML) can be an appropriate approach to overcoming common problems associated with sensors for low-cost, point-of-care diagnostics, such as non-linearity, multidimensionality, sensor-to-sensor variations, presence of anomalies, and ambiguity in key features. This study proposes a novel approach based on ML algorithms (Neural nets, Gaussian Process Regression, among others) to model the electrochemiluminescence (ECL) quenching mechanism of the [Ru(bpy)₃]²⁺/TPrA system by phenolic compounds, thus allowing their detection and quantification. The relationships between the concentration of phenolic compounds and their effect on the ECL intensity and current data measured using a mobile phone-based ECL sensor is investigated. The ML regression tasks with a tri-layer neural net using minimally processed time series data showed better or comparable detection performance compared to the performance using extracted key features without extra preprocessing. Combined multimodal characteristics produced an 80% more enhanced performance with multilayer neural net algorithms than a single feature based-regression analysis. The results demonstrated that the ML could provide a robust analysis framework for sensor data with noises and variability. It demonstrates that ML strategies can play a crucial role in chemical or biosensor data analysis, providing a robust model by maximizing all the obtained information and integrating nonlinearity and sensor-to-sensor variations.

MATHEMATICS

P-21 *The delta-unlinking number of algebraically split links*

Jeannelle Green⁺, Gabriel Palacios⁺, Moises Reyes⁺, Noe Reyes⁺ (Anthony Bosman)

It is known that algebraically split links (links with vanishing pairwise linking number) can be transformed into the trivial link by a series of local moves on the link diagram called delta-moves; we define the delta-unlinking number to be the minimum number of such moves needed. This generalizes the notion of delta-unknotted number, defined to be the minimum number of delta-moves needed to move a knot into the unknot. While the delta-unknotted number has been well-studied and calculated for prime knots, no prior such analysis has been conducted for the delta-unlinking number. We prove a number of lower and upper bounds on the delta-unlinking number, relating it to classical link invariants including unlinking number, 4-genus, and Arf invariant. This allows us to determine the precise value of the delta-unlinking number for algebraically split prime links with up to 9 crossings as well as determine the 4-genus for most of these links.

P-22 *Ricci solitons on Riemannian submanifolds with special vector field*
Yun Oh

We investigate the recent development of Ricci solitons on Riemannian submanifolds with several kinds of vector fields. Many results have been provided after Perelman used the Ricci soliton to solve the Poincare conjecture. This notion also has some connection with rectifying submanifolds and some recent characterization results will be discussed.

PHYSICS

P-23 *Understanding electrical conduction in MEPA-MOCVD grown InN*
Brendan Cross, Andrews University; Alexander Kozhanov, Duke University; Zaheer Ahmad, Epir Technologies; Mark Vernon; Daniel Seidlitz; Chrstin Cooper, Andrews University; Aiden Dryer, Andrews University; Zoe Limberopoulos, Andrews University; and Marika Ruppert, Andrews University

We are working on the electrical characterization of migration enhanced, plasma assisted metal-organic chemical vapor deposition (MEPA-MOCVD grown Indium Nitride (InN). InN is a group III-Nitride semiconductor that has applications in sensing and energy production. Along with GaN and AlN, InN would allow for this material system to be used from infrared wavelengths through the UV. While work has been done (Cross et al., (536 2020, J. Crystal Growth) to measure the carrier concentration $((3 \pm 2) \times 10^{20} \text{ cm}^{-3})$ and mobility $(10 - 70 \text{ cm}^2/\text{V}\cdot\text{s})$ of these InN samples, the method of conductivity is still being explored.

P-24 *Mutual Information of Short-Term Memory of Stellar Flares.*
Jonathan Homan⁺, Andrews University; Jay Johnson, Andrews University; Elmer Rivera, Andrews University; Simon Wing, John Hopkins University

Stars radiate energy stored in their magnetic fields in the form of stellar flares, and the dynamics of a system that causes flare events can be well-described by the sequence of times between flare events, known as waiting times. From the stellar intensity data collected by the Kepler satellite, the waiting time sequences of different stars is created by finding sudden elevations in the light curve above a certain threshold. The mutual information, which measures the information within a data set, is then calculated for the original data as well as for surrogate data sets created by random permutations of waiting times within regions with constant flaring rates. Comparing the mutual information of the actual waiting times against the mutual information of the surrogate waiting times, we find that there is a significant elevation in the mutual information of the original data set, and thus our information theory analysis indicates a dependence between successive flares. This increased mutual information is due to the clustering of flares, evidenced by comparing the cumulative distribution function (CDF) of successive flares in the original data set with the CDF of flares in the surrogate sequences.

P-25 *Gravitational Wave Astronomy and Gravity Spy*
Tiffany Summerscales

The LIGO and Virgo detectors have made over 50 confirmed measurements of gravitational waves, the faint ripples in the fabric of spacetime predicted by Einstein's theory of general relativity. The majority of these gravitational wave events were caused by the inspiral, collision, and merging of pairs of black holes. One event was caused by the merging of a pair of neutron stars and two by neutron stars merging with black holes. These measurements have helped us learn about the objects that produced the gravitational waves.

Gravity Spy is a project that combines the efforts of citizen scientist volunteers with machine learning to investigate and remove sources of detector noise. The resulting improvements have made the detectors more sensitive and will improve gravitational wave discovery.

J.N. ANDREWS HONORS PROGRAM

P-26 *Application of Approximate Q-Learning to Simplified Macromanagement in StarCraft II*
Lee Michael⁺ (Rodney Summerscales)

Contemporary research in Machine Learning in regards to StarCraft II has recently utilized the power of both neural networks and reinforcement learning in the form of "Deep Reinforcement Learning," and has risen greatly in popularity. Unfortunately, the use of neural networks comes with great costs in resources and requires expensive hardware to run in a manageable amount of time. Instead, we propose the use of a modified form Approximate Q-learning and forego the use of neural networks to explore the performance of non-neural network strategies in the StarCraft II environment in regards to outpacing an enemy in simplified macromanagement gameplay.

P-27 *The Positive Relationship Between Stock Price of Technology Firms and ROA, EBITDA margin, Bond ratings, and Current Ratio*
Marvin Schatzschneider⁺ (Alan J. Kirkpatrick and Lucile Sabas)

This research updates expanding literature in the financial field on the relationship between stock price and financial performance indicators – return on equity, debt to assets, net margin, return on assets, EBTIDA margin, bond rating, and current ratio. Specifically, stock prices of year-end 2018 were examined to 2018 year-end financial data. The hypothesis developed is that financial performance indicators validate the stock price. Therefore, using an (OLS) multivariate regression analysis the explanatory variables were tested for their significance to price. Return on equity, debt to assets, net margin, and current ratio proved to be statistically significant.

ORAL PRESENTATIONS

ORAL SESSION I: LIBRARY SCIENCE & HEALTH PROFESSIONS

A-01 *Library Space for Teaching: What are AU students saying?*

Margaret Adeogun, James White Library
3:00 pm (Buller Hall, Room 250)

Academic libraries today are asked to justify the value they bring to the advancement of learning. This challenge for accountability has pressured many libraries to re-examine how students learn and the best approaches to the 21st-century learning environment. Libraries are re-examining their assets – information materials, services, abilities, and skills, particularly the library space. They are deliberating on better supporting a learning environment geared toward knowledge-building and reflecting a need for flexible space, time, people, and technology. Library space has turned out to be the library's most cherished resource. As digital collections continue to increase and library services are increasingly accessible online in real-time, most libraries are experiencing low traffic of patrons in the physical building. But academic libraries that have repurposed their spaces for social and educational explorations are experiencing an upsurge in the traffic of students. Teaching faculty are beginning to cherish the importance of adopting an experiential pedagogy that provides the opportunities for students to engage intellectually, creatively, emotionally, and learn by doing to prepare their students for a knowledge capitalist society. Well-designed experiential learning pedagogy consists of activities that are both inside and outside the classroom. But activities outside the traditional classroom in an open environment that facilitates exploration, hands-on learning, and collaboration for knowledge construction are more effective. This paper presents the result of a study that evaluated the teaching and learning experiences of faculty and students' use of the James White Library Innovation Lab as a teaching and learning space for INEN 221-001 Introduction to Innovation & Entrepreneurship: Foundations of Play—a class based on experiential learning.

A-02 *The development of a questionnaire to measure the perception of marital dissatisfaction among Nigerian immigrants in North America: Immigrant Marital Disruption Questionnaire (IMDQ) North America: Immigrant Marital Disruption Questionnaire (IMDQ)*

Jean A. Cadet, Andrews University; Jochebed Ade-Oshifogun, Andrews University; and Augusta Y. Olaore, Babcock University, Ilishan-Remo, Ogun State.
3:20 pm (Buller Hall, Room 250)

The process of acculturation of Nigerian immigrants is laden with challenges, including marital disruptions; however, we could not find any culturally sensitive tool available to measure marital disruption among this population. Therefore, we developed a tool to measure culturally sensitive factors leading to marital disruptions among Nigerians Immigrants in North America (NINA). A 17-item questionnaire was developed and tested on 160 subjects.

Five constructs derived from the analysis were Financial Stressors, Marital Relationship Deficits, Intercultural Conflicts, Spiritual Systems, and Others. The overall Questionnaire has high construct validity. However, the validity of the individual constructs ranged from Cronbach's alpha of .54 to .74. The purpose of this follow-up study is to further validate the IMDQ with larger sample size and with a marital satisfaction tool. We will conduct an in-depth interview of subjects for relevant themes to refine the tool further. Methods: Mix-methods design. 15 participants were approached for in-depth interviews via zoom. IMDQ will be refined using the results of the qualitative data. The refined IMDQ and the Kansas Marital Satisfaction Scale (KMS) will be administered electronically to 450 subjects recruited by snowball technique via social media and Nigerian social gatherings/organizations.

Analysis: Content analysis of the qualitative data is being conducted for relevant themes. Descriptive statistics, factor analysis, and parametric tests will be utilized for the quantitative data.

Expected Results: Relevant themes to refine or affirm IMDQ will be identified. KMS will validate IMDQ. Factor analysis will reveal moderate to high Cronbach's alpha for the refined IMDQ.

ORAL SESSION II - RELIGION & ENGLISH

B-01 *BibleOL v2.0 – AU research and Global Learning*

Oliver Glanz, Adrian Negrea, and Mabio R. Cohelo Neto
3:00 pm (Buller Hall, Room 251)

Bible-Online-Learner was updated on Oct 4 with a brand-new user interface and new functionality. Most of the new features have been contributed by our FRG-funded research group at AU. The BibleOL allows teachers and students to approach Biblical languages with the tools developed persuasive object learning technology (PLOT). This has proven to improve the language proficiency of students by about 12%. Therefore, students of classes that use the BibleOL as a basic tool for learning will translate significantly faster and more accurate Biblical texts in their original language. In our presentation, we will showcase the linguistic features, the automatic grading feature, and the exam feature that we have developed over the last years. Several universities on most continents use BibleOL. The new features will allow for much broader adoption of the BibleOL and make grading and exam production much more effortless. With the latest update, BibleOL can now offer TOEFL-like tests for Biblical Hebrew and Biblical Greek.

B-02 'Kind of Magic Back Here': Gardening and Human Limitations in George Saunders's 'The Semplica Girl Diaries,' Scott Moncrieff 3:20 pm (Buller Hall, Room 251)

Previous writers have noted George Saunders's interest in critiquing American consumerist mentality and satirizing corporate ethics. A smaller number have studied Saunders's interest in the human experience as defined through a spiritual quest. The material and spiritual collide in this essay, which studies Saunders's use of the Semplica Girls, in "The Semplica Girl Diaries," to embody an intersection between our human limitations and our responses to those limitations through material, aesthetic, and spiritual avenues.

KEY:

+ Andrews University Student

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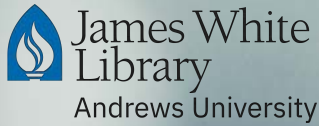
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