

19TH ANNUAL

Graduate



Multidisciplinary Conference

An annual conference to showcase the research and projects of the Clark University and Worcester graduate student community.

WEDNESDAY, APRIL 19, 2023, 10:00 AM. – 4:00 PM.

TILTON HALL, CLARK UNIVERSITY



MULTIDISCIPLINARY CONFERENCE PROGRAM

Tilton Hall, Clark University, Worcester, MA 01610

This conference is to provide a space for emerging researchers where they can display and present their research contribution. Clark University organizes this conference every year to highlight the research contribution of graduate students from different disciplines.

XIX Multidisciplinary Conference is a platform to learn about the ideas and methods unique to each of the many fields encompassed by graduate research. The mission of the Multidisciplinary Conference is to give students a broad perspective on academic research, as well as to offer the graduate community the experience of communicating their findings to a diverse academic audience.

10:00 am	Continental breakfast
10:00 am – 10:15 am	Opening note
10:15 am – 10:30 am	Keynote speech
10:30 am – 12:10 am	Oral presentation session I
12:10 am – 12:30 pm	Lunch break & networking
12:35 pm – 1:35 pm	Oral presentation session II
1:35 pm – 3:00 pm	Poster presentation session I
3:00 pm – 3:15 pm	Coffee break
3:15 pm – 4:00 pm	Poster presentation session II

Wednesday, April 19, 2023. 10:00 am. – 4:00 pm.

CONFERENCE OPENING ADDRESS



Yuko Aoyama
Associate Provost and Dean of Research and Graduate Studies.
Professor, Graduate School of Geography at Clark University. B.A., International Christian University, Tokyo, 1986; M.A., University of California, Los Angeles, 1990; Ph.D., University of California, Berkeley, 1996.

CONFERENCE KEYNOTE SPEAKER



Alan Ritacco

Alan Ritacco (Ph.D., Worcester Polytechnic Institute) is the AVP for External Relations, Senior Fellow for Electronic Arts, Computer Science and Esports at Clark. Alan leads several initiatives at Clark University, including esports and was formerly the dean of the school of Design and Technology. Prior to this, Alan has held executive positions across science and technology areas in private and public industry. Alan is a strategic and visionary leader with a background as an entrepreneur, who leverages business acumen to unite communities around a student-focused vision for the future. Alan has decades of experience cultivating strategic vision across super/high performance computing, computer science, research, esports, and game design. Alan serves on several boards and works with startups and entrepreneurs to help launch their businesses.

Oral Presentations: Session I

Si Wang	10:30 am to 10:50 am
Adam Liebell-McLean	10:50 am to 11:10 am
Gisselle Vila Benites	11:10 am to 11:30 am
Ly Kha Ngo	11:30 am to 11:50 am
K. V. Varun Chowdary	11:50 am to 12:10 pm

Lunch break

Oral Presentations: Session II

Zoe Plumb	12:35 pm to 12:55 pm
Snigdha Munuru	12:55 pm to 1:15 pm
Oluwole Ajayi	1:15 pm to 1:35 pm

Poster Presentations: Session I

Vijay Kumar Yadav	1:35 pm to 1:55 pm
Zhaoyi Chen	1:55 pm to 2:15 pm
Varshitha Manjunath	2:15 pm to 2:30 pm
Kartik Khanna	2:30 pm to 2:45 pm
Eleanor Verhagen	2:45 pm to 3:00 pm
Coffee break	

Poster Presentations: Session II

Sohum Kapadia	3:15 pm to 3:30 pm
Shasha Yu	3:30 pm to 3:45 pm

ORAL PRESENTATIONS: SESSION I

Chicken Blood Moms - Modern Chinese Mother's Goal and Practices

Presenter: Si Wang

Department: Developmental Psychology

In June 2021, the Chinese Education Bureau published a new policy regarding regulation of the educational industry to prevent children's academic stress from Chicken Blood Parenting. Chicken Blood Parenting - a new parenting culture that represents a type of obsessive parent style that is on the rise among today's Chinese families, which has replaced the concept of Tiger parenting to include high academic achievement on top of everything else. Despite some nuanced differences between the two parenting practices, Chinese parents seem to believe that it is their responsibility to prepare their children with skills and knowledge for a successful future. This seemingly new phenomenon of modern Chinese motherhood – or, more precisely, female identity as a mother is embedded in relatively radical changes in contemporary Chinese history. The interactions of the social and cultural-historical variables encourage the Chinese family to prioritize children's education, with mothers being the primary project manager to support children's academic achievement. By use of qualitative interviews, I explored Chinese mother's positions in relation to others (their husbands, their mothers, other mothers), to their past and future (historically, socially, biographically - and where they see themselves in their life-course). I also explored how they position themselves as agents in their families and own lives, or as passive recipients of obligations that they feel they have been tasked to perform. My study navigates Chinese mothers' daily lives and past experiences to explore how they construct their identity as a changing concept of "modern" Chinese motherhood.

“A Consensus was Reached...”: Complexity, Harmony, and Disagreement in the Durham and Chapel Hill Chapters of the League of Women Voters, 1947-1965

Presenter: Adam Liebell-McLean

Department: History

On first glance, the Durham and Chapel Hill chapters of the League of Women Voters are simple organizations. They study and discuss local issues then support or oppose courses of action. In addition to publicly voicing their consensus on issues, they also sponsor meetings, lectures, and events. Ultimately, their aim is to perform and encourage exemplary citizenship. However, the Durham and Chapel Hill Leagues of Women Voters are anything but simple. Meeting minutes, bulletins, newspapers, and results from studies they conducted reveal complex organizations with a variety of ideas about what makes a good citizen. This paper examines records from Durham and Chapel Hill to shed light on organizations which other historians have not written about extensively. It highlights the activist and democratic nature of the LWV. At the same time, it distinguishes between the organizations and their specific members to illustrate complicated dynamics which appeared when it came to specific issues, especially civil rights and integration of schools. To think about questions of civil rights and citizenship more broadly, this paper draws on work from historians Evelyn Brooks Higginbotham and William Chafe who have written about the use of respectability and civility by Black activists.

Performing Traceability: Unpacking the Artisanal and Small-Scale Gold Mining (ASGM) Trade Circuit in Peru

Presenter: Gisselle Vila Benites

Department: Geography

To what extent can traceability requirements improve the transparency in artisanal and small-scale gold mining (ASGM)? This article addresses the crucial but rarely explored problem of gold traceability, and what happens when gold moves mine-to-market. Building on transparency discussions that scrutinize the power dynamics behind information demands, we argue that the push for origin information of minerals can generate the ideal scenario for “performative governance”, in which actors opt to feign traceability to continue participating in the gold value chain. To evidence these dynamics, we unpack how gold circulates in two ASGM constellations in Peru: Arequipa (in the Andes) and Madre de Dios (in the Amazon). We find that Northern markets’ concerns for the legal origin of gold has created contradictions in Peru’s formalization regulatory framework. To bypass these barriers, actors along the value chain will benefit from the assistance of “logistic entrepreneurs” to secure gold production and trade. We

conclude that, rather than pushing meaningful changes towards a more responsible and transparent gold value chain, traceability requirements can promote more opaque practices and inject more complexity in an already highly informal sector such as ASGM.

A Case Study - The Suggestions on Marketing Strategy for Boutique Hotels after the Pandemic

Presenter: Ly Kha Ngo

Department: Marketing Communications

As travel demand rebounds post-pandemic, boutique hotels around the world are still grappling with significant losses in revenue. While some have tried to boost earnings through renovation projects and enhanced marketing efforts, many small and independent hotels are facing obstacles such as limited resources, ineffective traditional marketing strategies, higher competition, reputation management challenges, and talent shortages. To address these challenges, this case study offers practical recommendations for boutique hotel marketing strategies. Drawing on successful practices from reputable hotels worldwide, the study identifies three effective solutions: developing unique products with exclusive services, providing guests with a seamless online-to-offline journey, and leveraging partnerships with hotel agents and industry giants. By exploring the challenges faced by luxury independent hotels and analyzing successful marketing solutions, this study provides valuable insights for boutique hotels around the world looking to enhance their reputation and revenue in the post-pandemic landscape.

Machine Learning in Fetal Cardiology

Presenter: K. V. Varun Chowdary

Department: Health Care

The pervasiveness of cardiac issues in newborn infants before or after birth is intensifying, with potential causes including diet, medication, and genetic factors. Conventional evaluation approaches, such as ultrasound scans, traditional 2-D imaging, and tissue Doppler imaging, may be insufficient to anticipate and classify fetal cardiac issues. Supervised algorithms of machine learning such as Decision Tree, Linear Regression, and Random Forest may be applied to anticipate and classify fetal cardiac issues based on previous data. These algorithms can contrast heart parameters to earlier trained data to foresee the category of cardiac problem and recommend diets and medications. While the predictions are not accurate, they are still more precise than previous algorithms. This research examined the use of algorithms based on machine learning in anticipating and categorizing fetal cardiac issues, potentially providing a solution to the increased occurrence of cardiac issues in newborn infants.

ORAL PRESENTATIONS: SESSION II

Disturbance Regimes and Management Strategies of Mountain Ash Forest Ecosystems in Victoria, Australia; A Literature Review

Presenter: Zoe Plumb

Department: Forest Ecology and Management

This paper discusses the ecology of mountain ash forests, the disturbance regimes that currently exist in these ecosystems, and finally addresses the current management practices and future management practices. Mountain ash forests are subjected to a wide range of research in the Central Highlands of Victoria, an area approximately 14,000 hectares in range. These forests are dominated by montane ash trees (*Eucalyptus regnans* F. Muell), which are critically endangered and at risk of collapse, attributed to the decline in large hollow-bearing trees throughout the region. Management of these forests are controlled by the Department of Environment, Land, Water, and Planning and primarily carried out by VicForests. There are three major disturbance regimes within these forests; fire regimes, silviculture, and climate change. Silviculture has a dominant impact on the forest ecosystems through clear-cut logging, although there have been other methods proposed that are gaining traction that have a primary goal of preserving natural ecosystem functions and composition such as Variable Retention Harvesting System and the Traditional Owners cultural landscape strategy. However, it is becoming important to consider climate change impacts on this ecosystem, with projected increase in temperature and decrease in precipitation. These changes have the potential to cause a significant impact on the ecosystem, via alteration in size, duration, and intensity of wildfires, which has already been observed. This change in wildfire regimes is necessary to consider for future management in Victoria, with an introduction of land ethics into management that extends beyond economic gains.

Presenter: Snigdha Munuru

Department: Data Analytics

Big data analytics has become an essential tool in many fields, from business and finance to healthcare and education. The vast amounts of data generated by modern technology can provide valuable insights and help organizations make better decisions, but only if they can effectively collect, process, and analyze it. In this paper, we explore the latest developments in big data analytics, including machine learning algorithms, data visualization techniques, and cloud computing platforms. We also discuss the challenges and opportunities of big data analytics, such as data privacy, security, and ethical considerations. Finally, we present case studies from various industries to illustrate the potential of big data analytics in solving real-world problems and improving performance. Our research shows that big data analytics has enormous potential to

transform how organizations operate and create value, but also highlights the need for further research and collaboration to overcome the challenges and harness the full potential of this technology.”

Gender Equality; The Pathway to Food Systems Security, Economic Sustainability; and Ecological Preservation; Women Owned Farms as Case Study

Presenter: Oluwole Ajayi

Department: Food Sustainability, Climate Action, Gender, and Development

“There are strong links between food security, good nutrition and gender. A gender approach to food security can enable shifts in gender power relations and assure that all people, regardless of gender, benefit from, and are empowered by development policies and practices to improve food security. Research from the UN Food and Agriculture Organization (FAO) also shows that gender equality opens doors for entire communities to improve nutrition security as well as social and economic well-being. According to the FAO reports, if women farmers had the same access to resources as male farmers, they could bring 100-150 million people out of hunger. In 2017, the United States had 1.2 million female producers, accounting for 36 percent of the country’s 3.4 million producers. Female producers are slightly younger, more likely to be a beginning farmer, and more likely to live on the farm they operate than male producers. More than half of all farms (56 percent) had a female producer. These female-operated farms accounted for 38 percent of U.S. agriculture sales and 43 percent of U.S. farmland. According to the U.S. Department of Agriculture, 32% of Massachusetts state farms are owned by women. Women are involved in a variety of agricultural operations such as crops, livestock and fish farming. At community level women undertake a range of activities that support natural resource management and agricultural development, such as soil and water conservation, afforestation and crop domestication. Women often have unique perspectives on, as well as understanding of local biodiversity importance for the development of adapted and improved varieties. To achieve food sustainability in the United States and the world at large, the role of women is highly essential. This research project focuses on women owned farms in the United States of America specifically in the states of New York, Massachusetts and Maine. The research focuses on how these farms, owned by women, contribute to sustainable food security, economic interdependence as well as climate change mitigation.

POSTER PRESENTATIONS: SESSION I

Hotel Review Sentiment Analysis Using Machine Learning techniques **Presenter: Vijay Kumar Yadav**

Department: School of Professional Studies

Natural language processing (NLP) has become an essential business tool for uncovering hidden data insights from social media channels. Sentiment analysis can analyze the language used in social media posts, responses, reviews, and more to extract attitudes and emotions in response to products, promotions, and events—information companies can use in product designs, advertising campaigns, and more. This NLP machine learning project goals to develop a model that can accurately classify and extract relevant information from textual data. The model utilizes state-of-the-art Machine learning techniques, such as Random forests, K-nearest neighbors, and transformer models, to analyze and understand the semantic structure of natural language. This study aims to show how sentiment analysis can be performed using python open-source Libraries. The project focuses on various NLP tasks such as sentiment analysis, text classification, named entity recognition, and text summarization. The model is trained and tested on large-scale datasets (500K Records and 17 Features) to ensure its effectiveness in real-world scenarios. This is usually used on social media posts and customer reviews to automatically understand if some users are positive or negative and why”

Voice Recognition Technology for Identifying Similarities in Users’ Voices

Presenter: Zhaoyi Chen

Department: Data Analytics

Voice recognition is a rapidly developing field that has many applications, including security, speech-to-text transcription, and voice-activated devices. In this study, the focus is on using voice recognition technology to identify different users and determine the similarity of their voices. The primary goal of the system is

to match users’ voices with those of celebrities or public figures, providing users with insights into whose voice their own most resembles. This could be a fun and interesting feature for users, as they can discover whose voice, they share similarities with and potentially use this information to improve their own communication skills. In addition to this, the system can also identify users whose voices are most similar and potentially recommend them as friends. This could be particularly useful in social networking applications, where users are looking to connect with people who share similar interests or characteristics. The proposed system uses machine learning algorithms and deep neural networks to analyze voice

samples from different users and identify patterns in their speech. The system then compares these patterns to a database of voice samples from celebrities or other public figures, identifying the best match for each user. Overall, this system has the potential to be a valuable tool for a wide range of applications, from improving communication skills to connecting users with like-minded individuals. As voice recognition technology continues to improve, it is likely that we will see many more innovative applications for this technology in the future.

Implementing Artificial Intelligence in Super Mario Game **Presenter:**

Varshitha Manjunath

Department: Artificial Intelligence

Super Mario game, a very popular video game has been a franchise for many years. With the advent of machine learning and computer vision, we can enhance the game experience by integrating poseNet, a real time human pose estimation model, which can track different human beings’ poses in image or video. It works for both single human pose detection and multi human pose detection. The practical applications of PoseNet used in snapchat filters, fitness apps like cult to detect your exercise poses, posture detection in Instagram reels, virtual games to analyze shots of players. In this paper we are trying to implement PoseNet to Super Mario Game. Players will be able to use their nose to move the Super Mario. Integrating PoseNet into Super Mario game can create a new and exciting gaming experience for players and showcase the potential of combining ML with traditional video games.

Market Basket Optimization

Presenter: Kartik Khanna

Department: Data Analytics

“Market basket optimization is a data-driven approach that uses customer transaction data to optimize product placement in retail stores. In this project, we conducted market basket optimization for a retail store by analyzing transaction data over a period of six months. The objective of the analysis was to optimize product placement within the store to increase sales and improve customer satisfaction by identifying the association between the products purchased. We utilized a combination of data mining and machine learning techniques to identify product associations, customer behavior patterns, and sales trends. For this project, we used Association rule in combination with the Decision Tree model. One Limitation of the Decision Tree model is that it cannot quantify the relationship of each association. Whereas one disadvantage of the association rule is that it takes every possible association in account to analyze. To overcome this, we predicted if the

customer would buy a particular product or not given that he already bought other products using Decision Tree model. After that, we can use Association rule analysis to evaluate the product combinations. Association rule in combination with Decision Tree improves the overall impact of strategy. We then used this information to optimize product placement within the store, considering factors such as product popularity, shelf space, and customer traffic flow.

Drosophila melanogaster Transcription Factor Binding Affinity Predictions

Presenter: Eleanor Verhagen

Department: Biology

Transcription factors, proteins involved in the process of transcribing DNA into RNA, have been a particular interest to scientists due to their critical role in gene expression. In this larger collaborative project, biochemical, biological, bioinformatic, and mathematical approaches were used in order to help identify how and why certain fruit fly homeodomain transcription factors bind to different binding sites and understand how nucleotide differences within binding sites affect their binding affinity. As a collaboration between the Spratt lab, Drewell lab, and Dresch lab, this project has individual parts that make up the whole. The Spratt lab obtains binding affinity data from isothermal titration calorimetry (ITC) techniques, the Dresch lab analyzes the binding affinity data and creates algorithms that will make binding affinity predictions, and the Drewell lab uses these predictions in the design of a synthetic enhancer. Although the larger project has multiple components, the computational approaches taken in the Dresch lab will be the focus of this paper. The bioinformatic part of the larger project was mostly focused on current binding affinity prediction algorithms, testing them for accurate predictions as well as potentially as a tool for understanding. As experimental binding affinity data for each transcription factor came in from the Spratt lab, they were compared to the predictions, which gave insight into how to adjust the algorithm to make it more biologically relevant. Since homeodomain transcription factors are so widely conserved and since *Drosophila* is such a helpful model organism, greater understanding in these areas could also have broader applications in the understanding of human genetics and development.

POSTER PRESENTATIONS: SESSION II

Dynamics of Lumbriculus Variegatus in a

Square Chamber Presenter: Sohum

Kapadia

Department: Soft Matter Physics

We study the dynamics of an aquatic worm - *Lumbriculus variegatus*, confined in a quasi-2D square chamber. We employ image processing to track the worm's head, centroid and tail coordinates to analyze its dynamics. We observe that the worm moves along the boundary while gradually aligning with it, owing to its steric interaction. The worm spends more time at the corners than the edges, following which, it escapes the corner due to its undulatory motion. We analyze this trapping using body orientation angle distribution and trapping times. We also model the worm as an undulating active polymer in a rigid square boundary. The simulation captures the observed boundary following and trapping behavior.

Multi-Label Classification of Ocular Diseases using Transfer Learning and Multi-Task Learning Technique Presenter: Shasha Yu

Department: Data Science

Eye diseases are a prevalent health issue worldwide, but early detection and prompt treatment can significantly reduce their impact. Fundus images have been traditionally used to diagnose ocular lesions, and recent research has focused on leveraging machine learning techniques to assist in this process. However, researchers face challenges such as insufficient samples, imbalanced datasets, and multiple disease detection. To address these challenges, the authors applied various techniques such as image augmentation, transfer learning, and multi-task learning in this research. This research achieved satisfactory results for multi-label classification of fundus images based on the transfer learning of a pre-trained VGG-16 model. The resulting classification model can rapidly screen for multiple ocular diseases simultaneously and provide probability reports for each ocular disease. This can provide complementary diagnostic recommendations to ophthalmologists, especially in remote and underdeveloped areas with a shortage of eye care professionals. Furthermore, this technique can be extended to other medical image diagnosis methods, such as Magnetic Resonance Imaging (MRI) and Computerized Tomography (CT) scan, to reduce diagnostic time and make the healthcare product development process more efficient.