GRAD COHORT

URMD

AUSTIN, TX

MARCH 6-7, 2020

Underrepresented Minorities & Persons with Disabilities

POSTER SESSIONS

CRA-WP

Computing Research Association

Widening Participation

POSTER SESSION

Poster #	Primary Research Area	First Name	Last Name	Current University or Institution	Abstract Title
1	Accessibility	Veronica	Alfaro	New York University	Breathe With Me: A Multi-Sensory Squeeze Ball to Release Stress and Anxiety
2	Accessibility	Oliver	Alonzo	Rochester Institute of Technology	Automatic Text Simplification Tools for Deaf and Hard of Hearing Adults: Benefits of Lexical Simplification and Autonomy
3	Accessibility	Nayeri	Jacobo	Rochester Institute of Technology	Designing for Situationally-Induced Impairments: Method Cards to Improve Mobile Interaction
4	Accessibility	Preeya	Mody	Carnegie Mellon University	A First Glance Into Accessibility Across Educational Institutions
5	Accessibility	Venkatesh	Potluri	University of Washington	Investigating Non Visual Interaction Techniques on Laptop Touchpads
6	Algorithms	Sampson	Akwafuo	University of North Texas	Real-time Optimization Algorithm for Efficient Management of Epidemics and Disasters
7	Algorithms	Fariba	Nofeli	Mississippi State University	Quantum Computers Based on HHL Algorithm
8	Artificial Intelligence	Damilola	Adesina	Prairie View A&M University	Aircraft Location Prediction Using Deep Learning
9	Artificial Intelligence	Adefolarin	Bolaji	Purdue University	Community Detection of Anomalies in Large Scale Network with Deep Learning Recurrent Neural Network
10	Artificial Intelligence	Kaitlin	Maile	University of Texas, Austin	Evolutionary Parameter Optimization for Resting-state Functional Connectivity Human Brain Model
11	Artificial Intelligence	Irené	Tematelewo	Oregon State University	Sensor Diagnostic Based Anomaly Detection in Weather Stations
12	Artificial Intelligence	Raul Alejandro	Vargas Acosta	University of Texas, El Paso	Towards Increasing our Understanding of Scientific Data
13	Bioinformatics	Diana	Aguilar Gomez	University of California, Berkeley	Adaptation of the Toad-Headed Lizard to the Colorful Sand of the Gobi Desert
14	Computational Biology	Selina	Bauernfeind	University of New Mexico	Using Player Generated Data to Elucidate Molecular Docking
15	Computational Social Science	Oforiwaa Pee	Agyei-Boakye	University of Minnesota	Linking Child Health, Spatial Accessibility of Food and Climate Change Using Computational Techniques
16	Computational Social Science	Sahiti	Kunchay	Pennsylvania State University	Investigating Users' Perceptions of Light Behaviors in Smart-Speakers
17	Computational Social Science	Michael	Threatt	Northwestern University	Understanding The Effects of SRAM Delay on Dynamic Timing Slack.
18	Computer Architecture	Leul	Belayneh	University of Michigan	Addressing Bottlenecks in PIM-Based Graph Analytics with Multicast
19	CS Education	Ruth	Akintunde-Okoilu	North Carolina State University	Data-informed Curriculum Sequences for a Curriculum-Integrated Game
20	CS Education	Meenakshi	Das	Auburn University	Innovative Block-Based Accessible Coding for K-12 Students with Hearing Impairments.

POSTER SESSION

Poster #	Primary Research Area	First Name	Last Name	Current University or Institution	Abstract Title
21	CS Education	Jean	Salac	University of Chicago	Personalized Assessment Worksheets for Scratch (PAWS): Exploring a Bridge between Interviews, Written Assessments, and Artifact Analysis
22	Data Mining	Adewale	Obadimu	University of Arkansas at Little Rock	Identifying Latent Toxic Features on YouTube Using Non-negative Matrix Factorization
23	Distributed Computing	Tanvi	Jain	University of Saskatchewan	Integrating Blockchain-Based Identity Management and Deep Learning Trust-Factor for Water Science Project
24	Graphics & Imaging	Bakari	Hassan	Carnegie Mellon University	Estimating the Appearance of Translucent Materials Via Empirical Speckle Field Correlation Measurements
25	Graphics & Imaging	Niall	Williams	University of Maryland	Efficient Estimation of Redirected Walking Thresholds Using Confidence Ratings
26	Health Informatics	Maciej	Kos	Northeastern University	Computational Methods for Continuous Monitoring of Cognitive Changes Using Passively Captured Smartphone Data - Towards a Digital Biomarker of Cognitive Health
27	Human-Computer Interaction	Iyadunni	Adenuga	Pennsylvania State University	User Centered AI techniques
28	Human-Computer Interaction	Upol	Ehsan	Georgia Institute of Technology	Automated Rationale Generation: This AI Agent Can Explain Its Actions in Plain English
29	Human-Computer Interaction	Vidya	Gaddy	Colorado State University	Exploring the Impact of Belonging on Computer Science Enrollment Using Virtual Reality
30	Human-Computer Interaction	Derek	Haqq	Virginia Tech	Playing Together While Apart: Technology-Mediated Shared Outdoor Play for Non-Collocated Participants
31	Human-Computer Interaction	Lindah	Kotut	Virginia Tech	All Things Considered: Stories as Signals and Guides to Understand and Design for Unmet Needs
32	Human-Computer Interaction	Divine	Maloney	Clemson University	Social VR and Communication via Nonverbals
33	Human-Computer Interaction	Maya	Mundell	Cornell University	Understanding Strategies of Digital Influence
34	Human-Computer Interaction	Ather	Sharif	University of Washington	On the Reliability of Fitts' Law as a Movement Model for People With and Without Limited Fine Motor Function
35	Machine Learning	Marcae	Bryant-Omosor	Dakota State University	Building NextGen URMW Execs: Addressing the STEM Equity-Gaps?
36	Machine Learning	M. Clara	De Paolis Kaluza	Northeastern University	Incremental Dynamic Graph Embedding
37	Machine Learning	Victor	Gonzalez	University of Illinois	OccITW: Finding Hidden Joints in the Wild
38	Machine Learning	Gonzalo	Martinez	University of Notre Dame	Increasing the Efficiency and Efficacy of Multi-Modal Longitudinal Sensing Studies

POSTER SESSION

Poster #	Primary Research Area	First Name	Last Name	Current University or Institution	Abstract Title
39	Machine Learning	Pedro	Soto	Florida International University	Dual Entangled Polynomial Code: Three-Dimensional Coding for Distributed Matrix Multiplication
40	Natural Language Processing	Geetanjali	Rakshit	University of California, Santa Cruz	Neural Approaches to Generate Figurative Language
41	Networks	Simeon	Babatunde	Clemson University	Greentooth: Towards Intermittently Powered Sensor Networks with Commodity Radios
42	Networks	Israel	Elujide	University of Texas, Arlington	An Entropy-Based WLAN Channel Allocation Using Channel State Information
43	Networks	Alamin	Mohammed	University of Notre Dame	A Passive Client Side Control Packet-Based WiFi Traffic Characterization Mechanism
44	Robotics	Iretiayo	Akinola	Columbia University	Accelerated Robot Learning via Human Brain Signals
45	Robotics	Felipe	Arias	University of Illinois, Urbana Champaign	Efficient Motion Planning in Dynamic Environments
46	Robotics	Diane	Uwacu	Texas A&M University	Using Motion Planning to Study the Accessibility of Robots and Proteins
47	Robotics	Diane	Uwacu	Texas A&M University	Annotated-Skeleton Based Planning for Robots and Drug Molecules
48	Robotics	Troi	Williams	University of South Florida	Learning State-Dependent, Sensor Measurement Models for Localization
49	Security/Privacy	Ilemona	Atawodi	University of Southern Mississippi	Threat Detection in Network Intrusion Detection Systems Using K Nearest Neighbors, Random Forest and Deep Learning
50	Security/Privacy	Matthew	Landen	Georgia Institute of Technology	Towards Anomaly Detection of Advanced Persistent Threats Using Whole System Provenance Information
51	Security/Privacy	Chukwuemeka	Monwuba	St. Cloud State University, St. Cloud, MN	Smartphone Applications Privacy Research
52	Security/Privacy and Human-Computer Interaction	Adebunmi	Odefunso	Purdue University	Identification, Classification and Modelling of Traditional African Dance Using Deep learning.
53	Security/Privacy and Human-Computer Interaction	Kentrell	Owens	Carnegie Mellon University	Mental Models of Surveillance when Communicating with Incarcerated Relatives
54	Social Networking	Daniel	Nkemelu	Georgia Institute of Technology	Online Learning Approach for Election Monitoring
55	Software Engineering	Rrezarta	Krasniqi	University of Notre Dame	Enhancing Source Code Refactoring Detection with Explanations from Commit Messages
56	Theory	Matheus Venturyne	Xavier Ferreira	Princeton University	Proof-of-Stack Mining Games

POSTER ABSTRACTS

Poster #1 • Veronica Alfaro

New York University

Breathe With Me: A Multi-Sensory Squeeze Ball to Release Stress and Anxiety

This project started with the main goal of developing an assistive device that can be placed in the multi-sensory room at the NYU Oral Health Center for People with Disabilities. The project then was expanded to be a calming device for people with stress and anxiety. Breathe with me is a calming tactile interface for patients who are waiting for their oral procedures and their caregivers. This device will be portable so it can be used inside the multisensory room and also it will be possible to use in the waiting area as a way of inviting both patients and caregivers to use the multi-sensory room. The device can be placed in the lap of the user so it will be accessible to everyone including people in wheelchairs. The user squeezes the stress ball by following the breathing pattern shown in the screen and the goal is to match that pattern by inhaling and squeezing at the same time. This is a calming device and the final form has an enclosure for the electronic components and the light that is altered by squeezing the sensory ball. The device has been tested on different occasions with different user groups and each round of feedback helped implement the changes and create new iterations, this is an ongoing investigation that focusses both on understanding the use of textures and releasing stress by squeezing a ball and at the same time, the use of breathing patterns in order to calm patients down before they have their dental procedures done. The goal of this research is to be expanded to use outside the multisensory room in the dentist office, in order to be also helpful for users that suffer from stress and anxiety. This project was developed in collaboration with Nicole Nimeth and Gabrielle Caguete and under the mentoring of Amy Hurst.

Poster #2 • Oliver Alonzo

Rochester Institute of Technology

Automatic Text Simplification Tools for Deaf and Hard of Hearing Adults: Benefits of Lexical Simplification and Autonomy

With recent improvements in Automatic Text Simplification (ATS), which replaces text with simpler equivalents, researchers have explored its use as reading-assistance tools. However, little research has examined the preferences of adults who are deaf or hard-of-hearing (DHH) for such tools, and none empirically evaluated the use of lexical simplification (replacement of individual words) with these users. Prior research has revealed that DHH adults in the U.S. have lower reading literacy on average than their hearing peers, with unique characteristics to their literacy profile. Thus, we investigate whether DHH adults perceive a benefit from lexical simplification applied automatically or when users are provided with greater autonomy, with control and visibility as to which words are replaced. We conducted formative interviews to inform the design of an experimental study, in which DHH participants read English texts in their original form and with lexical simplification applied automatically or on-demand. Our results suggest that participants perceived a benefit form lexical simplification, and they preferred a system with on-demand simplification.

POSTER ABSTRACTS

Poster #3 • Nayeri Jacobo

Rochester Institute of Technology

Designing for Situationally-Induced Impairments: Method Cards to Improve Mobile Interaction

Despite significant research that has leveraged Situationally-Induced Impairments and Disabilities (SIIDs) to improve the accessibility of mobile technology, there is still a lack of awareness on how to design for SIIDs. Designing for situational impairments does not only affect usability for people who have temporary or long-term disabilities, but it also affects users that do not identify as having a disability. Limited resources on how to design for situational impairments hinder the creation of mobile accessibility. Thus, developing a set of method cards that centers on improving mobile accessibility through the panorama of Situationally-Induced Impairments. The method cards engage designers in a design process sensitive towards making informed decisions that impact both users with disabilities and people who experience situational impairments due to contextual factors. To further understand how the cards elicit behaviors from designers into motivating them into thinking about disability and accessibility, we implemented research through design methodology. Specifically, a design workshop was conducted and identified how scenarios regarding situational impairments helped student designers engage their view of disability with a positive approach.

Poster #4 • Preeya Mody

Carnegie Mellon University

A First Glance Into Accessibility Across Educational Institutions

Institutions of higher education often brand themselves as being aware of accessibility however may fail to demonstrate accessibility at the first step of a student's inclination to a university—their website. Using web scraping tools, we have gathered data on accessibility of university web pages to measure if they are accessible in displaying information of their school and the services provided. Specially, we examined aspects such as color friendliness, font size, and alternative text.

Poster #5 • Venkatesh Potluri

University of Washington

Investigating Non Visual Interaction Techniques on Laptop Touchpads

Screen reader interactions on personal computers have predominantly been restricted to keyboards and other third-party hardware like braille displays. At the same time, personal computers are increasingly equipped with touchpads with rich input and output capabilities like multitouch and haptics (for example, force touch Trackpads on Macbooks). This hardware, though widely available is not utilized to support rich meaningful screen reader interactions. While screen readers like Apple's VoiceOver replicated common touch screen gestures from smartphones to laptops, these may not be suited for interactions on personal computers as the availability of the keyboard offers quick, efficient nonvisual interactions. We present a preliminary exploration of nonvisual interaction techniques on laptop touchpads to support manipulation of continuous input UI controls (such as video sliders) and exploration of spatially organized data (such as tables, date pickers, and images). Our interaction techniques are designed to complement the presence of, and familiarity with, the keyboard among screen reader users. We discuss findings from a pilot with two blind participants. We would like to discuss and get feedback on our future direction for this work: to map out a design space for nonvisual interactions on touchpads, to test the design space by designing interaction techniques to perform specific tasks and to formally evaluate the usability and effectiveness of these techniques through studies with people who are blind and visually impaired.

POSTER ABSTRACTS

Poster #6 • Sampson Akwafuo

University of North Texas

Real-time Optimization Algorithm for Efficient Management of Epidemics and Disasters

Timely intervention is vital in reducing impacts of sudden epidemic outbreaks, natural disasters or terrorism attacks. This can only be achieved, if there is a ready-to-activate emergency response plan in place, incorporating geographical, time, location demand and vehicular capacity constraints. An efficient meta-heuristic hybrid static and dynamic algorithm for optimizing logistics and emergency deliveries during emergencies is presented here. Our algorithm involves three stages: Selection of depot and clustering; Route construction; and Real-time route improvement. In the initial phase, locations to be visited are strategically clustered near a depot. The second phase iteratively constructs routes through all locations clustered in a depot, subject to time, the population in need and vehicle capacity constraints. Pruning is heuristically implemented, to ensure compliance with all constraints, until a feasible set of solution is obtained. The third phase accepts real-time changes, dynamically re-constructs and improves routing network. Computational application of our algorithm to test instances in a most-at-risk region, clearly indicate its efficiency. It yields an optimal set of routes, incorporating real-time demands and capable of implementing either single or multi-depot scenarios.

Poster #7 • Fariba Nofeli

Mississippi State University

Quantum Computers Based on HHL Algorithm

Quantum computers are a new version of computers which utilize by quantum mechanics to compute problems that classical computers are unable to do. We are going to study a set of linear equations by quantum algorithms and compare it with classical algorithms. One of the important problems in engineering and science is solving linear equation systems, and it plays a fundamental role in these fields. The algorithm of Harrow, Hassidim, and Lloyd (HHL) can be used for quantum linear systems problem for preparing a quantum state $|x\rangle$ which is proportional to the solution of $Ax = b$. Consider a given Hermitian NxN matrix A, and a unit vector b, and we are going to find x which satisfies $Ax = b$. Linear equations systems by using the quantum HHL (Harrow, Hassidim and Lloyd) algorithm would be possible. A quantum adiabatic algorithm (QAA) is an alternative approach to quantum optimization. QAA is able to solve CSP problems (constraint satisfaction problem) by applying a sequence of constraints to input bits, and in output we are going to set an assignment to the input bits by increasing the number of satisfied constraints. final eigenstates and the system will remain in the ground state. Therefore, we can create a new Hamiltonian with new properties which can be encoded as the ground state by maximizing the number of satisfied constraints solution. Therefore, this algorithm can be used for physical systems in which the Hamiltonian can be varied smoothly between initial and final Hamiltonian.

Poster #8 • Damilola Adesina

Prairie View A&M University

Aircraft Location Prediction Using Deep Learning

Localization of aircraft is important to control air safely and effectively. Although the Automatic Dependent Surveillance Broadcast (ADS-B) has many advantages, the transfer of control over the reported location to the aircraft brings a number of safety and security issues. In order to mitigate these issues and determine the locations of the aircraft which do not have position reporting capabilities or may report wrong locations, complementary or redundant localization methods that are independent of the aircraft are needed. The goal of this work is to study the feasibility to localize aircraft (estimate the longitude, latitude, and altitude of an aircraft) based on crowd-sourced air traffic control communication data, specifically time of arrival and signal strength measurements reported by many different sensors. Specifically, we design and test a deep neural network model for aircraft location prediction using real-world data from OpenSky Network, a crowd-sourced receiver network that obtains volumes of air traffic data from thousands of sensors. It is demonstrated that the proposed deep neural network outperforms the time difference of arrival (TDOA) and support vector regressor (SVR) in terms of the mean absolute percentage error (MAPE), and the proposed deep learning based method using crowd-sourced air traffic control communication data is an effective solution for accurate aircraft location prediction that is independent of the aircraft.

POSTER ABSTRACTS

Poster #9 • Adefolarin Bolaji

Purdue University

Community Detection of Anomalies in Large Scale Network with Deep Learning Recurrent Neural Network

Investigation of the internal and external structures is essential in community detection for large and complex networks. Studies on various proposals and implementations of community detection has been given wide adoption over the last decade. Community detection has wide application in many research domains; these domains include biological networks, social networks, neuroscience and most importantly, cyber security. There is a need to employ the most appropriate metrics in measuring the quality of community structures in large networks. Depending on the application in focus, various heuristics have been suggested as possible solutions to problems identified in community detection of large networks. This research focuses on the provision of necessary tools for addressing the drawbacks of existing community detection solutions. The overall intention is to find out how to better represent the graph of network traffic anomalies in overlapping communities. This will further assist to apply and evaluate appropriate deep learning techniques for predicting anomalies that could lead to changes in community structures. An analysis of network variables that can assist the community detection technique in large networks will be presented at the end of this study. The study aims at employing the distributed algorithm approach for the development of a deep learning recurrent neural network anomaly detection model to identify anomalies in the dataset of large-scale cyber networks. Minimum Description Length (MDL) and a factorization-based approach will be used for selecting the model with the best fit because of its ability to minimize total description length of labeled network. Community detection will be performed on the network of identified anomalies using a generated graph based on the nodes and/or the links of the network. A formulated composite modularity metrics such as extended modularity density or excess modularity density will be used to evaluate the strength of the community structure. To predict network traffic anomalies in given large-scale networks, a tensor with two disjoint and model communities will be used for iterative changes and observation. TensorCast method will be used for the predictions because of its ability to scale to hundreds of millions of non-zeros on large datasets. Gephi will be used for data visualization of detected communities of anomalies. The quality of the results of the analysis and predictions will be evaluated with Matthew's correlation coefficient (MCC); especially, because of its ability to be used as a balanced measure even if the sizes of the classes are different. Summarily, the research will propose, implement and evaluate new techniques for detecting and predicting communities of anomalies in large-scale networks with community detection technique.

POSTER ABSTRACTS

Poster #10 • Kaitlin Maile

University of Texas, Austin

Evolutionary Parameter Optimization for Resting-state Functional Connectivity Human Brain Model

Computational models are crucial in understanding brain function. One particularly interesting class of models is designed to replicate known brain structures using structural connectivity (SC) measured with diffusion spectrum imaging, and the behavior that emerges is then compared to empirical functional connectivity (FC), measured using functional magnetic resonance imaging. As the models become more accurate and more complex with more parameters, they can explain more of the observed phenomena, and may eventually be used for diagnosis and design of treatments of brain disorders. However, those parameters need to be carefully optimized for the models to work best, which becomes intractable to do manually or with traditional computational techniques like gradient descent as the models grow. Evolutionary computation techniques use adaptation over generations in nature as inspiration to optimize functions that are otherwise difficult and have succeeded in solving optimizations in similarly difficult search spaces (Miikkulainen, 2019). In this work, the Covariance Matrix Adaptation Evolutionary Strategy (CMA-ES) was configured to optimize continuous parameters of a large-scale biophysical network model that stimulates neural activity from structural connectivity of 66 cortical parcellations and computes FC (Deco et al., 2013). Empirical SC and FC data was collected and aggregated from 24 right-handed healthy young volunteers (Deco et al., 2013). The application of CMA-ES on this data resulted in a significantly better fit to empirical FC data than manually selected parameters in all four trials run of the CMA-ES algorithm so far. The best parameter set from the best trial run generates a functional connectivity matrix with a correlation of 0.5205 +- 0.0102 with empirical FC, compared to the previous best set of manually selected parameters that yield a correlation of 0.4647 +- 0.0114. This work provides a basis for utilizing evolutionary computation to optimize neural activity models. Statistically significant improvement has already been achieved with a relatively simple approach. To further increase the optimization potential, this approach will be combined with other evolutionary computation techniques to optimize other parameters, and these techniques will be scaled up to more detailed and patient-specific SC and FC data and more complex computational models. Optimizing neural activity models will further our understanding of the human brain and bring the field of neurology closer to personalized medicine.

Poster #11 • Irené Tematelewo

Oregon State University

Sensor Diagnostic Based Anomaly Detection in Weather Stations

From guiding the style of clothes we wear, to influencing flights planning by airline companies, to motivating preventive actions for anticipating natural catastrophes, weather forecasting is important to individuals and organizations of all level. Like in every data driven models, accurate weather prediction starts with good quality data. The problem is that weather data is both challenging and impossible to detrend. In this work, we present an approach of failure detection in weather stations using Probabilistic Diagnostic of individual sensors. Unlike traditional joint anomaly detection method that reports anomalous observations without identifying the broken sensor, our method not only finds outliers but gives information about the cause of failures. We model the joint distribution of a target weather station and each of its nearest neighbors for different variables like rain, temperature, relative humidity, wind speed, etc... We evaluate the model on a network of stations and compare the result with the standard QC in weather stations. Our data set is a record of measurements from 120 weather stations in Oklahoma in 2008 and 2009.

POSTER ABSTRACTS

Poster #12 • Raul Alejandro & Vargas Acosta

University of Texas, El Paso

Towards Increasing our Understanding of Scientific Data

While advancements in current technology has enabled the sharing and reuse of digital objects (e.g., documents, pictures, software), the need to efficiently discover and reuse these objects is still prevalent. More specifically, in the scientific community more attention has been given to how to discover and invoke software automatically. Moreover, the scientific community has concentrated its efforts on improving the construction of scientific workflows – i.e., "a representation of complex distributed scientific computations", or "the orchestration of multiple computational tasks over the course of a scientific campaign". Scientific workflows can be constructed through the discovery of scientific models developed and shared by scientists and assist them when scientific experiments have to be reproduced. Reproducibility is an essential part of the scientific method; it allows scientist to confirm or refute findings of their peers and to build upon previous experiments. However, reproducibility is sometimes not possible (e.g., data used is not public, the experiment contains ambiguous steps) and it is by the adoption of scientific workflows that scientists can aim to facilitate the reproduction of their experiments. One identifiable challenge in the orchestration process, a fundamental part of the creation of scientific workflows, is the design of the workflow itself. In this work, we describe our most recent efforts on enabling the automatic generation of scientific workflows by means of semantic input annotations. Semantic input annotations, metadata readable by machines, empower the understanding of data by machines. Our current efforts focus on discovering the type of metadata required to automatically generate a workflow by means of semantically annotate micro-services (i.e., an atomic computational component designed to carry out a single-independent task) and automatically orchestrate a workflow based on the metadata of inputs. Our approach consists of using the Hydra vocabulary, a generic vocabulary that allows micro-services to be described using none-domain specific terms, for the creation of semantic annotations encoded in JSON-LD format. JSON-LD allows context to be embedded in data enabling machines to understand its meaning. We anticipate that this task will allow us to advance our knowledge in the automatic generation of workflows for scientific research across different domains (e.g., scientific workflows, engineering workflows). Our approach will be validated by using historical workflows (i.e., previously defined workflows) as baseline (i.e., previously defined workflows) and by generating candidate workflows that will be validated by domain experts in the area of water sustainability. This work contributes to the further improvement of automatic scientific workflows generation enabling scientific research and addresses the upcoming data deluge already identified and recognized by the NSF as a current scientific challenge.

Poster #13 • Diana Aguilar Gomez

University of California, Berkeley

Adaptation of the Toad-Headed Lizard to the Colorful Sand of the Gobi Desert

The arid landscape of the Chinese Gobi Desert is inhabited by the variegated toad-headed agamid, Phrynocephalus versicolor. We analyzed populations from different locations (GZ, HSK, and EJN), which vary in substrate color and altitude. The sand color is either light-yellow (GZ), yellow (EJN) or black (HSK); the corresponding lizard populations colors match their substrate: non-melanic and melanic. In a previous study we showed these phenotypes are not plastic, thus, we believe that a genetic adaptation underlies its coloration, allowing them to camouflage. We assembled the P. versicolor genome and sequenced over 90 individuals from three different populations. Non-melanic populations are not the closest genetically, instead, divergence between populations corresponds to their geography. Using selection scans based on differences in allele frequencies, we identified slc2a11 and mlph among other genes, that might be related to pigment and altitude adaptation. slc2a11 is a gene that is necessary for xanthophore differentiation (yellow pigment cells), this gene is down-regulated in our melanic population of lizards, suggesting its role in P. versicolor coloration.

POSTER ABSTRACTS

Poster #14 • Selina Bauernfeind

University of New Mexico

Using Player Generated Data to Elucidate Molecular Docking

One of the most difficult challenges in molecular docking is implementing the flexibility of the molecules. This is because of the large number of degrees of freedom which makes calculating forces between molecules computationally demanding. To tackle this problem, we implemented ensembles of rigid ligand conformations on our mobile molecular docking game DockAnywhere. We performed a pilot study using these conformations and compared the resulting pathways to those generated by the previous version of DockAnywhere which used only one rigid conformation of the ligand. We found that the edition of ligand conformations did have an impact on the resulting low energy pathways we were able to generate. These conformations increased players' ability to find lower energy states which contributed to finding shorter pathways to the known binding state of the ligand. While using the ensembles of rigid ligands is not the same as true flexibility, it allows the finding of lower energy states with no additional computational cost.

Poster #15 • Oforiwaa Pee & Agyei-Boakye

University of Minnesota

Linking Child Health, Spatial Accessibility of Food and Climate Change Using Computational Techniques

The complexity of the dynamics of coupled environmental and human systems and their connectivity across space and time poses daunting challenges to a variety of urban development and sustainable issues. Advancements in technology have opened up frontiers for data-driven geo-computing and analytics to understand the dynamics of these systems. My research uses computational techniques to promote insight into social issues to solve geographic problems. The nexus between climate change, health, transportation, and food security is not clearly established. I am therefore interested in using geo-computational and data driven research to address this gap. My research examines the interaction between child health and the spatial accessibility of food in the face of climate change at different temporal and spatial scales. It focuses on Geo-spatial machine learning, Spatial Data science, Geographical Information Systems (GIS) and Global Positioning System (GPS) traces for geo-computing. It uses heterogenous big data available from sensors, spatial data and empirical models to analyze existing patterns, parameterize key trends and processes, forecast alternative futures, and visualize key results for non-technical decision-makers to develop effective and timely solutions to challenging social problems for policy interventions. This research will further advance work in the computational social science area of human-environment interactions by engaging in research that tackles societally beneficial real-world problems at the core of geographic science.

Poster #16 • Sahiti Kunchay

Pennsylvania State University

Investigating Users' Perceptions of Light Behaviors in Smart-Speakers

Light expressions can communicate and convey information in an unobtrusive manner. Smart-speakers employ light behaviors to indicate a wide range of device states as well as notifying users. However, no prior work has looked into the efficacy of these light behaviors in smart-speakers. That is, can users distinguish and understand information states associated with different light behaviors in smart-speakers? In this work, we aim to address this gap by investigating whether users can accurately identify light behaviors in Amazon Echo and Google Home devices. For this, we conducted two surveys with 405 smart-speaker owners. Our findings reveal that only 38% of the light behaviors are correctly recognized by users on average. Moreover, we found that users find it easier to recognize light behaviors in Amazon Echo than in Google Home devices. These findings show a clear need for rethinking the design of light behaviors in smart-speakers. We also explored novel light behaviors that users might find useful but are not supported by current devices including expressing sentiment and privacy notifications.

POSTER ABSTRACTS

Poster #17 • Michael Threatt

Northwestern University

Understanding The Effects of SRAM Delay on Dynamic Timing Slack.

As Moore's Law continues to end, technology scaling becomes increasingly difficult as we are achieving diminishing returns in terms of energy consumption. Dynamic Timing Slack (DTS) is an emerging solution that occurs when all signals have propagated through the circuit in advance of the clock signal. Power can be reduced during this gap, since no work is currently being done, to improve power efficiency. Previous work proposed a cross-layer optimization that exploits DTS to reduce power consumption by up to 40%. This is achieved through co-designing the architecture alongside the compiler. Previous work, however, did not explore the impact of SRAM delay in relation to logic delay under the Timesqueezing optimizations. Timesqueezer 2 will thoroughly test a range of SRAM delays to determine its impact on the amount of total slack produced across a workload. These results will be compared with the original work to determine the viability of this path. We believe this could potentially provide another space for future research into power optimization.

Poster #18 • Leul Belayneh

University of Michigan

Addressing Bottlenecks in PIM-Based Graph Analytics with Multicast

The wide adoption of graphs as a key data structure for big-data analytics has increased the demand for efficient graph processing. To meet this demand, prior works have proposed processing in memory (PIM) solutions in 3D-stacked DRAMs, such as Hybrid Memory Cubes (HMCs). However, PIM-based architectures, despite considerable improvement over conventional architectures, continue to be hampered by the presence of high inter-cube communication traffic. In turn, this trait has limited the underlying processing elements from fully capitalizing on the memory bandwidth an HMC has to offer. In this work, we show that it is possible to combine multiple messages emitted from a source node into a single multicast message, thus reducing the inter-cube communication without affecting the correctness of the execution. Hence, we propose to add multicast support at source and in-network routers to reduce vertex-update traffic.

Poster #19 • Ruth Akintunde-Okoilu

North Carolina State University

Data-informed Curriculum Sequences for a Curriculum-Integrated Game

In this paper, we perform a predictive analysis of a curriculum-integrated math game, ST Math, to suggest a partial ordering for the game's curriculum sequence. We analyzed the sequence of STMath objectives played by elementary school students in 5 U.S. districts and grouped each objective into difficult and easy categories according to how many retries were needed for students to master an objective. We observed that retries on some objectives were high in one district and low in another district where the objectives are played in a different order. Motivated by this observation, we investigated what makes an effective curriculum sequence. To infer a new partially-ordered sequence, we performed an expanded replication study of a novel predictive analysis by a prior study to find predictive relationships between 15 objectives played indifferent sequences by 3,328 students from 5 districts. Based on the predictive abilities of objectives in these districts, we found 17 suggested objective orderings. After deriving these orderings, we confirmed the validity of the order by evaluating the impact of the suggested sequence on changes in rates of retries and corresponding performance. We observed that when the objectives were played in the suggested sequence, we record a drastic reduction in retries, implying that these objectives are easier for students. This indicates that objectives that come earlier can provide prerequisite knowledge for later objectives. We believe that data-informed sequences, such as the ones we suggest, may improve efficiency of instruction and increase content learning and performance.

POSTER ABSTRACTS

Poster #20 • Meenakshi Das

Auburn University

Innovative Block-Based Accessible Coding for K-12 Students with Hearing Impairments.

American Sign Language (ASL) is the primary means of communication for an estimated 500,000 people in the United States yet there are not many online resources providing computer science instruction in ASL. This poster will present the assessment of a project helping Deaf/Hard of Hearing (D/HH) K-12 students and sign interpreters acquire knowledge of complex Computer Science concepts. It will showcase an accessible block-based computer science curriculum to engage D/HH students in hands-on computing education and evaluate its learning outcomes through pilot studies.

Poster #21 • Jean Salac

University of Chicago

Personalized Assessment Worksheets for Scratch (PAWS): Exploring a Bridge between Interviews, Written Assessments, and Artifact Analysis

The computer science community has struggled to assess student learning, especially at the early elementary level. Prior work has included one-on-one interviews, written assessments, and artifact analysis, each with their own benefits and drawbacks. Through our Personalized Assessment Worksheets for Scratch (PAWS) tool, we explore personalized assessments as an assessment technique that lies in between interviews, written assessments, and artifact analysis. PAWS creates personalized written assessments that integrates code from student Scratch projects. We hope that our PAWS tool, and more generally personalized assessments, will lead to an assessment technique that is both more accurate than written assessments and artifact analysis, and less time-consuming than interviews.

Poster #22 • Adewale Obadimu

University of Arkansas at Little Rock

Identifying Latent Toxic Features on YouTube Using Non-negative Matrix Factorization

Toxic behavior, in its various forms, often disrupts constructive discussions in online communities. The proliferation of smart devices and mobile applications has further exacerbated these nefarious acts on various social media platforms. Largely, toxic behavior is regulated by human moderators employed by platform operators. However, given the volume and speed of content posted on online platforms, identifying and deterring these behaviors remains challenging. In this study, we propose a Non-negative Matrix Factorization (NMF) technique for predicting commenter toxicity on YouTube. We utilized the YouTube Data API to collect data from the Cable News Network (CNN) channel on YouTube. Our final dataset consists of 144 videos, 243,344 commenters, and 421,924 comments. We then utilized Google's Perspective API to assign a toxicity score to each comment. We used the resultant dataset to create a commenter toxicity score prediction model. We tested our proposed NMF model against other popular prediction methods, comparing the speed of model execution and the common Root-Mean-Square-Error (RMSE) accuracy metric. This work sets the stage for a richer, more detailed analysis of toxicity on various online social media networks.

POSTER ABSTRACTS

Poster #23 • Tanvi Jain

University of Saskatchewan

Integrating Blockchain-Based Identity Management and Deep Learning Trust-Factor for Water Science Project

The water science project is to develop and aid the public and communities for raising awareness specifically related to water resources with the added value of environmental challenges our natural resources are facing. Usually qualitative and time-specific data is hard to collect partly because of all the pertaining security and privacy threats. Users are not always in favor to expose their identities or share personal or sensitive data. In order to protect the privacy of users and data they share, we propose blockchain technology as a solution to provide a decentralized community-based network. By this, the user will have full control over the information or content they want to share and with whom on the pseudo-anonymous infrastructure. Blockchain, also known as distributed ledgers provides decentralized, tamper-free record-keeping in the trustless environment and in this project blockchain part is implemented for identity management resulting in more security and data integrity mapping between the user and content within the network. Moreover, for creating this system faster, reliable and intelligent, the deep learning trust generating factor is created to enhance overall speed and reliability as blockchain transactions can have slow processing while the network grows resulting in the whole infrastructure run even slower. To speed up this whole process, the machine learning module for verification will make a significant difference. This module will trim down the verification/validation process of transaction and user identity significantly based on the trust-factor generated by prior transactions. So, when the system grows, the data-set will grow, making it faster as opposed to conventional issues of the growing network. This unique trust-factor is embedded in the transaction and can be used to provide the verification and validation of both the user and content without compromising the confidentiality and security attacks.

Poster #24 • Bakari Hassan

Carnegie Mellon University

Estimating the Appearance of Translucent Materials Via Empirical Speckle Field Correlation Measurements

The visual appearance of everyday materials is the result of many light-matter interactions such as absorption, scattering, and reflection. Translucent materials such as human tissue, soil, and composites are particularly difficult to represent graphically due to high-order scattering deep within the material. While realistic representation can impact areas spanning through-tissue imaging, remote sensing, and precision fabrication, progress has been limited due to the difficult task of estimating their scattering properties. Previous methods have relied on either 1) diluting material samples so only easily-measured single-scattering is present or 2) inverse Monte Carlo rendering to estimate the parameters from images. While the former is simple, it requires thin samples; the latter is precise, but it is slow, and accuracy is sensitive to initial conditions. We propose a new empirical estimation method with the pros of both methods: by illuminating the sample and measuring the correlation of the scattered light field, the single-scattered light can be isolated from the multi-scattered light, and the appearance can be realized quickly and accurately via forward Monte Carlo rendering. A successful result will enable advances in the aforementioned areas as well as X-ray-free mammography, cloud tomography, and fluid particle sizing.

POSTER ABSTRACTS

Poster #25 • Niall Williams

University of Maryland

Efficient Estimation of Redirected Walking Thresholds Using Confidence Ratings

Locomotion in virtual reality (VR) is an important component of creating an immersive experience. Studies have shown that, compared to other locomotion techniques, real walking is the most intuitive and beneficial form of travel in VR. Redirected walking (RDW) techniques enable users to naturally locomote in virtual environments (VEs) that are larger than the tracked space. RDW works by imperceptibly transforming the VE around the user such that they adjust their physical path to remain on an intended virtual path. It relies on measured detection thresholds to determine which manipulations are imperceptible. Users often complete hundreds of trials so we can accurately estimate the detection thresholds. Recent work showed we can estimate thresholds in fewer trials using users' confidence ratings. We tested the viability of this method on estimating RDW thresholds. Results suggest that more work is needed to understand the relationship between perception and confidence.

Poster #26 • Maciej Kos

Northeastern University

Computational Methods for Continuous Monitoring of Cognitive Changes Using Passively Captured Smartphone Data - Towards a Digital Biomarker of Cognitive Health

Cognitive deficits associated with aging and neurodegenerative diseases pose significant challenges to healthcare systems throughout the world. Nearly 46 million people worldwide suffered from some form of dementia in 2015, with this number estimated to increase by 6-10 million new cases per year and to more than double by 2050, reaching 115 million worldwide. In the U.S. alone, Alzheimer's disease affected an estimated 5.4 million in 2017 and was the fifth leading cause of death among older Americans.

Aging demographics and prevalence of neurodegeneration are increasingly challenging our ability to deliver the necessary level of healthcare and high quality of life. Optimization of care and rehabilitation of the aging population requires effective methods for early detection and monitoring of cognitive impairments. However, the effectiveness of existing neuropsychological assessments is thwarted by their sporadicity, difficulty in accounting for the context-dependent nature of patients' health (e.g., having a "good" or a "bad" day), and reliance on frequently inaccurate patients' and caregivers' reports. Thus, improvements to care and research necessitate new methods for objective and ecologically valid assessment. Current mHealth and AI approaches allow us to circumvent these issues by continuously inferring context from smartphone use and location data.

This poster discusses existing methods and proposes new computational approaches for augmenting conventional clinical assessments with continuous and ecologically valid estimates of cognitive changes by combining cognitive modeling with mHealth and AI methods and applying them to unobtrusively collected smartphone-based data. The methods for inferring cognitive function include estimation of:

1) life-space mobility from location data,
2) degree of engagement in Instrumental Activities of Daily Living from app use logs,
3) motor function from typing, swiping and walking speeds (including dual-task),
4) attention and short-term memory from application use patterns.

Fusion of the proposed estimates into a multidimensional digital biomarker of cognitive function has the potential to transform cognitive care by enabling estimation of clinically meaningful, ecologically valid cognitive parameters for cognitive care providers and open-source tools for researchers studying neurodegeneration.

POSTER ABSTRACTS

Poster #27 • Iyadunni Adenuga

Pennsylvania State University

User Centered AI techniques

Many technologies today are powered by complex artificial intelligence (AI) algorithms. These algorithms already occur in everyday life in various forms but are also, emerging in sensitive areas with more consequential adverse effects such as in defense systems, the criminal justice system, and the medical field. It is imperative that user trust is developed in these systems before they can be effectively utilized in these areas. This research proposal introduces a solution of algorithmic and output transparency as well as interactions that enhance user agency as possible elements on the user interface of a complex AI system like the Living Document which implements text summarization. The literature review of various theories and previous research situates the solution, the methods for creating and testing the solution are introduced and a discussion of the implications of this solution is presented.

Poster #28 • Upol Ehsan

Georgia Institute of Technology

Automated Rationale Generation: This AI Agent Can Explain Its Actions in Plain English

If the power of AI is to be democratized, it needs to be accessible to anyone regardless of their technical abilities. From healthcare to finances, as AI becomes consequential, we need explainable systems to mitigate fairness, accountability, and transparency issues. This project takes a foundational step towards understanding the role of natural-language-based explanations. Past research focuses on single-action-explanation paradigms. Our approach is the first to tackle sequential decision-making where past actions influence present ones. Specifically, how might we enable an AI agent to explain its actions in English, and what design implications can we learn from how humans perceive them? We pioneer Automated Rationale Generation, an approach for real-time explanation generation whereby a computational model learns to translate an autonomous agent's internal state and action data representations into natural language (English). Using the context of an agent that plays Frogger (sequential decision-making environment), (a)-we describe how to collect a corpus of explanations, (b)-how to train a deep-learning algorithm to produce different styles of rationales, and (c)-how people perceive these rationales. To evaluate, we conducted two user studies. Along the dimensions of confidence, humanlike-ness, adequate justification, and understandability, the first study establishes the plausibility of our rationales against two baselines—human-generated (gold standard) rationales and random rationales (lower bound). Overall, participants preferred human-generated rationales first, with AI-generated responses a close second. The second study explores user preferences of communication while communicating failure and unexpected behavior. Context permitting, participants preferred detailed rationales to form a stable mental model of the agent's behavior.

POSTER ABSTRACTS

Poster #29 • Vidya Gaddy

Colorado State University

Exploring the Impact of Belonging on Computer Science Enrollment Using Virtual Reality

There has been a persistent decline in the number of diverse students entering computer science (CS) and technological majors for several decades. This decline has resulted in lower rates of employment in STEM fields (especially technology fields) for diverse populations during a time when there is an excess of technology-related careers to go around in this country. There is plenty of evidence to suggest that diversity is a major contributor to innovation and a variety of backgrounds are crucial when developing new ideas. Therefore, solving the problem of underrepresentation is pivotal in the coming years as new innovative technologies become necessary to combat society's ever-growing challenges.

Before diversity can spread within technological industries the reasons behind the decline must be explored and properly dealt with. The research we are pursuing is a unique avenue toward the goal of solving the underrepresentation problem in CS and other technological fields. A lack of belonging has been identified as a major contributor to diverse populations' lack of interest in some majors and especially technological fields of study. For this reason, it is pivotal to understand where a sense of belonging commonly originates among people entering college.

This experiment provides a basis for exploring students' sense of belonging in CS in a controlled virtual environment. It attempts to better understand what belonging means to people as a concept rather than a person's own experience with belonging in the CS field.

Several factors have been shown to impact a person's sense of belonging including demographics, self-efficacy, family background, and goal orientation. We expect that some of the causes behind a lack of belonging are more significant than others.
While in a virtual reality simulation, participants will embody an avatar. As the avatar, the participant will listen to one of several audio cues related to one of several factors that affect a person's sense of belonging. At the end of each audio cue, the participant will be asked if they would like to enroll in a CS course while still embodying the avatar. They would then complete a short questionnaire asking them how likely they would be as the avatar to take the course.
We expect that cues designed to improve a person's sense of self-efficacy and cues designed to construct a strong family background in CS will be most influential when choosing to take the CS course.
This study will aid in the work being done to create initiatives that are meant to bring in more diverse students. Because of this research future initiatives have the opportunity to be more specialized. It will allow programs to target more specific factors that impact a person's decision to enroll in CS courses. This could result in students finding the motivation and assistance they need to take the first step in their CS careers.

POSTER ABSTRACTS

Poster #30 • Derek Haqq

Virginia Tech

Playing Together While Apart: Technology-Mediated Shared Outdoor Play for Non-Collocated Participants

Sharing recreational experiences with loved ones has the potential to improve individual well-being, experience enjoyment, and relationship quality. Despite these benefits there are numerous circumstances - disabilities affecting one or more members of the relationship, differences in recreational preferences between companions, and challenges inherent in long-distance relationships - which may hinder shared participation in recreational experiences with family, friends, and romantic partners. This may be especially true for activities involving the outdoors, such as biking, exploring, hiking, and running.

This research explores how mobile and game technology may provide opportunities for shared outdoor play despite circumstances which may hinder collocated participation. To this end we developed the PlanetRunner prototype, a two-player cooperative digital-physical running game designed to support a shared asymmetric game experience. Players must complete game objectives requiring one person to run an outdoor route of their choosing while supported by a remote companion. Both players utilize a shared virtual environment which approximates and augments the runner's real-world route.

Through informal study the research team gathered participant feedback regarding the PlanetRunner prototype, the shared experience gameplay design, and the opportunities afforded through the technology-mediated experience. Analysis of interview feedback yielded positive results and demonstrated how such solutions may mitigate aforementioned barriers and provide a viable means of supporting shared outdoor play for non-collocated participants.

Poster #31 • Lindah Kotut

Virginia Tech

All Things Considered: Stories as Signals and Guides to Understand and Design for Unmet Needs

Designing persuasive technology intended to support decision-making or inspire behavioral change is fraught with ethical and efficiency challenges. To guide our design approach, we leverage storytelling: every person has a story, and every person can tell a story. By looking at stories told by different communities both offline and offline, and understanding who the storytellers are, how the stories are told, and why the stories are told, we can elicit ethical and sensitivity guidelines to design respectful technologies that support and sustain community. We use postcolonial computing lens to first explore, understand, interpret and support stories from rural communities, online communities, and underserved communities -- and then guide how we translate these storytelling experiences into design recommendations. We apply the recommendations and lessons learned towards designing technology that sustain interactions with museum exhibits, trigger discussion and introspection in online political discussions, and spark understanding surrounding privacy and informed consent.

POSTER ABSTRACTS

Poster #32 • Divine Maloney

Clemson University

Social VR and Communication via Nonverbals

Exploring communication dynamics in digital social spaces such as massively multiplayer online games and 2D/3D virtual worlds has been a long-standing concern in HCI and CSCW. As online social spaces evolve towards more natural embodied interaction, it is important to explore how non-verbal communication can be supported in more nuanced ways in these spaces and introduce new social interaction consequences. In this paper we especially focus on understanding novel non-verbal communication in social virtual reality (VR). We report findings of two empirical studies. Study 1 took an ethnographic approach to explore the types of non-verbal interactions being used naturally in social VR. Study 2 was an interview study (N=30) that investigated people's perceptions of non-verbal communication in social VR as well as the resulting interaction outcomes. This study helps address the limitations in prior literature on non-verbal communication dynamics in online social spaces. Our findings on what makes non-verbal communication in social VR unique and socially desirable extend our current understandings of the role of non-verbal communication in social interaction. We also highlight potential design implications that aim at better supporting non-verbal communication in social VR.

Poster #33 • Maya Mundell

Cornell University

Understanding Strategies of Digital Influence

"You don't get what you deserve, you get what you negotiate," a young woman participant from my ethnographic study shares insight on her views around work, entrepreneurship, and influence in the digital realm. I began to conduct this study entitled, Understanding Strategies of Digital Influence in order to understand how people from marginalized groups can increase their power by using digital technology. In order to do so, I analyze how digital/social media influencers create and leverage digital influence to change how individuals think and behave. The goal of this study is to understand digital influencer strategies and tactics, the logic behind those tactics, and the potential efficacy of those tactics to benefit marginalized populations. After conducting several participant interviews, a new central question arose; this question is, "How do marginalized communities create new markets, industries, forms of supply & demand, and entrepreneurial endeavors from their digital influence creation and leverage?"

Poster #34 • Ather Sharif

University of Washington

On the Reliability of Fitts' Law as a Movement Model for People With and Without Limited Fine Motor Function

For over six decades, Fitts' law has been used by researchers to quantify human pointing performance in terms of "throughput," a combined speed-accuracy measure of aimed movement efficiency. Throughput measurements were and still are commonly used to evaluate pointing techniques and devices, helping to inform further software and hardware developments. Although prior work has shown that Fitts' law provides good model fits, with R2 values commonly at 0.90 or above, the test-retest reliability of Fitts' law is less clear, especially for people with limited fine motor function. In this paper, we conducted a study with 16 participants with limited fine motor function and 30 participants without such limitations. Each participant performed a classic Fitts' task comprising vertical ribbons in a one-dimensional layout in two sessions that were at least 4 hours and at most 48 hours apart. The findings from our work, which is in progress and awaiting final results, suggest that the throughput values between the two sessions were significantly different for people with limited fine motor function, suggesting that Fitts' law may provide good model fits but still does not have a good reliability from one test session to the next for both people with and without limited fine motor function. These results indicate Fitts' law should be used with caution and over multiple sessions, especially when incorporated into assistive technology evaluations.

POSTER ABSTRACTS

Poster #35 • Marcae Bryant-Omosor

Dakota State University

Building NextGen URMW Execs: Addressing the STEM Equity-Gaps?

In today's vast society, companies are scrambling to address growing concerns that stem from lack of trained cybersecurity and information technologists to fill the equity gaps. The focus for human resource personnel to recruit and retain key missing talent pool and skillsets lead to uncharted territory. Such that, recent technology advancements in the digital landscape is a driver for key businesses to cultivate solid products transparently combined to empower and transform customer experiences. Cybersecurity landscape has significantly changed through the advancement of information discovery techniques; which enhance customer experiences, product suggestions, and provide connected environments (Fraley & Cannady, 2017; Dua & Du, 2011). With the continually evolving cyber security attacks, two main concerns are shared by many company executives as they implement a top-level security strategy. First, hackers can expand their reach trans-globally; in matters of seconds, to take down and gravely cripple single or multiple organizations at an alarming rate.

Secondly, software vulnerability analysis and rapid discovery is a major concern for security professionals due to the exponentially growing severity of cyberattacks (Ghaffarian & Shahriari, 2017). Executives must adhere to national and international compliance regulations, in order to effectively combat hackers that threaten the fibers of the network in a blink of an eye by exploiting known and unknown security vulnerabilities. The female and minority-voice are lacking, hiring talent is dependent on the company culture that they feel comfortable in the workspace. Dezso, Ross, & Uribe (2013) argue that lack of women managers contributes to that fact that females are less apt to pursue promotions if they don't meet all the required specifications whereas men tend to charge after a job that they are only meet like 2 out 10 requirements. Additionally, Dezso et al's findings highlight that women tend to get into each other's way and undermine the growth of others plus as organizational efforts increase to attract and retain female executives then efforts will begin to decline regressively. Females remain an untapped resource that businesses have underutilized as the percentage of educated females is increasingly growing due to the higher education matriculation. More women are pursuing degrees and ramping up their skillsets; but, despite growth gender imbalances resemble a pyramid-shape and mitigation strategies must be adopted to reduce the overall impact. Therefore, the lack women executive representation directly impacts recruitment within STEM career fields as it difficult to recruit female talent in which they do not self-identify. Conversely, research still needs to be conducted to explore existing cultural biases causing turbulent landscape of technological, demographic, and socio-economic practices that impact the executive gender-equity gaps (World Economic Forum, 2016). Reference available

Poster #36 • M. Clara De Paolis Kaluza

Northeastern University

Incremental Dynamic Graph Embedding

Graph Neural Network (GNN) models have shown to be effective tools for graph representation learning as demonstrated by state-of-the-art results on node classification, link prediction, edge classification, and other graph tasks. Recently, GNN-based models for sequences of graphs have been proposed to embed nodes in dynamic graphs. These methods require re-embedding all nodes in a graph at every time point in the series. However, for many applications with graph data, the changes in the graph over time steps is small, affecting a relatively small subset of the nodes. Incrementally updating node embeddings allows for updating embeddings only when necessary, saving computation costs. These savings are particularly crucial in applications with large graphs but relatively small changes at each time point. We propose a graph convolutional network (GCN) model for identifying and updating a small set of affected nodes at each time point in a sequence of a dynamic graph. In empirical studies, we demonstrate competitive performance compared to existing methods and several constructed baselines while updating 10% or fewer node embeddings for an entire sequence.

POSTER ABSTRACTS

Poster #37 • Victor Gonzalez

University of Illinois

OccITW: Finding Hidden Joints in the Wild

Computer vision systems can now recover a 3D human pose from a 2D image of a human with high accuracy. However, localization of occluded joints continues to be a challenge for these systems. There is evidence that localization accuracy on occluded joints can be improved by applying synthetic occlusions to training data. However, current datasets do not allow us to evaluate the effect of natural occlusion on prediction accuracy. This paper seeks to fill this gap. To do so, we first describe a method to evaluate 3D pose predictions on images of humans obtained in the wild (ITW) by measuring registration consistency from different viewpoints. We show this proxy strongly predicts ground truth error for Human3.6M. We then collect an evaluation dataset of people ITW with natural occlusions. Finally, we modify an existing method for creating synthetic occlusions in training data to give more detailed control of occlusion statistics. Our results indicate a substantial gap between reconstruction accuracy on Human3.6M and on ITW poses.

Poster #38 • Gonzalo Martinez

University of Notre Dame

Increasing the Efficiency and Efficacy of Multi-Modal Longitudinal Sensing Studies

Over the past few years, the quality and sophistication of wearable devices and smartphones have improved dramatically. The steady increase in the adoption of these devices has given researchers the opportunity to conduct research at a larger scale, outside of the laboratory and following less intrusive approaches to gathering real-time data from multiple sensors for a large number of participants. Simultaneously, the cloud has evolved to provide a significant data repository to support multi-modal sensing, gathering data from smartphones, social media, and wearables.

However, these multi-modal longitudinal studies are expensive because they usually require providing equipment, monetary incentives, and require substantive effort to recruit sizable and diverse populations. Because of the added cost and complexity of these studies, the focus of our research has been and will be to explore ways to maximize the data collected in the studies with minimum wasted effort and expense. To accomplish this goal, we have investigated how early one can anticipate whether a participant will be compliant and to what degree participant compliance in studies can be improved. Furthermore, to increase the efficacy of the longitudinal study, the imputation of time-series data will be needed to deal with missing data due to unpredictable events such as breakages, bugs, and drops in compliance. In addition, there will be a need to carefully engineer features that fuse the data from the multiple sensors to provide an accurate characterization of the phenomenon that are being measured. To address these challenges, I have focused my latest research efforts in the fusion of sensors specifically in the case of sleep detection, in the adaptation of a current sleep debt model to work with wearables and real-world data, and in the imputation of time-series data through collaborative filtering and GAN.

Poster #39 • Pedro Soto

Florida International University

Dual Entangled Polynomial Code: Three-Dimensional Coding for Distributed Matrix Multiplication

Matrix multiplication is a fundamental building block in various machine learning algorithms. When the matrix comes from a large dataset, the multiplication will be split into multiple tasks which calculate the multiplication of submatrices on different nodes. As some nodes may be stragglers, coding schemes have been proposed to tolerate stragglers in such distributed matrix multiplication. However, existing coding schemes typically split the matrices in only one or two of their dimensions, limiting their capabilities to handle large-scale matrix multiplication. Three-dimensional coding, however, does not have any code construction that achieves the optimal number of tasks required for decoding. The best result is twice the optimal number, achieved by entangled polynomial (EP) codes. In this paper, we propose dual entangled polynomial (DEP) codes that significantly improve this bound from 2x to 1.5x. With experiments in a real cloud environment, we show that DEP codes can also save the decoding overhead and memory consumption of tasks.

POSTER ABSTRACTS

Poster #40 • Geetanjali Rakshit

University of California, Santa Cruz

Neural Approaches to Generate Figurative Language

We explore methods to generate utterances from meaning representations (MRs) that contain figurative rather than literal content, thereby producing utterances that are richer and more interesting to the reader. We propose two neural frameworks for this task, and report preliminary results.

Poster #41 • Simeon Babatunde

Clemson University

Greentooth: Towards Intermittently Powered Sensor Networks with Commodity Radios

A typical Wireless Sensor Network (WSN) is made up of a considerable number of wirelessly connected nodes with sensing, computation and communication capabilities. Emerging intermittently powered, battery-free sensing devices are beginning to replace their larger, and shorter-lived battery powered devices. However, the intermittent operation of these devices hinders even the most basic single-hop communication between a sensor node and a base station. Worse, in situations where base stations are subjected to stringent energy constraints and must carefully allocate bandwidth to battery-less sensor nodes even though those nodes may not have enough energy to send or receive packets. As the number of unsynchronized, energy starved sensor nodes increase into the thousands, channel contention and congestion caused by correlation in energy harvesting pattern leads to packet loss and inefficient use of energy at both the base station and the battery-less sensor nodes. This paper presents Greentooth, a network architecture and protocol for efficient communication between an energy constrained base station and numerous battery-free sensor nodes using active radios and low power wakeup receivers. Through a combination of fuzzy TDMA scheduling and a resilient mechanism for handling intermittency, Greentooth achieves reduction in connection cost and improvement in packet delivery ratio compared to the state-of-the-art.

Poster #42 • Israel Elujide

University of Texas, Arlington

An Entropy-Based WLAN Channel Allocation Using Channel State Information

Low-cost access points have proliferated wireless local area networks (WLAN) providing main wireless access in many unmanaged networks. The majority of these access points rely on received signal strength indication (RSSI), known to be unreliable, as a measure of the wireless link quality. However, an accurate link measurement is a precursor to channel selection which in turn allows more efficient use of the wireless resources, especially in a crowded and dense wireless environment. In this paper, we present CSI-EWCA, an entropy-based WLAN channel allocation model using channel state information to combat the unreliability in RSSI. To develop a self-reliant system that is independent of CSI data for devices with low computational power, we develop a machine learning model to predict channel spectral entropy from physical layer network information extracted from the Linux kernel. The experimental results in our testbed using CSI-EWCA for channel selection show a 44.87% decrease in average jitter and 16.15% improvement in average throughput compared with the conventional RSSI model.

POSTER ABSTRACTS

Poster #43 • Alamin Mohammed

University of Notre Dame

A Passive Client Side Control Packet-Based WiFi Traffic Characterization Mechanism

WiFi has emerged as a pivotal technology for delivering Quality of Experience (QoE) to mobile devices. Unfortunately, exploding numbers of competing devices, potential encroachment by cellular technology, and dramatic increases in content richness deliver a more variable QoE than desired. Moreover, such variance tends to occur both across time and space making it a difficult problem to debug. Existing active approaches tend to be expensive or impractical while existing passive approaches tend to suffer from accuracy issues. In our paper, we propose a novel passive client-side approach that provides an efficient and accurate characterization by taking advantage of the properties of Frame Aggregation (FA) and Block Acknowledgements (BA). We show in the paper that one can accurately derive important metrics such as airtime and throughput with only a minimal amount of observed BAs. We show through extensive experiments the validity of our approach and conduct validation studies in the dense environment of a campus tailgate.

Poster #44 • Iretiayo Akinola

Columbia University

Accelerated Robot Learning via Human Brain Signals

In reinforcement learning (RL), sparse rewards are a natural way to specify the task to be learned. However, most RL algorithms struggle to learn in this setting since the learning signal is mostly zeros. In contrast, humans are good at assessing and predicting the future consequences of actions and can serve as good reward/policy shapers to accelerate the robot learning process. Previous works have shown that the human brain generates an error-related signal, measurable using electroencephalography (EEG), when the human perceives the task being done erroneously.

In this work, we propose a method that uses evaluative feedback obtained from human brain signals measured via scalp EEG to accelerate RL for robotic agents in sparse reward settings. As the robot learns the task, the EEG of a human observer watching the robot attempts is recorded and decoded into noisy error feedback signal.

From this feedback, we use supervised learning to obtain a policy that subsequently augments the behavior policy and guides exploration in the early stages of RL. This bootstraps the RL learning process to enable learning from sparse reward. Using a robotic navigation task as a test bed, we show that our method achieves a stable obstacle-avoidance policy with high success rate, outperforming learning from sparse rewards only that struggles to achieve obstacle avoidance behavior or fails to advance to the goal.

Poster #45 • Felipe Arias

University of Illinois, Urbana Champaign

Efficient Motion Planning in Dynamic Environments

Motion planning, the process by which a robot computes the trajectory it will take to arrive at its goal configuration, is a widely studied problem with countless applications such as space exploration, search and rescue, and autonomous driving. As such, motion planning in static environments has been extensively studied and can be solved efficiently. However, motion planning in dynamic environments is still computationally expensive because it requires adding a dimension (i.e., time) to the search space. Our goal is to create algorithms that quickly find cheap paths in the presence of dynamic obstacles without exhaustive search. We use sampling-based motion planning approaches that efficiently avoid collisions with moving obstacles by approximating the connectivity of the workspace with a graph. Some of our contributions and interests include faster path finding, better sampling efficiency, cheaper paths, and roadmaps that are more robust in the dynamic setting.

POSTER ABSTRACTS

Poster #46 • Diane Uwacu

Texas A&M University

Using Motion Planning to Study the Accessibility of Robots and Proteins

To effectively investigate a planning problem's unique environment, motion planning algorithms can take advantage of information on the topology of the environment. However, methods based on topological guidance only accounts for connectivity whilst ignoring other path requirements such as clearance. Since environments often contain more information that helps to meet more path requirement criteria, we present an annotated-skeleton biased planning method that annotates the workspace skeleton with environment properties and guides a sampling-based motion planner. Based on results from testing on robotics problems and applications arising in drug design, we found more quality-specific and useful paths with little to no time overhead.

Poster #47 • Diane Uwacu

Texas A&M University

Abstract Title: Annotated-Skeleton Based Planning for Robots and Drug Molecules

Motion planning problems consist of finding a valid path for a movable object in a given environment. In order to effectively investigate each motion planning problem's unique environment, planning algorithms can take advantage of information about the connectivity of the environment using a topological skeleton of the environment for guidance. However, topological guidance alone does not help with additional properties to connectivity such as path safety, energy optimization, etc. Since environments often contain information that helps meet those path requirement criteria, we annotate the skeleton with the additional information and use it to bias planning towards finding the desired paths efficiently. We test our method on different motion planning problems arising in robotics and in drug design by studying the path of a drug molecule to the binding site of a protein.

Poster #48 • Troi Williams

University of South Florida

Learning State-Dependent, Sensor Measurement Models for Localization

A robot typically relies on sensor measurements to infer its state and the state of its environment. Unfortunately, sensor measurements are noisy, and the amount of noise can vary with state. The literature provides a collection of methods that estimate and adapt measurement noise over time. However, many methods do not assume that measurement noise is stochastic, or they do not estimate sensor measurement bias and noise based on state. In this paper, we propose a novel method called state-dependent, sensor measurement models (SDSMMs). This method: 1) learns to estimate measurement probability density functions directly from sensor measurements and 2) stochastically estimates an expected measurement (which includes measurement bias) and a measurement noise, both of which are conditioned upon the states of a robot and its environment. Throughout this paper, we discuss how to learn an SDSMM and use it with the Extended Kalman Filter (EKF). We then apply our method to solve an EKF localization problem using a real robot dataset. Our localization results showed that at least one of our proposed methods outperformed a standard EKF in all 15 cases for 2D position error and 10 of 15 cases for 1D orientation error. Our methods had a mean improvement of 39% for position and 15% for orientation.

POSTER ABSTRACTS

Poster #49 • Ilemona Atawodi

University of Southern Mississippi

Threat Detection in Network Intrusion Detection Systems Using K Nearest Neighbors, Random Forest and Deep Learning

The web offers great opportunities and plays a crucial role in modern societies. It is also a quickly adapting sandbox for cybercrime. Out of 20 million attacks created daily, only 227,000 are detected and 85% of these attacks target the retail industry, costing billions of dollars annually. In this work, we leveraged the power machine learning algorithms to improve the detection rate of malicious communications. K nearest neighbors, Random Forest and multilayer perceptron (deep learning) were applied to the UNSW NB15 dataset. 10-fold cross-validation for applied to all models. As the baseline model, KNN had an accuracy of 96.06%. The multilayer perceptron surprisingly underperformed with an accuracy of 95.77%. A likely cause for this poor performance is the need for larger amounts of data for a multilayer perceptron. Random Forest outperformed the baseline model with an accuracy of 99.78%. number of bytes from source to destination, number of connections to the same service as the destination connection in the last 2 seconds and percentage of connections to the same service were found using Random Forest to be the most relevant features in discriminating between malicious and safe communications.

Our findings indicate that machine learning methods can detect and predict malicious communications better than the reactive approach of rule-based methods such as blacklists, antiviruses and antimalware.

Poster #50 • Matthew Landen

Georgia Institute of Technology

Towards Anomaly Detection of Advanced Persistent Threats Using Whole System Provenance Information

When trying to detect traditional malware, an analyst has an executable file that runs and displays certain behaviors. These behaviors are used to decide whether the executable is malicious or benign. In the context of an advanced persistent threat, this setup cannot successfully detect these attacks because attackers purposefully minimize the signs of their presence. Observing one piece of these attacks does not give the analyst enough confidence to accurately determine if program behaviors are part of a larger attack or just normal behaviors. To address this challenge, past work has shown that whole system provenance data which captures processes running on the system and the files, internet connections, and other processes they interact with is useful for attack detection and forensic investigation. This data allows analysts to connect related events together and reveal an overall attack path containing multiple attack steps.

This project seeks to capitalize on this rich source of information to perform anomaly detection to identify attack behaviors unfolding in the system. We propose to leverage graph structure embedding methods from the deep learning field to learn a model of normal system behavior. This model will then be deployed in a front-line detection system that raises an alarm when a subset of the active processes and system objects exhibit behavior that does not fit the learned model.

Poster #51 • Chukwuemeka Monwuba

St. Cloud State University, St. Cloud, MN

Smartphone Applications Privacy Research

Security and privacy are some of the prominent technology buzzwords of the last couple years. Every day, users interact with smartphone applications to perform several tasks both necessary and unnecessary to improving their quality of life. This study aims to reflect on user perception and awareness of possible privacy violations perpetuated by smartphone applications. Several smartphone applications from iOS and Android platforms were studied for this research. A survey was then conducted with the students and faculty of St. Cloud State University, MN. The results of this survey inspire and provide the contents of this research.

POSTER ABSTRACTS

Poster #52 • Adebunmi Odefunso

Purdue University

Identification, Classification and Modelling of Traditional African Dance Using Deep learning.

Human action is defined as a temporal variation of human body. Many classification and mining activities have been carried out on a wide variety of datasets, but only few has been on dance classification and much less has been targeted towards generation of data that can be used for cultural preservation.

There are several deep learning frameworks that are being used for image and video classification with different accuracy level. There are daily improvements on these frameworks for better accuracy. Most of the algorithms that are being used have good action recognition and prediction scores when the images and or videos used in the datasets were taken inside and eliminates a lot of background noise. This is far from what real-life scenarios presents. The challenge in these cases is that most of the algorithms fail when used in real life situations. There is therefore a need to train the model with real life scenarios so that the aim of recognizing and predicting actions in real life by machines will be achieved.

The Traditional African dances are dance variations that has been practiced over different generation which involves rapid movement of various parts of the body at the same time. Dance varies from one culture to another. In Nigeria alone, there are dances such as Bata, Ighogho, Swange etc. Other examples are the Adumu dance of the Masai tribe from Kenya, Kpalongo for Ghana, Xhosa from south Africa. All these dances vary in the rate of movements, body part moved and sequence. The study is based on contemporary theory of preservation which emphasizes the need to preserve cultural heritages and why they should be preserved.

The study is set to carry out a multi stage and multi-layer Convolutional Neural Networks (CNN) and Recursive Neural Network (RNN) for the classification and identification of the dance actions from a images and videos with real life scenarios. One hundred thousand (100,000) images of ten dance classes and 50 videos will be used for the image classification using CNN architectures and frameworks. Dance classification will be carried out using RNN and libraries like Theano, caffe and Torch7. Dance modelling will be carried out using Generative Adversarial Networks (GANs).

The proposed framework is expected to output well classified and identified dance actions with high prediction rate. The output is also expected to generate a pose-stick dance model of at least one class of the dance types which can be used to transfer the dance actions on any other computer-generated model. This will have different applications in digital preservation of dance and intangible culture, as well as present a usable model that can be used for texturing in films and animation industries.

Poster #53 • Kentrell Owens

Carnegie Mellon University

Mental Models of Surveillance when Communicating with Incarcerated Relatives

Prisons are institutions that have robust systems of surveillance and collect lots of data from people that interact with them, but to date have received little attention in the computer privacy/security community. We sought to analyze this surveillance from the perspectives of people with incarcerated relatives. We examined the privacy expectations (or "mental models") of families of incarcerated people and compared them to actual privacy practices of prisons/prison communication service vendors (as determined from our research into these practices). We interviewed 16 adults and found that families of incarcerated people typically underestimate the technological capabilities of prison communication companies and cannot distinguish well between prison and companies that they use for their communication services (e.g. phone, mail processing). The participants employed some privacy preserving mechanisms when communicating with their incarcerated relative but were unable to achieve any formal privacy due to the level of surveillance. The participants proposed several mechanisms for improving the privacy of their communications with their incarcerated relatives that also maintain their perceptions of the security goals of prisons.

POSTER ABSTRACTS

Poster #54 • Daniel Nkemelu

Georgia Institute of Technology

Online Learning Approach for Election Monitoring

Election monitoring is a democratic activity designed to improve electoral processes, deter fraud and prevent outbreak of violence. In recent years, most electoral conversations happen online where manual monitoring approaches are human-labor intensive, inefficient and difficult to scale. In this work, we present an online learning method to support intelligent real-time monitoring of social media streams, particularly Twitter, to identify actionable content posted online. Using data aggregated from the 2012 presidential elections in Ghana, we show that graph-based online learning algorithms can help drastically reduce and rank tweets for human reviewers while simultaneously handling topical shifts. This approach can be effective in a machine-in-the-loop setup, where the algorithm first filters out inactionable content, and the remaining data is passed to users for flagging, verification and action.

Poster #55 • Rrezarta Krasniqi

University of Notre Dame

Enhancing Source Code Refactoring Detection with Explanations from Commit Messages

We investigate the extent to which code commit summaries provide rationales and descriptions of code refactoring. We present a refactoring description detection tool CMMiner that detects code commit messages containing refactoring information and differentiates between twelve different refactoring types. We further explore whether refactoring information mined from commit messages using CMMiner, can be combined with refactoring descriptions mined from source code using the well-known RMiner tool. For six refactoring types covered by both CMMiner and RMiner, we observed 21.96% to 38.59% overlap in refactoring detected across four diverse open-source systems. RMiner identified approximately 49.13% to 60.29% of refactoring missed by CMMiner, primarily because developers often failed to describe code refactoring that occurred alongside other code changes. However, CMMiner identified 10.30% to 19.51% of refactoring missed by RMiner, primarily when refactoring occurred across multiple commits. Our results suggest that integrating both approaches can enhance the completeness of refactoring detection and provide refactoring rationales.

POSTER ABSTRACTS

Poster #56 • Matheus Venturyne & Xavier Ferreira

Princeton University

Proof-of-Stack Mining Games

Blockchains are the main innovation behind cryptocurrencies and have received significant public and industry attention since it allows the creation of decentralized public ledgers. Early cryptocurrencies like Bitcoin, make use of a Proof-of-Work (PoW) protocol in the production of blocks. In PoW, miners select the last block in the chain and try to solve a cryptographic puzzle. It follows, the probability of a miner mining the next block is proportional to their mining power. To incentivize users to mine, the Bitcoin protocol awards bitcoins as a reward for a miner that extends the longest chain. Unfortunately, PoW mining is expensive and causes significant environmental impact due to high energy consumption.

As an alternative, Proof-of-Stake (PoS) mining emerged as an environmentally friendly protocol. In PoS, in each time step, a miner is chosen randomly to receive timestamp, and the probability of a miner to be selected is proportional to their wealth. Each timestamp can be used to create a ``single'' block and are publishable on top of any block with a lower timestamp. Unfortunately, PoS protocols are significantly more complex to construct, and the economic incentives of PoS are little understood, which has slowed down their adoption. When miners are rewarded only for blocks that end in the longest chain, strategic miners can choose to withhold blocks and create a private longest chain to force honest miners to waste resources. If a miner has less than half of the mining resources, withholding attacks carries risks since strategic miners have no guarantee their private chain will ever become longer than the public chain.

The central question is to understand bounds on the mining resources of strategic miners such that those miners have the incentive to follow the protocol. We show that while a miner with a given mining resource prefers to follow the protocol in PoW, the same is not valid for PoS. Intuitively, when a miner withholds in PoW, that miner already committed with computational power to create those blocks on top of a parent block. On the other hand, in PoS, a miner has no cost for creating a block with an old timestamp. This difference implies that although a strategic miner must sometimes abandon their private chain in PoW, the same strategic miner has no cost for saving all their available timestamps. The lack of commitment brings to question if a strategic miner in PoS would ever want to forget the history since previous incentive analysis in blockchain mining relies heavily on the assumption that miners forget all the past once they publish a block. We settle this question by showing a reduction of an arbitrary strategy to a strategy that ignores history once it uses half of the timestamps it received so far. We further show that if a strategy is optimal, miners must use at least half of their timestamps infinitely often, which implies a recurrent Markov Chain can represent the strategy.