Aug 16-19, 2023

COMPASS

Protea Hotel Breakwater Lodge, Waterfront
Cape Town, South Africa

Program Summary
Wednesday 16 August 2023 (Workshops)

8:00 - 9:00	**Registration + Tea/Coffee**	
9:00 – 17:30	**Workshop 1:** Natural Language Processing	Venue 4
	Doctoral and Masters Consortium (DMC)	Venue 5, 6

Thursday 17 August 2023 (Main Conference)

8:00 - 9:00	**Registration + Tea/Coffee**	
9:00 - 9:30	**Inauguration**	Auditorium
9:30 – 10:30	Opening Keynote **by *Bushra Razack***	Auditorium
10:30 - 11:00	**Coffee break**	
11:00 - 11:50	**Paper Session 1**: Non-profit organizations and social workers	Auditorium
	Paper Session 3: Technology applications and innovations	Venue 4, 5, 6
11:55 - 12:45	**Paper Session 2:** Sustainability	Auditorium
	Paper Session 4: Machine Learning and AI	Venue 4, 5, 6
12:45 - 14:00	Lunch break	
14:00 - 15:30	**Posters and Demos**	Venue 1, 2, 3
15:30 - 16:00	**Coffee break**	
16:00 - 16:50	**Paper Session 5:** Climate & Environment	Auditorium
	Panel 1: *Effective Working Environment and Factor for A Software Engineer in Companies That Are Not ICT Based*	Venue 4, 5, 6
16:55 - 17:45	**Paper Session 6:** Finance & Economics	Auditorium
	Panel 1 (cont'd): *Effective Working Environment and Factor for A Software Engineer in Companies That Are Not ICT Based*	Venue 4, 5, 6
19:00 – 21:00	Gala Braai	**Venue 1, 2, 3**

Friday 18 August 2023 (Main Conference)

8:00 - 9:00	**Registration + Tea/Coffee**	
9:00 - 10:30	**Keynote 2** by *Shikoh Gitau* and *Mmaki Jantjies*	Auditorium
10:30 - 11:00	Coffee break	
11:00 - 11:50	**Paper Session 7:** Privacy, Trust, Security, Ethics	Auditorium
11:55 - 12:45	**Paper Session 8:** Social Networks and Human Factors	Auditorium
12:45 - 14:00	Lunch break	
14:00 - 15:30	**Panel 2:** *The World Usability Initiative: Toward Inclusive and Usable Computing Technologies Worldwide*	Auditorium
15:30 - 16:00	Coffee break	
16:00 - 17:30	**Town Hall and Closing**	Auditorium

Saturday 19 August 2023 (Workshops)

8:00 - 9:00	Registration + Tea/Coffee	
9:00 – 12:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
	Workshop 3: Empowering Future Scholars	Venue 4
12:30 - 14:00	Lunch break	
14:00 - 17:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
	Workshop 4: Research with Communities	Online

Program
Wednesday 16 August 2023 (Workshops)

The Doctoral and Masters Consortium (DMC) and workshop 1 will run in parallel.
Workshop 1: Natural Language Processing for Southern African Languages

8:00 - 9:00	Registration + Tea/Coffee	
9:00 - 10:30	**Workshop 1:** Natural Language Processing	Venue 4
	Doctoral and Masters Consortium (DMC)	Venue 5, 6
10:30 - 11:00	Coffee break	
11:00 - 12:30	**Workshop 1:** Natural Language Processing	Venue 4
	Doctoral and Masters Consortium (DMC)	Venue 5, 6
12:30 - 14:00	Lunch break	
14:00 - 15:30	**Workshop 1:** Natural Language Processing	Venue 4
	Doctoral and Masters Consortium (DMC)	Venue 5, 6
15:30 - 16:00	Coffee break	
16:00 - 17:30	**Workshop 1:** Natural Language Processing	Venue 4
	Doctoral and Masters Consortium (DMC)	Venue 5, 6

Thursday 17 August 2023 (Main Conference)

Papers have been divided into paper sessions by theme. The morning paper sessions will be running in parallel so please select one to attend in each time slot. The afternoon paper sessions will run parallel to a panel discussion.

8:00 - 9:00	Registration + Tea/Coffee	
9:00 - 9:30	**Inauguration**	Auditorium
9:30 – 10:30	Opening Keynote **by *Bushra Razack***	Auditorium
10:30 - 11:00	Coffee break	
11:00 - 11:50	**Paper Session 1 & 3 run in parallel, select either one**	
	Paper Session 1: Non-profit organizations and social workers • **Windhoek Smart City Hunt App: Designing for Citizen Engagement** *by Kaulyaalalwa Peter, Tinashe Kanengoni, Takunda Hwaire, Heike Winschiers-Theophilus* • **Focusing on the Unfocused: Corresponding Perspectives on Connectivity among Small-Scale Non-Profit Organizations Working for Street Children in Bangladesh and Their Donors** *by Rudaiba Adnin, Ishita Haque, Sadia Afroz, Alvi Md. Ishmam, Sakil Sarkar, Md. Kafi Khan, Afsana Mimi, Sriram Chellappan, A. B. M. Alim Al Islam* • **Exploring the Barriers and Potential Opportunities for Technology Integration in Community-based Social Service Organizations** *by Oghenemaro Anuyah, Ann-Marie Conrado, Clinton Carlson, Hope Gilbride, and Ronald Metoyer* • **Quantifying the Quality of Parent-Child Interaction Through Machine-Learning Based Audio and Video Analysis: Towards a Vision of AI-assisted Coaching Support for Social Workers** *by Atefeh Jebeli, Lujie Karen Chen, Katherine M Guerrerio, Sophia Papparotto, Lisa Berlin, Brenda Jones Harden* • **On the Frontline During the Covid-19 Pandemic: Gender Inequality and Experiences of Healthcare Workers in Pakistan** *by Rukhshan Haroon, Ayesha Naeem, Priya Fatima Sajjad, Zartash Afzal Uzmi*	Auditorium

	Paper Session 3: Technology applications and innovations • **VibWall: Smartphone's Vibration Challenge-Response for Wall Crack** Detection *by Wei Sun* • **Exploring and testing Fuzzy Logic AI and IoT-enabled hydroponic dosing systems aimed at rural subsistence farmers in South Africa** *by Damion Joyner, Sarina Till* • **Robust OCR Pipeline for Automated Digitization of Mother and Child Protection Cards in India** *by Devesh Pant, Dibyendu Talukder, Aaditeshwar Seth, Rohit Singh, Brejesh Dua, Rachit Pandey, Srirama Maruthi, Mira Johri And Chetan Arora* • **Evaluation of Dependency Structure for Multivariate Weather Predictors using Copulas** *by Samuel C. Maina, Dorcas Mwigereri, Jonathan Weyn, Lester Mackey, Millicent Ochieng* • **Pixel Perfect: Using Vision Transformers to Improve Road Quality Predictions from Medium Resolution and Heterogeneous Satellite Imagery** *by Aggrey Muhebwa, Gabriel Cadamuro and Jay Taneja*	Venue 4, 5, 6
11:55 - 12:45	**Paper Session 2 & 4 run in parallel, select either one**	
	Paper Session 2: Sustainability • **Understanding Household Consumption Practices and their Motivations: Opportunities to Foster Sustainability Practices** *by Dushani Perera, Nervo Verdezeto Dias, Julie Gwilliam, Parisa Eslambolchilar* • **How Viable are Energy Savings in Smart Homes? A Call to Embrace Rebound Effects in Sustainable HCI** *by Christina Bremer, Harshit Gujral, Michelle Lin, Lily Hinkers, Christoph Becker, Vlad C. Coroamă* • **How sustainable is your menu? Designing and assessing an interactive artifact to support chefs' sustainable recipe-planning practices** *by Aykut Coskun, Hüseyin Uğur, Aysen Coskun* • **FoodWise: Food Waste Reduction and Behavior Change on Campus with Data Visualization and Gamification** *by Yue Yu, Sophia Yi, Xi Nan, Leo Yu-Ho Lo, Leo Yu-Ho Lo, Kento Shigyo, Liwenhan Xie, Jeffry Wicaksana, Kwang-Ting Cheng, Huamin Qu* • **Designing for Educational Resilience to reduce School Dropout: A Case Study of Namibian San Learners** *by Rosetha Kays, Naska Goagoses, Heike Winschiers-Theophilis*	Auditorium
	Paper Session 4: Machine Learning and AI • **Analysis of performance improvements and bias associated with the use of human mobility data in COVID-19 case prediction models** *by Saad Mohammad Abrar, Naman Awasthi, Daniel Smolyak, Vanessa Frías-Martínez* • **Hate Speech Detection in Limited Data Contexts using Synthetic Data Generation** *by Aman Khullar, Daniel Nkemelu, Cuong Viet Nguyen, Michael Best* • **AI-based Market Intelligence Systems for Farmer Collectives: A Case-study from India** *by Ronak Ladhar, Sourav Sharma, Srikant Tangirala, Nishant Gupta, Abdul Azeem, Arjav Jain, Bhuvan Chand Katakam, Bommakanti Aditya, C. Sankaraiah, Hari Prasad Piridi, Kaushalendra Yadav, Kumra Vittalrao, Matiur Rahman, Rashul Chutani, Rishi Shah, Rohan Katepallewar, Dipanjan Chakraborty, Aaditeshwar Seth* • **Community and Facility Health Information System Integration in Malawi: A Comparison of Machine Learning and Probabilistic Record Linkage Methods** *by Anna Dixon, Limbani Thengo, Emmanuel Kitsao, Kondwani Matiya, Mourice Barasa, Revelation Nyirongo, Jennifer Muli, Funny Kamanga, Chiyembekezo Kachimanga, Fabien Munyaneza, Phillip Ngari, Henry Makungwa, Jones Chimpukuso, Mercy Amulele, Elijah Karari, Simon Mbae* • **Flamingo: Environmental Impact Factor Matching for Life Cycle Assessment with Zero-Shot Machine Learning** *by Bharathan Balaji, Venkata Sai Gargeya Vunnava, Nina Domingo, Shikhar Gupta, Harsh Gupta, Geoffrey Guest, Aravind Srinivasan*	Venue 4, 5, 6
12:45 - 14:00	Lunch break	
14:00 - 15:30	**Posters and Demos**	Venue 1, 2, 3

15:30 - 16:00	Coffee break	
	Paper Session 5 & 6 (runs parallel to Panel 1)	
16:00 - 16:50	**Paper Session 5:** Climate & Environment • **Characterizing Swiss Alpine Lakes: from Wikipedia to Citizen Science** *by Yuanhui Lin, Daniel Gatica-Perez* • **A Characterization of Land-use Changes in the Proximity of Mining Sites in India** *by Shivani A Mehta, Ashish, Mayur Solanki, Aaditeshwar Seth* • **Analysis of Elephant Movement in Sub-Saharan Africa: Ecological, Climatic, and Conservation Perspectives** *by Matthew Hines, Gregory Glatzer, Shreya Ghosh, Prasenjit Mitra* • **PollutionMapper: Identifying Global Air Pollution Sources** *by Dhruv Agarwal, Pankaj Kumar, Srinivasan Iyengar* • **Adapting Forests to an Uncertain Climate - A Critical Technology Review** *by Max Krüger, Felix Carros, Maximilian Brandt, Debora de Castro Leal*	Auditorium
16:55 - 17:45	**Paper Session 6:** Finance & Economics • **Beyond Digital Financial Services: Exploring Mobile Money Agents in Tanzania as General ICT Intermediaries** *by Anandítha Raghunath, Innocent Obi, Hosea Mpogole, Richard Anderson* • **"Do you collect data to give to the university or do you do the work to benefit people?": Indigenous Data Sovereignty in Environmental Contexts** *by Amelia Lee Dogan, Danielle Wood* • **Moving targets: When does a poverty prediction model need to be updated?** *by Emily Aiken, Tim Ohlenburg, Joshua Blumenstock* • **Tracking Socio-economic Development in Rural India Using Satellite Imagery** *by Anant Sushil Gulgulia, Aman Gupta, Akshay Sarashetti, Aaditya Sinha, Aaditeshwar Seth* • **Poverty rate prediction using multi-modal survey and earth observation data** *by Simone Fobi, Manuel Cardona, Elliott Collins, Caleb Robinson, Anthony Ortiz, Tina Sederholm*	Auditorium
16:00 – 17:30	**Panel 1 (runs parallel to Paper Session 5 & 6):** Effective Working Environment and Factor for A Software Engineer in Companies That Are Not ICT Based	Venue 4, 5, 6
19:00 – 21:00	Gala Braai	Venue 1, 2, 3

Friday 18 August 2023 (Main Conference)

8:00 - 9:00	Registration + Tea/Coffee	
9:00 - 10:30	**Keynote 2** by *Shikoh Gitau* and *Mmaki Jantjies*	Auditorium
10:30 - 11:00	Coffee break	
11:00 - 11:50	**Paper Session 7:** Privacy, Trust, Security, Ethics • **Localised trust in a globalised knot: Designing information privacy for Digital-ID** *by Stefanus van Staden and Nicola J Bidwell* • **A First Look into Software Security Practices in Bangladesh** *by Ankit Shrestha, Tanusree Sharma, Pratyasha Saha, Syed Ishtiaque Ahmed, Mahdi Nasrullah Al-Ameen* • **Making ethics at home in Global CS Education: Provoking stories from the Souths** *by M. Wong-Villacres, C. Kutay, S. Lazem, N. Ahmed, C. Abad, C. Collazos, S. Elbassuoni, F. Islam, D. Singh, A. T Mayeesha, M. M. Ujakpa, T. Zaman, N.J. Bidwell* • **Shadow Program Committee: Designing for Diversity and Equity within Academic Communities** *by Delvin Varghese, Hafeni Mthoko, Jessica Waterson, Pranav Kulkarni, Dan Richardson, Shaimaa Lazem, Patrick Olivier*	Auditorium

	• **Evaluating Mobile Banking Application Security Posture Using the OWASP's MASVS Framework** *by Trevor Henry Chiboora, Lenah Chacha, Theoneste Byagutangaza, Assane Gueye*	
11:55 - 12:45	**Paper Session 8:** Social Networks and Human Factors • **A Friend in Need is a Friend Indeed: Investigating the Quality of Training Data from Peers for Auto-generating Empathetic Textual Responses to Non-Sensitive Posts in a Cohort of College Students** *by Ravi Sharma, Sriram Chellappan, Jamshidbek Mirzakhalov, Pratool Bharti, Raj Goyal, Trine Schmidt* • **To Reply or to Quote: Comparing Conversational Framing Strategies on Twitter** *by Himanshu Zade, Spencer Williams, Christina Smith, Theresa Tran, Sukrit Venkatgiri, Gary Hsieh, Kate Starbird* • **'Khep': Exploring the Factors Behind the Rise of Contractual Rides and the Reluctance to Adopt Ride-Sharing Apps in Bangladesh** *by Aditto Baidya Alok, Hasibul Sakib, Shamsil Arafin Ullah, Fardin Huq, Riya Ghosh, Joyanta Jyoti Mondal, Md. Sadiqul Islam Sakif, Jannatun Noor* • **Examining Indian Teachers' Sociotechnical Support Infrastructures in Low-income Schools** *by Akanksha Y. Gavade, Annie Sidotam, Rama Adithya Varanasi* • **Roles of Technology for Risk Communication and Community Engagement in Bangladesh during COVID-19 Pandemic.** *by Anik Sinha, Nova Ahmed, Md Sabbir Ahmed, Ifti Azad Abeer, Rahat Jahangir Rony, Anik Saha, Syeda Shabnam Khan, Shajnush Amir, Shabana Khan*	Auditorium
12:45 - 14:00	Lunch break	
14:00 - 15:30	**Panel 2:** The World Usability Initiative: Toward Inclusive and Usable Computing Technologies Worldwide	Auditorium
15:30 - 16:00	Coffee break	
16:00 - 17:30	**Town Hall and Closing**	Auditorium

Saturday 19 August 2023 (Workshops)

Workshops will run in parallel.
Workshop 2: Approaches to leveraging digital higher education in Africa
Workshop 3: Empowering Future Scholars - Coaching Workshop for Junior Researchers
Workshop 4: Online Only - Research with Communities: Learning with Experts from Global Community Networks

8:00 - 9:00	Registration + Tea/Coffee	
9:00 - 10:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
	Workshop 3: Empowering Future Scholars	Venue 4
10:30 - 11:00	Coffee break	
11:00 – 12:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
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12:30 - 14:00	Lunch break	
14:00 - 15:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
	Workshops 4: Research with Communities	Online
15:30 - 16:00	Coffee break	
16:00 - 17:30	**Workshop 2:** Approaches to leveraging digital higher education in Africa	Venue 3
	Workshop 4: Research with Communities	Online

Keynote Speakers

Bushra Razack

CEO of Philippi Village

Bushra is a community development specialist with a strong background in social justice. Her expertise in stakeholder engagement and conflict resolution is at the core of her skillset.

She has worked across the African continent, as well as internationally. Countries such as Ghana, Kenya, Cameroon, Ireland, Czech Republic, and South Africa are some of the countries where she spent significant time in social justice work and community engagement. Bushra's experience in the development sector includes working with Standard Chartered Bank and their global initiative Seeing is Believing, Christian Blind Mission, Islamic Relief South Africa, United Nations Office for the Coordination of Humanitarian Affairs and Peace Child International.

At the age of 11, Bushra interviewed Archbishop Emeritus Desmond Tutu. At 12 she participated in the Millennium Young People's Congress in Hawaii, and at 13, she co-edited her first book. These early life events are hallmark, and forever paved the way for living her authentic self and passionately striving toward social justice for all. Bushra is one of the100 young South African leaders that were selected for the prestigious Mail & Guardian Mzanzi Top 100 list and is the winner of the Power Woman of the Year Award in Innovation.

In South Africa, Razack was instrumental in the establishment of a much-needed orphanage and emergency placement centre in Mitchells Plain. Bushra was the first female to be appointed as National Program Manager at Islamic Relief South Africa.

Bushra is highly driven and committed to ensuring honest and positive outcomes to make the world a better place. She is an incredible place maker and recognizes local and community assets, inspiration and potential. She successfully creates spaces and programs that are relevant and harnesses ideas and assets of the people that these projects affect in a way that is not just a box ticking exercise. The ground in communities, recognizing the power of community ensuring that outcomes are not just a box ticking exercise but that they achieve real shifts and meaningful results.

Dr Mmaki Jantjies

Group Executive: Innovation & Transformation, Telkom SA

Dr. Mmaki Jantjies is the Group Executive for the Innovation & Transformation Office at the South African Telecommunications Provider, Telkom SA. She joined Telkom in April 2021 to establish the new Innovation Office, focusing on leading digital innovation as well as research and development initiatives of the Telkom Group. Dr. Jantjies is also an Adjunct Associate Professor at a South African University.

She holds a PhD in Computer Science from the University of Warwick (UK), other qualifications from the UK and South Africa, and is one of South Africa's foremost thought leaders in technology for development. Prior to joining Telkom SA, she led two Academic Departments and has played a key leadership role in advancing technology innovation and programmes within South Africa, in emerging technology areas such as Augmented and Virtual Reality as well as Big Data.

Dr. Jantjies is a member of the South African Young Association of Scientists (SAYAS), which supports the development of the field of science in South Africa. Passionate about community development, she founded a non-profit organization that rolled out programs that would educate and skill teachers and children on digital literacy, programming and related technology skills. She is also a member of the World Economic Forum (WEF) Young Global Leaders.

Dr Shikoh Gitau

CEO of Qhala

Shikoh is the CEO of Qhala, a Digital Innovation company that catalyzes digital transformation capabilities for organizations across Africa. She has over 10 years of experience in the Research, Design, Implementation, and Management of Digital Technologies. She has established expertise in both African and Emerging Markets specialized in solving problems in Agriculture, Education, Health, Payments, Retail and Renewable energies.

She is responsible for the set-up of Safaricom Alpha, a first of the kind corporate innovation hub in Africa. Where she worked as the Head of Products – Innovation and acted as the Chief Innovation Officer. Shikoh also led Safaricom's foray into becoming a digital company, by putting together a strategy, and cross-functional teams to execute the strategy.

Dr. Shikoh has previously worked with Africa Development Bank (AfDB), where she was leading and advising governments across Africa to adopt ICT for service delivery, she developed the Digital Government Blueprint, a strategic document to guide governments in digital transformation, now adopted by Smart Africa. She has also worked with Google and Microsoft in their emerging markets teams.

She has received numerous awards in recognition of her efforts in influencing Business and Government as well as Technology. Dr. Shikoh seats on various boards in ICT companies and contributes to a number of steering committees and think tanks on Africa and technology. Shikoh holds a PhD and MSc in Computer Science from the University of Cape Town, South Africa.

Dr. Shikoh serves as an advisor to governments on matters of data and digital development.

Paper Abstracts

Paper Session 1: Non-Profit Organizations and Social Workers

Thursday 17 August, 11:00 - 11:50, Auditorium

Windhoek Smart City Hunt App: Designing for Citizen Engagement

Kaulyaalalwa Peter, Tinashe Kanengoni, Takunda Hwaire, Heike Winschiers-Theophilus

This paper presents a Smart City Hunt app, which was developed to engage diverse citizens by raising awareness, providing smart experiences and collecting data to guide strategies to transform the City of Windhoek into a smart and sustainable city. The project was done in collaboration with the UNDP accelerator lab Namibia, the City of Windhoek, and youth from informal settlements to explore alternative mechanisms of involving citizens from different backgrounds. Twenty-five participants took part in the half-day city hunt, making use of different modes of transport on their journey. The participants were guided via a location-based smart application, built with Locatify, which triggered challenges and important information such as identifying high carbon emitters and job vacancies respectively. A post-experience survey revealed that the participants recommend the use of the Smart City Hunt app for further citizen engagements, acknowledging the format of creating awareness and providing information on smart cities.

Focusing on the Unfocused: Corresponding Perspectives on Connectivity among Small-Scale Non-Profit Organizations Working for Street Children in Bangladesh and Their Donors

Rudaiba Adnin, Ishita Haque, Sadia Afroz, Alvi Md. Ishmam, Sakil Sarkar, Md. Kafi Khan, Afsana Mimi, Sriram Chellappan, A. B. M. Alim Al Islam

Non-profit organizations (NPOs) serve marginalized communities, such as street children. Their success highly depends on donationraising and their connections with donors, where online platforms (e.g. social media, individual websites, messaging applications, etc.) play a significant role. However, small-scale NPOs face several challenges due to their resource constraints while connecting with their donors and potential donors using existing online platforms. Therefore, we performed a mixed-method study to investigate the connectivity settings among such NPOs, donors, and potential donors. Consequently, we performed semi-structured interviews with seven NPOs working for street children and 21 current donors and conducted an online survey of 42 potential donors in a developing country (Bangladesh). The findings of our study reveal influential factors pertinent to the non-profit work contexts and gaps in connectivity among the stakeholders (small-scale NPOs, donors, and potential donors). We discover that, although having an online presence positively impacts the credibility of small-scale NPOs to the donors by introducing familiarity, yet, possessing such an online presence is challenging for the resource-constrained small-scale NPOs. We further provide several design implications for improving the connectivity settings, especially in terms of online connectivity, among the stakeholders by focusing on their essential roles and reduction of their encountered challenges.

Exploring the Barriers and Potential Opportunities for Technology Integration in Community-based Social Service Organizations

Oghenemaro Anuyah, Ann-Marie Conrado, Clinton Carlson, Hope Gilbride, and Ronald Metoyer

Community-based social service organizations often face multifaceted challenges, including limited resources, inadequate staffing, funding constraints, and high demand for their services. These challenges are often exacerbated when serving vulnerable communities with complex social needs. Despite these difficulties, technology holds the potential to help bridge the service gap, enabling these organizations to respond more effectively to the diverse needs of their communities. In this paper, we conducted semi-structured interviews with 21 social service organizations in the USA that serve a marginalized community affected by poverty. Our study revealed several technological challenges that these organizations face, particularly in knowledge management and outreach efforts. Based on our findings, we offer design recommendations for empowering community-based social service organizations and the people they serve through technology. By leveraging the capabilities of technology, our study aims to promote social justice by assisting community-based organizations in better serving their communities.

Quantifying the Quality of Parent-Child Interaction Through Machine-Learning Based Audio and Video Analysis: Towards a Vision of AI-assisted Coaching Support for Social Workers
Atefeh Jebeli, Lujie Karen Chen, Katherine M Guerrerio, Sophia Papparotto, Lisa Berlin, Brenda Jones Harden

Attachment is the emotional bonding between a child and a caregiver. Whether or not there is a secure attachment in early childhood has a profound life-long impact on the child. In recent years, attachment-based interventions have been developed and implemented, especially with families from low socioeconomic backgrounds. One important aspect of the program is to assess the quality of parent-child interactions through audio/video recorded at home while parent-child dyads were engaged in semi-structured interaction tasks, such as "three-bag-games". The current practice relies on human coders to rate the videos which is a time-consuming process. Using a dataset of 220 video recordings of parent-child dyads collected at home as part of an attachment-based intervention program, we prototype a machine learning approach based on human body keypoints extracted from the posture analysis tool OpenPose and voice activity features derived from audio recordings. The results show that there are potential values in using machine learning to improve the coding efficiency of parent-child interactions. When further developed and improved, this kind of model may contribute to a new vision of AI-assisted parenting coaching support to make evidence-based interventions accessible and affordable at a large scale to children and families.

On the Frontline During the Covid-19 Pandemic: Gender Inequality and Experiences of Healthcare Workers in Pakistan
Rukhshan Haroon, Ayesha Naeem, Priya Fatima Sajjad, Zartash Afzal Uzmi

This mixed methods study investigates the experiences of healthcare workers (HCWs) along gender lines during the Covid-19 pandemic in Lahore, the second most populous city in Pakistan. In-person semi-structured interviews (n=62) and researcher-administered surveys (n=631) were conducted with doctors and nurses in five private and public hospitals. The findings reveal that male and female HCWs shared experiences related to increased working hours, psychological burdens, and adverse financial impacts. However, female HCWs struggled more than male HCWs, as their responsibilities at home and in the workplace increased. Additionally, more female HCWs than their male peers reported experiencing occupational stress due to transportation issues, working during pregnancy, and discriminatory attitudes of the patients toward them. Building on the results from our study, we propose several technological and policy initiatives that can be adopted by governments and organizations, especially in countries like Pakistan, where women account for most of the healthcare workforce but continue to bear a heavier burden when balancing work and family.

Paper Session 3: Technology applications and innovations
Thursday 17 August, 11:00 - 11:50, Venue 4, 5, 6

VibWall: Smartphone's Vibration Challenge-Response for Wall Crack Detection
Wei Sun

As the building ages, the wall structure may become deteriorated (e.g., wall cracks, discontinuities, and corrosion) due to the variation of the environment (i.e., temperature and humidity). Moreover, these wall cracks, discontinuities, and corrosion will affect the living comfort and coziness. As such, the wall health diagnostic becomes crucial for the safety and comfort of modern buildings. However, the existing wall health detection techniques (e.g., UWB radars, acoustic sensing, and sensor embedding techniques) are high-cost, not ubiquitous, and not robust to the variation of the environment.

In this paper, we propose VibWall, a system that can use the smartphone's sensors (i.e., accelerometer, gyroscope, and vibrator) to detect the wall's structural health. Specifically, the wall cracks can be detected for living safety, comfort, and coziness. Our key idea is that the smartphone's vibration is absorbed, reflected, and propagated disparately based on the physical structure of the wall. To be specific, we employ a novel challenge-response scheme, where the challenge is a sequence of heterogeneous vibration patterns from the smartphone's vibrator, and the responses to these vibrations are sensed by the smartphone's gyroscope and accelerometer sensors. Then, the machine learning-based classifier (e.g., random forest classifier) will be used to discriminate between the healthy wall and the wall with cracks, discontinuities, or corrosion based on these responses. Our experimental results show good performance on the wall's structural health detection with the wall specimen and real-world walls.

A simulated study exploring and testing Fuzzy Logic AI and IoT-enabled hydroponic dosing systems aimed at rural subsistence farmers in South Africa
Damion Joyner, Sarina Till

This paper analyses the suitability of a Fuzzy Logic (FL) AI-trained machine learning model to assist IoT-based smart hydroponics for deployment with South African rural subsistence farmers. To answer these questions a fuzzy logic model was developed to accurately determine and adjust outputs, based on inputs received from IoT sensors monitoring the nutrient solution and environment conditions in the hydroponics system. We conducted an initial evaluation of the FL-AI, followed by a real-world test based on an existing data set and finally conducted testing on simulated data to ensure that the AI can accurately determine crisp values to pass to a could based IoT platform access by a micro-controller which adjusts the environment and settings of the hydroponics system. This approach was followed to ensure that we respect the time and availability of our research participants. We found that the system was able to accurately determine the necessary crisp values needed by the microcontroller. We further report on the suitability of FL-AI for rural subsistence farmers as the AI is less complex, reduces energy consumption, and resource waste, and the burden of manually monitoring and adjusting hydroponics systems, and is easy to use for first-time growers. We further discuss lessons learned particularly in the South African context such as the necessity of solar power-enabled systems and local wifi networks rather than cloud-based IoT platforms.

Robust OCR Pipeline for Automated Digitization of Mother and Child Protection Cards in India
Devesh Pant, Dibyendu Talukder, Aaditeshwar Seth, Rohit Singh, Brejesh Dua, Rachit Pandey, Srirama Maruthi, Mira Johri And Chetan Arora

The Universal Immunization Programme (UIP) in India has a mandate to fully vaccinate all of India's 27 million children born annually. The vaccination doses are recorded by frontline health workers on standardized paper-based Mother and Child Protection (MCP) cards, which are manually digitized by data entry operators, resulting in poor data quality, delays, and significant time and resources. In our paper, we focus on Optical Character Recognition (OCR) based automated digitization of MCP card images captured through a smartphone application developed by us. By utilizing a standardized template for the MCP cards, which is available a-priori, we register the card images and perform OCR on the extracted region of interest (ROIs). Since the cards with curvature or torn edges had poor ROIs, we built a global-local alignment technique which first approximates the ROI using global Homography and then refines using a local Homography resulting in improved accuracy. Our pipeline gives a character level accuracy of 98.73% on our dataset, against 75.02% by Google Cloud Vision and 79.26% by Azure OCR. We also describe our field testing experience, where the digitized MCP card images were used to provide useful features on the smartphone application for health workers to conduct vaccination sessions.

Evaluation of Dependency Structure for Multivariate Weather Predictors using Copulas
Samuel C. Maina, Dorcas Mwigereri, Jonathan Weyn, Lester Mackey, Millicent Ochieng

In the Global South, climate change has had a significant impact, resulting in more frequent and severe weather events like droughts, floods, and storms, which are leading to crop failures, food insecurity, and job loss. Populations with limited resources are especially vulnerable. In addition, coastal infrastructure and settlements are at risk as a result of rising sea levels and coastal erosion. As a result of climate change, the marginalized communities will be further disadvantaged and existing inequalities will worsen and these effects are expected to increase in intensity in the future, emphasizing the urgency of preventing and adapting to them. Although machine learning and numerical modeling have advanced, accurate forecasting of weather remain a difficult challenge due to the complex interactions between atmospheric and oceanic variables. It is crucial to understand the relationship between weather predictors in order to improve the accuracy and reliability of forecasts.

The purpose of this research is to examine the potential of vine copulas in explaining these complex relationships in different locations. Copulas provide a way to separate the marginal distributions from the dependency structure, offering a potential solution. They provide flexible way to model the dependence structure between random variables, allowing for more accurate and realistic risk assessments and simulations. Vine copulas are based on a variety of bivariate copulas, including Gaussian, Student's t, Clayton, Gumbel, and Frank copulas. Vine copulas, specifically, are effective in high-dimensional problems and offer a hierarchy of trees to express conditional dependence. In addition, we propose how this framework can be applied within the sub-seasonal forecasting models to enhance the prediction of different weather events or variables.

Pixel Perfect: Using Vision Transformers to Improve Road Quality Predictions from Medium Resolution and Heterogeneous Satellite Imagery
Aggrey Muhebwa, Gabriel Cadamuro, and Jay Taneja

Critical infrastructure, such as roads and electricity, are core systems that enable economic development. However, these crucial systems are frequently under-monitored in developing regions, resulting in lost opportunities for growth. Recent advances in remote sensing and machine learning have enabled monitoring and measurement of infrastructure faster and more frequently than traditional methods. However, ground data is often unavailable, resulting in a disconnect between labels and remotely sensed data. Furthermore, data from industrialized regions can only sometimes be transferred to regions with sparse data due to differences in the concept of quality between regions. Additionally, inconsistency in data and the complexity of ML models can introduce bias due to learned characteristics across diverse regions, leading to inaccurate predictions and recommendations for action. In this study, we train and compare traditional neural networks and vision transformers to predict road quality from medium-resolution satellite imagery and apply them to realistic data conditions: heterogeneous temporal-spatial resolutions. The best models (vision transformers) achieve AUROC scores of 0.934 and 0.685 for binary and five-class classification tasks, respectively, exhibiting results appealing for inference in otherwise unmeasured areas. Furthermore, these experiments and results showed that proper training techniques could produce accurate models from limited, heterogeneous, and low-resolution data.

Paper Session 2: Sustainability
Thursday 17 August, 11:55 - 12:45, Auditorium

Understanding Household Consumption Practices and their Motivations: Opportunities to Foster Sustainability Practices
Dushani Perera, Nervo Verdezeto Dias, Julie Gwilliam, Parisa Eslambolchilar

Understanding household practices, beliefs, relationships among the members, and their preferences are often overlooked in the design of home-based interventions aiming to reduce consumption. We conducted a survey in the United Kingdom (22 responses) and a follow-up interview with 13 households to inform the design of interventions for reducing household consumption by: 1) understanding household consumption practices, and 2) identifying the concerns and challenges for household engagement with sustainability practices. Our findings highlight how the perspectives, understanding, and motives for consumption reduction actively shape household practices and their intentional and non-intentional attempts to curtail consumption. Existing non-negotiable practices led to additional household consumption and we found different strategies households use to reach a shared-decision on food and energy use or to engage in sustainable practices that vary across inter-generational family members. Based on our findings, we provide opportunities for motivating and fostering engagement with sustainable practices at home.

How Viable are Energy Savings in Smart Homes? A Call to Embrace Rebound Effects in Sustainable HCI
Christina Bremer, Harshit Gujral, Michelle Lin, Lily Hinkers, Christoph Becker, Vlad C. Coroamă

As part of global climate action, digital technologies are seen as a key enabler of energy efficiency savings. A popular application domain for this work is smart homes. There is a risk, however, that these efficiency gains result in rebound effects, which reduce or even overcompensate the savings. Rebound effects are well-established in economics, but it is less clear whether they also inform smart energy research in other disciplines. In this paper, we ask: to what extent have rebound effects and their underlying mechanisms been considered in computing, HCI and smart home research? To answer this, we conducted a literature mapping drawing on four scientific databases and a SIGCHI corpus. Our results reveal limited consideration of rebound effects and significant opportunities for HCI to advance this topic. We conclude with a taxonomy of actions for HCI to address rebound effects and help determine the viability of energy efficiency projects.

How sustainable is your menu? Designing and assessing an interactive artefact to support chefs' sustainable recipe-planning practices
Aykut Coskun, Hüseyin Uğur, Aysen Coskun

Rising sustainability concerns in the food industry have driven the need for innovative approaches in culinary operations. Redesigning the menus and recipes from a sustainability perspective is a promising approach to reducing restaurants' environmental impact. Chefs, as crucial decision-makers in menu and recipe planning practices, play a vital role in promoting sustainable food services. However, the literature lacks insights into chefs' sustainable recipe planning practices and how information and communication technologies (ICTs) could support these practices. This paper addresses this gap by conducting individual interview sessions (n=10) and recipe generation workshops (n=10) with 20 chefs in total. It reveals four dimensions of sustainable recipes (locality, seasonality, frugality, and food quality) based on semi-structured interviews. It presents a novel interactive recipe planning concept called KNOBIE, which was designed to support chefs' sustainable recipe planning practices by using insights that gathered from the interviews. Lastly, based on an assessment of this concept through online recipe generation sessions with chefs, it provides five design implications for integrating ICTs into the sustainable menu and recipe planning practices to promote sustainable food services in restaurants.

FoodWise: Food Waste Reduction and Behavior Change on Campus with Data Visualization and Gamification
Yue Yu, Sophia Yi, Xi Nan, Leo Yu-Ho Lo, Leo Yu-Ho Lo, Kento Shigyo, Liwenhan Xie, Jeffry Wicaksana, Kwang-Ting Cheng, Huamin Qu

Food waste presents a substantial challenge with significant environmental and economic ramifications, and its severity on campus environments is of particular concern. In response to this, we introduce FoodWise, a dual-component system tailored to inspire and incentivize campus communities to reduce food waste. The system consists of a data storytelling dashboard that graphically displays food waste information from university canteens, coupled with a mobile web application that encourages users to log their food waste reduction actions and rewards active participants for their efforts.

Deployed during a two-week food-saving campaign at [the home university of the authors] in March 2023, FoodWise engaged over 200 participants from the university community, resulting in the logging of over 800 daily food-saving actions. Feedback collected post-campaign underscores the system's efficacy in elevating user consciousness about food waste and prompting behavioral shifts towards a more sustainable campus. This paper also provides insights for enhancing our system, contributing to the broader discourse on sustainable campus initiatives.

Designing for Educational Resilience to reduce School Dropout: A Case Study of Namibian San Learners
Rosetha Kays, Naska Goagoses, Heike Winschiers-Theophilis

School dropout amongst minority groups is a serious problem worldwide. Focusing on educational resilience can offer a novel beneficial approach to overcome the challenge. In this paper, we focus on San learners in Namibia, gaining a deeper understanding of the adversities they faced resulting in school dropout, and identifying personal and environmental factors that promote the development of educational resilience. Narrative interviews were conducted with ten San who completed secondary school and ten who dropped out of school, to identify challenges and factors. Rich picture sessions with twelve primary learners were used to identify current challenges. Based on an in depth analysis of the local adversities, a mobile digital application was designed, deploying a role model approach with local content. This empirical study provides a contribution to local technology design for social and mental well-being as part of a holistic solution for resilience building among marginalized learners.

Analysis of performance improvements and bias associated with the use of human mobility data in COVID-19 case prediction models
Saad Mohammad Abrar, Naman Awasthi, Daniel Smolyak, Vanessa Frías-Martínez

The COVID-19 pandemic has mainstreamed human mobility data into the public domain, with research focused on understanding the impact of mobility reduction policies as well as on regional COVID-19 case prediction models. Nevertheless, current research on COVID-19 case prediction tends to focus on performance improvements, masking relevant insights about when mobility data does not help, and more importantly, why, so that it can adequately inform local decision making. In this paper, we carry out a systematic analysis to reveal the conditions under which human mobility data provides (or not) an enhancement over individual regional COVID-19 case prediction models that do not use mobility as a source of information. Our analysis - focused on US county-based COVID-19 case prediction models - shows that (1) at most, 60% of counties improve their performance after adding mobility data; (2) that the performance improvements are modest, with median correlation improvements of approximately 0.13; (3) that improvements were lower for counties with higher Black, Hispanic, and other non-White populations as well as low-income and rural populations, pointing to potential bias in the mobility data negatively impacting predictive performance; and that (4) different mobility datasets, predictive models and training approaches bring about diverse performance improvements.

Hate Speech Detection in Limited Data Contexts using Synthetic Data Generation
Aman Khullar, Daniel Nkemelu, Cuong Viet Nguyen, Michael Best

A growing body of work has focused on text classification methods for detecting the increasing amount of hate speech posted online. This progress has been limited to only a select number of highly-resourced languages causing detection systems to either under-perform or not exist in limited data contexts. This is majorly caused by a lack of training data which is expensive to collect and curate in these settings. In this work, we propose a data augmentation approach that addresses the problem of lack of data for online hate speech detection in limited data contexts using synthetic data generation techniques. Given a handful of hate speech examples in a high-resource language such as English, we present three methods to synthesize new examples of hate speech data in a target language that retains the hate sentiment in the original examples but transfers the hate targets. We apply our approach to generate training data for hate speech classification tasks in Hindi and Vietnamese. Our findings show that a model trained on synthetic data performs comparably to, and in some cases outperforms, a model trained only on the samples available in the target domain. This method can be adopted to bootstrap hate speech detection models from scratch in limited data contexts. As the growth of social media within these contexts continues to outstrip response efforts, this work furthers our capacities for detection, understanding, and response to hate speech.

Disclaimer: This work contains terms that are offensive and hateful. These, however, cannot be avoided due to the nature of the work.

AI-based Market Intelligence Systems for Farmer Collectives: A Case-study from India
Ronak Ladhar, Sourav Sharma, Srikant Tangirala, Nishant Gupta, Abdul Azeem, Arjav Jain, Bhuvan Chand Katakam, Bommakanti Aditya, C. Sankaraiah, Hari Prasad Piridi, Kaushalendra Yadav, Kumra Vittalrao, Matiur Rahman, Rashul Chutani, Rishi Shah, Rohan Katepallewar, Dipanjan Chakraborty, Aaditeshwar Seth

Small and marginal farmers are unable to get a good price for their produce because of several challenges they face in market participation. Aggregation of produce via farmer cooperatives and the ability to delay sales (for non-perishable crops) to when market prices are high, has emerged as a useful strategy to improve farmer incomes. We work with a network of farmer cooperatives in India growing soyabean, and explore the potential of developing a machine learning based price forecasting and sales recommendation system that produces suggestions on the best dates when harvested soyabean crops should be sold: e.g. whether to sell right away (if prices are likely to fall in the future) or to wait (if prices are likely to rise). We present an evaluation of different methods for price forecasting and a prospect theory based method to produce sales recommendations. Experiments on historical data indicate that we can provide modest gains to farmers, and we build and field test an Android application for this purpose. Early results indicate a positive feedback. Our methods can be generalized to other agricultural commodities that can be stored for several months and help farmer cooperatives to compete effectively in agricultural markets.

Community and Facility Health Information System Integration in Malawi: A Comparison of Machine Learning and Probabilistic Record Linkage Methods
Anna Dixon, Limbani Thengo, Emmanuel Kitsao, Kondwani Matiya, Mourice Barasa, Revelation Nyirongo, Jennifer Muli, Funny Kamanga, Chiyembekezo Kachimanga, Fabien Munyaneza, Phillip Ngari, Henry Makungwa, Jones Chimpukuso, Mercy Amulele, Elijah Karari, Simon Mbae

Accurate and efficient record linkage methods are essential to link patients between community health worker digital health apps and an EMR system, facilitating information flow and improving coordination of care. This study presents the eTrace workflow as an illustrative example, highlighting the benefits of enhanced coordination of care for patients in antiretroviral and non-communicable disease programs in rural Neno district, Malawi. This research focuses on the following major contributions: (1) development of a machine learning-based record linkage model for electronic health information systems, (2) comparison between the machine learning-based and probabilistic approaches to record linkage and (3) a concrete evaluation of our approach on real data for the eTrace workflow. A review of the standard record linkage architecture and its application to health information exchange systems is also presented. An empirical comparison conducted of logistic regression and the Fellegi-Sunter algorithms for this use case reveals comparable results. Both classifiers demonstrate an average precision of 0.86, while logistic regression achieves a higher recall at a fixed 0.90 precision of 0.74.

Flamingo: Environmental Impact Factor Matching for Life Cycle Assessment with Zero-Shot Machine Learning
Bharathan Balaji, Venkata Sai Gargeya Vunnava, Nina Domingo, Shikhar Gupta, Harsh Gupta, Geoffrey Guest, Aravind Srinivasan

Consumer products contribute to more than 75% of global greenhouse gas (GHG) emissions, primarily through indirect contributions from the supply chain. Measurement of GHG emissions associated with products is a crucial step toward quantifying the impact of GHG emission abatement actions. Life cycle assessment (LCA), the scientific discipline for measuring GHG emissions, estimates the environmental impact associated with each stage of a product from raw material extraction to its disposal. Scaling LCA to millions of products is challenging as it requires extensive manual analysis by domain experts. To avoid repetitive analysis, environmental impact factors (EIF) of common materials and products are published for use by LCA experts. However, finding appropriate EIFs for even a single product under study can require hundreds of hours of manual work, especially for complex products. We present Flamingo, an algorithm that leverages natural language machine learning (ML) models to automatically identify an appropriate EIF given a text description. A key challenge in automation is that EIF databases are incomplete. Flamingo uses industry sector classification as an intermediate layer to identify when there are no good matches in the database. On a dataset of 664 products, our method achieves an EIF matching precision of 75%.

Paper Session 5: Climate and Environment
Thursday 17 August, 16:00 - 16:50, Auditorium

Characterizing Swiss Alpine Lakes: from Wikipedia to Citizen Science
Yuanhui Lin, Daniel Gatica-Perez

In order to understand the ecological impacts of climate change on bacteria communities in Swiss alpine lakes, researchers in project 2000Lakes analyzed their chemistry and biology. Within the scope of this citizen science project, an educational platform has been implemented using the data mainly collected from Wikipedia and from the research results. By presenting Swiss alpine lakes and the 2000Lakes project in an interactive way, the goal of this platform is to raise interest and promote awareness about Swiss alpine lakes to the public, and ultimately, to conserve these ecosystems by joining forces with local citizens. Volunteers were invited to use the platform and answer a survey that contains a list of questions regarding Swiss alpine lakes and a list of platform usability questions. The results were used to evaluate and improve the platform. An online crowdsourcing activity was also initiated to promote the 2000Lakes project and to complete the Swiss alpine lakes database.

A Characterization of Land-use Changes in the Proximity of Mining Sites in India

Shivani A Mehta, Ashish, Mayur Solanki, Aaditeshwar Seth

For a growing economy like India, most of its energy resources are obtained through extractive processes such as mining of coal and other minerals. Mining can however have many negative social and ecological impacts if it is not well regulated. Illegal mining or inadequate reclamation of abandoned mines can amplify these impacts, emphasizing the need to develop methods that can monitor changes in the land-use patterns in and around mining sites. We develop a method using machine learning on freely available satellite data to monitor the extent of mines, and couple it with other tools to monitor deforestation, changes in built-up areas, and socio-economic development, taking place in areas in the proximity of mines. We provide evaluation results of our mining delineation classifier, a feasibility check of this suite of tools to monitor mining areas over a period of five years, and finally provide a temporal characterization study over 628 mines in India. We are in the process of enhancing these tools to eventually provide a rich set of indicators to track mining areas over time.

Analysis of Elephant Movement in Sub-Saharan Africa: Ecological, Climatic, and Conservation Perspectives

Matthew Hines, Gregory Glatzer, Shreya Ghosh, Prasenjit Mitra

The interaction between elephants and their environment has profound implications for both ecology and conservation strategies. This study presents an analytical approach to decipher the intricate patterns of elephant movement in Sub-Saharan Africa, concentrating on key ecological drivers such as seasonal variations and rainfall patterns. Despite the complexities surrounding these influential factors, our analysis provides a holistic view of elephant migratory behavior in the context of the dynamic African landscape. Our comprehensive approach enables us to predict the potential impact of these ecological determinants on elephant migration, a critical step in establishing informed conservation strategies. This projection is particularly crucial given the impacts of global climate change on seasonal and rainfall patterns, which could substantially influence elephant movements in the future. The findings of our work aim to not only advance the understanding of movement ecology but also foster a sustainable coexistence of humans and elephants in Sub-Saharan Africa. By predicting potential elephant routes, our work can inform strategies to minimize human-elephant conflict, effectively manage land use, and enhance anti-poaching efforts.

This research underscores the importance of integrating movement ecology and climatic variables for effective wildlife management and conservation planning.

PollutionMapper: Identifying Global Air Pollution Sources

Dhruv Agarwal, Pankaj Kumar, Srinivasan Iyengar

Air pollution adversely impacts public health. The National Capital Region (Delhi-NCR) is among the most polluted urban areas in the world. One component of air pollution is PM2.5, which accounts for around 80% of deaths due to air pollution. Solutions for lowering PM2.5 levels in Delhi have been ineffective due to their unscientific design. In this paper, we build a mixed-methods model that captures the interplay of various factors---geographical, chemical, meteorological---that contribute to the concentration of PM2.5. Using domain knowledge and KDE sampling from NASA's GEOS-CF dataset, we identify the major sources of each of the seven constituents of PM2.5. From the 68 sources thus selected, we run the NOAA's HYSPLIT wind dispersion model to track the movement of released particles to the sink, i.e., Delhi. Using the concentration of pollutants at the sources and by tracking their movement, we can predict the PM2.5 levels at the sink and identify polluting sources. Our model performed significantly better than the baseline fixed-effects model and captured seasonal variations in all seven constituents of PM2.5. It also uncovered the impact of polluting sources hundreds of kilometers away on the air of Delhi. Policymakers can use such a model to design data-driven policy interventions.

Adapting Forests to an Uncertain Climate: A Critical Technology Review

Max Krüger, Felix Carros, Maximilian Brandt, Debora de Castro Leal

Forests across the world play a crucial role in the fight against the climate catastrophe as well as mass extinction that characterise the Anthropocene. However, they are also increasingly threatened by destructive human practices such as agriculture and mining, but also climate change itself. This article focuses on forests in Germany, which have been devastated in recent years by heat, drought and bark beetles. Hence, forests and associated forestry practices are in urgent need of adaptation to a different climate. Several digital applications have been developed to assist with this effort. Adaptation is complicated by the epistemological challenge of climate change, that the uncertainty of how exactly climate change will affect specific local sites, as well as future markets for forest products, poses. In this short paper we review how two applications address this uncertainty in their approach to supporting the climate adaptation of forests and draw out preliminary lessons for HCI research and design.

Paper Session 6: Finance and Economics

Thursday 17 August, 16:55 - 17:45, Auditorium

Beyond Digital Financial Services: Exploring Mobile Money Agents in Tanzania as General ICT Intermediaries

Ananditha Raghunath, Innocent Obi, Hosea Mpogole, Richard Anderson

Tanzanian mobile money and telecom agents (called wakala(s) in Swahili) have played a crucial role in expanding digital financial services (DFS) to rural areas. However, wakalas are losing their ability to financially sustain themselves and therefore provide compensated/uncompensated intermediation services that their communities require. This work explores the potential for the wakala network to extend intermediation services to emerging ICTs beyond the scope of commercial DFS by uncovering the social and institutional factors that currently shape wakala practices. First, we investigate how two different models of intermediation from ICTD literature can inform broader strategies for intermediation. We then complement this research with an on-the-ground quantitative survey and focus groups with community members and wakalas in Kagera, Tanzania. Our focus groups reveal that community members face challenges with new ICTs that require sustained intermediation and that wakalas encounter mounting financial instability and are thus receptive to intermediating for other ICTs. Finally, we examine three factors that influence the broadening of the wakalas' role of general ICT intermediaries: (1) aligning incentives and addressing the limits of pro bono actions, (3) providing appropriate training and a suitable support infrastructure, and (3) fostering trust-building and reciprocity.

“Do you collect data to give to the university or do you do the work to benefit people?”: Indigenous Data Sovereignty in Environmental Contexts

Amelia Lee Dogan, Danielle Wood

This paper analyzes the current practices of Indigenous data sovereignty in environmental research and activism in the United States, as known by the settler government. The CARE principles are a widely adopted set of guidelines for Indigenous data sovereignty, yet there exists little detail on current practices of operationalization and im- plementation of the CARE principles. This research specifically iden- tified opportunities to further clarify how environmental data can be managed in accordance with the CARE principles. Using current literature, we examine how sustainability and Human-Computer Interaction (HCI) research could better incorporate Indigenous data sovereignty and governance. Through three interviews with Indige- nous environmental practitioners, we use inductive and deductive analysis to understand current thoughts and practices. In a forestry analysis case study with the Penobscot Nation, we examine specifi- cally how the CARE principles could be implemented into a research project. The interviews and case study reveal design considerations such as emphasizing roles in responsibility and ethics to be taken into future HCI research involving Indigenous data sovereignty in environmental contexts.

Moving targets: When does a poverty prediction model need to be updated?

Emily Aiken, Tim Ohlenburg, Joshua Blumenstock

A key challenge in the design of effective anti-poverty programs is determining who should be eligible for program benefits. In developing countries, one of the most common criteria is a Proxy Means Test --- a rudimentary decision rule that determines eligibility based on basic information about each household (such as the number of children, whether there is indoor plumbing, etc.). At the core of each Proxy Means Test (PMT) is a machine learning algorithm, which uses the short list of household characteristics to predict whether the household should be deemed poor, and therefore eligible, or non-poor, and therefore ineligible. Using nationwide survey data from four African countries, this paper documents an important weakness in this application of machine learning: that the accuracy of the PMT prediction algorithm decreases steadily over time, by roughly 1.7 percentage points per year. We illustrate the implications of this finding for real-world anti-poverty programs, which typically update the PMT model only every 5-8 years, and then show that the aggregate effect can be decomposed into two forces: "model decay" caused by model drift, and "data decay" caused by changing household characteristics. Our final set of results show how an understanding of these forces can be used to optimize data collection policies, and how that optimization in turn can improve the effectiveness of anti-poverty programs.

Tracking Socio-economic Development in Rural India Using Satellite Imagery
Anant Sushil Gulgulia, Aman Gupta, Akshay Sarashetti, Aaditya Sinha, Aaditeshwar Seth

Longitudinal analysis of socio-economic development at sub-national scales can reveal valuable insights about which areas tend to develop faster than others and why. Such analysis is however difficult to conduct with traditional data sources such as censuses and surveys which are not repeated frequently and may require assumptions for imputation of values at non-surveyed locations. Indicators of socio-economic development based on satellite data have emerged as a proxy to track development at fine spatial and temporal scales. We build a model using daytime and nightlights satellite data to estimate an index of socio-economic development at the village level in India. We evaluate our model for temporal robustness and use it to produce estimates at three time points over a two decade period. We then use these estimates to understand the effect on village-level development of factors such as the geographic distance of a village to hubs of economic activity and the inequality of development in the district. Our findings provide evidence of the possible impact that policy changes during this period have had on village development

Poverty rate prediction using multi-modal survey and earth observation data
Simone Fobi, Manuel Cardona, Elliott Collins, Caleb Robinson, Anthony Ortiz, Tina Sederholm

This work presents an approach for combining household demographic and living standards survey questions with features derived from satellite imagery to predict the poverty rate of a region. Our approach utilizes visual features obtained from a single-step featurization method applied to freely available 10m/px Sentinel-2 surface reflectance satellite imagery. These visual features are combined with ten survey questions in a proxy means test (PMT) to estimate whether a household is below the poverty line. We show that the inclusion of visual features reduces the mean error in poverty rate estimates from 4.09% to 3.88% over a nationally representative out-of-sample test set. In addition to including satellite imagery features in proxy means tests, we propose an approach for selecting a subset of survey questions that are complementary to the visual features extracted from satellite imagery. Specifically, we design a survey variable selection approach guided by the full survey and image features and use the approach to determine the most relevant set of small survey questions to include in a PMT. We validate the choice of small survey questions in a downstream task of predicting the poverty rate using the small set of questions. This approach results in the best performance – errors in poverty rate decrease from 4.09% to 3.71%. We show that extracted visual features encode geographic and urbanization differences between regions.

Paper Session 7: Privacy, Trust, Security & Ethics
Friday 18 August, 11:00 - 11:50, Auditorium

Localised trust in a globalised knot: Designing information privacy for Digital-ID
Stefanus van Staden and Nicola J Bidwell

We designed the system to manage, verify and exchange identity information for Namibia's national Digital-ID. We applied Grounded Theory methods to five focus groups to understand experiences and expectations in different contexts of legal identity verification and sharing. While local perspectives on privacy aligned with prevalent models for Digital-ID, in which people individually own and trade their personal information, they cannot be disentangled from social relations. Thus, our design responds to the ways people establish trust with organisations over time and relate consent and privacy control to organisational accountability. Our Situational Analysis considered the policy-design-adoption 'knot' in constructing data governance, and relations between data protection and privacy policy discourse, social structures and Namibia's sociotechnical imaginary of 'unity in diversity'. Our thick analysis revealed how unequal access to telecommunications contributes to systems that can produce inegalitarian and harmful data relations and prompted designing a collectivist approach to consent for information exchange that leverages government notices and civil society activism. While analysis of the policy knot improved design, our reflections also show some of the challenges in reconciling real-world design of information systems with nationwide impact in the Global Souths with best practices for Digital-ID and scholarly norms of the Global North

A First Look into Software Security Practices in Bangladesh
Ankit Shrestha, Tanusree Sharma, Pratyasha Saha, Syed Ishtiaque Ahmed, Mahdi Nasrullah Al-Ameen

Software security practices are critical in minimizing vulnerabilities and protecting unauthorized access to the code and the system. However, software security practices outside Western countries need to be better understood. This need for understanding security practices is further necessitated by the increased outsourcing of software development which can result in vulnerabilities on a global scale. This paper addresses this gap, focusing on Bangladesh, a country that represents a booming software industry in the Global South. In this study, we conducted semi-structured interviews with 15 developers to understand their security perceptions and identify the factors influencing software security practices in Bangladesh. Our findings unpack how security fits in the local software development life cycle and shed light on the challenges deterring security practices in Bangladesh. Based on our results, we provide recommendations for developing situated and sustainable strategies to support software security practices in the local context.

Making ethics at home in Global CS Education: Provoking stories from the Souths
M. Wong-Villacres, C. Kutay, S. Lazem, N. Ahmed, C. Abad, C. Collazos, S. Elbassuoni, F. Islam, D. Singh, A. T Mayeesha, M. M. Ujakpa, T. Zaman, N.J. Bidwell

Despite the increase in university courses and curricula on the ethics of computing there are few studies about how CS programs should account for the diverse ways ethical dilemmas and approaches to ethics are situated in cultural, philosophical and governance systems, religions and languages. We draw on the experiences and insights of 46 university educators and practitioners in Latin America, SouthAsia, Africa, the Middle East, and Australian First Nations who participated in surveys and interviews. Our modest study seeks to prompt conversation about ethics and computing in the Global Souths and inform revisions to the ACM's curricular guidelines for the Society, Ethics and Professionalism knowledge area in undergraduate CS programs. Participants describe frictions between static and anticipatory approaches to ethics in globalised regulations and formal Codes of ethics and professional conduct, and local practices, values and impacts of technologies in the Global Souths. Codes and regulations are instruments for international control and their gap with local realities can cause harm, despite local efforts to compensate. However, our insights also illustrate opportunities for university teaching to link more closely to priorities, actions and experiences in the Global Souths and enrich students' education in the Global North.

Shadow Program Committee: Designing for Diversity and Equity within Academic Communities
Delvin Varghese, Hafeni Mthoko, Jessica Waterson, Pranav Kulkarni, Dan Richardson, Shaimaa Lazem, Patrick Olivier

The development of early career researchers (ECRs) and their induction into academia has traditionally been a process that is at best obscure, and at worst, cronyism laden. Arguably this is especially true for cross-disciplinary fields like HCI, where relatively fragmented specialisms co-exist. With COVID-19 and its negative impacts on ECRs as the backdrop, we explored the design of a five-month virtual training program for ECRs worldwide (with particular emphasis on Global South). Through an action research approach, the program was executed in collaboration with the organizers of a cross-disciplinary conference. 81 participants from 26 countries took part. The program created a collaborative learning experience for attendees and provided opportunities for networking and learning the nuances of the peer-review process. This paper details our experiences and provides reflections on design opportunities to (1) develop professional development spaces for underserved researchers, and (2) leverage ECRs' unique capacity for contributing to inclusive conference spaces.

Evaluating Mobile Banking Application Security Posture Using the OWASP's MASVS Framework
Trevor Henry Chiboora, Lenah Chacha, Theoneste Byagutangaza, Assane Gueye

In the context of financial gain, hackers are motivated to exploit vulnerabilities that could result in financial or data loss. Therefore, it is crucial for financial applications to undergo thorough testing to identify and address such vulnerabilities. Regrettably, many financial institutions neglect proper testing procedures and sometimes even fail to establish a suitable security release baseline. This report presents an analysis of 18 mobile applications, each belonging to a different financial institution in Africa. The selection of these applications was carefully executed, considering institutions of varying sizes, to enable a comparative assessment of security practices across different organizational scales. The assessment was conducted by evaluating the sampled applications against the Mobile Application Security Verification Standard v2.0. This is a set of checklists and guidelines by the Open Web Application Security Project (OWASP) used as a baseline for mobile application security. Due to the extensive nature of the project, the testing scope was limited to the application itself, as experienced by the end user. This included examining the application's interaction with the back-end server and observing its behavior on the user's mobile device. It is important to note that this report does not provide a comprehensive analysis, as it excludes the assessment of the server-side API and testing of business logic

that requires elevated privileges within the application. Furthermore, a survey was conducted to gain insights into why developers may neglect baseline security thereby introducing potential vulnerabilities in mobile applications. The findings of this survey are also included in a short summary at the end of this document.

Paper Session 8: Social Networks and Human Factors

Friday 18 August, 11:55 - 12:45, Auditorium

A Friend in Need is a Friend Indeed: Investigating the Quality of Training Data from Peers for Auto-generating Empathetic Textual Responses to Non-Sensitive Posts in a Cohort of College Students

Ravi Sharma, Sriram Chellappan, Jamshidbek Mirzakhalov, Pratool Bharti, Raj Goyal, Trine Schmidt

Digital mental wellness apps are increasingly recommended for college students. Still, not all students using these apps have mood problems and do not need to be engaged in conversations involving follow-up questions. An alternate mechanism to handle such non-sensitive posts (i.e., those not indicating mood problems) could be to respond in a contextual, emotionally aware, and empathetic manner while also being terminal (not asking follow-up questions). In this paper, we evaluate the quality of training data provided by a cohort of peer college students to design AI models to respond to non-sensitive posts and minimize perceptions of being intrusive. To do so, we fine-tune the DialoGPT model using peer-provided training data, resulting in acceptable and empathetic responses with low intrusiveness (4.875%). In contrast, DialoGPT, when fine-tuned with the Empathetic Dialogue dataset, resulted in responses with high intrusiveness (69.75%), as reported by four student evaluators. We believe that mental wellness apps must be adaptive to student needs and not assume that any student posting via these apps has mood problems. The perception of intrusiveness (i.e., asking too many questions) must be considered while designing these apps. We also believe that peer students can provide a rich and reliable source of training data for college mental wellness apps.

To Reply or to Quote: Comparing Conversational Framing Strategies on Twitter

Himanshu Zade, Spencer Williams, Christina Smith, Theresa Tran, Sukrit Venkatgiri, Gary Hsieh, Kate Starbird

Social media platform affordances allow users to interact with content and with each other in diverse ways. For example, on Twitter, users can like, reply, retweet, or quote another tweet. Though it's clear that these different features allow various types of interactions, open questions remain about how these different affordances shape the conversations. We examine how two similar, but distinct conversational features on Twitter --- specifically reply vs. quote --- are used differently. Focusing on the polarized discourse around Robert Mueller's congressional testimony in July 2019, we look at how these features are employed in conversations between politically aligned and opposed accounts. We use a mixed methods approach, employing grounded qualitative analysis to identify the different conversational and framing strategies salient in that discourse and then quantitatively analyzing how those techniques differed across the different features and political alignments. Our research (1) demonstrates that the quote feature is more often used to broadcast and reply is more often used to reframe the conversation; (2) identifies the different framing strategies that emerge through the use of these features when engaging with politically aligned vs. opposed accounts; (3) discusses how reply and quote features may be re-designed to reduce the adversarial tone of polarized conversations on Twitter-like platforms.

‘Khep’: Exploring Factors that Influence The Preference of Contractual Rides to Ride-Sharing Apps in Bangladesh

Aditto Baidya Alok, Hasibul Sakib, Shamsil Arafin Ullah, Fardin Huq, Riya Ghosh, Joyanta Jyoti Mondal, Md. Sadiqul Islam Sakif, Jannatun Noor

With rapid urbanization and increasing traffic congestion in major cities, alternative modes of transportation have gained significant attention. The ride-sharing app revolution also has sparked a significant transformation in the transportation industry, along with ``Khep'', an unusual ride-sharing approach where individuals negotiate fares directly with drivers personally, which has become a popular means of transportation. In this research, we investigate various factors that influence the preference for such unconventional contractual rides over ride-sharing apps, such as cultural norms, trust issues, affordability, and accessibility. Moreover, we explore the role of technology literacy, marketing strategies, and regulatory frameworks in shaping the adoption landscape. After conducting a survey, we conduct a thorough analysis to determine the expected findings and uncover meaningful insights regarding the utilization, preferences, and challenges within the ride-sharing industry in Bangladesh. The findings of this study reveal that cultural factors, such as the preference for bargaining and personal connections, strongly influence the popularity of contractual rides. Additionally, concerns related to safety, data privacy, and trust act as barriers to ride-sharing app adoption. Being associated with UN SDG Goals 11 and 9, the implications of this research extend beyond Bangladesh and can provide insights for policymakers, transportation companies, and technology developers seeking to understand the factors shaping the adoption of ride-sharing apps in similar contexts.

Pandemic, Hybrid Teaching & Stress: Examining Indian Teachers’ Sociotechnical Support Practices in Low-income Schools

Akanksha Y. Gavade, Annie Sidotam, Rama Adithya Varanasi

Support plays a vital role in the teaching profession. A good support system can empower teachers to regulate their emotions and effectively manage stress while working in isolation. The COVID-19 pandemic has ushered in a hybrid form of education, necessitating the acquisition of new skills by teachers and compelling them to adapt to remote teaching. This new development further amplifies the sense of isolation prevalent amongst the teaching community. Against this backdrop, our study investigates the availability of sociotechnical support infrastructures for teachers in low-income schools while also looking into the support practices embraced by this class of teachers following the pandemic. Through 28 qualitative interviews involving teachers, management and personnel from support organizations, we demonstrate how teachers have largely taken the initiative to establish their own informal support networks in the absence of formal support infrastructures. Smartphones have significantly augmented these support practices, serving as both a valuable source of support as well as a medium for facilitating support practices. However, in comparison to other forms of support received from these sources, the availability of emotion-focused support for teachers have proven to be inadequate, creating imbalances in their support seeking practices. Our paper provides different contextual ways to reduce these imbalances and improve the occupational well-being of teachers.

Roles of Technology for Risk Communication and Community Engagement in Bangladesh during COVID-19 Pandemic.

Anik Sinha, Nova Ahmed, Md Sabbir Ahmed, Ifti Azad Abeer, Rahat Jahangir Rony, Anik Saha, Syeda Shabnam Khan, Shajnush Amir, Shabana Khan

The COVID-19 pandemic required handling a clear communication of risk and community engagement. A gap is noted in scholarly studies portraying strong community engagement for risk handling, particularly in resource constrained regions. This study covers community engagement and its use of technology during COVID-19 through a case study of Bangladesh. The study looks at minoritized communities who have struggled through the pandemic yet handled the difficult time through their effective problem solving, working together as a community. It is a qualitative study during the pandemic consisting of 9 communities, presenting 58 participants (N=58, Female= 33, Male=23, Transgender =2) across four divisions of Bangladesh covering urban, semi urban, and rural regions. The study uncovers the challenges and close community structures. It also shows the enhanced and increased positive role of technology during the pandemic while referring to a few communities being digitally disconnected communities that could benefit from digital connectivity in the future through increased awareness and support.

Estimating indicators of human development in South Africa from satellite images using machine learning

Emily-Rose Steyn, Martin Bekker, Ken J. Nixon

This research investigates the extent to which socioeconomic indicators that reflect human development can be estimated from satellite images. The investigation extends previous work that incorporates nighttime lights into a deep-learning model to estimate asset wealth and consumption expenditure. Here, we apply this approach to estimate access to infrastructure and basic services in a South African context. This research is a stepping stone in the direction of estimating a variety of indicators from low-cost satellite data regularly. This would provide critical complementary data to current development surveys, especially in data-scarce countries.

Data Driven Remote Sensing Approach For Peri-Urban Demarcation of Hyderabad City, India

Soumil Hooda, Ravi Bhushan, Hiten Vidhani, Manik Gupta, Lavanya Suresh, Timothy Clune

With rapid urbanisation, the centres of urban transformation across the metropolitans in India have shifted to their peripheries, leading to the creation of peri-urban areas. These areas with both urban and rural attributes are undergoing dynamic socio-spatial and physical changes. Despite their importance in urban transformation, there have been limited administrative efforts to demarcate these areas which leads to improper land zoning and inefficient governance. There is a lack of existing studies from the global south that have tried to understand the peri-urban expansion spatially and temporally and demarcate peri-urban boundary in the last decade. This paper uses spatial parameters to propose a data driven remote sensing approach for demarcating peri-urban areas in Hyderabad Municipal Region (HMR) in India. The model using a combination of thresholding and Support Vector Machine (SVM) has been used to demarcate peri-urban areas and it has been demonstrated that peri urban area has increased by 95.1 per cent between 2013 and 2020. The proposed method is significant for developing countries where the timely availability and quality of socio-economic data is a challenge.

Milk Matters 4.0: Challenges in Deploying University-Led Mobile Application Development for Small NGOs

Deborah Talbot, Melissa Densmore

Milk Matters is a small Cape Town based non-profit milk bank. Their primary role is to collect expressed breastmilk from donor mothers, pasteurize it and distribute it to recipient infants in need. Previous postgraduate projects from the University of Cape Town (UCT) have co-designed a donor facing mobile application with Milk Matters, however no mobile application is currently deployed or promoted by the non-governmental organization (NGO). This project will build upon the work already done with Milk Matters and aims to update the full system for deployment. While post-deployment evaluation will also analyse the uptake and usage of the application, this poster will focus on discussing the challenges in the deployment of university-led mobile application development for small NGOs

AI-Based Platform For Predicting The Risk of Having NCDs

Ariane Shimirwa, Claudine Mahoro, Tyson Muvunyi

Non-communicable diseases (NCDs) are chronic medical conditions not caused by infectious agents and primarily associated with lifestyle factors. This paper highlights the significant impact of non-communicable diseases (NCDs) on global public health, particularly in low- and middle-income countries where they account for most premature deaths. A privacy-preserving AI platform is proposed as a solution to predict the risks of having NCDs, such as cardiovascular diseases and type 2 diabetes, using clinical data and advanced machine learning algorithms to reduce the number of deaths that occur yearly. The platform alerts individuals with high risks and provides them with further medical consultation options.

Mapping Construction Grade Sand: Stepping Stones Towards Sustainable Development
Ando Shah, Suraj R Nair

Sand and gravel are critical inputs to economic growth as the primary constituents of concrete and asphalt. While demand for these materials has skyrocketed due to large construction and reclamation demands, rates of extraction are unsustainable and result in adverse environmental and socio-economic consequences, especially in the Global South. Excessive sand and gravel mining threatens biodiversity and hydrological functions, heightens the risk of damage to critical infrastructure, and increases vulnerability to extreme climatic events. In this poster, we argue that mapping the world's sand and gravel resources is the first step towards informing effective policy that can ameliorate these harms while achieving sustainable development. We have developed flexible machine learning algorithms which can detect usable sand and gravel resources in river basins and coastlines at global scale with high spatial resolution (10 m). Our approach uses object based image analysis methods fusing freely available Sentinel-1 and Sentinel-2 multispectral satellite datasets. This method achieves an F1 score of 78.53% and accuracy of 79.59% using a random forest classifier trained on a global dataset of in-situ grain size observations. We further validate performance in sections of the River Ganga where a gravel to sand transition is known to occur, and in a section of the River Sone where a number of known sand mine concessions exist. This work lays the foundation to build end-to-end deep learning models that can predict where illegal sand mining occurs.

Examining the Features of Mobile Apps for Environmental Sustainability
Sarah Cooney, Jeremiah Matthew, Ava Ferrentino

This short paper presents initial results from an ongoing effort to collect data on commercially available applications for promoting environmental sustainability. It discusses the preliminary searches and the resulting set of 76 apps. The paper details initial insights from analyzing the features of these apps and describes areas for future work.

Designing Empathic VUIs: A study of Non-Verbal Vocal Cues of Synthetic Speech
Riya Singh, Anupriya Tuli

The emotional value embodied in audio responses of voice user interfaces (VUIs) impacts how users interpret, experience, and understand these interfaces. The emotion delivered in a voice response depends both on its verbal content and non-verbal vocal cues. We undertook a preliminary investigation where we used non-verbal vocal cues of pitch, speech rate, and intonation to modulate the emotion embodied in a synthetic speech to generate an empathic voice response. Using the Wizard of Oz, we investigate how matching Alexa's response emotion with the user's affective state impacts the overall user experience. Our results establish the potential of non-verbal vocal cues of a synthetic speech as crucial parameters to generate empathic voice-only responses. We also noted that our approach improves the likability and usability experience with VUIs.

CoLRN - A Community-Based Vision for Local Resilient Networks
Ndinelao Iitumba, Siddhant Shinde, Deysi Ortega, Naveen Bagalkot, Nervo Verdezoto, Melissa Densmore, TB Dinesh

In this research, we share our findings from a series of design workshops with community wireless network members and their users in India and Africa to develop a community-based vision for resilient local networks. We simultaneously leveraged existing projects in India and South Africa around network management interfaces and local content creation to evaluate our design strategies to foster resilience and effectiveness in empowering community networks. Through this work, we identified the challenges and opportunities for innovative approaches to leveraging networked technologies to bring communities together to learn from each other on how they manage and use their community network. We highlight key opportunities to explore a) infrastructural resilience through community-centred design of network management tools, and b) novel approaches to support content creation tapping community desires to capture local knowledge, through annotation of digital stories and production of radio content.

An Educational Ecosystem Based on Blockchain
Rudaiba Adnin, Rezwana Reaz

Blockchain as a new technology plays a significant role in education, yet, there exists a limited number of research on blockchain-based educational ecosystems. Therefore, in this paper, we propose a novel educational ecosystem integrating four stakeholders (students, instructors, institutions, and employers) for a wide range of academic functions such as cross-institutional study, skill development, academic assessments, certification, and employment opportunities in a blended learning environment. Moreover, the proposed user-centric system tackles issues regarding potential bias and tampering with the educational records of students. We further discuss the advantages, challenges, and possibilities that arise within this proposed ecosystem.

Exploring Deployment and Adoption of Locally hosted Digital Services with Communities
Lizalise Luxande, Holly Judge, Shreeya Khoosal, Melissa Densmore

This paper discusses the implementation and development of 3 services on the iNethi community wireless network platform, namely - a community radio, parenting chatbot and community exchange platform. The implementation timeline, design considerations and project aims are scaffolded within this proposal with the overarching objective of empowering individuals in the Ocean View community through democratizing access to local services by hosting them on the iNethi network and making them "zero-rated".

User-Agent Interactions in Mobile Money Banking in Kenya and Tanzania
Karen Sowon, Edith Luhanga, Lorrie Faith Cranor, Giulia Fanti, Conrad Tucker, Assane Gueye

Digital financial services have catalyzed financial inclusion in Africa. Commonly implemented as a mobile wallet service referred to as mobile money (MoMo), the technology provides enormous benefits to its users. While the benefits of mobile money services have largely been documented, the challenges that arise especially in the interactions between human stakeholders remain relatively unexplored. In this study, we investigate the practices of mobile money users in their interactions with mobile money agents. We conduct 72 structured interviews in Kenya and Tanzania (n=36 per country). The results show that users and agents design several workarounds in response to limitations and challenges that users face within the ecosystem. These include advances or loans from agents, relying on the user-agent relationships in place of legal identification requirements, and altering the intended transaction execution to improve convenience. The results suggest a need for rethinking among other things the privacy, security and usability components of the ecosystem, as well as policy and regulatory controls to safeguard interactions while using mobile money.

Scaling Carbon Footprinting: Challenges and Opportunities
Bharathan Balaji, Geoff Guest, Gargeya Vunnava, Jared Kramer, Aravind Srinivasan, Michael Taptich

Rapid and continuous increase in greenhouse gas (GHG) emissions is warming our planet at unprecedented rates. Consumer products and services, including all aspects of the corresponding supply chain, contribute to more than 75% of these emissions. Attribution of GHG emissions to each product will drive awareness and change from individual consumers to large corporations that produce and own these products. However, accurate and standards-compliant accounting of carbon emissions for millions of products is challenging as it requires detailed manufacturing and supply chain data, and subject expertise in life cycle assessment (LCA). We posit that ideas from computer science and machine learning can alleviate bottlenecks in LCA, and research contributions from this community will accelerate solutions for accurate carbon footprint estimation as well as carbon abatement strategies at scale. We present the principal components of an LCA study with a step-by-step walk-through. We elaborate on the challenges to scale LCA, and identify the opportunities to innovate in this space with techniques such as information extraction, personalized recommendations, and decision making under uncertainty.

Inclusion Drives Sustainable Development: The Case of Social Robotics for Africa
Pamely Zantou, David Vernon

The achievement of sustainable development goals requires collaboration among all stakeholders. In turn, this necessitates that the environment in which solutions are developed be inclusive of all. Artificial intelligence (AI) is widely recognized to be a powerful enabling technology that can be used to leverage these solutions. However, AI, including the increasingly important field of robotics, is not inherently inclusive and much remains to be done in the democratization of AI. In this paper, we argue that inclusivity cannot be achieved without cultural sensitivity being factored into the design of AI and robotics technologies. This paper presents culturally sensitive human-robot interaction in social robotics as one example of endeavours to achieve this inclusivity and, thereby, drive sustainable development in Africa.

Power Analysis of a Large-Scale Solar-Powered Urban Sensor Network
Alex Cabral, Jim Waldo

Solar power is often touted as a reliable renewable energy source for low-cost sensor networks in various environments. However, there have not been extensive real-world studies to examine how well solar-powered sensor networks perform in urban settings over long periods. In this work we analyze the performance of a large-scale solar-powered sensor network over one year in Chicago, Illinois. We find that over 35\% of the devices experienced charging issues between the months of October and March, resulting in over 33,000 hours of data loss. Surprisingly the devices that had issues charging were not all located near tall buildings and were often found in majority Black and Latine neighborhoods. These findings highlight the need for continued research in alternative power sources and energy harvesting techniques, and increased real-world deployments to identify additional barriers in using sensor networks for real-time monitoring in cities.

Systematic analysis of the effectiveness of adding human mobility data to COVID-19 case prediction linear models
Saad Mohammad Abrar, Naman Awasthi, Daniel Smolyak, Vanessa Frias-Martinez

Human mobility data has been extensively used in COVID-19 case prediction models. Nevertheless, related work has questioned whether mobility data really helps that much. In this paper, we present a systematic analysis across mobility datasets and prediction lookaheads and reveal that adding mobility data to predictive models improves model performance only for about two months at the onset of the testing period, and that performance improvements – measured as predicted vs. actual correlation improvement over non-mobility baselines – are at most 0.3.

“Why SuaCode?": Understanding African Students’ Motivations for Taking a Smartphone-Based Online Coding Course
Michael Addo, Nana Maryam, Victor Kumbol, Judith Uchidiuno, George Boateng

Computer programming MOOCs are instrumental in providing students with high-quality instruction in areas where there is limited access. They are especially beneficial to post-secondary African students as less than 1% of them leave secondary school with fundamental coding skills. One strategy for increasing their efficacy for African students is to understand students’ motivation for enrolling. These insights can inform the design of MOOC content and assessments to align with students’ interests. We administered an open-ended response survey to (self-identified) Africans enrolled in a smartphone-based online coding course (SuaCode). We analyzed a random sample of 450 (of 3000) responses using a grounded theory approach. We found that most African students (68.7%) participated in SuaCode for intrinsic reasons such as improving themselves, learning with like-minded individuals, and gaining skills to help address societal issues. We discuss the implications of these findings in the design of programming MOOCs targeted at African students.

Understanding Black People Building Technology For Black Lived Experiences
Lisa Egede, Leslie Coney, Brittany Johnson, Christina Harrington, Denae Ford

The HCI field has seen a heightened interest in understanding how racially minoritized people create and foster community across various platforms. While the growth in this research space is evident, little work has been done around understanding how Black creators build and design technological systems for the needs of their own communities. In this poster we present findings from our study conducted with Black technologists from a wide array of domains, with the goal of highlighting their experiences using, creating or curating resources to support the Black Lived experience. Concluding this work we found that technologists take a multifaceted approach to design as a means of survival, to stay connected, for cultural significance and to celebrate Black joy. Finally, we discuss how designing for the Black experience extends beyond tackling inequities and that taking various approaches to supporting technologists building for their own communities can lead to more impactful outcomes.

A Mean Field Game Approach to Promote Sustainable, Socially Optimal Behavior in Rational Individuals for Effective Management of Epidemics
Amal Roy, Pranoy Das, Chandramani Singh, Soumyarup Sadukhan, Yadati Narahari

When an epidemic strikes, it becomes crucial to effectively contain and suppress its spread in order to minimize the loss of lives and alleviate the burden on the public healthcare system. Numerous non-pharmaceutical and pharmaceutical interventions have been extensively explored to tackle and limit the spread of epidemics. However, it has been observed that despite the imminent threat posed by an epidemic, individuals often exhibit rational behavior and exercise their free will instead of adhering to best practices tailored for epidemic control. This, unfortunately, leads to potentially undesirable consequences. In this paper, we study an appropriately formulated epidemic game that involves rational individuals, aiming to identify strategies that can induce socially optimal behavior. By employing a mean field approach, we derive a centralized control policy that optimizes societal well-being, as well as a Nash equilibrium-based control policy. We conduct carefully designed thought experiments which highlight various policy measures and refinements in non-pharmaceutical interventions, to promote sustainable, socially optimal behavior in rational individuals. Notably, our study is conducted within the realistic context of vaccine availability, further enhancing its practical relevance.

Demos

Thursday 17 August, 14:00-15:30, Venue 1,2,3

Collaborative Decision-Making Assistant for Healthcare Professionals: A Human-Centered AI Prototype Powered by Azure Open AI

Kenneth Yamikani Fukizi

This paper presents a demonstration of a collaborative decision-making assistant designed to support healthcare professionals in making informed and personalized treatment decisions for their patients.

The prototype highlights the integration of advanced AI algorithms, explainable AI techniques, and the utilization of mainly Microsoft related technology stacks, including ASP.Net Core and Azure Open AI services.

The significance of this prototype lies in its contribution to the field of human-computer interaction, design and critical perspectives, specifically within the sub-domain of Human-centered AI.

The prototype demonstration highlights innovation in the design, usage, sociotechnical context, and application of the prototype, and emphasizes commitment to ethical AI practices and responsible AI development, with considerations for fairness, transparency, and mitigating bias in AI algorithms, promoting the ethical use of AI in healthcare.

Community Networks powered by Community Currencies

Keegan White, David Lloyd Johnson, Senka Hadzic, Melissa Densmore

In this demo, we will show how a mutual credit-based community voucher or currency integrated with a community-owned network and a local content server could incentivise users to become better custodians of commons infrastructure. This could lead to the generation of more locally relevant digital content and the expansion, use, and stability of a community voucher to support wider local markets that embrace local digital and physical goods and services.

Multi-Objective Portfolio Optimization Towards Sustainable Investments

Yong Zheng, Kumar Neelotpal Shukla, Jasmine Xu, David Xuejun Wang, Michael O'Leary

The process of financial portfolio optimization involves choosing the most suitable mix of assets to meet a particular investment goal. Conventional portfolio optimization primarily focuses on maximizing returns and minimizing risks while overlooking the importance of social responsibility or sustainability in financial investments. In this paper, we present a Python-based multi-objective portfolio optimization library for sustainable investments (MOPO-LSI). MOPO-LSI is able to take Environmental, Social and Governance (ESG) factors into consideration in financial portfolio, where investors assets can be well allocated to mutual funds towards the ESG optimization along with their financial goals in the investment. MOPO-LSI is easy to be configured and used, and it is capable of production solutions in two scenarios when client preferences are known or unknown. The developers can also easily customize the library to adapt it to their own financial objectives.

The BALTO Toolkit - A New Approach to Ethical and Sustainable Data Collection for Equitable Public Transit

Vanessa Frias-Martinez, Saad Abrar, Naman Awasthi, Sunyup Park, Jessica Vitak

In most American cities commuters on public transit have disproportionately lower incomes than commuters who use automobiles. Given the proven link between geographic and economic mobility, it is critical to offer quality public transit to improve access to jobs, health care and education opportunities. Departments of Transportation (DOTs) routinely measure public transit performance and quality perceptions to assess the need for improvements in the transit systems. Nevertheless, the performance metrics used fail to capture the experiences of low-income individuals who often endure complex, lengthy trips, requiring several modes or transfers. We propose BALTO, a novel toolkit to characterize transit system performance and passenger s quality perceptions across all types of passengers and trips. We are designing the BALTO toolkit in collaboration with public housing residents from the Housing Authority of Baltimore City (HABC) and together with two local transit advocacy groups and the departments of transportation in Baltimore and in the state of Maryland.

Self-directed digital learning for maternity health workers A Choose-Your-Own-Adventure application for empathic care

Sharifa Negesa, Melissa Densmore

We explored the use of digital stories to support empathy skills training in maternity health workers. Our digital stories build on an existing in-person training approach; the Secret History (SH) that was developed by the Perinatal Mental Health Project. During SH training, health workers are invited to enact scenarios with patients, examining their reactions and responses as they learn more about the "history" of their patients and of their assumed characters as health workers. This training has resulted in improvement in empathic skills for health workers, but opportunities to scale the intervention are limited. The SH is costly to implement, requiring in-person workshops and facilitator training for small groups of workers. Our mobile application may either supplement or introduce the SH concepts at scale to health workers. The stories have been co-designed with mental health experts, midwives, and other trainers, and employ a "choose-your-own-adventure" approach, slowly revealing the histories of the characters, as in the original SH protocol. To inform decisions of the app design, data was collected through interviews, co-design workshops and focus group discussions as detailed in the methods section.

Digital Public Goods Interoperability: A Low-Code Middleware Approach

Andrew Amstrong Musoke, Jean Paul Nishimirwe, Nafiu Lawal, Assane Gueye

Digital Public Goods (DPGs) play a vital role in achieving the United Nations Sustainable Development Goals (SDGs) in low-income and middle-income countries. However, the lack of interoperability among different DPGs could lead to duplication of efforts and/or lack of (inter)-functionality since one DPG is not able to benefit from the features of another. This paper illustrates the need for interoperability, the difficulty of retrofitting interoperability in the numerous mature DPG projects and introduces a middleware application as a solution. The middleware application is a lightweight, technology-agnostic, portable, and modular application which facilitates transactions between the integrating system and the integrated system. By customizing and deploying the middleware, integrating system developers can save time and costs, reducing barriers to prototyping and increasing the adoption rate of DPGs. Furthermore, developers do not need to provision or access a sandbox as the middleware supports mocking responses. A use case involving the integration of two DPGs, a digital identity system and a health information system, is illustrated. The paper also describes future enhancements to the generalizability of the middleware from 1-to-any to any-to-any as well as improving security resilience with WebAuthn and custom cyber-security hardening tools and procedures.

Workshops

Workshop 1: Natural Language Processing for Southern African Languages
Everlyn Asiko Chimoto, Thapelo Sindane, Rooweither Mabuya, Febe de Wet, Vukosi Marivate
Wednesday 16 August, 9:00-17:30, Venue 4

The inclusion of African languages in Natural Language Processing (NLP) research has become a matter of utmost importance. With over 2000 globally recognized African languages significantly underrepresented in the field and their marginalized status in major conferences, it is crucial to address this gap. This workshop aims to raise awareness about the opportunities, gaps, and challenges in NLP for low-resource languages (LRL). We will equip participants with the necessary tools to embark on their NLP journey for LRL by providing guidance on finding resources, technology, and mentorship during talks and panel sessions. Additionally, we will discuss data creation, governance, ethics, and policy in NLP to inform attendees. The workshop will also foster collaborative research and projects focused on community development and NLP in the context of low-resource languages via a pitching session where participants may share their ideas and get feedback.

Workshop 2: Approaches to leveraging digital higher education in Africa
Edward Peter Greenwood White, Jussi Okkonen, Reeta Oksa, Benjamin Ghansah, Christopher Yarkwah, Ephrem Kwaa-Aidoo, Issifu Yidana, Wilson Osafo Apeanti, Rosemary Twum
Saturday 19 August, 9:00-17:30, Venue 3

The provision of digital higher education hopes to meet the demand of quality higher education called for by the United Nation's Sustainable Development Goals. You are invited to submit your papers under the theme of "Build Back Better", where you discuss the building of higher educational capacity within Africa. Topics could be anything from the economic and social benefits derived from developing digital higher education capacity, to the ways this could be achieved. Alternatively, provide us with your critical perspectives under the theme of "critique of digital higher education capacity building". For example, this could be a decolonised perspective to the cultural imperialism created through capacity building in higher education and consequently the usurping of indigenous knowledge systems.

Workshop 3: Empowering Future Scholars - Coaching Workshop for Junior Researchers
Hafeni Mthoko, Joy Ming, Rama Varanasi
Saturday 19 August, 9:00-12:30, Venue 4

In recent years, there has been a growing focus on HCI research in non-western contexts, attracting junior researchers from diverse backgrounds to actively engage in this global community. However, there are limited avenues for junior researchers to learn the unwritten practices and nuances of the research process. Our workshop addresses this need through a 3-hour coaching session where junior researchers are paired with experienced senior researchers to work on a concrete research task of the junior researcher's choice, providing valuable mentorship and guidance.

Workshop 4: Research with Communities: Learning with Experts from Global Community Networks
Siddhant Shinde, Ndinelao Iitumba, Naveen Bagalkot, Melissa Densmore, Nicola J Bidwell
Saturday 19 August, 14:00-17:30, Online

Community Networks (CNs) worldwide are promising low-resource communities new ways of connecting and interplaying with technology. The embedded infrastructures of the CNs are derived from the sociocultural, political, spatial, and economic practices of the people they are built with and the communities they are located in. CNs situated in an area are not only followed by the technical requirements and possibilities of making the networks alive and accessible but are also shaped and moulded by the people and their practices. Community members' lived experience and awareness of the local knowledge and local practices materialize the network in the situated realities. Yet the knowledge and experiences of the communities are often invisible and not considered in future research agendas for infrastructure and technology developments. In this workshop, we aim to bring together community members from around the world working on the frontlines of CNs as experts to share their local knowledge and experiences of designing, developing, negotiating, and maintaining the network, while opening the space for early career researchers and students to listen and learn from the ground.

Panels

Panel 1: Effective Working Environment and Factor for A Software Engineer in Companies That Are Not ICT Based

Christianah Titilope Oyewale, Akintomiwa Mayowa Abolade, Olukunle Oyewumi

Working as Software Engineer in the healthcare industry for four years. There were rules guiding the work environment of healthcare professionals but none for Software engineers, who tend to overwork. Such resulted in health issues. Not ICT-based organizations need an understanding of the working factors of the Software Engineer to make them effectively produce. The panelists will discuss this and give their recommendations.

Panel 2: The World Usability Initiative: Toward Inclusive and Usable Computing Technologies Worldwide

Elizabeth Rosenzweig, Shaima Lazem, Susan Dray

Usability is the key to making future technology useful to the world, yet it is often ignored. This workshop will introduce Usability, and brainstorm ways to incorporate it into UN SDGs. One example is our effort to add World Usability Day (WUD) to the UN calendar. We will explore implications for technology design for the Global South. We will also identify concrete next steps that we all can take to advance Usability worldwide.