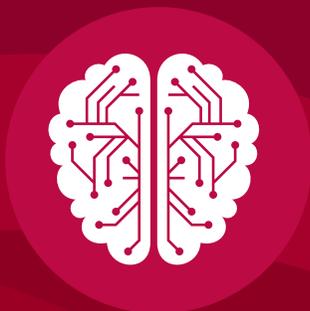


POSTERS



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COMPUTING RESEARCH

ADDRESSING NATIONAL PRIORITIES AND SOCIETAL NEEDS

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POSTER DESCRIPTIONS

Abolfazi Asudeh | University of Michigan, Ann Arbor

Query Reranking for Minority User Support

Data-driven techniques typically present results driven by a majority of the instances considered. As such, they often fail to address the diverse and sometimes contradicting preferences of the minorities and may become barriers to equality. Minorities who differ may have these differences overlooked in deference to the majority. To address this for the popular problem of ranked retrieval, we propose a third-party service that enables on-the-fly re-ranking of results based on user needs and preferences.

Eric Baumer | Lehigh University

Developing Methods for Human-Centered Algorithm Design

Complex algorithmic techniques are being increasingly incorporated into user-facing interactive systems. These systems provide numerous capabilities. However, mismatches can occur between how such systems work and what users interpret them to mean. This poster describes means of incorporating human users into the design process to achieve better alignment between the lay interpretation and the technical functioning of these systems.

Eduardo Blanco | University of North Texas

Making Computers Understand Human Language

Dr. Blanco's work enables computers to understand language as humans do. Specifically, I am interested in building computational models to infer spatial timelines, extract detailed interpersonal relationships, and reveal hidden interpretations from intricate phenomena such as negation and modality. My research targets implicit meanings that are intuitive to humans when interpreting language, and incorporates temporal inference and uncertainty to create meaning representations from language.

Omar Chowdhury | University of Iowa

Towards the Vision of a Compliant Internet Public-Key Infrastructure (PKI)

With the growing concerns of surveillance by resourceful adversaries, design and deployment of effective secure communication mechanisms have become extremely desirable. Although the core SSL/TLS protocol and its security parameter choices have undergone heavy scrutiny, such level of rigor is absent from the inspection of X.509 implementations, which can make the SSL/TLS vulnerable to impersonation attacks and/or may cause interoperability issues. The vision of this research is to develop a formally verified X.509 reference implementation and an effective mechanism for detecting noncompliance of existing X.509 implementations with the standard. Although conventional wisdom says that symbolic execution is not scalable for such a task, our technique dubbed SymCert has been proven to be extremely effective in exposing noncompliance in real implementations.

Seth Cooper | Northeastern University

Data-Driven Improvement of Video Games for Human Computation

Video games have shown potential as a framework for humans and computers to work together on solving challenging problems. Games have engaged players in solving real-world problems from a number of domains, including biochemistry. However, designing such games remains a challenging problem. Using telemetry data from gameplay may provide a means to assist in making and automating game design decisions, thus improving the effectiveness of games as human computation systems.

Sauvik Das | Georgia Institute of Technology

Social Cybersecurity: Reshaping Security Through an Empirical Understanding of Human Social Behavior

Social influences strongly affect cybersecurity behaviors, and it is possible to encourage better cybersecurity behaviors by designing security systems that are more social. In support of this statement, I will report on three projects: an empirical analysis of how security tools diffuse through the social networks; an experiment people in which we show that social proof encourages good security behaviors; and, the design and evaluation of the first socially inclusive authentication system.

Roya Ensafi | University of Michigan

Censored Planet: Measuring Internet Censorship Globally and Continuously

Internet stakeholders such as ISPs and governments are increasingly interfering with users' online activities, through behaviors that range from censorship and surveillance to content injection, traffic throttling, and violations of net neutrality. This poster presents Censored Planet, a system for continuously monitoring global Internet censorship that uses novel measurement techniques to remotely detect instances of interference almost anywhere on the Internet. Compared to previous approaches—which relied on having volunteers in censored regions deploy special hardware or software—this results in significantly better coverage, lower costs, and reduced ethical risk.

Kenneth Fletcher | University of Massachusetts Boston

A Method for Dealing with Data Sparsity and Cold-Start Limitations in Service Recommendation Using Personalized Preferences

Data sparsity and cold-start remains the main limitations in recommendation systems that employ collaborative filtering. Efforts to alleviate these limitations typically require additional user or item information such as social context of users and features of items, besides ratings that are usually available. This poster presents a method to resolve data sparsity and cold-start limitations using users' personalized preferences on non-functional attributes, as additional information.

Vanessa Frias-Martinez | University of Maryland

Understanding Human Behavior and Resilience During Shocks in Smart and Connected Communities

In this poster, Dr. Frias-Martinez will present two research projects focused on understanding human behaviors during shocks using large-scale, geo-referenced data extracted from ubiquitous technologies. In the first project, she and her research team proposed a novel framework to analyze behavioral changes in human mobility during floods in Rwanda using Call Detail Records (CDRs) from a telecommunications company. For the second project, Dr. Frias-Martinez and her research team proposed a semi-automatic framework to extract and compare the digital communication footprints of citizens and governments during snowstorms on the US east coast using Twitter communications. The end objective of her research is to offer evidence-based information that can help decision makers change, adapt or enhance response policies during shocks.

Rafael Frongillo | University of Colorado at Boulder

Information Elicitation: Crowdsourcing, Peer Grading, Machine Learning

Robust crowdsourcing mechanisms often use monetary contracts that incentivize someone to truthfully reveal their private information. Surprisingly, these contracts also show up in machine learning and statistics as loss functions, which guide the algorithm toward better predictions. Leveraging this connection, we combine ideas from economics and computer science to design new mechanisms for crowdsourcing and peer grading, but also new loss functions for machine learning.

Michael Gilbert | Google

Picture2Practice: Making the Invisible Visible

Speaking to “AI and Amplifying Human Abilities” - my poster will reframe the focus from bold-uppercase AMPLIFYING human abilities (e.g., typically through technological means) to amplifying HUMAN abilities (e.g., how can we reclaim, protect, or amplify the things that make us human - our passions, anxieties, the desirable aspects of our lived experience?). This reframing is the output of a Google-led research group at the University of Washington during the entire 2016-2017 academic year.

Dan Goldwasser | Purdue University

Machine Learning Methods for Analyzing Political Discourse and Extracting Social Information from Text

In online social networks, users openly interact, share content, endorse and disapprove of the behavior and stances of each other. Although the data is interconnected and dependent, previous research has primarily focused on modeling the social network behavior separately from the textual content. Our work makes the needed connections between the social behavior of users and the content generated. We show how social information can help support advanced text processing tasks, such as analyzing political discourse on social media.

Yufan Guo | IBM Almaden Research Center

Cognitive Review of Multimodal Clinical Data: Improving the Path from Diagnosis to Documentation

EMR systems are intended to improve care management and system analytics. However, the information stored in EMRs can be disorganized, incomplete or inconsistent creating problems at the patient and system level. We present a technology that enables reconciliation of inconsistencies between clinical diagnoses and administrative records by analyzing multimodal clinical data (HL7 and DICOM) in real time. This cognitive data review tool improves the path from diagnosis to documentation, facilitating accurate and timely clinical and administrative decision-making.

Christoffer Heckman | University of Colorado at Boulder

Rapid, Reliable Perception and Control for Autonomous Robots

To address the growing disconnect between probabilistic perception algorithms and deterministic control methods, the theory of dynamical systems is leveraged to develop rigorous, novel control approaches. This work draws on developments from other fields in robotics such as visual-based perception to tightly fuse complex models of the environment and their dynamics. Experimental platforms including autonomous vehicles are used to validate these methods in uncertain and dynamic environments.

Jeffrey Hemmes | Regis University

Towards Resilience in Wireless Sensor Networks

In many instances, wireless sensor networks are characterized by mobility and ad-hoc topologies. While mobile ad-hoc networks (MANETs) have been a popular area of research for years, they have fundamental characteristics that pose significant challenges to application design and usage in practice. This research explores ways in which resilience can be incorporated into the design and implementation of routing protocols, security subsystems, and network node localization in mobile sensor networks. We have shown that a cooperative data-sharing model can significantly reduce localization error, that predictive techniques can improve network throughput in many cases and assert that such models can additionally improve performance of routing protocols and security mechanisms, such as intrusion detection systems, that rely on them.

Amir Houmansadr | University of Massachusetts Amherst

MassBrowser: Unblocking the Web for the Masses, by the Masses

The Internet plays a crucial role in today's social and political movements—democracy and human rights throughout the world critically depend on preserving and bolstering the Internet's openness. Consequently, repressive regimes and totalitarian censor their citizens' access to the Internet using a wide range of technologies. This poster will introduce MassBrowser, a new system designed in our group to help censored users bypass censorship reliably.

Chien-Ming Huang | Johns Hopkins University

Amplifying Human Abilities Through Human-Centered AI systems

In this poster, I will highlight my prior work demonstrating the importance of human-centered design in building effective AI systems that aim to support people in a socially intuitive manner. I will show how embodied AI systems—robots—can employ human-inspired interaction strategies to provide cognitive (learning gains), social (user experience), and task (team performance) benefits to their users in various contexts such as personalized tutoring and adaptive collaboration.

Jeff Huang | Brown University

Personalized Behavior-Powered Systems

I am developing personalized systems that are built on top of passively captured behavioral data, or as I call them, Personalized Behavior-Powered Systems. The key opportunity in these systems is how easy-to-collect behavior data, with its noise and biases as products of human activity, can still support robust and innovative applications like online webcam eye tracking and automated sleep recommendations.

Eakta Jain | University of Florida

Understanding Humans Through Their Eyes

Eyes are a rich source of information about a human. They tell us what a person is interested in, what she finds important, and whether she is fearful or angry. My research aims to leverage eye-tracking technology to create empathetic artificial intelligence.

Zhe Jiang | University of Alabama

Utilizing Spatial Big Data from Intelligent Infrastructure to Enhance Situational Awareness for Disaster Management

Deadly flood events (e.g., Hurricane Harvey) are costing the U.S. billions of dollars each year. Accurately assessing disaster situation is still an unsolved issue. Spatial big data (e.g., high-resolution aerial imagery, volunteered geographic information on Twitter and Google Map) provides unprecedented opportunities to enhance the situational awareness for disaster response agencies. The poster will introduce research on utilizing spatial big data for flood extent mapping in disaster response.

Aron Laszka | University of Houston

Privacy-Preserving Energy Transactions (PETra): Providing Privacy, Safety, and Security in IoT-based Transactive Microgrids Using Blockchains

Power grids are undergoing major changes due to rapid growth in renewable energy and improvements in battery technology. Prompted by the increasing complexity of power systems, decentralized IoT solutions are emerging, which arrange local communities into transactive microgrids. However, providing security, safety, and privacy in such energy systems is challenging. We introduce PETra, a blockchain-based solution for transactive microgrids that enables consumers to trade energy without sacrificing their privacy and provides safety and security for the grid.

Dave Levin | University of Maryland

Provably Avoiding Nation-State Censorship

Traditional Internet communication leaves communicating parties vulnerable to persecution and disruption from online censorship. Although there are many systems in active use today that seek to resist censorship through anonymous, confidential communication (most notably Tor), they are currently rather brittle in the presence of a large censoring regime. This poster will present our work towards empowering users with greater control over where their packets don't go. Rather than rely on inaccurate maps of the Internet, we use novel measurement techniques and universal constraints to provide provable guarantees. We have applied this insight to achieve provable avoidance of user-specified geographic regions, and to protect Tor against several challenging attacks from nation-state adversaries.

Yafeng Lu | Arizona State University

AI and Amplifying Human Activities

In this poster, I will present two experiments integrating statistical models, visual analytics techniques, and user experiments to study the effectiveness of combining human- and machine-driven forecasting systems. These experiments are framed around the analysis of social media data for box office prediction problems and compare the prediction performance between a baseline model and users and between different settings of human collaborations. In another experiment using the same system, we analyzed the effects of human collaboration as teams, groups, and individuals. Our results indicate that a team's performance is mediated by the team's characteristics such as openness of individual members to others' positions and the type of planning that goes into the team's analysis.

Francisco Munoz-Arriola | University of Nebraska-Lincoln

Toward a Resilient Food-Energy-Water-Ecosystem Services Nexus: Analytics and Synthesis

To ensure long-term U.S. global competitiveness, it is imperative to build resilient infrastructure based on cyber-physical systems that ultimately enable sustainable food, water, energy and ecosystem services (FEWES). FEWES systems involve spatially and temporally varying data, present in multiple forms, formats and volumes, available at various exchange rates, and connected to different applications. To create a secure FEWES system we require efficient and effective transformations of multidimensional data into information based on novel theories, designs, and technologic developments.

Razieh Nabi | Johns Hopkins University

Fairness Through Causality

This poster portrays the problem of fair statistical inference involving outcome variables. The issue of fairness arises where some covariates or treatments are "sensitive," in the sense of having potential of creating discrimination. We believe the presence of discrimination can be formalized in a sensible way as the presence of an effect of a sensitive covariate on the outcome along certain causal pathways. A fair outcome model can then be learned by solving a constrained optimization problem

Aravind Prakash | Binghamton University

On Provenance and Security of Large-Scale Community-Level Software

The proliferation of software and their interconnectivity in the last few decades has placed an ever-increasing communal dependence on software. E-management of health records, online voting systems, online management of tax profiles, etc. are some of the various avenues at local, state and federal levels where we have seen the positive impacts of software. Unfortunately such a reliance on software has also seen a drastic increase in the number of attacks that target sensitive personal and financial information of various stakeholders. Now more than ever, there is a pressing need to establish provenance, and integrity and security. In this poster, I will present a high-level view of our platform that addresses these considerations while evaluating software for consumption at different levels of communities.

Goran Radanovic | Harvard University

Multi-View Decision Processes

We consider a helper-AI problem with two agents, human and AI that make joint decisions over a longer period of time. The human agent has an imperfect model of the world, so the AI agent needs to take into account possible imperfections of the human's actions when calculating its optimal policy. We model this as a multi-view decision process, which we use to formally analyze the positive effect of the AI's steering policies that can lead to a significant improvement of the agents' utilities.

Huzefa Rangwala | George Mason University

AI Opportunities in Improving Student Outcomes in College

The six-year higher-education graduation rate has been around 59% for over 15 years; less than half of college graduates finish within 4 years. This has high human, economic and societal costs. The National Research Council has identified a critical need to develop innovative approaches to improve student retention, graduation, and workforce-preparedness. The objective of this project is to develop new computational methods to analyze large and diverse types of education and learning data to help discover successful academic pathways for students, improve pedagogy for instructors, and enhance student persistence and retention for institutions. The proposed research will produce new dynamical system modeling, collaborative filtering, and multi-task learning methods. These innovations will coalesce into three pilot applications: DegreePlanner for students, CourseInsights for instructors, and StudentWatch for academic advisors.

David Reitter | Pennsylvania State University

Understanding Cognition Through Computational Models: Consequences for A.I.

Computational cognitive science aims to explain what makes humans intelligent through computer programs. These models describe thinking in terms of algorithms and data structures and are trained on large-scale data. Such cognitive models provide a new way to formalize our understanding of the mind. The big-data approach disrupts behavioral fields such as psychology. Our work on dialogue and deep, distributed representations is applied in natural-language processing and neural machine learning.

Florian Schaub | University of Michigan

Usable Privacy Notices and Controls for Consumers

Privacy notice and choice are essential aspects of privacy and data protection regulation. Yet, today's privacy notices and controls are surprisingly ineffective at informing users or allowing them to express choice. We analyze why existing mechanisms fail consumers, study how their usability and effectiveness can be increased, and design and evaluate usable privacy mechanisms that empower consumers to effectively manage their privacy online, with mobile technologies and the Internet of Things.

Max Schuchard | University of Tennessee

Taking Back the Internet: Mitigating Modern DDoS Attacks via Reactive BGP Routing

In this work, we present a system for mitigating Distributed Denial of Service, or DDoS, attacks by routing critical benign traffic around links under attack. Our system alters how Autonomous Systems (ASes) handle route selection and advertisement in the Border Gateway Protocol (BGP) in order to achieve isolation of critical traffic away from degraded links. We find that in more than 98% of cases our system can successfully migrate critical traffic off of the attacked network segments. In more than 70% of such cases the alternative path has sufficient capacity to handle the added traffic load without congestion.

Muhammad Shahzad | North Carolina State University

WiFi Based Human Sensing to Enable Aging-in-Place for the Elderly

With the senior members of the “baby boomers” demographic cohort crossing the age of 70, the US has started to experience a considerable growth in its elderly population. The National Research Council’s report from the workshop on “Grand Challenges of Our Aging Society” has stressed the need to develop technologies that can track and monitor the activities of the elderly, and thus enable them to age in place. We present WiFi based human sensing systems that can unobtrusively monitor activities and gestures of the elderly and enable not only their continuous health monitoring but also gesture-based control of equipment in their smart homes.

Houbing Song | Embry-Riddle Aeronautical University

Intelligent Infrastructure for the Airport of Things towards Smart & Connected Cities and Communities

There are airport capacity needs in the National Airspace System (NAS). Airport of Things (AoT) is the networking infrastructure for the landside airport assets, systems, and services. Airport of Dependable and Controllable Things will enable the full systems-of-systems optimization in the NAS and make the national airport system safe, efficient, and environmentally responsible.

Vivek Srikumar | University of Utah

Natural Language Understanding in the Wild

As natural language processing technology becomes increasingly mature, it will find use in a broad range of user-facing applications. This poster focuses on two applications: answering complex questions that require reasoning, and assessing the quality of mental health therapy. We will use these examples to highlight challenges that need to be addressed as such applications become commonplace.

Eirini Eleni Tsiropoulou | University of New Mexico

Socio-physical Coalition Formation in Smart IoT Applications

A socio-physical coalition formation process among smart Internet of Things (IoT) devices in an intelligent infrastructure environment is proposed and the problem of efficient resource management is studied. Realistic IoT applications, such as multi-purpose sensing in smart homes, smart lighting systems, etc. will be illustrated. The importance of IoT devices’ interest, social and physical ties for the robustness, viability and sustainability of smart IoT applications will be demonstrated.

Ranga Raju Vatsavai | North Carolina State University

Monitoring Critical Infrastructures with Spatiotemporal Edge Computing

In many real-world applications, such as, natural disasters, crop diseases and bioterrorism, traffic, human activity, and public place monitoring, near real-time extraction of knowledge from the sensor data streams is becoming critical. Recent advances in embedded supercomputers (e.g., Jetson TX1, size of a credit card, low power ~10W) are bringing computing closer to the sensors to enable real-time analytics and decision-making. We present the enabling technologies behind this revolution and showcase the utility in critical infrastructure monitoring.

Huy Vo | City College of New York

Towards an End-to-End Platform for Interactive Analysis and Visualization of Big Urban Data Sets

The ubiquity of sensors, GPS-enabled devices and social networks, notably in urban environments, has led to an explosion in the volume of data sets that have both spatial and temporal components. However, analyzing them efficiently is not easy, nor even possible, using traditional tools and techniques due to the large size and the amount of computing needed to process the data. Our objective is to allow the creation of visual analysis applications, specifically for big urban spatio-temporal data sets, to be more accessible to data enthusiasts and domain experts. We propose an open-source, native plug-in for Unity3D, the leading game engine, to facilitate the management, analysis and visualization of spatio-temporal data sets including 3D geometries and scientific data.

Gang Wang | Virginia Tech

Adversarial Machine Learning in the Physical Domain

Machine learning has been widely used to help computer systems to better interact with the physical world. Meanwhile, machine learning can also introduce new vulnerabilities. For example, changing a few target pixels in an image may cause a machine learning classifier to misclassify a “stop” sign, causing real troubles to systems like self-driving cars. Existing studies have looked into adversarial machine learning mainly in the digital domain. Our work seeks to understand the feasibility of adversarial attacks in the physical domain and potential ways of defense.

William Wang | University of California, Santa Barbara

Automated Fake News Detection

Automatic fake news detection is a challenging problem in deception detection, and it has tremendous real-world political and social impacts. However, statistical approaches to combating fake news has been dramatically limited by the lack of labeled benchmark datasets. In this paper, we present LIAR: a new, publicly available dataset for fake news detection. We collected a decades-worth of 12.8K manually labeled short statements in various contexts from POLITIFACT.COM, which provides detailed analysis report and links to source documents for each case. We have designed a novel, hybrid convolutional neural network to integrate metadata with text that can improve a text-only deep learning model.

Yan Wang | SUNY at Binghamton

SmartPark: An Intelligent Parking Adviser Using Crowd Sourcing

How to balance the utility of parking space in a community has been an important question for administration departments for years. This project aims to build an intelligent parking system, SmartPark, that can effectively convince drivers to park their vehicles in further parking lots by providing drivers convenient parking choices based on confident estimations of parking space and public transportation schedules. Given high dynamics and density of smartphones in our daily lives, we propose to develop a crowdsourcing application that can track availability of on-campus parking spots by exploiting the advanced sensing techniques in the phones.

Zhangyang Wang | Texas A&M University

Exploiting Low-Quality Visual Data Using Deep Networks

While many sophisticated models are developed for visual information processing, very few pay attention to their usability in the presence of data quality degradations. Most successful models are trained and evaluated on high-quality visual datasets. On the other hand, the data source often cannot be assured of sufficiently high quality in practical scenarios. Quality factors, such as occlusion, motion blur, missing data and bad weather conditions, are also ubiquitous in the wild. The seminar will present a comprehensive and in-depth review, on the recent advances in the robust sensing, processing and understanding of low-quality visual data, using deep learning methods. I will further demonstrate how our proposed approach largely improves a broad range of real-world applications, such as traffic monitoring, security surveillance, and video communication.

Tim Weninger | University of Notre Dame

Models of Social Media Manipulation

Society is increasingly relying on the digitized, aggregated opinions of others to form opinions and make judgments. This poster illustrates our study of social news aggregation Web sites and presents the results of our investigation into how these information aggregators distort opinions and decision-making in society. The study of influence dynamics on social platforms is a critical step towards a deeper understanding of the complex interactions between individuals using new technology.

Da Yan | University of Alabama at Birmingham

Big Data Frameworks: Bridging High Performance of HPC Community with Programming Friendliness of Data Science Community

The poster will introduce the latest big data analytics frameworks being developed in my group. They include vertex-centric model for data-intensive graph analytics, subgraph-centric model for compute-intensive graph mining, and matrix-based model for data analytics and machine learning. These frameworks expose user-friendly API to data analysts and guarantee the scalability and efficiency of the underlying execution engine.

Kwang Soo Yang | Florida Atlantic University

Spatial Network Big Data for Transportation Resource Planning: Challenges, Approaches, and Opportunities

Increasingly, Spatial Network Big Data (SNBD) is of a size, variety, or update rate that exceeds the capacity of commonly-used spatial computing technologies to learn, manage, and process with reasonable effort. Examples of SNBD include temporally detailed road maps that provide a driver's speed every minute for every road-segment, GPS trace data from cell phones, and engine measurements of fuel consumption, greenhouse gas emissions, etc. However, there are many practical challenges today because the methods, models and algorithms currently used for query processing do not scale and/or perform well for large volumes of SNBD. We are currently investigating three research problems within SNBD data processing: 1) storage scheme for SNBD, 2) design of scalable algorithms for transportation resource planning, and 3) unified data model for SNBD.

Yezhou Yang | Arizona State University

Computer Vision-based Quantitative Assessment of Motor Function in Stroke Patients

Objective quantification of movement characteristics of Upper Extremities is a critically necessary step to capture the key characteristics of patient's sensorimotor impairment reliably. Recently, significant effort has been devoted to developing technology and methods for measuring hand and arm kinematics and kinetics. However, these methods are typically expensive, need significant time to set up and are designed for specific tasks that are unfamiliar to clinicians. To overcome these drawbacks, we explore a novel solution to quantitative assessment of human UE function based on state-of-the-art Computer Vision techniques. This approach combines the use of existing, standardized clinical assessment tools with advances in human movement tracking using low-cost cameras, to measure the motion of the arm and hand, as well as their interaction with the environment.

Xun Zhou | University of Iowa

Mining Spatio-Temporal Big Data for Urban Event Footprint Analytics

Identifying the footprint of urban events such as crowd gathering and traffic congestion is crucial to improving transport efficiency and mitigating public safety risks. The poster presents our recent research on urban event analytics, i.e., early detection and forecasting of urban gathering events through mining spatio-temporal big data (e.g., vehicle GPS trajectory). Case studies and experiments on real data are presented to validate the effectiveness and scalability of the techniques.



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The mission of Computing Research Association's Computing Community Consortium (CCC) is to catalyze the computing research community and enable the pursuit of innovative, high-impact research. CCC conducts activities that strengthen the research community, articulate compelling research visions, and align those visions with pressing national and global challenges. CCC communicates the importance of those visions to policymakers, government and industry stakeholders, the public, and the research community itself.

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