



9th Health Care Engineering Systems  
**SYMPOSIUM**

Hosted at Jump Trading Simulation & Education Center | Peoria

**#ARCHES2022**

**Jump** | ARCHES

AN OSF HEALTHCARE, UNIVERSITY OF ILLINOIS  
URBANA-CHAMPAIGN AND UNIVERSITY OF ILLINOIS  
COLLEGE OF MEDICINE PEORIA COLLABORATION



## DEPLOYING INNOVATION TO RADICALLY SIMPLIFY CARE

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- We are partnering across the state to offer care and resources to our communities

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# WELCOME

It's our pleasure to welcome you to the 9th Health Care Engineering Systems Symposium and Interactive Exposition, a part of the Jump Applied Research for Community Health through Engineering and Simulation (ARCHES) program.

Following three years of social distancing, virtual meetings and symposiums, we are excited to personally greet you here at Jump Trading Simulation & Education Center. While COVID-19 has put some constraints on how we collaborate, it has not deterred any of you from developing concepts to transform health care.

Today, we will highlight some of these projects from the past year and discuss how your idea can be considered for the next round of Jump ARCHES funding. In addition, you will have the opportunity to network with each other and form partnerships to strengthen your chances of receiving an award.

This fall, we are focusing on funding projects exploring a variety of themes, including precision medicine, digital connections to health care, delivering care to underserved populations and expanding care to people with disabilities, mental health concerns and neurological issues.

We look forward to hearing your ideas. Thank you for continuing to help us build the future of health care.



**John Vozenilek, MD, FACEP**  
*Vice President, Chief Medical Officer  
for Innovation and Digital Health  
Jump Trading Simulation & Education Center  
OSF HealthCare*



**Elizabeth Hsiao-Wecksler, PhD, MS**  
*Interim Director of the Health Care  
Engineering Systems Center  
University of Illinois*

# INNOVATION ACADEMIC INCUBATOR

Become part of an effort to combine the talents of OSF HealthCare clinicians with academic researchers to develop novel health care solutions by joining the Innovation Academic Incubator (IAI).

The IAI is a network of clinicians across OSF HealthCare as well as faculty and students from university partners that helps execute innovative health care solutions, convert them into companies or license them to outside companies.

As a member, you will receive the latest information on opportunities for professional development, networking and upcoming events based on your interests. Sign up today, and you will be the first to know when the application process opens for the following grants and events:



- **Jump Applied Research for Community Health through Engineering Simulation (ARCHES)**
  - A collaborative grant program with the University of Illinois Urbana-Champaign
- **Community Health Advocacy (CHA)**
  - A collaborative grant program with the University of Illinois Chicago
- **Innovation for Health**
  - A collaborative grant program with Bradley University
- **Trailblazer Challenges**
  - A competition among health care innovators to solve complex problems for the Ministry

Register for the IAI at [osfinnovation.org/IAI](https://osfinnovation.org/IAI)



# 9th Health Care Engineering Systems Symposium and Interactive Exposition

Friday, September 30, 2022 | 8 a.m. to 2:30 p.m.

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**8:30 - 9 a.m.**

## Registration/Coffee/Breakfast

**9 - 9:30 a.m.**

## Welcome & Opening Remarks

- **Michelle Conger**, chief strategy officer, OSF HealthCare, and chief executive officer, OSF OnCall Digital Health
- **Susan Martinis, PhD**, vice chancellor for research and innovation, University of Illinois Urbana-Champaign
- **Mike Cruz, MD**, chief operating officer, OSF HealthCare
- **Rashid Bashir, PhD**, dean, Grainger College of Engineering, University of Illinois Urbana-Champaign

**9:30 - 10 a.m.**

## Jump ARCHES Review

- **John Vozenilek, MD, FACEP**, vice president, chief medical officer, Innovation and Digital Health, OSF HealthCare
- **Elizabeth Hsiao-Weckler, PhD, MS**, interim director, Health Care Engineering Systems Center, University of Illinois Urbana-Champaign

**10 - 10:10 a.m.**

## Break

**10:10 - 11 a.m.**

## Clinical Panel Discussion

- **John Vozenilek, MD, FACEP**
- **Melinda Cooling, DNP**, senior vice president, Advanced Practice, and chief clinician executive, OSF OnCall Digital Health

- **Meenakshy Aiyer, MD, MACP**, regional dean, University of Illinois College of Medicine Peoria

- **Becky Buchen**, senior vice president, Innovation, OSF HealthCare

- **Jon Handler, MD, FACEP, FAMIA**, senior fellow, Innovation Clinical Intelligence, OSF HealthCare

**11:05 - 11:50 a.m.**

## Featured ARCHES Presentation

1. **Adam Cross, MD, FAAP**, clinical informatics specialist and pediatric hospitalist, OSF HealthCare Children's Hospital of Illinois
2. **Minh Do, PhD**, professor, Department of Electrical and Computer Engineering, University of Illinois Urbana-Champaign
3. **Matthew Bramlet, MD**, pediatric cardiologist, OSF HealthCare Children's Hospital of Illinois, and director, Advanced Imaging and Modeling Lab, OSF HealthCare

**11:50 a.m. - 12:40 p.m.**

## Lunch

**12:40 - 1:30 p.m.**

## Center for Social and Behavioral Sciences Session

- **Jessie Chin, PhD**, assistant professor, University of Illinois Urbana-Champaign
- **Chung-Yi Chiu, PhD**, assistant professor, University of Illinois Urbana-Champaign
- **Mardia Bishop, PhD**, teaching associate professor, University of Illinois Urbana-Champaign

- **Abigail Wooldridge, PhD**, assistant professor, University of Illinois Urbana-Champaign

- **Alexandra Chronopoulou, PhD**, clinical associate professor, University of Illinois Urbana-Champaign

**1:30 - 2 p.m.**

## Office of Technology Management Session (Edison)

- **Kip McCoy, MBA**, vice president, The Innovation Studio, OSF HealthCare
- **Svetlana Sowers, PhD**, assistant director and senior technology manager, Office of Technology Management, University of Illinois Urbana-Champaign

**1:30 - 2:30 p.m.**

## Poster/Demo (Lecture Hall)

Six presentations from list of current projects

- **Deana McDonagh, PhD**
- **M. Jawad Javed, MD, FAAP**
- **Girish Krishnan, PhD**
- **William Cope, PhD**
- **Inki Kim, PhD**
- **Christopher Zallek, MD**

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# The Grainger College of Engineering

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

## Health Care Engineering Systems Center

HCESC at the University of Illinois at Urbana-Champaign provides clinical immersion and fosters collaboration between engineers and physicians. We design collaborative solutions to improve health care outcomes utilizing our expertise in simulation technologies, smart health systems, data analytics, human factors, and medical robotics. We are a partner in the Jump ARCHES endowment with OSF HealthCare and the University of Illinois College of Medicine Peoria. Together, we have provided researchers between the three institutions with over \$8.25 million shared among 125+ awards.

HCESC also manages the Jump Simulation Center on the Urbana-Champaign campus, a state-of-the-art educational space focused on using and developing simulation technology to train innovative medical professionals, uniquely equipped to transform the world of health care.

We work with campus-wide, domestic, and international entities to discover new answers to some of the most pressing health care issues. Contact us if you are interested in collaborating with us or learning more about our technology.



[healtheng.illinois.edu](http://healtheng.illinois.edu) | [hcesc@illinois.edu](mailto:hcesc@illinois.edu)



### **Mike Cruz, MD**

*Chief Operating Officer, OSF HealthCare*

Dr. Mike Cruz serves as chief operating officer for OSF HealthCare. He is responsible for ensuring that clinical and administrative services are organized to meet the needs of those we serve.

Dr. Cruz started with OSF HealthCare Saint Francis Medical Center in 1987 as a resident in the emergency medicine program. He was hired as an emergency medicine attending physician in 1990 and held the position of vice chairman of the department for a decade. In September 2007, Dr. Cruz was appointed vice president of Quality & Safety for OSF Saint Francis and began serving as the associate chief medical officer. Dr. Cruz was promoted to president of OSF Saint Francis in January 2015.

In January 2017, Dr. Cruz assumed the responsibilities of interim CEO of the Central Region in addition to serving as the OSF Saint Francis president. He formally took over the role of CEO of the Central Region in November 2017, providing leadership support, which included OSF Saint Francis and OSF HealthCare Children's Hospital of Illinois in the Peoria area as well as the broader geographic area to the north and south of the Tri-County Area.

In addition to his role as Central Region CEO, Dr. Cruz was promoted to chief operating officer of OSF HealthCare in December 2018. He served both roles until September 1, 2022, when the role of Central Region CEO was filled, enabling him to focus more on his operational responsibilities.

Dr. Cruz earned a bachelor's degree in biochemistry from the University of Illinois at Urbana-Champaign and medical degree from the University of Illinois College of Medicine Chicago.



### **Michelle Conger**

*Chief Strategy Officer, OSF HealthCare, and CEO, OSF OnCall Digital Health*

Michelle Conger is the chief strategy officer for OSF HealthCare and chief executive officer for OSF OnCall Digital Health. In her role as chief strategy officer, she partners with the CEO, board of directors and executive leadership in the ongoing generation and execution of system strategy. She also assists in ensuring the alignment of key strategic initiatives and business development plans.

Conger led the creation of OSF Innovation, a division dedicated to health technology incubation, usability and simulation strategies and venture capital investment strategies. As CEO of OSF OnCall Digital Health, she is leading the organization in the development of a versatile digital platform that will use existing and emerging digital technologies to transform health care delivery to meet the challenges and expectations of the modern health care user.

She has led many transformation initiatives across the Ministry including the implementation of Epic, organizational design transformation, population health strategy development and the creation of a systemwide program management office. Her past roles have included senior vice president of the Performance Improvement Division and executive director of planning for the Information Technology division. Her professional accomplishments also include achieving a 6 Sigma Black Belt and 6 Sigma Master Black Belt. Conger has a master's in social work from the University of Illinois.

## Symposium Speakers

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### **Rashid Bashir, PhD**

*Dean, Grainger College of Engineering, University of Illinois Urbana-Champaign*

Rashid Bashir holds the Grainger Distinguished Chair in Engineering, tenured appointment in bioengineering and affiliate appointments in electrical and computer engineering, mechanical science and engineering, materials science and engineering and molecular and integrative physiology.

He has authored or co-authored over 250 journal papers, over 200 conference papers and conference abstracts and over 100 invited talks and has been granted 45 patents. Bashir is a fellow of eight international professional societies. His research interests include bionanotechnology, BioMEMS, lab on a chip, interfacing of biology and engineering from the molecular to the tissue scale and applications of semiconductor fabrication to biomedical engineering, all applied to solving biomedical problems.

Bashir's key technical contributions and achievements are in the area of BioMEMS and biomedical nanotechnology, especially in the use of electrical- or mechanical-based label-free methods for detection of biological entities on a chip. In addition, he has also made key contributions to 3D fabrication methods that can be used for tissue engineering and development of cellular systems. He has been involved in three startups that have licensed his technologies. Bashir completed his PhD from Purdue University in 1992 and holds a Master of Science in Electrical Engineering from Purdue University.



### **Susan Martinis, PhD**

*Vice Chancellor for Research & Innovation, University of Illinois Urbana-Champaign*

Susan Martinis is vice chancellor for Research and Innovation at the University of Illinois at Urbana-Champaign, where she provides leadership for the campus-wide interdisciplinary research institutes, promotes new research initiatives and oversees the administrative and business processes that ensure the safe, ethical and productive conduct of research at Illinois.

Dr. Martinis, the Stephen G. Sligar Professor of Molecular and Cellular Biology, studies the mechanisms, evolution and biomedical applications of protein synthesis and RNA-protein interactions. She is a successful researcher, engaged in entrepreneurial and corporate partnerships, a committed educator and an experienced administrator.





### **John Vozenilek, MD, FACEP**

*Vice President, Chief Medical Officer, Innovation and Digital Health, OSF HealthCare*

Dr. John Vozenilek is the vice president and chief medical officer for Innovation and Digital Health at Jump Trading Simulation & Education Center, a collaboration between OSF HealthCare and the University of Illinois College of Medicine Peoria (UICOMP). In this role, Dr. Vozenilek provides central coordination and oversight for undergraduate, graduate, interdisciplinary and continuing medical education programs for OSF HealthCare. Under his direction, OSF HealthCare and UICOMP have built resources for educators who wish to use innovative learning technologies for teaching and assessment.

As the Duane and Mary Cullinan Professor in Simulation Outcomes, Dr. Vozenilek is actively involved in academic programs across traditional departmental boundaries and in clinical practice at OSF HealthCare. In addition to his role in simulation, Dr. Vozenilek teaches master's degree candidates in the fields of simulation, health care quality and safety and is formally appointed to teach biodesign at the University of Illinois at Urbana-Champaign.



### **Elizabeth Hsiao-Wecksler, PhD**

*Interim Director of the Health Care Engineering Systems Center (HCESSC) in The Grainger College of Engineering, University of Illinois Urbana-Champaign*

Elizabeth Hsiao-Wecksler is the interim director of the Health Care Engineering Systems Center (HCESSC) at the University of Illinois Urbana-Champaign. She is also the Willett Faculty Scholar and Professor in the Department of Mechanical Science and Engineering (MechSE).

Hsiao-Wecksler served as associate head for Undergraduate Programs for four years and holds multiple affiliations with ISE, BIOE, Beckman Institute, CI MED, and ZJUI. In addition, she directs the Human Dynamics and Controls Laboratory (HDCL) in the MechSE department, where they apply principles from soft and hard robotics, wearables, musculoskeletal biomechanics and movement analysis. The goal of this lab is to investigate and improve the quality of life of individuals with disabilities through the development of user-centered assistive technologies and health care education simulation trainers.

Her work closely aligns with the HCESSC and she has been an active faculty member of this prestigious center, including being a member of the HCESSC steering committee.

## Symposium Speakers

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### **Melinda Cooling, DNP**

*Senior Vice President, Advanced Practice, and Chief Clinician Executive, OSF OnCall Digital Health*

Melinda Cooling serves as the senior vice president of Advanced Practice and the chief clinician executive for OSF OnCall Digital Health at OSF HealthCare. In this role, she works with operational and clinical leaders to design and implement new digital solutions to provide care for patients and communities.

Cooling is a family nurse practitioner and practiced within an internal medicine/pediatrics facility as well as modern urgent care. She developed the vision for the Center for Advanced Practice within OSF, which included the conceptualization of an APP Fellowship model that has now achieved national accreditation. She has held faculty positions in undergraduate and graduate colleges of nursing.

Cooling has experience in research, serving as a principal investigator for studies related to rheumatoid arthritis. She has been a co-investigator for several current studies relating to APP transition to practice, burnout and preceptor evaluation tools for post-graduate fellowship. She has served as a member of a research team for studies of the efficacy of simulation for nursing students.



### **Meenakshy Aiyer, MD, MACP**

*Regional Dean, University of Illinois College of Medicine Peoria*

Dr. Meenakshy Aiyer is the regional dean for the University of Illinois College of Medicine Peoria (UICOMP) campus. Before taking on this role, she served as interim regional dean, expanding the UICOMP Graduate Medical Education program and creating the Research Services Division to support and elevate research and scholarship for faculty, staff and learners. Her efforts supporting philanthropy led to the establishment of two endowed professorships and more than \$1.5 million in new student scholarship and rural education endowment.

Prior to her interim post, Dr. Aiyer served the associate dean for Academic Affairs at the Peoria campus, where she was responsible for medical student education. Dr. Aiyer also holds the titles of professor of Clinical Medicine and head of the Department of Health Sciences Education, a department she helped design and create in 2016.

Born and raised in India, Dr. Aiyer received her medical degree from the Madurai Kamaraj University. She came to the United States to complete her internal medicine residency at the University of Louisville and UICOMP, where she served as chief resident. Dr. Aiyer remained in Peoria and joined the faculty of the College of Medicine in 1996, following her residency.



### **Becky Buchen**

*Senior Vice President, Innovation, OSF HealthCare*

Becky Buchen has served as the senior vice president of Innovation Operations for OSF HealthCare since 2018. In this role, Buchen oversees the OSF Innovation Studio and Performance Improvement.

This includes oversight of Intellectual Property Policy management, the Performance Improvement portfolio across the Ministry and the innovation process that supports idea generation, solution discovery and pilot testing. She is also responsible for the development of the operational infrastructure needed to support innovation and ensures innovation results are measured and achieved.

Buchen works collaboratively with executive leadership to drive the OSF Innovation agenda, including engaging Mission Partners in the process, educating them on innovation and creating an innovation competency at OSF HealthCare.



### **Jon Handler, MD, FACEP, FAMIA**

*Senior Fellow, Innovation Clinical Intelligence, OSF HealthCare*

Jonathan Handler is the senior fellow for Innovation at OSF HealthCare. He also serves as an adjunct associate professor at Northwestern University's Feinberg School of Medicine.

Dr. Handler is board-certified in emergency medicine as well as clinical informatics. He has served as the senior vice president of Strategy at EmOpti, vice president of Digital Innovation at Baxter Healthcare Corporation, chief medical information officer at M\*Modal, chief deployment architect at Microsoft's Health Solutions Group, director of Development at the National Institute for Medical Informatics and director of Emergency Medicine Research and Informatics at Northwestern University.

Dr. Handler holds a BA in finance from the University of Illinois at Urbana-Champaign, an MD from University of Illinois College of Medicine Chicago and is a graduate of the combined Georgetown/George Washington University emergency medicine residency program.

## Symposium Speakers

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### **Adam Cross, MD, FAAP**

*Clinical Informatics Specialist and Pediatric Hospitalist,  
OSF HealthCare Children's Hospital of Illinois*

Dr. Adam Cross is a board-certified pediatrician, board-eligible pediatric hospitalist and board-eligible clinical informaticist who has recently been appointed as the leader of the Children's Innovation Lab for OSF Innovation.

Though an Illinois native, Dr. Cross has spent the past four years providing care to underserved populations in New Mexico and Arizona, including indigenous populations, refugees and immigrants. In 2017, he received an American Academy of Pediatrics Community Access to Child Health (CATCH) grant to create a community-sourced, multilingual resource guide and video series for New Mexico's three largest refugee demographics.

Dr. Cross also served as one of the state's primary ethicists and assisted in drafting legislation on fair and just allocation of critical care resources during the COVID-19 pandemic. He has a passion for improving outcomes and reducing disparities in pediatric health care through technological innovation, medical education and infrastructure optimization.



### **Minh Do, PhD**

*Professor, Department of Electrical and Computer Engineering,  
University of Illinois Urbana-Champaign*

Minh Do is the Thomas and Margaret Huang Endowed Professor in Signal Processing and Data Science in the Department of Electrical and Computer Engineering at the University of Illinois Urbana-Champaign. He holds affiliate appointments with the Coordinated Science Laboratory, the Beckman Institute for Advanced Science and Technology, the Department of Bioengineering and the Department of Computer Science.

Do's current research interests include signal processing, computational imaging, machine perception and data science. He co-authored two papers with Arthur L. da Cunha and Ha T. Nguyen that received Best Student Paper Awards at the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) in 2005; a paper with Yue Lu that received a Most Innovative Paper Award at the IEEE International Conference on Image Processing (ICIP) in 2006; and a paper with Yue Lu that received a Student Paper Award at ICIP in 2007. He received a Young Author Best Paper Award from the IEEE Signal Processing Society in 2008 for a paper with Martin Vetterli.

Do received a Bachelor of Science in Computer Engineering from the University of Canberra, Australia, in 1997 and a Doctor of Science in Communication Systems from the Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland, in 2001.



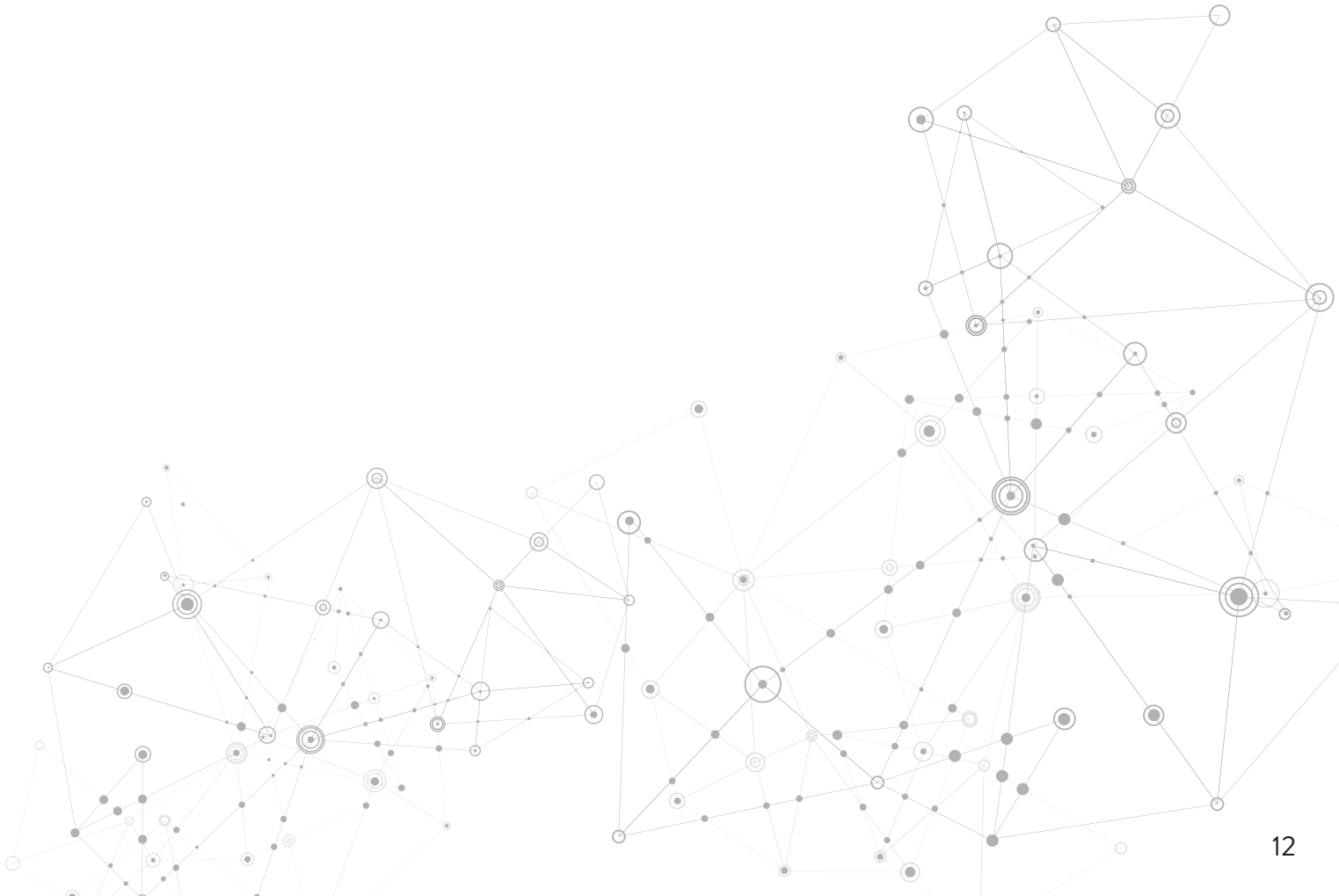
**Matthew Bramlet, MD**

*Pediatric Cardiologist, OSF HealthCare Children's Hospital of Illinois, and Director, Advanced Imaging and Modeling Lab, OSF HealthCare*

Dr. Matthew Bramlet is the director of the Advanced Imaging and Modeling Lab for OSF Innovation. He is also a pediatric cardiologist directing the congenital cardiac MRI program at the OSF HealthCare Children's Hospital of Illinois and serves as an assistant professor of Clinical Pediatrics at the University of Illinois College of Medicine Peoria.

Dr. Bramlet's success in congenital heart disease surgical planning through 3D printing led to the creation of the AIM Lab, which offers free segmentation to institutions seeking 3D modeling for pre-surgical planning. The AIM lab invented a virtual reality authoring capability to meet the needs of teams needing to rapidly convey complex 3D problems.

He founded Enduvo, Inc., to transition the tool from a research model to a scaled solution. His current research at UICOMP studies the efficiency and effectiveness of VR educational models as well as 3D segmentation of patient specific pathologies.



## Center for Social and Behavioral Sciences Session

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### **Jessie Chin, PhD**

*Assistant Professor, University of Illinois Urbana-Champaign*

Dr. Jessie Chin is an assistant professor in the School of Information Sciences at the University of Illinois at Urbana-Champaign. Her research programs aim at advancing knowledge in cognitive sciences regarding evolving human interaction with the contemporary information technologies, and translating theories in social and behavioral sciences to the design of technologies and interaction experience to promote health communication and behavior across the lifespan. Chin will speak to her expertise on misinformation in the health care context, including cancer care.



### **Chung-Yi Chiu, PhD**

*Assistant Professor, University of Illinois Urbana-Champaign*

A Certified Rehabilitation Counselor, Professor Chiu's research aims to promote holistic health, well-being and quality of life of people with disabilities and chronic illnesses. She has conducted theory-driven and interdisciplinary research in self-regulation of healthy lifestyles, positive psychosocial adjustment and social participation. Her research focuses include: Improving the Health Action Process Approach to enhance individuals' self-management of healthy behaviors; strengthening individuals' positive psychosocial factors, such as resilience, coping and self-efficacy, to promote quality living with physical and mental health conditions; empowering individuals to optimize their participation in health care, community resources and life fulfillment.



### **Mardia Bishop, PhD**

*Teaching Associate Professor, University of Illinois Urbana-Champaign*

Mardia Bishop holds a Ph.D. from The Ohio State University. She is a teaching associate professor and the director of Public Speaking Instruction for the Communication Department at the University of Illinois. In addition to her director duties, Bishop teaches courses in storytelling, listening, business and professional communication and rhetorical performance styles through the ages. She consistently is on the Faculty Ranked as Excellent List and in 2014 won the Campus Award for Excellence in Undergraduate Teaching.

Bishop also serves as a communication consultant to organizations and in that capacity has developed and facilitated numerous interactive workshops that focus on Presentation Skills; Diversity, Equity and Inclusion; Active Listening; and Conflict Management. She has also written and directed 100+ interactive training videos targeted at improving communication skills through practice.



### **Abigail Wooldridge, PhD**

*Assistant Professor, University of Illinois Urbana-Champaign*

Abigail R. Wooldridge is an assistant professor in the Department of Industrial and Enterprise Systems Engineering, where she directs the Human Factors in Sociotechnical Systems Laboratory. Her research focuses on engineering sociotechnical systems to support teams and improve equity and justice, particularly in health care and health-related settings. She has courtesy appointments in Computer Science, Kinesiology and Community Health, School of Information Sciences, Beckman Institute for Advanced Science and Technology, Coordinated Science Laboratory and Biomedical and Translational Sciences at Carle Illinois College of Medicine. Dr. Wooldridge received her PhD from the University of Wisconsin-Madison focused on Human Factors and Ergonomics; she also has worked in industry, with experience in process improvement consulting, decision support and surgical scheduling. Her work appears in *Ergonomics*, *Applied Ergonomics*, *Cognition*, *Technology and Work*, *Applied Clinical Informatics*, *Internal and Emergency Medicine*, *Health Affairs*, *PLOS One* and more. Her edited volume, *Advancing Diversity, Inclusion, and Social Justice Through Human Systems Engineering*, received the Choice Outstanding Academic Title 2020 Award. She recently was awarded the Presidential Medallion from University of Illinois System President Tim Killeen and the inaugural Robert L. Wears Early Career Award by the Health Care Technical Group of the Human Factors and Ergonomics Society.



### **Alexandra Chronopoulou, PhD**

*Clinical Associate Professor, University of Illinois Urbana-Champaign*

Alexandra Chronopoulou is a clinical associate professor at the University of Illinois Urbana-Champaign (UIUC) in the Department of Statistics. Before that, she was an assistant professor in the Department of Industrial & Enterprise Systems Engineering at UIUC, an assistant professor at the City University of New York, and a visiting assistant professor at the University of California, Santa Barbara. She did a post-doc at INRIA Nancy Research Center, in the BIGS (Biology, Genetics and Statistics) team. She obtained her PhD in statistics at Purdue University, and her diploma in applied mathematics and physics at the National Technical University of Athens.

Her research interests include (i) statistical inference for stochastic processes (estimation of the Hurst parameter, statistical inference for fractional stochastic differential equations), (ii) stochastic modeling (simulation methods, modeling of stochastic systems with long memory processes), (iii) financial engineering (option pricing, high-frequency finance, stochastic volatility models, fractional stochastic volatility, Monte Carlo and particle filtering methods and financial time series), and (iv) health care analytics (time series modeling, predictive modeling, experimental design).

## Office of Technology Management Session

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### **Kip McCoy, MBA**

*Vice President, Innovation Studio, OSF HealthCare*

Kip McCoy is the vice president of the Innovation Studio for OSF HealthCare. In this role, he oversees the evaluation and building of strategic partnerships internally and externally as well as the identification and development of internal ideas and inventions. Prior to this, Kip was the director of the Office of Innovation Management for OSF Innovation, where he worked to cultivate and advance internal ideas and inventions.

Kip joined OSF in 2016 as part of the Ministry Performance Improvement division, establishing a new rural health care model that brings together internal and external resources and stakeholders for new care coordination efforts. Before coming to OSF, Kip worked as a consultant and also served as the chief operating officer of a non-profit economic development organization. He earned his Bachelor of Science degree and an MBA from Bradley University.



### **Svetlana Sowers, PhD**

*Assistant Director and Senior Technology Manager, Office of Technology Management, University of Illinois Urbana-Champaign*

Prior to joining the tech transfer community seven years ago, Svetlana worked in software engineering for major corporations including Yahoo! and Motorola, and for a university startup. At OTM, her strategic responsibilities include organizing showcase events, formulating licensing strategies and managing key external partnerships.

Svetlana's portfolio focus is on software and other copyright inventions arising from departments across campus and spanning broad areas in engineering and humanities, including patentable algorithms, cybersecurity, visualizations, educational software, mobile apps and other.





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Advancing health  
for everyone  
through outstanding

EDUCATION

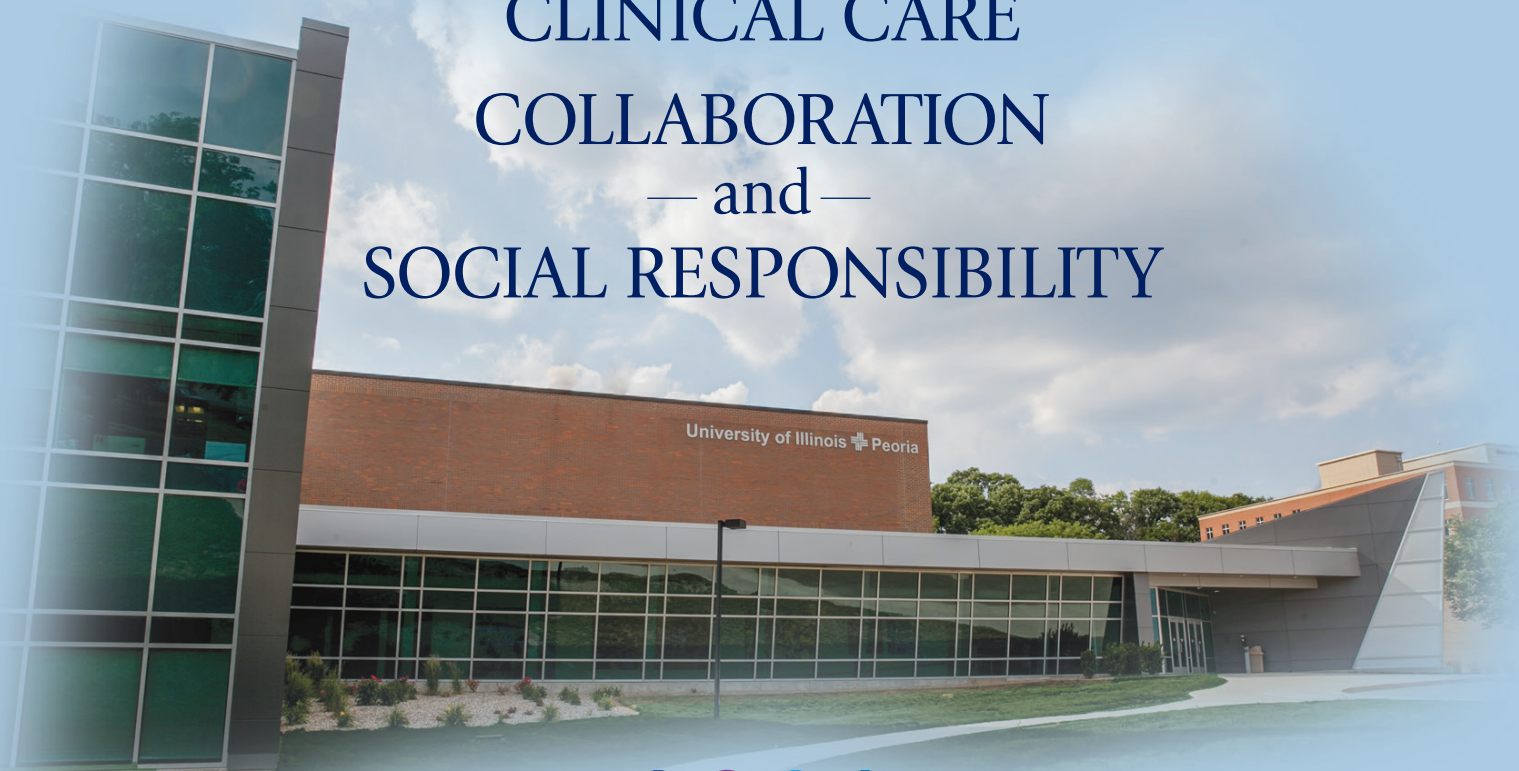
RESEARCH

CLINICAL CARE

COLLABORATION

— and —

SOCIAL RESPONSIBILITY





# JUMP ARCHES FALL 2022 REQUEST FOR PROPOSALS

## Description

The Jump Applied Research for Community Health through Engineering and Simulation (Jump ARCHES) endowment offers this priority Request for Proposals to faculty and researchers of the University of Illinois Urbana-Champaign, health care providers of the University of Illinois College of Medicine Peoria and OSF HealthCare clinicians. The seed funding from the Jump ARCHES program allows teams to demonstrate proof-of-concept ideas or generate pilot data.

## Goals

The goal of this priority RFP is to address the challenges faced by our community and society as we develop policies and procedures for health care delivery through new mediums including tele-health platforms and to improve health care quality and patient safety through the combined efforts of researchers, engineers, clinicians and social and behavioral scientists.

The Jump ARCHES program seeks proposals from cross-institution and interdisciplinary teams for projects that will result in clinical impact, scholarly contributions, large externally funded grants, intellectual property and new startup companies. To be successful, applicants are expected to develop

personal relationships that will result in highly collaborative and engaged interdisciplinary teams that can identify and tackle significant health care problems.

To achieve this goal and promote collaboration between institutions, OSF HealthCare and the Health Care Engineering Systems Center at the University of Illinois Urbana-Champaign encourage applicants to contact Jump ARCHES leadership for assistance with match-making and team formation. Additionally, contact us if project ideas require facilities or technologies that they cannot access at their home institution. Examples of such facilities and technologies may include simulation areas, robotics technology, 3D printing or other prototyping and manufacturing needs. View these facilities on the HCESC website, Jump Simulation Center Urbana website and Jump Trading Simulation & Education Center Peoria website.

## Focus Areas

This round, we are seeking proposals incorporating solutions in digital health, data science, health equities, community health, AI and related areas in the development of technologies to:

# Jump ARCHES Fall 2022 Request for Proposals (cont.)

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- Develop novel technologies and new automations which adopt and incorporate individual health data, diagnostic results and data analytics to provide individuals with tailored roadmap to drive improved health, and where appropriate, help them navigate the health care system.
- Address the evolving standards of care to incorporate personalized precision medicine and genomic best practices.
- Address accuracy and completeness of diagnosis, treatment and health literacy of historically underserved populations.
- Alleviate administrative burden at the bedside to increase the quality of patient interactions.
- Improve the ease of digital connection to health care.
- Assist in diagnosis and treatment of neurological disorders through collaborative efforts with the OSF Children's Hospital and OSF HealthCare Illinois Neurological Institute. Emphasis will be on early diagnosis of neurological disorders, enhancement of social skills associated with chronic neurological disorders, support of children and adults with chronic neurological disorders as they navigate everyday life at home, in school, and in the workplace, and exploration of technologies to utilize unique skills of individuals with neurological disorders.
- Explore the needs of people with visible and non-visible disabilities
- Special attention will be given to proposals addressing
  - Social and behavioral sciences topics, especially related to issues involving inequity and poverty, social and behavioral health and the digital revolution (for more information on these topics, see the grand challenges at the Center of Social and Behavioral Sciences).
  - Neurological science, particularly assistive technologies
  - Autism spectrum disorders
  - Social and behavior influences on the cancer continuum
- Outstanding proposals in additional areas affecting health and wellness may be considered for funding.

## Evaluation Criteria

Proposals will be specifically evaluated for their respective alignment to program goals (relevance), the potential impact on patient and learner outcomes (impact) and the proposed plan and quality of the team (approach).

Proposals will be examined for team composition (inclusion of appropriate UIUC and OSF/UICOMP investigators and distributed funding between organizations) and demonstration of healthy existing team relationships.

Evaluation will take in consideration of next steps and advancement of the work, as well as plans for future funding and product development activities (e.g., IP, start-up, who will advance the work, commercialization plan).

## APPLICATION PREPARATION

*Please refer to the application instructions on the Jump Simulation or HCESC websites: [jumpsimulation.org/ARCHES](http://jumpsimulation.org/ARCHES) [healtheng.illinois.edu/jumparches](http://healtheng.illinois.edu/jumparches)*

### **For the preparation of a responsive application, please contact:**

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### **For questions on the submission of the application, please contact:**

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**The deadline is Monday, October 3, at 5 p.m.**



# EXPLORE OPPORTUNITIES in health care

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Jump STEAM education specialists leverage our world-class simulated medical space to engage students in a variety of health care roles.

## Jump STEAM at Home

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If you want to gauge your child's interest in STEAM and health care, we offer fun activities you can easily do at home as a family and a suite of educational apps for your kids to enjoy.



*Learn more about or register for an opportunity today!*

[jumpsimulation.org/STEAM](https://jumpsimulation.org/STEAM)

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# DO YOU NEED HELP **SUBMITTING AN IDEA** TO JUMP ARCHES?

Jump Research is a team of skilled professionals who conduct and support research in the areas of health care simulation, education and innovation. Possessing a diverse range of skillsets and competencies, the team guides research projects from initiation of the research question to the publication of study results.

If you are seeking support for your Jump ARCHES submission or sponsored project, Jump Research has the skills and resources to help!

## WHAT WE OFFER

### **Jump ARCHES submission support**

- Building clinical partnerships
- Specific aims development
- Research methodology
- Budget development
- Submission process

### **Project support**

- Protocol development
- IRB support
- Subject consenting and enrollment
- Data collection
- Chart review
- Data analysis

### **Publication support**

- Manuscript writing and development
- Literature review and citation
- Journal formatting and submission
- Conference poster development

## CONTACT US

Get the support you need for your Jump ARCHES project.

**William Bond, MD, director of Jump Research**

*William.F.Bond@jumpsimulation.org*

**Kristin Adams, manager of the Jump Simulation portfolio**

*Kristin.C.Adams@jumpsimulation.org*

## Improving the Lives of Children with Asthma - Examining Indoor Air Quality and Using Education to Empower

**Elise Albers, MS**, *Manager, Children's Population Health, Women's and Children's Service Line OSF HealthCare*



A multidisciplinary team from OSF HealthCare, the University of Illinois, and the University of Illinois College of Medicine Peoria have created a pilot study with indoor air monitoring devices (sensors) that can be deployed in homes and schools of a small cohort of OSF pediatric patients with asthma. The air quality data collected by these sensors allows for a more individualized asthma care plan, taking into account the environmental allergens and pollutants that are present in the patient's home and providing education on how to mitigate these environmental exposures. In an effort to provide supplemental education outside of the traditional health care setting and improve compliance with the asthma care plan, the project team has engaged school personnel in education that 1.) demonstrates the impact of environmental allergens and pollutants on a patient's asthma diagnosis and 2.) increases the school nurse's comfort level with asthma management, including treatment. This propagates the education to a supplemental source, school personnel, so that the patient is receiving asthma education outside of a traditional healthcare setting and the patient, family, and school nurse feel empowered to manage the asthma diagnosis from prevention to treatment.

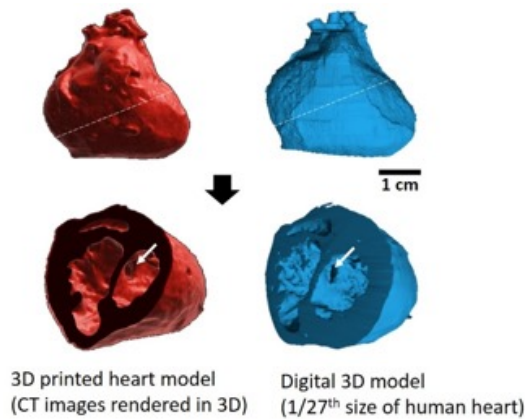
## Point Cloud Segmentation of Prostate Cancer for Daily Adaptive Radiation Treatment Planning

**Jianxin Zhou, MS**, *The Grainger College of Engineering, Nuclear, Plasma, and Radiological Engineering University of Illinois Urbana-Champaign*

Automated segmentation methods in radiotherapy can improve workflow for treating prostate cancer by quickly and accurately defining target treatment volumes and minimizing dose to radiosensitive healthy organs at risk. This work aims to demonstrate the use of deep-learning -based point-cloud model to segment the prostate for daily adaptive treatment of prostate cancer. We convert the CT prostate images into 3-D point clouds, and then use the PointNet++-based model to outline the organs. We use radiation transport simulations and computational phantoms to augment the dataset for model training, which gives us the full control of the organ properties in the image, such as its shape and size. So, we can generate large datasets for model training. We will validate the performance of the point cloud model against a voxel-based segmentation method, in terms of the computational time and the segmentation accuracy. For this comparison, we have developed a voxel-based V-Net model, which achieves an average Dice coefficient of 0.8 for organ segmentation, where a unit Dice coefficient represents a segmentation that matches the ground truth exactly. Compared to the V-Net mode, the point-cloud segmentation method is expected to predict the organ boundaries more accurately and quickly and therefore, may be suitable for daily adaptive treatment. We will validate these findings in a real world clinical setting by acquiring anonymized patient images and segmenting them with both methods.

## Preoperative Surgical Planning via Patient-specific, Tough and Anti-drying Hydrogel-based Cardiac Mimic

**Joanne Hwang, BS**, Graduate research assistant, Chemical and Biomolecular Engineering University of Illinois Urbana-Champaign



Surgical procedures can be extremely challenging due to the complexities of each patient's medical condition. Therefore, imaging tools have been utilized to help visualize the targeted tissue. Scanning outputs are reconstructed and printed out as physical models via 3D additive manufacturing. As these organ mimics enable clinicians to perform preoperative practice, the material properties should be carefully tailored to resemble real tissue. Hydrogel has emerged as a candidate due to its high-water content and tissue-like softness. Though conventional hydrogels are too brittle to endure surgical manipulations, researchers have developed tough and stretchable hydrogels that mitigate this problem. However, they are still limited by dehydration, which results in a highly stiff, glassy polymer that hinders its use. We incorporated glycerol into tough hydrogel to make a uniquely tough and anti-drying hydrogel in a one-batch synthesis. The 3D printed gel would be ready to use upon fabrication, and no post-treatment or soaking step is required. We fabricated heart mimics with our 3D printed tough and anti-drying hydrogel showing a healthy and a diseased model diagnosed

with ventricular septal defect (VSD), respectively. The printed models were examined by CT to evaluate the printing precision. These models are suitable to practice platforms to understand different cases better and establish next-generation surgical simulations that will further improve health care.

## Developing Virtual Reality Simulation for ECG Training

**Harris Nisar, BS**, Simulation Engineer, CSL University of Illinois Urbana-Champaign



Electrocardiogram (ECG) is a procedure to record the electrical signals in the heart and diagnose numerous cardiac abnormalities. It is a frequently performed, non-invasive procedure where a nurse or technician places electrodes on the patient's skin. Lead placement is crucial in this procedure. Currently, there is no standard educational tool to teach the process quickly. Therefore, we are developing virtual reality software to teach about the ECG machine, how to prepare the patient to hook them up to it, and how to place the leads. The software was developed using the Unity Software with frequent feedback from cardiologists. This simulation, which contained a general VR tutorial and a step-by-step walkthrough of ECG, utilized the Oculus Meta Quest 2 to deliver the simulation to participants. We plan to collect content and face validity and usability data on this software with experts in ECG.

## Remote State Anxiety Detection and Monitoring Using Multimodal Wearable Sensors

**Manuel Hernandez, PhD**, *Assistant Professor, KCH, University of Illinois Urbana-Champaign*

Mental health disorders are prevalent, with nearly one in four adults living with mental illness in the United States. In frontline health care workers, recent evidence suggests increased depression, anxiety, insomnia and distress due to the COVID-19 pandemic. For physician trainees, even during normal times, the need to both provide care and learn clinical best practices already presents significant challenges for emotional well-being, let alone when faced with a pandemic. This interdisciplinary project aims to integrate data from a suite of wearable multimodal sensors to quantify symptoms of stress and anxiety in physician trainees, providing initial validation data of the wearable technology toward the goal of monitoring and potentially improving well-being before mental health disorders develop. Using a combination of wearable multimodal sensors (e.g., electrodermal response (EDR), electrocardiography (ECG), dual channel respiratory inductance plethysmography, and inertial measurement units (IMUs)), we will evaluate the feasibility of wearable sensors in unison with a machine learning (ML), artificial intelligence (AI) framework to detect and predict increased state anxiety.

## Empowering Families and Clinicians: Visualizations of Social Communication Behavior of Children with Autism

**Sayantani Basu, MS**, *PhD Candidate, Computer Science, University of Illinois Urbana-Champaign*



According to the Centers for Disease Control and Prevention, one in 44 children has autism spectrum disorder (ASD) in the United States. Autism is usually characterized in children by behavioral and developmental changes. Families of children with autism need to understand the behaviors exhibited by the children. Moreover, parent-clinician communication remains less explored for children with autism. Coordinated communication between parents and clinicians can help parents and caregivers understand the social behaviors of the child and help with appropriate interventions. The conventional format of the RapidABC protocol makes it harder for researchers and clinicians to obtain a behavioral model of the child. Visualization tools like EnGaze and Plexlines can help bridge this gap in understanding behaviors of a child in the form of color-coded visualizations generated from hand-coded annotations of RapidABC protocols. Our goal is to facilitate parent-clinician interaction using behavioral visualizations of children with autism. Building on visualizations of communicative behaviors, we have implemented an annotations bar along with the visualizations for the parents and clinicians to leave notes. We will also explore the pros and cons of artificial intelligence methods in the context of visualizations.



## Extensive Simulation of Human Robot Interaction for Critical Care Telemedicine

**Anthony Nepomuceno, BS**, *Research Assistant, Health Care Engineering Systems Center (HCEC), University of Illinois Urbana-Champaign*



This demonstration highlights the proposed Extensive Simulation framework: a new immersive digital-twin simulation framework for high-precision analyses of human-robot interaction (HRI) for applications within critical care telemedicine. The proposed approach first reproduces in a virtual ICU environment, the real-time digital replica of physical robot navigating under ICU care setting. Then, the digital twin constructed in the virtual environment is extended with immersive simulation technology, to elicit and collect interactive human behaviors from diverse group of tele-ICU users (including physicians, nurses, and technical staffs either on site or remotely located, along with patients and guardians). The proposed Extensive Simulation framework advances digital twin concept by including humans into the loop via immersive simulation, which will help reliably capture diverse human behaviors and construct human model for tele-ICU work system.

## ALS Patient/Caregiver/Care Provider Needs Study

**Deana McDonagh, PhD**, *Chair, Design for Responsible Innovation, University of Illinois Urbana-Champaign*



A needs study was completed utilizing a range of design research methods to better understand the impact of the material landscape on ALS patients. This presentation will share the initial findings and share the impact assistive technology has on the individual.

## Is Virtual Reality a Valid Teaching Model for Neonatal Procedures?

**Jawad Javed, PhD**, *Division Head/Medical Director of Neonatology, Pediatrics, University of Illinois College of Medicine Peoria*



**Background:** Neonatal procedures are typically taught using simulation. A new method is needed to train providers without the need of patient availability, expert oversight, or simulation centers. Objective: To determine the face and content validity of virtual reality (VR) simulation for emergency umbilical vein catheter (UVC) placement. Methods: Engineers from UIUC developed the VR module using Unity 3D simulation engine. A participatory design approach provided feedback on development. Seven neonatal nurse practitioners (NNPs) from a quaternary care NICU tested the VR UVC module. Participants completed the SIM-TLX, System Usability Scale (SUS), and an 11 item survey. Results: NNPs were female (35-65 y/o) with 3-28 years of experience. All rated themselves as “expert” at UVC placement. Six of seven rated as “novice” in VR. The items, “model is realistic” and “instructions very clear” were unanimously marked as agree or strongly agree. Items scoring the lowest (3.14 of 5) include “tools are realistic,” “effective in teaching landmarks,” and “effective in teaching placement.” All NNPs agreed the module provided a safe environment to make mistakes. Six of seven NNPs would strongly recommend this module to new trainees. The average SUS score was 67.14.

**Conclusions:** The UVC VR module was effective in providing a safe environment and potentially beneficial as a training tool.

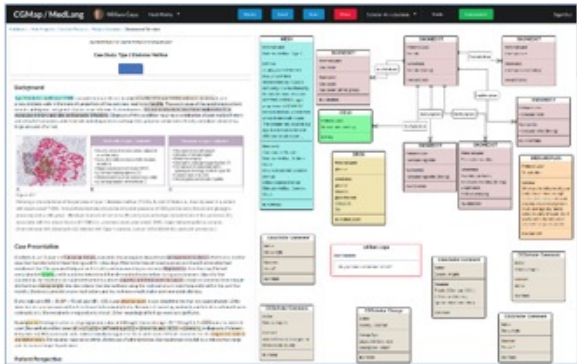
## Soft and Dexterous Service Robot Configurations to Support Health Care at Home for Older Adults

**Girish Krishnan, PhD**, *Associate Professor, Industrial and Enterprise Systems Engineering, Carle Illinois College of Medicine, University of Illinois Urbana-Champaign*

An increasing number of older adults live independently but have health conditions that must be managed – both chronic (e.g., diabetes, hypertension) and acute (e.g., post-surgery monitoring, rehabilitation). The current social distancing norms have prompted physicians to investigate remote health care solutions. One solution is to use telerobots that are stationed in the older adult’s home environment and controlled remotely by a health care provider to provide on-demand high quality videos and images for diagnosis and treatment. However, the unstructured and uncertain nature of the environment, coupled with safety concerns, currently preclude these robots from being in proximity with the older adult, which further prevents semi-autonomous operation. Such limitations may cause delays in diagnosis, increased financial burdens if home visits are required, and compromise the overall quality of health care delivered. We present a hybrid soft-rigid robot that can operate in close proximity with patients primarily for close-up imaging, vital signs monitoring and performing simple manipulation operations. In this talk, we highlight some initial impressions of health care providers and older adults regarding potential use case scenarios, and attitude, barriers and facilitators of these technologies.

## MedMap: An Ontology-based Medical Informatics Tool

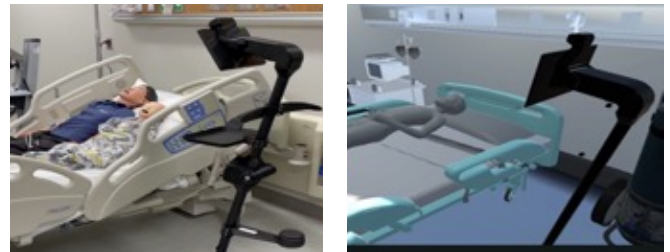
**William Cope, PhD**, *Professor, College of Education, College of Engineering, University of Illinois Urbana-Champaign*



“MedMap,” is an ontology-based tagging, tag-suggestion and diagramming tool. It leverages medical and everyday life ontologies, suggesting labels with a high degree of semantic precision for supervised machine learning, and offering conjectures about possible labels in the case of unsupervised machine learning. Our prototype has two sites of application: medical education and electronic health records.

## Can Health Care Providers and Robots Build Mutual Understanding in Complex Cooperative Tasks?

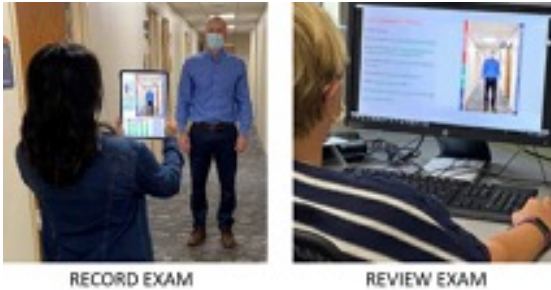
**Inki Kim, PhD**, *Assistant Director of Research in Medical Simulation, Health Care Engineering Systems Center, University of Illinois Urbana-Champaign*



This presentation introduces our ongoing study that builds and tests a new digital-twin simulation platform for critical care telemedicine, in order to understand how care providers can work collaboratively with telepresence robot at ICU, for improved vigilance and productivity while reducing the risk of in-hospital infection. Despite the growing attention to telemedicine and robots for their potential to limit physical contact since the COVID-19 outbreak, only a few institutions have actually deployed them due to the lack of confidence that robots could effectively collaborate with humans to perform complex care tasks, rather than burdening them. To our knowledge, we are the first to develop an experimental digital-twin platform to enable the testing of diverse human-robot interaction scenarios. The proposed approach first creates a virtual ICU environment, patients, and a robot that precisely replicates the real-time navigation of a physical robot in care setting. We use this digital twin constructed in virtual world to make participants immersed in collaboration scenarios to elicit interactive behaviors, from diverse group of tele-ICU stakeholders (e.g., physicians, nurses, and technical staffs, who are either on site or remotely located, along with patients and guardians). Currently, an ICU nursing scenario is under development. It will help determine a desired level of automation for each care task, and derive a general model of task allocation for tele-ICU work system.

## The Video Enhanced Neurology (VEN)

**Christopher Zallek, MD**, *Neurologist,*  
*OSF HealthCare Illinois Neurological Institute*



The main objective of this project is to develop and implement an infrastructure enabling OSF clinicians to use video recordings of visualized exam findings to communicate exam information reliably and efficiently. This tool will help neurologists better screen ASAP referrals to identify those needing evaluated urgently, guide pre-evaluation testing, and provide documentation of exam changes for monitoring patients for continuing care. The second objective is to create a process for collecting and annotating neuro exam data. This is required to develop digitized neurological assessments for clinical care and future predictive analytics projects. Additional information, advisor guidance, and 40 customer discovery interviews, prompted modification of initial aims. A custom and an off the shelf solution were not pursued. A Performance Improvement team piloted use of the Epic Haiku/ Canto video record function with 10 clinicians. Clinician workflow and IT/Epic constraints and concerns were identified. User-experience wireframes of video and digitized neurological exam data were constructed to be able to gather clinical use feedback and design needs. This project establishes that basic video recording can be implemented within the OSF Epic system and that technology and user adoption challenges are present but not limiting. A future platform to collect, annotate, and digitize neurological exam information requires interoperability within clinical team acceptable workflows.







# COMMUNITY HEALTH ADVOCACY

*Addressing health and wellness challenges in urban communities*

Community Health Advocacy is a partnership between OSF HealthCare and the University of Illinois Chicago (UIC) to address health and wellness challenges in urban communities.

Through the commitment of OSF HealthCare and the University of Illinois Chicago, clinicians collaborating with academic researchers on multidisciplinary projects can receive funding and other resources.

The CHA program builds on the success of the OSF Innovation Lab at the UIC Innovation Center, where interdisciplinary teams of faculty and students work together to find new solutions to combat problems in health care.

Learn more about CHA and our partner organizations at:



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