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

Latest Jump ARCHES grants support personalized, novel approaches for diagnosis and treatment

For Immediate Release

Contact: Colleen Reynolds| Media Relations Coordinator – OSF HealthCare | (309) 825-7255
Kim Gudeman | Director of Communications – Grainger College of Engineering Research Labs
(217) 333-9735

(June 7, 2023|PEORIA|URBANA, ILLINOIS) – Sixteen research projects are sharing more than $1.6 million in funding through the Jump ARCHES research and development program. Projects funded focused on novel automation in health data and patient experience, precision medicine, digital tools to enhance patient engagement in health, wellness and treatment, plus improved treatment and diagnosis of neurologic disorders. The latest request for proposals also encouraged supporting underserved populations.

The Jump ARCHES program is a collaboration between OSF HealthCare, the University of Illinois Urbana-Champaign (UIUC), and the University of Illinois College of Medicine Peoria (UICOMP). The funding supports research involving clinicians, engineers and social scientists to rapidly develop technologies, devices, and treatment approaches that improve outcomes and reduce costs.

Spring 2023 Project Awards

STREAM-ED: Simulation to Refine, Enhance and Adapt Management of Emergency
William Bond, MD, OSF HealthCare
Hyojung Kang, PhD, University of Illinois Urbana-Champaign

This study aims to develop practical models combining machine learning, discrete event simulation, and optimization techniques to improve emergency department (ED) resource utilization and address ED overcrowding, which is exacerbated by the COVID-19 pandemic and staffing shortages.

Prototype: Intelligent Regulatory Change Management System
Scott Lowry, MHA, CHC, CCEP, OSF HealthCare
ChengXiang Zhai, PhD, University of Illinois Urbana-Champaign

This study proposes an Intelligent Regulatory Change Management (IRCM) System that uses natural language processing and artificial intelligence to track and evaluate public policy actions governing OSF HealthCare. This will enable compliance professionals to identify critical changes and determine appropriate courses of action, reducing manual review and improving quality, safety, privacy risk management and efficiency.

Machine Learning of Standardized DICOM Metadata from Imaging Datasets
Matthew Bramlet, MD, OSF HealthCare
Brad Sutton, PhD, University of Illinois Urbana-Champaign

This project aims to develop a machine learning-based algorithm that can categorize image parameters directly from signal intensity variations of 2D medical images to enable efficient pipelines for medical image segmentation. The proposed algorithm is expected to estimate patient and image-acquisition information by utilizing machine learning methods in situations where the DICOM header fields are incomplete or unreliable, ultimately allowing for automated characterization of unknown 3D DICOM imaging datasets.

Machine-Guided Staging of Neuroblastic Tumors of Patient Specific 3D Models
Daniel Robertson, MD, OSF HealthCare

Brad Sutton, PhD, University of Illinois Urbana-Champaign

The OSF HealthCare Children's Hospital of Illinois is using segmentation services to create 3D models of neuroblastic tumors for pre-surgical planning. The hospital aims to transition from 2D imaging to 3D modeling to increase the reproducibility of staging analysis, establish a new standard for segmented models of neuroblastic tumors and develop machine-guided tools that can improve upon and automate current recommended image-defined risk factors staging.

Toward Machine-Learned Aortic Arch Measured Diameters
Matthew Bramlet, MD, OSF HealthCare
Brad Sutton, PhD, University of Illinois Urbana-Champaign

The original project aims to automate the segmentation and clinical measurement of aortic arch diameters from MRI imaging. The researchers leading this project have successfully completed several steps, including de-identification and curation of datasets, manual segmentation and the development of a novel method for automatically analyzing each aortic arch with promising results, indicating correlation between the automated and clinically derived measurements.

A Field Experiment to Evaluate the Efficacy of Convenient Health Kiosks
Ann Willemsen-Dunlap, CRNA, PhD, OSF HealthCare
Ujjal Mukherjee, PhD, University of Illinois Urbana-Champaign

This proposal outlines a field experiment to evaluate the efficacy of health kiosks supported by community health workers (CHWs) in delivering first line preventive health screenings to rural and underserved communities. The project is intended to lead to large-scale development and deployment of health kiosks with the goal of positively impacting social determinants of health and long-term health status of those served.

Contextualizing Nursing Needs for Development of Retention-Support App
Sheryl Emmerling, PhD, Rn, NEA-BC, OSF HealthCare
Ann-Perry Witmer, PhD, University of Illinois Urbana-Champaign

The goal of this project is to address the high turnover rate of new nurses by providing a digital app that offers personalized nursing support. The Contextual Engineering (CE) paradigm will be used to assess the needs and values of first-year nurses, including those who have left their positions, to inform the development of the app in the first phase of the project, with the goal of stabilizing the nursing staff, improving the quality of service and reducing operating costs.

Community Health Café: Engaging Digital Innovation and Community-Based Resources to Enhance Health Equities in Underserved Communities
Scott Barrows, MA, OSF HealthCare
Joe Bradley, PhD, MA, University of Illinois Urbana-Champaign

The purpose of the community health café is to provide digital access to health and health care resources, including links for assistance with the social determinants of health, health education and connections to public health in underserved communities. The eventual goal is a Medicaid telemedicine option with OSF OnCall. This proposal aims to address critical needs of underserved residents in vulnerable communities and is crucial for their health.

AI-Powered Brain Tumor Segmentation
Matthew Bramlet, MD, OSF HealthCare
Zhi-Pei Liang, PhD, University of Illinois Urbana-Champaign

This project aims to enhance the detection and monitoring of brain diseases. Phase 1 of the project focuses on accurate delineation and segmentation of brain tumors using a combination of structural and molecular multimodal brain imaging data and deep learning. The proposed work includes developing brain atlases for AI-powered brain image analysis, computational tools for automated tumor detection and segmentation and evaluating potential clinical applications.

Optimizing Pharmacologic Management of Behaviors in Patients with Autism
Adam Cross, MD, FAAP, OSF HealthCare
Ravishankar Iyer, PhD, University of Illinois Urbana-Champaign

This proposal aims to provide physicians with a machine learning model that assists in selecting appropriate medication and dosage strategies for patients with Autism Spectrum Disorder (ASD). By incorporating patient history, genetic information and clinician notes, the model will dynamically adapt the treatment protocol as the patient progresses, ensuring optimal choices for improved behavioral symptoms with a high degree of confidence.

Predicting Medication Non-Adherence in Type 2 Diabetes
Mary Stapel, MD, OSF HealthCare
Hyojung Kang, PhD, University of Illinois Urbana-Champaign

Medication adherence is crucial for managing diabetes, but disparities exist, particularly among racial/ethnic minorities and those with lower socioeconomic status. This proposal aims to use data-driven models to identify high-risk individuals and areas for non-adherence to diabetes medication, develop and validate prediction models and implement and evaluate them in clinical practice.

Knowledge Graph Construction with Large Language Models to Predict DKA Occurrence and Severity
Adam Cross, MD, FAAP, OSF HealthCare
Jimeng Sun, PhD, University of Illinois Urbana-Champaign

Diabetic ketoacidosis (DKA) hospitalizes over 50,000 American children annually, with underprivileged and underserved children at higher risk. This proposal aims to develop a predictive model using patient-specific knowledge graphs generated from clinical data extracted through name entity recognition and language modeling. Clinicians can use the model to identify high-risk diabetic patients and prevent DKA.

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OSF HealthCare is an integrated health system owned and operated by The Sisters of the Third Order of St. Francis, headquartered in Peoria, Illinois. OSF HealthCare employs nearly 24,000 Mission Partners in 150 locations, including 15 hospitals – 10 acute care, five critical access – with 2,089 licensed beds, and two colleges of nursing throughout Illinois and Michigan. The OSF HealthCare physician network employs more than 1,500 primary care, specialist and advanced practice providers. OSF HealthCare, through OSF Home Care Services, operates an extensive network of home health and hospice services. It also owns Pointcore, Inc., comprised of health care-related businesses; OSF HealthCare Foundation, the philanthropic arm for the organization; and OSF Ventures, which provides investment capital for promising health care innovation startups. In 2020, OSF OnCall was established, a digital health operating unit, including a hospital-at-home, which delivers care and services when, where and how patients prefer to receive them. OSF HealthCare has been recognized by *Fortune* as one of the most innovative companies in the country. More at osfhealthcare.org.

Jump Trading Simulation and Education Center, a part of OSF Innovation, is a collaboration between University of Illinois College of Medicine at Peoria and OSF HealthCare. Jump replicates a variety of patient care settings to ensure novice and seasoned clinicians can practice handling medical situations in a real-world environment. Boasting six floors and 168,000 square feet, the center is one of the largest of its kind and provides space for conferences, anatomic training, virtual reality and innovation. For more information, visit www.jumpsimulation.org.

Partners in Jump ARCHES:

University of Illinois College of Medicine Peoria (UICOMP) educates 244 medical students and nearly 300 physician residents annually. The College of Medicine is home to the Cancer Research Center, the Center for Outcomes Research and is a collaborator in Jump Simulation. Learn more about UICOMP at peoria.medicine.uic.edu.

Health Care Engineering Systems Center (HCESC) provides clinical immersion and fosters collaboration between engineers and physicians. HCESC designs collaborative solutions to improve health care outcomes utilizing their expertise in simulation technologies, smart health systems, data analytics, human factors and medical robotics. HCESC partners with Jump in this innovative relationship of Applied Research for Community Health through

Engineering and Simulation (ARCHES). HCESC is a research center in The Grainger College of Engineering at the University of Illinois. Learn more about HCESC at healtheng.illinois.edu/.

The Grainger College of Engineering at the University of Illinois is one of the world's top-ranked engineering programs with students, faculty and alumni that set the standard for excellence. The college is focused on driving the economy, reimagining engineering education and bringing revolutionary ideas to the world. They work to solve the world's greatest challenges and look toward the future to find ways to make the solutions reality. Learn more about the College of Engineering at grainger.illinois.edu.

The Center for Social and Behavioral Science (CSBS) at the University of Illinois was created to help address some of the grand challenges facing society that can be answered using the deep social and behavioral science expertise housed at U of I. In particular, the CSBS focuses on three distinct areas: 1) solving poverty, 2) understanding the effect of technology on society and 3) the role of social and behavioral factors in health. More information can be found at csbs.research.illinois.edu/.