

# PROJECT SUMMARY

## PROJECT NARRATIVE

**A. SIGNIFICANCE**

**B. INNOVATION**

**C. APPROACH**

# BIOSKETCH

## **CURRENT & PENDING**

## FACILITIES & OTHER RESOURCES

**The PI's lab resources.** The UCLA Human-Computer Interaction Research Laboratory (HCIR) maintains access to ample lab space (about 1000 sq ft) for the PI and graduate students for the expected duration of the project. There will be multiple Windows and Linux workstations available for student use for training data-driven AI models or hosting servers for distributed interactive systems. The Laboratory space is equipped with the necessary power and ethernet ports necessary for the operation of the various equipment as well as for use by researchers working in the space. The Laboratory maintain access to various sensors related to interactive systems (EMG, IMU, RGB-D, capacitive touch, ultrasonic, UWB), actuators for robotic systems (step motor, solenoid, quadcopters), and basic fabrication machines for rapid prototyping (laser cutter, paper cutter, 3D printer). There is a dedicated conference room that provides private and quiet space with established computers and recording devices for conducting human subject laboratory studies.

**UCLA ECE department and engineering school resources.** Laboratory space for the proposed infrastructure will also be provided by UCLA ECE Department for the extended lifespan of the equipment beyond the duration of this proposal. HCIR is also located close by and has access to the recently-established Maker Space provides extended use of laser cutters, 3D printers, electronics workstations (e.g., soldering, PCB) available for creating research prototypes. The UCLA Engineering School provides networking, disk storage and backup, general-purpose timesharing access to multiuser systems, email and workstation support. The School's central facility is for the support of research, and is open to undergraduate and graduate students, faculty and staff. The Department network is connected to the UCLA campus backbone via a gigabit connection. An 802.11n wireless network is available throughout the Department. The Department network is also linked to the School's network that includes IBM servers and workstations and PC-based labs, supporting classes and giving access to undergraduate students.

**Resources for data collection.** Although the proposed P-GEM is generalized to any medical data, the scope of this project will focus on histological imaging data to enable in-depth investigation. We will primarily use brain tissue slides as they represent a type of condition amenable for using generating synthetic data that simulates their various patterns. Typically tens of patients' slides (up to 10 slides per patient) are needed to train a generative model, which we will obtain by working with neuropathologists at the Medical School, UCLA Health, and University of Kansas Medical Center (where a previous UCLA collaborator has moved). The UCLA Department of Pathology and Laboratory Medicine includes full facilities and equipment for light microscopic, ultrastructural, immunohistochemical, and molecular study of human tissues. The Department is fully computerized with modern HP PCs, all linked to the network through UCLA Pathnet, as well as slide scanners for whole slide imaging. The Section of Neuropathology which evaluates several hundred brain tumors each year is housed in a facility of approximately 1700 sq. ft. in the former Brain Research Institute.

**Resources for recruiting physicians for studies.** Physicians in UCLA Health are highly supportive of cross-disciplinary collaboration and will collaborate with the PI as experts for user research (e.g., observing how radiologists work in their reading rooms) and participants in a usability evaluations of the proof-of-principle system prototypes.

# PROTECTION OF HUMAN SUBJECTS

## Risks to Human Subjects

Human subjects will comprise of physicians (including trainees) and will be involved in three types of studies: (i) Survey studies to conduct background research, which is necessary to establish a comprehensive and statistics-driven understanding of physicians' work; (ii) Interview studies to obtain an in-depth understanding physicians' work and elicit requirements for an AI-enabled system, which is necessary for informing and guiding the system design; (iii) Lab studies where physicians will interact with a software prototype of the proposed systems using a desktop computer, which is necessary for evaluating the performance and usability of the systems.

We expect to conduct surveys/questionnaires (100-150 subjects each time), interviews (5-10 subjects each time), participatory design sessions (5-10 subjects each time) and usability evaluations (10-20 subjects each time).

There are no specific age or health condition requirements for the human subjects. There will be no involvement of vulnerable populations.

Specific inclusion criteria will be based on the data type processed by AI. For example, to study an AI-enabled system for processing histological data, we will include pathologists. There are no exclusion criteria.

A survey, involving answering a questionnaire, takes 15-30 min; an interview or lab study takes about 1 hour.

For survey studies, quantitative data will be collected from subjects' response to the questionnaire; interview and lab studies will be audio and video recorded; in lab studies, we will also record the computer screens and log user input data (e.g., mouse and keyboard). Collected data will be encrypted and stored on local servers on campus and will be backed up periodically.

Subjects will be identified anonymously (e.g., as 'P1, P2, ...'). No personally identifiable information will be collected or retained.

The specific tasks involve answering a questionnaire or interview questions and using a computer software, which incur minimum risks as these are activities similar to how the subjects (physicians) communicate with others and use computers in their daily work.

## Adequacy of Protection Against Risks

Subjects will be recruited primarily via online community, words-of-mouth and internal mailing lists. Informed consent will be obtained as per UCLA IRB regulation prior to each study. The purpose, procedure, tasks and minimum risks of the study will be described as part of the consent form.

## Potential Benefits of Research to Human Subjects and Others

The topics of survey and interview questions as well as the software prototypes in the lab study are germane to the medical profession of the subjects. Thus the subjects who participate in our studies will have the benefits of learning about the general knowledge of AI and how AI can be applied in medicine, which is knowledge that complements and/or advances the subjects' own medical expertise.

The research supported by these studies are important to physicians' work, as such research leads to a new generation of clinical decision support systems that in the long run will mitigate physicians' workload and use AI to assist and support physicians' work.

## Importance of Knowledge to be Gained

Since the risk is minimum, it is thus significantly outweighed by the benefits that can be brought forth by the studies.