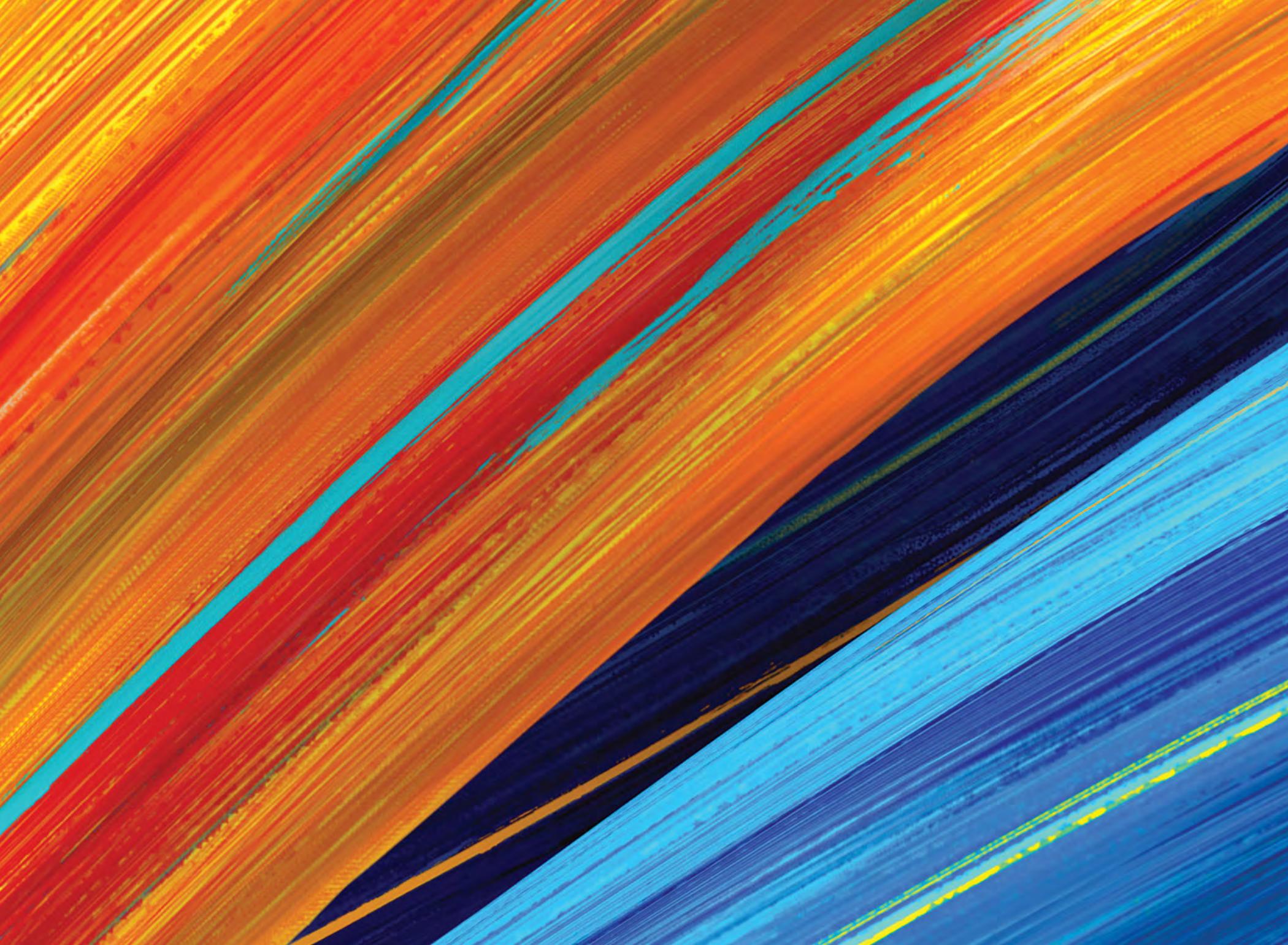




UCI Precision Health through
Directed Artificial Intelligence

THE CASE FOR SUPPORT

BRILLIANT FUTURE
THE CAMPAIGN FOR **UCI**



The background of the slide is an abstract composition of numerous thin, overlapping lines and streaks. The primary colors are various shades of blue, ranging from light sky blue to deep navy. Interspersed among these are streaks of bright orange and yellow, creating a sense of dynamic movement and energy. The lines are mostly oriented diagonally, sweeping across the frame from the top-left towards the bottom-right.

A goal of Precision Health through directed AI is to integrate multiple high-quality data streams with artificial intelligence to drive precision medicine

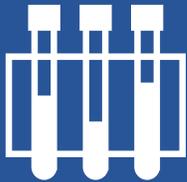
Multi-Omics



Radiologic Imaging



Laboratory



Clinical Exam



**Traditional
Therapy**



**Targeted
Therapy**



**Alternative
Therapy**

Pathology



Demographic Data



Integrating multiple high-quality data streams with artificial intelligence to drive precision medicine.

Figure 1



Precision Health through Directed AI (PHD-AI) at UCI

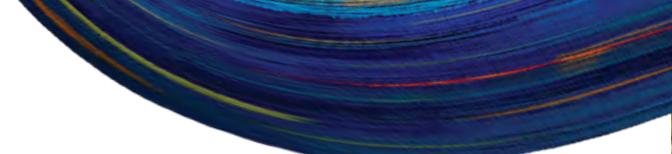
The challenge

Every minute, a patient is diagnosed with Alzheimer's disease with no treatments to change the course of the disease. Every minute, a patient dies from cancer in the United States. Impediments to treatments include delayed diagnosis such that therapeutics are developed for or applied to late-stage disease, and the diversity of individual patients is not effectively matched to diagnosis and therapeutics. Simultaneously, new technologies are combining to collect enormous amounts of individual health data of all types. While data alone cannot solve these challenges, approaches in which clinical and research expertise are empowered by artificial intelligence show that patterns in these data can shift diagnosis to early stage disease while differentiating among individuals so as to better tailor treatments.

The solution

Neurodegenerative disease and cancer pose significant health, social and financial burdens to patients, families and society. There is a tremendous need to develop artificial intelligence tools to address these critical needs. **UCI has assembled teams uniquely qualified to tackle these challenges. These teams are collectively integrating high-dimensional health data** including medical records, demographic information and multi-omic data sets, and using advances in artificial intelligence to tailor more rapid and affordable solutions to these healthcare challenges (Figure 1). This is the promise of an institute for Precision Health through Directed AI. We focus on three key areas: (1) **neurological conditions** (2) **oncology** and (3) **enhancement of clinical workflow**.

You can help.



collaboration begins at ideation

Why UCI?

Patient-Driven Focus: Rather than simply applying new technologies as they arise and seeing if there is a fit, UCI focuses first on patient needs and healthcare challenges to understand and formulate applications of AI Precision Health strategies. There is no single therapeutic for complex diseases and diverse patient populations. Our purposeful designs of healthcare-related tools are being tailored to address key questions for individualized clinical care.

Expertise in Multiple Areas: UCI boasts a uniquely multidisciplinary environment in which multiple sources of main expertise converge on goals for healthcare. We are building on this foundation by further integrating and leveraging clinical expertise in oncology, radiology, neurology, pathology, integrative health and other areas; through research in -omics and systems biology, computer science, stem cells, physiology, biological sciences, metabolism and circadian rhythms; and by developing tools and technologies

coming from engineering, computation and mathematics. These diverse domains are brought together in multiple precision-medicine programs at UCI that “translate” the research from the laboratory to the real world.

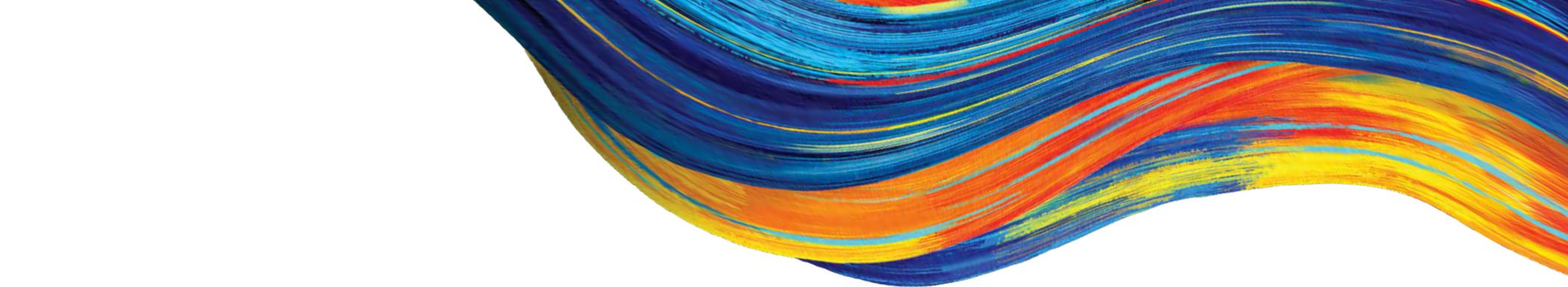
Culture of Collaboration: Despite the rapid and significant integration of AI into many non-healthcare industries, translation to medical care remains challenging, largely because of ineffective integration of domain expertise of the groups described above. What sets UCI apart is a novel interdisciplinary type of culture where collaboration begins at ideation and crosses disciplines. By cultivating and fostering teams that collaborate from inception, UCI is uniquely positioned to recognize the most salient, pressing clinical problems that can be addressed with current artificial intelligence technology. Investment in these unique interdisciplinary resources will enable UCI to take a leadership role in solving critical healthcare problems of the 21st century at affordable costs.



*Investment in these unique interdisciplinary resources will enable UCI to take a **leadership role** in solving critical healthcare problems of the 21st century at affordable costs.*



UCI is uniquely positioned to recognize the most salient, pressing clinical problems that can be addressed with current artificial intelligence technology



「better treatment **for patients**」

Making Research Discoveries Available to Patients – Today: A goal of UCI Health is to apply ongoing discoveries and newly developed technologies to diagnostics, drug development and clinical trials, and to adopt the best of the new discoveries into routine practice. In one example, investigators from our group are applying a tool for real-time brain bleed detection and strokes from routine imaging in order to rapidly treat neurologic emergencies. Groups are using AI to assist physicians with improved real-time identification of colon polyps. Our groups are working on Alzheimer’s disease to apply AI to image analysis for the earliest detection of pathology. In cancer, promising early work is showing AI’s ability to classify brain tumors that correspond to genetic abnormalities. Together, this progress will enable the desired shift to earlier detection and potentially insights

into mechanisms of these diseases, improved classification, and better treatments for individual patients. Going forward, work will incorporate insights from -omics and medical records.

First in Class – Educating Future Leaders: How do we ensure that this new pattern of striving toward precision healthcare goals through AI is sustainable? That development of artificial intelligence and related technologies will continue to advance in the next generation of students and professionals? To meet this demand, we propose to design multidisciplinary, healthcare project-based curricula at multiple educational levels, inclusive of undergraduates, graduate students, and medical students as well as postgraduates, residents, fellows and practicing clinicians.

「you can make an impact」

New Paths for Our Brilliant Future – A sustainable financial plan: Recently, 84 percent of enterprise organizations reported projections that say investing in artificial intelligence will lead to a competitive advantage and formation of new businesses/markets in which global revenues would grow from \$1.62 billion in 2018 to \$31.2 billion in 2025. Working with UCI Beall Applied Innovation (BAI) our teams are uniquely suited to translate developments and work with companies to test applications at UCI. Key personnel with BAI include recently recruited scientists, physicians and software engineers with entrepreneurial experience who are forging partnerships that bridge from the university to industry. As home to the largest academic institution in Orange County, UCI is an integral leader in the Southern California healthcare technology innovation widely regarded as a world-class hub.

Your philanthropic investment can make an impact

In spite of the strengths described above, successful fulfillment of the vision for Precision Health through Directed AI will take significant resources. Some of these, as indicated above, are in place. We will need others to achieve our five-year vision of a robust institute and build the foundation for long-term goals. Here are some of the areas where your investment can make an impact:

CLINICAL

UCI is deploying clinically driven tools to impact patient health in Orange County and beyond. Initial tools being made available to clinicians and patients will tackle immediate healthcare challenges, and investment will provide continued development that will change the healthcare landscape.





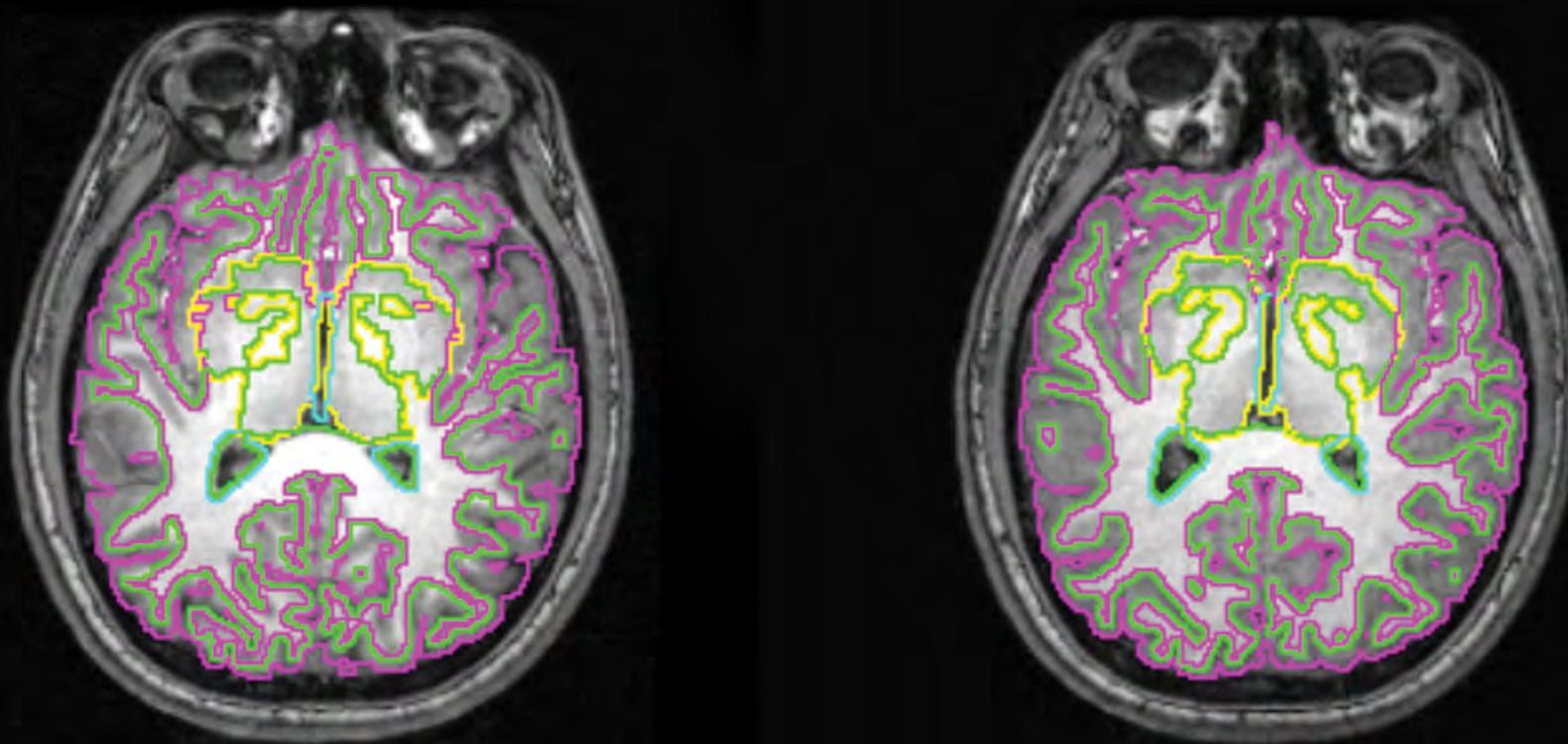


Figure 3. Leveraging AI to amplify the capabilities of existing resources. Depicted are brain MRIs with anatomic segmentations acquired at UCI's Center for the Neurobiology of Learning & Memory. On the left, this was carried out with traditional resources that required approximately 12 hours to complete. In a study of several hundred patients, this would typically freeze resources for days. On the right, annotations were created within a few seconds by leveraging AI. These innovative tools will be used to free up valuable resources and expand our centers and personnel's potential.



Impacting patients today informing research for tomorrow

Deployment of PHD-AI tools to improve patient health
by enhancing disease detection, diagnosis, and prediction for oncologic and neurologic disorders.

Specific Projects

AI tools for detection/screening – At UCI Health, we are already deploying AI tools to automatically triage head CTs by detecting and quantifying brain bleeds, which will provide real-time alerts to allow clinicians to respond quicker. We are expanding our platform to include stroke detection, and with additional support, this can be applied to other emergent conditions.

PHD-AI tools will guide treatment and management of patients, including diagnosis, surgical planning, and selection

of appropriate therapies initially targeting oncologic and neurologic disorders.

Development of a Distributed Learning Infrastructure will allow AI tools to learn simultaneously from multiple hospitals and clinics, protecting patient data while accelerating development and deployment of tools. This infrastructure is only possible if all participating sites are connected via a super high-speed fiber optic network. Fortunately, nearly all UC campuses are connected along the West Coast via the Pacific Research Platform (a giant fiber optic network), and UCI is currently leading one of the inaugural projects to tackle this exciting challenge. If successful, this would become the largest supercomputer in the United States.



Investment in these clinical advancements can support:

- Endowment for Director / Professor to direct this initiative – \$5 million
- GPU Infrastructure
- Programmers and Developers for each project (3-5 over next five years)

Total: \$8 million-\$10 million

RESEARCH AND DISCOVERY:

Coordinate basic research and targeted discovery with clinical needs

- Establish infrastructure for state-of-the-art technologies to generate patient-specific molecular signatures
- Utilize biospecimens and clinically derived cell/tissue samples for precision medicine and link these data with imaging and clinical information
- Develop targeted AI tools to provide new insights that can guide personalized diagnostics and therapeutic development

Investment in research and discovery that will bring us closer to clinical therapies can support:

Equipment to carry out deep molecular analysis for precision medicine; this equipment will allow the institute to identify robust disease signatures that will provide insights into disease mechanisms and allow for the development of patient-specific therapies in oncologic and neurologic populations over five years.

Total: \$2 million-\$3 million

Basic Research Endowment funds for personnel – the institute seeks 10-15 staff scientists with a range of expertise; including bench science/ data generation, bioinformatics and AI, and coordinator for collecting and preserving clinical biospecimens for analysis.

Total: \$2 million-\$3 million

EDUCATION

The institute will train the next leaders in health-directed AI and provide broad, cross-disciplinary educational opportunities. We envision the following immediate and long-term goals:

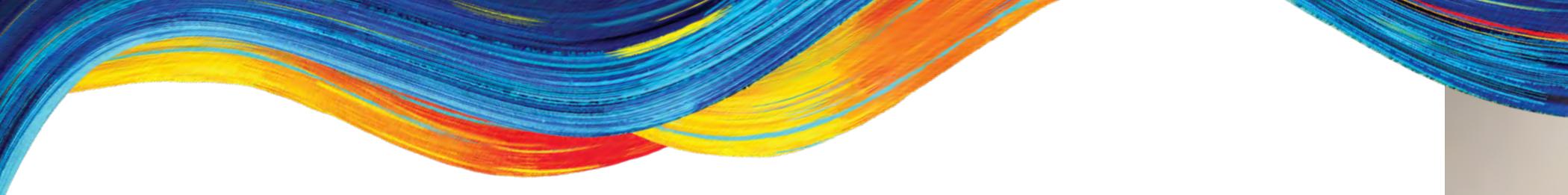
- Create a one-year MD fellowship program in a UCI certificate program
- Develop cross-disciplinary graduate student training courses
- Develop a training grant program at UCI for MD/PhD and PhD students to provide cross-disciplinary training for biologists, medical students, engineers and computer scientists
- Create a PhD program in health-directed Artificial Intelligence

Your investment in educating a new generation of health-directed AI leaders can support:

- Fellowship, post-doc and programmatic funding
- Teaching lab facilities

Total: \$1.5 million





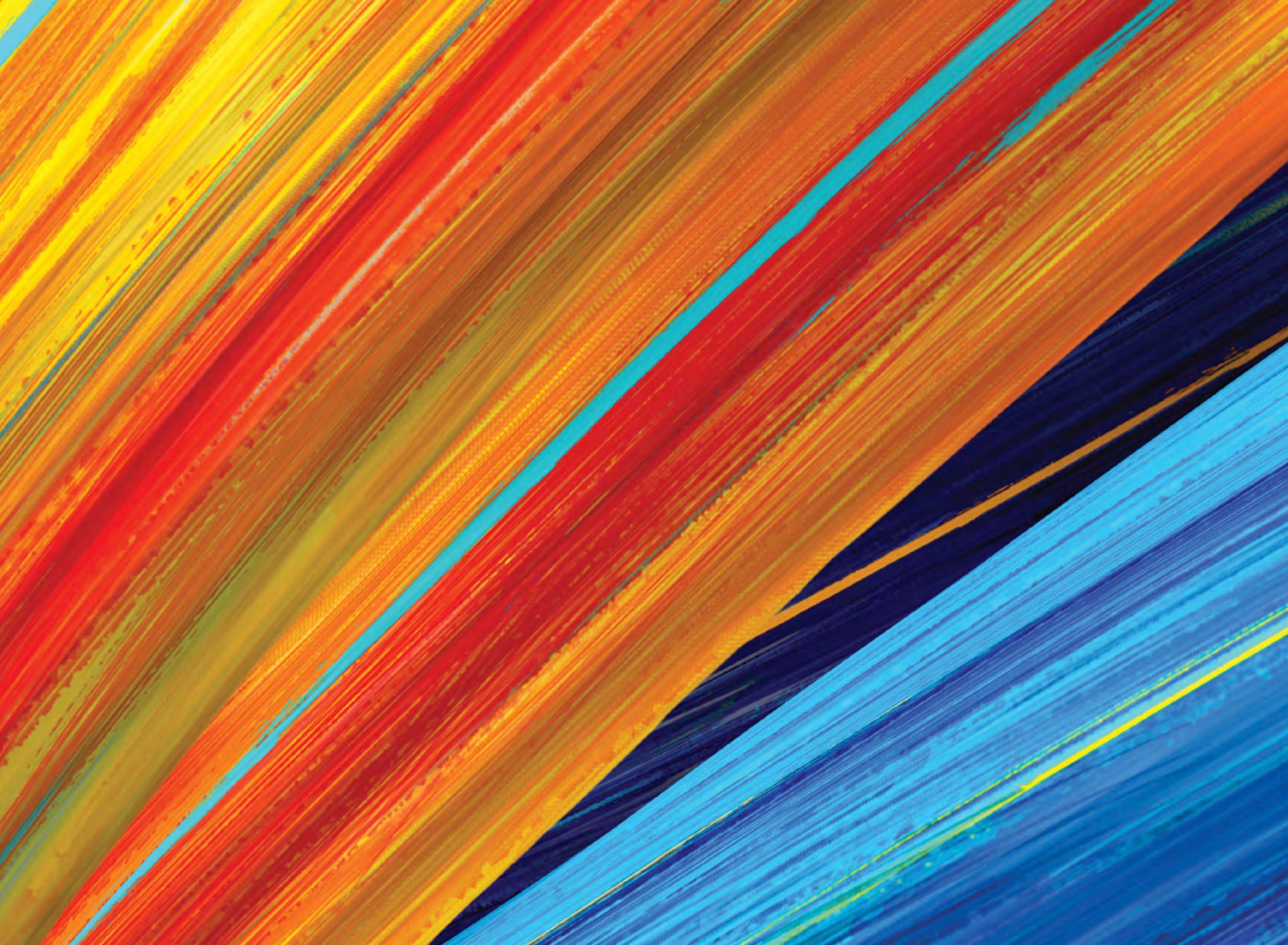
「improve personal health **outcomes**」

The institute for Precision Health through Directed AI will provide a UCI-wide platform comprised of focused cross-disciplinary teams dedicated to solving specific health needs – whether this is in the form of more effective lung cancer detection at UCI Health using AI tools or it is developing ways to understand and treat Alzheimer’s disease.

UCI is uniquely positioned to build on its unrivaled multidisciplinary approach to improve personal health

outcomes here in Orange County, and move the field of diagnostic and predictive medicine to the next level. Your support in the Brilliant Future campaign will help us to build on this foundation by further integrating and leveraging clinical and research expertise across the UCI enterprise. We invite you to join us in making an impact on the future of healthcare.









University of California, Irvine
Calit2 Building, Suite 4500
4100 E. Peltason Drive • Irvine, CA 92697
digitalhealth.uci.edu