A WINDOW INTO HUMAN HEALTH: AI AND THE EYE

COMPUTATIONAL OPHTHALMOLOGY

Imagine doing a complete eye exam using just the camera on your cellphone. Now imagine this same eye exam could detect a serious medical condition — like Alzheimer's, kidney or heart disease — *before it starts*. Apart from putting care into the hands of people everywhere, this kind of technology could enable interventions that prevent disease from ever progressing.

Advances in big data and machine learning in the last decade have led to the birth of the field of computational ophthalmology, which is bringing us closer to this imagined future.

Computational ophthalmology is being pioneered by researchers at the UW Medicine Eye Institute and the Karalis Johnson Retina Center, in partnership with experts across the University of Washington and the technology sector in the Pacific Northwest.

And, with your generous support, we can harness the power of computer science and vision science to revolutionize medicine.

THE EYES ARE A WINDOW TO YOUR HEALTH

The retina is the only part of the body where nerves, neural tissue and blood vessels can be directly imaged. Modern eye imaging technology now delivers previously inconceivable resolution — down to the single cell. The resulting data collected presents a unique opportunity to leverage artificial intelligence (AI) and machine learning to ask questions not only about eye health, but about the brain and disease processes in the body.

Together with the Paul G. Allen School of Computer Science and the College of Engineering at the University of Washington, UW Medicine's vision researchers are leading the field in the application of AI in healthcare.

The Lee lab is located in the Karalis Johnson Retina Center, pictured above, a facility dedicated to elevating research to alleviate the suffering caused by blinding eye disease.

This work is led by two clinician-scientist ophthalmologists in the Department of Ophthalmology — Aaron Lee, MD, MSCI, and Cecilia Lee, MD, MS — who are setting the standard for applying big data analysis to vision science. Using their approach, they are uncovering disease associations previously hidden within vast amounts of patient data. Their discoveries are already leading to the development of new and better treatments for diseases such as age-related macular degeneration, diabetic retinopathy, glaucoma, and Alzheimer's disease.

A PHILANTHROPIC OPPORTUNITY TO REENVISION THE FUTURE OF HEALTHCARE

Private and public support have been essential to the advancements made in computational ophthalmology so far. Thanks to this support, we have discovered new risk factors for eye diseases and ways that eye diseases are connected to other diseases like diabetes and Alzheimer's disease. And we have used machine learning to develop new, noninvasive eye disease detection methods with the promise to reach everyone anywhere and diagnose major diseases at the earliest stages — potentially improving healthcare equity.

To expand the impact of computational ophthalmology on human health, we seek philanthropic support from the community to:

- Maintain our leadership position in this field by recruiting and retaining a world-class team of data scientists, clinical researchers and computer scientists in a highly competitive market.
- Provide state-of-the-art computational facilities for this team.
- Collect data and study the development and progression of cardiovascular disease and make this data set available to researchers globally.
- Apply computational methods and pursue new studies investigating links between biomarkers in the eyes and the risk of other diseases like stroke, brain diseases and kidney disorders.

JOIN US

With your bold philanthropy, the Computational Ophthalmology Program can take game-changing steps forward in computational medicine that could dramatically improve diagnostics, increase healthcare equity and change the lives of millions of people worldwide. Investments of all sizes and types, including planned gifts to establish your legacy, are very welcome.

If you wish to learn how you can help support this program, please contact An Tran, director for philanthropy, at 206.221.3286 or antran03@uw.edu. Thank you for your kind consideration.

KEY FACULTY

CECILIA S. LEE, MD, MS
Associate Professor, Department of Ophthalmology
Klorfine Family Endowed Chair

Dr. Cecilia Lee is an active clinician-scientist with expertise in big data analyses and clinical epidemiology. Her research interests focus on finding the connections between the eye and the brain using non-invasive imaging and advanced computational approaches. Dr. Lee analyzes big data sources of ophthalmic and general medical clinical data to better understand blinding eye diseases, discover new ophthalmic biomarkers of disease and translate the research findings into providing better care for the patients.

AARON Y. LEE, MD, MSCI
Associate Professor, Department of Ophthalmology
C. Dan and Irene Hunter Endowed Professor

Dr. Aaron Lee is interested in the intersection of large clinical medical datasets and nontraditional computational techniques, and he was the first to apply novel visualization approaches to analyze results from cloud- and cluster-based computing environments. He has created programs to process next-generation sequencing data in supercomputing environments and analyzed numerous big data sources including Center's for Medicare & Medicaid Services (CMS), U.S. Census and National Library of Medicine's (NLM) MEDLINE archives. He is principal investigator of the large National Institutes of Health (NIH) Bridge2AI: Salutogenesis Data Generation project, which is uncovering the details of how human health is restored after disease, using type 2 diabetes as a model. His work is at the forefront of translating AI into ophthalmology research and practice.