BIOGRAPHICAL SKETCH

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NAME: Vahid Mohammadzadeh, MD

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POSITION TITLE: Heed Fellowshop

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Tehran University of Medical Sciences	MD (incl. internship)	09/2013	Medicine
Dept. of Ophthalmology, Farabi Eye Center, Tehran University of Medical Sciences	Residency 1	09/2017	Ophthalmology
Jules Stein Eye Institute, UCLA, Los Angeles CA	International Fellow	03/2020	Glaucoma
Jules Stein Eye Institute, UCLA, Los Angeles CA	Research Fellow	06/2023	Glaucoma
University of Louisville, Department of Ophthalmology and Vision Science	Residency 2	Present	Ophthalmology

A. Personal Statement

As an Ophthalmology resident and emerging researcher, I have garnered substantial expertise in the realm of clinical research through my dedicated pursuit of knowledge during my fellowship and ongoing commitment to research during my residency training. My formative research experience took place during my international fellowship at the prestigious Stein Eye Institute, UCLA, where I collaborated closely with my mentor, Dr. Kouros Nouri-Mahdavi. Together, we initiated the establishment of the Advanced Glaucoma Imaging and Artificial Intelligence (AI) Laboratory, with a primary focus on the integration of artificial intelligence in the early detection of glaucoma and, critically, the identification of glaucoma progression. Recognizing the pivotal role of extensive data, I actively engaged in the acquisition of a comprehensive dataset encompassing 8,000 patients, which encompassed diverse clinical and demographic information, as well as data derived from various imaging modalities, including optic disc photographs, optic nerve head and macula optical coherence tomography (OCT), and visual field data. Within this rich dataset, I conceptualized and executed numerous research projects, both AI-driven and conventional, with the overarching aspiration of enhancing contemporary clinical practices and ushering in technological advancements that benefit both healthcare practitioners and patients.

In addition to using AI in glaucoma, my research pursuits encompassed an exploration of structural and functional alterations through the utilization of both classical and contemporary statistical methodologies. The primary objective underlying these investigations was the refinement of techniques for the early detection of glaucoma progression. Among the structural modalities for evaluating glaucoma, I am very interested in macular OCT and have published several studies in evaluating the structure-function relationship between macular OCT and visual field and optimizing methods for evaluating rates of change of macula OCT in glaucoma. I was a recipient of a postdoc grant from the Fight for Sight organization, and I studied predicting central visual field from macular OCT volume scans. Additionally, I undertook investigations into the development of prognostic models intended to discern associations between baseline clinical and demographic parameters, including intraocular pressure and blood pressure, and the progression of glaucoma. A pivotal facet of my research endeavors was the quest to devise predictive models capable of forecasting future

glaucoma progression utilizing historical data. Over the course of several years of collaborative efforts with computer science engineers, we successfully formulated predictive models trained on a comprehensive dataset encompassing past imaging, functional assessments, and demographic information. My overarching aspiration is to translate these predictive models into practical clinical applications for the identification of high-risk glaucoma patients within the clinical setting.

I am currently an Ophthalmology resident at the University of Louisville. I plan to pursue a glaucoma fellowship after my residency. I foresee myself becoming a clinician scientist working in a prime academic center. My passions are to provide excellent care to my patients, perform landmark research studies and teach the next generation of ophthalmologists.

B. Positions, Scientific Appointments, and Honors

2018-2020: International Glaucoma Fellow, UCLA
2020-present: Assistant Project Scientist, UCLA
2023-present: Ophthalmology Resident Physician, University of Louisville

Other Experience and Professional Memberships

2018-present: **Member in training**, the Association for Research in Vision and Ophthalmology (ARVO)
2019-present: **Member in training**, the American Academy of Ophthalmology (AAO)
2019-present **Member in training**, the American Glaucoma Society
2023-present: **Member in training**, the American Society of Oculoplastic and Reconstructive Surgery
2023-present: **Member in training**, the American Society of Cataract and Refractive Surgery
2022-present: **Editorial Board Member**, the Diagnostics
2025-present: **Editorial Board Member**, the Scientific Reports

Honors

2020 **UCLA Stein Eye Top Research by Fellow Award**
2021 **UCLA Stein Eye Top Research by Fellow Award**
2022 **UCLA Stein Eye Top Research by Fellow Award**
2024 **American Glaucoma Society-Bernard Schwartz Award**
2026 **University of Louisville Research Runaway Mentor Award**

C. Contributions to Science

I. Artificial Intelligence for predicting glaucoma progression.

Artificial intelligence (AI) has rapidly emerged as a transformative field in medicine, including ophthalmology. I began developing expertise in AI and programming (R and Python) in 2018 and subsequently led early efforts at UCLA to apply AI to large-scale clinical datasets. My primary research focus has been the use of AI to predict glaucoma progression by integrating multimodal data. To this end, I curated a comprehensive dataset of approximately 8,000 glaucoma patients, including optic disc photographs, retinal nerve fiber layer (RNFL) and macular optical coherence tomography (OCT), 24-2 and 10-2 visual fields (VF), as well as detailed clinical and demographic information. In collaboration with the Computer Science department, we developed multiple deep learning (DL) models to predict glaucoma progression from these data sources. Our initial study, published in the *British Journal of Ophthalmology*, demonstrated that longitudinal optic disc photographs can accurately predict future glaucoma progression, particularly in fast progressors. We subsequently showed that baseline RNFL OCT and optic disc photographs also provide strong predictive performance; this work was presented at ARVO and published in the *American Journal of Ophthalmology.* Building on this, we developed a comprehensive prognostic model integrating structural, functional, and clinical variables—including intraocular pressure, central corneal thickness, visual field indices, and demographic factors—which demonstrated robust long-term predictive performance. This work was presented at the American Glaucoma Society and published in the *American Journal of Ophthalmology*.

Most recently, we evaluated early visual field parameters to predict future visual field outcomes with a median time horizon of five years; this study has been accepted for paper presentation at the 2026 ARVO Annual Meeting.

a. **Mohammadzadeh V,** Wu S, Besharati S, Rafiee M, Banaei Y, Martinyan A, Zou J, Kung E, Edalati K, Morales E, Scalzo F. An AI-Based Prognostic Model for Prediction of Functional Glaucoma Progression from Clinical and Structural Data. American Journal of Ophthalmology. 2026 Jan 1.
b. **Mohammadzadeh V**, Wu S, Besharati S, Davis T, Vepa A, Morales E, Edalati K, Rafiee M, Martinyan A, Zhang D, Scalzo F. Prediction of Visual Field Progression with Baseline and Longitudinal Structural Measurements using Deep Learning. American Journal of Ophthalmology. 2024 Feb 12.
c. **Mohammadzadeh V**, Wu S, Davis T, Vepa A, Morales E, Besharati S, Edalati K, Martinyan J, Rafiee M, Martynian A, Scalzo F. Prediction of visual field progression with serial optic disc photographs using deep learning. British Journal of Ophthalmology. 2023 Oct 13.
d. Nouri-Mahdavi K, **Mohammadzadeh V**, Rabiolo A, Edalati K, Caprioli J, Yousefi S. Prediction of visual field progression from OCT structural measures in moderate to advanced glaucoma. American journal of ophthalmology. 2021 Jun 1;226:172-81.

II. Bayesian statistics in glaucoma.

Bayesian statistics has emerged as a powerful modern framework that offers improved precision and flexibility compared with traditional statistical approaches for addressing complex longitudinal clinical questions. We established a close collaboration with Professor Robert Weiss, an internationally recognized expert in Bayesian longitudinal modeling. Our primary focus has been the application of Bayesian methods to detect and monitor glaucoma progression using macular OCT. We developed several Bayesian models, which consistently demonstrated strong performance in characterizing structural progression. Notably, these analyses identified the ganglion cell complex (GCC) as the most informative inner macular layer for monitoring glaucomatous change. Building on this work, we conducted a prognostic study using a Bayesian hierarchical model to evaluate the association of baseline intraocular pressure (IOP) and diastolic blood pressure (DBP) with rates of macular OCT thinning. This study, published in *JAMA Ophthalmology*, showed that higher IOP and lower DBP are independently associated with faster GCC thinning. Our collaboration with Dr. Weiss and his team is ongoing. Current efforts include extending these models to assess the impact of longitudinal IOP and DBP patterns on rates of structural progression, with the goal of improving individualized risk prediction in glaucoma.

a. **Mohammadzadeh V**, Su E, Zadeh SH, Law SK, Coleman AL, Caprioli J, Weiss RE, Nouri-Mahdavi K. Estimating ganglion cell complex rates of change with Bayesian hierarchical models. Translational vision science & technology. 2021 Apr 1;10(4):15-.
b. **Mohammadzadeh V**, Su E, Rabiolo A, Shi L, Zadeh SH, Law SK, Coleman AL, Caprioli J, Weiss RE, Nouri-Mahdavi K. Ganglion cell complex: the optimal measure for detection of structural progression in the macula. American Journal of Ophthalmology. 2022 May 1;237:71-82.
c. **Mohammadzadeh V**, Su E, Shi L, Coleman AL, Law SK, Caprioli J, Weiss RE, Nouri-Mahdavi K. Multivariate longitudinal modeling of macular ganglion cell complex: spatiotemporal correlations and patterns of longitudinal change. Ophthalmology science. 2022 Sep 1;2(3):100187.
d. **Mohammadzadeh V**, Moghimi S, Nishida T, Walker E, Kamalipour A, Micheletti E, Mahmoudinezhad G, Wu JH, Liebmann JM, Girkin CA, Fazio M. Association of rates of ganglion cell and inner plexiform thinning with development of glaucoma in eyes with suspected glaucoma. JAMA ophthalmology. 2023 Apr 1;141(4):349-56.

III. Structure-function relationship in glaucoma

Understanding the complex relationship between structural measurements and their functional correlates remains a central challenge in glaucoma. I have a strong interest in investigating both cross-sectional and longitudinal structure–function (SF) relationships, as accurate detection of change is critical for glaucoma diagnosis and monitoring. I led one of the first studies evaluating longitudinal SF relationships between macular OCT and central visual field (VF), which was published in *Ophthalmology*. Building on this work, I applied artificial intelligence to predict central VF parameters from macular OCT volume scans using a three-dimensional convolutional neural network. This study, supported by a postdoctoral grant from the Fight for Sight organization, was published in *Translational Vision Science and Technology* and demonstrated clinically

meaningful predictive performance. I am currently developing a longitudinal bivariate Bayesian model to evaluate pointwise SF relationships between macular OCT and central VF over time, with the goal of improving detection and characterization of glaucomatous progression.

a. **Mohammadzadeh V**, Rabiolo A, Fu Q, Morales E, Coleman AL, Law SK, Caprioli J, Nouri-Mahdavi K. Longitudinal macular structure–function relationships in glaucoma. Ophthalmology. 2020 Jul 1;127(7):888-900.
b. **Mohammadzadeh V**, Vepa A, Li C, Wu S, Chew L, Mahmoudinezhad G, Maltz E, Sahin S, Mylavarapu A, Edalati K, Martinyan J. Prediction of Central Visual Field Measures From Macular OCT Volume Scans With Deep Learning. Translational Vision Science & Technology. 2023 Nov 1;12(11):5-.

IV. Macular OCT for detection of glaucoma and disease progression.

The longstanding belief that macular ganglion cells are affected only in late stages of glaucoma has been challenged by both experimental evidence and clinical OCT findings. As a result, macular OCT parameters have emerged as critical biomarkers for the detection and monitoring of glaucoma progression. I conducted a comprehensive systematic review on the role of macular OCT in glaucoma, which was published in Survey of Ophthalmology. Building on this foundation, our group performed multiple studies evaluating rates of macular OCT change and their relationship with functional outcomes on visual fields. In collaboration with a computer science team, we developed advanced deep learning approaches, including a conditional generative adversarial network (cGAN), to predict future macular OCT volume scans from prior imaging. We also designed a novel deep learning framework capable of extracting volumetric features from macular OCT scans for the detection of early-stage glaucoma. Given the clinical importance of identifying conversion from glaucoma suspect to perimetric disease, I led a study using joint longitudinal–survival modeling to evaluate the association between rates of macular OCT change and the risk of conversion. This work was published in *JAMA Ophthalmology*. Additionally, we investigated the relationship between macular OCT progression rates and patient-reported quality of life, an increasingly important outcome in glaucoma care.

a. **Mohammadzadeh V**, Fatehi N, Yarmohammadi A, Lee JW, Sharifipour F, Daneshvar R, Caprioli J, Nouri-Mahdavi K. Macular imaging with optical coherence tomography in glaucoma. Survey of ophthalmology. 2020 Nov 1;65(6):597-638.
b. Hassan O, Sahin S, **Mohammadzadeh V**, Yang X, Amini N, Mylavarapu A, Mahmoudi G, Nouri-Mahdavi K, Scalzo F. Deep Learning for Prediction of Glaucoma Progression with Macular Optical Coherence Tomography. Proceeding of the 15th International Symposium on Visual Computing, Virtual meeting, October 5-7, 2020. In press.
c. **Mohammadzadeh V**, Cheng M, Zadeh SH, Edalati K, Yalzadeh D, Caprioli J, Yadav S, Kadas EM, Brandt AU, Nouri-Mahdavi K. Central macular topographic and volumetric measures: new biomarkers for detection of glaucoma. Translational Vision Science & Technology. 2022 Jul 8;11(7):25-.
d. **Mohammadzadeh V**, Moghimi S, Nishida T, Walker E, Kamalipour A, Micheletti E, Mahmoudinezhad G, Wu JH, Liebmann JM, Girkin CA, Fazio M. Association of rates of ganglion cell and inner plexiform thinning with development of glaucoma in eyes with suspected glaucoma. JAMA ophthalmology. 2023 Apr 1;141(4):349-56.
e. Nishida T, Moghimi S, **Mohammadzadeh V**, Wu JH, Yamane ML, Kamalipour A, Mahmoudinezhad G, Micheletti E, Liebmann JM, Fazio MA, Girkin CA. Association between ganglion cell complex thinning and vision-related quality of life in glaucoma. JAMA ophthalmology. 2022 Aug 1;140(8):800-6.

V. Optical coherence angiography (OCTA) and glaucoma.

I have a strong interest in emerging technologies in ophthalmology and have explored the role of optical coherence tomography angiography (OCTA) in glaucoma. In collaboration with Professor Robert Weinreb, a pioneer in OCTA research, I investigated the longitudinal structure–function relationship between macular OCTA metrics and central visual field outcomes. In a complementary study, I evaluated the association between corneal hysteresis and longitudinal changes in OCTA using a three-way interaction linear mixed-effects model incorporating corneal hysteresis, intraocular pressure, and OCTA-derived measures. We also examined whether integrating OCTA with structural OCT could enhance the detection of glaucoma progression using artificial intelligence approaches. Building on this work, I developed a deep learning model to detect glaucoma progression from longitudinal macular OCTA en face images. This study was published in the *British Journal of Ophthalmology*.

a. **Mohammadzadeh V**, Liang Y, Moghimi S, Xie P, Nishida T, Mahmoudinezhad G, Eslani M, Walker E, Kamalipour A, Micheletti E, Wu JH. Detection of glaucoma progression on longitudinal series of en-face macular optical coherence tomography angiography images with a deep learning model. British Journal of Ophthalmology. 2024 Aug 7.
b. **Mohammadzadeh V**, Moghimi S, Nishida T, Proudfoot JA, Eslani M, Kamalipour A, El-Nimri N, Micheletti E, Zangwill LM, Weinreb RN. Longitudinal Structure–Function Relationship between Macular Vessel Density and Thickness and Central Visual Field in Early Glaucoma. Ophthalmology Glaucoma. 2022 Nov 1;5(6):648-57.
c. **Mohammadzadeh V**, Moghimi S, Nishida T, Mahmoudinezhad G, Kamalipour A, Micheletti E, Zangwill L, Weinreb RN. Effect of Corneal Hysteresis on the Rates of Microvasculature Loss in Glaucoma. Ophthalmology Glaucoma. 2023 Mar 1;6(2):177-86.

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