

# Praneeth Chakravarthula

## Education

- 2016 – 2021 **Doctor of Philosophy**, *Computer Science*, University of North Carolina at Chapel Hill.  
IEEE VR Best Dissertation Award
- 2016 – 2019 **Master of Science**, *Computer Science*, University of North Carolina at Chapel Hill.
- 2014 – 2016 **Master of Technology**, *Electrical Engineering*, Indian Institute of Technology Madras.
- 2011 – 2014 **Bachelor of Engineering**, *Electrical Engineering*, Indian Institute of Technology Madras.

## Experience

- since 01/24 **Assistant Professor**, University of North Carolina at Chapel Hill.  
Department of Computer Science  
Department of Applied Physical Sciences (Adjunct)
- 07/21–12/23 **Research Assistant Professor**, *Computer Science*, UNC Chapel Hill.
- 07/21–12/23 **Postdoctoral Researcher**, *Computer Science*, Princeton University.
- 05/20–08/20 **Research Intern**, Facebook Reality Labs.
- 06/19–09/19 **Research Intern**, Microsoft Research Cambridge, UK.
- 05/18–08/18 **Research Intern**, NVIDIA Research.
- 05/17–08/17 **Research Intern**, NVIDIA Research.
- 05/14–09/14 **Visiting Researcher**, MIT Media Lab.
- 05/13–09/13 **Visiting Researcher**, National University of Singapore.

## Awards, Honors & Fellowships

- 2024 **NVIDIA Applied Research Accelerator Award**.
- 2023 **Optica Senior Member**.
- 2023 **Virtual Reality Best Dissertation Award**, *Awarded at IEEE Virtual Reality Conference*.
- 2022 **Mistletoe Research Fellowship**, *Momenta Foundation*.
- 2019 **Timothy L. Quigg Inventor of the Year Award**, *Awarded by UNC CS*.

## Best Paper and Demo Awards

- 2025 **Best Paper Honorable Mention**, *Multimodal Neural Acoustic Fields for Immersive Mixed Reality*, IEEE Conference on Virtual Reality (VR) 2025.
- 2025 **Best Paper Award**, *FlatTrack: Eye-tracking with ultra-thin lensless cameras*, Gaze meets Computer Vision, WACV 2025..
- 2024 **Best Paper Award**, *Cross-Domain Synthetic-to-Real In-the-Wild Depth and Normal Estimation for 3D Scene Understanding*, Omnidirectional Computer Vision, CVPR 2024.
- 2023 **Best Dissertation Award**, *Towards Everyday-use Augmented Reality Eyeglasses*, IEEE Visualization and Graphics Technical Committee (VGTC).

- 2022 **Best Paper Award**, *Image Features Influence Reaction Time: A Learned Probabilistic Perceptual Model for Saccade Latency*, ACM SIGGRAPH 2022.
- 2022 **Best Paper Honorable Mention**, *Joint Neural Phase Retrieval and Compression for Energy- and Computation-Efficient Holography on the Edge*, ACM SIGGRAPH 2022.
- 2022 **Best Paper Award**, *FoV-NeRF: Foveated Neural Radiance Fields for Virtual Reality*, IEEE International Symposium on Mixed and Augmented Reality (ISMAR) 2022.
- 2020 **Best Paper Award**, *DeepCGH: 3D Computer-Generated Holography Using Deep Learning*, Optical Society of America (OSA) Biophotonics Congress 2020.
- 2020 **Best Optical Design Award**, *Computing high-quality phase-only holograms for holographic displays*, SPIE Photonics West 2020.
- 2019 **Best Paper Nominee**, *Manufacturing Application Driven Near-Eye Displays*, IEEE Conference on Virtual Reality (VR) 2019.
- 2018 **Best Paper Award**, *focusAR: Auto-focus Augmented Reality Eyeglasses for both Real World and Virtual Imagery*, IEEE International Symposium on Mixed and Augmented Reality (ISMAR) 2018.
- 2018 **Best in Show Award**, *Steerable Application-Adaptive Near-Eye Displays*, ACM SIGGRAPH Emerging Technologies 2018.
- 2018 **Best Optical Design Award**, *Mitigating vergence-accommodation conflict for near-eye displays via deformable beamsplitters*, SPIE Photonics West 2018.

## Journal Publications

\* indicates equal contribution

- J23 **Present and Future of Everyday-use Augmented Reality Eyeglasses**, Praneeth Chakravarthula, IEEE Computer Graphics and Applications 2025.
- J22 **Multimodal Neural Acoustic Fields for Immersive Mixed Reality**, Guansen Tong, Johnathan Chi-Ho Leung, Xi Peng, Haosheng Shi, Liujie Zheng, Shengze Wang, Arryn Carlos O'Brien, Ashley Paula-Ann Neall, Grace Fei, Martim Gaspar, Praneeth Chakravarthula, IEEE Transactions on Visualization and Graphics (VR 2025).
- J21 **Beating Bandwidth Limits for Large Aperture Broadband Nano-Optics**, Johannes Fröch\*, Praneeth Chakravarthula\*, Jipeng Sun, Ethan Tseng, Shane Colburn, Alan Zhan, Forrest Miller, Anna Wirth-Singh, Quentin AA Tanguy, Zheyi Han, Karl F Böhringer, Felix Heide, Arka Majumdar, Nature Communications 2024.
- J20 **Spatially varying nanophotonic neural networks**, Kaixuan Wei\*, Xiao Li\*, Johannes Fröch\*, Praneeth Chakravarthula, James Whitehead, Ethan Tseng, Arka Majumdar, Felix Heide, Science Advances 2024.
- J19 **Neural Etendue Expander for Ultra-Wide-Angle High-Fidelity Holographic Display**, Ethan Tseng, Seung-Hwan Baek, Grace Kuo, Nathan Matsuda, Andrew Maimone, Praneeth Chakravarthula, Qiang Fu, Wolfgang Heidrich, Douglas Lanman, Felix Heide, Nature Communications 2024.
- J18 **Thin On-Sensor Nanophotonic Array Cameras**, Praneeth Chakravarthula\*, Jipeng Sun\*, Xiao Li\*, Chenyang Lei, Gene Chou, Mario Bijelic, Johannes Froesch, Arka Majumdar, Felix Heide, ACM Transactions on Graphics (SIGGRAPH Asia 2023).
- J17 **End-to-End Compression-Aware Computer-Generated Holography**, Mi Zhou, Hao Zhang, Shuming Jiao, Praneeth Chakravarthula, Zihan Geng, Optics Express 2023.
- J16 **Hexagonal Diffractive Optical Elements**, Yidan Zheng, Qiang Fu, Hadi Amata, Praneeth Chakravarthula, Felix Heide, Wolfgang Heidrich, Optics Express 2023.

- J15 **ChromaCorrect: Prescription Correction in Virtual Reality Headsets through Perceptual Guidance**, *Ahmet Guzel, Jeanne Beyazian, Praneeth Chakravarthula, Kaan Aksit*, *Biomedical Optics Express* 2023.
- J14 **Visual perception of noise in a simulated holographic display – a user study**, *Andreas Georgiou, Joel Kollin, Charlie Hewitt, Praneeth Chakravarthula, Brian Guenter*, *Elsevier Displays* 2022.
- J13 **Pupil-aware Holography**, *Praneeth Chakravarthula, Seung-Hwan Baek, Florian Schiffers, Ethan Tseng, Grace Kuo, Andrew Maimone, Nathan Matsuda, Oliver Cossairt, Douglas Lanman, Felix Heide*, *ACM Transactions on Graphics (SIGGRAPH Asia 2022)*.
- J12 **FoV-NeRF: Foveated Neural Radiance Fields for Virtual Reality**, *Nianchen Deng, Zhenyi He, Jiannan Ye, Budmonde Duinkharjav, Praneeth Chakravarthula, Xubo Yang, Qi Sun*, *IEEE Transactions on Visualization and Graphics (ISMAR 2022)*.
- J11 **Image Features Influence Reaction Time: A Learned Probabilistic Perceptual Model for Saccade Latency**, *Budmonde Duinkharjav, Praneeth Chakravarthula, Rachel Albert, Anjul Patney, Qi Sun*, *ACM Transactions on Graphics (SIGGRAPH 2022)*.
- J10 **Hogel-free Holography**, *Praneeth Chakravarthula, Ethan Tseng, Henry Fuchs, Felix Heide*, *ACM Transactions on Graphics (SIGGRAPH 2022)*.
- J9 **Joint Neural Phase Retrieval and Compression for Energy- and Computation-Efficient Holography on the Edge**, *Yujie Wang\*, Praneeth Chakravarthula\*, Qi Sun, Baoquan Chen*, *ACM Transactions on Graphics (SIGGRAPH 2022)*.
- J8 **Seeing Through Obstructions with Diffractive Cloaking**, *Zheng Shi, Yuval Bahat, Seung-Hwan Baek, Qiang Fu, Hadi Amata, Xiao Li, Praneeth Chakravarthula, Wolfgang Heidrich, Felix Heide*, *ACM Transactions on Graphics (SIGGRAPH 2022)*.
- J7 **Gaze-contingent Retinal Speckle Suppression for Perceptually-Matched Foveated Holographic Displays**, *Praneeth Chakravarthula, Zhan Zhang, Okan Tursun, Piotr Didyk, Qi Sun, Henry Fuchs*, *IEEE Transactions on Visualization and Graphics (ISMAR 2021)*.
- J6 **Learned Hardware-in-the-loop Phase Retrieval for Holographic Near-Eye Displays**, *Praneeth Chakravarthula, Ethan Tseng, Tarun Srivastava, Henry Fuchs, Felix Heide*, *ACM Transactions on Graphics (SIGGRAPH Asia 2020)*.
- J5 **DeepCGH: 3D Computer-Generated Holography Using Deep Learning**, *M. Hossein Eybposh, Nicholas W. Caira, Mathew Atisa, Praneeth Chakravarthula, Nicolas C. Pégard*, *Optics Express* 2020.
- J4 **Wirtinger Holography for Near-Eye Displays**, *Praneeth Chakravarthula, Yifan Peng, Joel Kollin, Henry Fuchs, Felix Heide*, *ACM Transactions on Graphics (SIGGRAPH Asia 2019)*.
- J3 **Towards a Switchable AR/VR Near-eye Display with Accommodation-Vergence and Eyeglass Prescription Support**, *Xinxing Xia, Yunqing Guan, Andrei State, Praneeth Chakravarthula, Kishore Rathinavel, Tat-Jen Cham, Henry Fuchs*, *IEEE Transactions on Visualization and Graphics (ISMAR 2019)*.
- J2 **Manufacturing Application Driven Near-Eye Displays**, *Kaan Aksit, Praneeth Chakravarthula, Kishore Rathinavel, Youngmo Jeong, Rachel Albert, Henry Fuchs, David Luebke*, *IEEE Transactions on Visualization and Graphics (VR 2019)*.
- J1 **focusAR: Auto-focus Augmented Reality Eyeglasses for both Real World and Virtual Imagery**, *Praneeth Chakravarthula, David Dunn, Kaan Aksit, Henry Fuchs*, *IEEE Transactions on Visualization and Graphics (ISMAR 2018)*.

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## Conference Publications

- C14 **Perceptually-Guided Acoustic “Foveation”**, *Xi Peng, Kenneth Chen, Iran Roman, Juan Pablo Bello, Qi Sun\*, Praneeth Chakravarthula\**, International Conference on Virtual Reality and 3D User Interfaces (IEEE VR) 2025.
- C13 **End-to-End Hybrid Refractive-Diffractive Lens Design with Differentiable Ray-Wave Model**, *Xinge Yang, Matheus Souza, Kunyi Wang, Praneeth Chakravarthula, Qiang Fu, Wolfgang Heidrich*, SIGGRAPH Asia 2024.
- C12 **Cross-Domain Synthetic-to-Real In-the-Wild Depth and Normal Estimation for 3D Scene Understanding**, *Jay Bhanushali, Manivannan Muniyandi, Praneeth Chakravarthula*, OmniCV, International Conference on Computer Vision and Pattern Recognition (CVPR) 2024.
- C11 **Point Spread Function-inspired Deformable Convolutional Network for Holographic Displays**, *Mi Zhou, Shuming Jiao, Praneeth Chakravarthula, Yang Yue, Ping Su, Ercan Engin Kuruoglu, Zihan Geng*, SPIE 2024.
- C10 **Seeing with Sound: Long-Range Acoustic Beamforming for Automotive Scene Understanding**, *Praneeth Chakravarthula, Jim Aldon D’Souza, Ethan Tseng, Joe Bartusek, Felix Heide*, International Conference on Computer Vision and Pattern Recognition (CVPR) 2023.
- C9 **Stochastic Light Field Holography**, *Florian Schiffers, Praneeth Chakravarthula, Nathan Matsuda, Grace Kuo, Ethan Tseng, Douglas Lanman, Felix Heide, Oliver Cossairt*, International Conference on Computational Photography (ICCP) 2023.
- C8 **Neural 3D Gaze: 3D Pupil Localization and Gaze Tracking based on Anatomical Eye Model and Neural Refraction Correction**, *Xinran Lu, Praneeth Chakravarthula, Kaihao Liu, Xixiang Liu, Siyuan Li, Henry Fuchs*, International Symposium on Mixed and Augmented Reality (IEEE ISMAR) 2022.
- C7 **Improved vergence and accommodation via Purkinje Image tracking with multiple cameras for AR eyeglasses**, *Xinran Lu, Praneeth Chakravarthula, Yujie Tao, Steven Chen, Henry Fuchs*, International Symposium on Mixed and Augmented Reality (IEEE ISMAR) 2020.
- C6 **Towards Eyeglasses-style Holographic Near-eye Displays with Statically Expanded Eyebow**, *Xinxing Xia, Yunqing Guan, Andrei State, Praneeth Chakravarthula, Tat-Jen Cham, Henry Fuchs*, International Symposium on Mixed and Augmented Reality (IEEE ISMAR) 2020.
- C5 **Computing high-quality phase-only holograms for holographic displays**, *Praneeth Chakravarthula, Yifan Peng, Joel Kollin, Felix Heide, Henry Fuchs*, SPIE Photonics West 2020.
- C4 **Mitigating vergence-accommodation conflict for near-eye displays via deformable beamsplitters**, *David Dunn, Praneeth Chakravarthula, Qian Dong, Henry Fuchs*, SPIE Digital Optics for Immersive Displays 2018.
- C3 **Towards Varifocal Augmented Reality Displays using Deformable Beamsplitter Membranes**, *David Dunn, Praneeth Chakravarthula, Qian Dong, Kaan Aksit, Henry Fuchs*, SID Display Week 2018.
- C2 **Penetra3D: A Penetrable, Interactive, 360-degree Viewable Display**, *Praneeth Chakravarthula, Pattie Maes*, IEEE 3DUI 2015.
- C1 **Single Access Point-based Indoor Localization Technique for Augmented Reality Gaming for Children**, *Praneeth Chakravarthula, Ravi Poovaiah, Ajanta Sen, Priya Ganas*, IEEE TechSym 2014.

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## Patents

- 2023 **Methods, systems, and computer readable media for hardware-in-the-loop phase retrieval for holographic near eye displays**, *P Chakravarthula, F Heide, E Tseng, T Srivastava*, US Patent App. 18/071,065.

2021 **High-speed computer generated holography using convolutional neural networks**, *N Pégard, MH Eybposh, N Caira, M Atisa, P Chakravarthula*, US Patent App. 17/235,476. licensed by Intelligent Imaging Innovations, Inc.

**Methods, systems, and computer readable media for improved digital holography and display incorporating same**, *P Chakravarthula, F Heide*, US Patent 11,137,719.

2019 **Methods, systems, and computer readable media for dynamic vision correction for in-focus viewing of real and virtual objects**, *P Chakravarthula, H Fuchs*, US Patent 10,319,154.

## Thesis

### Doctoral Thesis.

title *Towards Everyday-use Augmented Reality Eyeglasses*  
advisor Henry Fuchs  
award IEEE VR Best Dissertation Award

## Teaching

2024/2025 **COMP 790/590-175 Computational Imaging**, *Spring 2025*, UNC Computer Science.

2024/2025 **COMP 790-175 Optical Neural Networks and Computing Systems**, *Fall 2024*, UNC Computer Science.

2023/2024 **COMP 790/590-175 Computational Imaging and Display**, *Spring 2024*, UNC Computer Science.

2022/2023 **Differentiable Cameras and Displays**, ACM SIGGRAPH 2022 course (organizer and co-instructor).

## Service

**Guest Editor** Nature Communications engineering collection on Technologies for Augmented and Virtual Reality, Nature Publishing Group, since 2023.

**Guest Editor** MDPI Special Issue on Laser and Photonic Sensing in Interferometry and Holography, since 2024.

**Program Committee** ACM Symposium on Eye Tracking Research and Applications (ETRA) 2024, 2023, 2022, 2021, 2020

Frontiers in Optics + Laser Science (FiO+LS) Conference on Virtual Reality and Augmented Vision 2024

IEEE Conference on Virtual Reality (IEEE VR) 2023

International Conference on Computational Photography (ICCP) 2022

International Symposium on Mixed and Augmented Reality (ISMAR) 2022

**Reviewer** ACM SIGGRAPH, ACM SIGGRAPH Asia, Nature Scientific Reports, OSA Optics Express, ACM Transactions on Graphics (TOG), ACM Transactions on Computer-Human Interaction (TOCHI), IEEE Transactions on Visualization and Computer Graphics (TVCG), Transactions on Computational Imaging (TCI), IEEE Access, IEEE Virtual Reality (VR), IEEE International Symposium on Mixed and Augmented Reality (ISMAR), ACM Symposium on Eye Tracking Research and Applications (ETRA), ACM User Interface Software and Technology (UIST), Virtual Reality Software and Technology (VRST)

**Senior** Optica  
**Member**

**Member** ACM, SPIE

**University** **Admissions Committee**, *UNC Computer Science Department*, since 2024.  
**Service**