

# Gun-Yeal Lee

Postdoctoral Researcher  
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## EDUCATION

<b>Seoul National University</b> Ph.D. in Electrical and Computer Engineering Advisor: Prof. Byoungcho Lee Thesis: “Metasurface optical elements for holography and imaging”	Seoul, Korea 09/2015 – 08/2021
<b>Seoul National University</b> B.S. in Electrical and Computer Engineering B.S. in Physics Advisor: Prof. Byoungcho Lee & Prof. DaiSik Kim	Seoul, Korea 03/2011 – 02/2015

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## RESEARCH EXPERIENCE

<b>Stanford University</b> Postdoctoral Researcher in Department of Electrical Engineering Advisor: Prof. Gordon Wetzstein	Stanford, CA 09/2022 – present
<b>Seoul National University</b> Postdoctoral Researcher in Inter-university Semiconductor Research Center (Alternative military service of Korea until August 2022) Doctoral Student Researcher in Department of Electrical and Computer Engineering Research Intern in Optical Engineering and Quantum Electronics Lab Advisor: Prof. Byoungcho Lee	Seoul, Korea 09/2021 – 08/2022 09/2015 – 08/2021 03/2015 – 08/2015

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## RESEARCH INTERESTS

My current research focus is at the intersection of nanophotonics, optical engineering, and computational imaging, aiming to solve fundamental problems in optical systems and develop next-generation optical systems through the synergistic combination of advanced photonic devices and AI-driven algorithms. My research topics include:

- Photonic Devices: Nanophotonics, Nanofabrication, Metasurfaces, Flat Optics
- Optical Engineering: Optical Imaging, Photography, Microscopy, Holography, AR/VR displays
- Computational Engineering: Computational Imaging, Computational Displays, Optical Computing

I have collaborated on joint projects with academic and industry researchers at Stanford University, Seoul National University, Korea University, POSTECH, Korea Institute of Machinery & Materials, Samsung, Sony, Meta, and NVIDIA. I also enjoy mentoring and collaborating with undergraduate students and early-stage PhD students.

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## HONORS AND AWARDS

### **NRF Postdoctoral Fellowship**

Nurturing Next-generation Researchers Program, National Research Foundation of Korea (NRF), Korea, 2022.

### **Outstanding Doctoral Thesis Award**

Department of Electrical and Computer Engineering, Seoul National University, Korea, 2021.

### **Best Graduate Student Award**

Seoul National University, Korea, 2021.

### **Doyeon Academic Paper Award**

Inter-university Semiconductor Research Center, Seoul National University, Korea, 2020.

### **Best Paper Award of 2020**

WILEY ETRI Journal, Electronics and Telecommunications Institute (ETRI), 2020.

### **SPIE Optics and Photonics Education Scholarship**

International Society for Optics and Photonics (SPIE), USA, 2020

### **Best Paper Award**

Conference on Optoelectronics and Optical Communications, Daegu, Korea, 2018.

### **Incubic/Milton Chang Award**

Optica (formerly known as The Optical Society of America), Washington, USA, 2017.

### **Emil-wolf Award – Finalist**

Optica (formerly known as The Optical Society of America), Washington, USA, 2017.

### **Best Paper Award**

META'17 (International Conference on Metamaterials, Photonic Crystals and Plasmonics), Incheon, Korea, 2017.

### **Best Paper Award & Best Student Award**

International Conference on Optical and Photonic Engineering, Chengdu, China, 2016.

### **Best Paper Award - Grand Prize (1st place out of 600 papers)**

Nano Korea 2016, Ilsan, Korea, 2016.

### **National Science & Technology Scholarship**

Korea Student Aid Foundation (KOSAF), Korea, 2013-2015

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## JOURNAL PUBLICATIONS

(Google Scholar profile: <https://scholar.google.com/citations?user=SiXpVNkAAAAJ&hl=en&oi=ao>)

† denotes equal contribution

### Journal Publications – First authorship (9)

1. Manu Gopakumar<sup>†</sup>, **Gun-Yeal Lee<sup>†</sup>**, Suyeon Choi, Brian Chao, Yifan Peng, Jonghyun Kim, and Gordon Wetzstein, “[Full-colour 3D holographic augmented-reality displays with metasurface waveguides](#),” *Nature*, vol. 629, pp. 791-797, 2024. [Press: [Stanford News](#), [NVIDIA tech](#), [IEEE Spectrum](#)]
2. Junhyeok Jang<sup>†</sup>, **Gun-Yeal Lee<sup>†</sup>**, Jangwoon Sung, and Byoungcho Lee, “[Independent multichannel wavefront modulation for angle multiplexed meta-holograms](#),” *Advanced Optical Materials*, vol. 9, no. 17, pp. 2100678, 2021. [Citations: 43]
3. **Gun-Yeal Lee**, Jangwoon Sung, and Byoungcho Lee, “[Metasurface optics for imaging applications](#),” *MRS Bulletin*, vol. 45, no. 3, pp. 202-209, 2020. [Citations: 35]
4. **Gun-Yeal Lee**, Jangwoon Sung, and Byoungcho Lee, “[Recent advances in metasurface hologram technologies](#),” *ETRI Journal*, vol. 41, no. 1, pp. 10-22, 2019. [Citations: 80]
5. Jangwoon Sung<sup>†</sup>, **Gun-Yeal Lee<sup>†</sup>**, Chulsoo Choi, Jongwoo Hong, and Byoungcho Lee, “[Single-layer bifacial metasurface: full-space visible light control](#),” *Advanced Optical Materials*, vol. 7, no. 8, article 1801748, 2019. [Citations: 50]
6. **Gun-Yeal Lee<sup>†</sup>**, Jong-Young Hong<sup>†</sup>, SoonHyoung Hwang, Seokil Moon, Hyeokjung Kang, Sohee Jeon, Hwi Kim, Jun-Ho Jeong, and Byoungcho Lee, “[Metasurface eyepiece for augmented reality](#),” *Nature Communications*, vol. 9, article 4562, 2018. [Citations: 450]
7. **Gun-Yeal Lee**, Gwanho Yoon, Seung-Yeol Lee, Hansik Yun, Jaebum Cho, Kyookeun Lee, Hwi Kim, Junsuk Rho, and Byoungcho Lee, “[Complete amplitude and phase control of light using broadband holographic metasurface](#),” *Nanoscale*, vol. 10, pp. 4237-4245, 2018. [Citations: 389]
8. Eui-Young Song<sup>†</sup>, **Gun-Yeal Lee<sup>†</sup>**, Hyeonsoo Park, Joonsoo Kim, Jongwoo Hong, Hwi Kim, and Byoungcho Lee, “[Compact generation of Airy beams with C-aperutre metasurface](#),” *Advanced Optical Materials*, vol. 5, Issue 10, article 161028, 2017. [Citations: 92]
9. **Gun-Yeal Lee**, Seung-Yeol Lee, Hansik Yun, Hyeonsoo Park, Joonsoo Kim, Kyookeun Lee, and Byoungcho Lee, “[Near-field focus steering along arbitrary trajectory via multi-lined distributed nanoslits](#),” *Scientific Reports*, vol. 6, article 33317, 2016.

### Journal Publications – Contributing authorship (16)

1. Changhyun Kim, Jongwoo Hong, Junhyeok Jang, Gun-Yeal Lee, Youngjin Kim, Yoonchan Jeong, and Byoungcho Lee, “[Freeform metasurface color router for deep submicron pixel image sensors](#),” *Science Advances*, vol. 10, no. 22, eadn9000, 2024.
2. Suyeon Choi, Manu Gopakumar, Brian Chao, Gun-Yeal Lee, Jonghyun Kim, and Gordon Wetzstein, “[Neural Holographic Near-eye Displays for Virtual Reality](#),” *ACM SIGGRAPH 2023 Emerging Technologies*, 2023.

3. Junhyeok Jang, **Gun-Yeal Lee**, Youngjin Kim, Changhyun Kim, Yoonchan Jeong, and Byoungho Lee, "[Dispersion-engineered Metasurface Doublet Design for Broadband and Wide-angle Operation in the Visible Range](#)," *IEEE Photonics Journal*, 2023.
4. Joohoon Kim, Junhwa Seong, Wonjoong Kim, **Gun-Yeal Lee**, Seokwoo Kim, Hongyoon Kim, Seong-Won Moon, Dong Kyo Oh, Younghwan Yang, Jeonghoon Park, Jaehyuck Jang, Yeseul Kim, Minsu Jeong, Chanwoong Park, Hojung Choi, Gyoseon Jeon, Kyung-il Lee, Dong Hyun Yoon, Namkyoo Park, Byoungho Lee, Heon Lee, and Junsuk Rho, "[Scalable manufacturing of high-index atomic layer–polymer hybrid metasurfaces for metaphotonics in the visible](#)," *Nature Materials*, vol. 22, no. 4, pp. 474–481, 2023.
5. Youngjin Kim, **Gun-Yeal Lee**, Jangwoon Sung, Junhyeok Jang, and Byoungho Lee, "[Spiral metalens for phase contrast imaging](#)," *Advanced Functional Materials*, vol. 32, no. 5, 2106050, 2021.
6. Jangwoon Sung, **Gun-Yeal Lee**, Chulsoo Choi, Jongwoo Hong, and Byoungho Lee, "[Polarization dependent asymmetric transmission using bifacial metasurface](#)," *Nanoscale Horizons*, vol. 5, no. 11, pp. 1487–1495, 2020.
7. Jangwoon Sung, **Gun-Yeal Lee**, and Byoungho Lee, "[Progresses in the practical metasurface for holography and lens](#)," *Nanophotonics*, vol. 8, no. 10, pp. 1701–1718, 2019.
8. Chulsoo Choi, Seung-Yeol Lee, Sang-Eun Mun, **Gun-Yeal Lee**, Jangwoon Sung, Hansik Yun, Jong-Heon Yang, Hee-Ok Kim, Chi-Young Hwang, and Byoungho Lee, "[Metasurface with nanostructured Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub> as a platform for broadband-operating wavefront switch](#)," *Advanced Optical Materials*, article 1900171, 2019.
9. Seokil Moon, Chang-Kun Lee, Seung-Woo Nam, Changwon Jang, **Gun-Yeal Lee**, Wontaek Seo, Geeyoung Sung, Hong-Seok Lee, and Byoungho Lee, "[Augmented reality near-eye display using Pancharatnam-Berry phase lenses](#)," *Scientific Reports*, vol. 9, article 6616, doi: 10.1038/s41598-019-42979-0, 2019.
10. Kyookeun Lee, Hansik Yun, Sang-Eun Mun, **Gun-Yeal Lee**, Jangwoon Sung, and Byoungho Lee, "[Ultracompact broadband plasmonic polarimeter](#)," *Laser & Photonics Reviews*, vol. 12, 1700297, 2018.
11. Jinseob Kim, Hyuntai Kim, Gun-Yeal Lee, Juhwan Kim, Byoungho Lee, and Yoonchan Jeong, "[Numerical and Experimental Study on Multi-Focal Metallic Fresnel Zone Plates Designed by the Phase Selection Rule via Virtual Point Sources](#)," *Applied Sciences*, vol. 8, 449, 2018.
12. Hyuntai Kim, Jinseob Kim, Haechan An, Yohan Lee, **Gun-Yeal Lee**, Jeongkyun Na, Kyoungyoon Park, Seungjong Lee, Seung-Yeol Lee, Byoungho Lee, and Yoonchan Jeong, "[Metallic Fresnel zone plate implemented on an optical fiber facet for super-variable focusing of light](#)," *Optics Express*, vol. 25, no. 24, pp. 30290–30303, 2017.
13. Kyookeun Lee, Joonsoo Kim, Hansik Yun, **Gun-Yeal Lee**, and Byoungho Lee, "[Interferometric control of plasmonic resonator based on polarization-sensitive excitation of surface plasmon polaritons](#)," *Optics Express*, vol. 24, no. 19, pp. 21861–21868, 2016.
14. Eui-Young Song<sup>†</sup>, Seung-Yeol Lee<sup>†</sup>, Jongwoo Hong, Kyookeun Lee, Yohan Lee, **Gun-Yeal Lee**, Hwi Kim, and Byoungho Lee, "[A double-lined metasurface for plasmonic complex-field generation](#)," *Laser and Photonics Reviews*, vol. 10, no. 2, pp. 299–308, 2016. (Cover image paper)
15. Seung-Yeol Lee, **Gun-Yeal Lee**, and Byoungho Lee, "[Plasmonic directional beam switching with tilted nanoslit array surrounded by gratings](#)," *IEEE Journal of Lightwave Technology*, vol. 34, no. 4, pp. 1368–1372, 2016.

16. Seung-Yeol Lee, Kyuho Kim, **Gun-Yeal Lee**, and Byoungcho Lee, "[Polarization -multiplexed plasmonic phase generation with distributed nanoslits](#)," *Optics Express*, vol. 23, no. 12, pp. 15598-15607, 2015.
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## CONFERENCES

### First authorship (9)

1. **Gun-Yeal Lee**, Jangwoon Sung, and Byoungcho Lee, "Dielectric metasurfaces for arbitrary engineering of multi-channel spinorbit interactions," SPIE Optics + Photonics, Virtual Conference, paper 11498-21, Aug 2020. (**SPIE Optics and Photonics Education Scholarship**)
2. **Gun-Yeal Lee**, J.-Y. Hong, and Byoungcho Lee, "See-through metalens for augmented reality near-eye display with ultrawide viewing angle," OSA 2019 Frontiers in Optics + Laser Science APS/DLS, Washington D.C., USA, paper FTh1C.2, Sept 2019.
3. **Gun-Yeal Lee**, Jangwoon Sung, and Byoungcho Lee, "Designed conversion of spin and orbital angular momentum," The 13th Pacific Rim Conference on Lasers and Electro-Optics (CLEO-PR 2018), Hong Kong, paper F2B.2, July 2018.
4. **Gun-Yeal Lee**, Jangwoon Sung, and Byoungcho Lee, "Broadband metasurface for chiral phase control," OSA Frontiers in Optics 2017 (FiO 2017), Washington, USA, paper FTu5D.5, Oct 2017.
5. **Gun-Yeal Lee**, Kyookeun Lee, Yohan Lee, Hyeonsoo Park, Culsoo Choi, and Byoungcho Lee, "Continuous control of complex nonlinear susceptibility for harmonic generation using plasmonic metasurface," The 8th International Conference on Metamaterials, Photonic Crystals and Plasmonics - META'17, Incheon, Korea, paper P19, July 2017. (**Best Paper Award**)
6. **Gun-Yeal Lee** and Byoungcho Lee, "Reflection type metasurfaces for complex-amplitude modulation at visible frequency," Global Nanophotonics 2016, Osaka Japan, paper P-01, Nov 2016.
7. **Gun-Yeal Lee**, Joonsoo Kim, Yohan Lee, and Byoungcho Lee, "Reflection type metasurfaces for complex-amplitude modulation at visible frequency," International Conference on Optical and Photonic Engineering (icOPEN 2016), Chengdu, China, paper N054-A, Sept 2016. (**Best Student Award & Best Paper Award**)
8. **Gun-Yeal Lee**, Joonsoo Kim, and Byoungcho Lee, "Polarization multiplexed hologram via broadband metasurfaces," Nano Korea 2016, P1601\_0896, July 2016. (**Best Paper Award - Grand Prize**)
9. **Gun-Yeal Lee**, Seung-Yeol Lee, and Byoungcho Lee, "Plasmonic Vortex Lens with Distributed Nanoslits for Arbitrary Tuning of Vortex Size," The 11th Conference on Lasers and Electro-Optics Pacific Rim (CLEO-PR 2015), Busan, Korea, paper 26P-72, Aug 2015.

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## INVITED TALKS AND PRESENTATIONS

**Synopsys**, Seminar, June 2024

3D holographic AR glasses with metasurface waveguides

**Stanford University**, Talk invited by Prof. Mark Brongersma, June 2024

3D holographic AR glasses with metasurface waveguides

**Pohang University of Science and Technology (POSTECH)**

Seminar invited by Prof. Seung-Hwan Baek and Prof. Junsuk Rho, Feb 2024

Recent advances in Meta-optics for imaging and AR/VR devices

**Samsung Research**, Seminar, Feb 2024

Recent advances in Meta-Optics for imaging and AR/VR devices

**Samsung Advanced Institute of Technology (SAIT)**, Seminar, Feb 2024

Nanophotonics for optical imaging and displays

**Seoul National University**, Seminar - GoGE Workshop, Oct 2023

Metasurface Optics for next-generation displays

**Stanford University**, Talk invited by Prof. Mark Brongersma, Oct 2022

Metasurface Optics towards next-generation imaging systems

**Synopsys**, Seminar, Sept 2022

Meta-Optics: Fundamentals and Design methods

**Stanford University**, Talk invited by Prof. Gordon Wetzstein, Feb 2022

Metasurface optics towards next-generation imaging systems

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## PROFESSIONAL SERVICE

### Journal Reviewer

Nature Reviews Electrical Engineering, Nature: npj Nanophotonics, ACS Photonics, Nanophotonics, Scientific Reports, Optics Express, Optics Letters

### Conference Reviewer

ACM SIGGRAPH Asia, IEEE International Symposium on Mixed and Augmented Reality

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## TEACHING AND MENTORING EXPERIENCE

### Graduate Student Mentoring

2015 –2022

Optical Engineering and Quantum Electronics Lab, Seoul National University, Korea

6 Graduate Students, Mentored in research idea brainstorming, development, and paper writing.

### Undergraduate Student Mentoring

2017

Seoul National University, Korea

3 Undergraduate Students, Mentored in basic background training and research on nanophotonics.

### Teaching Assistant / Guest Lecture, Introduction to Electromagnetism

2017

Seoul National University, Korea

Prepared course content, graded homework and exams, assisted students with numerical simulations.

Delivered a guest lecture on nanophotonics and metasurfaces.