

# YOUNGJIN KIM

PhD Candidate

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## EDUCATION

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| <b>B.S.</b>         | Electrical and Computer Engineering<br>Seoul National University, Seoul, Republic of Korea<br>Advisor: Byung Gook Park (deceased)  | 2012. 3 – 2019. 2           |
| <b>M.S. - Ph.D.</b> | Electrical and Computer Engineering<br>Seoul National University, Seoul, Republic of Korea<br>Former advisor: Byoungcho Lee (deceased)<br>Current advisor: Yoonchan Jeong ( <a href="mailto:yoonchan@snu.ac.kr">yoonchan@snu.ac.kr</a> ) | 2019.3 – 2025. 2 (expected) |

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## PROFESSIONAL EXPERIENCE

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|---|------------------------------------|--------------------|
| <b>Visiting Researcher</b>  | Stanford University, CA, USA       | 2023. 12 – 2024. 2 |
| - Professor: Mark Brongersma, Department of Materials Science and Engineering |                                    |                    |
| <b>Research Scientist Intern</b>  | Meta Reality Labs, Washington, USA | 2024. 6 – 2024. 10 |
| - Department: Optics & Display Research                                       |                                    |                    |

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## RESEARCH EXPERIENCE

- **Metasurfaces / Nano-optics**
  - Physical understanding of nanostructures' optical response
  - Metasurfaces / Nano-optics design using near-field and far-field simulations
  - Hands-on nanofabrication using lithography-techniques
- **Waveguide system design**
  - Waveguide-type folded metasurface system design using ray-tracing or wave-optics simulations
  - Hands-on wafer double-side nanofabrication using lithography-techniques
- **Data-driven optimization of optical systems through machine-learning framework**
  - Joint optimization of metasurface and spatial light modulator (SLM) phase profiles
  - End-to-end optimization of metalens imaging system (Hardware + Software co-design)
  - Metasurface proxy model design for fully differentiable optimization framework
- **Inverse design of metasurface through optical simulation algorithms**
  - Metasurface blazed grating optimization through rigorous coupled-wave analysis using automatic differentiation

- Application to imaging system / 3D holographic display / optical neural network

## SKILLS

<b>Numerical simulations</b>	<b>Optical near-field simulations:</b> RCWA (Python, Pytorch), FEM (COMSOL Multiphysics), FDTD (Lumerical)
	<b>Optical far-field simulations:</b> Ray-optic simulation (Zemax), Wave-optic simulation (MATLAB, Python, Pytorch)
	<b>Computational optics design:</b> Data-driven optimization through machine-learning framework (Pytorch), Inverse design of periodic nanostructures using automatic-differentiation (Pytorch)
	<b>Programming languages &amp; tools:</b> MATLAB, Python (Pytorch), ZPL (for Zemax)
<b>Experimental experiences</b>	Optical microscopy, Photography, Holographic display with spatial light modulator, Laser/LED-based experiments
<b>Device fabrication</b>	<b>Nanofabrication:</b> Focused ion beam (FIB) milling, Electron beam lithography, Photolithography (Aligner, Maskless lithography), Electron beam evaporator, Plasma-enhanced chemical vapor deposition (PECVD), Reactive ion etching (RIE)
	<b>Measurement:</b> Scanning electron microscope (SEM), Ellipsometry
<b>Languages</b>	Korean (Native) / English (Fluent)

## RESEARCH EXPERIENCE - *Projects*

- **Metallens planar optic system for ultra-slim camera module**  
 Researcher, Samsung Science & Technology Foundation  
 Jun. 2020 – July. 2023
- **Improvement of  $\mu$ LED optical characteristics using metasurface technology.**  
 Researcher, Samsung Display  
 March. 2021 – Feb. 2023
- **Research for integrated meta-photonics system and its application to mobile real-time 3D imaging**  
 Researcher, National Research Foundation of Korea  
 Mar. 2020 - November. 2022
- **Development of virtual reality technology using metasurface optics**  
 Researcher, Samsung Display  
 March. 2020 – Feb. 2021

## HONOR AND AWARDS

- **Seoul National University Joint International Research Grant**  
 Seoul National University, 2023.

- **Silver Prize, Samsung Display Industry-Academia Technical Paper Awards**  
Samsung Display, 2023.
- **Scholarship of Foundation for SNU ECE - Kim Jung Sik Fund**  
Seoul National University, 2021.
- **Best Poster Paper Awards**  
Optics and Photonics Congress, Jeju, South Korea, 2021.

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## JOURNAL PUBLICATIONS

First Author (3)

† : equal contribution

1. **Y. Kim**, G. -Y. Lee, J. Sung, J. Jang, and B. Lee, "[Spiral Metalens for Phase Contrast Imaging](#)," **Advanced Functional Materials**, vol. 32, no. 5, pp. 2106050, 2022.
2. S. -W. Nam<sup>†</sup>, **Y. Kim**<sup>†</sup>, D. Kim, and Y. Jeong, "[Depolarized Holography with Polarization-multiplexing Metasurface](#)," **ACM Transactions on Graphics (SIGGRAPH Asia)**, vol. 42, no. 6, article 200, 2023.
3. **Y. Kim**<sup>†</sup>, T. Choi<sup>†</sup>, G.-Y. Lee, C. Kim, J. Bang, J. Jang, Y. Jeong, and B. Lee, "Metasurface Folded Lens System for Ultrathin Cameras," **Science Advances**, 2024. (Accepted)

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## JOURNAL PUBLICATIONS

Co-Author (6)

1. S.-J. Kim, C. Kim, **Y. Kim**, J. Jeong, S. Choi, W. Han, J. Kim, and B. Lee, "[Dielectric metalens: properties and three-dimensional imaging applications](#)," **Sensors**, vol. 21, no. 13, pp. 4584, 2021.
2. J. Jang, G. -Y. Lee, **Y. Kim**, C. Kim, Y. Jeong, and B. Lee, "[Dispersion-Engineered Metasurface Doublet Design for Broadband and Wide-Angle Operation in the Visible Range](#)," **IEEE Photonics Journal**, vol. 15, no. 4, pp. 1-9, 2023.
3. C. Kim, J. Hong, J. Jang, G. -Y. Lee, **Y. Kim**, Y. Jeong, and B. Lee, "[Freeform Metasurface Color Router for Deep Sub-micron Pixel Image Sensors](#)," **Science Advances**, vol. 10, no. 22, pp. eadn9000, 2024.
4. H. Son, T. Choi, K. Kim, **Y. Kim**, J. Bang, S.-J. Kim, B. Lee, and Y. Jeong, "[Strong Coupling Induced Bound States in the Continuum in a Hybrid Metal–Dielectric Bilayer Nanograting Resonator](#)," **ACS Photonics**, 2024.
5. T. Choi, C. Choi, J. Bang, **Y. Kim**, H. Son, C. Kim, J. Jang, Y. Jeong, and B. Lee, "[Multiwavelength Achromatic Deflector in the Visible Using a Single-Layer Freeform Metasurface](#)," **Nano Letters**, 2024.
6. E. Lee, Y. Jo, S.-W. Nam, M. Chae, C. Chun, **Y. Kim**, Y. Jeong, and B. Lee, "Speckle Reduced Holographic Display System with a Jointly Optimized Rotating Phase Mask," **Optics Letters**, 2024. (Accepted)

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## CONFERENCES

First Author (5)

1. **Y. Kim**, C. Kim, B. Lee, Y. Jeong, and B. Lee, "Meta-optic Miniaturized Telephoto Lens System," High Contrast Metastructures XII, SPIE Photonics West 2023, San Francisco, USA, paper 12432-32, Feb. 2023. **(Oral presentation)**
2. **Y. Kim**, C. Kim, and B. Lee, "Phase contrast imaging with multiwavelength achromatic spiral metalens," OSA Optical Design and Fabrication Congress, Virtual Conference, paper FW4C.3, Jun. 2021. **(Oral presentation)**

3. **Y. Kim**, J. Hong, and B. Lee, "Edge detection metalens with additional spiral phase profiles," The 20th International Meeting on Information Display (IMID 2020), Virtual Conference, paper 04-10-1232, Aug. 2020. **(Oral presentation)**
  4. **Y. Kim**, C. Kim, and B. Lee, "Single-layer edge detecting metalens with combining hyperbolic and spiral phase profiles," The 14th Pacific Rim Conference on Lasers and Electro-Optics (CLEO PR 2020), Virtual Conference, paper P5-7, Aug. 2020.
  5. **Y. J. Kim**, J. Hong, J. Sung, and B. Lee, "Transmission-Type Color Filters with Silicon Mie Resonators using Guided-Mode-Resonance," OSA Frontiers in Optics + Laser Science APS/DLS, Washington D.C., USA, paper JW4A.74, Sep. 2019.
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