YOUNGJIN KIM

PhD Candidate

Seoul National University, Seoul, South Korea

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EDUCATION

B.S. Electrical and Computer Engineering — 2012. 3 – 2019. 2
Seoul National University, Seoul, Republic of Korea
Advisor: Byung Gook Park (deceased)

M.S. - Ph.D. Electrical and Computer Engineering — 2019.3 – 2025. 2 (expected)
Seoul National University, Seoul, Republic of Korea
Former advisor: Byoungho Lee (deceased)
Current advisor: Yoonchan Jeong (yoonchan@snu.ac.kr)

PROFESSIONAL EXPERIENCE

Visiting Researcher Stanford University, CA, USA — 2023. 12 – 2024. 2

- Professor: Mark Brongersma, Department of Materials Science and Engineering

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

Numerical simulations	**Optical near-field simulations:** RCWA (Python, Pytorch), FEM (COMSOL Multiphysics), FDTD (Lumerical) **Optical far-field simulations:** Ray-optic simulation (Zemax), Wave-optic simulation (MATLAB, Python, Pytorch) **Computational optics design:** Data-driven optimization through machine-learning framework (Pytorch), Inverse design of periodic nanostructures using automatic-differentiation (Pytorch) **Programming languages & tools:** MATLAB, Python (Pytorch), ZPL (for Zemax)
Experimental experiences	Optical microscopy, Photography, Holographic display with spatial light modulator, Laser/LED-based experiments
Device fabrication	**Nanofabrication:** 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) **Measurement:** Scanning electron microscope (SEM), Ellipsometry
Languages	Korean (Native) / English (Fluent)

RESEARCH EXPERIENCE - *Projects*

- **Metalens planar optic system for ultra-slim camera module**
  Researcher, Samsung Science & Technology Foundation
  Jun. 2020 – July. 2023

- **Improvement of μLED 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.

JOURNAL PUBLICATIONS

First Author (2)

† : 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†, **Y. Kim†**, D. Kim, and Y. Jeong, "Depolarized Holography with Polarization-multiplexing Metasurface," **ACM Transactions on Graphics (SIGGRAPH Asia)**, vol. 42, no. 6, article 200, 2023.

JOURNAL PUBLICATIONS

Co-Author (2)

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.

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.
