# Jeongmin Kim

Assistant Professor
Department of Applied Bioengineering
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## RESEARCH INTERESTS

- Advanced optical microscopy/metrology methods
- Advanced optical imaging and manipulation systems for biology and medicine
- Novel photonic systems and devices for biology research, healthcare applications and bio/chemical sensing

## EDUCATION

Ph.D. Mechanical Engineering, University of California at Berkeley, USA — Aug 2016
- Emphasis in Nanoscale Science and Engineering, Minors in Physics and Electrical Engineering
- GPA: 4.0/4.0 (six $A^+$ grades among 11 courses taken)
- Dissertation: High-aperture optical microscopy methods for super-resolution deep imaging and quantitative phase imaging (Advisor: Prof. Xiang Zhang)

M.S. Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Korea — Feb 2006
- *Valedictorian* (GPA: 4.13/4.3)
- Thesis: Spectrally encoded slit confocal microscopy with nano-resolution and real-time imaging capability (Advisor: Prof. DaeGab Gweon)

B.S. Mechanical Engineering, Kyungpook National University, Korea — Feb 2004
- *Summa cum Laude* (Ranking: 1/51, GPA: 4.23/4.3)

## EMPLOYMENT AND APPOINTMENT

- Assistant Professor, Dept. of Applied Bioengineering, Seoul National University, Korea — Mar 2020-Present
- Affiliated Professor, Dept. of Intelligence and Information, Seoul National University, Korea — April 2022-Feb 2024
- Postdoctoral Scholar – Prof. Ke Xu group, QB3 and Dept. of Chemistry, UC Berkeley — Mar 2019-Feb 2020
- Postdoctoral Scholar – Prof. Xiang Zhang group, Dept. of Mechanical Engineering, UC Berkeley — Sep 2016-Feb 2019
- Graduate Student Researcher – Dept. of Mechanical Engineering, UC Berkeley — Summer 2012, May 2014-Aug 2016
- Grad Student Researcher – Materials Sciences Division, Lawrence Berkeley National Laboratory — Jun 2013-Aug 2013
- Optical Engineer – Manufacturing Technology R&D Center, Samsung Electronics, Korea — Feb 2006-Jun 2011
- Technical Research Personnel (alternative military service) – Samsung Electronics, Korea — May 2006-May 2009
- Graduate Research Assistant – Dept. of Mechanical Engineering, KAIST, Korea — Oct 2004-Feb 2006

## AWARDS AND HONORS

- Creative-Pioneering Researcher Award (2020 창의선도 신진연구자), Seoul National University, Korea — Sep 2020
- PicoQuant Young Investigator Award – SPIE Photonics West (BiOS) conference, San Francisco, USA — Feb 2019
- Graduate Division Block Grant Award for Distinguished Academic Record – UC Berkeley — Apr 2015
- STX Overseas Graduate Student Scholarship – STX Scholarship Foundation, Korea — July 2011
- Best M.S. Graduate Award – Department of Mechanical Engineering, KAIST, Korea — May 2006
- Academic Excellence Scholarship – Iljung Scholarship Foundation, Korea — Sep 2001-Dec 2003
- Undergraduate Merit-based Scholarship – Kyungpook National University, Korea — Mar 2000-Jun 2001

## PEER-REVIEWED PUBLICATIONS

† equal contribution, * correspondence

1. H. Chung, J.-K Choi, C. Hong, Y. Lee, K.H. Hong, S.J. Oh, **J. Kim**, S.-C. Song, J.-W. Kim and S.-H Kim*, "A micro-fragmented collagen gel as a cell-assembling platform for critical limb ischemia repair," ***Bioactive Materials*** 34, 80-97 (2024)
2. **J. Kim***, "Nonparaxial imaging theory for differential phase contrast imaging," ***Current Optics and Photonics*** 7, 537-544 (2023)
3. M. Lee†, J. Park† and **J. Kim***, "Line spectroscopic reflectometry for rapid and large-area thickness measurement," ***Optics Express*** 31, 32241-32252 (2023)
4. D. Koo†, M. Lee†, Y. Lee and **J. Kim***, "Enhancing obSTORM imaging performance with cubic spline PSF modeling," ***Biomedical Optics Express*** 14, 5075-5084 (2023)
5. Y. Lee, Y. Lee, M. Lee, D. Koo, D. Kim, H. Kim, K. Lee and **J. Kim***, "STORM imaging buffer with refractive index matched to standard immersion oil," ***ACS Photonics*** 10, 2589-2597 (2023)
6. **J. Kim***, "Recent advances in oblique plane microscopy," ***Nanophotonics*** 12, 2317-2334 (2023)
7. H.S. Yang, Y.J. Choi, H.Y. Han, H.S. Kim, S.Y. Park, **J. Kim** and S. Choi*, "The Relationship Between Retinal and Choroidal Thickness and Adiponectin Concentrations in Patients with Type 2 Diabetes Mellitus," ***Investigative Ophthalmology & Visual Science*** 64(4):6 (2023)
8. M. Lee†, D. Koo† and **J. Kim***, "Simple and fast calibration method of phase-only spatial light modulators," ***Optics Letters*** 48, 5-8 (2022)
9. S. Yang†, W. Bao†, X. Liu†, **J. Kim**, R. Zhao, R. Ma, Y. Wang and Z. Zhang*, "Subwavelength-scale lasing perovskite with ultrahigh Purcell enhancement," ***Matter*** 4, 404-4050 (2021)
10. B. Belardi†, T. Hamkins-Indik†, A.R. Harris, **J. Kim**, K. Xu and D.A. Fletcher*, "A weak link with actin organizes tight junctions to control epithelial permeability," ***Developmental Cell*** 54, 1-13 (2020)
11. Y. Xia†, Q. Li†, **J. Kim**, W. Bao, C. Gong, S. Yang, Y. Wang and X. Zhang*, "Room-temperature giant Stark effect of single photon emitter in van der Waals material," ***Nano Letters*** 19, 7100-7105 (2019)
12. W. Bao†, X. Liu†, F. Xue†, F. Zheng, R. Tao, S. Wang, Y. Xia, M. Zhao, **J. Kim**, S. Yang, Q. Li, Y. Wang, Y. Wang, L.-W. Wang, A.H. MacDonald* and X. Zhang*, "Observation of Rydberg exciton polaritons and their condensate in a perovskite cavity," ***Proceedings of the National Academy of Sciences, USA*** 116, 20274-20279 (2019)
13. **J. Kim**, M. Wojcik, Y. Wang, S. Moon, E.A. Zin, N. Marnani, Z.L. Newman, J.G. Flannery, K. Xu* and X. Zhang*, "Oblique-plane single-molecule localization microscopy for tissues and small intact animals," ***Nature Methods*** 16, 853-857 (2019)
14. N. Shitrit†, **J. Kim**†, D.S. Barth, H. Ramezani, Y. Wang and X. Zhang*, "Asymmetric free-space light transport at nonlinear metasurfaces," ***Physical Review Letters*** 121, 046101 (2018)
15. **J. Kim**, Y. Wang and X. Zhang*, "Comparison of different theories for focusing through a plane interface: comment," ***Journal of the Optical Society of America A*** 35, 591-592 (2018)
16. **J. Kim**, Y. Wang and X. Zhang*, "Calculation of vectorial diffraction in optical systems," ***Journal of the Optical Society of America A*** 35, 526-535 (2018)
17. A. Labno, C. Gladden, **J. Kim**, D. Lu, X. Yin, Y. Wang, Z. Liu* and X. Zhang*, "Three-dimensional nanoscale imaging by plasmonic Brownian microscopy," ***Nanophotonics*** 7, 489-495 (2018)
18. P.K. Jha†, N. Shitrit†, **J. Kim**, X. Ren, Y. Wang and X. Zhang*, "Metasurface-mediated quantum entanglement," ***ACS Photonics*** 5, 971-976 (2018)
19. Z.J. Wong†, Y.L. Xu†, **J. Kim**†, K. O'Brien, Y. Wang, L. Feng* and X. Zhang*, "Lasing and anti-lasing in a single cavity," ***Nature Photonics*** 10, 796-801 (2016)
20. P.K. Jha, M. Mrejen, **J. Kim**, C. Wu, Y. Wang, Y. Rostovtsev and X. Zhang*, "Coherence-driven topological transition in quantum metamaterials," ***Physical Review Letters*** 116, 165502 (2016)

21. T. Li[†], S. Ota[†], **J. Kim**, Z.J. Wong, Y. Wang, X. Yin and X. Zhang[*], "Axial plane optical microscopy," ***Scientific Reports*** 4, 7253 (2014)
22. P.K. Jha, M. Mrejen, **J. Kim**, C. Wu, X. Yin, Y. Wang and X. Zhang[*], "Interacting dark resonances with plasmonic meta-molecules, ***Applied Physics Letters*** 105 (2014)
23. **J. Kim**, T. Li, Y. Wang and X. Zhang[*], "Vectorial point spread function and optical transfer function in oblique plane imaging," ***Optics Express*** 22, 11140-11151 (2014)
24. S. Xiong[*], **J. Kim**, Y. Wang, X. Zhang and D. Bogy, "A two-stage heating scheme for heat assisted magnetic recording," ***Journal of Applied Physics*** 115, 17B702 (2014)
25. **J. Kim**[*], D. Kang and D. Gweon, "Spectrally encoded slit confocal microscopy," ***Optics Letters*** 31, 1687-1689 (2006)

## PATENTS

1. T. Li, S. Ota, **J. Kim**, Y. Wang and X. Zhang, "Multiplane optical microscope," US Patent Pub. No. 9823457B2 (2017)
2. **J. Kim**, S. Bae and S. Jang, "Maskless exposure apparatus and stitching exposure method using the same," Korea Patent Pub. No. KR101095549B1 (2011); US Patent Pub. No. US9019471B2 (2015)

## TEACHING

- Special Topics in Applied Bioengineering: Writing research papers, Fall 2023, SNU
- Special Topics in Applied Bioengineering: AI Bioimage Analysis (인공지능 바이오 이미지 분석), Fall 2022, SNU
- Special Topics in Super-resolution Microscopy (초해상도 현미경 특론), Spring 2024, Spring 2022, SNU
- Advanced Optical Imaging Theory (고등 광학 이미징 이론), Spring 2024, Spring 2022, Spring 2021, SNU
- Optical Microscopy (광학 현미경법), Fall 2020, Fall 2021, Fall 2022, Fall 2023, SNU
- Introduction to Applied Bioengineering (응용바이오공학개론), Fall 2021, SNU
- Seminar in Applied Bioengineering 1 (응용바이오공학 세미나1), Spring 2021, SNU
- Interdisciplinary Project Design (융합프로젝트 설계), Spring 2020, SNU

## INVITED TALK/SEMINAR

1. "Super-resolution optical microscopy for nanoscale biological measurements," Seminar, School of Mechanical Engineering, Yonsei University, Korea (May 2024)
2. "Single molecule microscopy for tissues and intact small animals", Seminar, Department of Biomedical Engineering, Ulsan National Institute of Science and Technology (UNIST), Korea (April 2024)
3. "Super-resolution fluorescence imaging for nanoscale biological measurements," Seminar, Department of Mechanical Engineering, Hanyang University, Korea (April 2024)
4. "Line spectroscopic reflectometry for rapid and large-area thickness measurement," Seminar, Tech University of Korea, Korea (Jan 2024)
5. "Super-resolution optical microscopy for biology," Seminar, Department of Mechanical Engineering, POSTECH, Korea (Nov 2022)
6. "Single molecule microscopy for tissues and intact small animals," Seminar, Department of Biomedical Science and Engineering, GIST, Korea (Apr 2022)
7. "Recent advances in fluorescence microscopy," Seminar, Electronics and Telecommunications Research Institute (ETRI), Korea (Feb 2022)
8. "Super-resolution fluorescence microscopy for biology," Colloquium (online), School of Electrical Engineering and Computer Science, GIST, Korea (Oct 2021)
9. "Super-resolution fluorescence microscopy for biology," Invited Lecture, Department of Anatomy and Cell Biology,

Seoul National University College of Medicine, Seoul, Korea (Aug 2021)

10. "Single molecule localization microscopy for tissue samples," The Korean Society of Microscopy (online conference), Korea (Jun 2021)
11. "Super-resolution deep-tissue investigation through single molecule imaging," The Korean Society of Medical & Biological Engineering (online conference), Korea (May 2021)
12. "Oblique STORM for thick biological samples," Analytical Chemistry Symposium, Korean Chemical Society General Meeting, Suwon, Korea (Apr 2021)
13. "Single molecule fluorescence imaging for nanoscale biological measurements," Seminar, Department of Mechanical Engineering, Seoul National University, Seoul, Korea (Apr 2021)
14. "Single molecule lightsheet microscopy for thick samples," The 1st Conference of Division of Biological Physics in the Korean Physical Society (online conference), Korea (Feb 2021)
15. "Superresolution imaging by single molecule localization," OSK Advanced Biophotonics Conference 2020, Cheonan, Korea (Nov 2020)
16. "Single molecule microscopy beyond cell level," Optical Society of Korea Summer Annual Meeting, Busan, Korea (Jul 2020)
17. "Development of optical imaging systems for nanoscale biological measurements," Seminar, Department of Mechanical Engineering, Ajou University, Suwon, Korea (Apr 2020)
18. "Optical microscopic imaging for studying biology and photonic devices," Seminar, Dept. of Information and Communication Engineering, Daegu Gyeongbuk Institute of Science and Technology, Daegu, Korea (Sep 2019)
19. "Super-resolution optical microscopy for biology," Colloquium, Department of Physics, Kyungpook National University, Daegu, Korea (Sep 2019)

## CONFERENCE PRESENTATIONS (SELECTED)

*** PRESENTER**

1. M. Lee*, J. Park and **J. Kim**, "Line spectral reflectometry for high-speed, large-area thickness measurement," CLEO PacificRim (Th1E-3), Incheon, Korea (2024)
2. Y. Lee*, Y. Lee, M. Lee, D. Koo, D. Kim, H. Kim, K. Lee and **J. Kim**, "Imaging buffer for STORM with standard immersion oil refractive index," CLEO PacificRim (Th1L-1), Incheon, Korea (2024)
3. M. Lee*, D. Koo and **J. Kim**, "Quick and simple calibration for phase response and optical flatness in phase-only SLMs," SPIE Photonics West (BiOS, 12851-24), San Francisco, CA, USA (2024)
4. D. Koo*, M. Lee, Y. Lee and **J. Kim**, "Enhanced obSTORM imaging through cubic spline PSF modeling," SPIE Photonics West (BiOS, 12849-30, poster), San Francisco, CA, USA (2024)
5. Y. Lee*, M. Lee, Y. Lee, D. Kim, H. Kim, D. Koo, K. Lee and **J. Kim**, "STORM imaging buffer at immersion oil refractive index," SPIE Photonics West (BiOS, 12849-5), San Francisco, CA, USA (2024)
6. H.S. Yang*, Y. Lee, S. Choi, M. Kim, D. Koo, M. Lee and **J. Kim**, "Super Resolution Microscopy in Retina: Enhancing Müller Cell Imaging," The 130th Annual Meeting of the Korean Ophthalmological Society, Seoul, Korea (2023)
7. K.M. Moon*, J. Jeong, J. Kim, J. Kang and **J. Kim**, "Automatic classification and decision supporting system for usual interstitial pneumonia in chest computed tomography using convolutional neural network," KATRD International Conference, Seoul, Korea (2023)
8. **J. Kim***, M. Wojcik, Y. Wang, K. Xu and X. Zhang, "Oblique lightsheet STORM for tissue samples," SPIE Photonics West (BiOS, *won PicoQuant Young Investigator Award*), San Francisco, CA, USA (2019)
9. **J. Kim***, M. Wojcik, Y. Wang, K. Xu and X. Zhang, "Oblique-Sectional Single-Molecule Microscopy," IEEE Photonics Conference, Reston, VA, USA (2018)

10. N. Shitrit*, **J. Kim**, D.S. Barth, H. Ramezani, Y. Wang and X. Zhang, "Asymmetric Light Transport at Nonlinear Metasurfaces," Conference on Lasers and Electro-Optics (CLEO), FTh1D.5, San Jose, CA, USA (2018)
11. S. Yang*, W. Bao, X. Liu, **J. Kim**, R. Zhao, Y. Wang and X. Zhang, "Accelerating Emission dynamics in Perovskites Plasmonic Nanolasers," CLEO, SM4I.1, San Jose, CA, USA (2018)
12. **J. Kim***, M. Wojcik, Y. Wang, K. Xu and X. Zhang, "Oblique single-molecule nanoscopy for thick biological samples," CLEO, JTh5C.7 (*prestigious postdeadline accepted presentation*), San Jose, CA, USA (2018)
13. Q. Li*, Y. Xia, **J. Kim**, W. Bao, Y. Wang and X. Zhang, "Electrical control of single photon emitter in layered hexagonal boron nitride," APS (American Physical Society) March Meeting, Los Angeles, CA, USA (2018)
14. P.K. Jha*, N. Shitrit, **J. Kim**, X. Ren, Y. Wang and X. Zhang, "Metasurface Route to Quantum Photonics," SPIE Optics and Photonics, San Diego, CA, USA (2017)
15. N. Shitrit*, P. K. Jha, J. Kim, X. Ren, Y. Wang and Xiang Zhang, "Metasurface-enabled on-chip quantum entanglement," CLEO, FTu3G.2, San Jose, CA, USA (2017)
16. Z.J. Wong*, Y.L. Xu, **J. Kim**, K. O'Brien, Y. Wang, L. Feng and X. Zhang, "PT-Symmetric Laser and Anti-Laser," Frontiers in Optics, FF2B.4, Rochester, NY, USA (2016)
17. P.K. Jha*, M. Mrejen, **J. Kim**, C. Wu, Y. Wang, Y.V. Rostovtsev and X. Zhang, "Trapped ultracold atoms make perfect quantum metamaterials," Frontiers in Optics, FTu1G, Rochester, NY, USA (2016)
18. P.K. Jha*, M. Mrejen, **J. Kim**, C. Wu, Y. Wang, Y.V. Rostovtsev and X. Zhang, "Topologically reconfigurable atomic lattice quantum metamaterial," CLEO, FF1D.6, San Jose, CA, USA (2016)
19. **J. Kim***, T. Li, Y. Wang and X. Zhang, "Resolving power in direct oblique plane imaging," SPIE Photonics West (BiOS), San Francisco, CA, USA (2015)
20. T. Li*, S. Ota, **J. Kim**, Z.J. Wong, Y. Wang, X. Yin and X. Zhang, "Wide-field axial plane optical microscopy," Frontiers in Optics, FW4G.1, Tucson, AZ, USA (2014)
21. **J. Kim***, T. Li, Y. Wang and X. Zhang, "Optical resolution in wide-field oblique plane microscopy," OSA (Optical Society of America) Classical Optics Congress (*postdeadline accepted presentation*), Hawaii, USA (2014)
22. M. Mrejen*, P.K. Jha, **J. Kim**, C. Wu, Y. Wang, X. Yun and X. Zhang, "Interacting dark resonances with metallic nano-antennas," CLEO, FM2K.3, San Jose, CA, USA (2014)
23. **J. Kim***, D. Kang, D. Gweon, Y. Sohn and H. Cho, "Design of real-time confocal microscopy using spectral encoding technique and slit aperture," Optomechatronic Technologies, Sapporo, Japan (2005)

## PROFESSIONAL SERVICE AND MEMBERSHIP

- Journal Referee:

| | | |
|---|---|---|
| Light: Science & Applications | Angewandte Chemie | Applied Physics Review |
| ACS Photonics | Nanophotonics | Physical Review Applied |
| Applied Physics Letters | APL Photonics | Optics Letters |
| Biomedical Optics Express | Optics Express | Applied Optics |
| Journal of the Opt. Soc. of Am. A | Microsystem Technologies | Review of Scientific Instruments |
| Frontiers in Physics | Frontiers in Neuroscience | Scientific Reports |

- Membership: Optical Society of Korea (OSK)

## TECHNICAL AND SCIENTIFIC SKILLS

- Optics: system design and analysis (including tools: ZEMAX, Code V, LightTools), home-built microscope construction (conventional fluorescence, TIRF, confocal, STORM, lightsheet), various measurement setups (*k*-space, pump-probe, lifetime, spectroscopy, interferometry, holography)
- Micro/nano fabrication (member of Berkeley Marvell Nanofabrication Laboratory, 2011-2019): e-beam lithography,

photolithography, focused ion beam (FIB), dry/wet etching, sputtering, evaporation, coating, dicing, SEM, AFM

- Biology: cell culture, immunostaining (IF and IHC)
- CAD/CAE: Solid Edge, SolidWorks, IDEAS, Pro/Engineer, ANSYS
- Machine tool: lathe, milling machine, drill press
- Numerical calculation and optimization: MATLAB, Fortran, C/C++
- Other software language or tools: Visual Studio (MFC), LabVIEW, MATLAB GUIDE, HTML, Adobe Photoshop and Illustrator, ImageJ, LaTeX