Jun Kyu Choe

Curriculum Vitae

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77 Massachusetts Avenue
Cambridge, MA, United States

RESEARCH FOCUSES

- Soft Materials for Human-Machine Interactions
- Programmable Matter and Mechanical Metamaterials
- Perceptive and Adaptive Soft Robots
- Functional Nanomaterials
- Finite Element Analysis
- Machine Learning

EDUCATION

M.S. -Ph.D.

Material Science and Engineering 2018/03 - 2024/02
Ulsan National Institute of Science and Technology (UNIST), Ulsan, Republic of Korea
Thesis: "Design and Simulation of Programmable Soft Robotic Devices for Adaptive Soft Robots"
Advisor: Prof. Jiyun Kim (Material Intelligence Lab)
*With mandatory military service as a government-selected technical researcher

B.S.

Material Science and Engineering 2013/03 - 2018/02
Ulsan National Institute of Science and Technology (UNIST), Ulsan, Republic of Korea

HONORS AND AWARDS

Postdoctoral Fellowship (Nurturing Next-generation Researchers)* 2024 - 2025
National Research Foundation of Korea (~$41,000)
* The fellowship is presented to 210 doctoral graduates, with 43 chosen from the Interdisciplinary research section.

UNIST Best Research Award* 2024
UNIST (~$1,000)
* The award is given to 4 distinguished doctoral graduates. 1st place award from the College of Engineering.

Global Ph.D Fellowship* 2019 - 2024
National Research Foundation of Korea (~$150,000)
* This is the most prestigious fellowship in Korea with block funding of 86 recipients (for 5 years) from general fields including humanities & social science, natural science, and engineering.

Korean Government Scholarship 2018 - 2024
Korean Scholarship Foundation (~$39,000)

National Science & Technology Scholarship 2013 - 2018
Korean Scholarship Foundation (~$19,000)

RESEARCH EXPERIENCE

Tangible Media Group, Media Lab, MIT 2024.09 – Present
Postdoctoral Fellow
Advisor: Hiroshi Ishii

- My research focuses on designing, modeling, simulating, and fabricating soft machines and robots to produce more intelligent and adaptive material-embedded systems.

Material Intelligence Lab, UNIST 2024.02 – 2024.09
Postdoctoral Researcher
Advisor: Jiyun Kim

Material Intelligence Lab, UNIST 2018 – 2024.02
Graduate Research Assistant
Advisor: Jiyun Kim

Wearable Lab, Yonsei University (previously UNIST) 2017 – 2018
Undergraduate Research Assistant
Advisor: Jang-Ung Park

- Developed flexible, transparent circuits using electrospinning and photolithography.
- Developed heat-responsive soft actuators.

Robust Multifunctional Materials Lab, UNIST 2016 - 2017
Undergraduate Research Assistant
Advisor: Ju-Young Kim

- Characterized mechanical properties of metal alloys using universal testing machine and nanoindenter.

PUBLICATIONS

Journal Publications

† indicates equally contributing authors.
* indicates the corresponding author(s)

1. **J. K. Choe**†, S. Kim†, A. Lee†, C. Choi, J. -H. Cho, W. Jo, M. H. Song*, C. Cha*, J. Kim*, "Flexible, Biodegradable, and Wireless Magnetoelectric Paper for Simple in situ Personalization of Bioelectric Implants", ***Advanced Materials***, 2311154 (2024)
   » This paper was selected for the inside back cover of *Advanced Materials*

2. H. Song†, Y. Jang†, J. P. Lee, **J. K. Choe**, M. Yun, Y. -K. Baek, J. Kim*, "Highly Compressible 3D-printed Soft Magnetoelastic Sensor for Human-machine Interfaces", ***ACS Applied Materials & Interfaces***, 15, 59776 (2023)

3. **J. K. Choe**, J. Yi, H. Jang, H. Won, S. Lee, H. Lee, Y. Jang, H. Song, J. Kim*, "Digital Mechanical Metamaterial: Encoding Mechanical Information with Graphical Stiffness Pattern for Adaptive Soft Machines", ***Advanced Materials***, 2304302 (2023)
   » This paper was selected for the back cover of *Advanced Materials*

4. **J. K. Choe**†, J. Kim†, H. Song, J. Bae*, J. Kim*, "A Soft, Self-Sensing Tensile Valve for Perceptive Soft Robots", ***Nature Communications***, 14, 3942 (2023)

5. S. W. Song†, S. Lee†, **J. K. Choe**, A. Lee, K. Shin, J. Kang, G. Kim, H. Yeom, Y. Choi, S. Kwon*, J. Kim*, "Pen-drawn Marangoni swimmer", ***Nature Communications***, 14, 3597 (2023)

6. S. W. Song†, S. Lee†, **J. K. Choe**, N. Kim, J. Kang, A. Lee, Y. Choi, A. Choi, Y. Jeong, J. -Y. Kim, S. Kwon*, J. Kim*, "Direct 2D-to-3D transformation of pen drawings", ***Science Advances***, 7, 13 (2021)

7. H. Lee, Y. Jang, **J. K. Choe**, S. Lee, H. Song, J. P. Lee, N. Lone, J. Kim*, "3D Printed Programmable Tensegrity for Soft Robotics", ***Science Robotics***, 5, 45, (2020)

8. H. Song, H. Lee, J. Lee, **J. K. Choe,** S. Lee, J. Yi, S. Park, J. -W. Yoo, M. Kwon*, J. Kim*, "Reprogrammable Ferromagnetic Domains for Reconfigurable Soft Magnetic Actuators", ***Nano Letters***, 20, 7, 5185–5192 (2020)

PATENTS

1. J. Bae*, J. Kim*, J. Kim, **J. K. Choe**, "Soft Valve", Korean Domestic, *Registration No. 10-2621411* (2024)
2. J. Bae*, J. Kim*, J. Kim, **J. K. Choe**, "An Electronic-free Assistive Exo-suit", Korean Domestic, *Registration No. 10-2741719* (2024)
3. J. Bae*, J. Kim*, J. Kim, **J. K. Choe**, "An Electronic-free Pneumatic Gripper", Korean Domestic, Application No. 10-2022-0149811 (2022)
4. J.Kim*, **J. K. Choe**, "Biomimetic Nanofiber Composite and Wireless-Electrical Stimulating Device for Neuroregenerative Therapy", Korean Domestic, *Registration No. 10-2430615* (2021)
5. J. Kim*, H. Lee, **J. K. Choe**, H. Song, S. Lee, "Tensegrity Structure Composite Material and the Manufacturing Method for the Same", Korean Domestic, *Registration No. 10-2297347* (2021)
6. J. Kim*, M. Kwon*, J. -W Yoo*, H. Song, H. Lee, J. Lee, **J. K. Choe**, S. Lee, J. Yi, S, Park, "Soft Magnetic Composite and Preparation Method Thereof", Korean Domestic, *Registration No. 10-2240698* (2021)
7. J. Kim*, J. Yi, **J. K. Choe**, Y. Jang, H. Song, "Shape Variable Composite and Manufacturing Method for the Same", Korean Domestic, *Registration No. 10-2142350* (2020)

CONFERENCE PRESENTATIONS

1. **J. K. Choe**, J. Kim, H. Song, J. Bae*, J. Kim*, "A Soft, Self-Sensing Tensile Valve for Analog and Programmable Control of Soft Pneumatic Actuators" in Materials Research Society (MRS), fall (2023)

2. **J. K. Choe**, J. Yi, H. Won, S. Lee, H. Song, J. Kim*, "A Reprogrammable Pixelated Metamaterial with Rich Mechanical and Shape-Shifting Reconfigurability" in Materials Research Society (MRS), fall (2022)
3. J. Kim, **J. K. Choe**, H. Song, J. Kim*, J. Bae*, "A Soft Tensile Valve for Analog and Self-sensing Control of Soft Actuators" in Materials Research Society (MRS), fall (2022)
4. **J. K. Choe**, J. Yi, H. Lee, H. Won, Y. Jang, H. Song, J. Kim*, "A Pixelated Mechanical Metamaterial with Widely Tunable and Reprogrammable Mechanical Properties" in Electronic Materials and Nanotechnology for Green Environment (ENGE), fall (2022)
5. **J. K. Choe**, J. Kim, H. Song, J. Bae*, J. Kim*, "A Programmable Soft Tensile Valve for Analog Control of Soft Actuators" in Materials Research Society (MRS), spring (2022)
6. **J. K. Choe**, A. Y. Lee, S. Kim, J. Cho, J. Wook, C. Cha, M. H. Song, J. Kim*, "Harnessing Magnetoelectricity for the Wireless, Scalable Therapy of Peripheral Nerve Injury" in The Korean Sensor Society, Domestic Conference, spring (2022)
7. **J. K. Choe**, A. Y. Lee, M. Song, J. Kim*, "Harnessing Magnetoelectric Composite for a Biomimetic, Wireless, and Highly Scalable Bioelectronic Platform for the Next Generation of Peripheral Neuroregenerative Therapy" in International Conference on Advanced Electromaterials (ICAE), fall (2021)
8. H. Lee, Y. Jang, **J. K. Choe**, S. Lee, H. Song, J. P. Lee, N. Lone, J. Kim*, "Synergistic Integration of Smart Materials into 3D Printed Programmable Tensegrity" in International Conference on Advanced Electromaterials (ICAE), fall (2021)
9. H. Song, H. Lee, **J. K. Choe**, S. Lee, J. Kim*, "Hierarchically Structured Reprogrammable Magnetic Composite for Soft Robots" in International Conference on Advanced Electromaterials (ICAE), fall (2021)
10. H. Lee, Y. Jang, **J. K. Choe**, S. Lee, H. Song, J. P. Lee, N. Lone, J. Kim*, "Synergistic Integration of Smart Materials into 3D Printed Programmable Tensegrity" in Materials Research Society (MRS), spring (2021)
11. H. Song, H. Lee, J. Lee, **J. K. Choe,** S. Lee, J. Yi, S. Park, J. Yoo, M. Kwon*, J. Kim*, "Reconfigurable Soft Magnetic Actuators with Reprogrammable Magnetization Pattern" in Materials Research Society (MRS), spring (2021)
12. H. Song, H. Lee, J. Lee, **J. K. Choe**, S. Lee, J. Yi, S. Park, J. -W. Yoo, M. S. Kwon*, J. Kim*, " Reprogrammable Ferromagnetic Domains for Reconfigurable Soft Magnetic Actuators" in Micro-Total Analysis Systems (Micro-TAS), (2020)
13. H. Song, H. Lee, **J. K. Choe,** J. Kim* "Reprogrammable Magnetic Soft Actuators using Thermal Phase Transition" in Nano Korea, (2019)
14. S. W. Song, S. Lee, **J. K. Choe**, J. Kang, S. Kwon*, J. Kim*, "New 4D Printing using Dry-Erase Marker" in Micro-Total Analysis Systems (Micro-TAS), (2019)
15. **J. K. Choe**, J. Kim*, "Biomimetic Nanoscale Wireless Electrical Stimulation Platform for the Next-Generation Peripheral Nerve Regeneration Therapy" in Society of Global Ph.D. Fellows (SGPF), Domestic Conference, fall (2019)
16. H. Lee, J. Yi, **J. K. Choe**, H. Song, J. Kim*, "Multimodal control of magnetic particles for programmable collective rotation" in Materials Research Society (MRS), fall (2018)

MEDIA COVERAGE

1. The paper "Flexible, biodegradable and wireless magnetoelectric paper for simple in situ personalization of bioelectric implants" was covered in [Phys.org], [Newatlas], [Nanowerk]

2. The paper “Digital Mechanical Metamaterial: Encoding Mechanical Information with Graphical Stiffness Pattern for Adaptive Soft Machines” was covered in [Nanowerk], [EurekaAlert,AAAS]. [TechXplore], [Interesting Engineering]
3. The paper “A Soft, Self-Sensing Tensile Valve for Perceptive Soft Robots” was covered in [TechXplore], [Community from Springer Nature]
4. The paper “Pen-drawn Marangoni swimmer” was covered in [Community from Springer Nature]
5. The paper “Direct 2D-to-3D transformation of pen drawings” was covered in [Science], [Nature Reviews Chemistry], [JTBC news room].
6. The paper “3D Printed Programmable Tensegrity for Soft Robotics” was covered in [3D Printing Industry], [FacFox], [TechXplore]
7. The paper “Reprogrammable Ferromagnetic Domains for Reconfigurable Soft Magnetic Actuators” was covered in [JTBC news room]

TEACHING EXPERIENCE

Teaching Assistant, UNIST

- “Introduction to material science and engineering”, Fall 2018.

Mentoring, UNIST MI Lab

- Mentored 3 junior researchers and taught fabrication details, 3D modeling, 3D printing, FEA, etc.

Invited Seminar, UNIST College of Engineering, 2024

- Gave seminar to freshman researchers on “how to conduct and write good research papers.”

SKILLS

- Finite Element Analysis (ABAQUS; magnetic actuation, 3D transformation, fluid-structure interactions, computational fluid dynamics, multi-material structure, quasi-static, dynamic impact)
- Programming (Python, MATLAB, Fortran, JAVA, HTML)
- 3D Modeling (Rhino7)
- 3D Printing (FDM, SLA, SLS, PolyJet)
- Software tools: Plotting (Origin), image processing (imageJ) Rendering (Keyshot) Video producing (Premiere Pro) citation managing (Endnote)
- Pneumatic system
- Machine Learning (CNN, RL)
- Electrospinning
- Cell culturing (PC12 cells)
- Fabrication Tools (molding process, laser cutter, heat sealer, tip sonicator, spin coater, vacuum oven, etc)
- Analysis Tools (SEM, TEM, XRD, universal testing machine, micro-CT, optical microscope, confocal microscope, contact angle meter, custom-built test bench etc.)