Jun Kyu Choe

Curriculum Vitae

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50, UNIST-gil
Ulsan, 44919, Republic of Korea

RESEARCH FOCUSES

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

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

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

Material Intelligence Lab, UNIST 2024.02 – Present

Postdoctoral Researcher
Advisor: Jiyun Kim

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

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

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)
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, Application No. 10-2022-0149812 (2022)
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 "Digital Mechanical Metamaterial: Encoding Mechanical Information with Graphical Stiffness Pattern for Adaptive Soft Machines was covered in [Nanowerk], [EurekaAlert,AAAS]. [TechXplore], [Interesting Engineering]
2. The paper "A Soft, Self-Sensing Tensile Valve for Perceptive Soft Robots" was covered in [TechXplore], [Community from Springer Nature]
3. The paper "Pen-drawn Marangoni swimmer" was covered in [Community from Springer Nature]
4. The paper "Direct 2D-to-3D transformation of pen drawings" was covered in [Science], [Nature Reviews Chemistry], [JTBC news room].
5. The paper "3D Printed Programmable Tensegrity for Soft Robotics" was covered in [3D Printing Industry], [FacFox], [TechXplore]
6. 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.)