

# Jun Kyu Choe

## Curriculum Vitae

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Daejeon 34141, Republic of Korea

### RESEARCH FOCUSES

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- Soft Robots/ Human-Robot Interactions
- Programmable Matter/ Mechanical Metamaterials
- Finite Element Analysis
- Physics Informed Neural Network/ LLM/ Physical AI

### EDUCATION

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#### 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

\*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

### RESEARCH EXPERIENCE

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#### InnoCORE PRISM-AI Center, KAIST

2025.09 – Present

##### Postdoctoral Fellow

Advisor: Seunghwa Ryu

- Advancing physical AI by integrating Large Language Models (LLMs) with real-time programmable matter for adaptive human-material interactions

#### Tangible Media Group, Media Lab, MIT

2024.09 – 2025.09

##### Postdoctoral Fellow

Advisor: Hiroshi Ishii

- Focused 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

### HONORS AND AWARDS

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#### 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. 1<sup>st</sup> 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)

## PUBLICATIONS

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### *Peer-Reviewed Papers*

† indicates equally contributing authors.

\* indicates the corresponding author(s)

1. (*Submitted*) **J. K. Choe**†, J. Kim†, J. Bae\*, J. Kim\*, “3D-Printed Soft Self-Feedback Regulator for Pressure Control, Memory, and Computation in Soft Robots”
2. (*Under Preparation*) **J. K. Choe**, W. Babatain, S. Ryu\*, H. Ishii\*, “A Bioinspired Fully Soft Orientation Sensor for Graviperceptive Soft Robots”
3. (*Under Preparation*) **J. K. Choe**, M. Kim, S. Ryu\*, J. Kim\*, “On-Demand Projection of Mechanical Properties through AI-Driven Programming of Digital Mechanical Metamaterials”
4. H. J. Youn, **J. K. Choe**, S. Y. Ahn, M. Tania, S. X Sara, H. Ishii\*, “PixBric: Precision Morphological Control of Pre-Stretched Fabrics Through Tessellated Primitive Geometries” [\*TEI '26: Proceedings of the Twentieth International Conference on Tangible, Embedded, and Embodied Interaction\*](#), 20, 1 – 15 (2026)
5. **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 Magnetolectric 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*
6. 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)

7. **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*
8. **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)
9. 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)
10. 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)
11. 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)
12. 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

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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

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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**

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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

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### **Mentoring**, MIT Tangible Media Group

- Mentored junior researchers and taught fabrication details, Programmable materials, etc.

### **Teaching Assistant**, UNIST

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

### **Mentoring**, UNIST MI Lab

- Mentored 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.”