

# Yoonho Kim

Phone: +1-617-852-3504 / +82-10-4714-5174  
 E-mail: [yooho@mit.edu](mailto:yooho@mit.edu) / Web: [yooho-kim.com](http://yooho-kim.com)  
 77 Massachusetts Avenue (MIT)  
 1-321 (Office) / 1-025 (Lab)  
 Cambridge, MA 02139, USA



## EDUCATION

|   |                |                       |
|---|----------------|-----------------------|
| <b>Massachusetts Institute of Technology (MIT)</b><br><i>Doctor of Philosophy, Mechanical Engineering</i><br>Thesis: Magnetic Soft Continuum Robots for Telerobotic Stroke Intervention [ <a href="#">PDF</a> ]                   | Cambridge, USA | Jun. 2018 – May 2022  |
| <b>Massachusetts Institute of Technology (MIT)</b><br><i>Master of Science, Mechanical Engineering</i><br>Thesis: Printing Ferromagnetic Domains in Soft Materials: Mechanism, Modeling, and Applications [ <a href="#">PDF</a> ] | Cambridge, USA | Sep. 2016 – Jun. 2018 |
| <b>Massachusetts Institute of Technology (MIT)</b><br><i>Harvard-MIT Program in Health Sciences and Technology</i>  | Cambridge, USA | Sep. 2016 – Jun. 2018 |
| <b>Seoul National University (SNU)</b><br><i>Bachelor of Science, Mechanical and Aerospace Engineering</i><br><i>Summa cum laude</i>  | Seoul, Korea   | Mar. 2008 – Aug. 2013 |

## ACADEMIC HONORS & AWARDS

|   |               |  |
|---|---------------|--|
| <b>MIT Technology Review's 35 Innovators Under 35</b><br><i>Under "AI and Robots" Category</i> [ <a href="#">Link</a> ] [ <a href="#">Full List</a> ]<br>• Teleoperated Robotic System for Treating Stroke and Aneurysms.         | June 2022     | MIT Technology Review  |
| <b>Luis de Florez Award</b><br><i>Graduate Design First Place</i> [ <a href="#">Link</a> ]<br>• Robo-thread – Advancing Neurosurgery for Stroke Patients.   | May 2021      | MIT Mechanical Engineering                                       |
| <b>Collegiate Inventors Competition</b><br><i>Graduate Finalist</i> [ <a href="#">Link</a> ]<br>• Robo-thread – Advancing Neurosurgery for Stroke Patients.   | August 2020   | National Inventors Hall of Fame (NIHF)                           |
| <b>MRS Graduate Student Award</b><br><i>Graduate Student Gold Award</i> [ <a href="#">Link</a> ]<br>• Ferromagnetic Soft Continuum Robots – Towards Next-generation Medical Soft Robots.  | December 2019 | Materials Research Society (MRS)                                 |
| <b>PM&amp;R Journal Best Paper Award</b><br><i>Original Research - International</i> [ <a href="#">Link</a> ]<br>• Effects of Cervical Extension on the Deformation of Intervertebral Disc and the Migration of Nucleus Pulposus. | November 2017 | American Academy of Physical Medicine and Rehabilitation (AAPMR) |

## SCHOLARSHIP / FELLOWSHIP

|   |                                  |
|---|----------------------------------|
| • 2020-2021 MathWorks Fellowship, MathWorks Inc., USA               | \$70,000/year from 2020 to 2021. |
| • Ph.D. Scholarship, ILJU Academy and Culture Foundation, Korea     | \$30,000/year from 2018 to 2022. |
| • Ph.D. Fellowship, Harvard-MIT Health Sciences and Technology, USA | \$75,398/year from 2016 to 2017. |
| • Seoul National University Scholarship, Korea                      | \$6,000/year from 2012 to 2012.  |
| • Korean National Scholarship for Science and Engineering, Korea    | \$6,000/year from 2008 to 2011.  |

## PATENTS

---

- **Y. Kim** & X. Zhao, "Magnetically Steerable Continuum Robotic Guidewires for Neurovascular Applications," U.S. Patent No.: US 11,103,324 (2021) / International Pub. No.: WO 2021/041099 (2021). [[Link](#)]
- **Y. Kim**, H. Yuk, X. Zhao, "Programmable Soft Materials Containing Ferromagnetic Domains and Methods of Making," U.S. Patent Pub. No.: US 2020/0223099 (2020) / International Pub. No.: WO 2019/195417 (2019). [[Link](#)]
- **Y. Kim**, S. -I. Kim, S. Park, C. Yoon, S. -H. Ahn, S. G. Chung, "Pillow for Patients with Cervical Disc Herniation," Republic of Korea Patent, 1014439710000.
- **Y. Kim**, J. C. Baek, S. M. Nam, S. U. Lee, S. S. Lee, J. H. Ko, K. A. Lee, D. Rhim, K. -J. Cho, "Detachable Wheelchair Umbrella," Republic of Korea Patent, 1014274000000.

## PUBLICATIONS

---

### Journal Articles [[Google Scholar](#)]

- [1] **Yoonho Kim**, Emily Genevriere, Pablo Harker, Jaehun Choe, Marcin Balicki, Robert W. Regenhardt, Justin E. Vranic, Adam A. Dmytriw, Aman B. Patel, Xuanhe Zhao<sup>#</sup>, "Telerobotic neurovascular interventions with magnetic manipulation," *Science Robotics*, **7**, eabg9907 (2022). [[Link](#)] [[PDF](#)] [[Summary Video](#)] [[MIT News](#)] [[Media](#)]
- [2] **Yoonho Kim**<sup>#</sup>, Emily Genevriere, Pablo Harker, Jaehun Choe, Marcin Balicki, Aman B. Patel, Xuanhe Zhao, "Telerobotically Controlled Magnetic Soft Continuum Guidewire for Neurovascular Interventions," *2022 IEEE International Conference on Robotics and Automation (ICRA)*. [[Manuscript PDF](#)]
- [3] **Yoonho Kim**<sup>#</sup> & Xuanhe Zhao<sup>#</sup>, "Magnetic Soft Materials and Robots," *Chemical Reviews*, **122** (5), 5317–5364 (2022). [[Link](#)] [[PDF](#)] [[LaTeX version](#)] <sup>#</sup>*Co-corresponding-authored*
- [4] Philipp Rothmund, **Yoonho Kim**, Ronald H. Heisser, Xuanhe Zhao, Robert F. Shepherd, Christoph Keplinger<sup>#</sup>, "Shaping the future of robotics through materials innovation," *Nature Materials*, **20**, 1582–1587 (2021). [[Link](#)] [[PDF](#)]
- [5] Xinyue Liu, Yueying Yang, Maria Eugenia Inda, Shaoting Lin, Jingjing Wu, **Yoonho Kim**, Xiaoyu Chen, Dacheng Ma, Timothy K. Lu<sup>#</sup>, Xuanhe Zhao<sup>#</sup> "Magnetic Living Hydrogels for Intestinal Localization, Retention, and Diagnosis," *Advanced Functional Materials*, **31**, 2010918 (2021). [[Link](#)] [[PDF](#)]
- [6] Liu Wang, **Yoonho Kim**<sup>\*</sup> Chuan Fei Gao, Xuanhe Zhao<sup>#</sup>, "Hard-magnetic Elastica," *Journal of the Mechanics and Physics of Solids*, **142**, 104045 (2020). [[Link](#)] [[PDF](#)] <sup>\*</sup>*Co-first-authored*
- [7] Xuanhe Zhao<sup>#</sup> & **Yoonho Kim**, "Soft microbots controlled by nanomagnets," *Nature*, **575** (7781), 58-59 (2019). [[Link](#)] [[PDF](#)]
- [8] **Yoonho Kim**, German A. Parada, Shengduo Liu, Xuanhe Zhao<sup>#</sup>, "Ferromagnetic Soft Continuum Robots," *Science Robotics*, **4**, eaax7329 (2019). [[Link](#)] [[PDF](#)] [[Video](#)] [[MIT Spotlight](#)]  
*Media Coverage: MIT News, Nature Highlights, NBC News, The Times, Discover, New Scientist, The Engineer, The Telegraph, Physics World, RT America, Futurism, Medgadget, Vice, Interesting Engineering, Le Monde etc. [[See more](#)]*
- [9] Ruike Zhao, **Yoonho Kim**<sup>\*</sup>, Shawn A. Chester, Pradeep Sharma, Xuanhe Zhao<sup>#</sup>, "Mechanics of Hard-magnetic Soft Materials," *Journal of the Mechanics and Physics of Solids*, **124**, 244-263 (2019). [[Link](#)] [[PDF](#)]  
<sup>\*</sup>*Co-first-authored*
- [10] **Yoonho Kim**, Hyunwoo Yuk, Ruike Zhao, Shawn A. Chester, Xuanhe Zhao<sup>#</sup>, "Printing Ferromagnetic Domains for Untethered Fast-transforming Soft Materials," *Nature*, **558**, 274-279 (2018). [[Link](#)] [[PDF](#)] [[Cover](#)] [[Video](#)] [[Behind the Paper](#)]  
*Media Coverage: MIT News, Nature News, BBC, Forbes, NBC News, National Geographic, Marshable, Quartz, Tech Xplore etc. [[See more](#)]*
- [11] **Yoon-Ho Kim**, Sung-In Kim, Seongjun Park, Sung-Hwan Hong, and Sun G. Chung<sup>#</sup>, "Effects of Cervical Extension on the Deformation of Intervertebral Disc and the Migration of Nucleus Pulposus," *PM&R*, **9**, 329-338 (2017). [[Link](#)] [[PDF](#)]  
*Received the 2017 PM&R Journal Best Paper Award for Original Research – International [[Link](#)]*
- [12] **Yoon-Ho Kim**, Yong-Jai Park, HyunKi In, Chang Wook Jeong, and Kyu-Jin Cho<sup>#</sup>, "Design Concept of Hybrid Instrument for Laparoscopic Surgery and Its Verification Using Scale Model Test," *IEEE/ASME Transactions on Mechatronics*, **21**, 142-153 (2016). [[Link](#)] [[PDF](#)]

## CONFERENCE PRESENTATIONS

---

- [1] **Yoonho Kim**, Xuanhe Zhao, “Magnetic soft materials and robots,” **11th European Solid Mechanics Conference (ESMC 2022)**, Galway, Ireland, Jul. 2022.
- [2] **Yoonho Kim**, Xuanhe Zhao, “Magnetic Soft Robots Enabling New Biomedical Applications,” **2022 Materials Research Society (MRS) Spring Meeting**, Honolulu, Hawaii, USA, May 2022.
- [3] **Yoonho Kim**, Emily Genevriere, Pablo Harker, Jaehun Choe, Marcin Balicki, Aman B. Patel, Xuanhe Zhao, “Telerobotically Controlled Magnetic Soft Continuum Guidewire for Neurovascular Interventions,” **2022 IEEE International Conference on Robotics and Automation (ICRA)**, Philadelphia, Pennsylvania, USA, May 2022.
- [4] **Yoonho Kim**, Emily Genevriere, Pablo Harker, Marcin Balicki, Sang Uk Lee, Heather G. Bowman, Aman B. Patel, Xuanhe Zhao, “Telerobotic neurovascular interventions with magnetic manipulation,” **2022 International Stroke Conference (ISC)**, New Orleans Louisiana, USA, Feb. 2022. [[Link](#)]
- [5] **Yoonho Kim**, Xuanhe Zhao, “Ferromagnetic Soft Continuum Robots Towards Robotic Endovascular Neurosurgery,” **2020 Gordon Research Conference (GRC) on Robotics**, Ventura, California, USA, Jan. 2020.
- [6] **Yoonho Kim**, Xuanhe Zhao, “Ferromagnetic Soft Continuum Robots – Towards Next-generation Medical Soft Robots,” **2019 Materials Research Society (MRS) Fall Meeting**, Boston, Massachusetts, USA, Dec. 2019.
- [7] **Yoonho Kim**, “Ferromagnetic Soft Continuum Robots – Towards Next-generation Medical Soft Robots,” 2019 Hamlyn Symposium on Medical Robotics, London, UK, Jun. 2019.
- [8] **Yoonho Kim**, Hyunwoo Yuk, Ruike Zhao, Shawn A. Chester, Xuanhe Zhao, “Untethered Soft Machines and Robots by Printing Ferromagnetic Soft Materials,” **2019 American Physical Society (APS) March Meeting**, Boston, Massachusetts, USA, Mar. 2019. [[Link](#)]
- [9] **Yoonho Kim**, Hyunwoo Yuk, Ruike Zhao, Shawn A. Chester, Xuanhe Zhao, “Untethered Soft Machines and Robots by Printing Ferromagnetic Soft Materials,” **2018 American Society of Mechanical Engineering (ASME) International Mechanical Engineering Congress & Exposition (IMECE)**, Pittsburgh, Pennsylvania, USA, Nov. 2018.
- [10] **Yoonho Kim**, Hyunwoo Yuk, Ruike Zhao, Shawn A. Chester, Xuanhe Zhao, “Printing Ferromagnetic Domains for Untethered Fast-transforming Soft Materials,” **2018 Materials Research Society (MRS) Spring Meeting**, Phoenix, Arizona, USA, Apr. 2018.
- [11] **Yoonho Kim**, Hyunwoo Yuk, Ruike Zhao, Shawn A. Chester, Xuanhe Zhao, “Ferromagnetic 4D Printing of Programmable Soft Active Matter,” **2017 Materials Research Society (MRS) Fall Meeting**, Boston, Massachusetts, USA, Nov. 2017.
- [12] Sun. G. Chung, **Yoon-Ho Kim**, Seongjun Park, and Sung-In Kim, “Effects of Cervical Extension on the Deformation of Intervertebral Disc and the Migration of Nucleus Pulposus,” **2013 American Academy of Physical Medicine and Rehabilitation (AAPM&R) Annual Assembly**, Washington, DC, USA, Oct. 2013.
- [13] **Yoon-Ho Kim**, Yong-Jai. Park, Chang Wook Jeong, and Kyu-Jin Cho, “Torque Transmissibility Analysis of Tendon-gear Mechanism for Development of Mechatronic Instrument for Laparoscopic Surgery,” **2013 Annual Conference of Korea Society of Medical Robot (KSMR)**, Seoul, Korea, Oct. 2013.
- [14] **Yoon-Ho Kim**, Sung-In Kim, Seongjun Park, and Sun. G. Chung, “Effects of Cervical Extension on the Deformation of Intervertebral Disc and the Migration of Nucleus Pulposus,” **2013 Spring Conference of the Korean Association of Pain Medicine (Clinical Pain)**, Seoul, Korea, Mar. 2013.
- [15] **Yoon-Ho Kim**, Seongjun Park, Sung-In Kim, HyunTaek Lee, Chiyul Yoon, Sung-Hoon Ahn, and Sun G. Chung, “Development of a Variable Geometry Pillow Assisting Neck Extension Movement for Patients with Cervical Disc Herniation,” **34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)**, San Diego, California, USA, Aug. 2012.
- [16] **Yoonho Kim**, Yong-Jai Park, and Kyu-Jin Cho, “Kinematic and Force Analysis of Tendon-gear Transmission System for Minimally Invasive Surgical Instrument,” **45th Spring Conference of the Korean Society of Medical and Biological Engineering (KOSOMBE)**, Gwangju, Korea, May 2012.

## INVITED TALKS AND SEMINAR

---

- [1] **Yoonho Kim**, “Magnetic Soft Materials and Robots for Medical Applications,” Telerobotics and Control Laboratory, Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, Jan. 2022.

- [2] **Yoonho Kim**, “Magnetic Soft Materials and Robots for Medical Applications,” Bio and Neural Interfaces Laboratory, Department of Bio and Brain Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, Jan. 2022.
- [3] **Yoonho Kim**, “Magnetic Soft Materials and Robots for Medical Applications,” Wearable Electronics Laboratory, Department of Materials Science and Engineering, Yonsei University, Seoul, Korea, Dec. 2021.
- [4] **Yoonho Kim**, “Magnetic Soft Materials and Robots for Medical Applications,” 2021 Special Seminar, Department of Nano-Biomedical Engineering and Institute for Basic Science (IBS) Center for Nano-Medicine, Yonsei University, Seoul, Korea, Dec. 2021.
- [5] **Yoonho Kim**, “Magnetic Soft Materials and Robots for Medical Applications,” Mechanical Engineering Seminar, Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), Pohang, Korea, Dec. 2021.
- [6] **Yoonho Kim**, “Ferromagnetic Soft Continuum Robots – Towards Next-generation Medical Soft Robots,” SNU Mechanical Engineering Seminar, Department of Mechanical Engineering, Seoul National University, Seoul, Korea, Nov. 2019.
- [7] **Yoonho Kim**, “Ferromagnetic Soft Continuum Robots,” Hamlyn Symposium on Medical Robotics, London, United Kingdom, Jun. 2019.
- [8] **Yoonho Kim**, “Untethered Soft Machines and Robots by Printing Ferromagnetic Domains in Soft Materials,” SNU Smart Materials & Design Seminar, Department of Mechanical Engineering, Seoul National University, Seoul, Korea, Jun. 2018.
- [9] **Yoonho Kim**, “Printing Ferromagnetic Domains for Untethered Fast-transforming Soft Materials,” SNU Biorobotics Lab, Department of Mechanical Engineering, Seoul National University, Seoul, Korea, Mar. 2018.

## EXTRACURRICULAR ACTIVITIES

---

**MIT KGSAME** (KGSAME: Korean Graduate Student Association in Mechanical Engineering)

Jan. 2019 – Present

**Chair**

MIT

- Serving the Korean graduate student community in the Department of Mechanical Engineering at MIT.

**Bangladesh Medical Outreach Program**

Mar. 2014 – Aug. 2014

**Volunteer Member** [\[Link\]](#)

Asiafocus

- Assisted medical service for underserved populations in Moorong and Battiari villages in Chittagong, Bangladesh.
- Co-worked work with Alacrity for Poverty Alleviation in Bangladesh (APAB).

**Campus Tutoring Program**

Mar. 2012 – Jun. 2013

**Mechanical Engineering Tutor**

SNU College of Engineering

- Served as a tutor for foreign students from Bangladesh, Indonesia, Peru, and Nepal.
- Subjects taught: Solid Mechanics, Fluid Mechanics, and Engineering Mathematics 1.

**Nepal Solar Volunteering Program**

Mar. 2011 – Aug. 2011

**Undergraduate Team Leader** [\[Link\]](#)

Nepal Solar Volunteer Corps, SNU

- Construction of a 2-kW Solar Power Plant with lighting system in Lama Hotel, Nepal.
- Organized a Science Camp as an educational outreach program for children in Syapru Besi, Nepal.

## INDUSTRIAL EXPERIENCES (in replacement of military service)

---

**Project Engineer**

Geoje, Korea

Sep. 2013 – Jul. 2016

**Daewoo Shipbuilding and Marine Engineering Co., Ltd. (DSME)**

- Propulsion system design and integration of the hybrid propulsion systems for naval vessels.
- Main projects:
  - MARS (Military Afloat Reach Sustainability) of the United Kingdom Ministry of Defense (UKMOD) [\[Link\]](#)
  - LSV (Logistics and Support Vessel) of the Norwegian Defense Logistics Organization (NDLO) [\[Link\]](#)

## REFERENCES

---

- Xuanhe Zhao                      Professor, Department of Mechanical Engineering, MIT ([zhaox@mit.edu](mailto:zhaox@mit.edu))
- Aman B. Patel                     Professor, Department of Neurosurgery, Mass General Hospital ([abpatel@mgh.harvard.edu](mailto:abpatel@mgh.harvard.edu))

- Pablo Harker      Researcher, Department of Neurology, University of Cincinnati ([harkerpo@ucmail.uc.edu](mailto:harkerpo@ucmail.uc.edu))
- Marcin Balicki      Scientist, Department of Image-guided Therapy, Philips Research ([marcin.balicki@philips.com](mailto:marcin.balicki@philips.com))
- Christoph Nabzdyk      Associate Professor, Mayo Clinic School of Medicine ([nabzdyk.christoph@mayo.edu](mailto:nabzdyk.christoph@mayo.edu))
- Ellen Roche      Associate Professor, Department of Mechanical Engineering, MIT ([etr@mit.edu](mailto:etr@mit.edu))
- Lallit Anand      Professor, Department of Mechanical Engineering, MIT ([anand@mit.edu](mailto:anand@mit.edu))
- Kyujin Cho      Professor, Department of Mechanical Engineering, Seoul National University ([kjcho@snu.ac.kr](mailto:kjcho@snu.ac.kr))
- Sung-Hoon Ahn      Professor, Department of Mechanical Engineering, Seoul National University ([ahnsh@snu.ac.kr](mailto:ahnsh@snu.ac.kr))
- Sun G. Chung      Professor, Department of Rehabilitation Medicine, SNU College of Medicine ([sungc@snu.ac.kr](mailto:sungc@snu.ac.kr))