

Junghwan Byun

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RESEARCH INTERESTS

- Electronic skin for sensing, HMI, plants, and energy
- Skin/Bio-interfacing computer
- Soft Robot
- 4D printing
- Biohybrid microrobot

EDUCATION AND APPOINTMENTS

Max Planck Institute for Intelligent Systems **Stuttgart, Germany**
Postdoctoral research associate, Physical Intelligence Department 2020-present
Advisor: Prof. Metin Sitti

Soft Robotics Research Center **Seoul, Korea**
Postdoctoral research associate, Seoul National University 2017-2020
Advisor: Prof. Kyu-Jin Cho

- Electronic epidermis that activates soft robots wirelessly
- Bioinspired dual-morphing soft robotic origami
- Buoyancy-driven swimming of soft-bodied sheets
- Function representation 4D printing

Seoul National University **Seoul, Korea**
Ph.D. in Electrical Engineering and Computer Science 2017
Advisor: Prof. Yongtaek Hong
Thesis : Fully integrated electronic skin based on printing techniques
B.S. in Electrical Engineering 2011

AWARDS AND HONORS

- **Postdoctoral Researcher Fellowship for Basic Science Research Program,** 2020
National Research Foundation of Korea (NRF)
- **Marquis Who's Who in the World** 2019
- **Best Academic Development in Printed & Flexible Electronics Award,** 2017
Printed Electronics USA
- **DOYEON Award,** Inter-university Semiconductor Research Center, Seoul 2017
National University
- **Distinguished Ph. D Dissertation Award,** Seoul National University 2017
- **Best Poster Award,** The 8th Int. Workshop on Flexible & Printable Electronics 2016
(IWFPE), Jeonju, South Korea

- **Best Poster Award**, The 15th Int. Meetings on Information Display (IMID), 2015
Daegu, South Korea
- **Excellence Award in Undergraduate Mathematical Competition**, Korean 2007
Mathematical Society
- **Korean Government Scholarship**, Korea Foundation for Advanced Studies 2007-2010

PROFESSIONAL ACTIVITIES

- Organizing Committee for IEEE RoboSoft 2019
- Reviewer for Advanced Materials, Soft Robotics, IEEE Robotics and Automation Letters, Sensors, Applied Sciences, etc.

PEER-REVIEWED PUBLICATIONS

†First authorship with equal contribution; *Corresponding authorship

1. **J. Byun**, M. Park, S.-M. Baek, J. Yoon, W. Kim, B. Lee, Y. Hong, K.-J. Cho*, “Swimming leaf: Underwater maneuvering of robotic sheets via buoyancy-mediated active flutter”, *Science Robotics*, under review.
2. B. Lee†, J.-Y. Oh†*, H. Cho, C. W. Joo, H. Yoon, S. Jeong, E. Oh, **J. Byun**, H. Kim, S. Lee, J. Seo, C. W. Park, S. Choi, N.-M. Park, S.-Y. Kang, C.-S. Hwang, S.-D. Ahn, J.-I. Lee, Y. Hong*, “Ultraflexible and transparent electroluminescent skin for real-time and super-resolution imaging of pressure distribution”, *Nature Communications* **11**, 663 (2020).
3. H. Cho, Y. Lee, B. Lee, **J. Byun**, S. Chung, Y. Hong*, “Stretchable strain-tolerant soft printed circuit board: A systematic approach for design rules of stretchable interconnects”, *Journal of Information Display* **21**, 41 (2020).
4. W. Kim†, **J. Byun**†, J.-K. Kim, W.-Y. Choi, K. Jakobsen, J. Jakobsen, D.-Y. Lee, K.-J. Cho*, “Bioinspired Dual-morphing Stretchable Origami”, *Science Robotics* **4**, eaay3493 (2019). *Front Cover Article*.
5. J. Yoon, Y. Joo, E. Oh, B. Lee, D. Kim, S. Lee, T. Kim, **J. Byun***, Y. Hong*, “Soft modular electronic blocks (SMEBs): A strategy for tailored wearable health-monitoring systems”, *Advanced Science* **6**, 1801682 (2019). *Front Cover Article*
6. E. Oh, T. Kim, J. Yoon, S. Lee, D. Kim, B. Lee, **J. Byun**, H. Cho, J. Ha, Y. Hong*, “Highly reliable liquid metal-solid metal contacts with a corrugated single-walled carbon nanotube diffusion barrier for stretchable electronics”, *Advanced Functional Materials* **28**, 1806014 (2018). *Inside Front Cover Article*
7. **J. Byun**, S. Chung*, Y. Hong*, “Artificial soft elastic media with periodic hard inclusions for tailoring strain-sensitive thin film responses”, *Advanced Materials* **30**, 1802190 (2018). *Back Cover Article*
8. J. Park†, Y. Jang†, **J. Byun**, K. Cho, T.-Y. Kim, J.-K. Kim, B. Y. Choi, J. Shin, Y. Hong, S. Chung*, T. Lee*, “Two-dimensional thickness-dependent avalanche breakdown phenomena in MoS₂ field-effect transistors under high electric fields”, *ACS Nano* **12**, 7109 (2018).

9. **J. Byun**[†], Y. Lee[†], J. Yoon, E. Oh, B. Lee, S. Chung, T. Lee, K.-J. Cho*, J. Kim*, Y. Hong*, “Electronic skins for soft, compact, reversible assembly of wirelessly activated fully soft robots”, *Science Robotics* **3**, eaas9020 (2018).
10. S. Lee, S. Lee, H. Yoon, C.-K. Lee, C. Yoo, J. Park, **J. Byun**, G. Kim, B. Lee, B. Lee, Y. Hong*, “Printed cylindrical lens pair for application to the seam concealment in tiled displays”, *Optics Express* **26**, 824 (2018).
11. **J. Byun**[†], E. Oh[†], B. Lee, S. Kim, S. Lee, Y. Hong*, “A single droplet-printed double-side universal soft electronic platform for highly-integrated stretchable hybrid electronics”, *Advanced Functional Materials* **27**, 1701912 (2017).
12. **J. Byun**[†], B. Lee[†], E. Oh, H. Kim, S. Kim, S. Lee, Y. Hong*, “Fully printable, strain-engineered electronic wrap for customizable soft electronics”, *Scientific Reports* **7**, 45328 (2017).
13. E. Oh, **J. Byun**, B. Lee, S. Kim, D. Kim, J. Yoon, Y. Hong*, “Modulus-gradient conductive core-shell structures formed by magnetic self-assembling and printing processes for highly stretchable via applications”, *Advanced Electronic Materials* **3**, 1600517 (2017).
14. S. Kim, S. Choi, E. Oh, **J. Byun**, H. Kim, B. Lee, S. Lee, Y. Hong*, “Revisit to three-dimensional percolation theory: accurate analysis for highly stretchable conductive composite materials”, *Scientific Reports* **6**, 34632 (2016).
15. Y. Joo, **J. Byun**, N. Seong, J. Ha, H. Kim, S. Kim, T. Kim, H. Im, D. Kim, Y. Hong*, “Silver nanowire-embedded PDMS with multiscale structure for highly sensitive and robust flexible pressure sensor”, *Nanoscale* **7**, 6208 (2015).
16. S. Kim, **J. Byun**, S. Choi, D. Kim, T. Kim, S. Chung, Y. Hong*, “Negatively strain-dependent electrical resistance of magnetically arranged nickel composites: application to highly stretchable electrodes and stretchable lighting devices”, *Advanced Materials* **26**, 3094 (2014). *Front Cover Article*

MANUSCRIPT IN PREPARATION

- S. Ahn[†], **J. Byun**[†] et al., “4D inverse design framework based on function representation” (In preparation)

CONFERENCE PRESENTATIONS

1. **J. Byun**, M. J. Park, W. Kim, S.-M. Baek, K.-J. Cho, “A swimming robotic sheet driven by a soft buoyancy control skin”, The 3rd IEEE International Conference on Soft Robotics (RoboSoft), Virtual Conference due to Covid-19 (2020) (poster).
2. **J. Byun**, Y. Lee, J. Yoon, Y. Hong, K.-J. Cho, “Electronic epidermis that activates soft robots wirelessly”, Materials Research Society (MRS) Fall Meeting, Boston, Massachusetts, November (2018) (talk).
3. **J. Byun**, Y. Hong, “Printing-based stretchable hybrid electronics: strategy and emerging applications”, Printed Electronics Europe, Berlin, Germany, April (2018) (talk).
4. **J. Byun**, K.-J. Cho, “Innervating Electronic Skin: A New Direction of Soft Robotic

- Assembly*”, The 3rd Aslla Symposium, Gangneung, South Korea, January (2018) (talk).
5. **J. Byun**, E. Oh, B. Lee, S. Kim, Y. Hong, “*Fully-printed, double-side integrated high-speed stretchable digital logic circuits for self-computable electronic skin*”, Materials Research Society (MRS) Spring Meeting, Phoenix, Arizona, April (2017) (talk).
 6. **J. Byun**, B. Lee, E. Oh, Y. Hong, “*Fully printed, custom-designed high-performance stretchable digital electronics*”, The 8th International Workshop on Flexible & Printable Electronics (IWFPE), Jeonju, Korea, November (2016) (poster) (***Best Poster Award***).
 7. **J. Byun**, B. Lee, E. Oh, S. Kim, H. Kim, S. Choi, Y. Hong, “*Stretchable and deformable LED configurations based on inkjet-printed chip-bonding technology*”, The 15th international Meetings on Information Display (IMID), Daegu, Korea, August (2015) (poster) (***Best Poster Award***).
 8. **J. Byun**, B. Lee, S. Kim, Y. Hong, “*Guided crack formation and stress localization of metallic thin film by using inkjet-printed embedded polymeric micro-islands for stretchable electronic applications*”, International Conference on Electronic Materials and Nanotechnology for Green Environment 2014 (ENGE), Jeju, Korea, November (2014) (talk).
 9. **J. Byun**, S. Kim, S. Chung, Y. Hong, “*High-performance stretchable silver electrode with scalable inkjet-patterned photo-curable strain modulators*”, Materials Research Society (MRS) Fall Meeting, Boston, USA, December (2013) (poster).
 10. **J. Byun**, S. Kim, S. Chung, H. Im, Y. Hong, “*Controlled wrinkling via artificially modulated surface stress using inkjet-printed transparent rigid island structures*”, Materials Research Society (MRS) Fall Meeting, Boston, USA, November (2012) (talk).

INVITED TALKS

- “*Printing-based Stretchable Hybrid Electronics: Strategy and Emerging Applications*”
Printed Electronics Europe, Berlin, Germany, 2018
- “*Innervating Electronic Skin: A New Direction of Soft Robotic Assembly*”
The 3rd Aslla Symposium, Gangneung, South Korea, 2018

PATENTS

1. “Forming method of stretchable substrate having via and stretchable substrate having via”, Y. Hong, E. Oh, **J. Byun**, B. Lee
Korea Patent: KR 101953962 B1. USA, 16/476,784 (Application, 2019)
2. “Method of fabricating stretchable electrical circuit and apparatus for fabricating stretchable electrical circuit”, Y. Hong, B. Lee, **J. Byun**
US Patent: US 2017 0332486 A1
3. “Stretchable electrical circuit fabrication method and stretchable electrical circuit fabrication apparatus”, Y. Hong, B. Lee, **J. Byun**
Korea Patent: KR 2017 0127901 A
4. “Forming method of stretchable substrate, stretchable substrate and electronic device having stretchable substrate”, Y. Hong, **J. Byun**, S. Kim

US Patent: US 20150189741 A1.

TEACHING AND OUTREACH

Seoul National University EECS Teaching Assistant:

- Spring 2011, 2012: Circuit Theory and Experiments
- Fall 2013: Introduction to Flexible Electronics

The Korean Information Display Society (KIDS) Display School Teaching Assistant (07. 2011)

Lecturer for the Career Exploration in Bugil high school (Cheonan, Korea) 2019.

SELECTED PRESS

- **Millenniumpost:** *Scientists produce e-skin that wirelessly activates soft robots*
- **Phys.org:** *Researchers develop electronic skins that wirelessly activate fully soft robots*
- **Asian Scientist:** *Giving soft robots electronic skins*
- **IEEE Spectrum**

REFERENCES

Available upon request