NBES NEURO & BIO ELECTRONICS LAB. @PNU

Please visit lab web page: https://www.nbeslab.com/

If you are interested in the lab, please contact Prof. Joonsoo Jeong (joonsoo_jeong@pusan.ac.kr) with brief introduction on yourself and your research interest with a transcript.

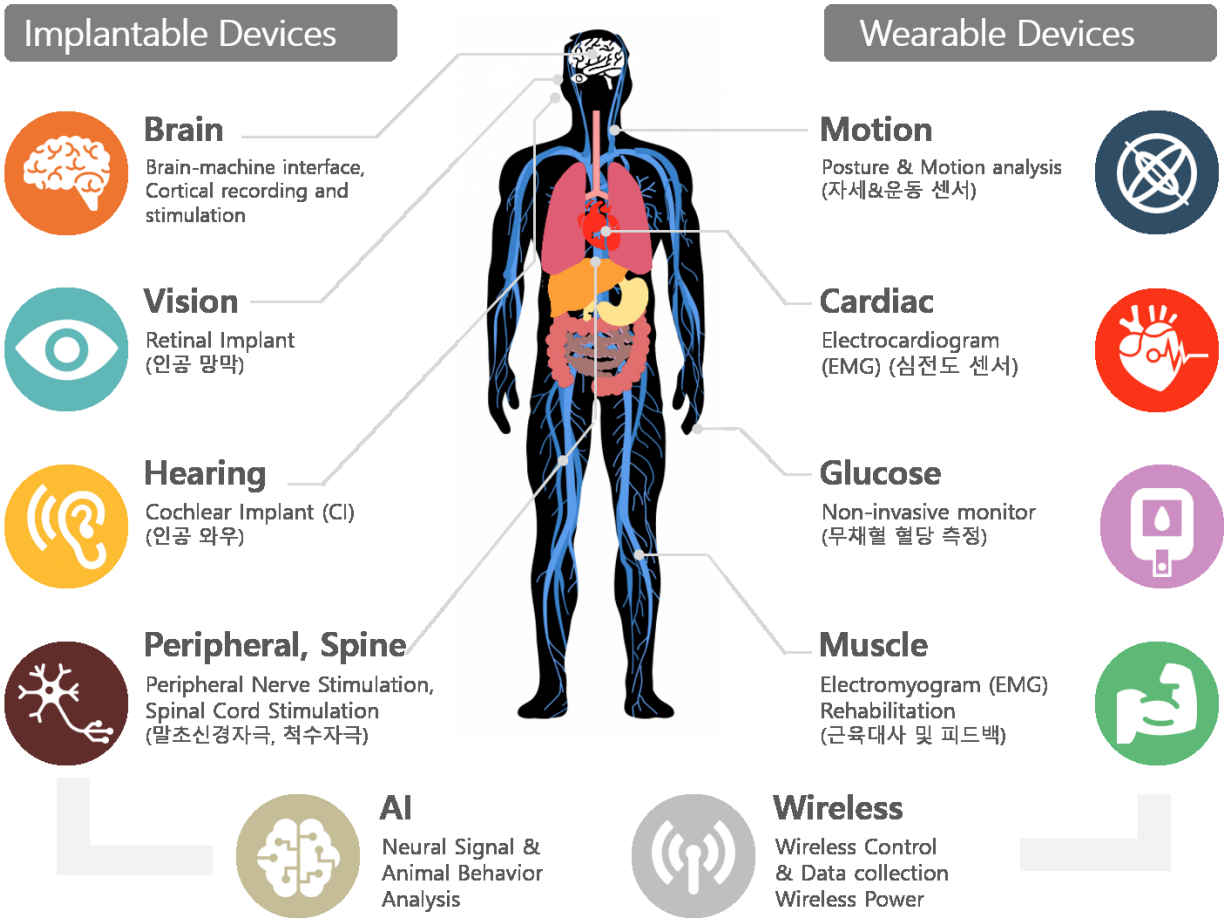
The **NEURO & BIO ELECTRONICS LAB** is recruiting graduate students for coming 2024 Spring admission.

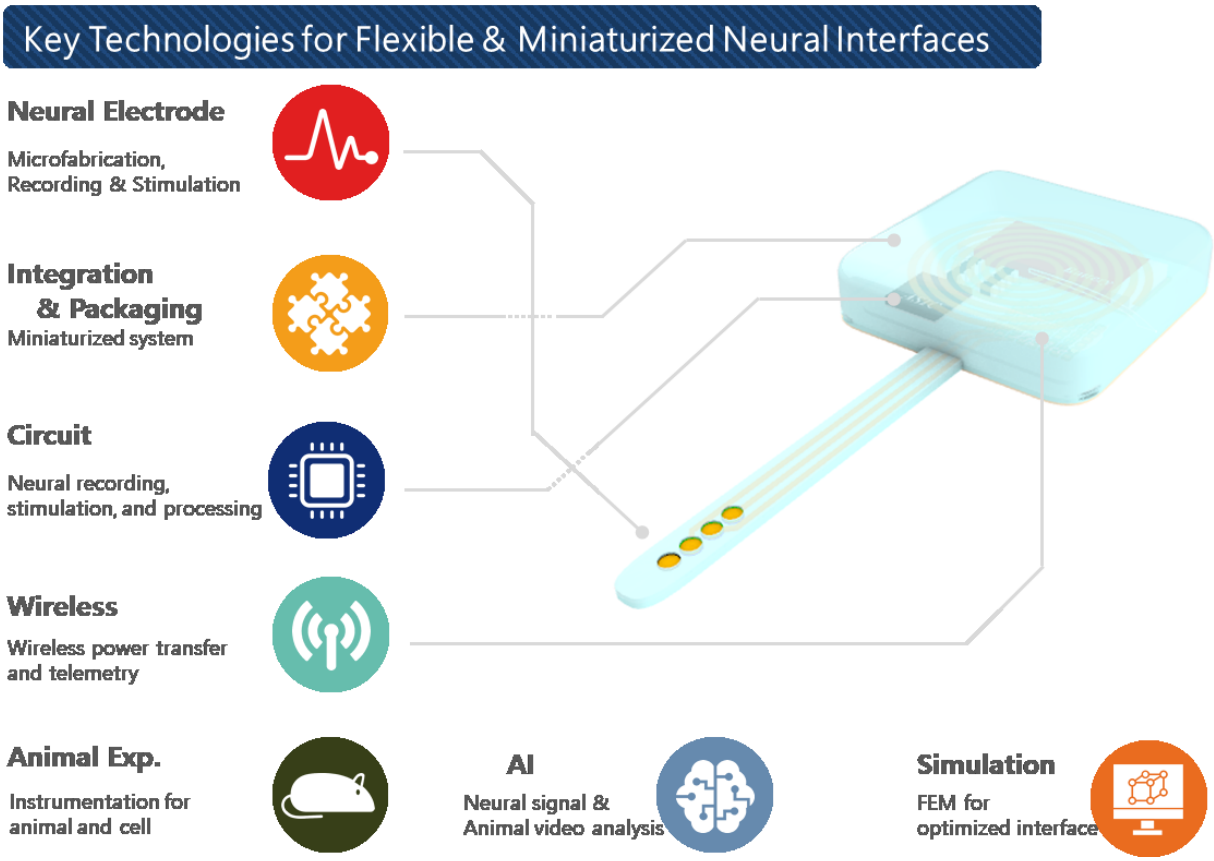
RESEARCH AREA

We are interested in the interface of electronics and biology (neurons), particularly focusing on

1) implantable neural electronics for restoring impaired sensory, motor, and cognitive neural functions
(e.g., visual restoration, auditory restoration, brain-machine interface, spinal cord stimulation)

2) wearable electronics for physiological monitoring of patients.
(e.g., electrocardiogram, electromyogram, glucose, motion sensors)





RESEARCH THEMES

Implantable and wearable neural electronics are not separated, but sharing fundamental key technologies, which can be configured, optimized and integrated for specific applications. Our key technologies, or the main research topics, include followings (more detail: https://www.nbeslab.com/keytechnologies):

1) Electrode fabrication: we employ microfabrication (MEMS) process for constructing efficient micro/nano-scale electronics-tissue interface, usually based on thin/flexible substrates, semiconductor technologies, and high-performance materials

2) Circuit: we develop circuit on PCB, microcontroller and system level for recording of neural signal and stimulation of neural tissues

3) Wireless: we build wireless power & data transfer module for fully implantable devices

4) Integration & Packaging: we integrate and package electrode, circuit and wireless module into a miniaturized and long-term reliable system to apply for animal/cell experiments.

5) Artificial Intelligence: we utilize AI-based techniques for neural signal processing as well as analysis of animals' behaviors

6) Animal experiments: we have a wide network of collaborators for animal experiments with which we can promptly evaluate our device.

7) Simulations: we also have expertise in FEM simulation (COMSOL) for optimization of electrode structure, electronics-tissue dynamics, wireless modules, system safety and so on.

NBES NEURO & BIO ELECTRONICS LAB. @PNU

RESEARCH GRANT

- As of Sep. 2023, we have seven active research grants, six from government and one from industry.
- Government grants are about: 1) development of artificial retina (retinal prosthesis) device for blind patients, 2) electrical brain stimulation device for treatment of cognitive disorders, 3) optical deep brain stimulation device, 4) vagus nerve stimulator, 5) evaluation methodologies for polymer-based implantable devices, and 6) wearable multifunctional sensor patch for patient monitoring in hospital.
- Industry project: optimization of cochlear implant package and wireless module.

REQUIREMENTS

- Electrical engineering may fit best, but any backgrounds from engineering and science are welcomed.
- Required undergraduate courses: Physics (mechanics and electromagnetics), Calculus, Linear Algebra, basic programming, basic statistics.
- Preferred (or related) undergraduate courses: Circuit theory, Higher level of programming (AI or DL), Signals & Systems, Signal processing, Microelectronic devices, Semiconductor devices (theory or manufacturing), any CAD experience.
- Applicants are not expected to have knowledge about biology, physiology or neuroscience. You may learn after joining the lab.
- Skills generally used in the lab are: Matlab or Python, 2D & 3D CAD, Circuit design tools (OrCAD, Eagle CAD...), and using semiconductor equipment. However, note that they are not the requirements to apply the lab. You may learn after joining the lab.
- The most important requirements are not the majors, but are self-motivation, engineering thinking, positive attitude, curiosity and diligence.
- Minimum level of English is expected for reading English articles, deliver conversation and presentation about academic matters in English.

OPENINGS:

- 2 graduate students (MS, PhD or Integrated course) for Spring 2024 admission
- You can enroll to Biomedical convergence major, Department of Information convergence engineering
- Please find more information about the application: https://go.pusan.ac.kr/graduate/main/grad_main.asp

BENEFITS:

- Monthly stipend and additional incentives for journal publication.
- Opportunity to present in an international conference every year (since 2nd year of your research)
- Intensive collaboration with medical partners in Yangsan campus, Busan campus and Seoul.

TRIVIA:

- We are located in Yangsan Campus, which is a biomedical research hub in the southeastern Korea.
- In September 2023, we are moving to a brand new building in the same campus which is fully equipped with facilities needed for our research.
- All the current and past MS students in our lab have published at least a SCIE paper of top 25% as a 1st author during their MS course.
- We haven't had yet PhD graduates, but a PhD candidate in his 4th year have published (or under review) three SCIE papers including two high-profile journals (within top 10%)