

생체 모사 바이오 전자소자 및 통합 시스템 연구실

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연구실구성원

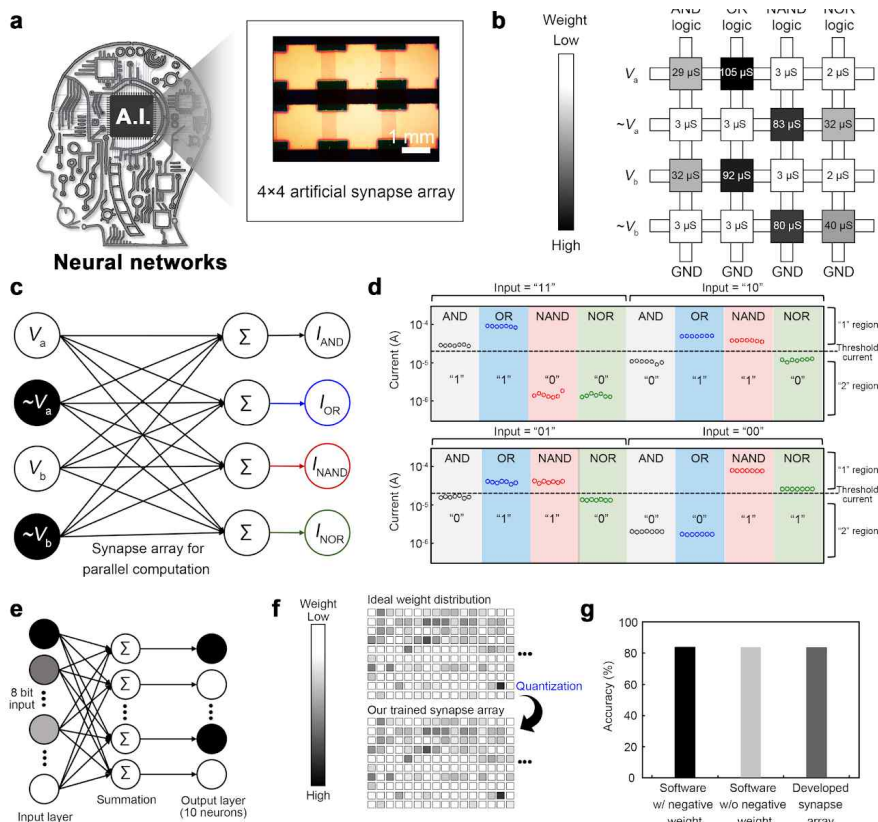
- 지도교수 : 이신형 교수님
- 박사생 : 모집 중
- 석사 : 김형욱, 정의훈, 김성은(학석연계 과정)
- 학부연구생 : 김도윤, 박민우, 장지수, 권기쁨, 이지원, 김미성

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연구분야

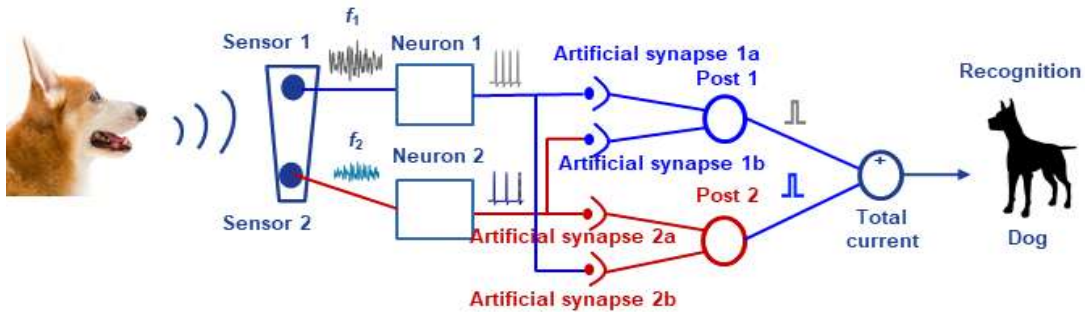
□ Brain-inspired electronics (Artificial synapse based on memristor)

- Conductive filament 기반 Memristor 소자 재현성 및 균일성 향상 연구
- 유기물 기반 Memristor 소자 제작 및 동작 원리 분석 연구
- Memristor 소자 기반 Artificial synapse 개발 및 성능 향상 연구
- Memristor array 제작을 통한 고밀도 인공신경망 구현 및 성능 개선 연구



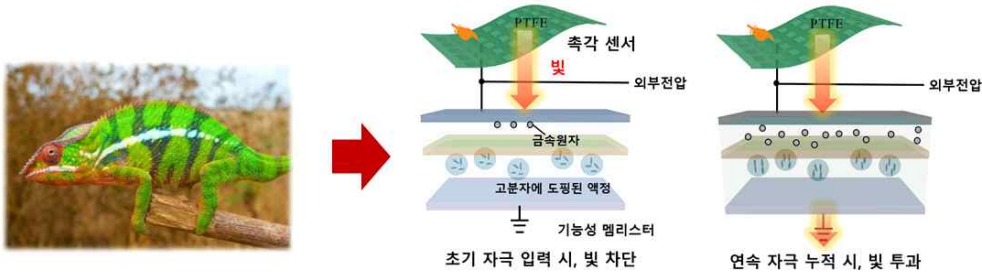
□ Bio-electronics

- 생물체의 피부를 모사한 터치 센서 개발 및 제작 연구
- 생물체의 청각을 모사한 음성 인식 시스템 개발 및 제작 연구



□ Integrated system for practical applications

- 인공지능망을 기반으로 한 스마트 윈도우 시스템 개발 연구
- 인공지능망을 기반으로 한 카모플라주 시스템 개발 연구



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주요 수행과제 및 최근 5년간 연구 논문

□ 주요 수행과제

- 웨어러블 지능형 시스템 적용을 위한 유기 저항변환 소자 동작 기저 연구 및 인공 시냅스 개발 / 한국연구재단 (2020.06 ~ 2023.02)
- 고성능 선택소자 개발을 통한 고집적 크로스포인트 시냅스 어레이 구현 / 삼성전자 반도체연구소 (2020.11 ~ 2024.12)
- 웨어러블 스파이킹 뉴럴 네트워크 시스템 구현을 위한 유기물 기반 고집적 인공 시냅스 어레이 개발 / 한국연구재단 (2021.03 ~ 2024.01)

□ 대표 연구 논문

- "Systematic Engineering of Metal Ion Injection in Memristors for Complex Neuromorphic Computing with High Energy Efficiency." *Advanced Intelligent Systems* (2022).
- "Fluoropolymer-based organic memristor with multifunctionality for flexible neural network system." *NPI Flexible Electronics* (2021).
- "Self-Selective Organic Memristor by Engineered Conductive Nanofilament Diffusion for Realization of Practical Neuromorphic System." *Advanced Electronic Materials* (2021).
- "Balance of Surface Energy Difference between Wetting and Dewetting Regions for Patterning Solution-Processed Organic Light-Emitting Diode." *Organic Electronics* (2021).
- "Reliable Organic Memristors for Neuromorphic Computing by Predefining a Localized Ion-Migration Path in Crosslinkable Polymer." *Nanoscale* (2020).
- "Realization of Biomimetic Synaptic Functions in a One-Cell Organic Resistive Switching Device Using the Diffusive Parameter of Conductive Filaments." *ACS Applied Materials & Interfaces* (2020).

- "Introduction of Interfacial Load Polymeric Layer to Organic Flexible Memristor for Regulating Conductive Filament Growth." *Advanced Electronic Materials* (2020).
- "Control of Conductive Filament Growth in Flexible Organic Memristor by Polymer Alignment." *Organic Electronics* (2020).
- "Full-coloration based on metallic nanostructures through phase discontinuity in Fabry-Perot resonators." *Optics Express* (2019).
- "High Resolution Micro-patterning of Stretchable Polymer Electrodes through Directed Wetting Localization." *Scientific Reports* (2019).
- "Solution-Processed Organic Light-Emitting Diode in High-Resolution Line Patterns by Scalable Wetting Modification." *Organic Electronics* (2019).
- "Organic Thin-Film Transistors with Liquid Crystalline Polymer Insulator Integrated for Solution-Processed Organic Light-Emitting Devices." *Semiconductor Science and Technology* (2019).
- "Interfacial Triggering of Conductive Filament Growth in Organic Flexible Memristor for High Reliability and Uniformity." *ACS Applied Materials & Interfaces* (2019).
- "Concept of chiral image storage and selection based on liquid crystals by circular polarization." *Optics Express* (2019).
- "Organic Flexible Memristor with Low Voltage Operation and High Stability by Interfacial Control of Conductive Filament Growth." *Physica Status Solidi Rapid Research Letter* (2019).
- "Highly Sensitive Color Tunability by Scalable Nanomorphology of a Dielectric Layer in Liquid-Permeable Metal-Insulator-Metal Structure." *ACS Applied Materials & Interfaces* (2018).
- "Generation of Intensity-tunable Color from Helical Photonic Crystal for Full Color Reflective-type Display." *Optics Express* (2018).
- "Flexible Multi-Level Resistive Memory with High Current Ratio by Electrical Triggering into Insulating Layer." *Organic Electronics* (2017).
- "Vertical organic light-emitting transistor showing a high current on/off ratio through dielectric encapsulation for the effective charge pathway." *Journal of Applied Physics* (2017).
- "Vapor Pressure Effect on Electrical Properties of Solution-processed Organic Field-Effect Transistor." *Science of Advanced Materials* (2017).
- "Effect of morphological and physicochemical properties of dielectric-organic semiconductor interfaces on photoresponse of organic phototransistors." *Thin Solid Films* (2017).