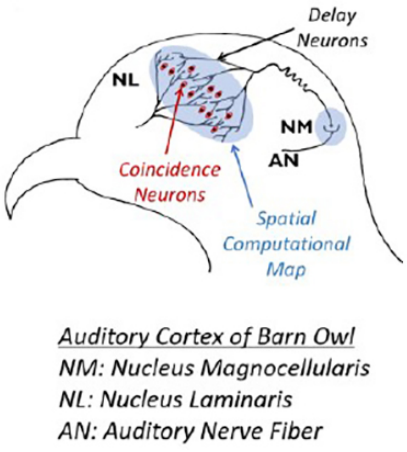
A Biomimetic 2D Transistor for Audiomorphic Computing

ID# 2019-4934



Barn Owl auditory cortex

Technology Summary

This technology is a biomimetic audiomorphic device that captures the neurobiological architecture and computational map inside the auditory cortex of the barn owl, which is known for its exceptional hunting ability in complete darkness using auditory cues. The device consists of multiple split-gates with nanogaps on a semiconducting MoS2 channel connected to the source/drain contacts for imitating the spatial map of coincidence detector neurons and tunable RC circuits for imitating the interaural time delay neurons following the Jeffress model of sound localization. Furthermore, global back-gating capability is used to demonstrate neuroplasticity to capture behavioral and/or adaptation related changes in the barn owl. This technology implementation can supercede that of the barn owl by several orders of magnitude.

Application & Market Utility

Neuromorphic computational devices are able to offer a low cost, low energy alternative to supercomputing by mimicking components of a biological nervous system. By taking inspiration from nature, such technology can enable high-performing functionality at a fraction of the cost (energy, component size/number, computational steps/complexity, etc.) of traditional methods. This type of efficiency will become ever more important as vast numbers of sensors are deployed to any number of devices, including IoT, autonomous vehicles, micro-devices, and defense applications.

Next Steps

This technology is patent pending. The research team seeks collaboration for future development and licensing opportunities.

TECHNOLOGY READINESS LEVEL 1-3

Seeking

Licensing | Research

Keywords

- Beyond Boltzmann Devices
- Neuromorphic Devices
- Neuromorphic Computing
- Biomimetic
- 2D materials / transistors

Researchers

Saptarshi Das
Assistant Professor of Engineering Science and Mechanics
Online Bio
Website

Sarbashis Das
Graduate Student

Akhil Dodda
Graduate Student

Originating College
College of Engineering

Office of Technology Management Contact
Rokita, Joseph
jjr152@psu.edu
814-863-6336