# BIOLOGICALLY INSPIRED SYSTEMS AND TECHNOLOGY (BIO-IST)


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**NUMBER OF STUDENTS**
- Ph.D.: 10 students

## RESEARCH KEYWORDS

Neural System, Self-Organization Learning, Swarm Intelligence, Intelligent System, Manufacturing Robot, Neural Network and Artificial Intelligence, Intelligent Control, Underwater Robotic, Deep Learning and Control System

## OUTLINE OF IKOHZA

Biologically Inspired System and Technology (BIST) Laboratory" is interesting, developing and demonstrating innovative and advanced technology for the well-being of mankind. Although there are many approaches for studying the technology that mimics nature, this research laboratory advances it mostly from a standpoint of system engineering.

**Our SDGs**


## CURRENT RESEARCH

**BIOMIMETIC**
Biomimetic is the study of sophisticated mechanism, function, and structure, which human being, animals, and plants have, as models for developing human-friendly system and technology and apply methods and systems found in nature to systems and technology. Biological systems have been optimized for wide variety of environments and tasks on a long road of evolution. They are multi-functional and are not specialized for only one task, e.g. the application to develop.

Currently, our target is to model machines that mimic the human eyes and to develop its hardware realization into integrated circuit design, we are focusing on following targets:

- Machine Vision
- Motion Control
- Bio-Signal processing.

**OPTIMAL CONTROL & OPTIMIZATION**

An optimal control system seeks to maximize the return from a system by minimizing a certain cost while optimization seeks to select a best element (with regard to some criteria) from some set of available alternatives. Topics related to optimal control and optimization theory include:

- The Linear Quadratic Regulator
- Multivariable Control
- Robust Control
- Adaptive and Learning System
- System Identification.

Among the objectives of research in this area is to apply these methods to control or optimize artificial biological systems such as robots, artificial limbs and synthetic tissues. In addition to this, applying the concepts and behaviors of biological systems to solve control and optimization problems will also be the focus of research in this area.

## MERIT OF THE TECHNOLOGY

**BIO-INSPIRED LEARNING**

The aim of this research is to study and analyze the bio-inspired learning process for development and application of machine learning. The research will mainly involve in modeling and simulation of the system architecture. The system will have based as a tool for various application e.g. data mining, image detection, power prediction etc. Currently, following titles are mainly focused:

- Spiking Self Organized Map for Short-Term Load Forecasting
- Modular Neural Network for Thermal Imaging Detection
- Supervised Learning model for Photovoltaic Power Prediction

## POSSIBLE INDUSTRY APPLICATION

The Bio-Ist iKohza was founded to establish research activities on these bases which focus on but not limited to neuroimaging, biosensors application, affective neuroscience, consumer neuroscience and IoT smart devices application. The laboratory is developing collaboration with MIMOS. Currently, MIMOS' R&D activities revolve around economic impact-driven and strategic-driven areas, which cover E&E including Renewable Energy & Future Grid; Electric & Autonomous Vehicle (EAV), E&E manufacturing; and Automation and Sensory in primary sectors.

**POTENTIAL COLLABORATIVE AREA:**

- Stereo Vision for Autonomous Vehicle
- Precision Agriculture using Deep Learning.
- Reinforcements Learning for Manufacturing Robot

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