

Project Synopsis:

- Short Title: COINs
- Title: Cooperative Intelligence System Over Low-power Tiny Edge Network
- Project lead and contact details: Dong Chen, dongchen@mines.edu
- Suggested Team Size: 3-4
- Logistics: On-campus

Project Description:

Deep neural networks (DNNs) have been widely deployed in many intelligent edge computing applications. Due to their often-heavy computational demands, cooperative deep learning inference—where a DNN model is adaptively partitioned and executed across different levels of devices, such as cloud servers and local edge devices—has been on the rise. This project is part of the ongoing project at CPSLab (<https://cps.mines.edu/>).

In this project, the team is expected to design and develop an open-sourced framework—Cooperative Intelligence System (COINs), which enables automatic cooperative intelligence over cloud servers, resource-constrained and low-power edge computing devices, supporting both Bluetooth Low Energy (BLE) and Wi-Fi.

The expected results are to use at least one widely used DNN model to demonstrate that by efficiently scheduling DNN tasks, COINs achieves performance comparable to cloud-based DNN services but with significantly reduced service latency.

Project Components:

The project will consist of multiple components implemented using microcontrollers, Raspberry Pis, and cloud servers.

- **Profiler:** Profiles the DNN model and underlying hardware to plan optimal model partitioning.
- **Partitioner:** Splits the DNN model into multiple partitions based on the capabilities of available hardware.
- **Scheduler:** Schedules and assigns partitions to run on different nodes, then collects and assembles the final results.

Desired Skills:

The following skills are essential but not necessarily required:

- Familiar with microcontroller programming, such as STM32 32-bit Arm Cortex MCUs or ESP32-C3-DevKitM.
- Familiar with Linux shell commands and basic C network programming
- Familiar with Amazon AWS Marketplace, instance creation, and management

Expected Outcomes:

At the end of the project, the team is expected to make demo showing that COINS could schedule the DNN models across different level of devices to perform accurate tasks.

Client Liaison:

Dong Chen, dongchen@mines.edu

Su Wang, suwang@mines.edu