

---

# Deploy Machine Learning Applications on A Swarm

Junjie Shi, Kuan-Hsun Chen

Informatik 12, TU Dortmund

14, April, 2021

# Main objective

---

Supporting distributed machine learning applications on swarms:

- Build a swarm with low power consumption
- Implement distributed machine learning applications with light-weighted workload

# Build a swarm based on emulation

---

- Objectives:
  - STM32F4 Discovery boards are used for emulating aircraft
  - ChibiOS<sup>1</sup> is applied as the RTOS for each aircraft
  - Paparazzi UAV<sup>2</sup> is deployed as autopilot
- Challenges:
  - Current solution<sup>3</sup> is based on very old version of ChibiOS and Paparazzi UAV
  - Lack of researches for latest version

---

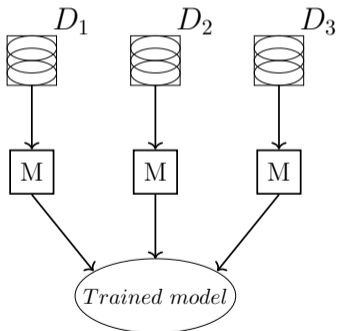
<sup>1</sup><https://www.chibios.org/dokuwiki/doku.php>

<sup>2</sup>[https://wiki.paparazziuav.org/wiki/Main\\_Page](https://wiki.paparazziuav.org/wiki/Main_Page)

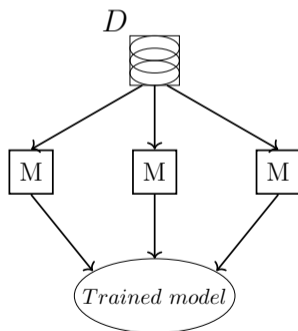
<sup>3</sup>[https://wiki.paparazziuav.org/wiki/RT\\_Paparazzi](https://wiki.paparazziuav.org/wiki/RT_Paparazzi)

# Distributed machine learning and Federated learning

- Motivations: privacy, edge computing, lack of storage, and connection issues
- System Model: data parallel and model parallel
- Limitations: Low power consumption systems, connection unstable, lack of storage



(1) Data parallelism



(2) Model parallelism

# Organization (6 students for 2 groups)

---

- Step 1 exploration:
  - Group 1: Establish the platform, and test the functionality of the swarm, e.g., computation, communication, etc. Start from the old versions
  - Group 2: Implement and validate suitable distributed machine learning algorithms
- Step 2 exploitation:
  - Deploy the machine learning application on the emulated platform
  - Advanced: Deploy other powerful machine learning applications on more powerful platforms, i.e., 1) Odroid N2 cluster, and 2) Nvidia Jetson AGX Xavier cluster

# Questions and Suggestions

---