CSE: 449 PARALLEL, DISTRIBUTED AND HIGH-PERFORMANCE COMPUTING

PAPER REVIEW PRESENTATION 2

Paper Title: Towards Edge-enabled Distributed Computing Framework for Heterogeneous Android-based Devices

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Introduction

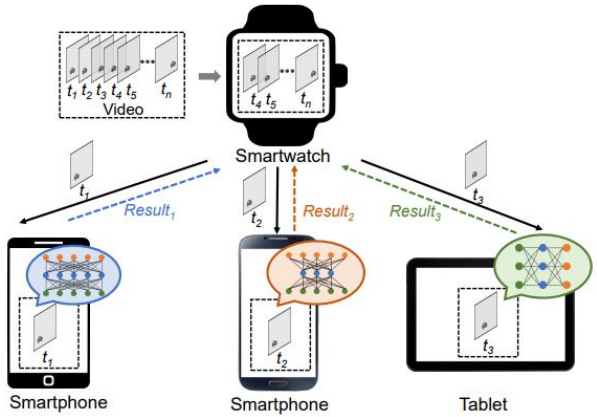
- The vast improvements in computing technologies and the wide deployment of communication mechanisms the past decades have led to the widespread adoption of smart home edge devices .
- Furthermore, Android is forecast to remain the most widely-used operating system for these smart home edge devices

Background and Related Work

- Distributed machine learning (DML) algorithms were developed to aid the implementation of complex iterative neural networks.
- Federated learning (FL) is a novel DML that is perfect to train models in a collaborative manner while preserving the privacy of sensitive data.
- Berkeley Open Infrastructure for Network Computing (BOINC) is one of the leading distributed computing platforms used in a variety of fields.
- BOINC provides clients for various operating systems, including the Android client, to allow volunteers to contribute their unused computing resources.
- ThinkAir is a popular framework that makes it simple for developers to migrate their smartphone applications to the cloud.
- ThinkAir exploits the concept of smartphone virtualization in the cloud and provides method-level computation offloading.
- RAPID was proposed based on ThinkAir, which supports CPU and GPGPU computation offloading on Linux and Android devices.

Methodology

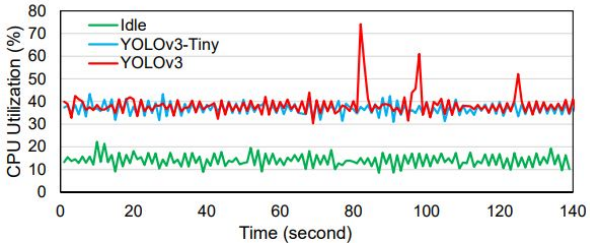
- **Hardware Setup**
  - Android Based edge devices, such as Smart Phone, Smart Watch etc
- **Dataset Selection**
  - PDTV dataset
- **Model Selection**
  - YOLOv3 and YOLOv3-Tiny
- **Framework Description**
  - TensorFlow Lite

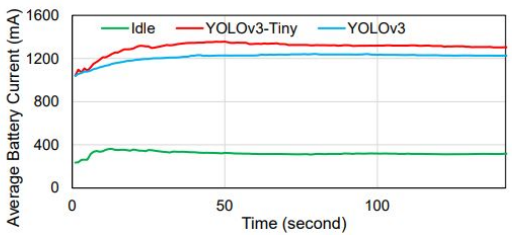


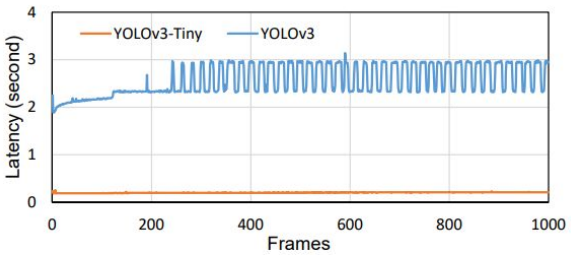
Design and Result Analysis

- Stand Alone Learning
- Distributed Computing Experiment

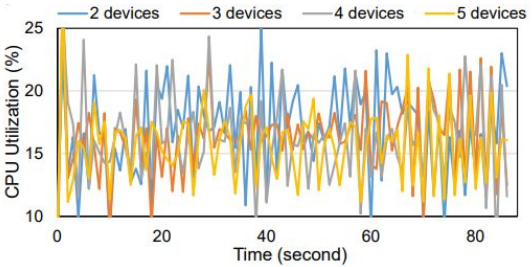
Stand Alone Learning

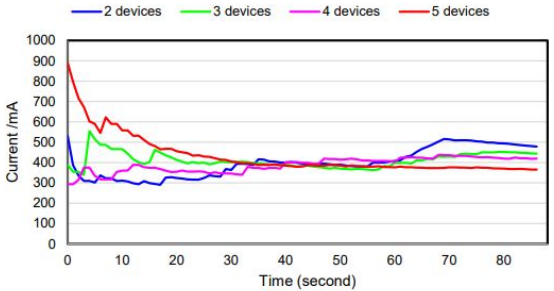


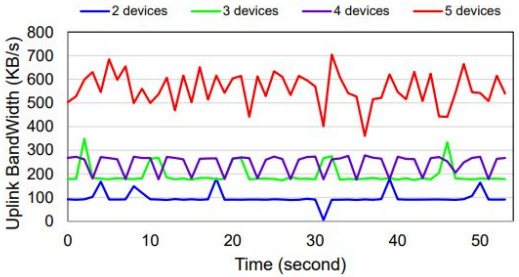




Distributed Computing Experiment







Conclusion

This paper proposes an Android distributed computing framework to accelerate edge DNN inference. The experimental results demonstrated that the proposed framework can reduce the CPU utilization by 24% and save 59.8% to 71.8% of the energy consumption. It is also demonstrated that the proposed framework will not lead to a high bandwidth footprint.

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