Image Processing AI run by Raspberry Pi 4 using Edge TPU Coral over a virtual, P2P, and decentralized network

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Abstract

My research focuses on new advances in computer science which include topics in Blockchain, IoT and AI.The integration of these systems is still relatively new and the current regulation in place does not fully account for their impact in the 21st century. Research into these areas is important because they are the newest technologies that pose the biggest impact when it comes to data privacy, AI safety, as well as changes to the way we think of data transactions. My aim in researching these technologies is to provide an analysis of these systems and of their usage in different networks as well as show the Coral Edge TPU's power in making AI and IoT devices usable and efficient.

Materials

Raspberry Pi 4

1.5GHz 64-bit quad-core ARMv8 CPU

4GB RAM

32 GB Micro SD Card

USB Accelerator Coral

Google Edge TPU coprocessor

PC

Intel Core i5-6500 CPUT @ 3.2GHz

16 GB DDR4 RAM

Radeon RX 580 GPU

Methods

My methodology was to collect data on the speed at which a Raspberry Pi models a Tensorflow AI using the Edge TPU Coral and the effects it has on performance over virtual, peer to peer, and decentralized networks.

Tensorflow Lite: Image Detection AI

Raspberry Pi: Cost effective IoT

Edge TPU Coral: ML Accelerator

VNC Viewer/Server: Virtual Network

Ad Hoc: Peer to Peer Network

Hyperledger Fabric: Decentralized Network

Results

Standalone Rasppberry Pi

Standalone Raspberry Pi

Frame per Second

Case		Min	Average	Top
	Without TPU	4	4	5
	With Std TPU	16	20-22	26
	With Max TPU	16	22-24	29

Virtual Network

Virtual Network

Frame per Second

Case		Min	Average	Top
	Without TPU	4	4.4	5
	With Std TPU	14	18-20	26
	With Max TPU	16	20-23	29

Peer to Peer

Peer to Peer Latency

Latency

Case		Latency
	Without TPU	26
	With Std TPU	9
	With Max TPU	9

Peer to Peer

Frame per Second

Case		Min	Average	Top
	Without TPU	4	4	5
	With Std TPU	16	17-18	22
	With Max TPU	16	20-23	25

Blockchain Network

Conclusion

The overall performance of the Google Edge TPU Coral makes it a must when thinking about using AI in any project as it enhances IoT and AI possibilities. Overall the virtual network had a almost semlease play back and the minimal difference in performance made up for in usability as you can use whenever you are connected to the internet.

References

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