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Edge AI : Today and Tomorrow

Kevin Jou, Chief Technology Officer / Dec 13, 2018

The Era of Practical Artificial Intelligence Has Arrived

- Advancements in computing capabilities
- Breakthroughs in algorithms
- Availability of big data



Supervised Learning



Reinforcement Learning



Generative Adversarial Learning



Imitation Learning



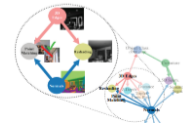
Transfer Learning with Domain Adaptation



On-device Learning / Incremental Learning



Multi-Tasks Learning



The Rise of Edge AI

- All sensors are on edge devices
- Need for ubiquitous function availability
- Faster response time
- User privacy
- Security
- Ease connection requirement even when network connection is available
- Collaboration of edge and cloud

Function Availability



Response Time



Privacy & Security



What Are The Killer Applications?

Almost everything --- AI can be applied to enhance user experience for many existing functions, elevating some from not usable to very attractive

Video Encoding

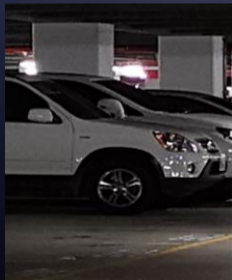


Conventional



With AI

Noise Reduction



Conventional



With AI

Noise Reduction



Conventional



With AI

Challenges for Edge AI

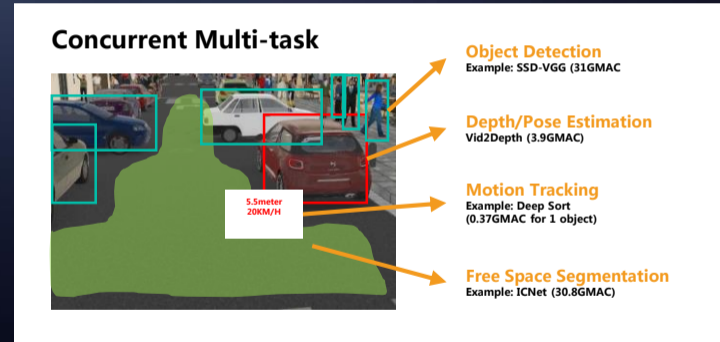
- Thermal constraints
- Power consumption
- Computing capabilities
- Bandwidth availability

- Applications are becoming increasingly more sophisticated
- Usage scenarios that run concurrent applications raise the challenge further

Model (224x224x3 @ FP16)	FPS	GMACs	Bandwidth GB/s
AlexNet	60	43	6.9
ResNet-v1-50	60	234	9.12
VGG-19	60	1179	19.8

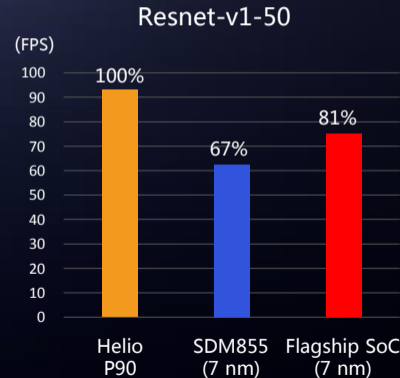
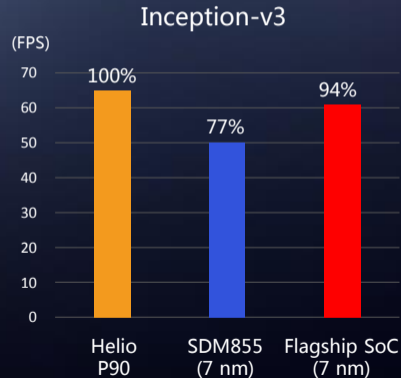
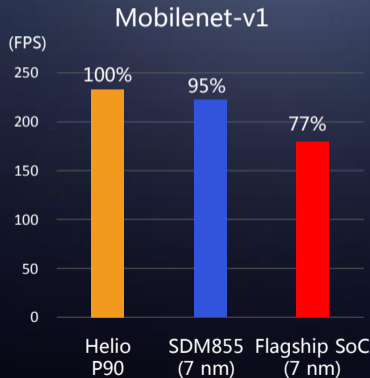
Performance (12 nm): CPU ~ 16 GMACs/W
GPU ~ 30 GMACs/W

SoC Total Bandwidth: 2CH LPDDR4 ~ 10 GB/s
4CH LPDDR4 ~ 22 GB/s



MediaTek Helio P90 Offers The Best AI Solution For Smartphones

- Heterogeneous platform with CPU, GPU, and APU
 - Flexibility
 - Low power consumption
- APU 2.0
 - High computing efficiency
 - Optimal bandwidth usage
 - High hardware utilization
- Helio P90 (12 nm and 2-channel LPDDR4) out-performs industry flagship products (7 nm and 4-channel LPDDR4) in AI



MediaTek Helio P90 Is Ranked First By ETH Zurich In AI-Benchmark

Model	CPU	RAM	Year	Android	Test 1a, ms (C)	Test 1b, ms (F)	Test 1c, ms (Q)	Test 2, ms (F)	Test 3, ms (Q)	Test 4, ms (F)	Test 5, ms (Q)	Test 6, ms (C)	Test 7, ms (C)	Test 8, ms (F)	Test 9, px (F)	AI-Score
MediaTek P90 Dev Platform	MediaTek Helio P90	6GB	2018	9	82	8	3	103	37	46	82	2403	377	989	14	25645
Qualcomm 855 Dev Platform	Snapdragon 855	6GB	2018	9	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="background-color: #f4a460; border-radius: 50%; width: 100px; height: 100px; display: flex; align-items: center; justify-content: center; text-align: center;"> <p>#1 25645</p> </div> <div style="background-color: #ff4500; border-radius: 50%; width: 100px; height: 100px; display: flex; align-items: center; justify-content: center; text-align: center;"> <p>#2 22082</p> </div> <div style="background-color: #4169e1; border-radius: 50%; width: 100px; height: 100px; display: flex; align-items: center; justify-content: center; text-align: center;"> <p>#3 21526</p> </div> </div>			6	63	266	146	10	22082			
Huawei Kirin 980 Dev Platform	HiSilicon Kirin 980	6GB	2018	9				19	55	347	20	21526				
Asus Zenfone 5z	Snapdragon 845	6GB	2018	9				8	151	184	10	14448				
OnePlus 6	Snapdragon 845	8GB	2018	9	7	160	188	10	14403							
Huawei Mate 20 Pro	HiSilicon Kirin 980	6GB	2018	9	52	19	84	50	743	58	663	1583	298	1150	4	14295

Source: http://ai-benchmark.com/ranking_all.html

The Mediatek logo consists of the word "MEDIATEK" in a bold, white, sans-serif font, centered within a white-outlined parallelogram shape that is wider than it is tall. The background is a dark blue gradient with a faint, light-colored circuit board pattern at the bottom.

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everyday genius