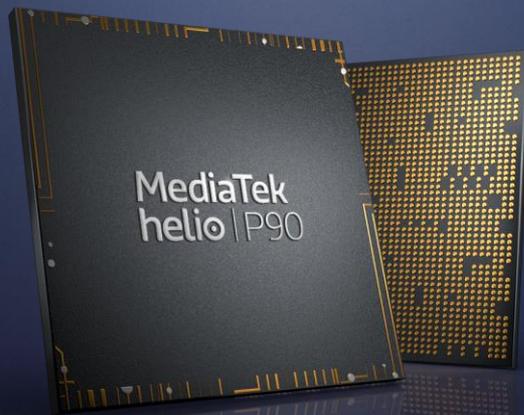**MEDIATEK**

MediaTek helio | P90

New AI Flagship

Super AI Powerhouse / Extraordinary AI Camera

Dr. Yenchi Lee / Senior Director
MediaTek Wireless Communications BU

AI Performance Upgrade
- New APU 2.0 Architecture
- TMACs AI Power

Camera Experience Upgrade
- AI + Flagship 3x ISP
- Best night shots and portrait photography

CPU / GPU Upgrade
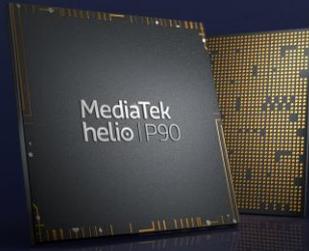- CPU Upgrade A75 / A55 Architecture
- GPU improve by 50%

Connectivity Upgrade
- Support Cat-12, 3xCA, 4x4 MIMO
- Support 802.11ac 2x2 MIMO

APU 2.0

New AI Computing Architecture : 4x AI performance , Half the power consumption

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Design Challenges of Edge AI Processors

MediaTek
helio P90

EDGE AI Processor
Considerations :

**AI Computing
Capability**

**Low Power
Design**

**Memory
Bandwidth
Optimization**

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APU 2.0 Upgrades

APU 2.0

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>**1.1T**MACs

AI Computing Capability

Flagship AI Performance

4x better than APU 1.0

Support Fixed and Floating Point Computing

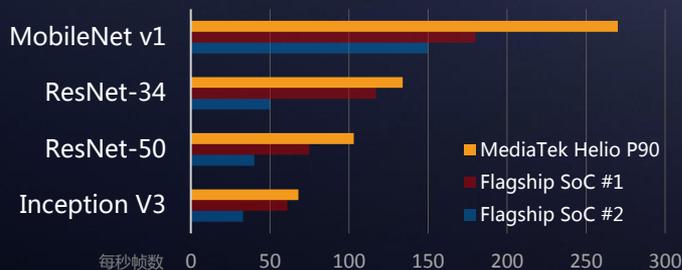Support both INT8 and FP16

Super Low Power

Power consumption is 50% lower than APU 1.0

Low Bandwidth Requirements

50% lower bandwidth requirements

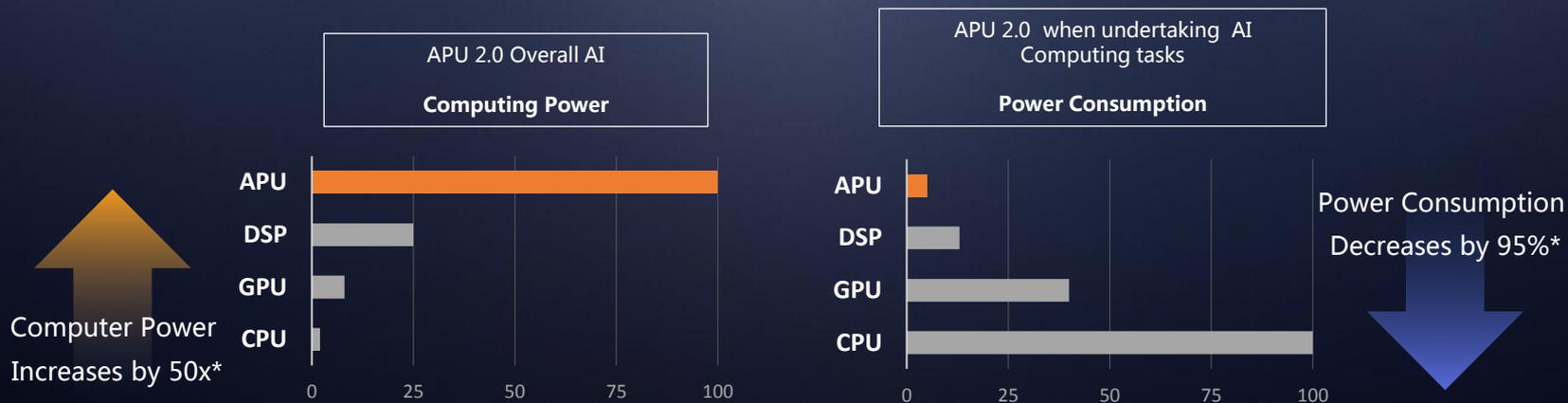MEDIATEK

Flagship Smartphone SOC
AI Capability Comparison

4 common AI networks
AI Computing Efficiency Benchmark

Network	Value
MobileNet v1	
ResNet-34	
ResNet-50	
Inception V3	

- MediaTek Helio P90
- Flagship SoC #1
- Flagship SoC #2

每秒帧数   0   50   100   150   200   250   300

ETH Zurich AI-Benchmark
AI Performance Score

MediaTek Helio P90	**25645**
No. 2	22082
No. 3	21526
No. 4	14448

0   10000   20000   30000

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APU 2.0 Advantages vs. CPU / GPU / DSP

APU 2.0 Overall AI

Computing Power

APU	(100)
DSP	(25)
GPU	(8)
CPU	(2)

0   25   50   75   100

Computer Power
Increases by 50x*

APU 2.0 when undertaking AI
Computing tasks

Power Consumption

APU	(5)
DSP	(13)
GPU	(40)
CPU	(100)

0   25   50   75   100

Power Consumption
Decreases by 95%*

• Compared to CPU computing
power and power consumption

MEDIATEK

Super AI Capabilities :
Enabling New & Exciting AI Camera Applications

Multiperson pose tracking @ 60 fps

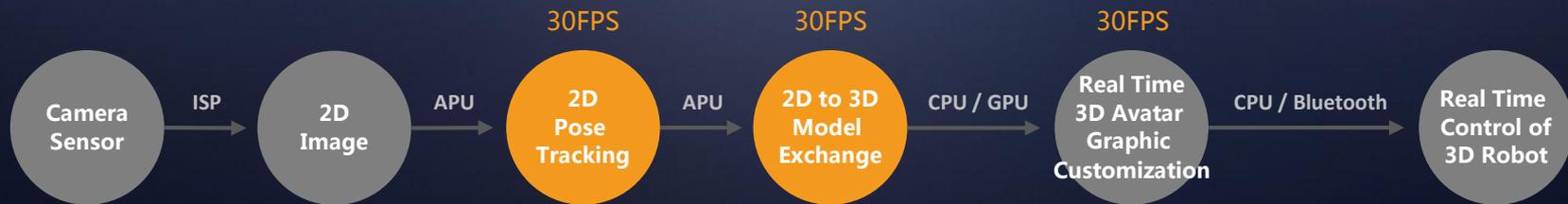**Edge AI-
3D human pose tracking/ Avatar**

**Edge AI-
Multi Object Recognition**

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Industry Leading :
Real-Time 3D Human Pose Tracking

Industry Leading :
Real-Time 3D Human Pose Tracking

30FPS   **30FPS**   **30FPS**

Camera Sensor → ISP → **2D Image** → APU → **2D Pose Tracking** → APU → **2D to 3D Model Exchange** → CPU / GPU → **Real Time 3D Avatar Graphic Customization** → CPU / Bluetooth → **Real Time Control of 3D Robot**

Can be applied in AR / VR、3D Motion Sensing Games、
Virtual Personal Trainer、3D Fitting Rooms

MEDIATEK

NeuroPilot 2.0 :
Complete and Open EDGE AI Platform
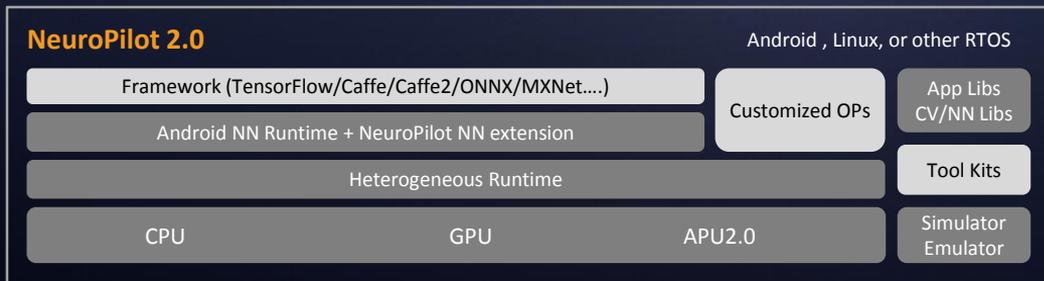
Face ID

Beautification

Scene Detection

Gesture Detection

Voice Recognition

Benchmark

NeuroPilot 2.0

Android , Linux, or other RTOS

Framework (TensorFlow/Caffe/Caffe2/ONNX/MXNet….)

Android NN Runtime + NeuroPilot NN extension

Heterogeneous Runtime

| CPU | GPU | APU2.0 |

Customized OPs

App Libs CV/NN Libs

Tool Kits

Simulator Emulator

Fully Support Android NNAPI

- Open Architecture
- Can flexibly call upon APU / GPU / CPU based on need
- Better for 3rd Party APP Developers
- Increase APU Efficiency

Provide Comprehensive Development Tools

- NeuroPilot Toolkit

MEDIATEK

Partner with 3rd Parties
to bring different AI applications to life

MEDIATEK

Google   Microsoft   Face++ 旷视   商汤 sensetime   ArcSoft 虹软   MALONG

MEDIATEK

Extraordinary AI Camera

Flagship 3x ISP Architecture / Best Portrait Photography

MEDIATEK

AI Camera KSPs

3x ISP Architecture Upgrade

- First to support 3x ISPs Active simultaneously
- Instant and smooth transition between multiple focal lengths
- 14-bit HDR

Best Portrait Photography

- AI Face Detection Engine
- AI Noise Reduction
- AI Depth Map

MEDIATEK

Industry First :
3x ISPs simultaneously ACTIVE. Instant & Smooth transition among 3 focus lengths, for best imaging experience.

16 MP
120° ultra-wide

14-bit ISP #1

48 MP
80° wide

14-bit ISP #2

8 MP
40° tele

14-bit ISP #3

MEDIATEK

14-bit HDR ISP： Best Single Shot HDR Effect

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Competitor

Industry's First AI Face Detection Engine

Extraordinary Performance
- High detection rate and
- High Accuracy

Super Low Power
- Dedicated HW can lower power consumption by 72%

Rich Features
- Face Detection / Gender Identification / Movement Prediction

Works under difficult conditions
- Side of Face / Side of Head / Turning Head / Strong Backlight / Distant Face / Moving, blurry face... can all be detected

AI Noise Reduction : Surpass Traditional CV Noise Reduction Abilities

AI NR Model Training

Use AI modeling algorithm, to produce image results that resemble that of large pixel sensors. Surpass traditional

CV NR limits, to deliver best image quality under low light environment
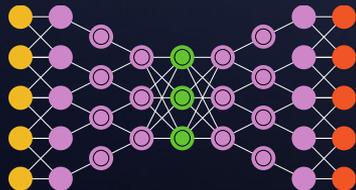
14-bit HDR ISP

Retain original image details.
Avoid color and detail loss due to NR

AI Multi Frame Noise Reduction

Processing Multi-Frame align/warp/de-ghost with powerful APU computing capability

10-bit   **14-bit**

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Extraordinary AI NR Examples : Low Light Image Capture

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Flagship SoC #1

Apple A12

Flagship SoC #2

MEDIATEK

Extraordinary AI NR Snapshot : Moving Subjects

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Moving Subject is Clear Low Noise Level

Flagship SoC #1

Apple A12

Flagship SoC #2

Moving Subject is Blurred High Noise Level
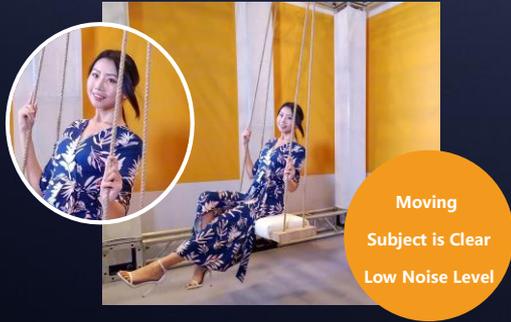
MEDIATEK

AI Depth Map

Machine Learning
+
Powerful AI Capability

= Accurate Depth

Scene

MediaTek AI Depth Map

3rd Party Algorithm

Error Depth

7nm AP

Poor foreground levels
Blurred Depth

7nm SoC #1

Poor foreground levels
Error Depth

Far ▭ Near

Original

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AI Bokeh

MEDIATEK

AI Camera： Surpass traditional CV algorithm and processing abilities. Provide best camera experience ever.

Best shots when subject is moving

Best shots in dark environments

MEDIATEK

CPU / GPU Upgrade

CPU / GPU Upgrades

| CPU Single Core increase by **30%** | CPU Multi Core increase by **15%** | GPU increase by **50%** |

GeekBench v4.2 Single Core

GeekBench v4.2 Multi Core

GFXBench 4.0 Manhattan 3.0

■ Helio P70
■ Helio P90

MEDIATEK

Modem / Connectivity Upgrades

Modem Upgrades

Upgrade to Cat-12

Support 3CA
UL/DL 150/600 Mbps

Support 4x4 MIMO

From 2 Rx to 4 Rx
Signal +5dB, Throughput +30%

Latency Optimization

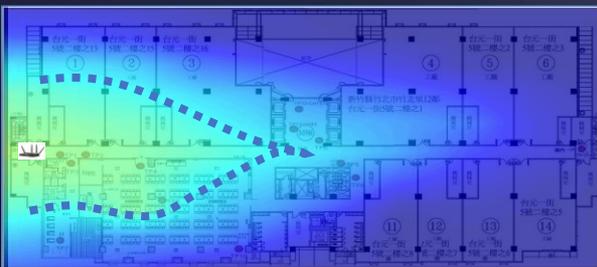Latency improvement by 80% vs prev. gen.
Better online gaming experience

Lower Power

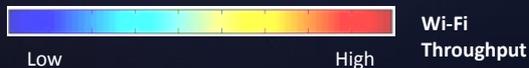Talking and Datalink
Power improvement
by 20% vs prev. gen.

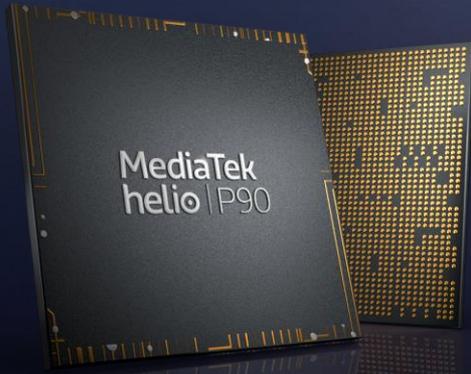MEDIATEK

Wi-Fi Upgrades

MediaTek Helio P60 (1x1 SISO)

MediaTek Helio P90 (2x2 MIMO)

Higher Throughput

Longer Range

Low   High

Wi-Fi Throughput

Support 2x2 Wi-Fi MIMO

- Double Max. Throughput
- Reception range increase by 20m under weak signal

MEDIATEK

MediaTek Helio P90 Platform KSP Summary

AI Capability Upgrade

- New APU 2.0 Architecture
- TMACs AI Power

CPU / GPU Upgrade

- CPU Upgrade to A75 / A55 Architecture
- GPU improve by 50%

Camera Experience Upgrade

- AI + Flagship 3x ISP
- Best Night Shots and Portrait Photography

Connectivity Upgrade

- Support Cat-12, 3CA
- Support 802.11ac 4x4 MIMO

MediaTek helio | P90

MEDIATEK

Helio P90 Industry Firsts

- **Highest AI-Benchmark Score**

- **AI Camera：** Surpass traditional CV algorithm and processing abilities. Provide best night shot and active shot (capturing split second moment) experience.

- **3X ISP simultaneously ACTIVE:** Support smooth and instant transition from ultra-wide to tele. (3 focal lengths)

- **First to use AI algorithm to track 3D human pose via smartphone camera in real time**

- **Most power efficient 4G modem**