The Past, Present and Future of ML

Applications of Machine Learning

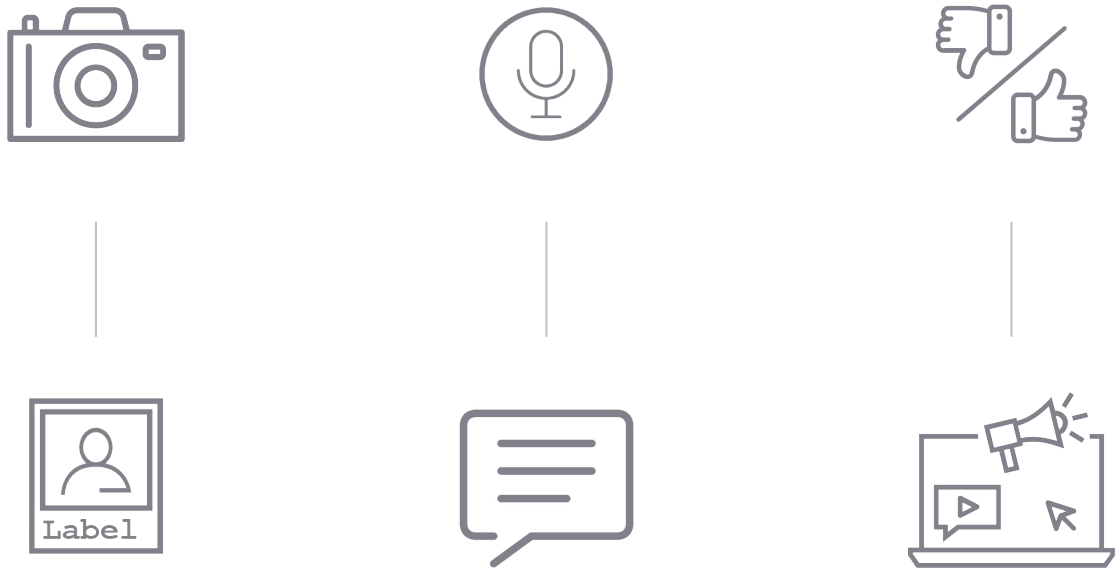
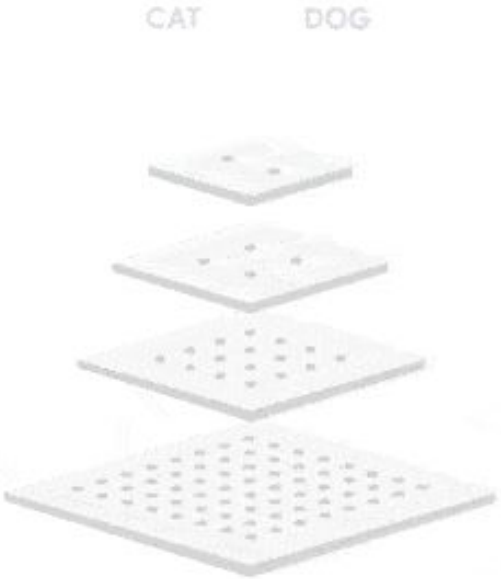
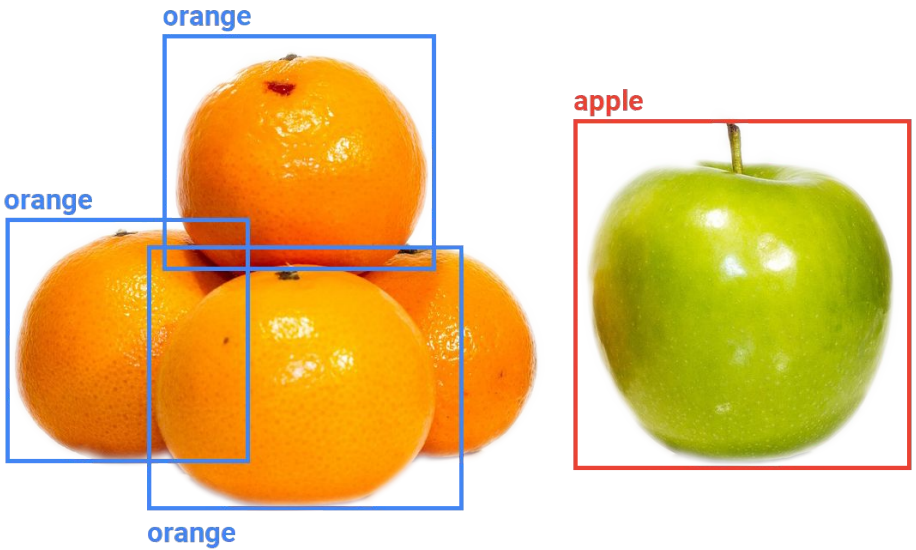


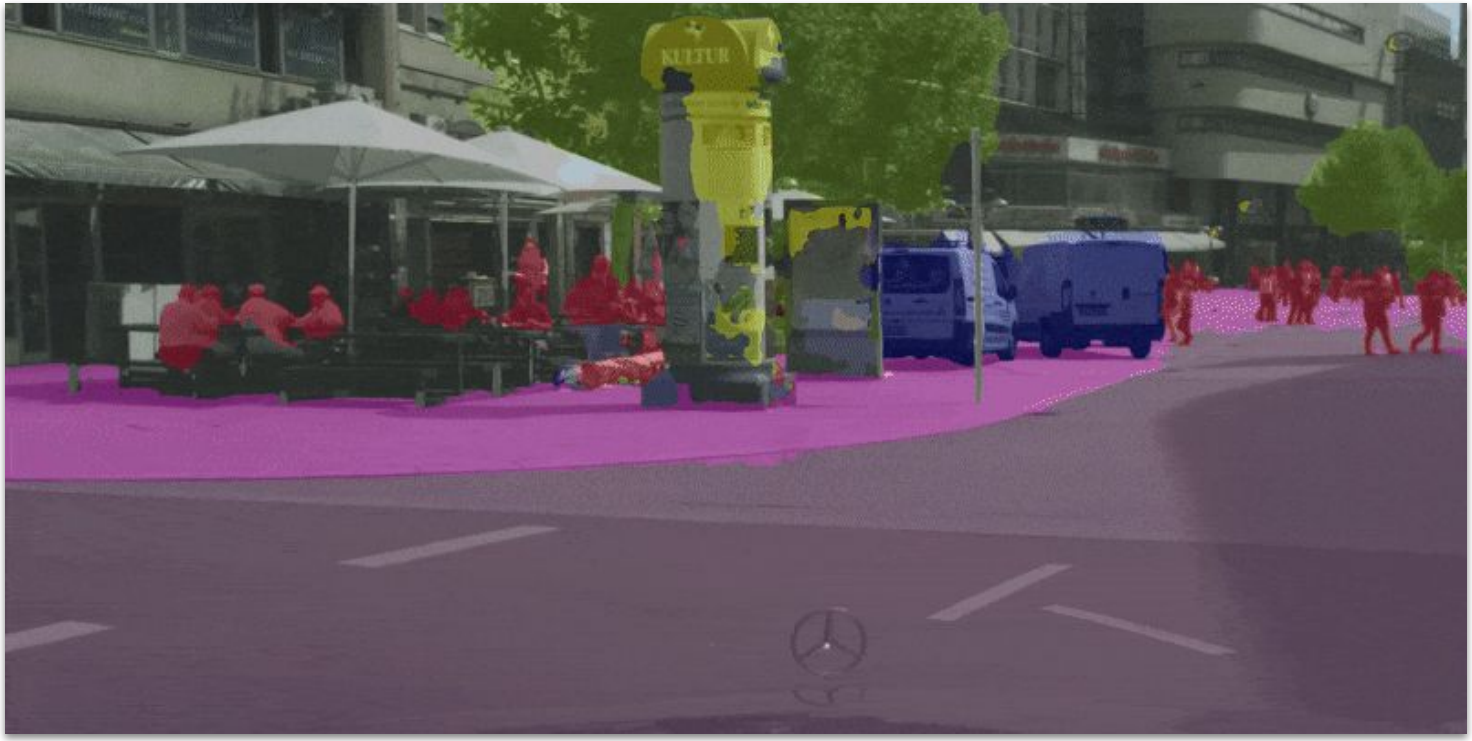
Image Classification



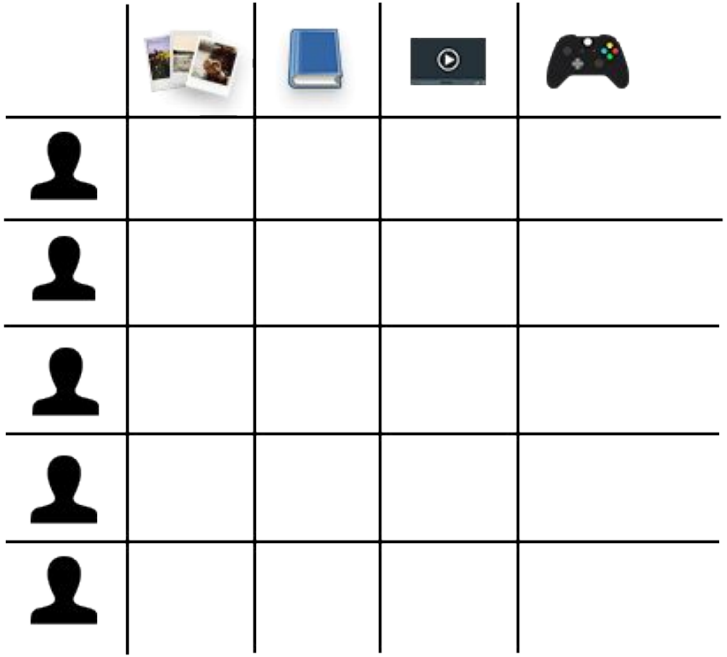
Object Detection



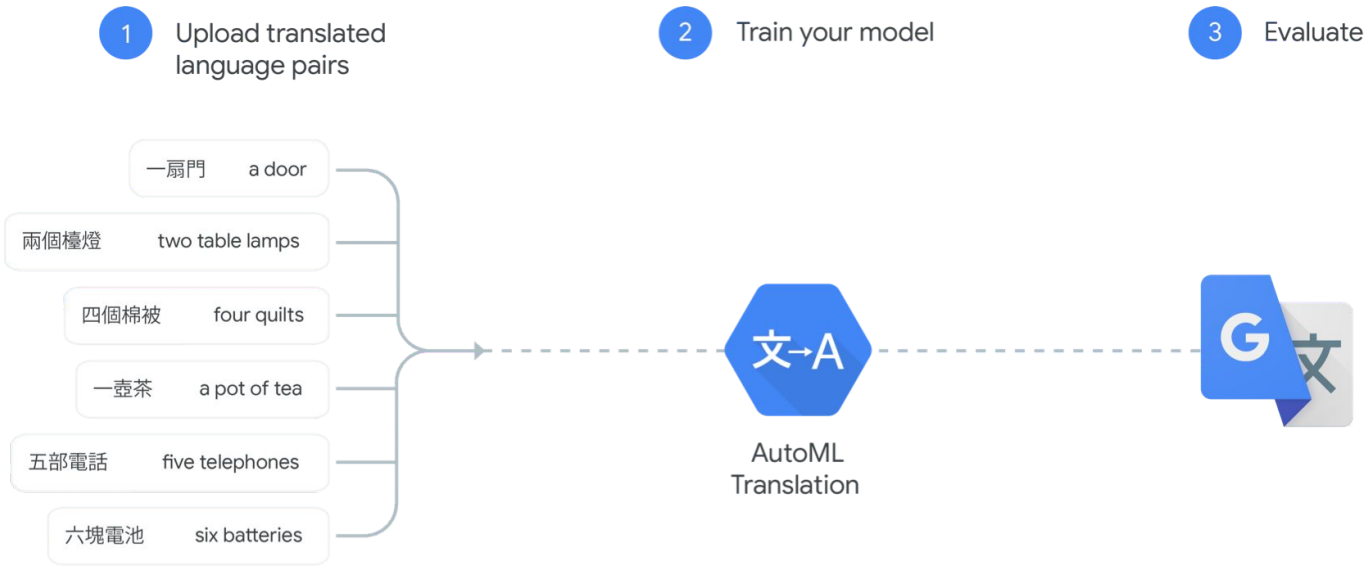
Segmentation



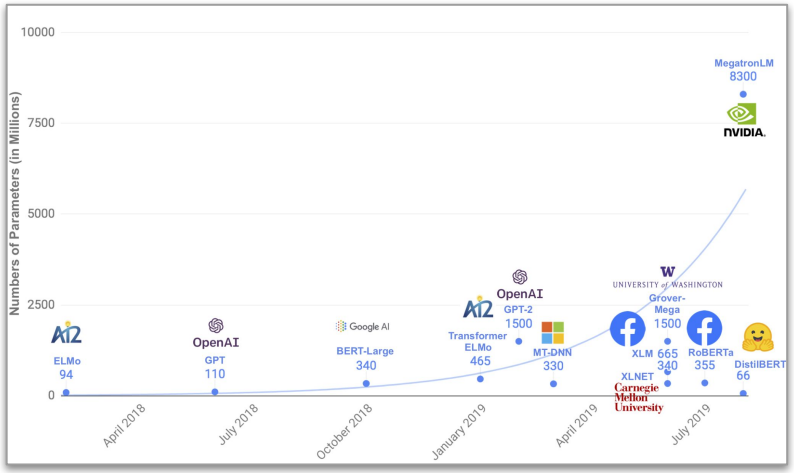
Recommendations



Machine Translation

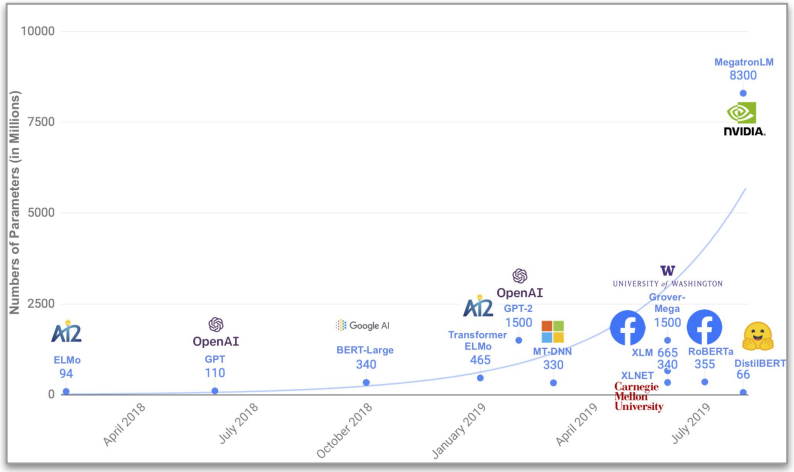


ML Models Are Getting Bigger

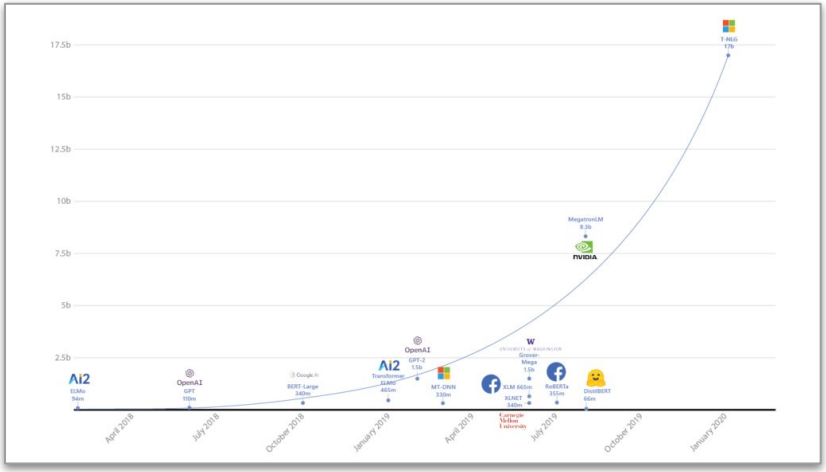


2019

ML Models Are Getting Bigger



2019



2020

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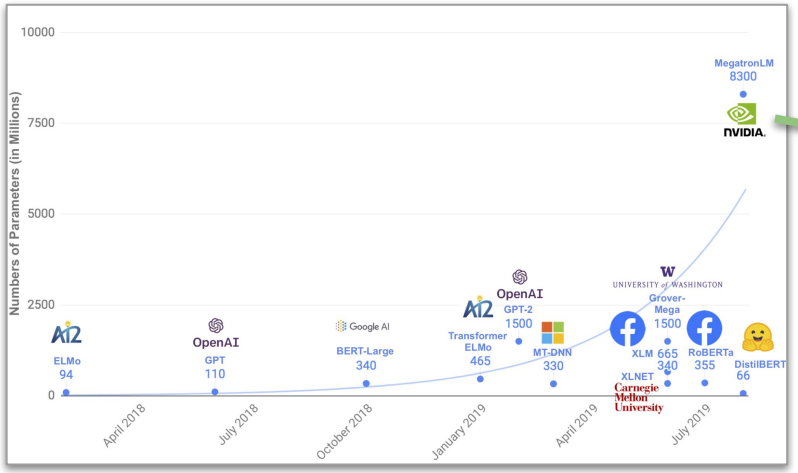

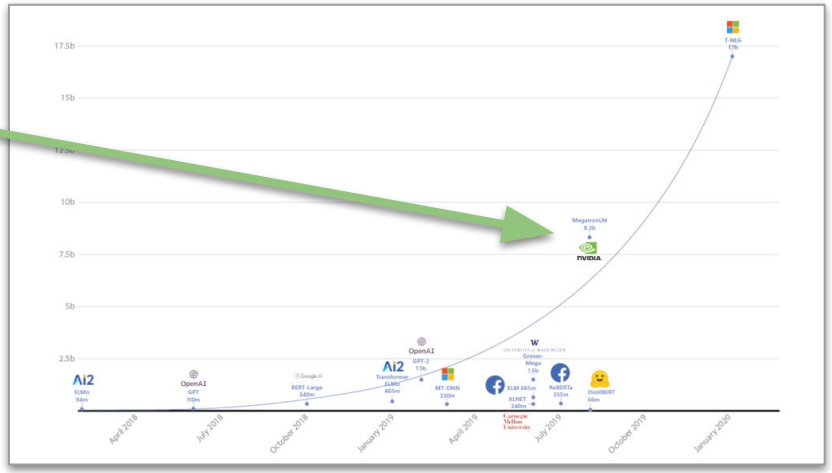

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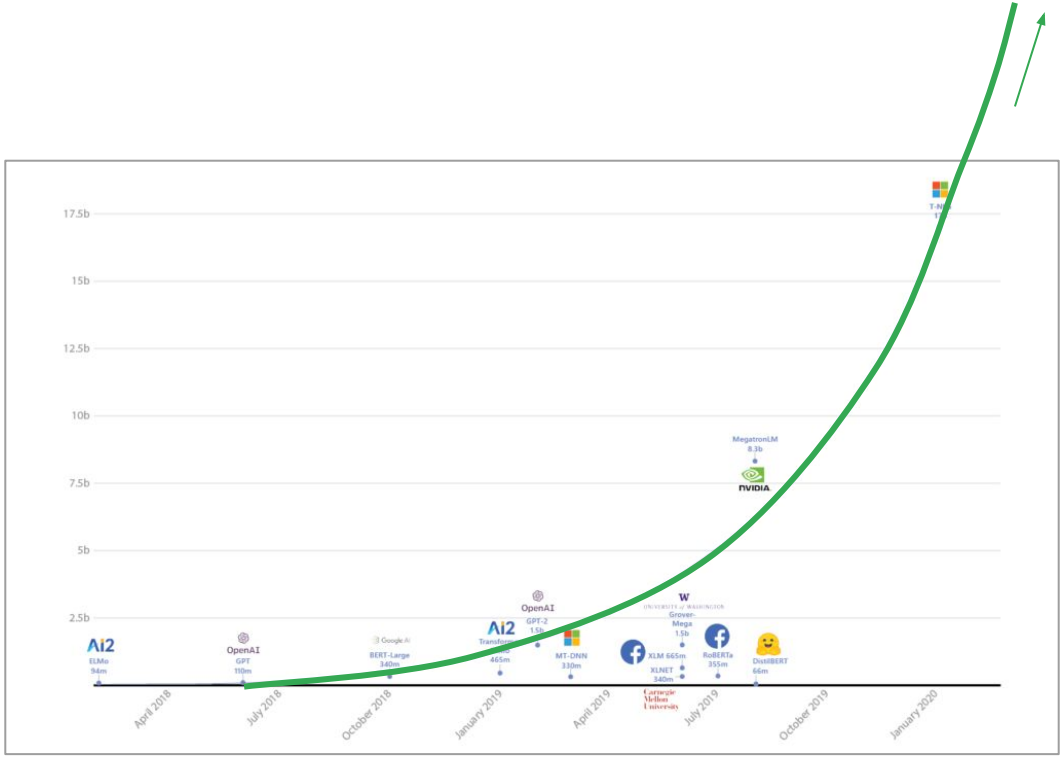
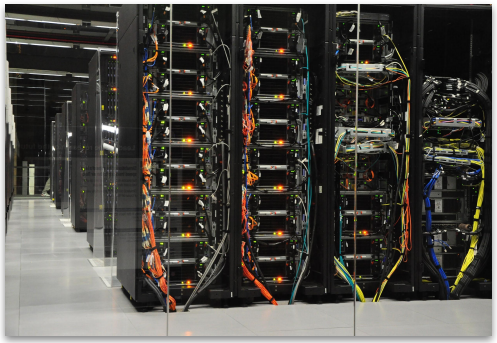


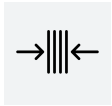
Cloud/ Datacenter

Mobile

IoT

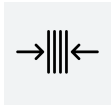


Google Assistant



Bandwidth

Edge devices can extract meaningful information from data that would otherwise be inaccessible due to bandwidth **constraints**



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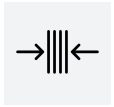
Latency

On-device ML models respond in **real-time** (less network latency)



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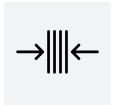
On-device processing avoids **cost** of cloud processing



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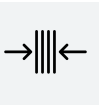

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Reliability

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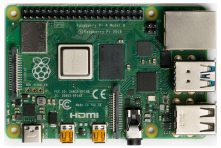
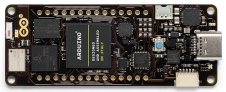
Privacy

Data **on-device**, less transmission to other devices, fewer opportunities for misuse of data

Jetson Nano
Cortex A + GPU

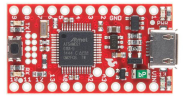


Raspberry Pi
Cortex A



Arduino Pro
Cortex M7

Arduino Nano
Cortex M4



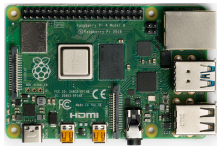
SAMD21
Cortex M0+

Vision

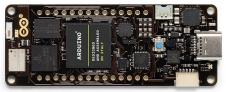
Audio

Sensor

Jetson Nano
Cortex A + GPU

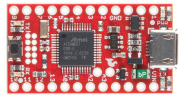


Raspberry Pi
Cortex A



Arduino Pro
Cortex M7

Arduino Nano
Cortex M4



SAMD21
Cortex M0+

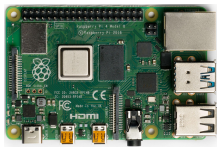
Vision

Audio

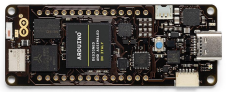
Sensor

Video Classification

Jetson Nano
Cortex A + GPU



Raspberry Pi
Cortex A



Arduino Pro
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Arduino Nano
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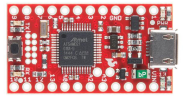


SAMD21
Cortex M0+

Vision

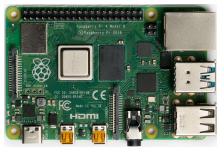
Audio

Sensor

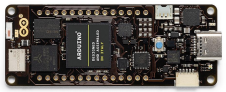
Video Classification

Object Detection
1MB

Jetson Nano
Cortex A + GPU



Raspberry Pi
Cortex A



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Arduino Nano
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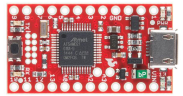


SAMD21
Cortex M0+

Vision

Audio

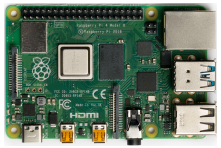
Sensor

Video Classification

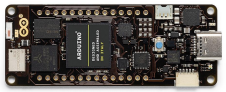
Object Detection
1MB

Image Classification
250KB

Jetson Nano
Cortex A + GPU



Raspberry Pi
Cortex A



Arduino Pro
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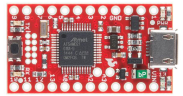


SAMD21
Cortex M0+

Vision

Audio

Sensor

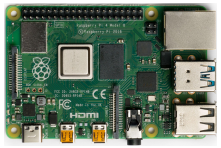
Video Classification

Object Detection
1MB

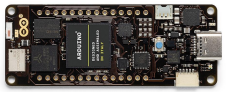
Image Classification
250KB

Keyword Spotting
50KB

Jetson Nano
Cortex A + GPU



Raspberry Pi
Cortex A



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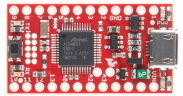

SAMD21
Cortex M0+

Vision

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Sensor

Video Classification

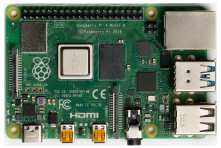
Object Detection
1MB

Image Classification
250KB

Keyword Spotting
50KB

Anomaly Detection
Sensor Classification
20KB

Jetson Nano
Cortex A + GPU



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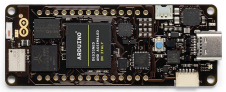

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Arduino Nano
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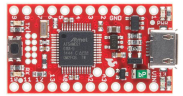

SAMD21
Cortex M0+

Vision

Audio

Sensor

???

Video Classification

Object Detection
1MB

Image Classification
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Keyword Spotting,
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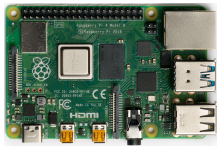
Cortex A + GPU



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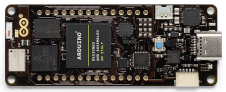

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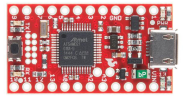

SAMD21
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“The Future of Machine Learning is Tiny and Bright”

Prof. Vijay Janapa Reddi
Harvard University