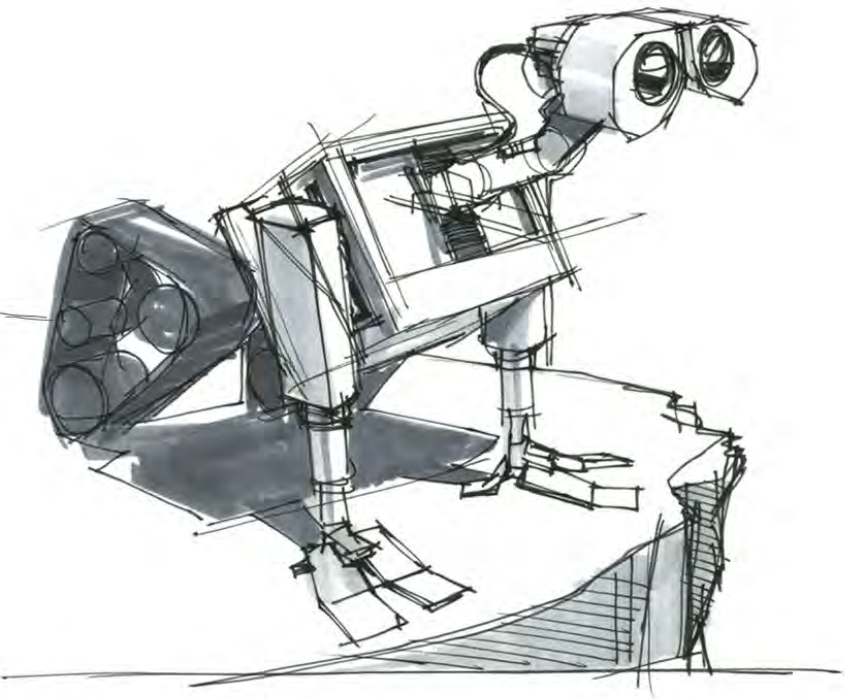
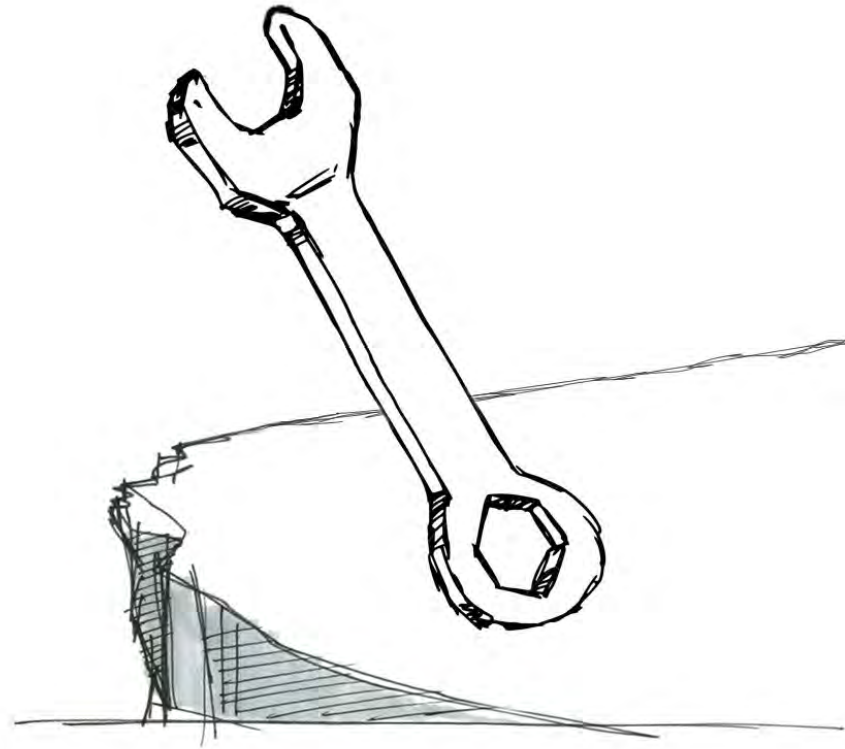


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Strong vs. Weak Artificial Intelligence

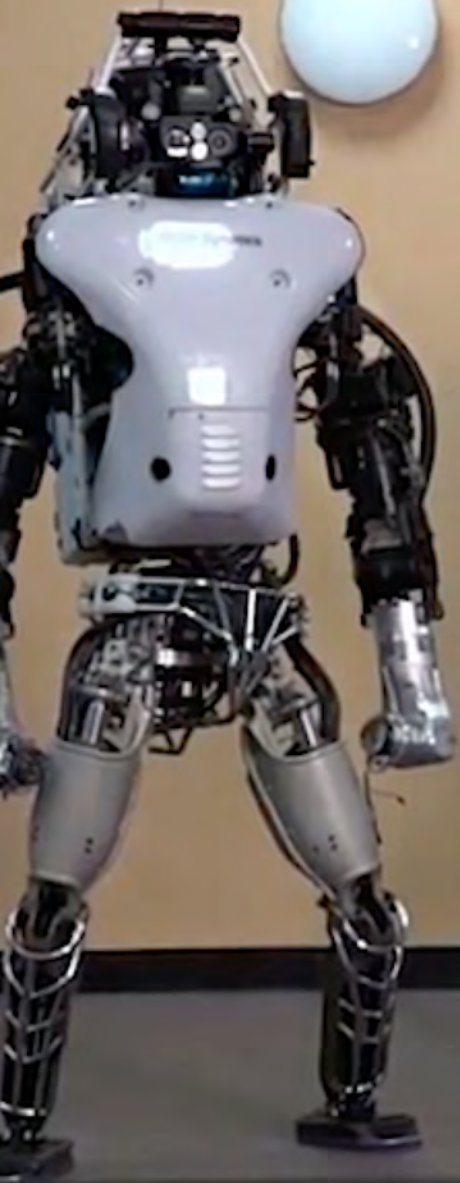


general purpose

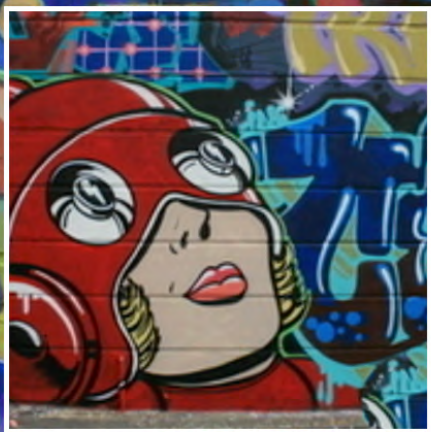


application specific

Boston Dynamics





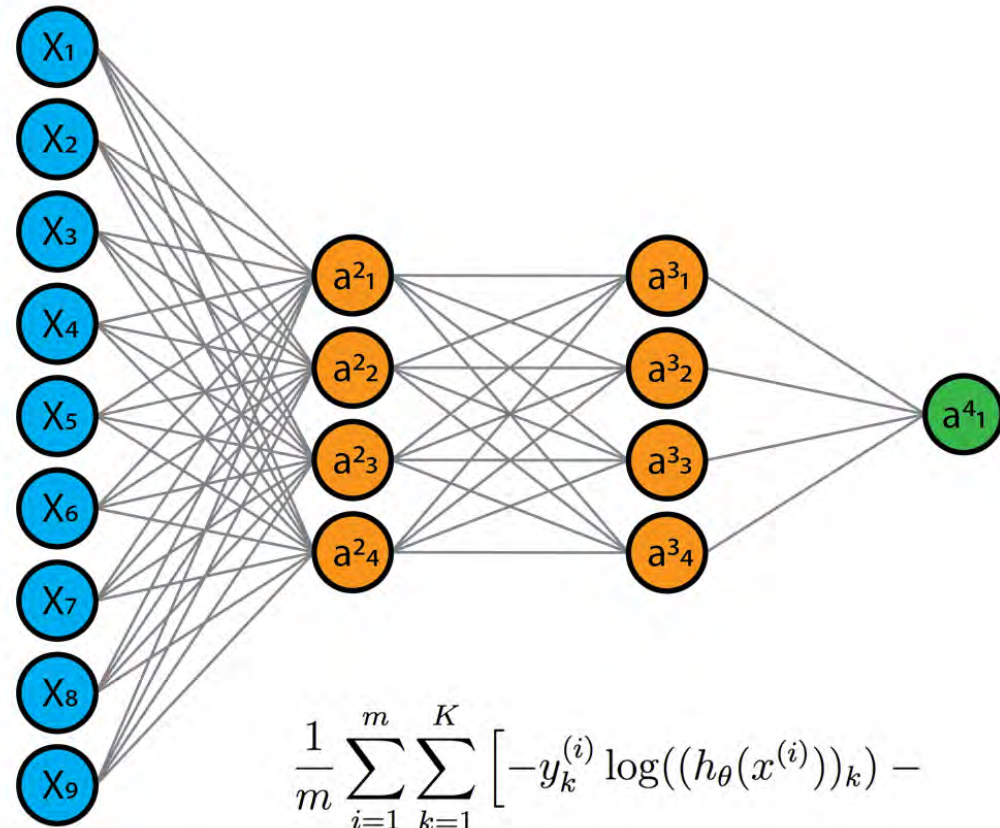




Rule Based

```
if y <= 0 {  
  if alpha >= 1 {  
    alpha = 1  
    if !settingsGearOn {  
      UIView.animateWithDuration(0.2, animations: {  
        self.settingsGearActive.alpha = 1  
        self.settingsGear.alpha = 0  
      })  
      settingsGearOn = true  
    }  
  }else{  
    if settingsGearOn {  
      UIView.animateWithDuration(0.2, animations: {  
        self.settingsGearActive.alpha = 0  
        self.settingsGear.alpha = 1  
      })  
      settingsGearOn = false  
    }  
  }  
  if !settingsGearOn {  
    settingsGear.alpha = alpha  
  }  
  settingsGearScale(alpha)  
}else{  
  settingsGear.alpha = 0  
  settingsGear.hidden = true  
}
```

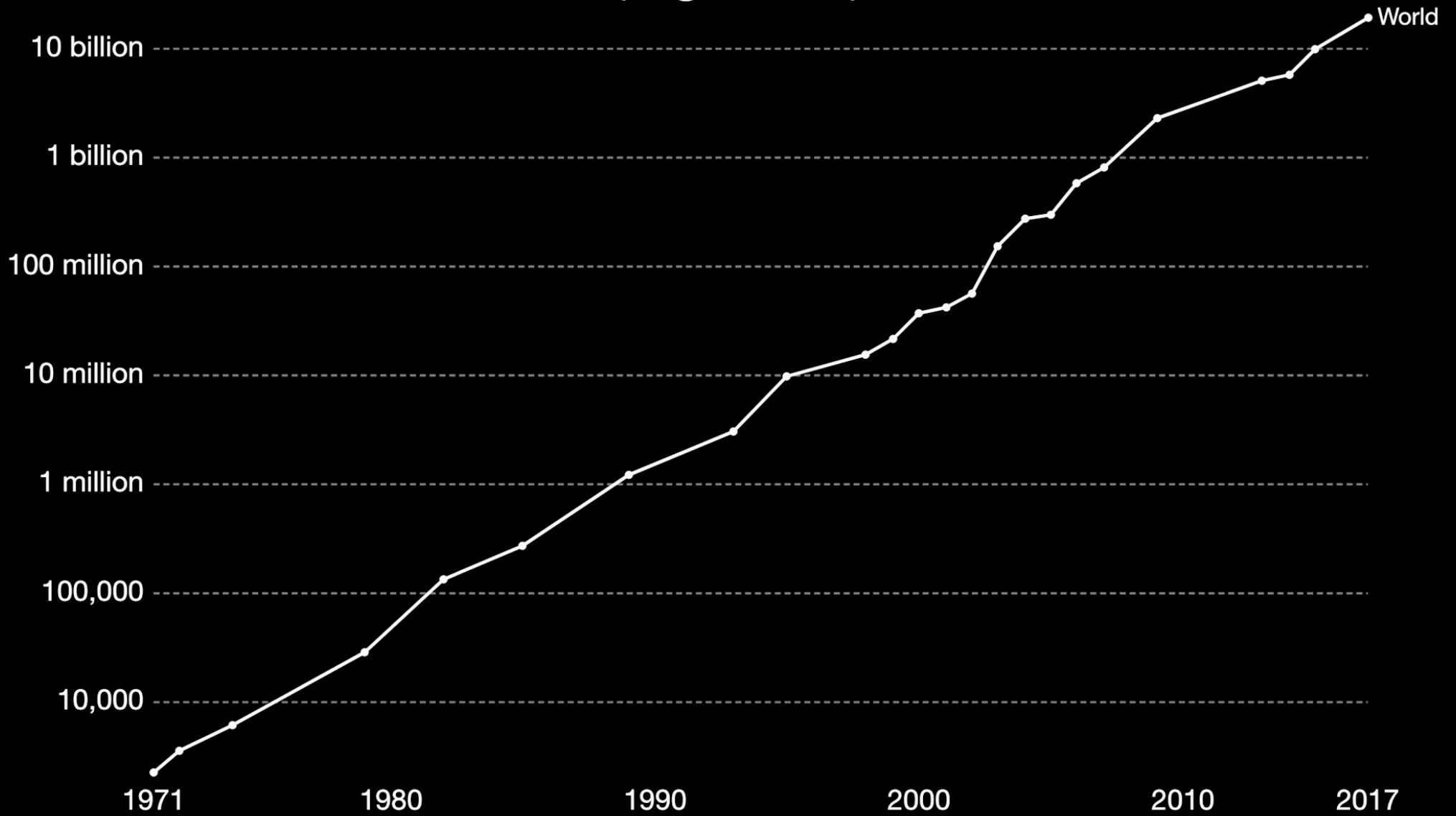
Machine Learning



$$J(\theta) = \frac{1}{m} \sum_{i=1}^m \sum_{k=1}^K \left[-y_k^{(i)} \log((h_{\theta}(x^{(i)}))_k) - (1 - y_k^{(i)}) \log(1 - (h_{\theta}(x^{(i)}))_k) \right] + \frac{\lambda}{2m} \left[\sum_{j=1}^{25} \sum_{k=1}^{400} (\Theta_{j,k}^{(1)})^2 + \sum_{j=1}^{10} \sum_{k=1}^{25} (\Theta_{j,k}^{(2)})^2 \right]$$

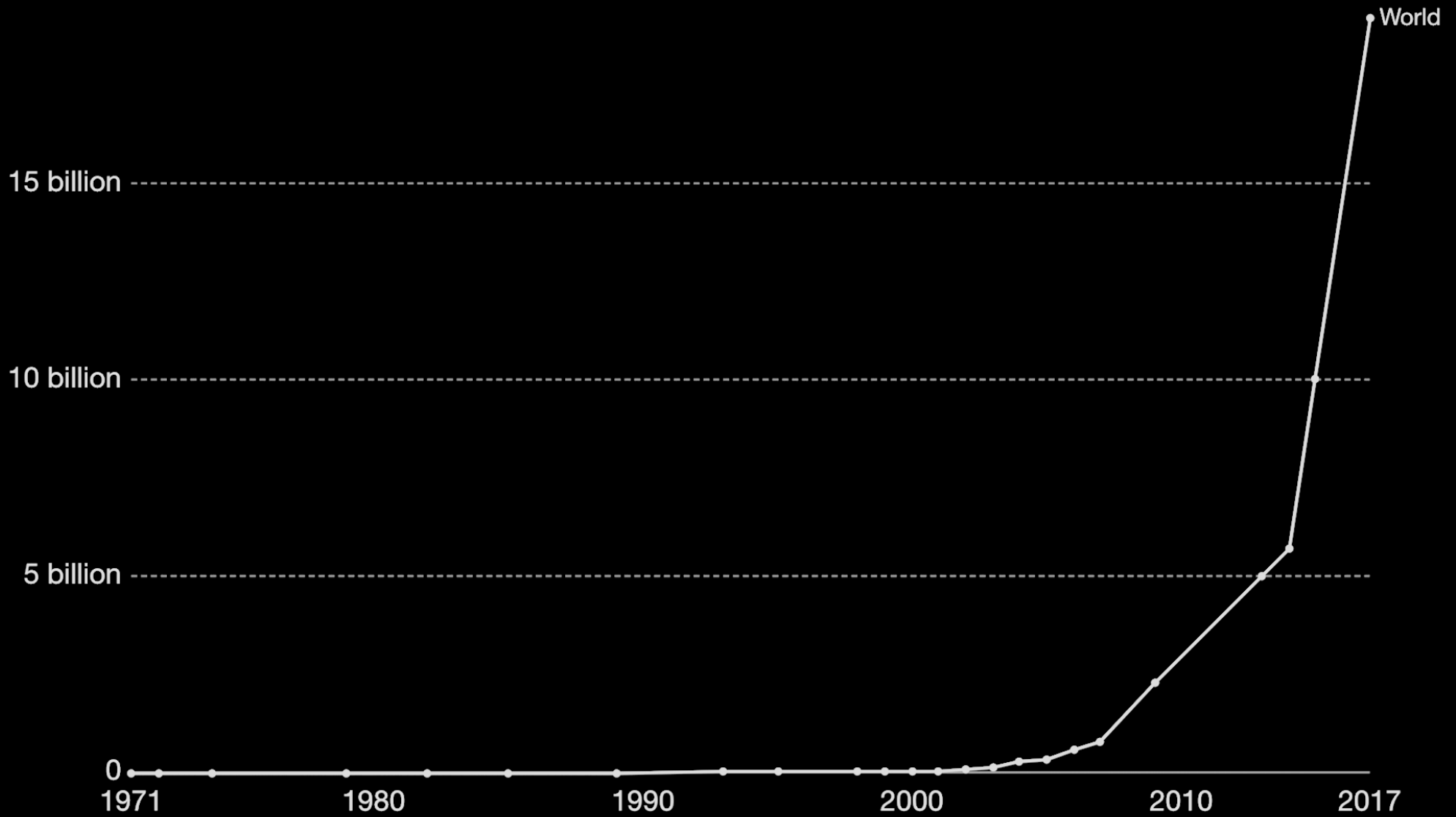
Moore's Law

(log scale)



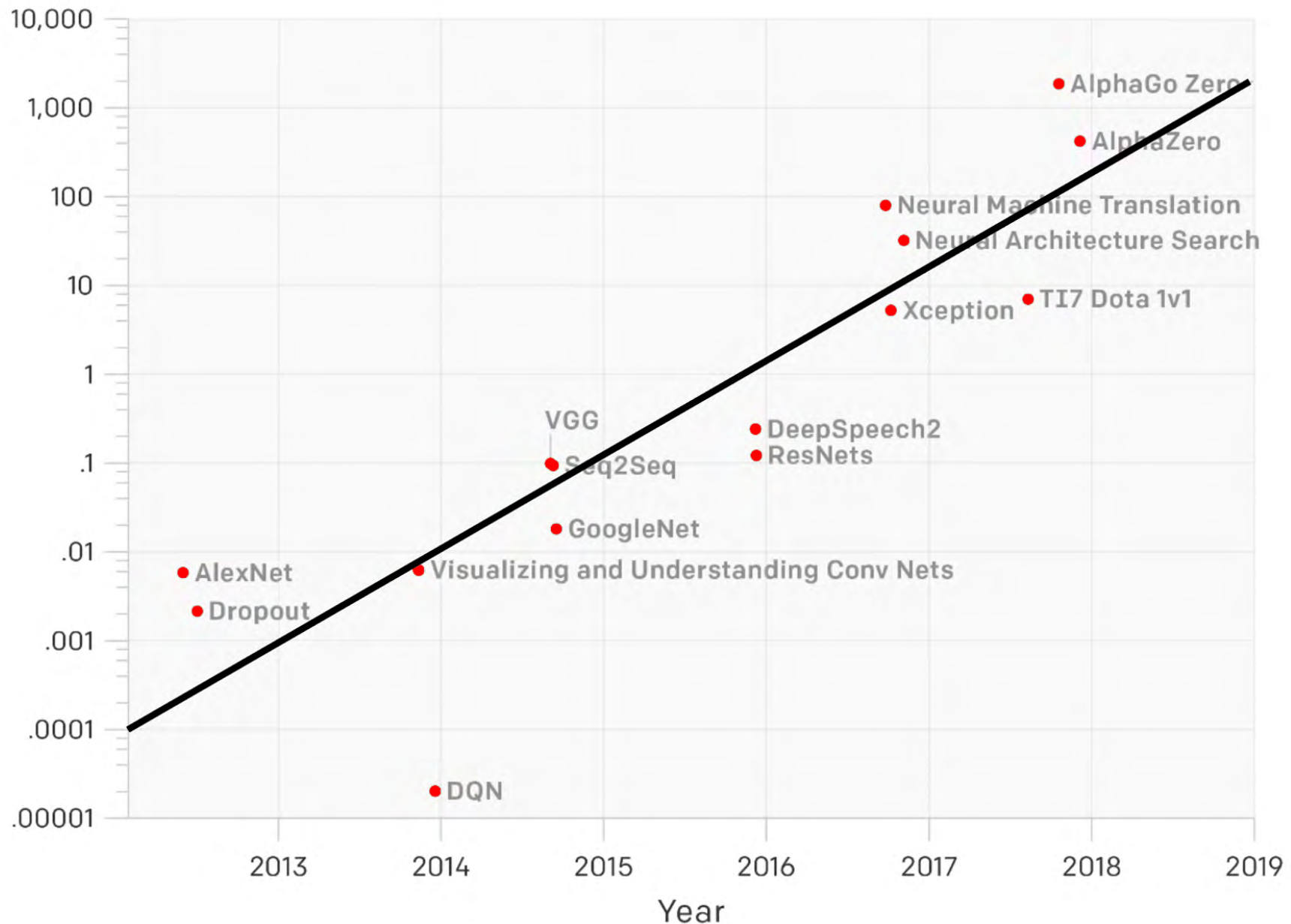
Moore's Law

(linear scale)



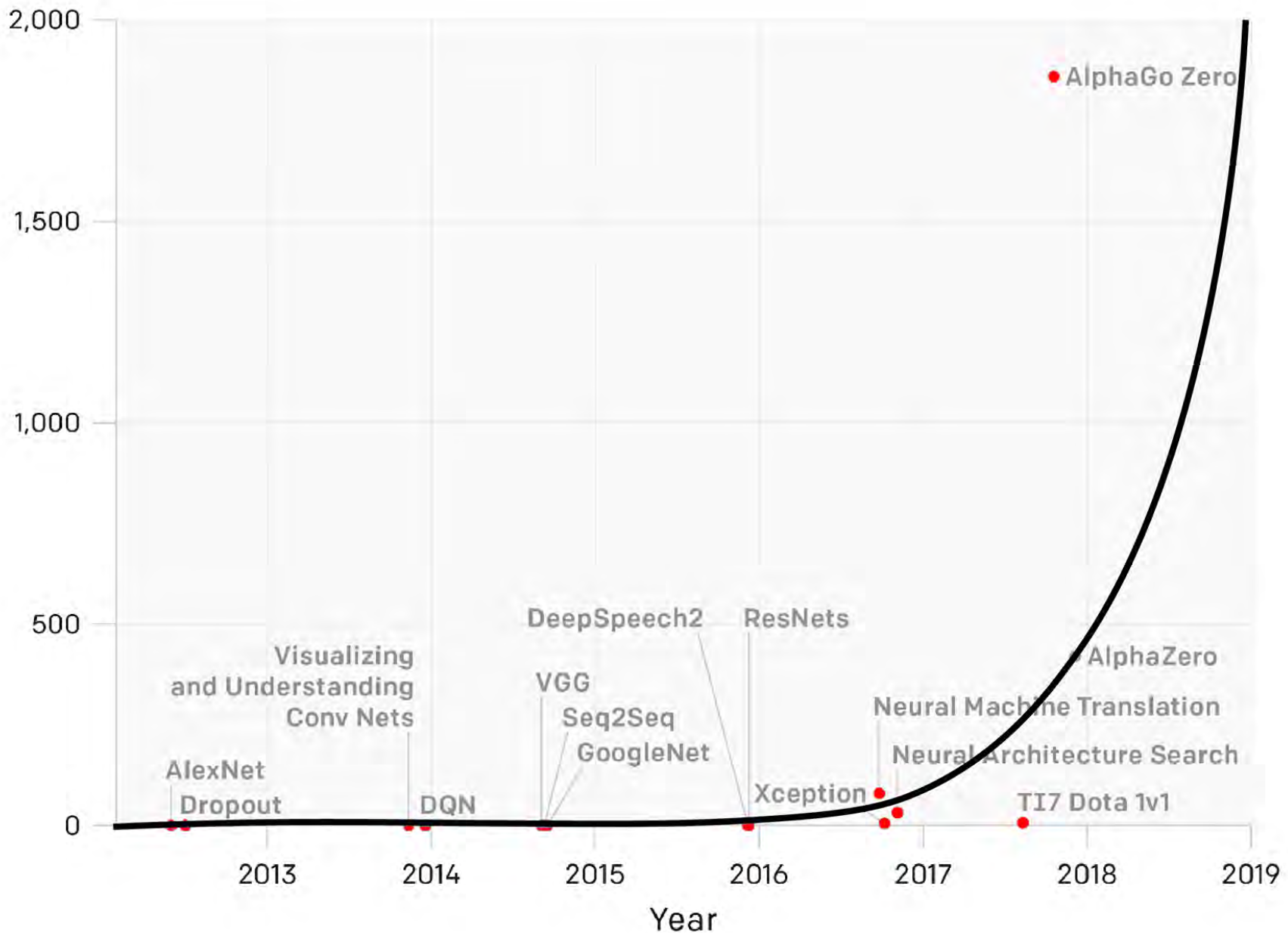
Resources Dedicated to ML

Double Every 3.5 Months

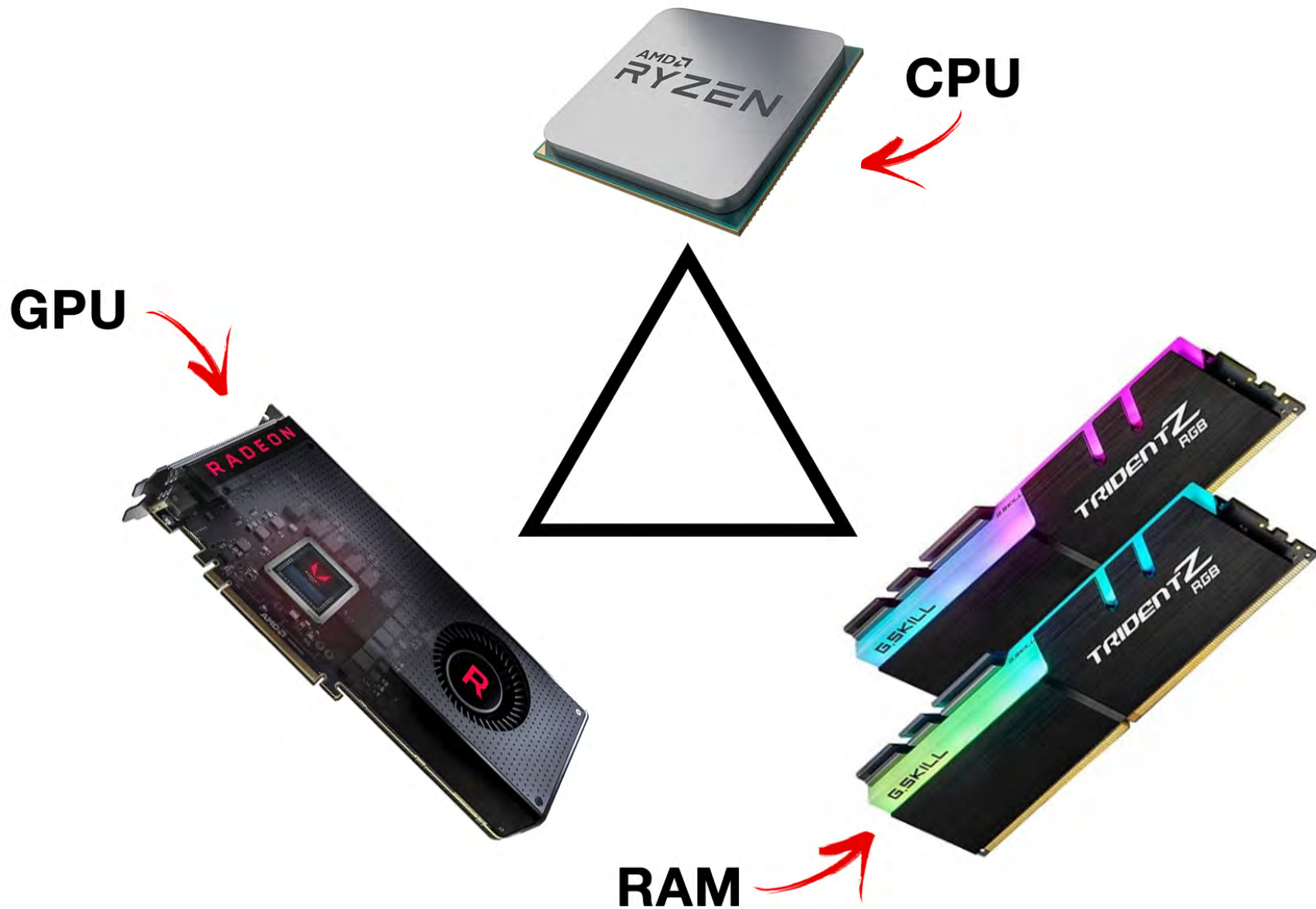


Resources Dedicated to ML

Double Every **3.5 Months**



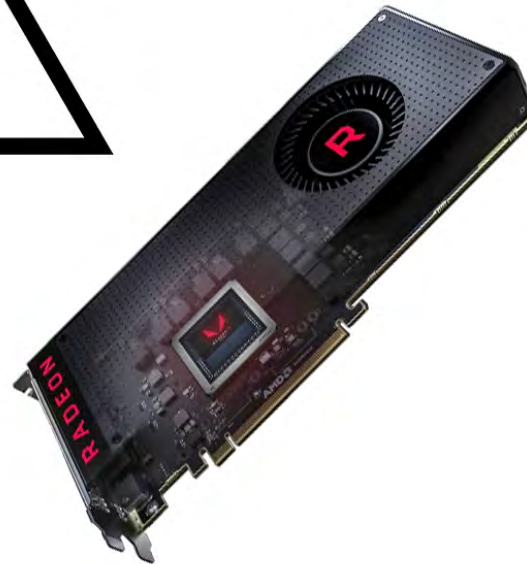
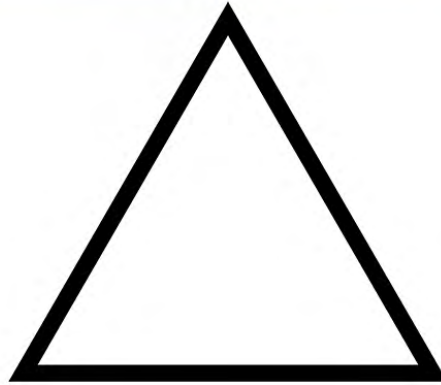
Compute Triangle



ML Triangle

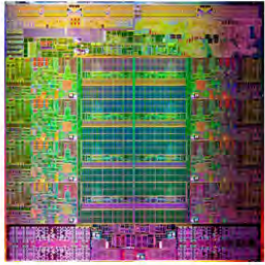


Current **ML**
Bottleneck



Density

Latency



SRAM

1x

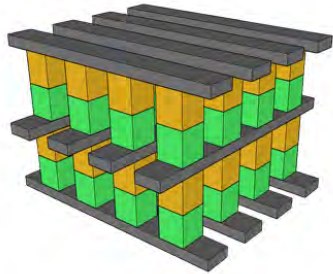
1x



DRAM

100x

10x



3D XPoint

1,000x

100x



NAND

1,000x

100,000x

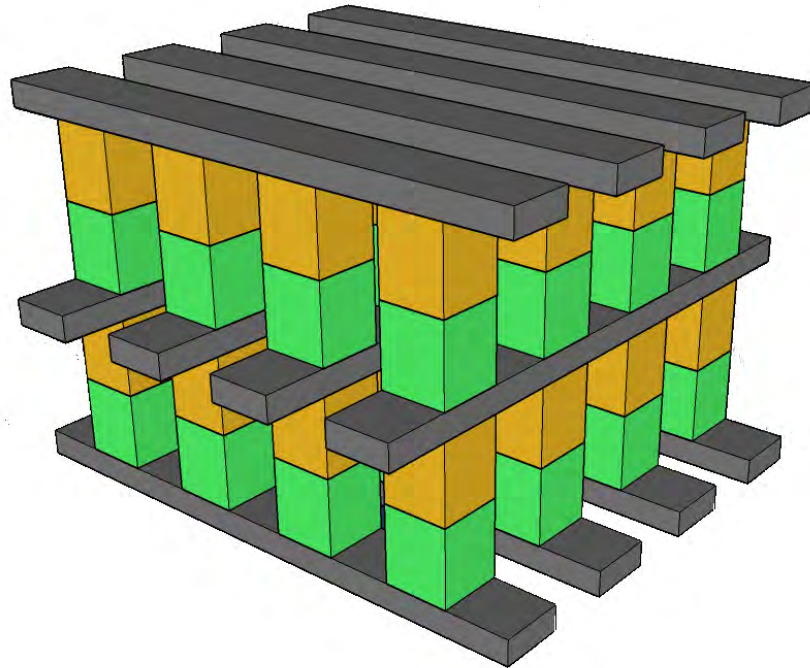


HDD

10,000x

1×10^7 x

Low Latency & High Density



Low Latency
Low Density



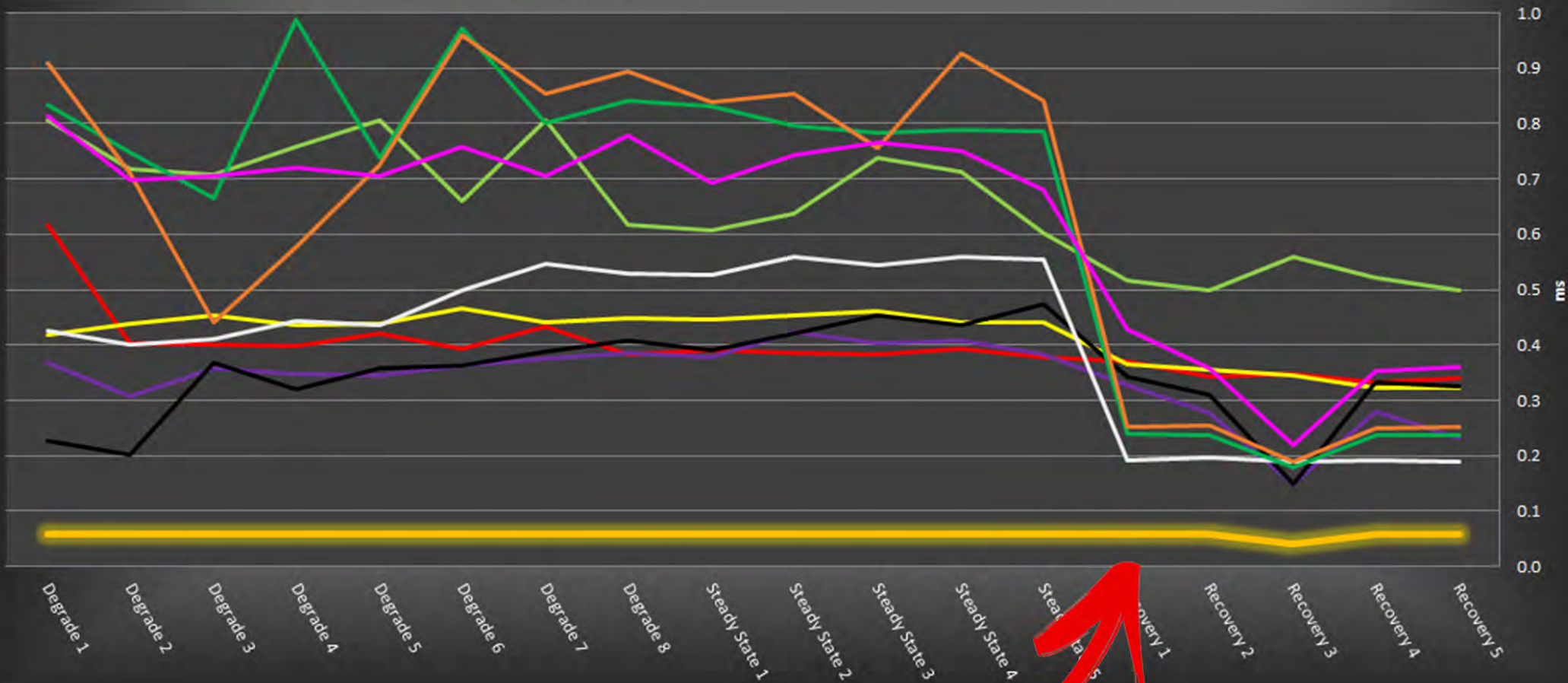
High Latency
Same Density

SSD Latency Benchmark



PCMark 8 Consistency Testing - Average Latency

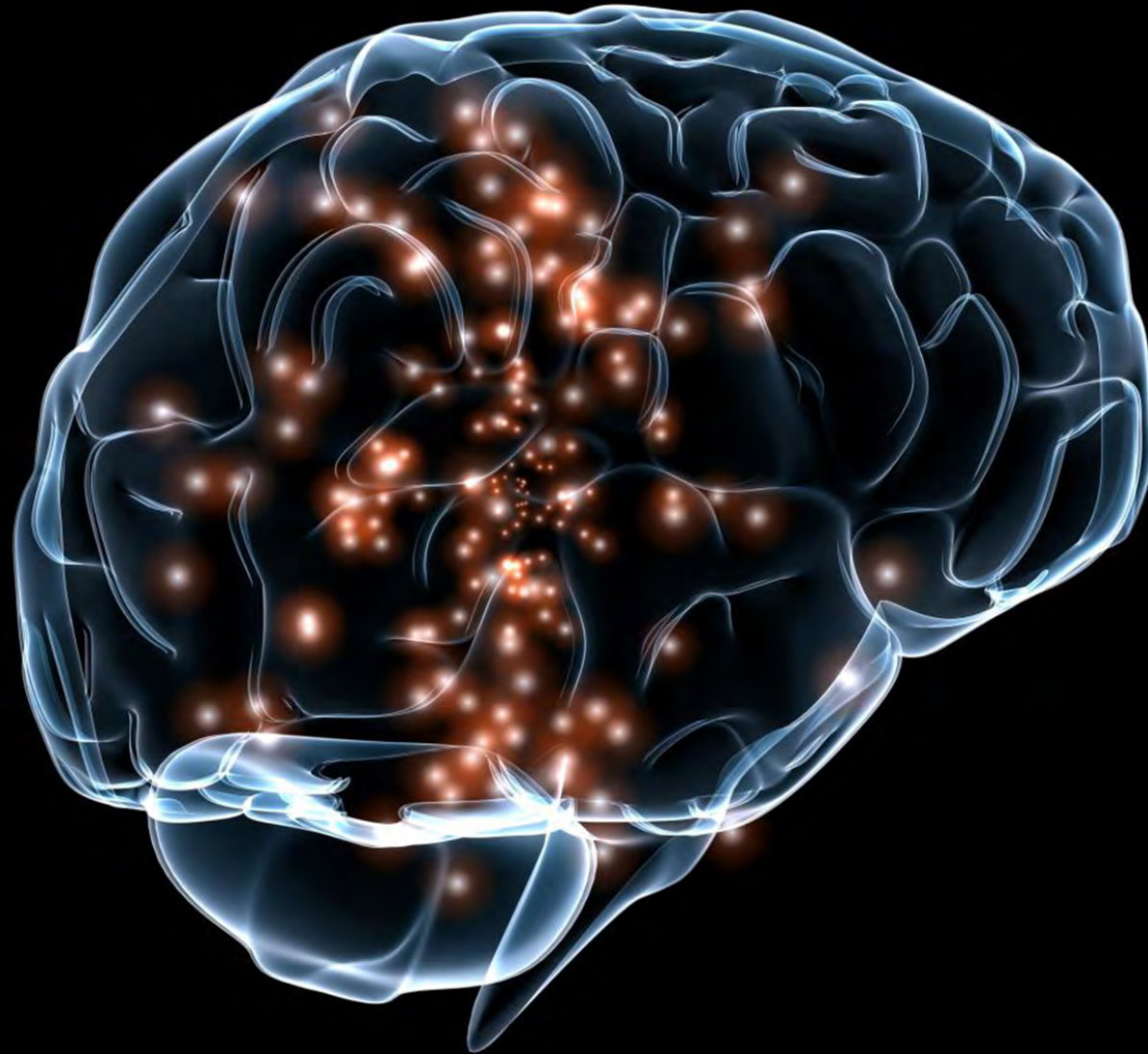
- Kingston HyperX Predator 480GB
- Intel 750 1.2TB
- Samsung 950 Pro 512GB
- OCZ RD400 1TB
- Samsung 960 Pro 2TB
- Samsung 960 EVO 1TB
- Corsair Force MP500 480GB
- MyDigitalSSD BPX 480GB
- WD Black PCIe 512GB
- Intel 900P 480GB



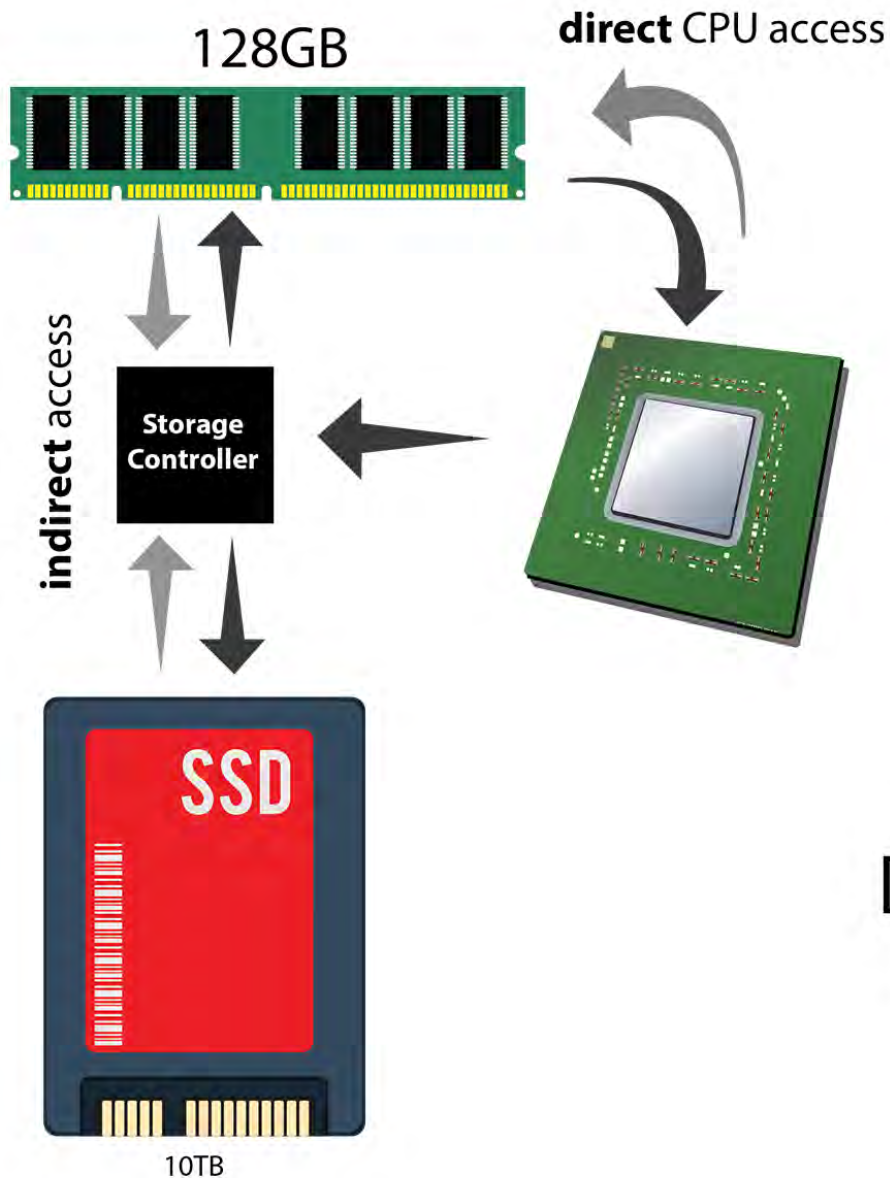
Intel 900P using **3D XPoint**



New Memory Paradigm

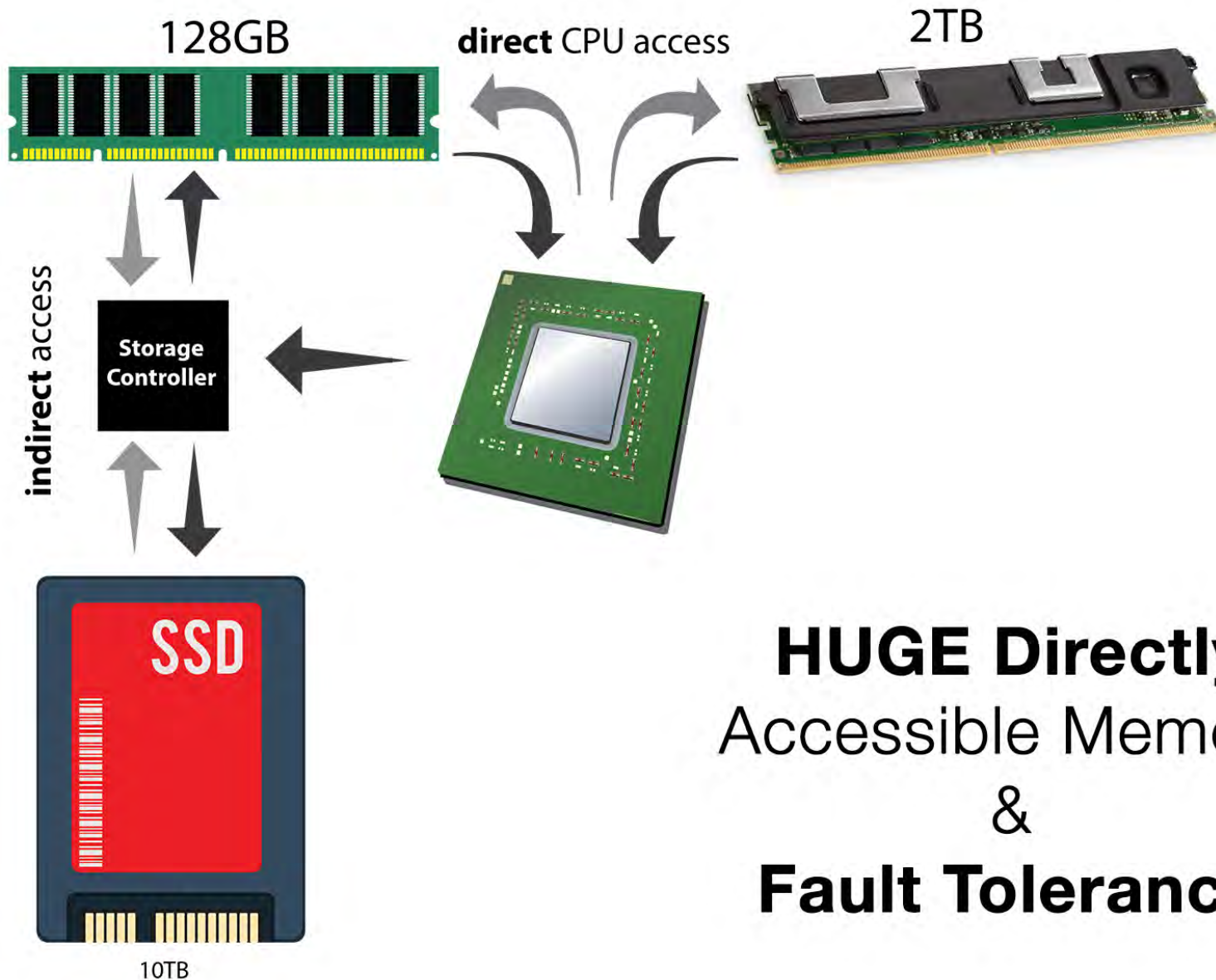


What we have **Today**



Limited
Directly Accessible
Non-Persistent
Memory

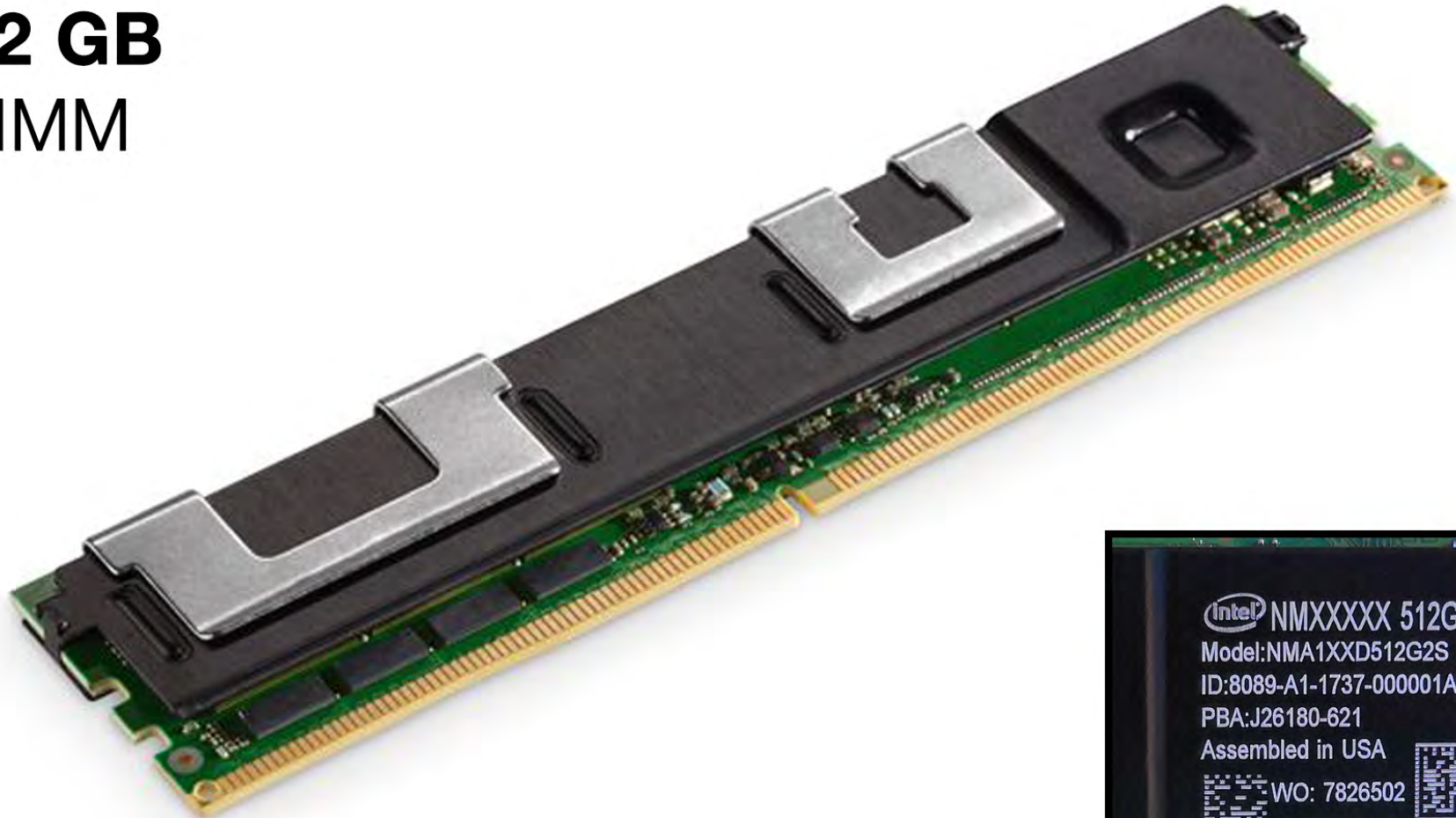
The **Future** with **3D XPoint**



HUGE Directly
Accessible Memory
&
Fault Tolerance

And the **Future** is **NOW**

512 GB
DIMM



DRAM

SAMSUNG

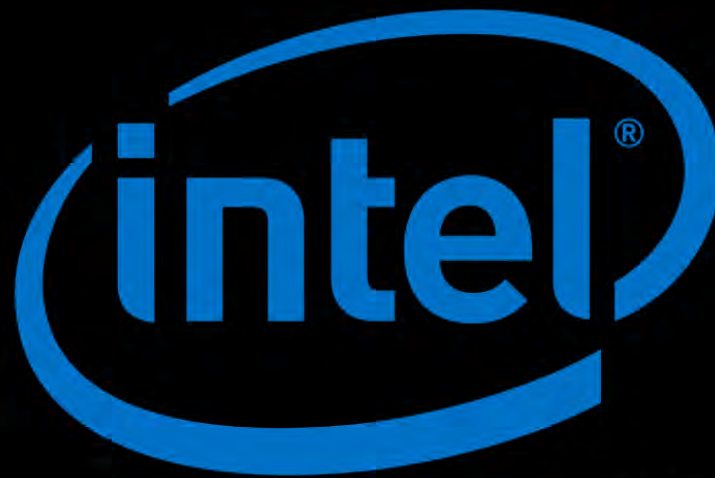
Micron

SK hynix



NANYA

3D XPoint



NAND

Micron

SK hynix

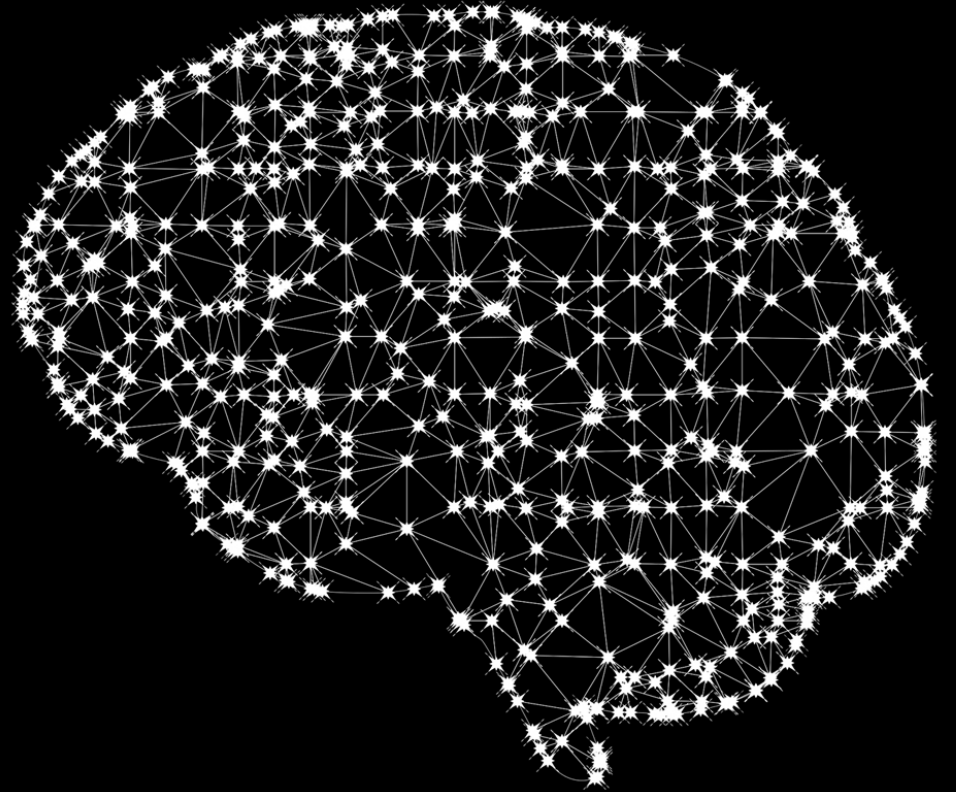
SAMSUNG

TOSHIBA

SanDisk







ZYNATH GROUP



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