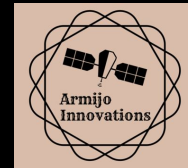


# Practical ML Tutorial: Part II

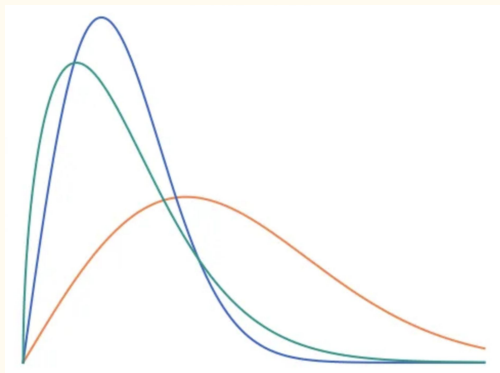
—  
George Williams



# Agenda

## Part I

- AI Trends
- ML Basics
- Survival Analysis
- Hands-On Programming



## Part II

- AI Hardware
- PyTorch Basics
- Computer Vision
- Hands-On Programming

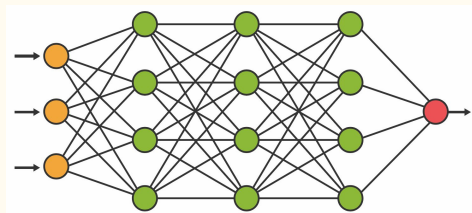
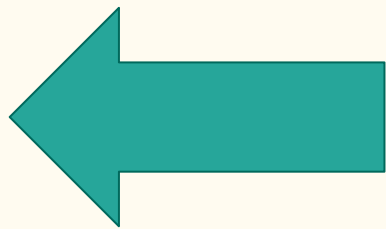


# AI & ML Hardware

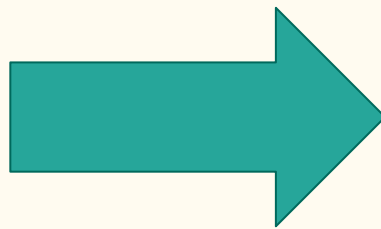


# Extreme Industry Divergence...

## Tiny ML



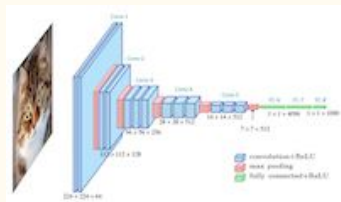
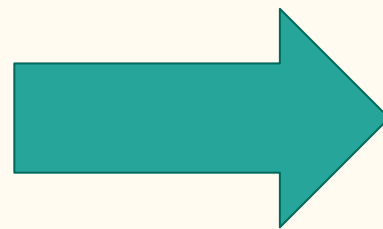
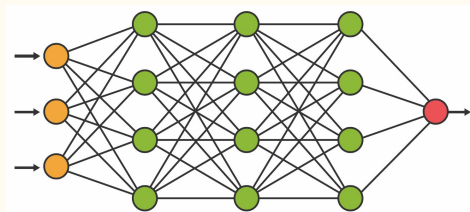
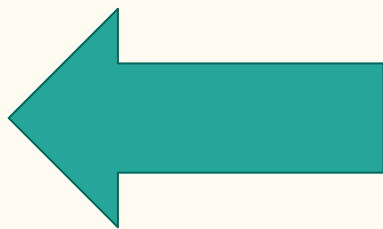
## Large ML



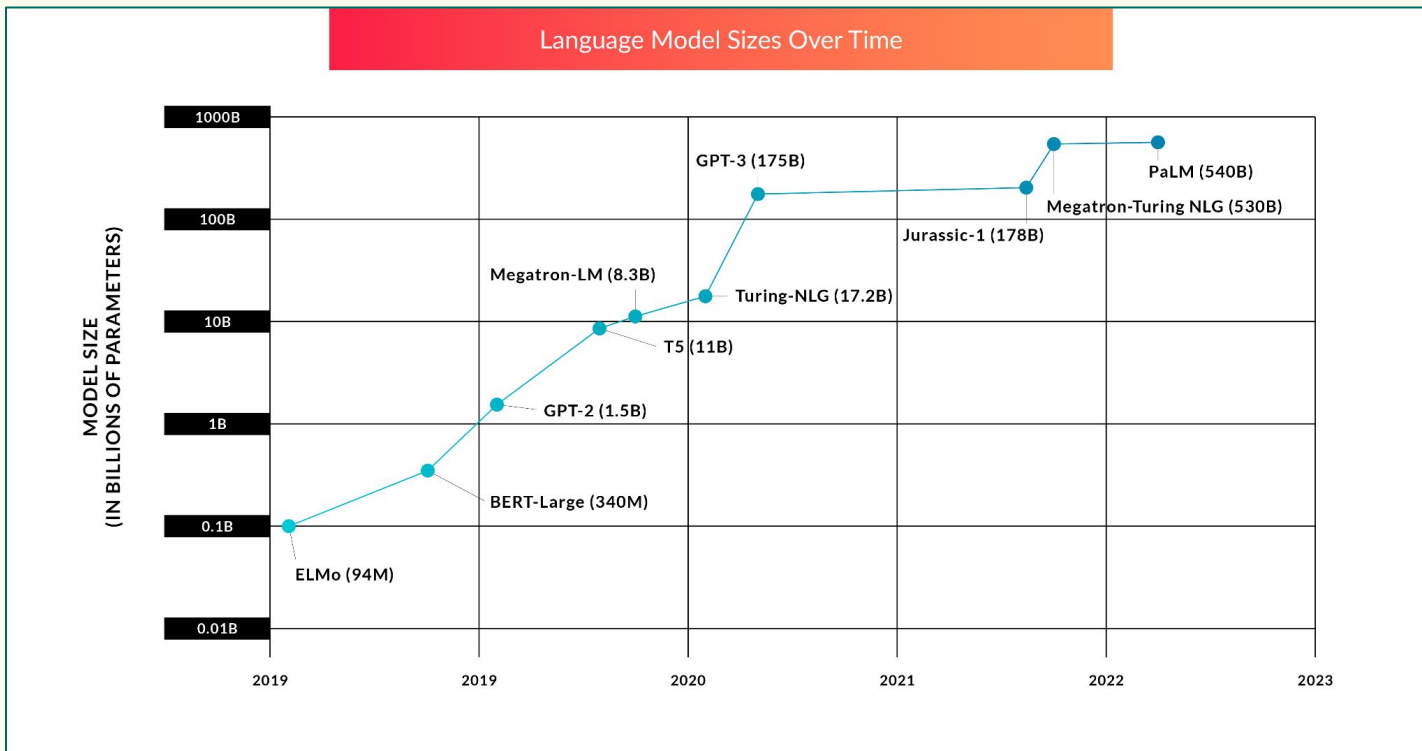
## Extreme Industry Divergence...

# Tiny ML

# Large ML



# Large ML: Large Language Models

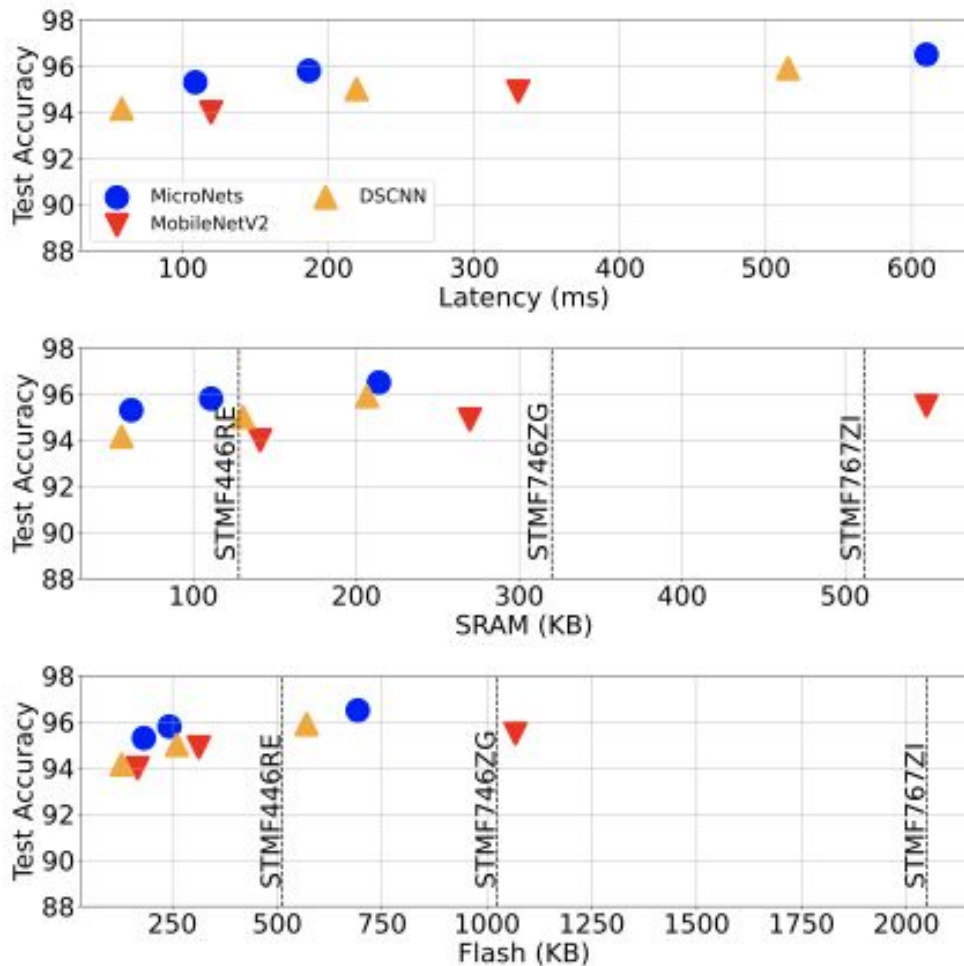


# Tiny ML: AI At The Edge

Task = Keyword Spotting  
("Alexa," "Hey Google"...10 of  
them )

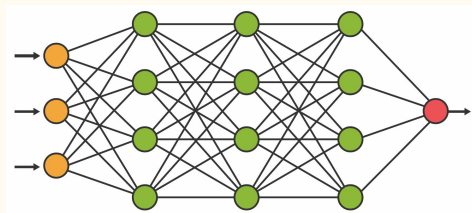
<https://community.arm.com/arm-research/b/articles/posts/neural-network-architectures-for-deploying-tinymml-applications-on-commodity-microcontrollers>

<https://mlcommons.org/en/inference-tiny-10/>

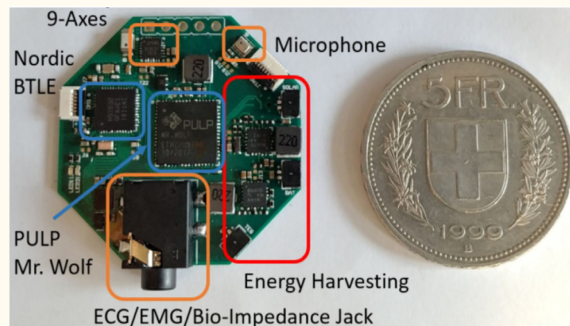


# Extreme Hardware Divergence...

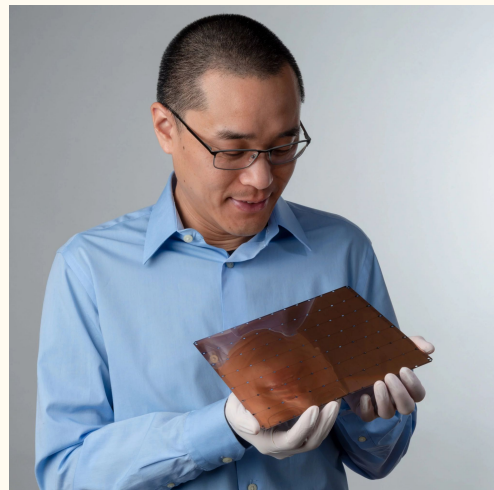
## Tiny ML



## Large ML



InfiniWolf Deep Learning on MCU



Cerebras Wafer-Scale for Deep Learning



# Jetson NANO



**\$100**  
**5-10 Watts**

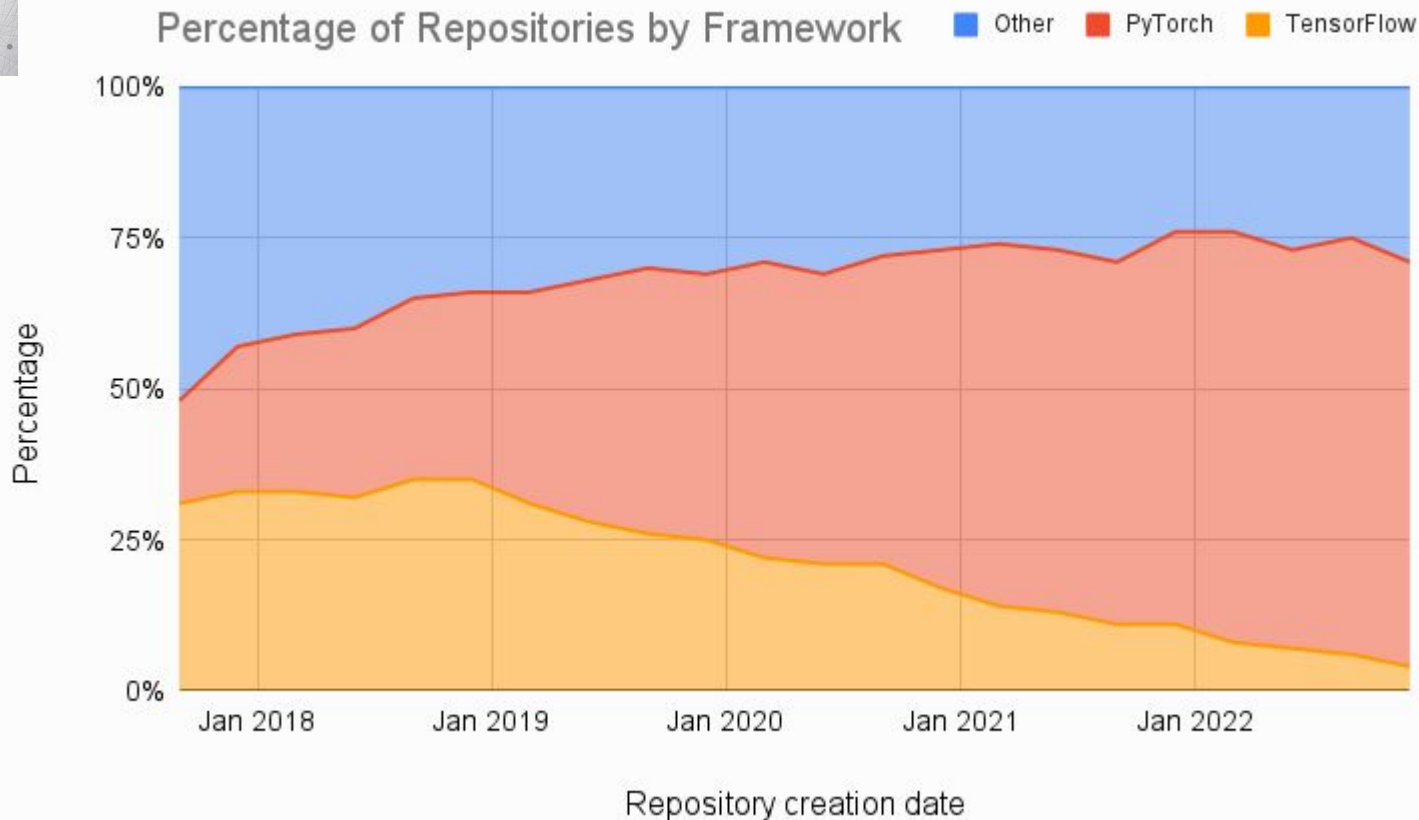
<b>GPU</b>	NVIDIA Maxwell architecture with 128 NVIDIA CUDA® cores
<b>CPU</b>	Quad-core ARM Cortex-A57 MPCore processor
<b>Memory</b>	4 GB 64-bit LPDDR4, 1600MHz 25.6 GB/s
<b>Storage</b>	16 GB eMMC 5.1

# Deep Learning Frameworks

—



Percentage of Repositories by Framework

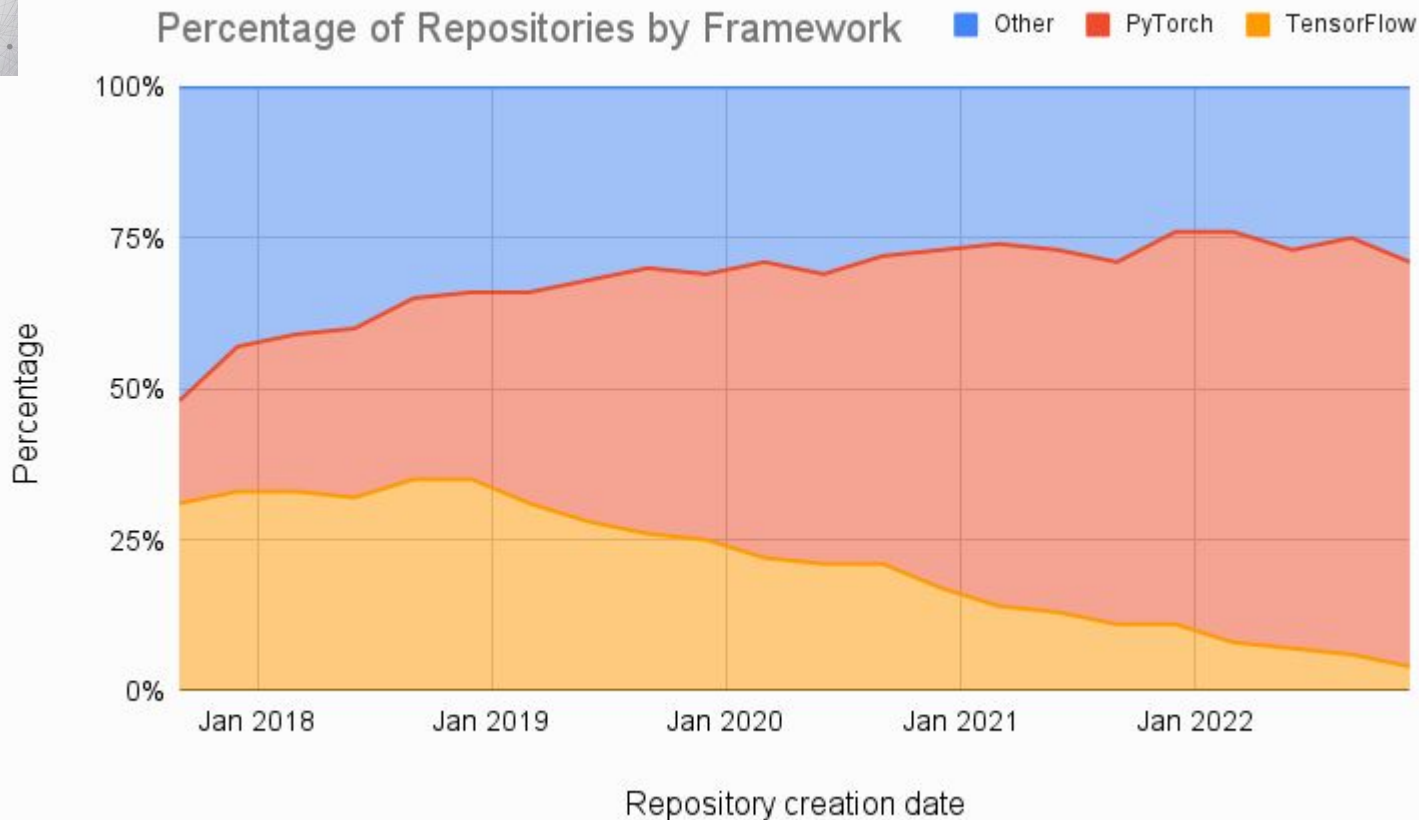


<https://www.assemblyai.com/blog/pytorch-vs-tensorflow-in-2023/>



**fast.ai**

<https://www.assemblyai.com/blog/pytorch-vs-tensorflow-in-2023/>



# Transfer Learning

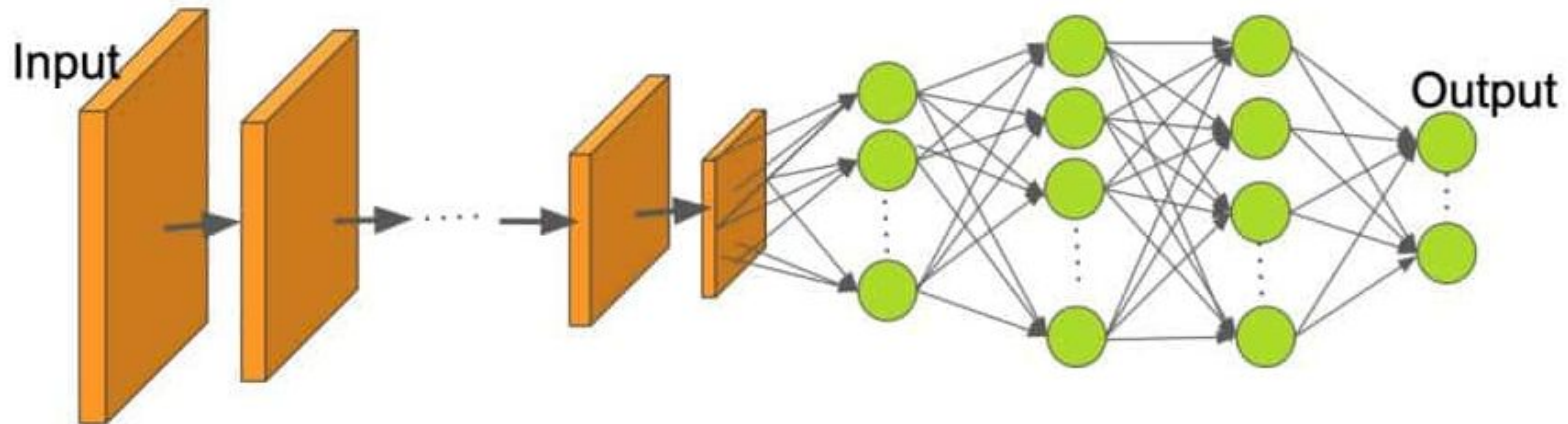
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# ML Training From Scratch

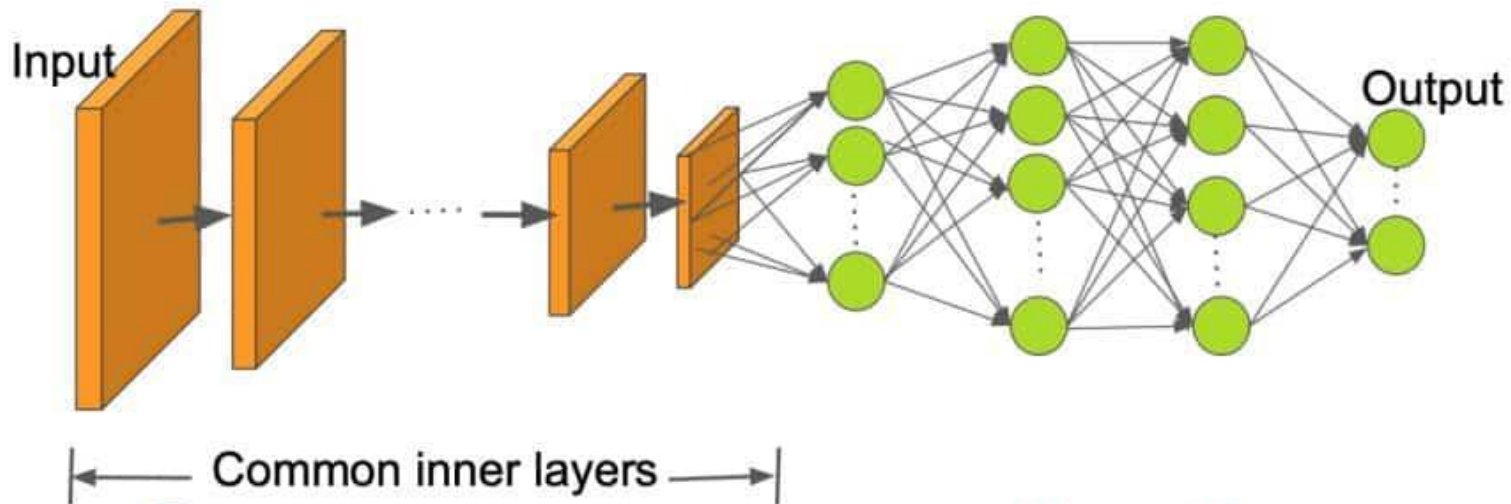
<i>Domain</i>	<i>Model</i>	<i>Time</i>	<i>Hardware</i>	<i>Training Data Size</i>
Computer Vision	ResNet	50 hours	4 V100s	150GB
NLP	Llama	3 weeks	2K A100s	2.TB

-[https://wandb.ai/wandb\\_fc/pytorch-image-models/reports/I-trained-on-ImageNet-for-the-first-time-here-s-what-I-learnt--Vmlldzo2MjkyMDA](https://wandb.ai/wandb_fc/pytorch-image-models/reports/I-trained-on-ImageNet-for-the-first-time-here-s-what-I-learnt--Vmlldzo2MjkyMDA)  
-<https://news.ycombinator.com/item?id=35008694>

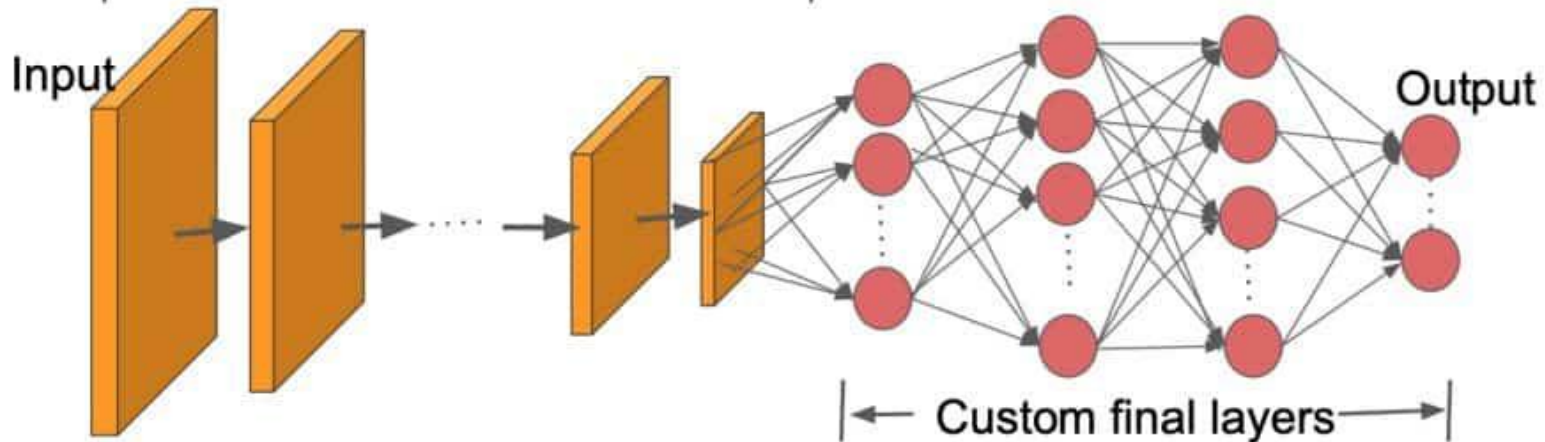
Pretrained  
Model



Pretrained Model

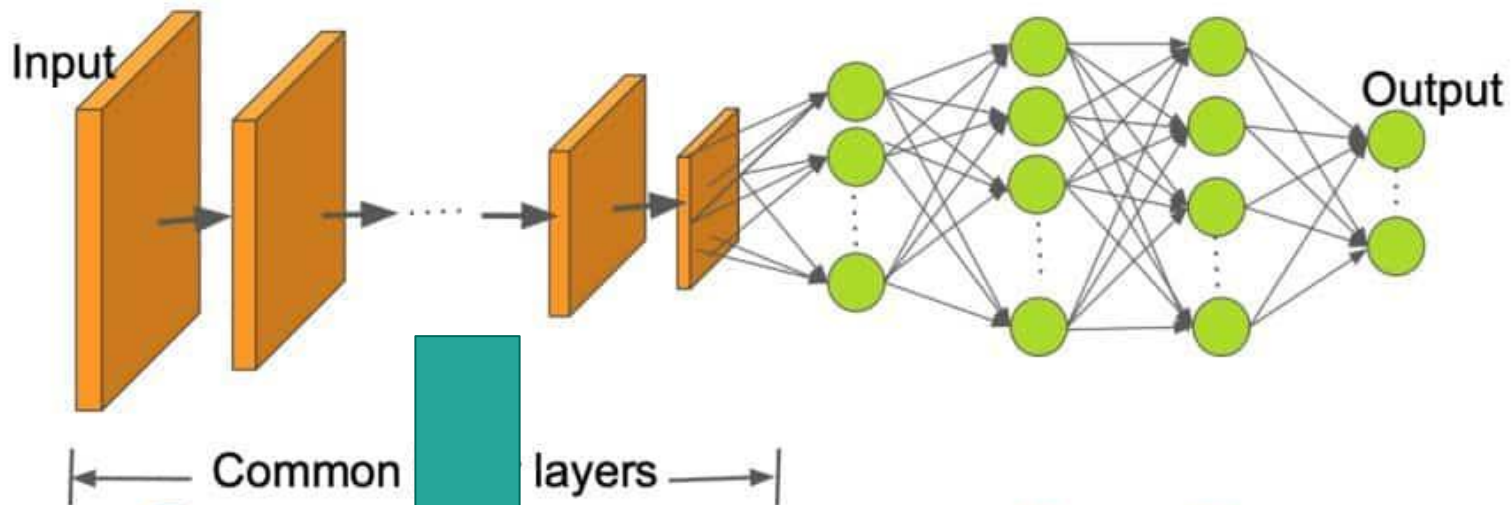


Custom Model

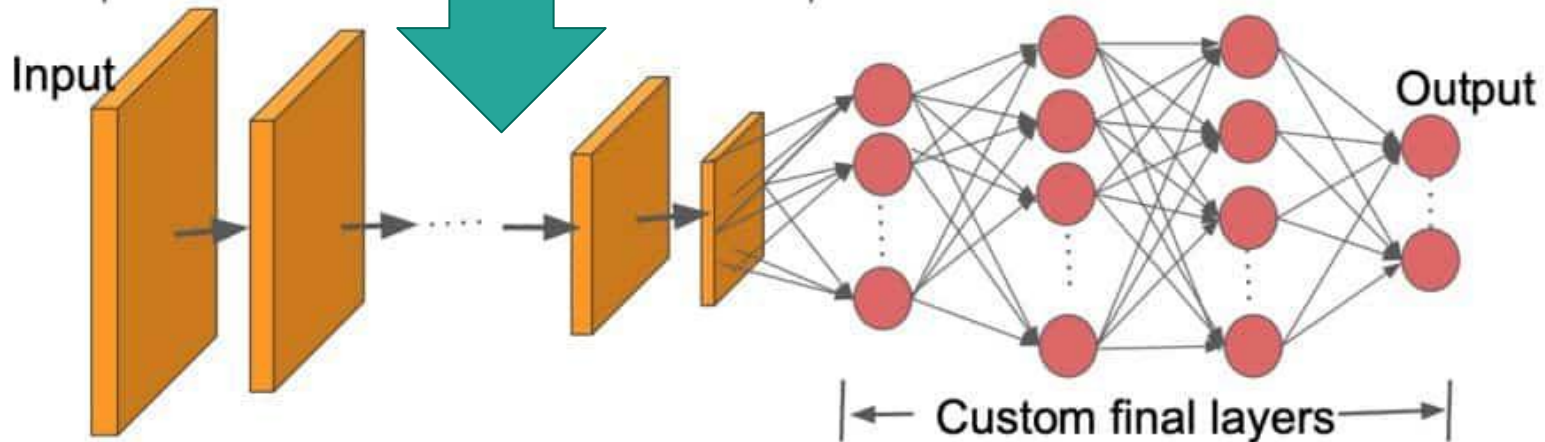




Pretrained Model



Custom Model



# Why Use Pre-Trained Models?

- In computer vision and NLP, you may not need to train from scratch
- Fewer resources and time to get your model trained on your data
- How many free/pre-trained models are out there?



**HUGGING FACE**

120K  
Openly  
Available  
Models

# Let's Continue Coding!

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