Dinosaur (2009 in 2020)

Machine Learning Setup & Choices

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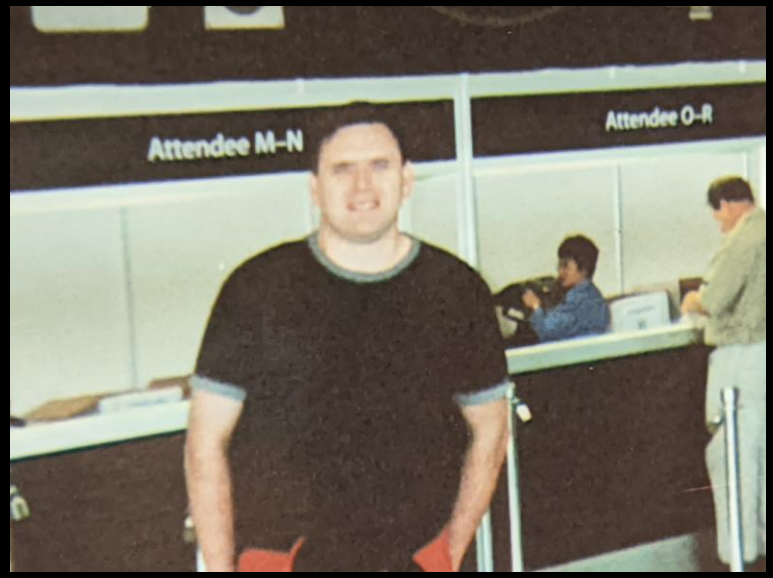
Cult of Mac / Why Apple ? / My story

- I've used Apple laptops for about 18 years (~2002) - First one: 1 GHZ titanium Powerbook (TiBook). First job out of college. $2000 laptop
- Really used to enjoy shopping at Micro Center , Kenwood Apple Store when sold actual software (Aspyr games – mac ports of PC games). EQ for Mac, Doom3 etc. Now on steam.
- Owned 3rd generation iPod, 5th gen iPod Touch, 1st generation iPad, never owned iPhone
- Really enjoyed the journey of OS X. "Cat releases: Lion, Tiger, etc.). About every year was a lot of OS hype.
- Went to San Francisco ! WWDC, developed simple Carbon & Cocoa apps

WWDC 2005 - Moscone Center (Saw Steve Jobs Apple World Wide Developers Conference



Age: 30 – blurry , did not own digital camera back then. Paid for trip out of own pocket to go as worked at insurance company. Last time the conference ended up going to Apple HQ via bus.

Time for a new computer! for AI / ML learnings

Options

1) Desktop , Laptop, or Cloud VM
2) Software: deep learning , PyTorch, TensorFlow 2, misc python
3) OpenCL or CUDA. (or both?)
4) Dedicated GPU. Lots of CPU cores and > 6 GB GPU RAM
5) Prefer Linux (Ubuntu) or MacOS. Over Windows 10

TensorBook (lambdalabs.com)

Lambda

Servers Workstations TensorBook GPU Cloud Resources +1 (866) 711-20

Due to global supply chain issues caused by COVID-19 we are currently experiencing shipping delays of 4 weeks for Tensorbooks.

TENSORBOOK

Deep Learning Laptop

GPU laptop with RTX 2070 Max-Q or RTX 2080 Max-Q. Ubuntu, TensorFlow, PyTorch, Keras, CUDA, and cuDNN pre-installed.

Start customizing >_ View top configurations >

Tensorbook Specs : Core i7, 32 GB RAM, Nvidia RTX 2080 (watered down max-q) . Yikes! $3100

Intel Core i7-9750H
6 Cores, 2.60 GHz

NVIDIA RTX 2080 Max-Q
8 GB VRAM

32 GB
System Memory

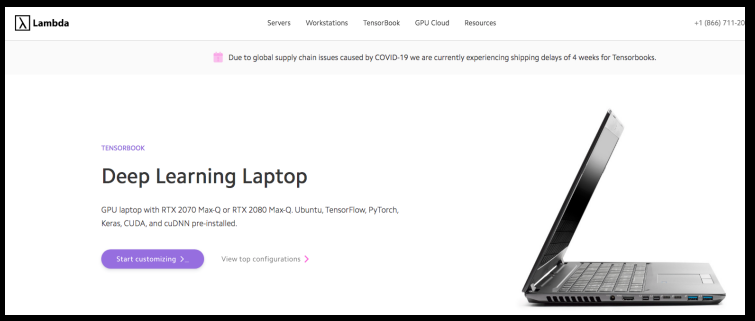
1 TB
NVMe SSD

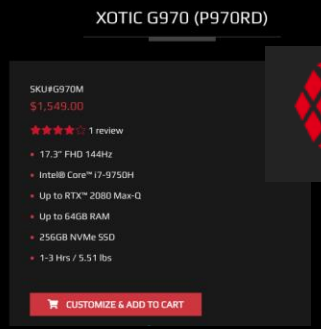
16.1" Display
Matte, 1920x1080

$3,100.00

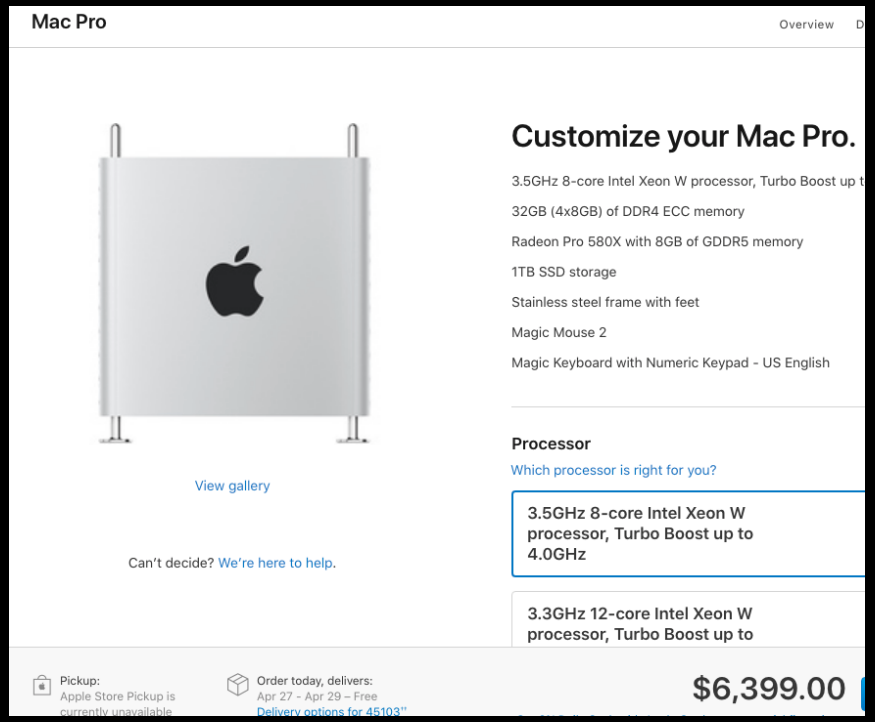
Laptop Puppy Mills! Say hello to Clevo!

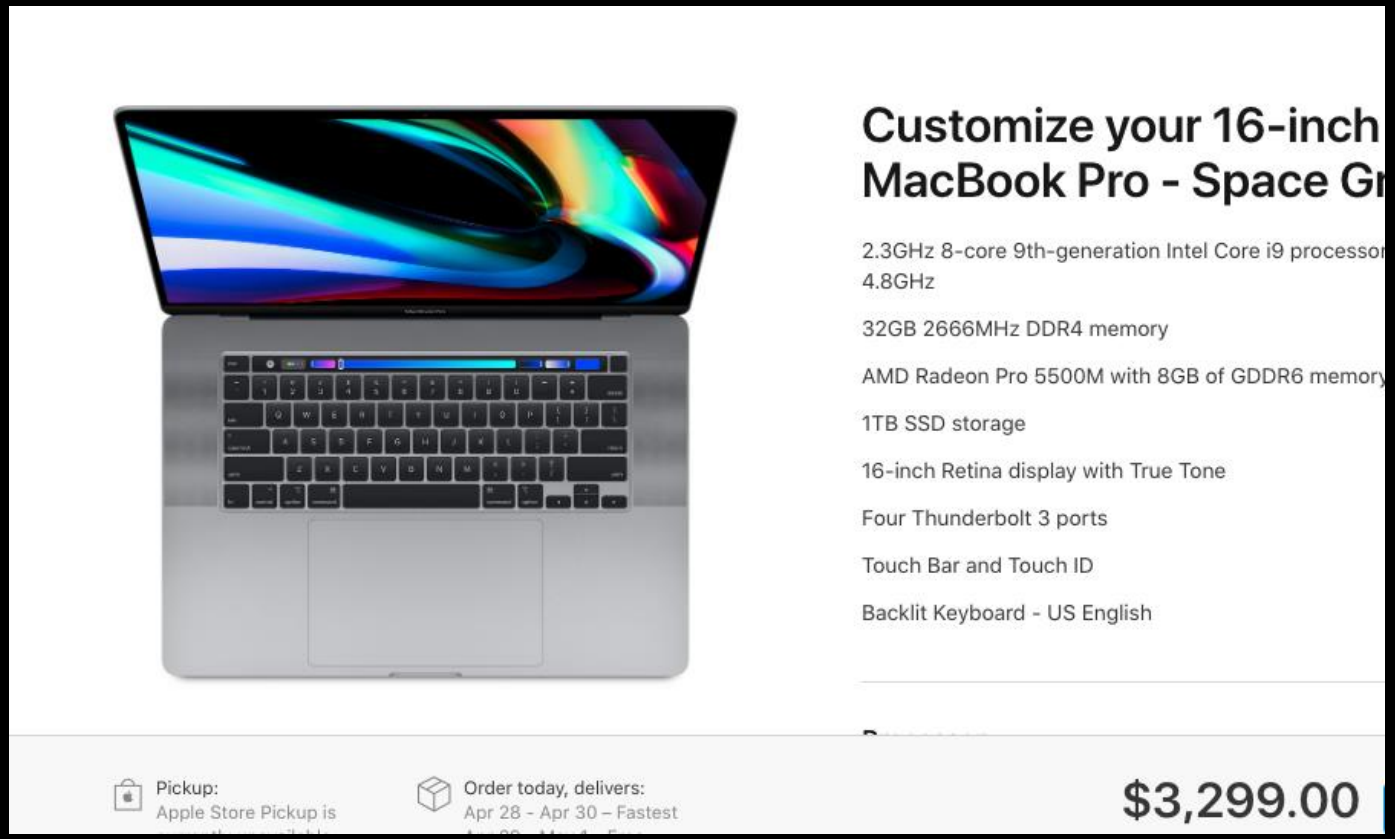
These are all the SAME laptop: rebranded companies – same Clevo unit
$2000 - $2800





What about Apple?

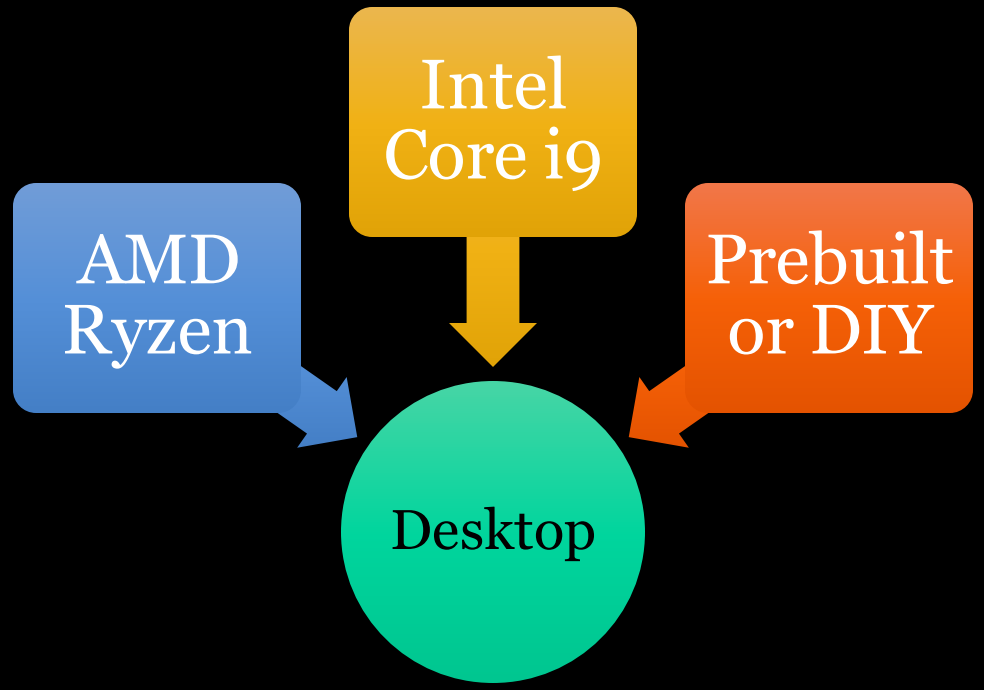




8-core machine , 32 GB for too much money! Price of a new furnace or driveway

Build own PC Desktop

- Nickel-and-dime mentally drives me insane. Just a little more $ for next level
- Not excited to put it togther
- My experience with building PC was more expensive than just buying off the shelf
- Cheaper but still over $1500. DDR4 is expensive along with a good 8 GB VRAM is expensive, Intel pricey
- State of the art graphics. Desktop graphics rock!

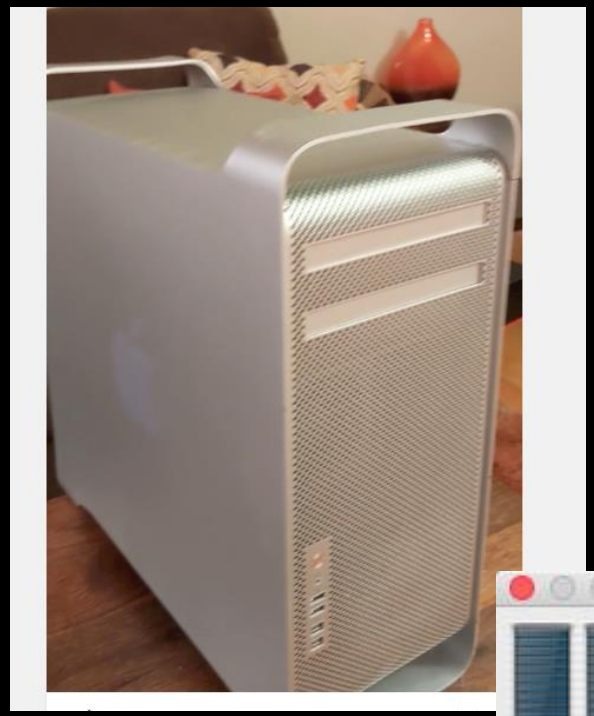


The goal / smart thing to do

But:

Hello, OLD & used Mac Pro

VIDEO: https://streamable.com/2p4x30



3.5 GHZ cores! -->

WHY ?
Macs must be good for AI – DS team has them

- 12 physical cores : 2 CPU (Intel Xeon) x 6 cores
- 24 virtual cores   3.46 GHZ each

- 128 GB ECC 1333 MHZ DDR3 ram, triple channel – cheap
- Build quality, cooling system
- Support 2 large GPUs, 4 PCI express
- It's a Mac, plays all my favorite games
- I always wanted one of these, were too expensive.
- CHEAP ! $800 for one with : 64 GB ram, 1 TB SSD

Lessons Learned! - Here Goes

- The CPUs are 10 years old! BUT – they are fast enough.
- Python 3.8 well supported, lots of additional stuff is supported via Homebrew , Jupyter works great. and so far so good!

- Need a GPU. Heard CUDA was more widely used for DL and needed for TensorFlow. So started looking at NVIDIA

- Issue #1: Nvidia stopped providing drivers to Apple – three OS versions back. OK. 13.6 High Sierra is modern enough and still supported.

- Issue #2: Nvidia RTX cards not supported. OK, buy older Nvidia GTX card. Wow, this one looks good.. Ebay Titan X with 12 GB ram and 3000 cuda cores. Wrong choice $250

- Issue #3: Titan GTX cards come in 4 varieties. Titan (maxwell), Titan X (pascal), Titan Xp, and Titan Z (basically a crappy double pascal). I didn't know and I bought the slowest one – maxwell and should have gotten a pascal based as 2x as fast! RAPIDS (GPU pandas) support missing

Lessons Learned! - Part 2

- Issue #4: Old Xeon CPUs do not have AVX or AVX2 instruction sets!! This is a breaker. Modern python BLAS libraries used for deep learning are based on these. Error: illegal instruction 4
- Issue #5: Prebuilt framework PyTorch only supports GPUs with CUDA cpapacity over 5. Must build from scratch
- Issue #6: GPU on Mac is not supported by TensorFlow 2
- Issue #7: Build system for PyTorch is broken for missing AVX. Ninja and other systems do not work
- Enjoyed the Mac other wise and really liked the old Titan and bonded with it. Titan is a cool card. A little brainwashed as want to use RAPIDS. (gpu pandas).

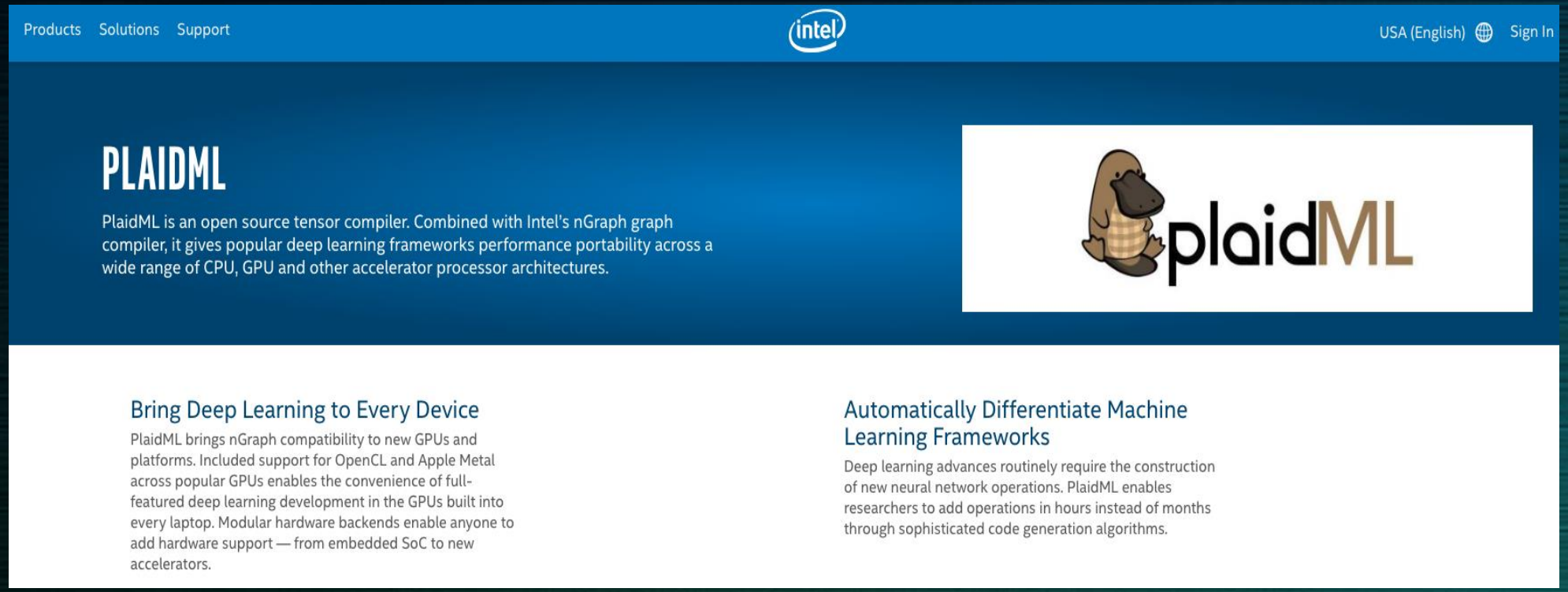
INTEL TO THE RESCUE!!! (not)

Intel Software Development Emulator
(https://software.intel.com/en-us/articles/intel-software-development-emulator)

Dynamically looks at each instruction and REPLACES missing AVX instructions with SSE instructions while running!

It works, but takes 30x- 50x longer to run for deep learning compared to other work laptop, so not really viable

INTEL TO THE RESCUE #2 (yes!)



Keras Framework : Recompiles base libraries like pandas and pytorch to avoid AVX! using LLVM compiler

INTEL TO THE RESCUE #2 (yes!)

PlaidML is an advanced and portable tensor compiler for enabling deep learning on laptops, embedded devices, or other devices where the available computing hardware is not well supported or the available software stack contains unpalatable license restrictions.

PlaidML sits underneath common machine learning frameworks, enabling users to access any hardware supported by PlaidML. PlaidML supports Keras, ONNX, and nGraph.

As a component within the nGraph Compiler stack, PlaidML further extends the capabilities of specialized deep-learning hardware (especially GPUs,) and makes it both easier and faster to access or make use of subgraph-level optimizations that would otherwise be bounded by the compute limitations of the device.

As a component under Keras, PlaidML can accelerate training workloads with customized or automatically-generated Tile code. It works especially well on GPUs, and it doesn't require use of CUDA/cuDNN on Nvidia hardware, while achieving comparable performance.
PlaidML works on all major operating systems: Linux, macOS, and Windows.

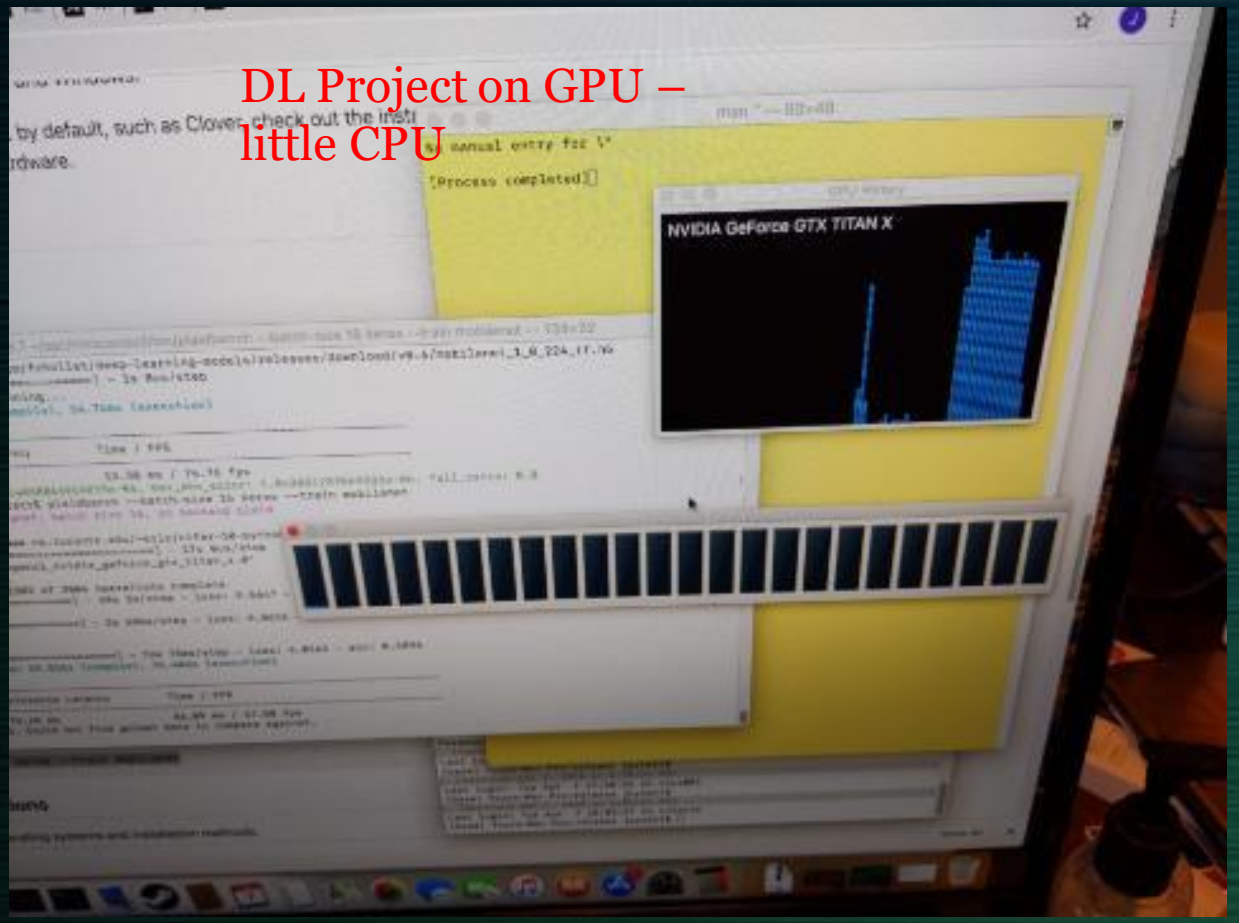
INTEL TO THE RESCUE #2 (yes!)

plaidML

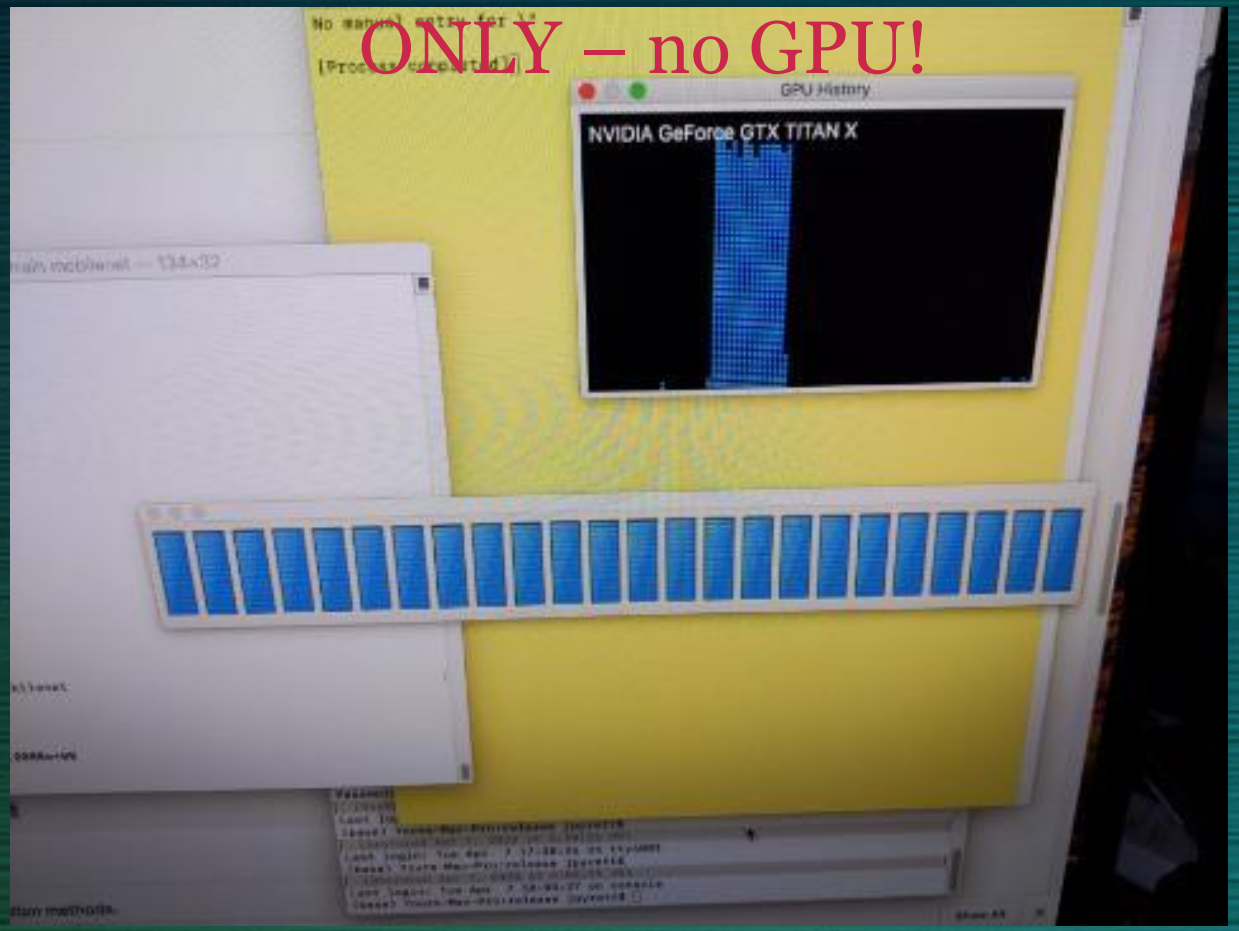
A platform for making deep learning work everywhere.

It did not work immediately OOTB. The rebuild instructions had ambiguous . I eventually figured out how to config it and will be writing a Medium article soon with the details. Possibly contribute to the project. Will see.. But it works!

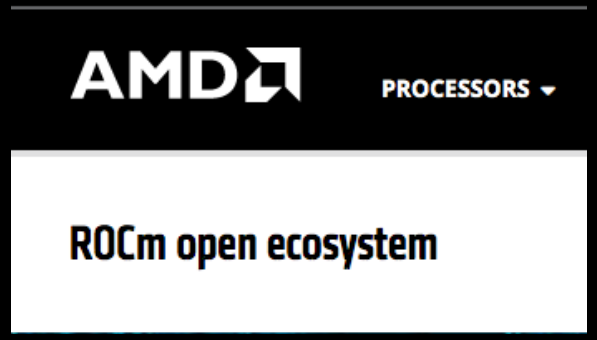
DL Project on GPU – little CPU



DL Project on CPU ONLY – no GPU!



WAIT – What is the solution? For current Mac Books. What about AMD Radeon?

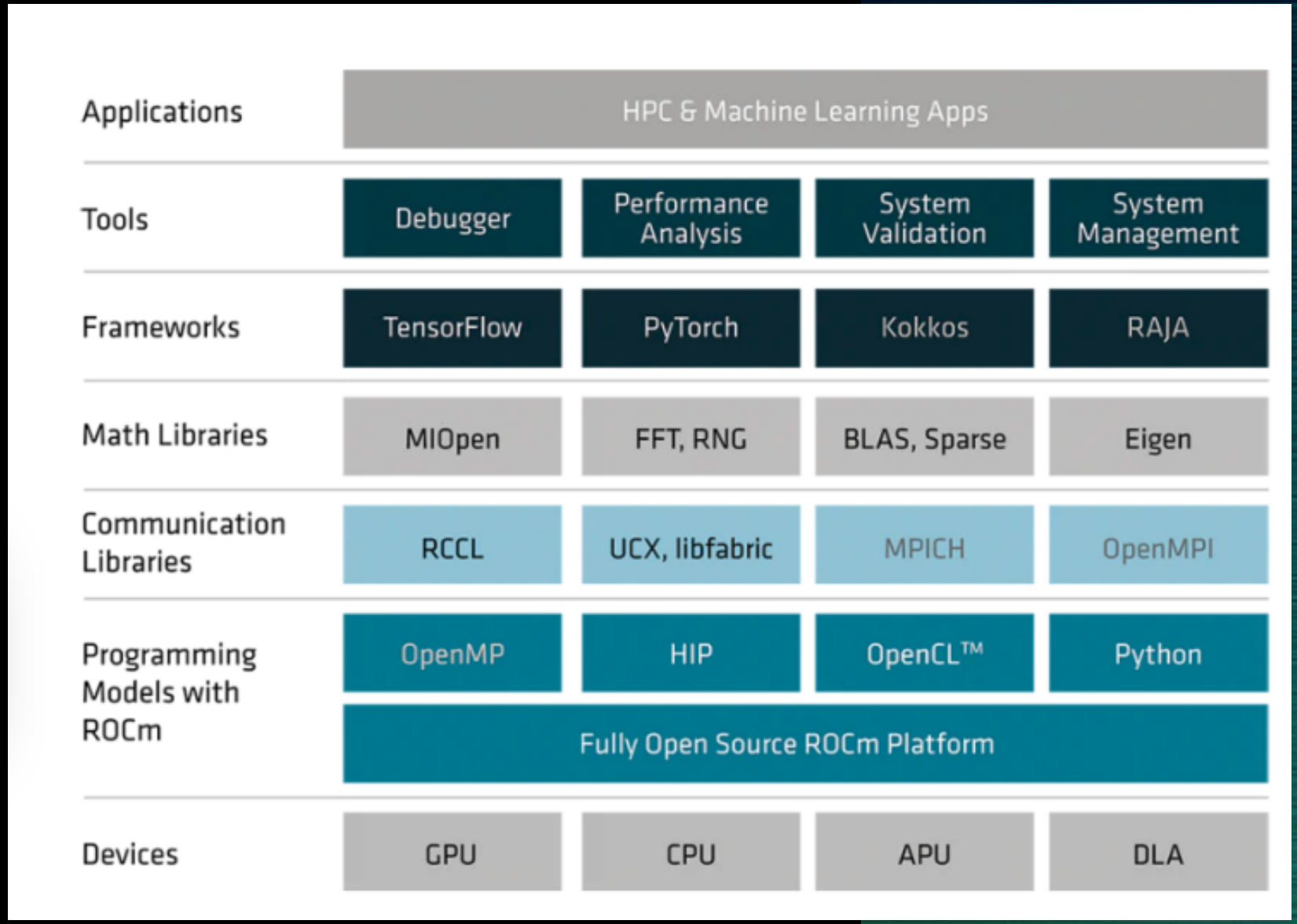


AMD ROCm

Since the ROCm ecosystem is comprised of open technologies: frameworks (Tensorflow / PyTorch), libraries (MIOpen / Blas / RCCL), programming model (HIP), inter-connect (OCD) and up streamed Linux® Kernel support – the platform is continually optimized for performance and extensibility.

Tools, guidance and insights are shared freely across the ROCm GitHub community and forums.

AMD ROCm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System Management
Frameworks
TensorFlow
PyTorch
Kokkos
RAJA
Math Libraries
MIOpen
FFT, RNG
BLAS, Sparse
Eigen
Communication Libraries
RCCL
UCX, libfabric
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