

TRAIN YOUR ML/AI MODEL ON GPUS

New cloud computing possibilities for researchers & students

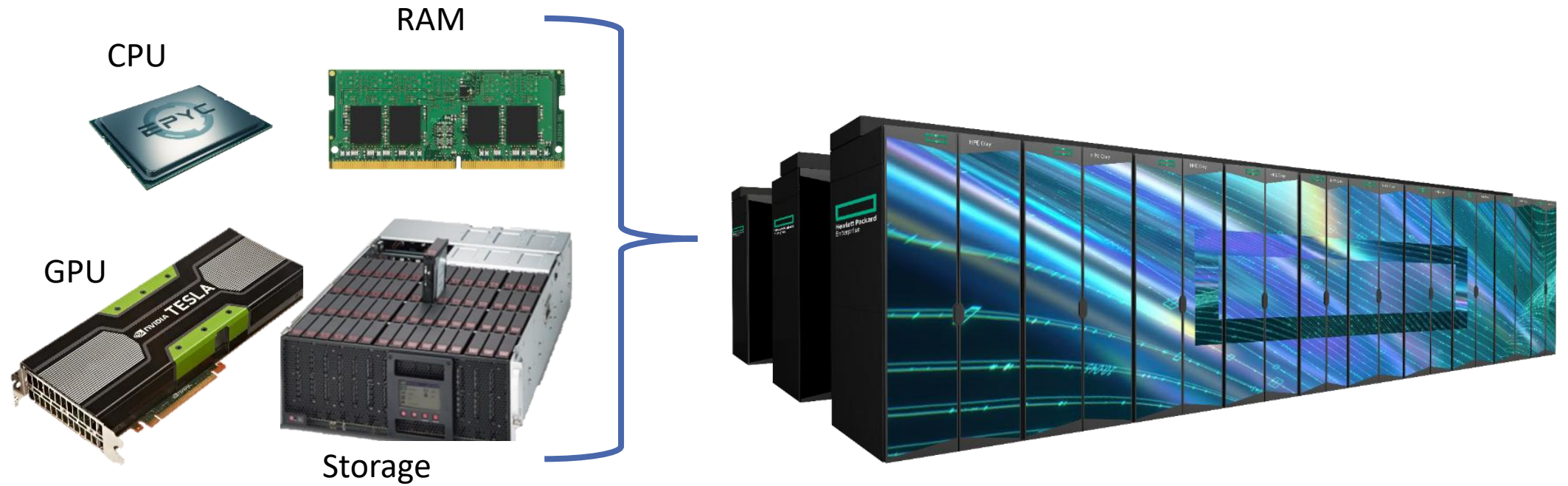
Kristoffer Gulmark Poulsen & Lars Nondal
Research Data Management Support
CBS Library



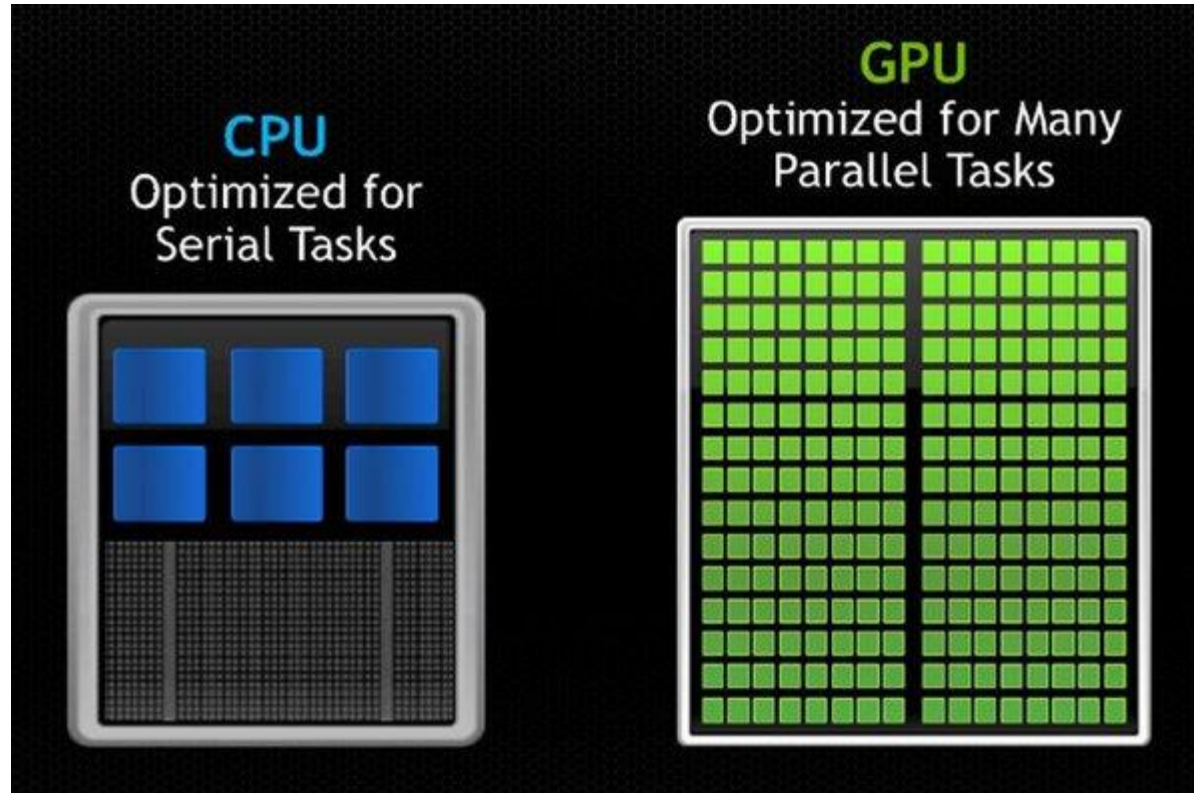
Program Today

- Apply for GPU resources on UCloud.
- Start a GPU based virtual machine (VM) on UCloud.
- Connect to the VM using SSH.
- Transfer data to and from the VM.
- Set up and use Conda for efficient library/package management.
- Open and run a Jupyter notebook from the VM.
- Example of multi-GPU parallelization with popular ML/AI frameworks such as Pytorch, Tensorflow and Scikit-Learn.
- <https://cbs-hpc.github.io/>

What is High Performance Computing (supercomputer)?

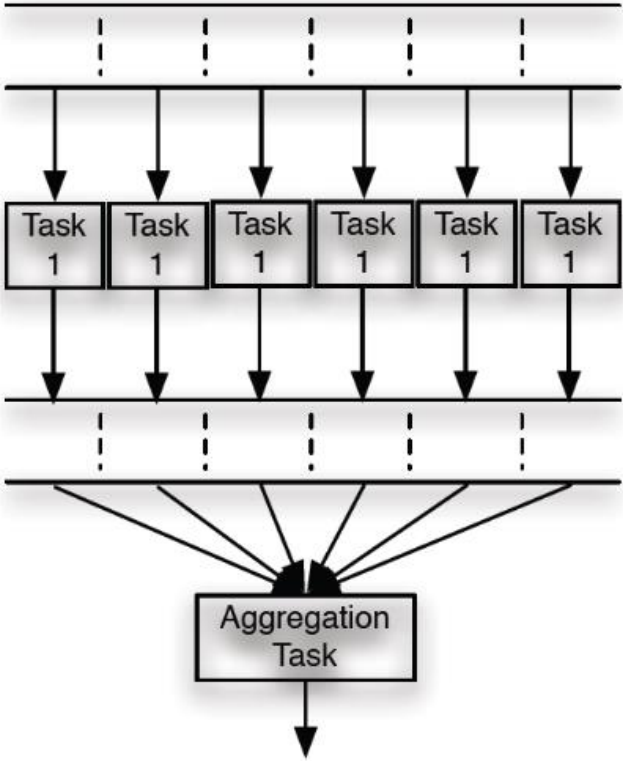


CPU vs GPUs

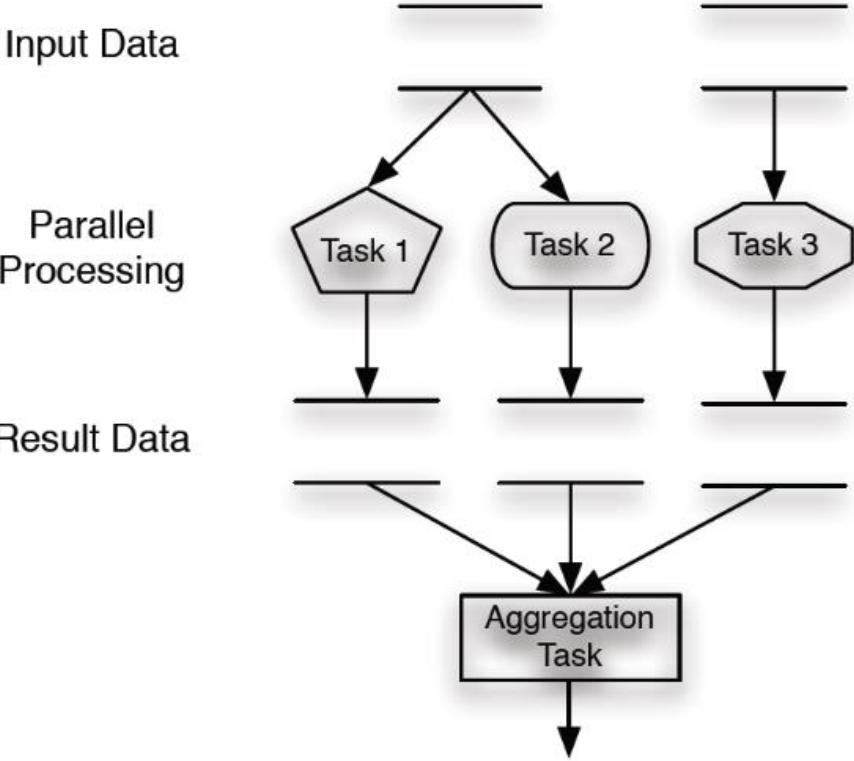


Parallel Programming

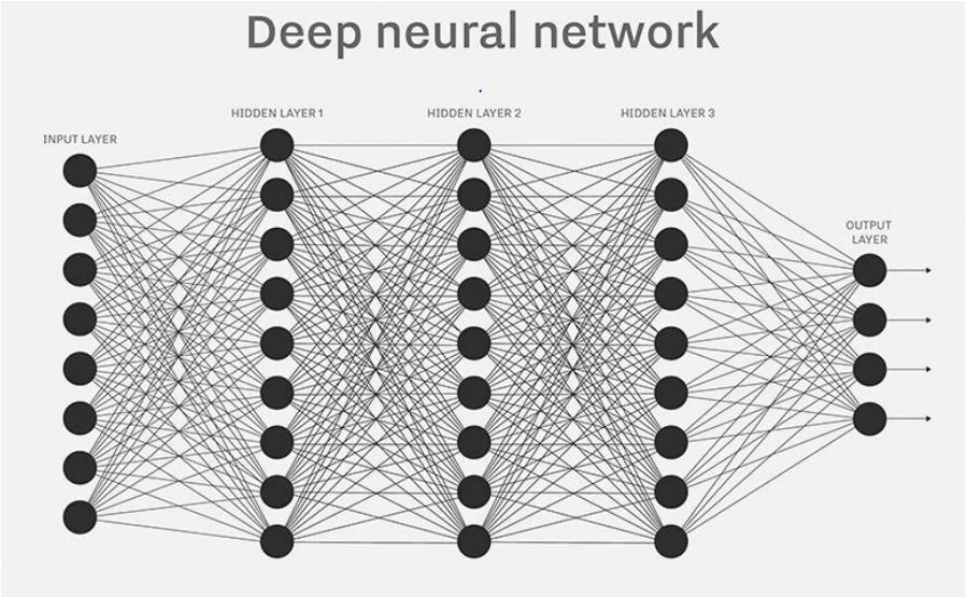
Data Parallelism



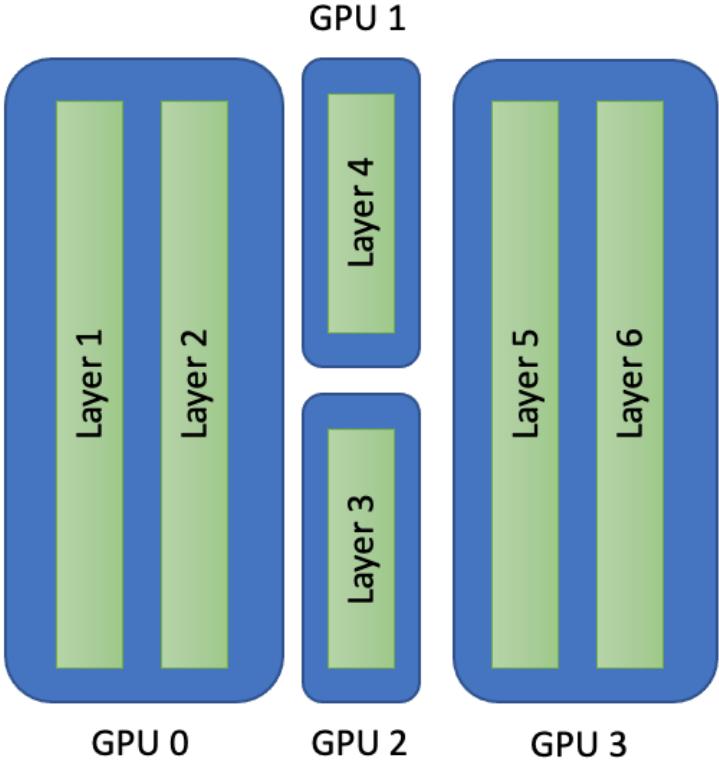
Task Parallelism



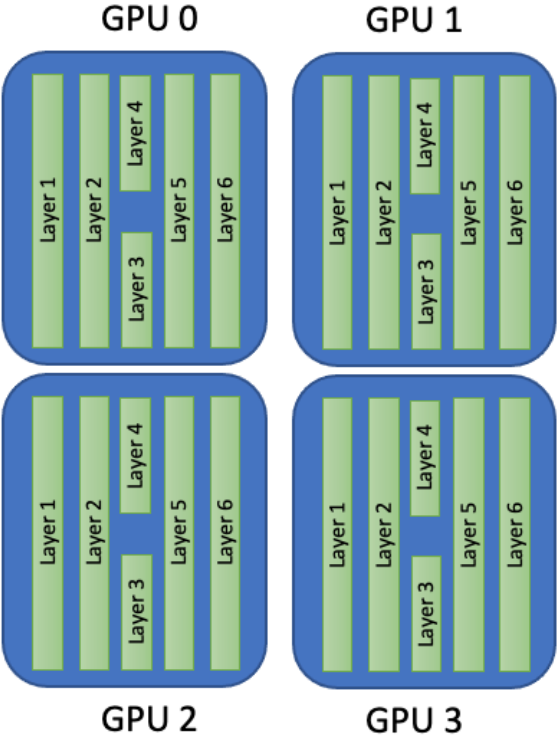
Parallel Programming & Deep-Learning



MODEL PARALLELISM



DATA PARALLELISM



Ucloud GPU resources

- GPU resources
- Virtual Machines
- SSH/terminal Access

GPU	Architecture	CUDA Cores	Tensor Cores	Memory	FP16 (Half) TFLOPS	FP32 (Float) TFLOPS	FP64 (Double) GFLOPS
Nvidia T4	Turing	2,56	320	16 GB GDDR6	65.1	8.1	254.4
Nvidia A10	Ampere	6,144	384	24 GB GDDR6	31.2	31.2	976.3
Nvidia A40	Ampere	10,24	320	48 GB GDDR6	37.4	37.4	0.59
Nvidia A100	Ampere	6,912	432	80 GB HBM2	78.0	19.5	9700

The image displays six virtual machine templates arranged in a 2x3 grid. Each template includes a logo, the OS name, version, and the provider.

- Arch Linux (Virtual M... latest)**: by AAU
- CentOS (Virtual Mac... latest)**: by AAU
- Debian 11 (Virtual Ma... 11)**: by Debian authors
- Ubuntu (CUDA + Jup... 20.04)**: by AAU
- Ubuntu (CUDA) (Virt... 18.04)**: by AAU
- Ubuntu (Virtual Mach... 22.04)**: by AAU

UCloud Dashboard

The dashboard features a blue header with the UCloud logo, a dropdown menu for 'Type 1 - CBS', and a search bar. A left sidebar contains navigation options: Files, Projects, Resources, Apps, and Runs. The main content area is divided into several panels:

- News:** Information about 'Maintenance on the DeiC Interactive HPC (AAU) provider' on 13/03/2023 at 08:00. It states that the provider will be performing scheduled maintenance on 21/03/23 between 09:00-15:00. A list of affected machine types is provided: uc-general, uc-a10, and uc-t4.
- Favorites:** A section indicating 'No favorites' and providing an 'Explore files' button.
- Recent runs:** A list of recent runs with status indicators (checkmarks for success, crosses for failure) and durations. Items include 'affaff' (MATLAB 2022a-1, 3 months), 'machine_01' (Ubuntu (Virtual Machine) 20.04, 5 months), 'testing' (Ubuntu (Virtual Machine) 20.04, 5 months), 'aff' (Ubuntu Xfce 22.04, 5 months), and 'LAC_live_test' (JupyterLab 3.4.5, 6 months).
- Recent notifications:** A list of notifications, including 'Type 1 - CBS' messages about new grant applications and 'Information' messages about role changes for users like EmilBegtrup-Bright#9222 and StefanBernidMöhler#0398.
- Resource allocations:** A table showing resource allocations for various HPC configurations, including 'DeiC Interactive HPC (AAU) / uc-general' (44,980,56 DKK) and 'DeiC Interactive HPC (SDU) / public-ip' (97 Public IP(s)).
- Resource usage:** A section showing 'Compute' usage for the 'Past 30 days' at 114,05 DKK.
- Grant applications:** A section indicating 'No recent outgoing applications' and providing an 'Apply for resources' button.
- Providers:** A section showing active providers: 'DeiC Interactive HPC (SDU)' and 'DeiC Interactive HPC (AAU)', both with green checkmarks.

At the bottom left, there is a status bar with the following items: Type 1/Type 1 - CBS, KristofferGulmarkP..., UCloud Docs, and SDU Data Protection.

<https://cloud.sdu.dk/app/dashboard>

SSH - Secure Shell

- SSH is a network protocol that allows secure access to remote systems over an unsecured network.

SSH Key Authentication

- Users generate a public-private key pair.
- The public key is placed on the remote server, and the private key is kept secure on the user's local machine.
- SSH authenticates the user by matching the keys.

SSH Connection

- Open a terminal.
- Use the `ssh` command followed by the remote server's address and your username.
- Authenticate with your private key or password.

SCP – Secure Copy

- SCP is a command-line utility for securely copying files between local and remote hosts.

