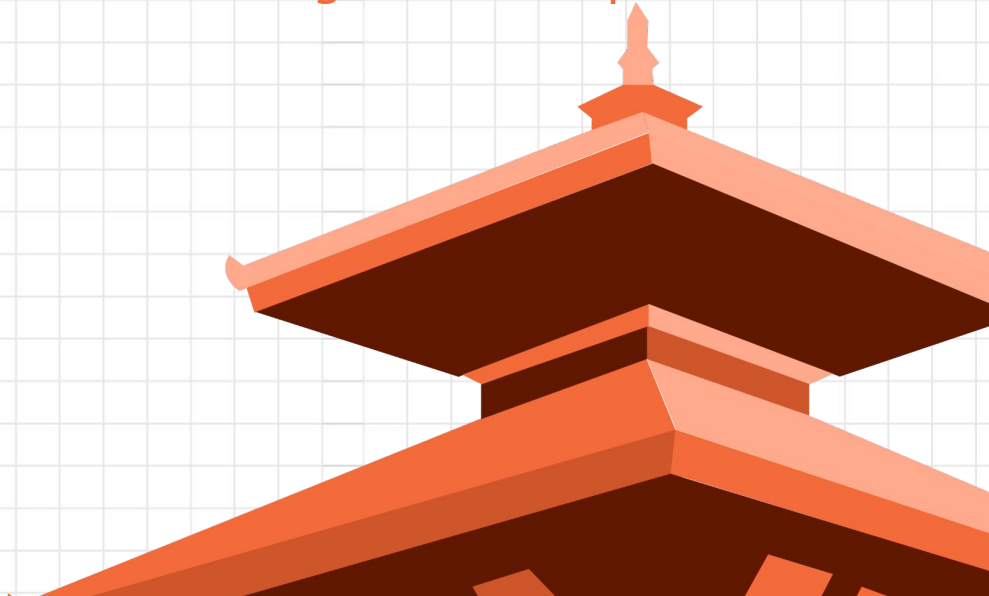
UbuCon Asia 2025

GNOME NEPAL

Empowering Ubuntu Linux:

Super Computing, Education, and Disaster Risk Management in Nepal

Aatiz Ghimiré [~aatizghimire]



Who am I ?

Aatiz Ghimiré

AI / HPC Research Engineer,
Tribhuvan University Supercomputing Center.

Lecturer / PI ,
Center for AI,
Herald College Kathmandu

Technical Consultant Engineer,
On Few Projects for Numerical Weather Forecasting in Nepal

How Many of Remember this ?

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How Many of Remember this ?

Nepal Flood, September 2024

250 fatalities, 18 missing persons, and 178 injured

Damage and Loss on infrastructure estimated at NPR 12.85 billion

© Gopen Rai, AP

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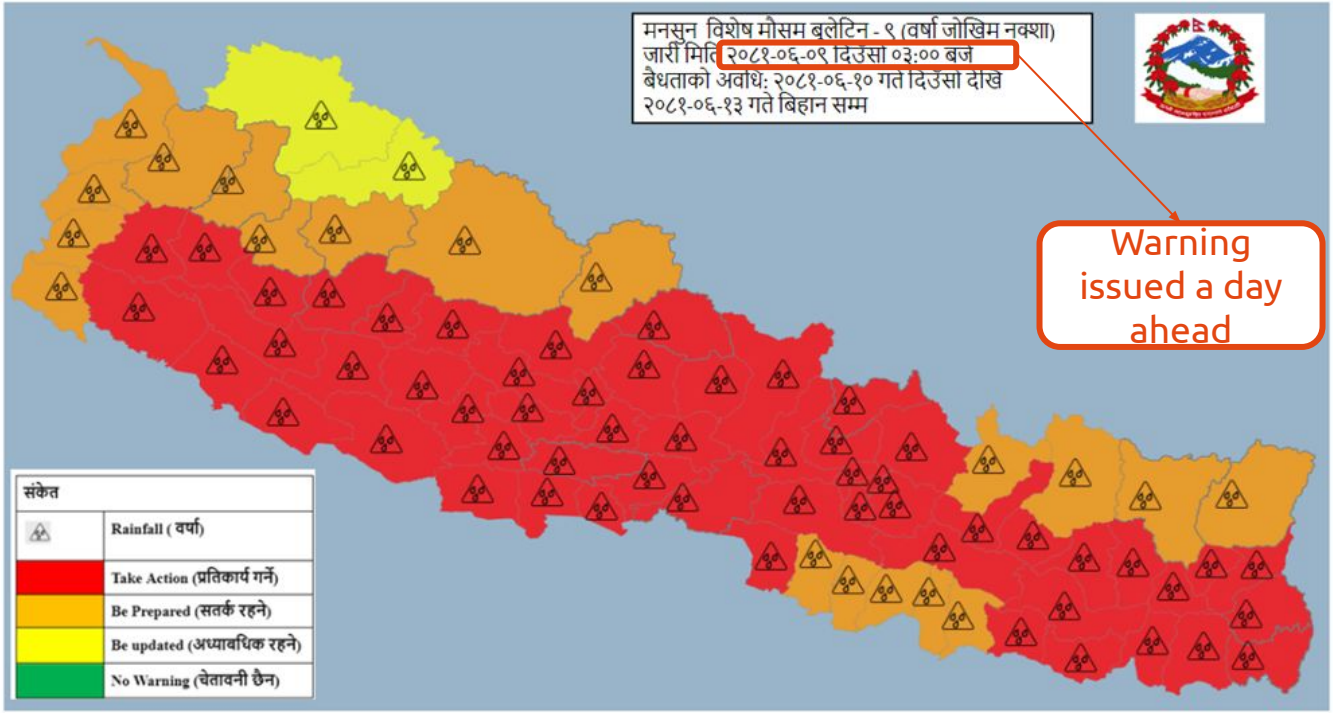
HPC Simulations predicted Monsoon Floods

In **2024**, **HPC simulation saved thousands of lives** — Major Forecasting Components are **powered by Ubuntu Linux**.



HPC Simulations predicted Monsoon Floods

HPC Cluster that numerically calculated the weather and forecast the flood. (Property of DHM, Nepal Government)

- Operationally running 4 times a day.
- GFS: 0.25 x 0.25 degree
- Resolution: 9/3 Km
- **Lead time: 3 days**

History before this (NWP in Nepal)

2010

Dell PowerEdge T610

2015

Dell PowerEdge R730

All **powered by Ubuntu Linux**.

Why i ❤ Ubuntu?

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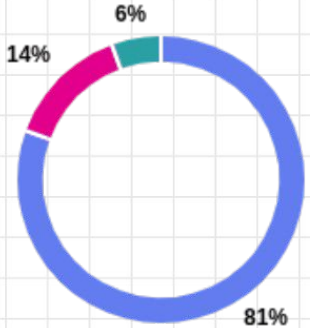
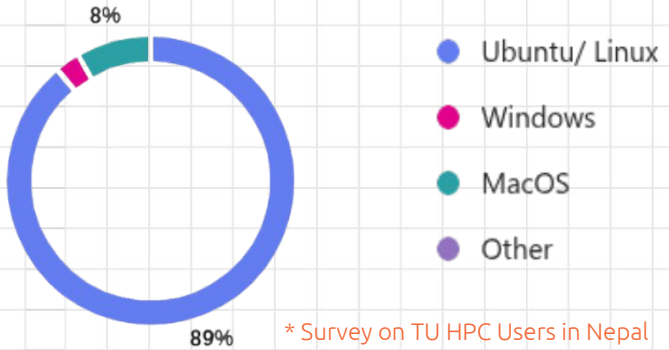
- **Open-source, cost-effective**
- **Wide package & driver support**
- **Stability for scientific workloads**

Primary OS in daily use



Preferred OS for Academic use



* Survey on TU HPC Users in Nepal

HPC in Nepal- The Landscape

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ICIMOD

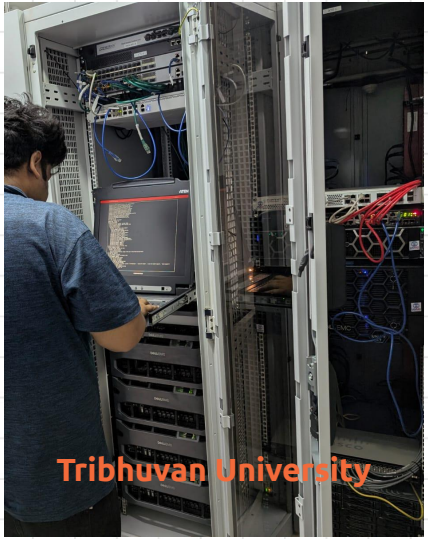
- 8 Node Cluster
- 2010s
- Brought in WRF

Kathmandu University

- 200 Node Cluster
- June 28, 2018
- 2500 Core, 8 TB Memory & 700 TB Storage

Weather Modelling Section, DHM, Nepal Government

- 23 Node Cluster
- 2020
- 368 Core, 100 TB Storage



Tribhuvan University

- 12 CPU +2 GPU Node Cluster
- 23 Jan, 2022
- 500 Core, 5 TB Memory, 50 TB Storage

Ubuntu/Linux in Action at

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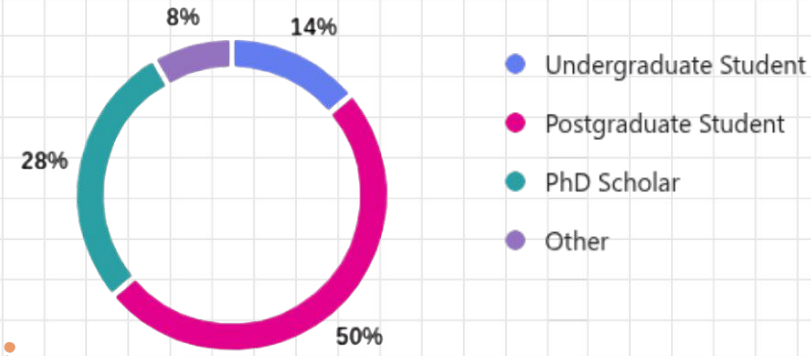
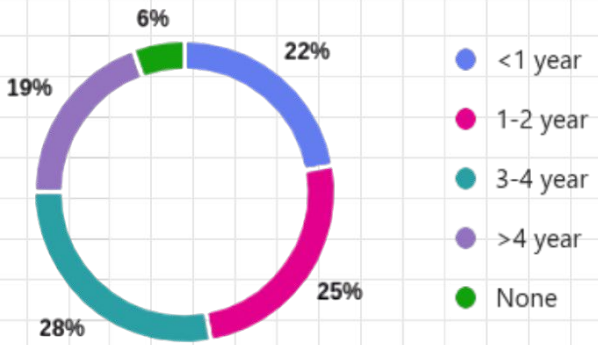
Level Enrolled



Years of Ubuntu/Linux experience



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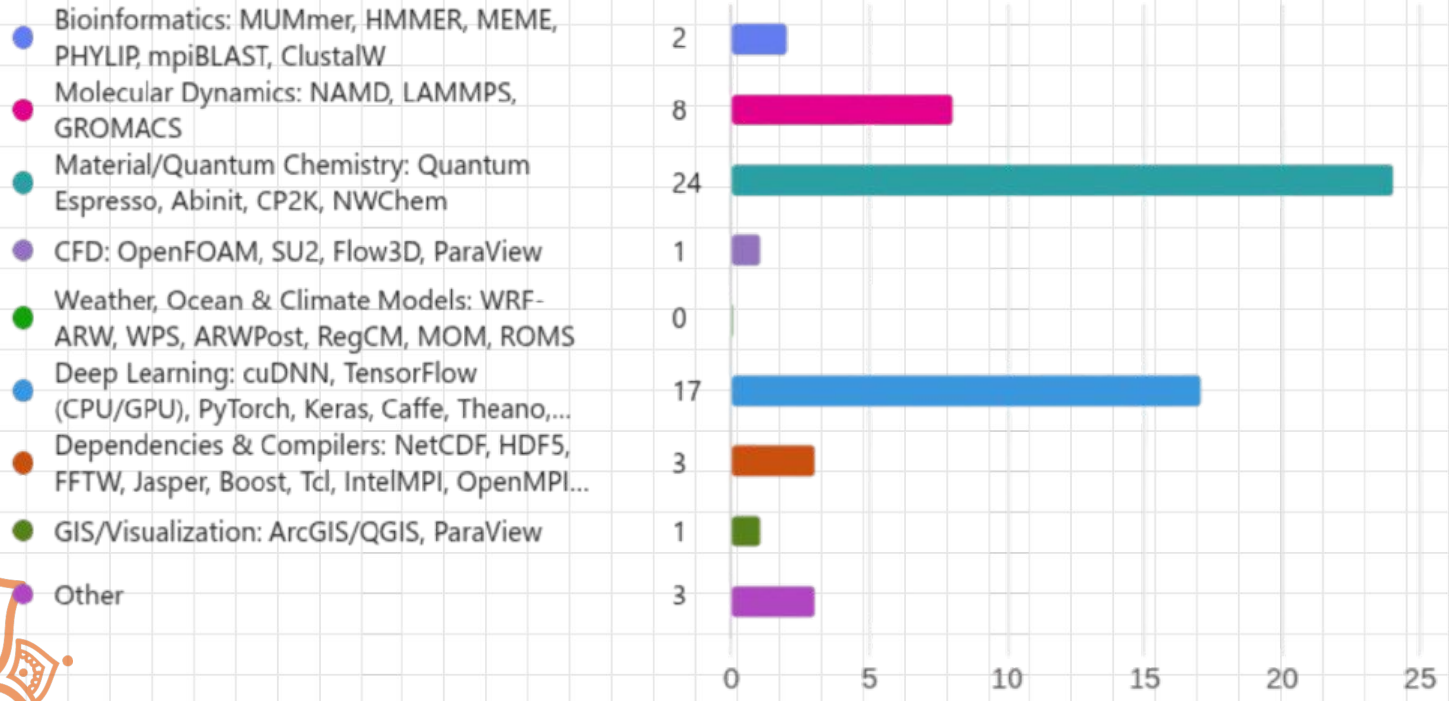

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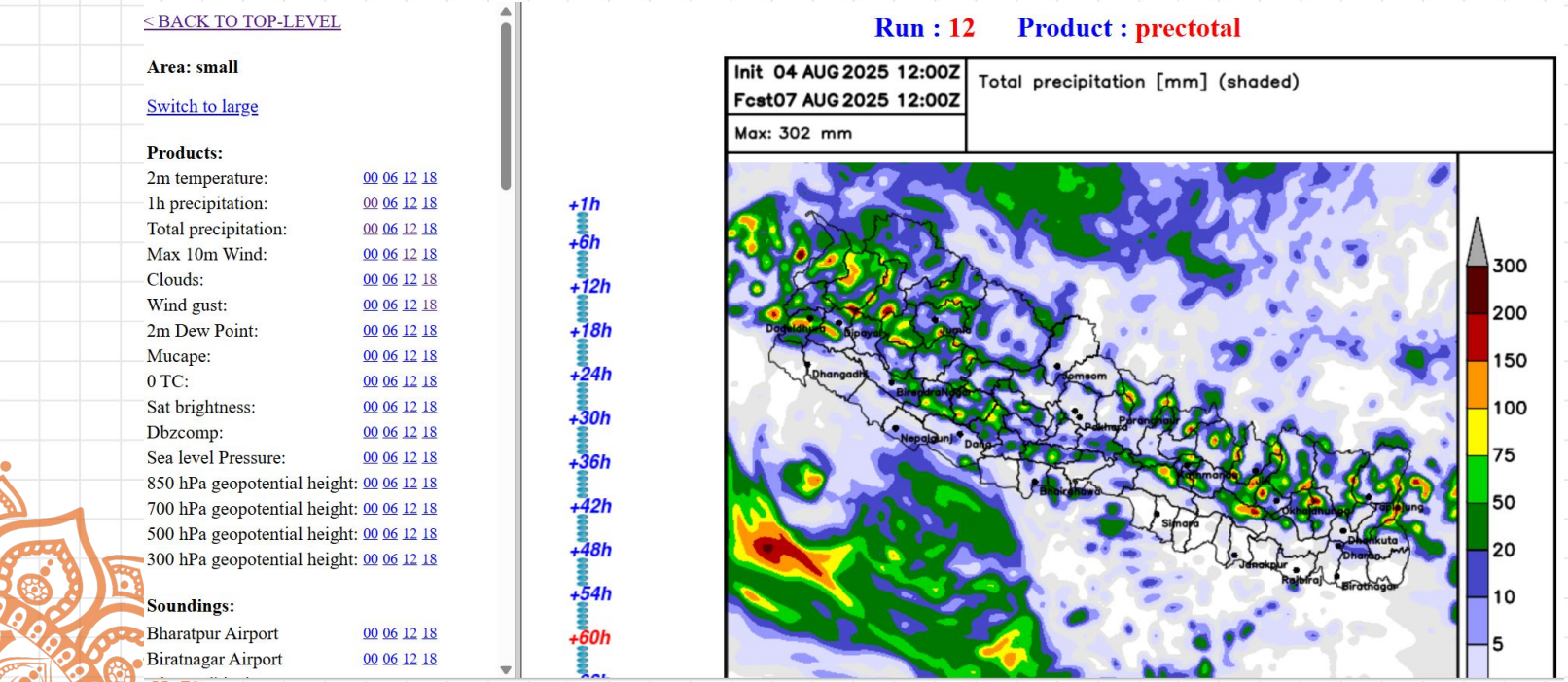
TU HPC DEMO

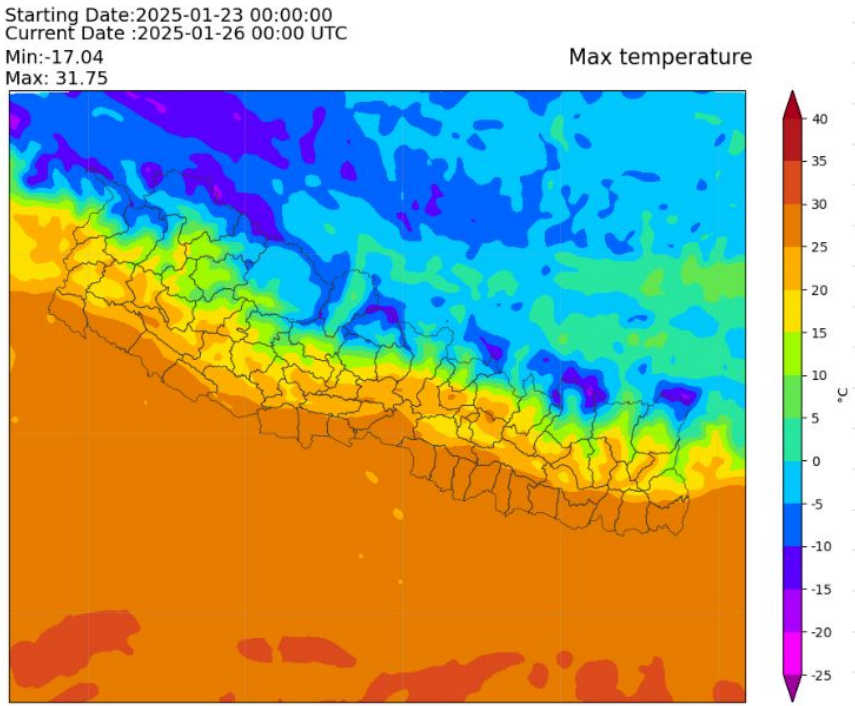
what they are working on?

Ubuntu/Linux in Action at DHM



©Numerical Weather Modelling Section @ DHM

Ubuntu/Linux in Action at DHM



Department of Hydrology and Meterology

WRF output images/data

- WRF maps and soundings
- Application to view meteograms and download raw data
- Direct links to WRF images and data
- WRF Logs
- WRF debug logs

Server localhost.localdomain local core

WRF runs:

00: 0 hours old

00: 17 hours old

00: 12 hours old

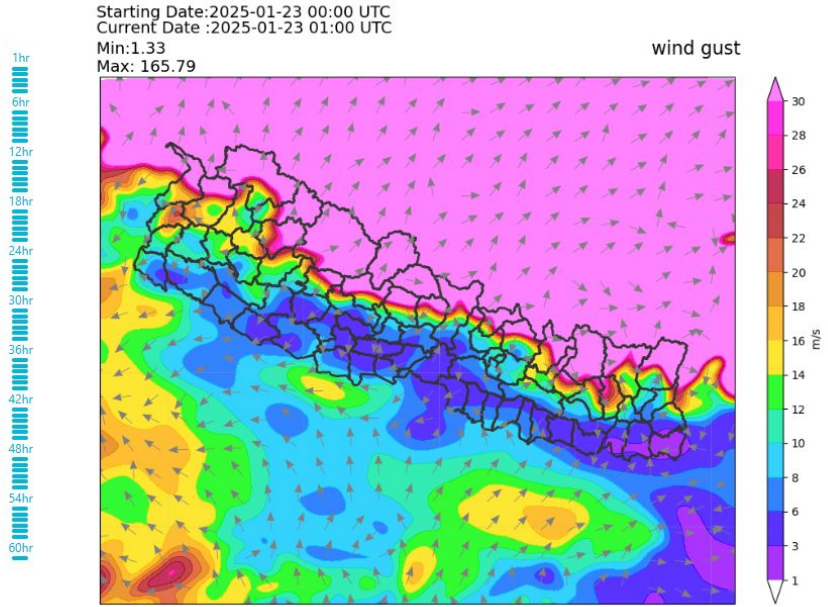
00: 6 hours old

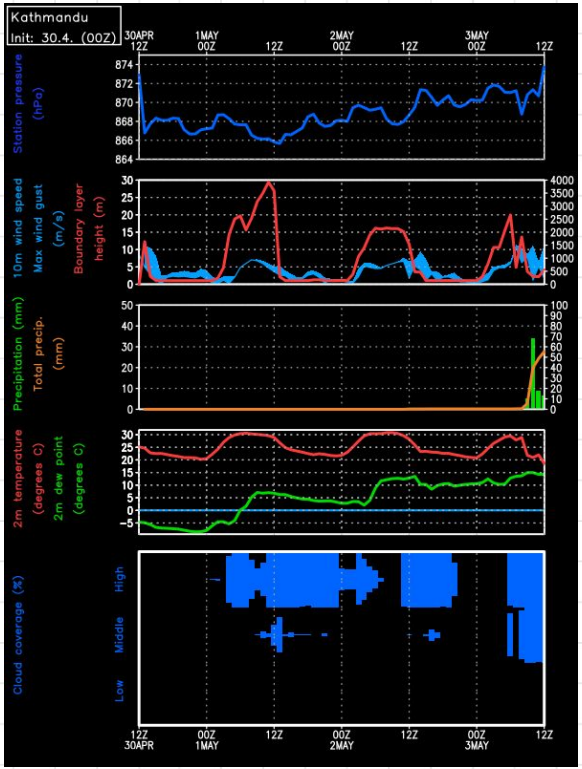
Documentation

- WRF Compilation Process
- WRF User Guides
- Python documentation

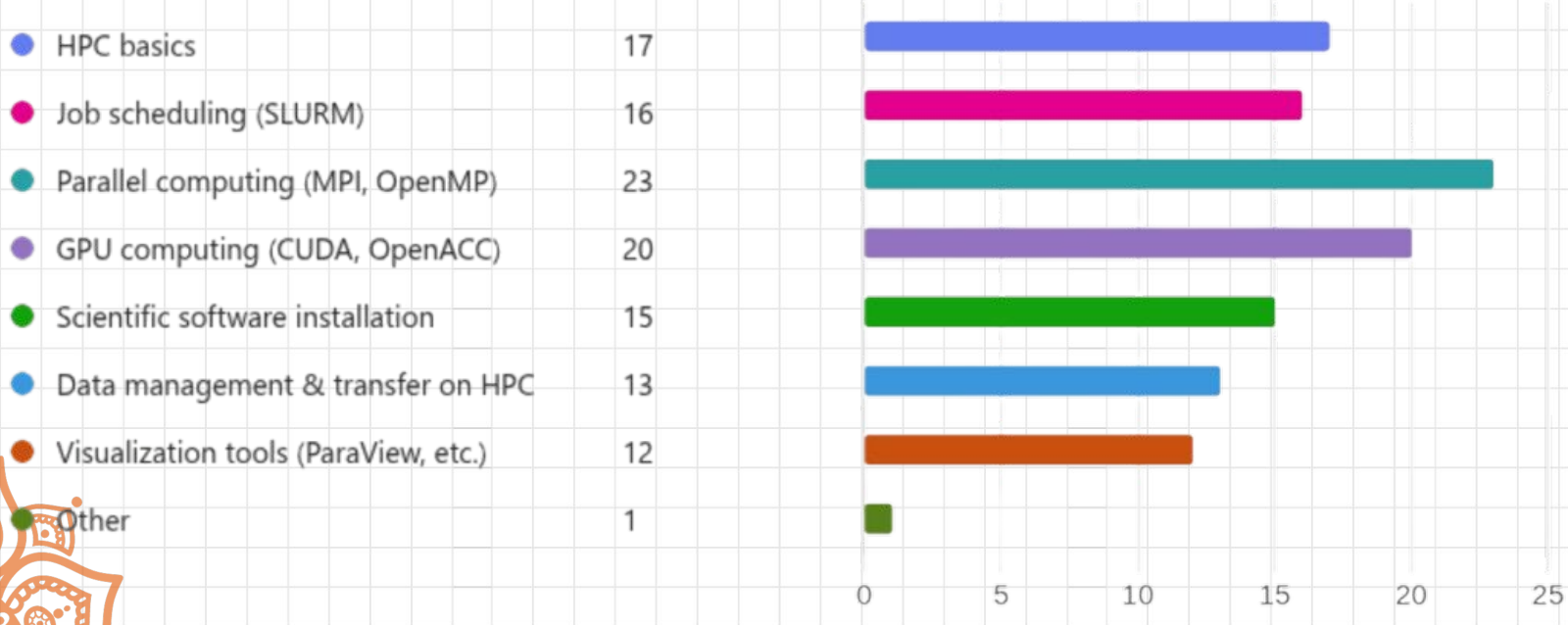
Last log:mainlog of Log
1. prepare the model run wiht ems_prep: 17:20 20240826
2. Starting to run the model with ems_run: 17:20 20240826

Ubuntu/Linux in Action at DHM





Ubuntu/Linux Training Needs



Case Study – AI with TU-HPC

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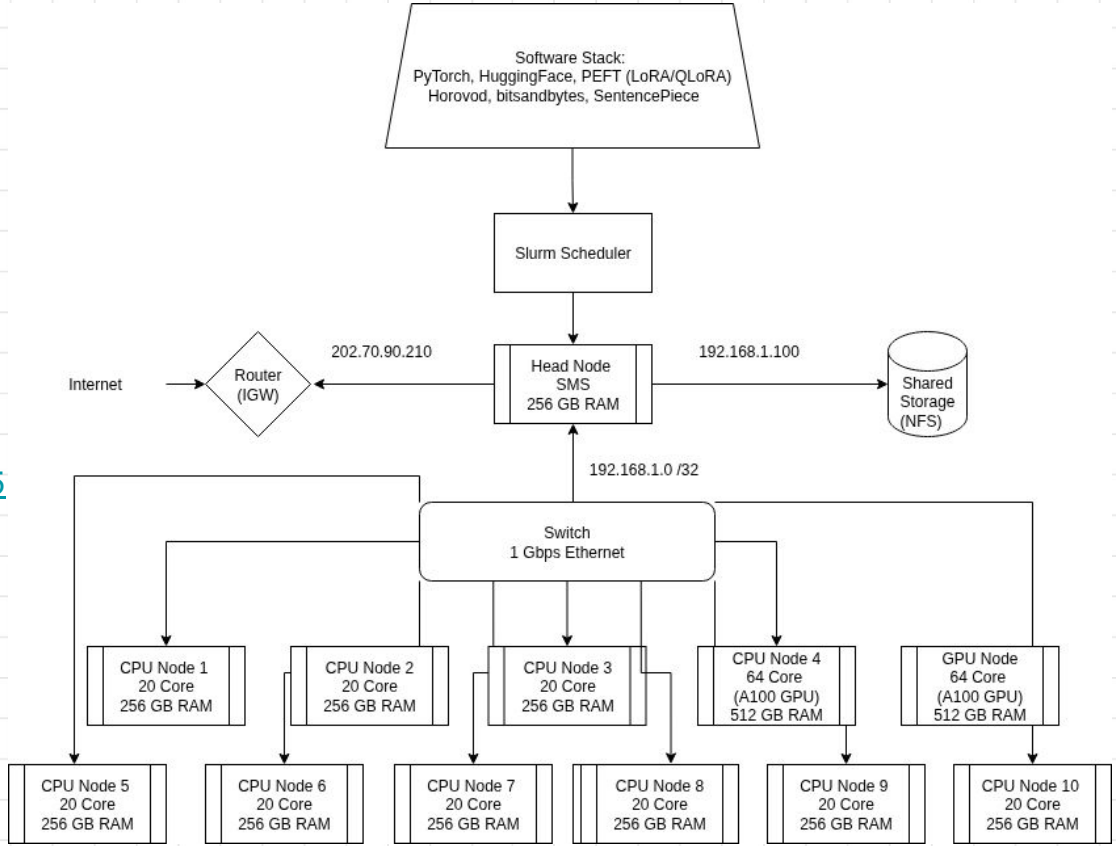
Training a DL with HPC

Data → HPC → AI Model →
Insights → Action

Github Script Link:

https://github.com/aatizghimire/ubucon-asia-2025



Case Study – AI with TU-HPC

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Challenge

- AI/ML jobs on TU-HPC ran as single scripts under SLURM.
- Difficult to manage end-to-end workflows: data prep → training → validation → deployment.

Case Study – AI with Ubuntu Charmed Kubeflow

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Solution

- End-to-end MLOps platform for developing & deploying ML models at scale.
- Runs on Ubuntu, ensuring a stable, secure, and cloud-native foundation.
- Supports hybrid and multi-cloud workflows (HPC + cloud burst).
- Integrates with MLflow, Spark, TensorFlow, PyTorch and more.

Charmed Kubeflow

JUJU

Kubeflow

Case Study – AI with Ubuntu Charmed Kubeflow

Few Scripts

$ juju status --watch 5s (Status)

$ microk8s kubectl -n kubeflow get svc istio-ingressgateway-workload -o jsonpath='{.status.loadBalancer.ingress[0].ip}' (IP)

Charmed Kubeflow

JUJU

Kubeflow

Ubuntu & Academic Integration

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- **Already Incorporated Ubuntu/Linux** in course curricula (e.g., Computational physics, HPC elective, AI lab)
- Hands-on training via boot camps & workshops
- Collaboration with open-source communities.

Future Plans - TU-HPC

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- Planned expansions: GPU clusters, AI supercomputing center
- Vision: “**Every Nepali researcher can run HPC workloads by 2030.**”

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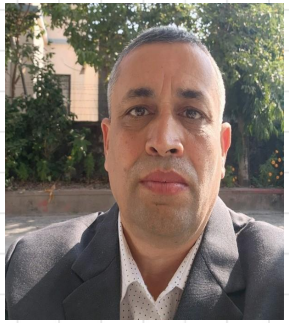
Key Takeaways

- Ubuntu = affordable, scalable HPC platform
- Education + Research + Disaster Management synergy
- Importance of skill development & community support

Acknowledgment



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Saroj Pudasainee
Meteorologist

Q & A

End

Thank You!

Reference

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