CI Compass Student Fellowship Program: Comparative Analysis of High-Performance Computing Facilities (TACC & NCAR)

RAJA ALLMDAR TARIQ ALI, Indiana University - Purdue University Indianapolis, Purdue School of Science, USA
ANGELA P. MURILLO, Indiana University – Indianapolis, School of Informatics and Computing, USA

Introduction

TACC and NCAR are leading high-performance computing facilities serving various research domains

- TACC, at the University of Texas at Austin, supports areas like life sciences, earth sciences, engineering, and physics with supercomputers like Frontera, Stampede2, and Lonestar5.
- NCAR, in Boulder, Colorado, focuses on atmospheric and earth system sciences, offering resources like the Cheyenne supercomputer for climate, weather, and geoscience research. Both centers provide cutting-edge computational resources, expertise, and support services to advance scientific discovery.

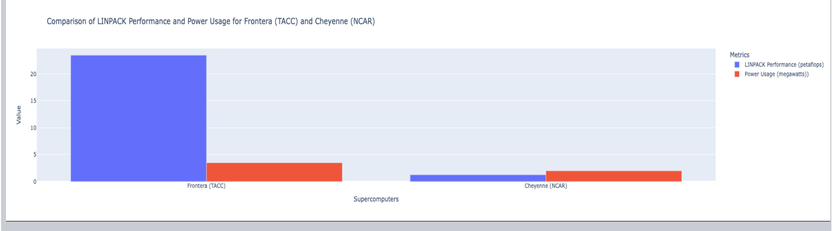
Frontera Supercomputer

Cheyenne Supercomputer

Locations

High-Performance Computing Systems

Feature	Frontera(TACC)	Cheyenne(NCAR)
Peak Performance	23.5 petaflops	13.2 petaflops
System Architecture	Intel Xeon Processors	Intel Xeon Processors
Nodes/Cores	8,008 nodes/16,016 cores	4,032 nodes/145,152 cores
Memory	2.1 TB of Optane Memory	315 TB
Interconnect	InfiniBand	InfiniBand
Storage	50+ Petabytes	38 Petabytes
Unique Features	Broad range of research domains and top supercomputer	Focus on atmospheric research and extensive data archive



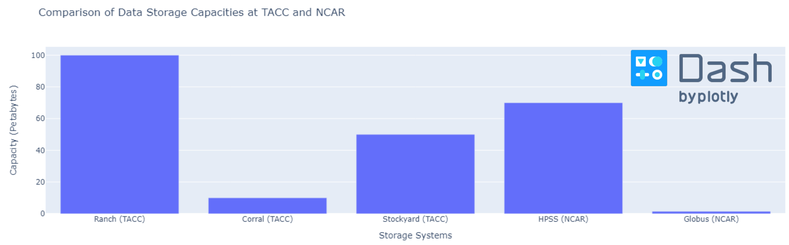
Data Visualization using *Plotly (Python visualization tool)*

plotly

Data Storage and Management

Both TACC and NCAR offer advanced data storage and management solutions to support their research communities

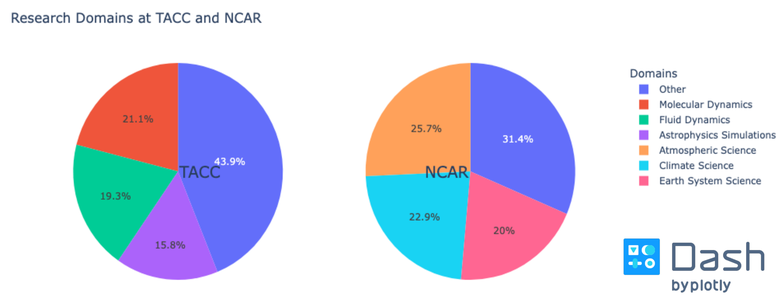
Storage Systems	Security	Accessibility
Ranch, Corral, Stockyard(TACC)	Encryption & Redundancy	Globus & Web Access
Globus (NCAR)	Encryption & Data Integrity	Web Access



Scan for accessing source code and

website link providing latest visual comparisons

Research Domains and Projects

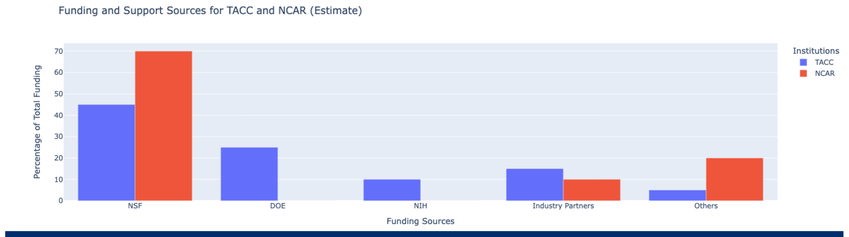


Facility	Research Domain	Example Project
TACC	Molecular Dynamics	Simulation of protein folding and drug interactions
TACC	Astrophysics Simulations	Simulation of galaxy formation and evolution
NCAR	Atmospheric Science	Investigation of atmospheric chemistry and air quality
NCAR	Climate Science	Study of climate change and its impact on global ecosystems

Funding and Support

TACC and NCAR receive funding and support from various sources, including government agencies, private foundations, and industry partnerships.

- TACC collaborates with a range of industry partners, such as **IBM, NVIDIA, Intel, and Dell**, which provide access to cutting-edge technologies and expertise.
- NCAR also receives funding from other federal agencies, such as the National Oceanic and Atmospheric Administration **(NOAA)** and the National Aeronautics and Space Administration **(NASA).**



Conclusion

- **TACC and NCAR are both vital players in advancing scientific research through high-performance computing and data storage solutions. TACC has a diverse research domain focus, encompassing molecular dynamics, fluid dynamics, and astrophysics simulations, while NCAR specializes in atmospheric, climate, and Earth system science research.**
- **Both institutions provide cutting-edge computing resources, such as Frontera (TACC) and Cheyenne (NCAR), and offer comprehensive data storage and management systems. They receive funding and support from a mix of government agencies, private foundations, and industry partnerships, and actively promote collaboration and data sharing through platforms like DesignSafe (TACC) and the Earth System Grid Federation (ESGF) at NCAR.**
- **In conclusion, TACC and NCAR significantly impact their respective fields and the broader scientific community. Their ongoing commitment to advancing high-performance computing and data storage solutions will continue to foster innovation and collaboration in the future.**

This project was supported by the National Science Foundation Grant no: 2127548