

PROJECT GIBBS

Power Analytics and Carbon-Aware Optimisation for Supercomputing



How To Apply

Send your CV, academic transcript and a brief introduction to recruit@nscg.sg with the subject line: **Internship Application - [Your Name] [Project Title]**

Please include your intended internship period within the email. Our team will be in touch with shortlisted candidates.

The Challenge

The National Supercomputing Centre (NSCC) Singapore manages Singapore's national high performance computing (HPC) resources, a critical asset that drives the advancement of cutting-edge research, technology, and innovation.

However, energy consumption remains a critical constraint for modern supercomputing. To make our infrastructure truly sustainable, we need to understand our power usage across every level—from the facility down to individual compute nodes, storage arrays, and user jobs.

We are building a data-driven sandbox to analyse workload efficiency and safely model new, power-smart operations without disrupting live scientific research.

What You Will Do

As part of our Green HPC initiative, you will focus on a modular component of our energy optimisation pipeline:

- **Data Collection & Engineering:** Build pipelines to ingest raw hardware telemetry (e.g. IPMI, RAPL) and link it to historical job logs. You will solve the challenge of mapping facility- and node-level power metrics directly to specific scientific workloads.
- **Workload Profiling:** Analyse the true energy footprint of different research domains. You will establish baselines for key efficiency metrics, such as computational throughput-per-watt and the Energy-Delay Product (EDP).
- **Optimisation & Simulation:** Design smart scheduling logic (e.g. carbon-aware job routing) and system operations (e.g. shifting idle storage into low-power modes). You will test these optimisations in a safe, simulated environment to measure potential energy savings against user wait times.

What You Will Deliver

A comprehensive Energy Audit of our current cluster usage and a simulation report evaluating your proposed power optimisations. Your work will provide the empirical foundation for NSCC's future sustainable supercomputing policies.

Required Qualifications

- Currently pursuing a degree in Computer Engineering, Computer Science, Data Engineering, or a related field
- Proficiency in **Python** and **SQL** for building data ingestion pipelines and querying telemetry data
- Solid understanding of computer hardware architecture (CPU, GPU, memory, storage)
- Strong analytical skills with a passion for sustainability and green computing

Bonus / Preferred Skills

- Knowledge of hardware-level telemetry and power monitoring tools (e.g. IPMI, Intel RAPL)
- Experience with low-level systems programming (C/C++)
- Familiarity with data centre operations, cooling, or power distribution concepts