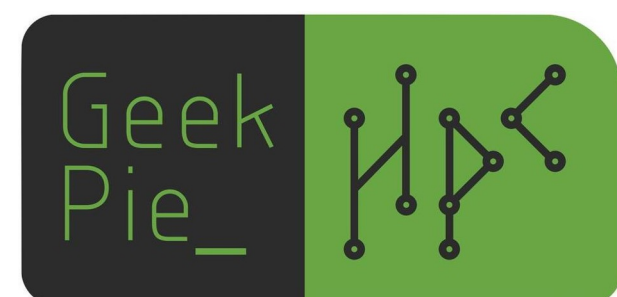




Team Introduction

Our **GeekPie_HPC** team is united with a broad background and different STEM minds that aim to discover and resolve challenging HPC engineering works.



As the youngest section of **GeekPie_**, a student association in ShanghaiTech University which has been collecting EECS-related geeks and nurturing enthusiasts towards gorgeous masters, GeekPie_HPC is growing steadily. Inspired by the success in ASC, ISC and SC student cluster competitions, newcomers influx, endowed with courage, eagerness, and full devotion.

With fresh blood injected into this vigorous team and more advanced HPC resources this year, GeekPie_HPC is sure to become one of the most influential student supercomputing teams in the next competition.

Competition Preparation

- ✓ Learned comprehensive **courses** provided by School of Information Science and Technology (SIST) and gained precious experiences from system optimization to application developments.
 - **General computer systems:** Operating Systems, Computer Architecture, Computer Network, Database, Distributed System, etc.
 - **Implementations and algorithms:** Parallel Computing, Advanced Algorithms Design and Analysis, etc.
 - **Applications:** Artificial Intelligence, Computer Vision, Computer Graphics, Natural Language Processing, Machine Learning, Deep Learning, etc.
- ✓ Actively participated in HPC-related student activities organized by the GeekPie_HPC student association.
 - Tutorials in **system setup** and **parallel coding** techniques
 - Talks given by experienced engineers and researchers from top-ranked HPC institutes around up-to-date HPC achievements and state-of-art supercomputing technologies
- ✓ Other vigorous assistance:
 - Library and Information Center (LIC): computation resources for practice and necessary guidance in assembling clusters and maintenance
 - Laboratory of I/O Systems and Data Science (LION): insight into various research projects on large-scale parallel/distributed storage systems and efficient parallel/distributed algorithms from the application and algorithms perspective

Skills & Strategies

Optimization Techniques

HPL

- **Auto tuning** the parameter based on Bayesian Optimization Methods.
- **Reduce communication** between two CPU sockets.
- Try different kinds of numerical libraries.

miniVite

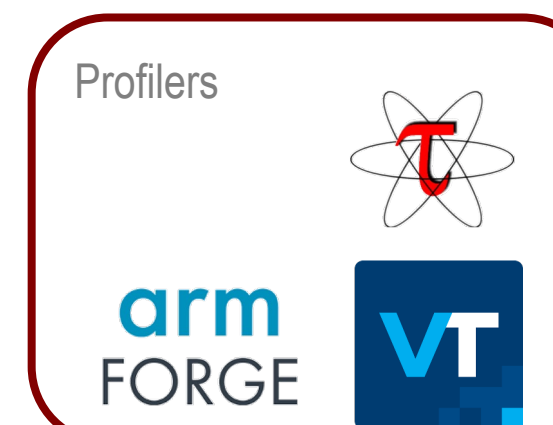
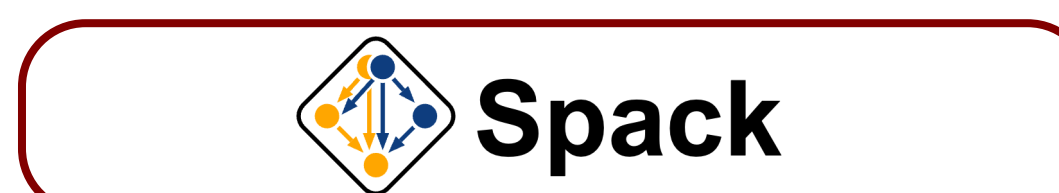
- A **balance** between **OpenMP** threads and **MPI** processes for the specific architecture.
- Analyze communication pattern between nodes.
- Profiling to optimize hot code.

NAMD

- Analysis whether a computing-bound application or a communication-bound application.
- Flexible version with different compilers and libraries using Spack, such as FFTW + GCC + Open MPI, MKL + ICC + Intel MPI.

Management Strategy

- **Spack:** flexible and configurable package managing across different systems and architectures, with a uniform interface
 - using up to date compilers and tuning options optimized for specific hardwares
- **Ansible:** automated provisioning, configuration management and intra orchestration
- **Grafana:** log aggregation and real time monitoring
- **BeeGFS:** parallel cluster network-storage being distributed, resilient, highly configurable with good performance



Diversity & Collaboration

Demographic Diversity

- ✓ Gender diversity
 - With a female team member actively participating in STEM activities.
- ✓ Birthplace diversity
 - Come from different provinces of China.
 - Resulting in various cultural backgrounds.

Cognitive Diversity

- ✓ Different HPC experience
 - From novices to experienced HPC contestants.
 - From sophomore to senior students majored in Computer Science.
- ✓ Diverse personal and research interests
 - Various courses taken, various knowledge acquired.
 - Respect every team member to persue preferred tasks based on their skill sets and interests.

Jiajun Cheng
Networking & DevOps @ 2020

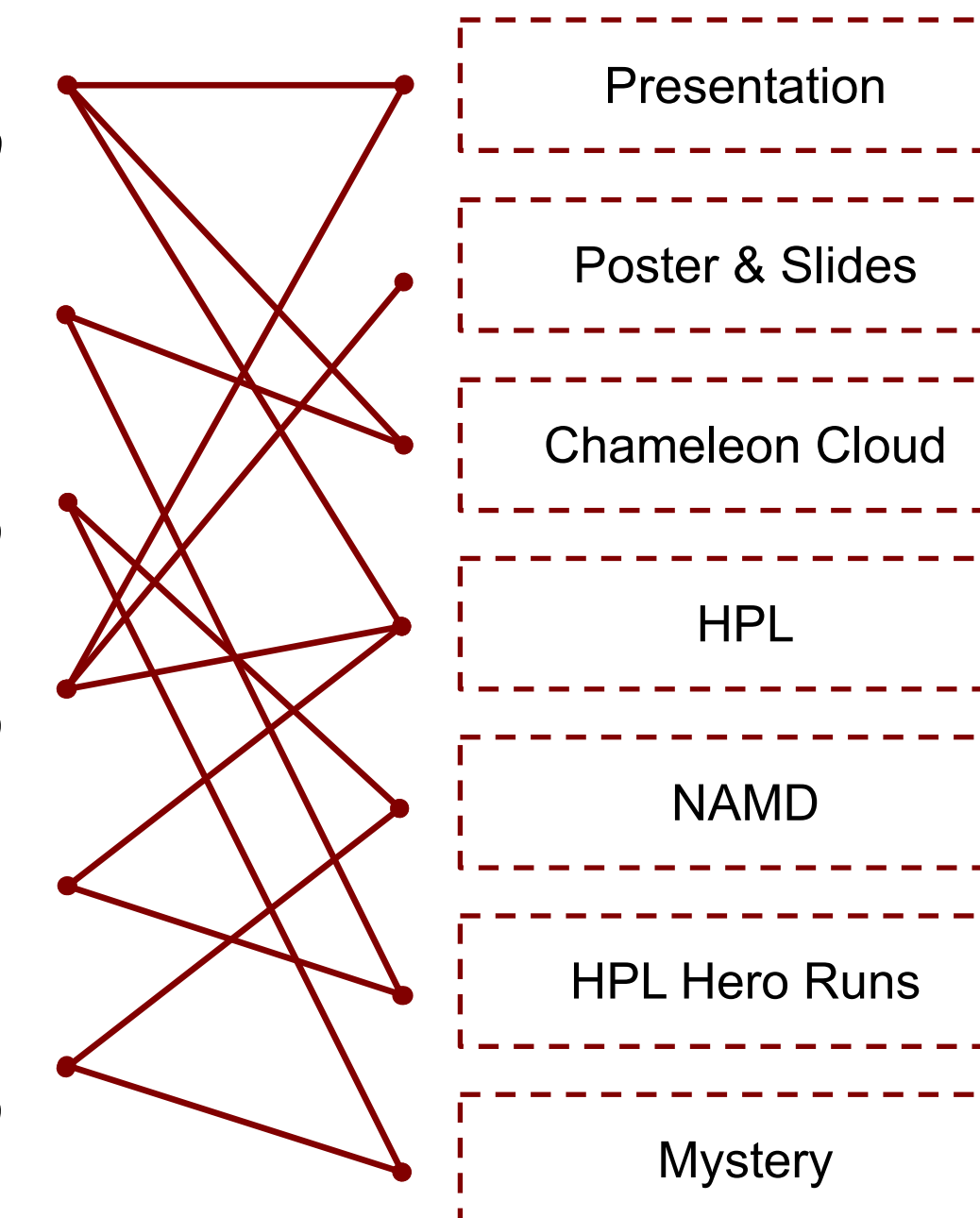
Aibo Hu
Compiler & DevOps @ 2021

ZeCheng Li
Compiler & System @ 2019

Weiqi Wu
NLP & AI @ 2019

Yichi Zhang
Backend & Algorithm @ 2021

Yining Zhang
Compiler & System @ 2019



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