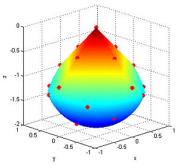# Parallel and Distributed Systems
CSCI 5551/CSCI 7551
Gita Alaghband
E-Mail: Gita.Alaghband@ucdenver.edu
http://cse.ucdenver.edu/~gita/

This is a state-of-the-art course in the vital area of parallel and distributed systems.
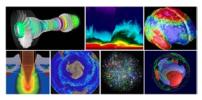
With the advances in the computer architecture field, all new computers including laptops are now multi-core systems. While the computer architectures have all moved to multi-core, the system software and programming of these computers have not advanced at the same rate of progress. In fact AMD and Intel have announced that they will increase the number of cores on a chip in all future processors as have most computer companies. For these computers to be used effectively, new system software, programming languages and applications must be designed with expertise in parallel and distributed systems. Industry is now looking for software designers with training in parallel and distributed systems for all of their new developments.

This course will cover and relate three main components essential in parallel computation namely, parallel algorithms, parallel architectures, and parallel languages. The three areas will be described and their design influences on each other will be demonstrated.

Student will use our "**Parallel Distributed Systems (PDS) Laboratory** that houses:

- Heracles: a multi-core cluster consisting of 18 nodes distributed as:
  - 1 master node, 2 x Intel Xeon E5-2650v4 Processor with 24 cores
  - 16 compute nodes, 2 x Intel Xeon E5-2650v4 with 24 cores (12 cores/processor)
  - a cluster node with Intel Xeon E5-2650v4 Processor hosting 4 x NVIDIA Tesla P100 GPUs
  - Mellanox SwitchX-2 18-Port QSFP FDR Externally Managed Switch (1U)
  - Non-Blocking Switch Capacity of 2Tb/s
  - 128GB
- Hydra: a multi-core cluster consisting of 17 nodes distributed as:
  - 1 master node (12 cores)
  - 16 AMD Opteron 2427 nodes (12 core each)
  - 416 GB RAM
  - ~ 5TB disk space
  - four nodes connected to 8 Tesla Fermi GPUs 2050, PCIE2x16 (1792 CUDA cores each)
- a 64-core AMD Opteron 6274 server with one NVIDIA Kepler GPU (K40c)
- a 16-core Intel Xeon processor with 2 Intel Xeon Phi 7120P Coprocessors (122 cores) equipped with Intel® Parallel Studio XE latest software.

The PDS Lab supports teaching and research in all areas of parallel and distributed computing: advanced computer architectures, operating systems, parallel programming languages, applications, and high

performance computing and networking. For more information on the PDS Lab, please visit: http://PDS.ucdenver.edu