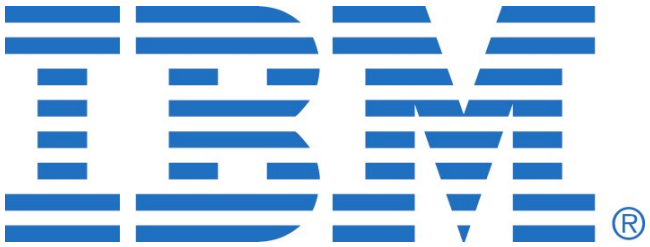
MITIGATING VARIABILITY IN HPC SYSTEMS AND APPLICATIONS FOR PERFORMANCE AND POWER EFFICIENCY

BILGE ACUN

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

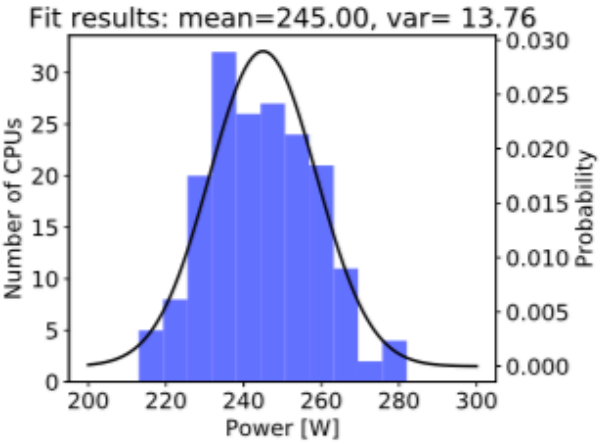


Dissertation Goal

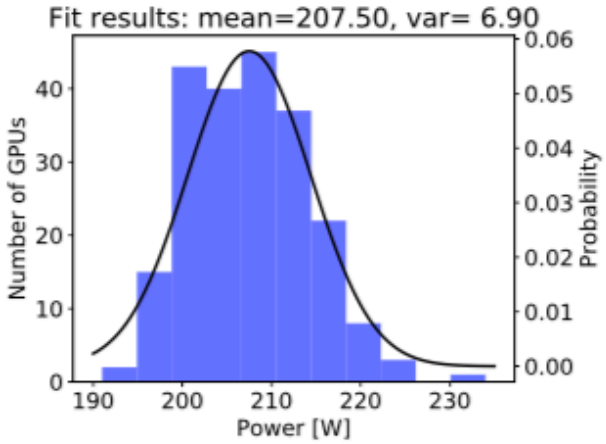
To increase the performance and power efficiency of High Performance Computing (HPC) systems through mitigating various sources of variability without sacrificing from performance

- Analyze variability in large scale HPC systems
  - Frequency, power, temperature
- Address each of the sources of the variability
  - Via software and hardware techniques

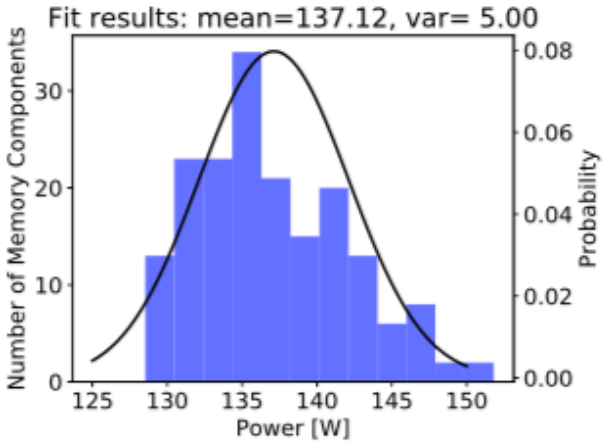
CPU



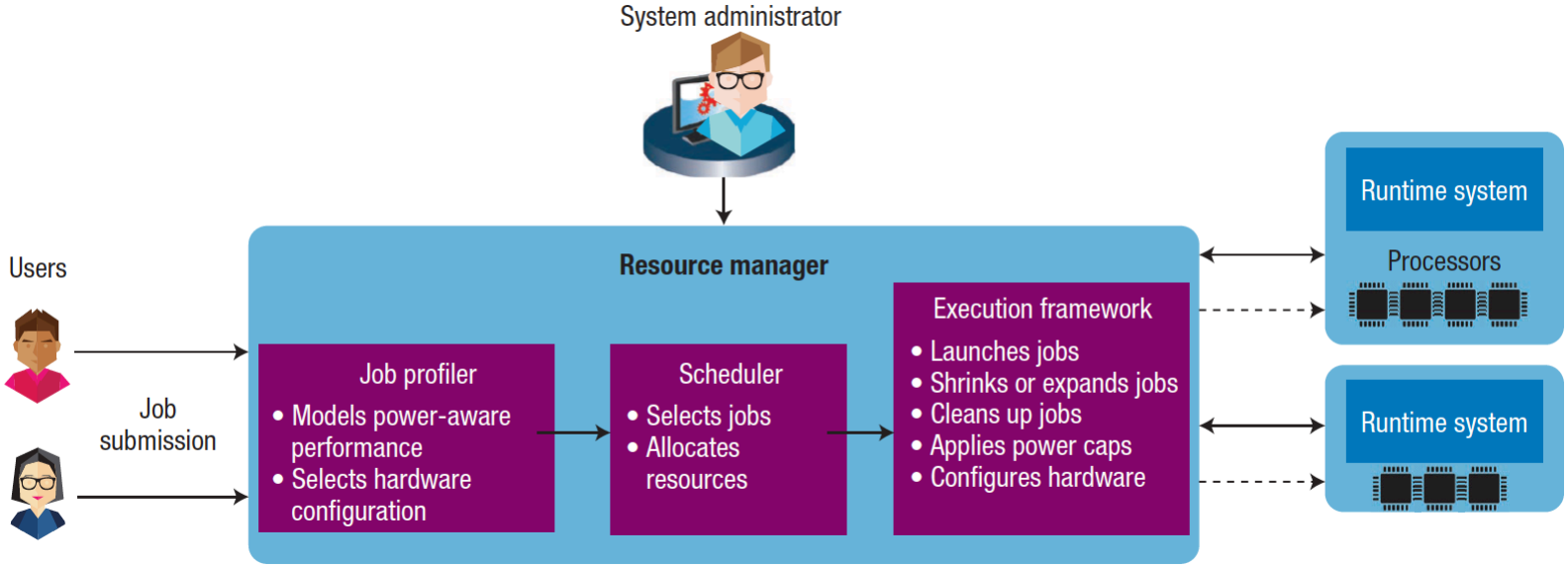
GPU

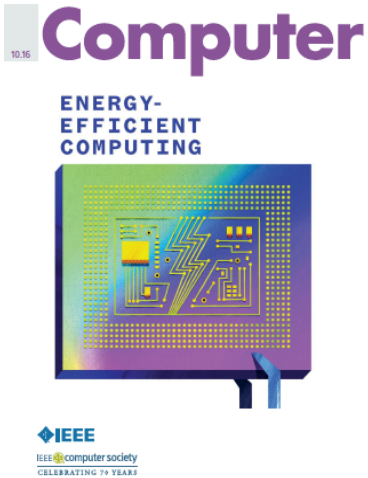


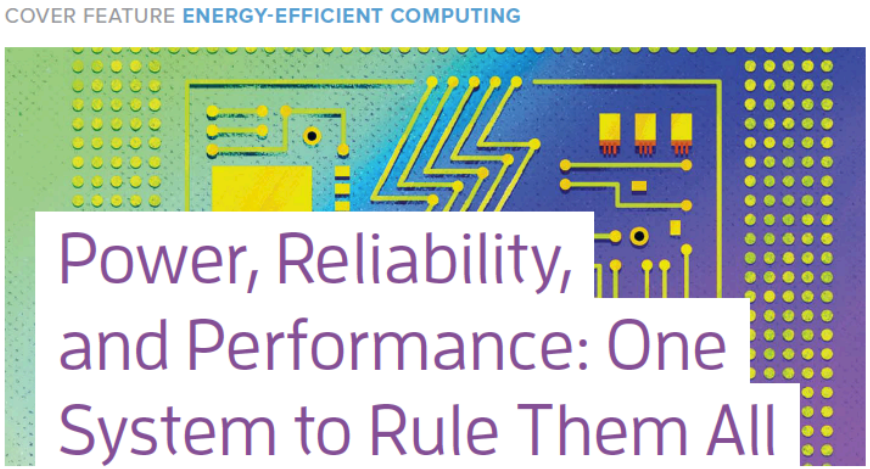
Memory



Interaction Between the Resource Manager and Energy Efficient Runtime: Charm++

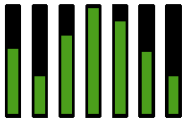






B. ACUN, A. LANGER, H. MENON, O. SAROOD, E. TOTONI, AND L. V. KALE. "POWER, RELIABILITY, PERFORMANCE: ONE SYSTEM TO RULE THEM ALL". IEEE COMPUTER, 2016.

Thesis Contributions

- Processor Variation Analysis: Frequency, Temperature, Power 
- Mitigating Frequency Variation 
- Mitigating Temperature Variation 
- Mitigating Power Variation 
- Mitigating Within Appl ation Variations 

"Power Aware Heterogenous Node Assembly" is going to appear at HPCA'19