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#HPCMatters: Understanding the Hype of High Performance Computing

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ABSTRACT

What is the hype behind supercomputers and high performance computing? How can you gain exposure to HPC? What opportunities will help put you on the path to starting an HPC career? Come chat with two recent graduates now pursing different careers in HPC. We will share personal undergraduate experiences that sparked our initial interest in HPC, and provide attendees with resources for launching into this field.

AUDIENCE

The SOL will be a career-related talk, targeted primarily at students who want to learn about HPC, or are interested in pursuing a career in HPC and want to know what sorts of actions they can take to reach their goals. Early career individuals interested in transitioning to a career in HPC may also find benefit from this SOL.

INTRODUCTION

HPC is a powerful enabling technology allowing our scientists and engineers to solve the next generation of complex scientific applications ranging from climate and weather prediction to medical imaging. Current petascale systems are capable of executing 10^{15} floating-point operations per second, or FLOPS. Within the next five years, we expect to see the first exascale system that can perform 1 billion billion (10^{18}) FLOPS.

The field of HPC is at an exciting transition point. The next generation of supercomputers will introduce several challenges, such as more advanced hardware architectures, imposed power constraints, and reduced memory bandwidth and capacity [1].

The typical HPC career starts in graduate school, by working with a research advisor with HPC expertise. By its nature, graduate school offers less flexibility for exploratory coursework, since the expectation is that the student will be an expect in a particular research area. Experiencing HPC as an undergraduate can be a rare occurrence, leading students to choose a research area based on a hunch as to whether HPC is the career for them.

We had unique exposure to HPC while as undergraduates as participants on an all-women's team at the Student Cluster Challenge at the largest international supercomputing conference held every November [2,3,4,5]. The challenge itself is a 48-hour competition in which teams of six undergraduate and/or high school students race to complete a series of open-source scientific applications given a strict power constraint. Prior to the competition, teams work with vendor partners to design and assemble a small cluster from commercial components operating under a specific power limit. In addition, teams work with application experts to tune the applications for optimum performance [7].

This multi-faceted competition provides participants with a one-of-a-kind hands-on experience in HPC [8]. Students have the opportunity to design a machine based on various constraints, construct an HPC system, set up and administer the system, build and tune simulation codes, such as the Linpack Benchmark, research the impacts of a power constraint, and even create some visualizations of the resulting simulations. In addition, the competition is an excellent opportunity to showcase students' knowledge in HPC to well-renowned leaders in the supercomputing field. It can lead to future research collaborators in graduate school, a summer internship or even a full time position after graduation!

In the years since participating in the competition, our undergraduate university has increased its focus on providing our engineering and computer science students with new HPC opportunities and related-courses. There are so many open research problems within HPC that will be a critical component of solving the world's most complex scientific problems. It's an exciting and ever-evolving field and we hope to inspire women and other underrepresented minority to pursue a career in HPC!

OUTCOMES/CONCLUSION

At the very least, we hope we can spark new interest in HPC through our unique experience as participants in the Student Cluster Challenge at the annual Supercomputing Conference. For students, we want to help define actions they can take to put them on the path to pursuing their goal, whether that be taking an HPC-related course or finding an HPC professor to conduct research with. We want to provide guidance, mentorship, and a supportive environment to those who may be interested in pursuing a career in HPC.

PARTICIPATION STATEMENT

If accepted, Stephanie Labasan will attend GHC 2016 in Houston, TX in October.

If accepted, Kathleen Shoga will attend GHC 2016 in Houston, TX in October.

BIO

Stephanie Labasan is a third year Ph.D. student at the University of Oregon. Her research focuses on strategies to optimize performance of scientific visualization applications on future power-constrained high performance systems. Prior to graduate school, she graduated with a B.S. in Computer Engineering from University of the Pacific, where she was a member of the first all-women's team to participate in the Student Cluster Challenge at SC12. It was through this unique opportunity that sparked her interest in pursuing a career in HPC, and has led to unique opportunities in academia, industry, and the national lab.

Kathleen Shoga is a computer scientist at Lawrence Livermore National Laboratory. She graduated from University of the Pacific in May 2015. She participated in on Pacific's supercomputing team, Team Venus, in the Student Cluster Challenge at both SC12 and SC13. In 2013, she was both the system administrator and team captain for Team Venus.

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