Abstract:
Graphics Processing Units (GPUs) are becoming an inevitable part of every computing system because of their ability to accelerate applications consisting of abundant data-level parallelism. They are not only used to accelerate big-data applications in data centers and high-performance computing (HPC) systems, but are also employed in mobile and wearable devices for efficient execution of multimedia-rich applications and smooth rendering of display. However, in spite of the massively parallel structure of GPUs and their ability to execute multiple threads concurrently, they are far from achieving their theoretical peak performance. In this talk, I will discuss the primary reasons behind this performance gap and some solutions to bridge it. In particular, I will show how the problem of shared resource (e.g., caches and memory) contention can cause severe loss in overall GPU performance. I will also discuss how this resource contention problem can cause unfairness and lead to low system throughput when multiple applications are concurrently executed on a GPU. To address these inefficiencies, my doctoral research has focused on developing various thread and memory scheduling techniques. I will present some of these techniques and finally conclude my talk by briefly discussing my future research directions, which are inspired by my belief that all computing systems in the future will consider GPUs as first-class computing citizens and not just as coprocessors.

Biosketch:
Adwait Jog is a Ph.D. Candidate in the Department of Computer Science and Engineering at Penn State University. His research interests lie in the broad areas of computer architecture and systems, with an emphasis on designing high-performance and energy-efficient GPU-based platforms. He has received the Best Graduate Research Assistant Award at Penn State and was selected as one of 25 finalists for an NVIDIA Ph.D. Fellowship. Adwait worked as an intern with NVIDIA Research in the summer of 2013, and with Intel in the summers of 2012 and 2011. Before joining Penn State with College of Engineering Fellowship, he completed his undergraduate studies at NIT Rourkela, India in 2009.