Heterogeneous Computing for Undergraduates: Introducing the ToUCH Module Repository

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The need for increased performance per watt, coupled with the demands of processing diverse workloads, has triggered an industry shift towards heterogeneous computing systems. Integration of high-performance CPUs with energy-efficient GPUs is now common in HPC. Architectural heterogeneity has also permeated other domains such as mobile processing, cloud computing, and the Internet of Things. Machine learning practitioners routinely use accelerators in both training and inference. The move towards heterogeneity presents a significant educational challenge since few current curricula include much about heterogeneous computing except possibly in upper-division electives. The NSF-funded initiative *ToUCH: Teaching Undergraduates Collaborative and Heterogeneous computing* was conceived to confront this impending challenge (https://touch.cs.txstate.edu). The ToUCH project has several ongoing initiatives to promote and encourage teaching of heterogeneous computing. These include summer bootcamps, faculty training workshops and the design, implementation, and integration of a collection of teaching modules on heterogenous computing.

In this workshop, we present modules from the ToUCH repository to incorporate heterogeneous computing into core CS courses taken by all majors (e.g., CS 1, CS 2, Computer Organization, Operating Systems). Attendees will have time to work through lab exercises, assignments and tutorials associated with the modules while we assist. We will provide post-workshop support for instructors interested in adopting the modules. In addition, we will solicit feedback from them to help guide our future module development.