

Democratizing Error-Efficient Computing

ABSTRACT

We live in a world where errors in computation are becoming ubiquitous and come from a wide variety of sources -- from unintentional soft errors in shrinking transistors to deliberate errors introduced by approximation or malicious attacks. Guaranteeing perfect functionality across a wide range of future systems will be prohibitively expensive. Error-efficient computing offers a promising solution by allowing the system to make controlled errors. Such systems can be considered as being error-efficient: they only prevent as many errors as they need to for an acceptable user experience. Allowing the system to make errors can lead to significant resource (time, energy, bandwidth, etc.) savings. Error-efficient computing can transform the way we design hardware and software to exploit new sources of compute efficiency; however, excessive programmer burden and a lack of principled design methodologies have thwarted its adoption.

My research addresses these limitations through foundational contributions that enable the adoption of error-efficiency as a first-class design principle by a variety of users and application domains. In this talk, I will show how my work (1) enables an understanding of how errors affect program execution by providing a suite of automated and scalable error analysis tools, (2) demonstrates how such an understanding can be exploited to build customized error-efficiency solutions targeted to low-cost hardware resiliency and approximate computing and (3) develops methodologies for principled integration of error-efficiency into the software design workflow. Finally, I will discuss future research avenues in error-efficient computing with multi-disciplinary implications in core disciplines and emerging application areas.

SPEAKER BIO

Radha Venkatagiri is an assistant professor of computer science at Oregon State University. Her research interests lie in the area of computer architecture and systems. Venkatagiri's dissertation work aims to build efficient computing systems that redefine "correctness" as producing results that are good enough to ensure an acceptable user experience. Venkatagiri spent the last year working as a post-doctoral researcher at AMD Research. Before her doctoral work, Venkatagiri was a CPU/Silicon validation engineer at Intel where her work won a divisional award for key contributions in validating new industry standard CPU features. Prior to that, she worked briefly at Qualcomm on architectural verification of the Snapdragon processor.



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Q/A: 11:30-11:45

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