The availability of a wide range of general purpose as well as accelerator cores on modern smartphones means that a significant number of applications can be executed on a smartphone simultaneously, resulting in an ever increasing demand on the memory subsystem. While the increased computation capability is intended for improving user experience, memory requests from each concurrent application exhibit unique memory access patterns as well as specific timing constraints. If not considered, this can lead to significant memory contention and result in lowered user experience.

This work first analyzes the impact of memory degradation caused by the interference at the memory system for a broad range of commonly-used smartphone applications. The real system characterization results show that smartphone applications, such as web browsing and media playback, suffer significant performance degradation. Based on the detailed characterization results, this work focuses on the design of an effective memory interference mitigation technique. Since web browsing, being one of the most commonly-used smartphone applications, represents many html-based smartphone applications, this work focuses on meeting the performance requirement of a web browser on a smartphone in the presence of background processes and co-scheduled applications. My thesis proposes a light-weight user space frequency governor to mitigate the degradation caused by interfering applications, by predicting the performance and power consumption of web browsing. The governor selects an optimal energy-efficient frequency setting periodically.
by using the statically-trained performance and power models with dynamically-varying architecture and system conditions, such as the memory access intensity of background processes and/or coscheduled applications, and temperature of cores. By operating at the most energy-efficient frequency setting in the presence of interference, energy efficiency is improved by as much as 35% and with an average of 18% compared to the existing interactive governor, while maintaining the satisfactory performance of web page loading under 3 seconds.