

**Department of Computer Science
National Tsing Hua University
CS5100 Advanced Computer Architecture
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Homework 4

Due: 2017/05/24

Gem5-gpu is an integrated simulation infrastructure for heterogeneous CPU-GPU computing. It builds on gem5, a modular full-system CPU simulator, and GPGPU-Sim, a detailed GPGPU simulator. Gem5 and GPGPU-Sim run as two separate processes and communicate through shared memory in the Linux OS. Gem5-gpu routes most memory accesses through Ruby, which is a highly configurable memory system in gem5. Gem5-gpu can run most unmodified CUDA 3.2 source code. Applications can launch non-blocking kernels, allowing the CPU and GPU to execute simultaneously.

1. Please follow the instructions on the gem5-gpu wiki (<https://gem5-gpu.cs.wisc.edu/wiki/start>) to install gem5-gpu.
2. Please follow the steps in (<https://gem5-gpu.cs.wisc.edu/wiki/benchmarks>) to install benchmark programs for x86 ISA.
3. Please pick three benchmark programs. Vary the number of cores for at least three different values to run the three benchmarks. Compare the performance data and report your results. To set the system parameter, you can study and modify the configuration file “GPUConfig.py” and “gpu_config/gpusim.fermi.config.template” in gem5-gpu/config/.
4. Please modify the “kmeans” benchmark program in “benchmarks/rodinia/kmeans/” by changing the number of blocks and threads in the program. Recompile and run the program. Compare the performance data using different parameters and report your results.