

CS 6810 Homework #5

Due: 9:10 a.m. Dec. 10 (no late submissions will be graded)

You will hand your paper in as a hard copy in class – if you can't attend class then ask a fellow student to bring it in for you.

General instructions: Same as usual – namely you are encouraged to work in a small group to gather information and discuss things but **WRITE** your own paper. This final homework asks you to use what you've hopefully learned as a basis for learning about a CPU, GPU, or computer system described in the literature and then providing a critique. The assignment is worth 200 points (double assignment).

Background: Your paper length target should be: 10 pages, single-spaced, 10 point font. To avoid the usual questions consider 8 pages to be the minimum and 15 pages to be the maximum page length. The key is to be concise and informative and you will be graded both on the quality of your writing as well as the content. You should include diagrams that are descriptive as opposed to glossy advertising style pictures. You may copy these diagrams from your references or draw them yourself. However if you copy and paste a diagram then you must reference the source. Similarly you will need to provide a bibliography, which lists all of your sources. This is an extremely important professional ethics issue. If you fail to reference figures that you copy and/or sources in your bibliography you will lose 100 points. It is that important. The format for your bibliography should be in the IEEE style, look at any IEEE document to see what that is. Both the Corona and HyperX papers available on the class web page are also examples. If you are a LaTeX user then there are IEEE style files that you can use. If you use some other document tool that doesn't have the equivalent of style files then you will just need to mimic the IEEE style.

You are free to choose whatever processor (this includes both CPU's & GPU's), or computer system, that you find interesting but choose carefully. If you choose something that has insufficient literature then the quality of your paper will suffer. If your bibliography only contains web URL references then you will be marked down. You are expected to get some of your information from published literature. There are several useful tools that are available to you for finding literature online. Both the ACM and IEEE digital libraries are available to you. Probably the best way is to go through the Marriott Library web proxy – <https://tproxy01.lib.utah.edu> - you will need to login with your CIS uNID and password. You will then get a menu of a huge number of sources – most useful to you in this endeavor will be “ACM Publications” and “IEL Online/IEEE Xplore” – often you'll find the same paper or article in both since most of the computer architecture related conferences are co-sponsored by both organizations. The other useful tool is CiteSeerX (earlier version is CiteSeer which seems to now be superseded.) CiteSeerX is an NSF sponsored project that allows you to access papers, track down bibliography references that you see in some paper and even get evaluations of the importance of a particular publication venue. You can access CiteSeerX via: <http://citeseerx.ist.psu.edu>

One issue you should consider is that the very newest bleeding edge devices or systems may not be adequately described in the literature. The idea here is that you should never trust a single vendor's website. There has been a lot written on Intel's new Nehalem processor so that might be interesting but make sure you can find some alternative information that may give benchmark evaluations. If Intel has presented the architecture in a peer reviewed forum such as IEEE Micro then it's fine to refer to such a paper. The key is to not just get information off a corporate website which will always be glowing. The AMD Barcelona processor is also a possible candidate. For GPGPU devices a good initial place to start is on the Nvidia or AMD/ATI web pages but make sure there is back up literature. Sun has 3 CPU's that you might find interesting - Niagara, Niagara Falls, and Victoria Falls. If you want to study a whole system I'd suggest that you check <http://www.top500.org> to get some ideas. IBM's Roadrunner, Cray's Jaguar, and IBM's BlueGene systems are out there now and performance data has been collected. If you study one of these supercomputers you'll need to consider a broad spectrum of things like interconnect, memory system, as well as the architectures of the processors that are used in the system. This is likely too much for a single person, but if you have a talented group of compadre's to split up the work of understanding these complex systems then you will learn a lot.

The information that I'm expecting you to provide in your paper will vary somewhat depending on what you choose. If it's a processor, you should talk about caches, execution units, instruction sets, and memory architecture. If it's a GPU, you'll need to provide similar information but these things have a more specialized memory model and employ wide-SIMD execution units so you'll need to provide information on these choices. If you are looking at a supercomputing system then stick to the higher level architectural issues since you'll have to write a book if you include low level details of the CPU. For the instruction set - DON'T just enumerate the instruction set - anybody can do that with a simple copy and paste - characterize it.

Collecting the proper references is time consuming so do yourself a favor and start early on this so you can make your selection and plan your schedule.

Specific grading model:
100 points content
60 points writing quality
40 points analysis quality

Also feel free to use the class mailing list to look for partners to study something you find interesting, point to good sources of information, etc.

Good luck and hopefully this will be a fun assignment.