CSCI-GA.3033-017 Special Topic: Multicore Programming
Homework 1
Due September 29, 2016

Please solve the following and upload your solutions to your private GitHub repository for the class as homework1.pdf by 11:59pm on the due date above. If for some reason this poses a technical problem, or you wish to include diagrams that you don't wish to spend time drawing in a drawing application, you may hand in a printed copy (*not* hand-written) at the beginning of class (7:10pm) on the day of the deadline. **Unlike labs, late homeworks will be assigned a grade of 0.**

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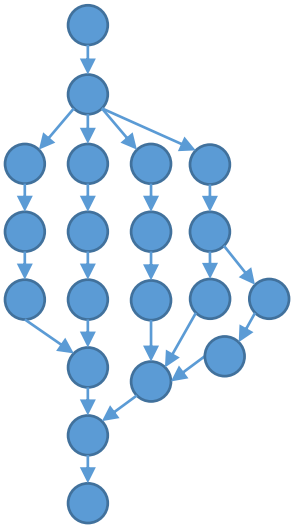
1. Warm up: without Googling (although the slides are fair game), what makes MISD processor architectures unusual? What are they generally used for, and why aren't they used more widely?

2. Discuss five types of parallelism (hint: the lowest-level type is instruction-level parallelism). What are they, and for each one, what is necessary from the hardware and/or programmer?

3. Apply Amdahl's law to compute the speedup for the following program if you have (a) 1, (b) 2, (c) 4, (d) 8, (e) 16, and (f) ∞ CPUs. In the following diagram, **S** portions are sequential and **P** are parallelizable.

S	P	S	P	S	P	S
15%	15%	5%	25%	5%	25%	10%

4. Assuming that each block of the diagrammed program takes 1 unit of time, what is the work and span of the following program? What is the parallelized execution time T_P on (a) P=1 processors? (b) P=5 processors? (c) P=6 processors? (d) How long is the critical path?



5. Explain the difference between concurrency and parallelism with an example: if an operating system is executing two long-running programs, how would its scheduler execute the programs concurrently on one core, concurrently on two cores, or in parallel on two cores?