

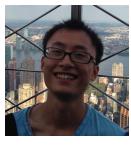
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## Lecture 1: Course Introduction

(CPEG323: Intro. to Computer System Engineering)

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- Course web site:
  - <http://www.ece.udel.edu/~hfang/cpeg323.html>
  - Canvas!
- Instructor: Prof. Hui Fang
  - Office Hours: by appointment, Evans 201B
  - I do research on Information Retrieval (also known as search engine technology)
- TAs:
  -  3-4pm on Wednesdays, 325 Dupont Hall  
Fateme S. Hosseini ([fateme@udel.edu](mailto:fateme@udel.edu))
  -  4-5pm on Thursdays, 209 Evans Hall  
Kuang Lu ([lukuang@udel.edu](mailto:lukuang@udel.edu))

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### Detour: About my research

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http://www.udel.edu	World Wide Web <a href="http://www.udel.edu">http://www.udel.edu</a> (1 PB+)	2004 Walmart Transaction DB <a href="#">http://www.walmart.com</a> (200 TB)	One day of Instant Messaging in 2002 <a href="#">http://www.w3.org</a> (750 GB)
<b>INTERNET ARCHIVE</b>		<b>Wikipedia</b> <a href="#">http://en.wikipedia.org</a> (10 GB)	
Literature		Internet Archive (2 PB+)	
BLOG		News	
		Annual Email Traffic, no Spam (300 PB+)	

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We need new tools to help us organize, access and understand these huge amounts of information.

My research focuses on helping users share, manage and exploit all the information!!!

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### In 1994, two graduate students

- Proposed to organize the websites in a hierarchy




**YAHOO!**

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**In 1996, another two graduate students**

- Proposed to utilize the link structure in search algorithm



Google™

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**In 2004, undergraduate students**

- Launch a social networking website



facebook.

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**In 2006,**

- Microblogging



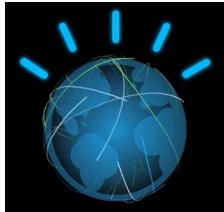
twitter

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**In 2011,**

- A computer system competed on the quiz show Jeopardy!



IBM Watson

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**Are you good at programming? We need you!**

- Know more about search engines
- Get hands on experiences of search related projects
- Do cool things that these companies are doing or plan to do



- Take CPEG 457/657: Search and data mining in the spring 2019 (no class in Spring 2020)
- Join InfoLab group and get involved in some interesting research projects!

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**End of Detour...**

**Let us go back to CPEG323**

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## Computers

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## Are computers smart?

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- DeepBlue

May 11th, 1997  
Computer won world champion of chess  
(Deep Blue) (Garry Kasparov)  
(Reuters = Kyodo News)

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**Artificial intelligence (AI)**

### IBM computer Watson wins Jeopardy clash

Supercomputer outwits US quiz show champions in epic head-to-head battle

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## AlphaGo

Google AI defeats human Go champion  
© 28 May 2017

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- OpenAI 5

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AI isn't good enough to beat the best 'Dota 2' players just yet

Two teams of pro players beat OpenAI in a best-of-three series.

Jamie Rigg, @jmerigg  
08.27.18 in AV



## Below Your Program



- Application software
  - Written in high-level language
- System software
  - Compiler: translates HLL code to machine code
  - Operating System: service code
    - Handling input/output
    - Managing memory and storage
    - Scheduling tasks & sharing resources
- Hardware
  - Processor, memory, I/O controllers



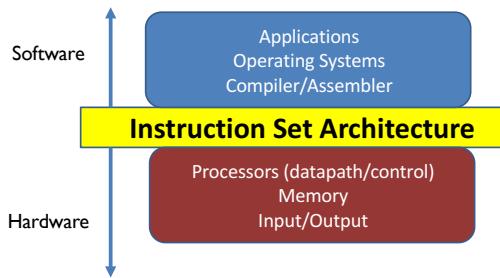
## What is this course about?

- Computer architecture is about building and analyzing computer systems.
  - Instruction Set Architecture (ISA): a bridge between hardware and software
  - Basic components of computers.
    - CPU: datapath and control
    - Memory
  - Parallelism
  - Performance measurement and improvement

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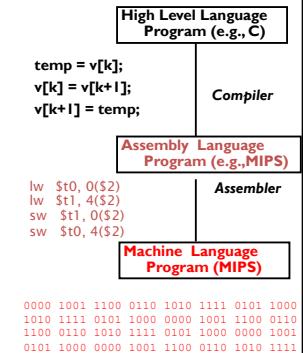


## Big Picture of ISA

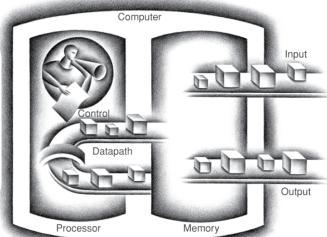


### Levels of Program Code

- High-level language
  - Level of abstraction closer to problem domain
  - Provides for productivity and portability
- Assembly language
  - Textual representation of instructions
- Hardware representation
  - Binary digits (bits)
  - Encoded instructions and data



## Basic Components of computers



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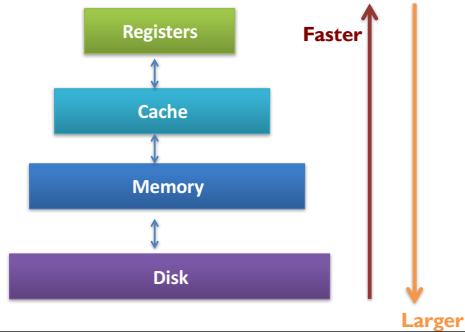
## Performance Measurement and Improvement

- Latency vs. Throughput
- Exploit techniques to improve performance
  - Locality
  - Parallelism

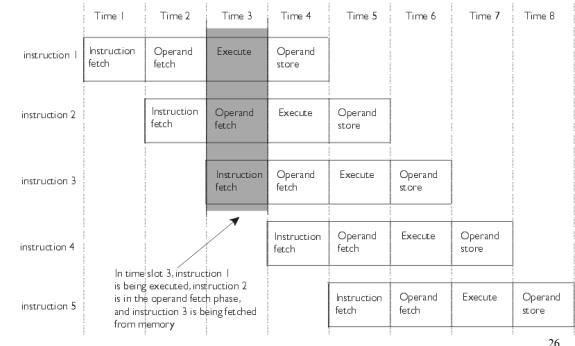
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## Memory Hierarchy



## Exploiting Parallelism



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## Others Skills learned in CPEG323

- More knowledge about programming in C
  - If you know one, you should be able to learn another programming language largely on your own.
- Assembly Language Programming
  - Understanding how your program is translated to assembly code lets you reason about correctness and performance.
- Hardware design
  - We will learn just the basics of hardware design.
  - CPEG 324 teaches this in more detail.

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## Textbook

- Computer Organization and Design: The Hardware/Software Interface*, David A. Patterson and John L. Hennessy .



## Course Format

- Lectures
  - Cover new course materials
  - Lecture notes will be available on Canvas.
- Discussion Sections
  - Review course materials
  - Solve problems together
  - Solutions will NOT be posted online.
- Bring pens and papers!
  - You need them to answer questions in both lectures and discussion sections.

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## Your final grade

- Class participation (10%)
  - Attending lecture and answering questions
  - Asking great questions in discussion and lecture and making it more interactive
- Assignments (40%)
  - Written assignments (HW) due in class
    - Individual assignments
    - Machine problems (MP) due 11:59:59pm
      - Group assignments, up to 2 persons per group
- Midterm exam (20%)
- Final exam (comprehensive) (30%)

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## Policy on Assignments

- Late policy is available at the course website.
- You are encouraged to discuss with other students, but we expect that the assignment that you hand in is your work.
- Do NOT copy solutions from other students.
- Do NOT copy solutions (or start your) solutions from the Web.
- Please look at the following page for more information about academic honesty
  - <http://www1.udel.edu/stuguide/16-17/code.html#honesty>

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## Tips to help you succeed

- Come to the classes and **actively** participate
- Read the textbook.
  - It is well written and contain more detailed explanations for the concepts covered in the lectures.
- Talk to each other
  - You can learn a lot by discussing with your classmates. But please keep in mind that your assignment should be your own work.
- Ask questions
  - In class
  - Office hours or appointments
- I am here to help!!!

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## One thing you need to do

- You would need an eecis account for some of the assignments
- Your accounts have been pre-approved.
- But you still need to go to eecis.udel.edu to apply for an account
  - Choose Academic account
  - Select me as your sponsor



## Reading

- 5<sup>th</sup> Edition: 1.1-1.4

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