

CIS 351: Introduction

Adapted from slides by Jared Moore

Modern Computing

Microprocessors form the basis of modern computing

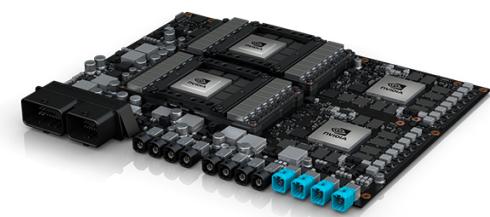


Why should I care?

New architectures and computing paradigms are being released a few times a year.

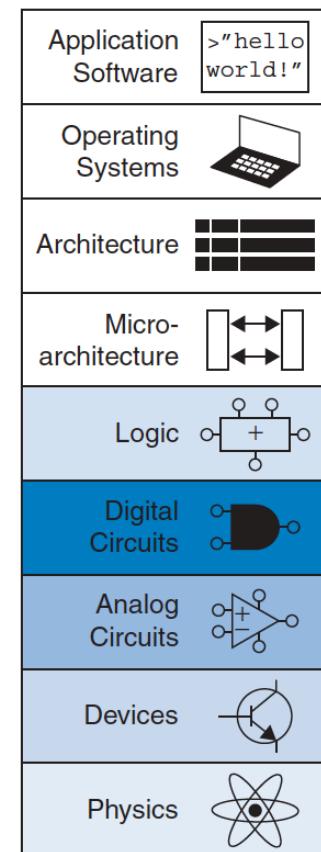
Machine learning, AI, and self-driving cars are leveraging massively parallel computing units.

Familiarity with underlying architecture theory helps build understanding with these cutting-edge technologies.



How does a microprocessor work?

1. Build circuits from logic gates
2. Put together many gates to make a microprocessor
3. Interact with microprocessors through assembly language

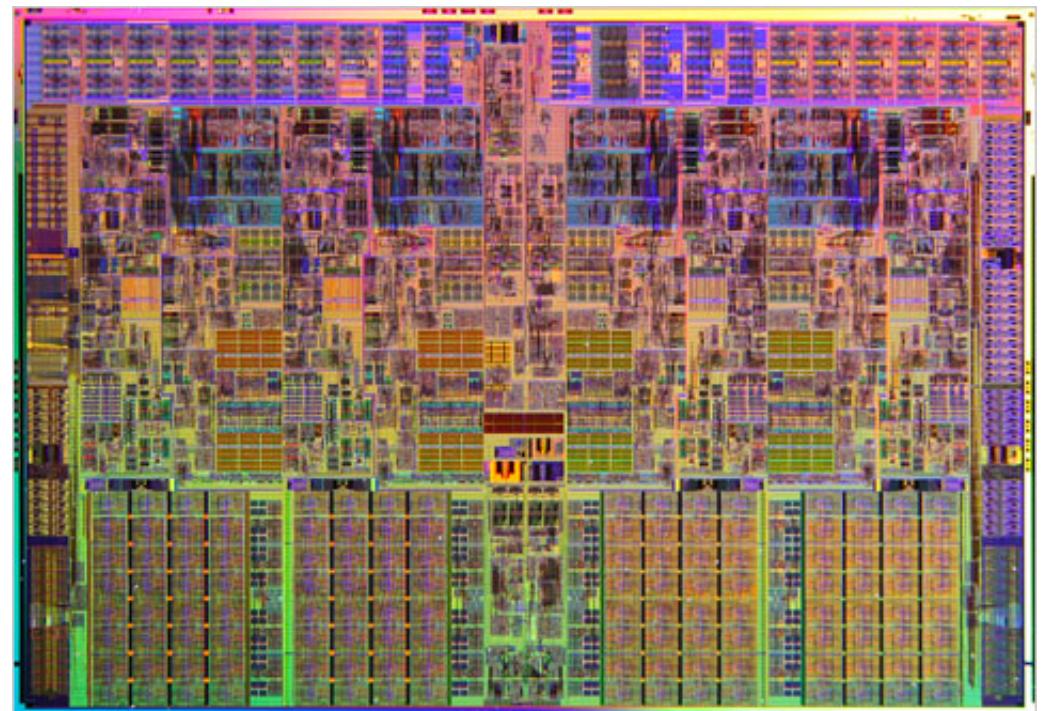
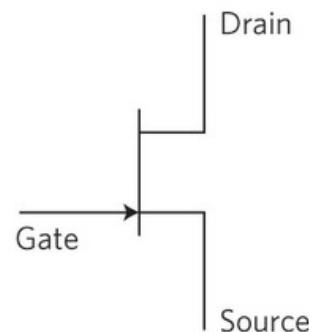


How do we build a complex microprocessor?

Microprocessor is millions or billions of transistors

Transistor

- Fundamental building block of electronics
- Functions as a switch (on/off)
- Allows circuits to be small, cheap, and efficient



Intel Core i7

Your job is to build these circuits!

Modern processors are extremely complex

Use design principles to realize this:

1. Abstraction
2. Discipline
3. "The three Y's"

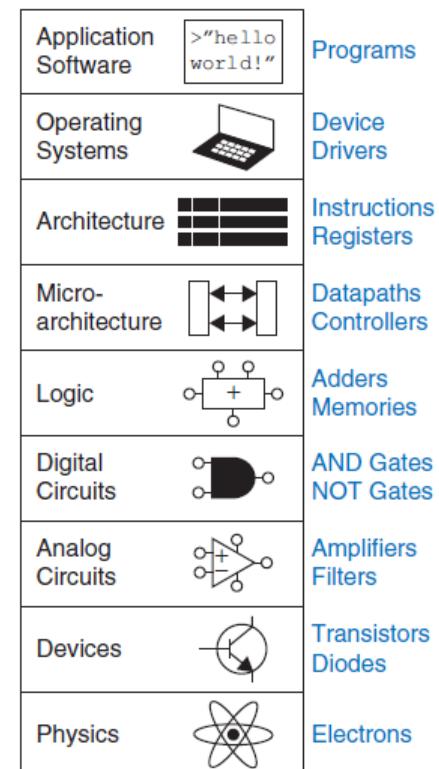


Figure 1.1 Levels of abstraction
for an electronic computing system

Abstraction

Key: Hide details when they are not important

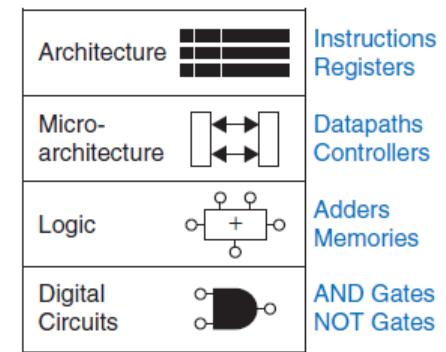
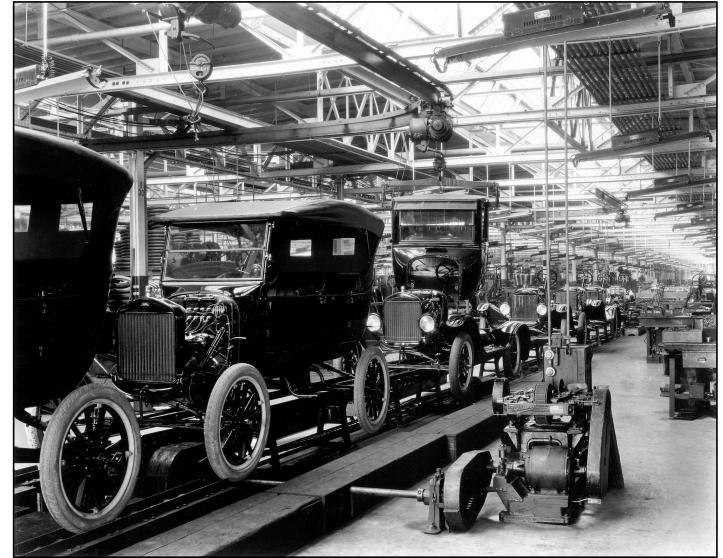


Figure 1.1 Levels of abstraction
for an electronic computing system

Discipline

Restrict design choices to maintain productivity

- Could create a custom part for each possible piece
- Also do it with interchangeable parts
 - Might be less efficient, but also reproducible.



Simple constructs

- Less is more



Manage Complexity

1. Hierarchy

- Divide the system into modules, and those into small modules

2. Modularity

- Modules are well defined
- Connect easily with other modules
- Avoid side effects

3. Regularity

- Uniformity of modules
- Reuse modules

Key: Want to be able to swap in and out components.

