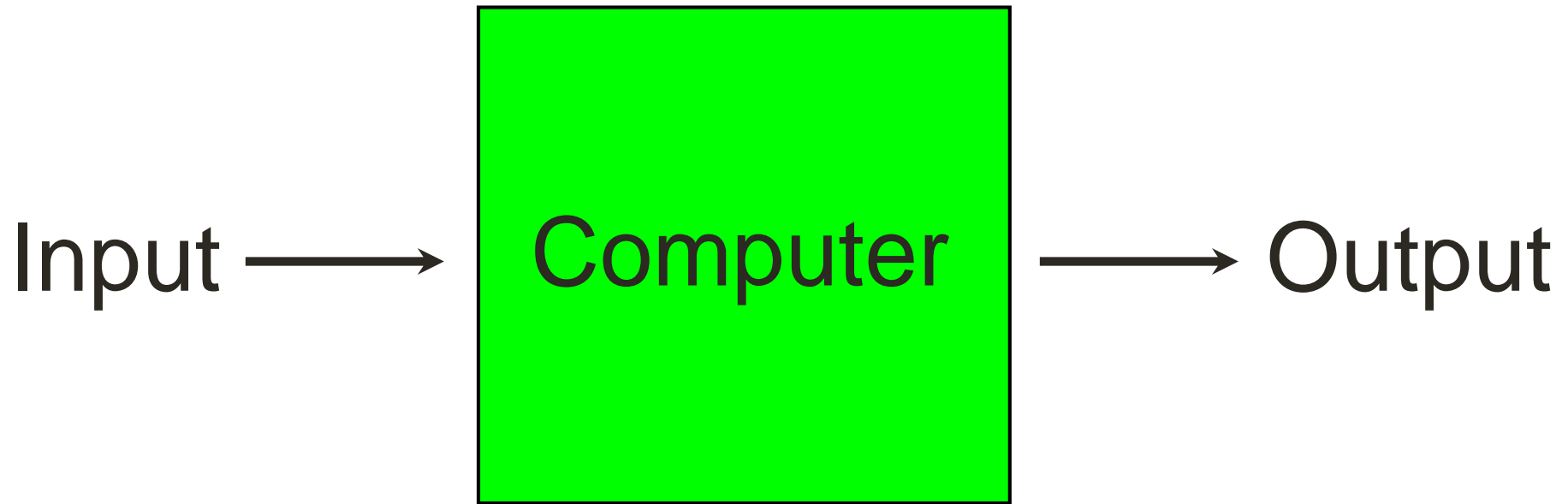


Introduction to Computer Science I

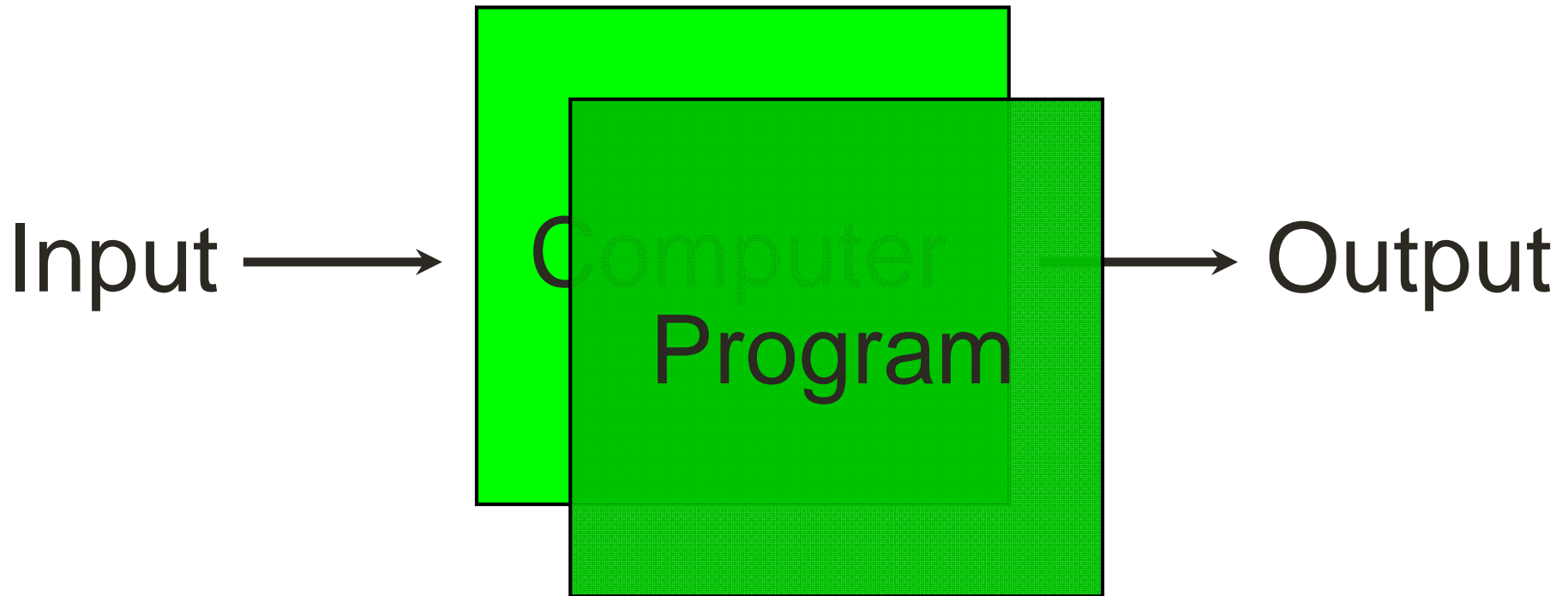
Fall 2013
Carola Wenk

The Computational Landscape



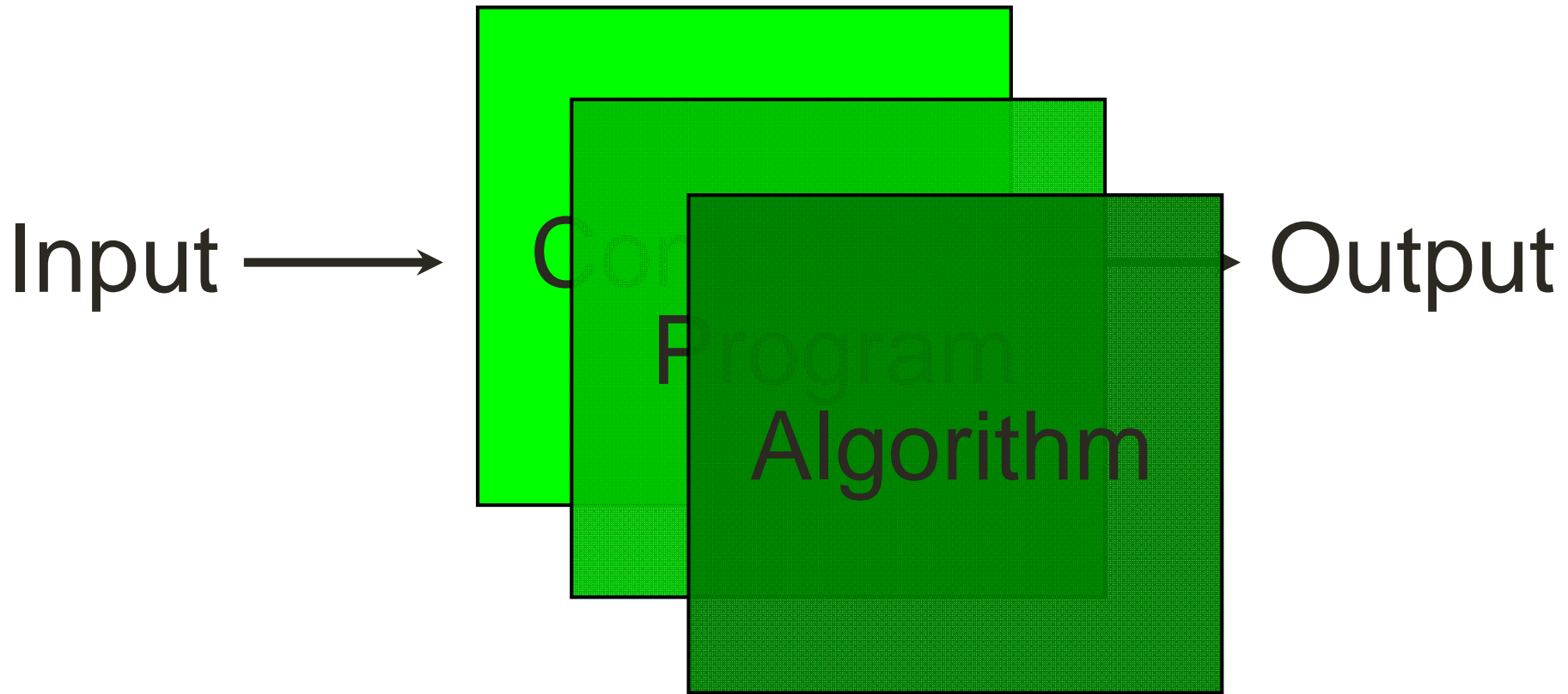
Nearly every modern electronic device can be thought of as a computer that transforms input to the desired output.

The Computational Landscape



Most computers are general-purpose: we can accomplish a number of different tasks on a single piece of hardware by changing the program being executed.

The Computational Landscape



A program is just a realization (= implementation) of an abstract procedure, or algorithm, on a particular hardware platform (= computer). One algorithm can be used for a variety of applications.

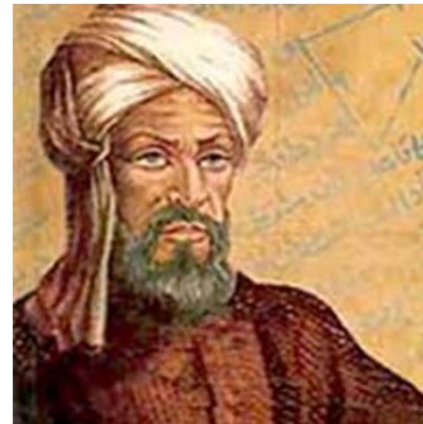
A Brief History of Computing

The first known “algorithms”, for computing square roots, were designed by the Babylonians (circa 1600 BC).



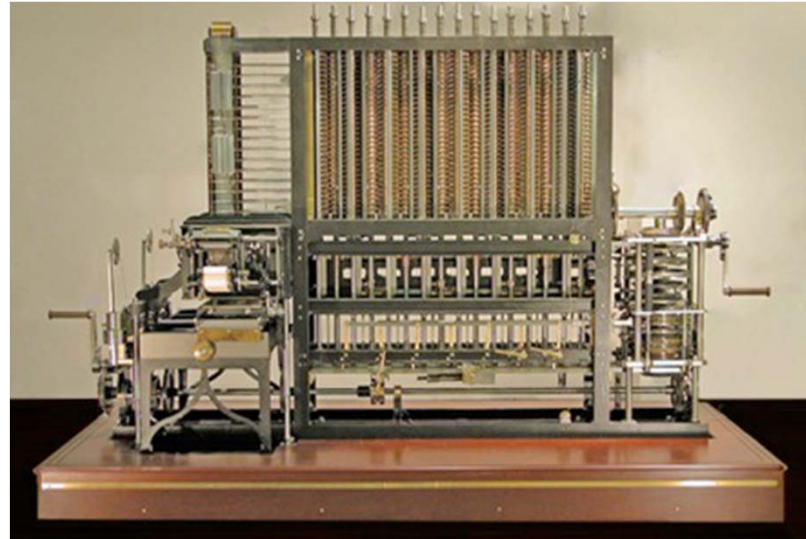
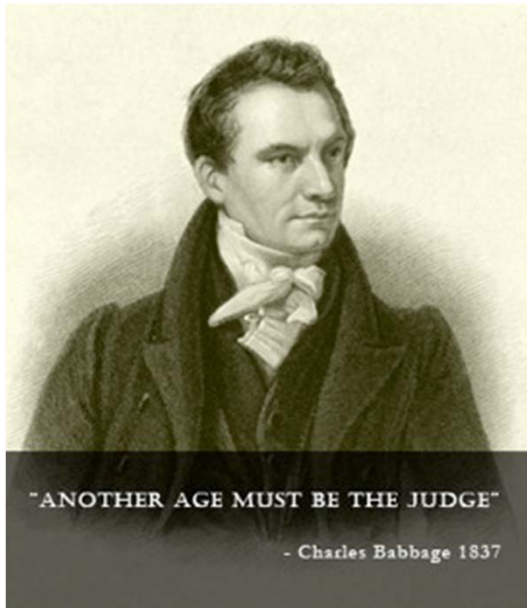
Clay tablet from 1700BC
Yale Babylonian Collection

2400 years later, in the 9th century AD, Mohammed ibn-Musa *al-Khwarizmi*, develops “algorithms” for solving linear and quadratic equations. The word “algorithm” stems from the Latin translation of his name, and the word “algebra” stems from one of his operations to manipulate equations.



Muhammad ibn-Musa
al-Khwarizmi

A Brief History of Computing



Difference engine, 1822

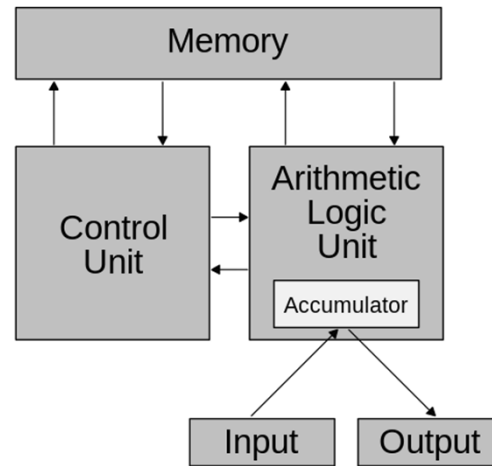
The idea of performing calculations automatically has been around for several thousand years; advances in manufacturing were the bottleneck until recently.

A Brief History of Computing

The second World War brought about tremendous advances in technology, and the notion of general-purpose computing.



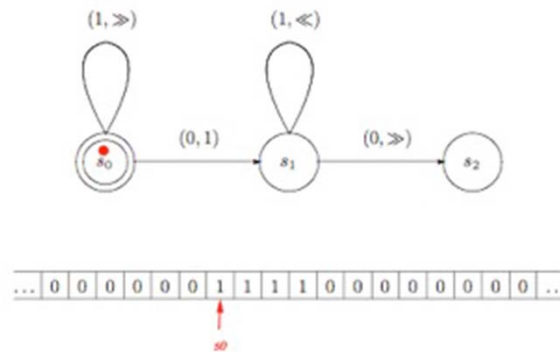
John von Neumann



The von Neumann architecture provides a single architecture for implementing different computational methods.



Alan Turing



A “Turing” machine provides a mathematical framework for reasoning about computational work.

A Brief History of Computing

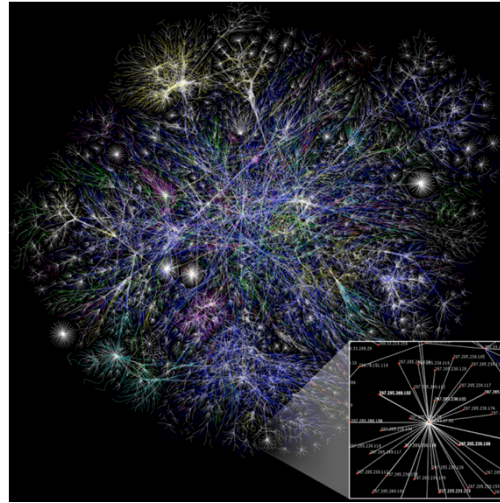
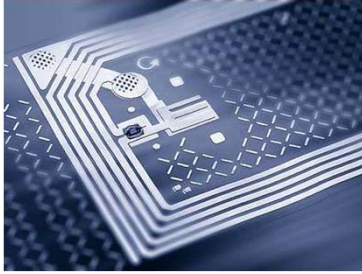
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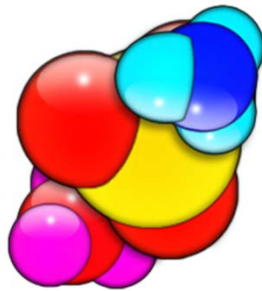
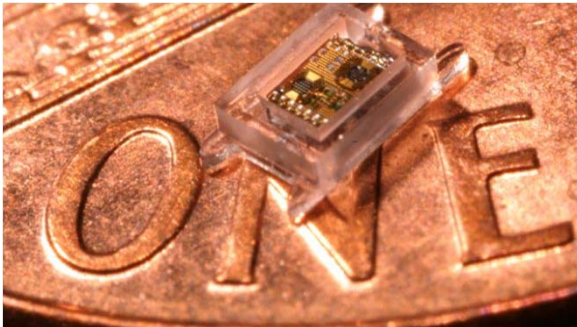
Funded by the Army to calculate artillery tables, the ENIAC (Electronic Numerical Integrator and Calculator) was the first general-purpose computer.

The ENIAC followed a von Neumann architecture; reconfiguration was done by manually modifying the contents of memory.

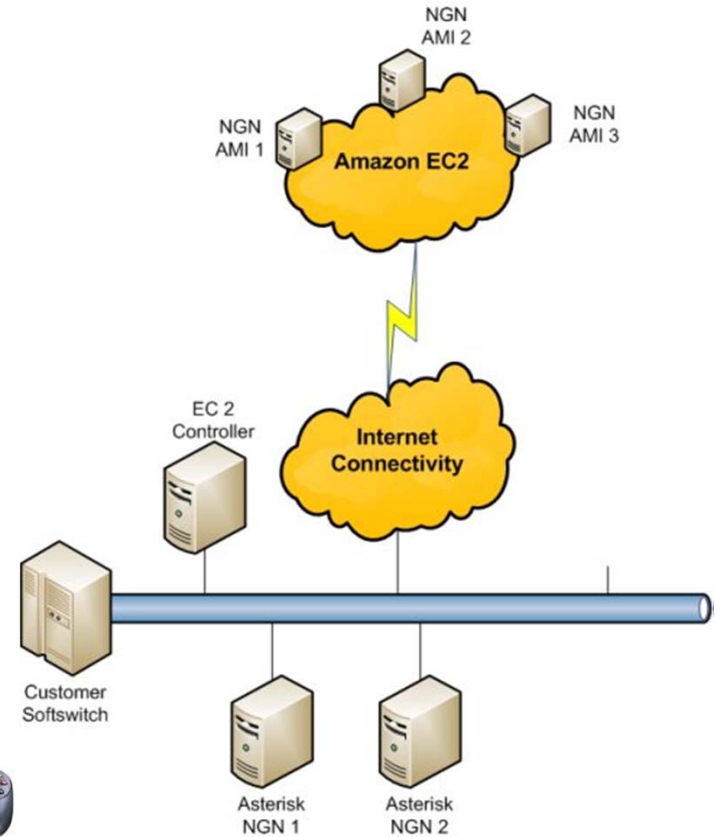
Recent History



The Internet



Folding@Home



Amazon EC2 Cloud Storage and Computing

1980s: Manufacturing technology allows personal computing.

1990s: Computers become ubiquitous, begin to “connect”.

2000s: Internet grows rapidly and connects everything.

2010s: Everything computes and is connected.

This Class

What is a Computer System and how is it organized?

von Neumann architecture; transistors, gates and logic; modern CPUs; embedded systems; networked systems

How are computational tasks performed on modern computer systems?

machine instructions and operating systems; Python programming; elementary data structures; application development and software libraries

What is the best way (if any) to use computation to solve a given problem?

recurrence relations and algorithm behavior; profiling and timing in Python; limits of computability

Labs Tomorrow: Software Installation

- Bring your laptops to the lab
- Before the lab (tonight?), download the following software (do not install yet):
 - Python 2.7.5:
<http://www.python.org/download/releases/2.7.5/>
Download Python 2.7 for your operating system.
[32-bit Windows is the “Windows **x86** MSI Installer (2.7.5)”]
 - Eclipse Standard 4.3:
<http://www.eclipse.org/downloads/index.php>
Download "Eclipse Standard 4.3" for your operating system.