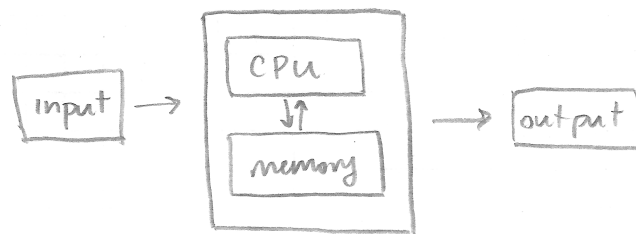


Lecture 2 - Intro to Excel and Python

* prayer / AMA

I. Computing Tools

* What is a computer?

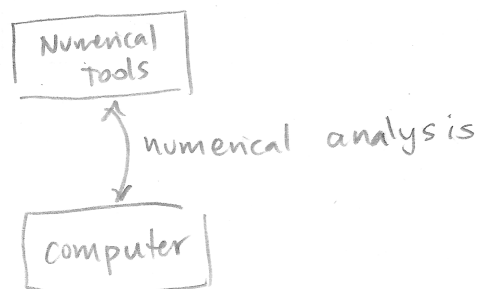


- input: mouse, keyboard, etc.
- output: screen, printer, etc
- CPU: central processing unit
 - arithmetic logic unit — add, subtract, multiply, divide (arithmetic) and, or, not (logic)
 - control unit — execution of instructions, including communicating with memory
- memory: information storage
 - volatile memory (RAM) : goes away when power off
 - non-volatile (hard disk) : stays when power is off.

* All computers do the same thing: Logic, arithmetic, store & retrieve from memory.

↳ Some have faster CPUs & memory though.

- * Numerical tools are pieces of software, built on top of computing machines that make it convenient to solve math problems.



- * Numerical Analysis is the branch of mathematics that allows us to turn simple logic & arithmetic into algorithms in mathematical software. We will learn a little bit of numerical analysis in this class.

- * we will focus on two tools

(1) A spreadsheet - A spreadsheet is a large table, where each cell of the table is able to perform calculations. (e.g. MS Excel)

(2) A structured programming language - A programming language is a codified series of instructions that tell the CPU and memory what to do. (e.g. Python, C/C++, Java)

Q: (Puzzle Question) If all a computer can do is arithmetic & logic, how can it evaluate $\sin(\pi/3)$? transcendental functions

(Think, Pair, Share) A: Taylor Series, Chebyshev polynomials, lookup tables.

II. Spread sheets

- * MS Excel is an excellent spread sheet.
- * Each cell has an address, e.g. B4. This is a memory location. In other words, each cell is a variable.
- * Each cell can also run a short calculation when you type in a formula. The formula evaluates (executes) when you hit enter.
- * Spread sheets function by relating different cells to each other using their addresses.
- * Notice how useful copy & paste are. You can also "lock" a cell when copying & pasting using \$, e.g. \$B\$4.
- * Excel has useful help documentation

Activity • Navigate Excel, copy/paste/fill.
 • Perform arithmetic, use formulas and locked cells.
 (see Excel Example)

III. Structured Programming

- * We will use python - a popular programming language for doing math. The program "Spyder" is a useful code development environment.

- * Programs are a sequence of keywords read by the python interpreter. The interpreter executes the code from top to bottom.
- * Python codes need some "boilerplate" stuff at the top to load some libraries, We'll learn more about this later.
- * Variables are assigned on the left hand side of the '=' operator. This is the assignment operator. we will see the equals operator ("==") in a few days.
- * The "print" statement is useful for output.
- * You can add comments with the pound sign (#). These lines are skipped by the interpreter.
- * Python also has useful help documentation

Activity

- write a "Hello World" program
 - practice basic arithmetic
- (see python example)