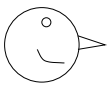
CSC101 Spring 2013
Introduction to Computer Science

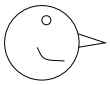
- **Computer Science includes:**
  - Algorithms
  - Heuristics
  - Theory (models of computation and limits of computation)
  - Materials science
  - Semiconductor physics
  - Hardware design
  - Software design
  - Human-computer interface design
  - Computer communication (networks)
  - Digital audio, digital image, and digital video processing
  - Machine learning
  - Operating systems
  - Data representation
  - Data bases
  - Computer generated graphics (still and video)
  - Gaming
  - Virtual environments
  - Translators (for artificial languages)
  - Mobile computing
  - Robotics
- **Algorithms**
  - **Definition** – An input with clearly defined properties, a sequence of instructions, and an output with clearly defined properties.
  - Ok, so what counts as "an instruction"



Instruction: "Bake a cake"

Chef

Chef says: "Ok"



Instruction: "Bake a cake"

Auto Mechanic

A.M says: "Do what ? "

Algorithm:

Mix 2 cups of flour, 2 eggs
1 tsp baking powder
1/2 cup sugar, 1/2 cup milk
Pour into cake pan
Bake 35 minutes at 350 degrees F

A.M says: "Got it."

- **An instruction set is relative to the entity (person or machine) performing those instructions.**
- **Writing algorithms for computers**
  - **Binary machine language (codes consisting of 0's and 1's)**
  - **High level language translated into machine language**
- **Writing algorithms for human understanding and machine implementation:**
  - **Diagrams**
  - **Pseudocode: (Mixture of English and mathematical notation)**
  - **Variables are used to name storage spaces.**

Algorithm must be expressed in a form that can be directly translated to operations which can be performed by a machine.

Finding the largest item in a list

Input: A number n, which is greater than zero. An array A.

Output: The largest number in the array.
Method:

$t = A[0]$
$i = 1$
while ($i < n$) do
    if ($t < A[i]$) then $t = A[i]$
    $i = i + 1$
end while
Output t

Finding the sum of items in a list

Input: A number n, which is greater than zero. An array A.

Output: The largest number in the array.
Method:

$t = 0$
$i = 0$
while ($i < n$) do
    $t = t + A[i]$
    $i = i + 1$
end while
Output t