• **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:
\[
\begin{align*}
t &= A[0] \\
i &= 1 \\
\text{while } ( i < n ) \text{ do} \\
&\quad \text{if } ( t < A[i] ) \text{ then } t = A[i] \\
&\quad\quad i = i + 1 \\
\text{end while}
\end{align*}
\]
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:
\[
\begin{align*}
t &= 0 \\
i &= 0 \\
\text{while } ( i < n ) \text{ do} \\
&\quad t = t + A[i] \\
&\quad i = i + 1 \\
\text{end while}
\end{align*}
\]
Output \( t \)