

# Introduction

CS154

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Jan 24, 2007.

# Outline

- Why are we studying Formal Languages?

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- Computer science is about how to make software computer to make a computer do what we want it to do.
- One important component to this is the study of algorithms.
- Formal Languages are interesting for two main reasons:
  - It gives us a framework for developing algorithms for strings
  - It gives us insights into what it is possible to make a computer do in principle with any algorithm.

# Why are we interested in strings?

- Frequently, we want to be able to search for things.
- For instance, find all the web pages that contain Chris Pollett.
- Here “Chris Pollett” is a string and it appears in the context of much larger strings called web pages.
- Sometimes though we misspell things, so we want to be able to have algorithms which are more general and do not need an exact match.

# How are algorithms for strings developed?

- Just like in CS146 where data structures like queues, trees, etc are developed for storing and retrieving data, in CS154, we will develop an abstract model for dealing with strings.
- This model comes in several flavors, but is generally known as a **automata**.

# More Things we'd like to do with Strings

- Another task that one sometimes needs to solve is that of compiling a program.
- How do we tell what makes a valid C or Java program?
- We'll use another abstract model to solve this problem called a **grammar**.

# What is it possible to program a computer to do?

- It turns out a slight generalization of our automata model called a **Turing Machine** can be used to give us some insight on this question.