**Lecture 1 | Introduction to Convolutional Neural Networks for Visual Recognition**

What is this class?

* Computer vision
* Uses visual data

Computer vision

* Used in physics, biology, engineering, mathematics, computer science

History of computer vision

* Evolution’s big bang
  + Specific short term of time when # of species were ‘exploded’.
* Camera Obscura
  + Pin hole camera theory
  + Similar to early animals’ eye
* Hubel & Wiesel, 1959
  + To find neural response mechanism or visual recognition mechanism of mammals
  + Stick electrode in cat’s brain & checked what made neuron respond excited
  + Simple cells, responded in specific moving direction
* Block world
  + Reconstruct the structure
  + “The summer vision project”
* How can we recognize structure?
  + Generalized cylinder
  + Pictorial structure
* If object recognition is too hard, maybe we should first do object segmentation
  + Task of taking image and group the pixels into meaningful areas
  + **“Image Segmentation”**
* Face detection
  + AdaBoost to do real-time face recognition
* “SIFT” feature
  + SIFT & object recognition, David Lowe, 1999
* PASCAL visual object challenge (2006~2012)
  + 20 object categories
* ImageNet / ImageNet large scale visual recognition challenge
  + to recognize the objects / overcome the ML bottleneck of overfitting, ImageNet project is launched.
  + Error rate decreased, and made lower error(3.57%) than human(5%)

Goal of this course

* Learn about Convolutional Neural Network
* Focuses on image classification
* Object detection, image captioning

Difference of 1990’s and 2010’s

* # of transistors(speed of computation)
* # of labeled data