Sina Masoud-Ansari Centre for eResearch

## Real Quick Intro to Machine Learning

• Including

- Some general concepts
- No maths (sort of)
- No code!
- Example: a point-and-click-adventure



### Machine Learning can be used for

Classification

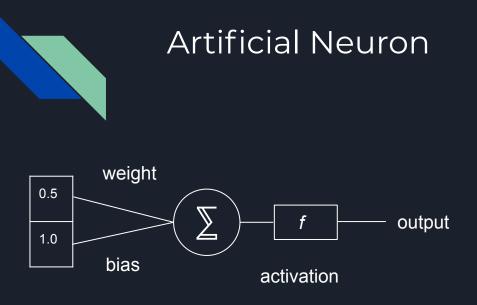
## Prediction

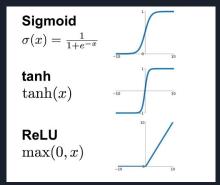
## Clustering

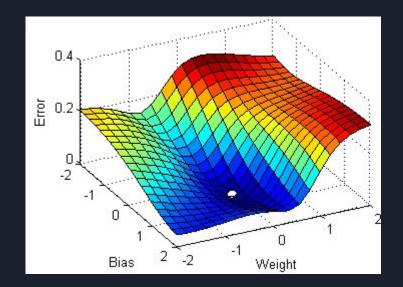


There are many techniques to solve these and other problems

Today we'll look at neural networks and image classification







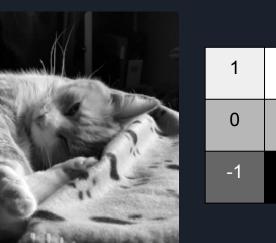
- Provide training examples
- Compute error between output and true value
- Use gradient descent to modify parameters
- Backpropagation



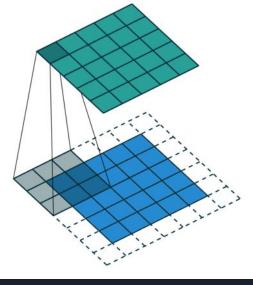
### Image Filters

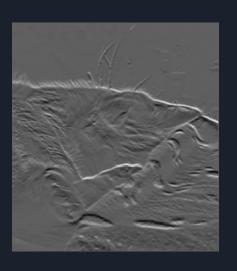
Filters can be manually designed e.g.

Can a neural network learn kernels appropriate to the task?









input

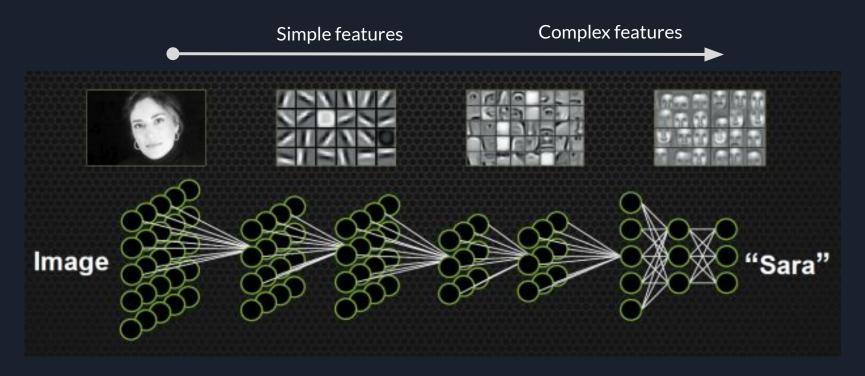
Sobel kernel feature = vertical gradient

convolution

output



### Deep Convolutional Neural Network





### More than just classification

## Classification Classification + Localization

# CATCAT, DOG, DUCKCAT, DOG, DUCK

**Object Detection** 

Single object

Multiple objects

Instance

Segmentation





### Quality of Life









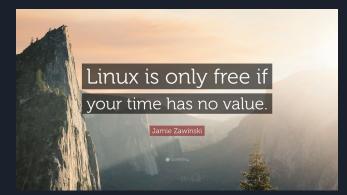
# ubuntu<sup>@</sup>

### 😣 🖨 🗊 Terminal

### vms20591@aldo:~\$ cowsay -l

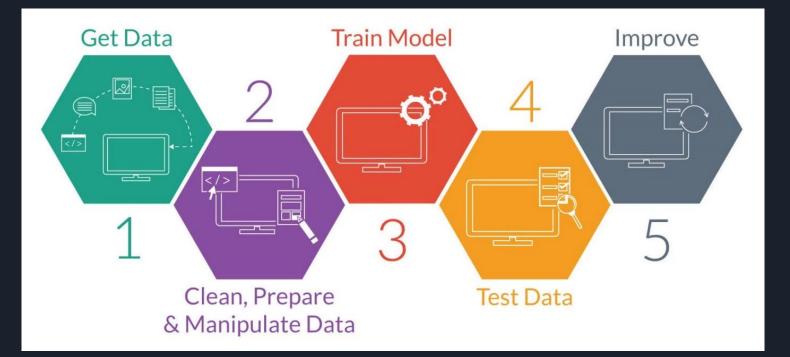
Cow files in /usr/share/cowsay/cows: apt beavis.zen bong bud-frogs bunny calvin cheese cock cower daemon default dragon dragon-and-cow duck elephant-in-snake eyes flaming-sheep ghostbusters gnu head-in hellokitty kiss kitty koala kosh luke-koala mech-and-cow meow milk moofasa moose mutilated pony pony-smaller ren sheep skeleton snowman sodomized-sheep stegosaurus stimpy suse three-eyes turkey turtle tux unipony unipony-smaller vader vader-koala www vns205910aldoi-5\_cowsay -f Stegosarurus Hello







### So what does a ML workflow look like?





### NVIDIA DIGITS

Simple user interface for image processing tasks using neural networks

O O 

MNIST - handwritten digit classification dataset

10 classes: 0 - 9

Data: 28x28 grayscale images

