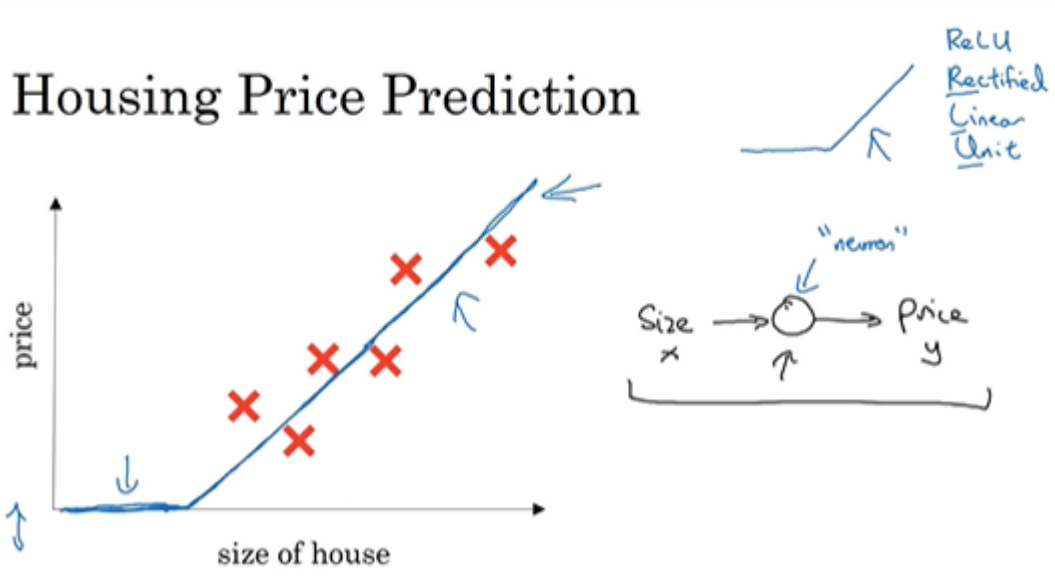
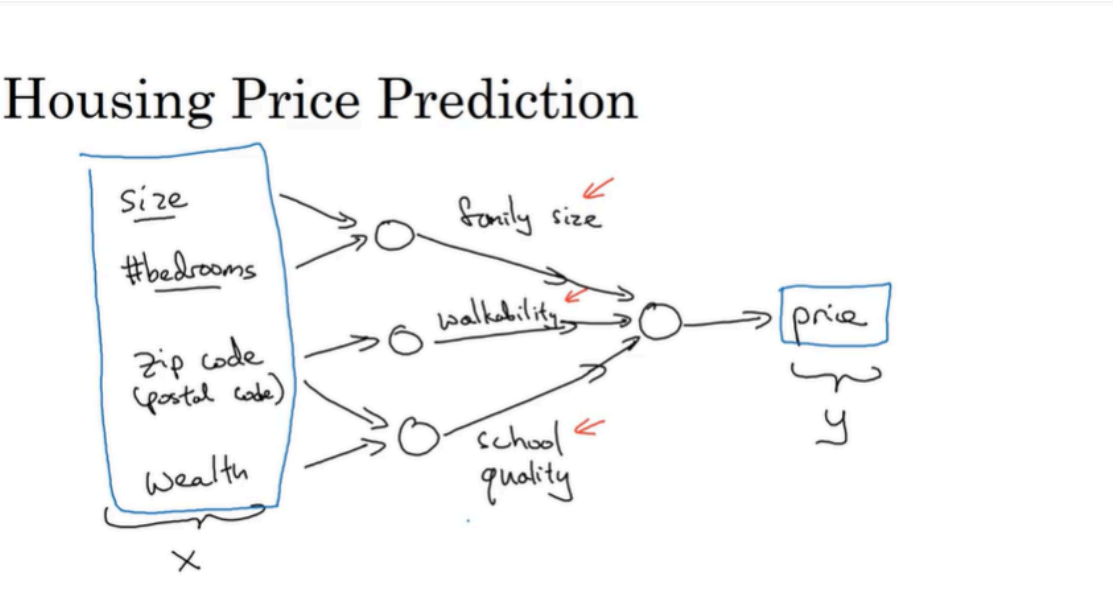
Introduction to deep learning

What is a Neural Network?



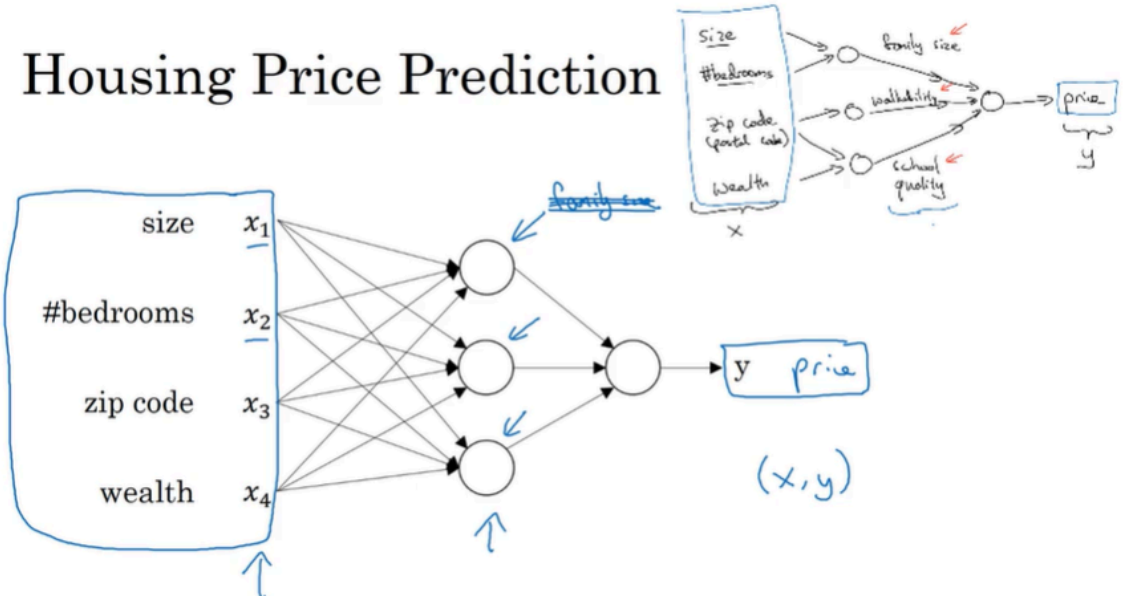
Each neurol have an activation function (in this slide that is a ReLU function) y = max(0, x)

This is a single neuron, neural network, really a tiny little neural network, a larger neural network is then formed by taking many of the single neurons and stacking them together.



X: the input of 4 features

y: the predicted value (price)



So we say that layer that this is input layer and this layer in the middle of the neural network are densely connected.

Because every input feature is connected to every one of these circles in the middle. And the remarkable thing about neural networks is that, given enough data about x and y, given enough training examples with both x and y, neural networks are remarkably good at figuring out functions that accurately map from x to y

Supervised Learning with Neural Networks

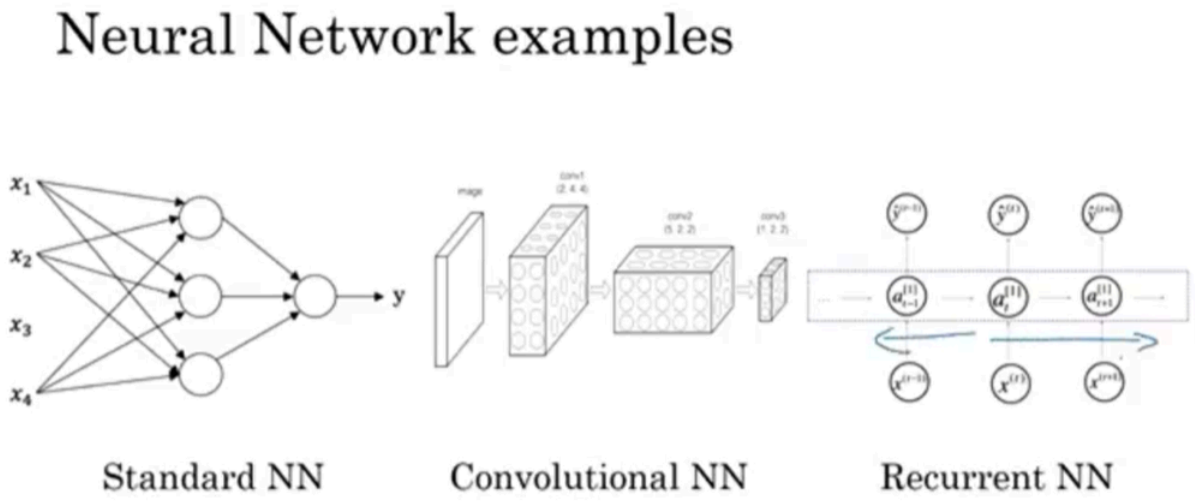
Application of Supervised Learning

Supervised Learning

Input(x)	Output (y)	Application
Home features	Price	Real Estate
Ad, user info	Click on ad? (0/1)	Online Advertising
Image	Object (1,...,1000)	Photo tagging
Audio	Text transcript	Speech recognition
English	Chinese	Machine translation
Image, Radar info	Position of other cars	Autonomous driving

where:

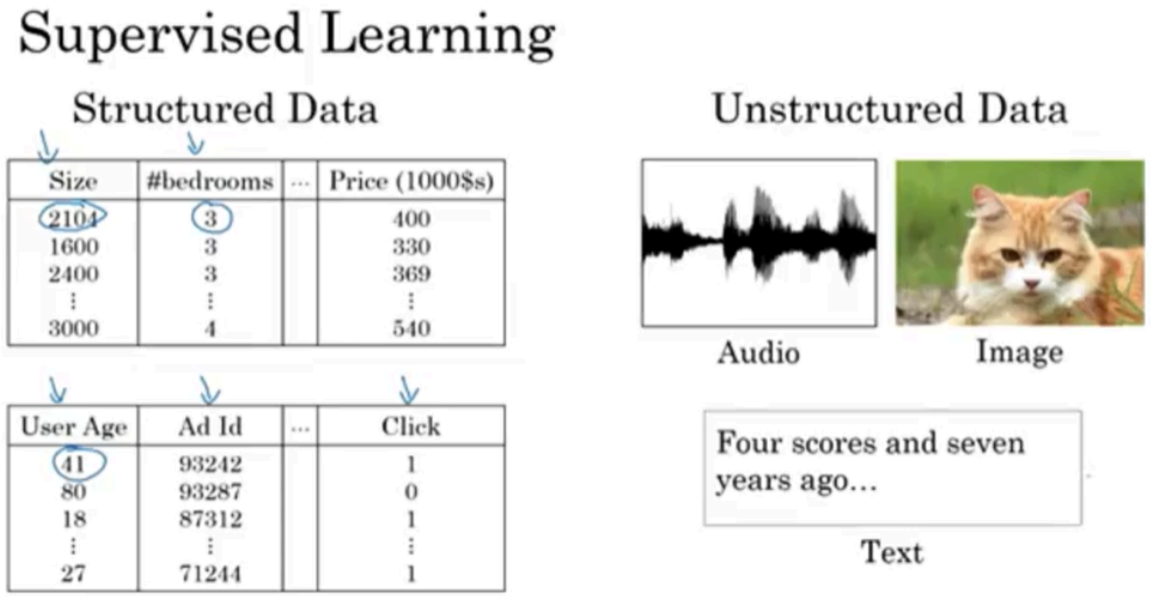
- Standard neural network:
  - Real estate
  - Online advertising
- CNN
  - Photo tagging
- RNN
  - Speech recognition
  - Machine translation
- Custom/hybrid
  - Autonomous driving



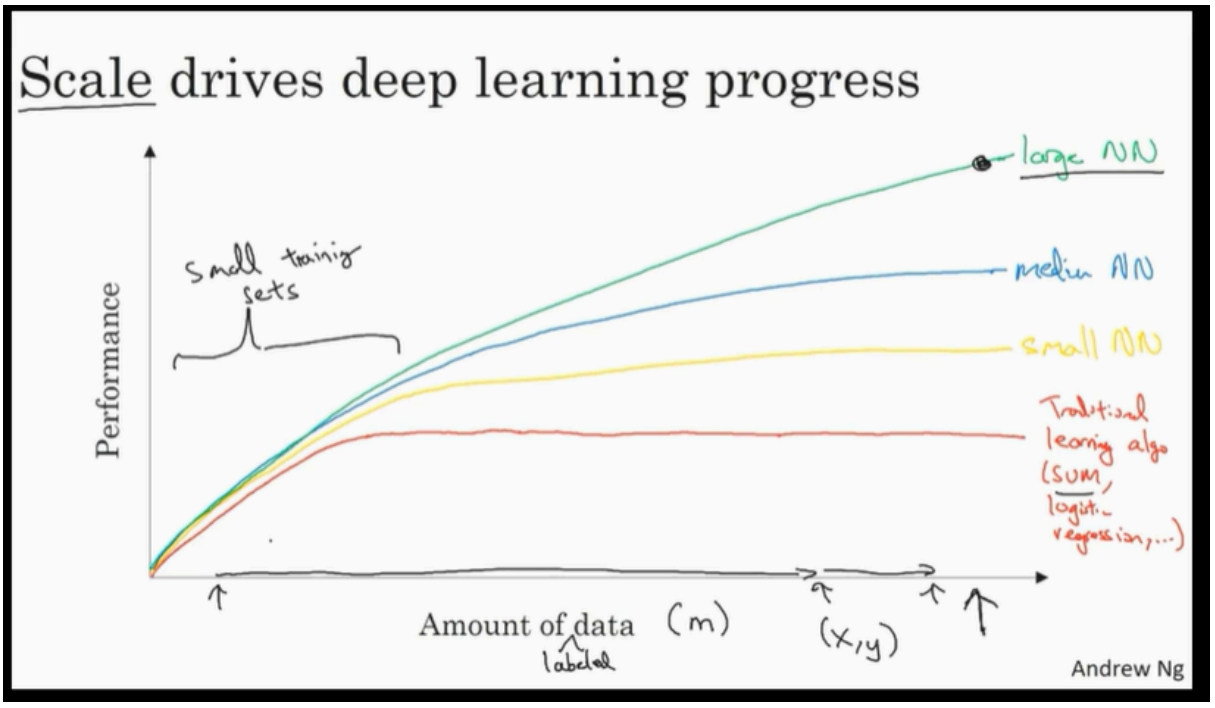
So, just to be a bit more concrete about what are the standard CNN and RNN architectures. So in the literature you might have seen pictures like this. So that's a standard neural net.

You might have seen pictures like this (the picture in the center). Well this is an example of a Convolutional Neural Network, and we'll see in a later course exactly what this picture means and how can you implement this. But convolutional networks are often used for image data.

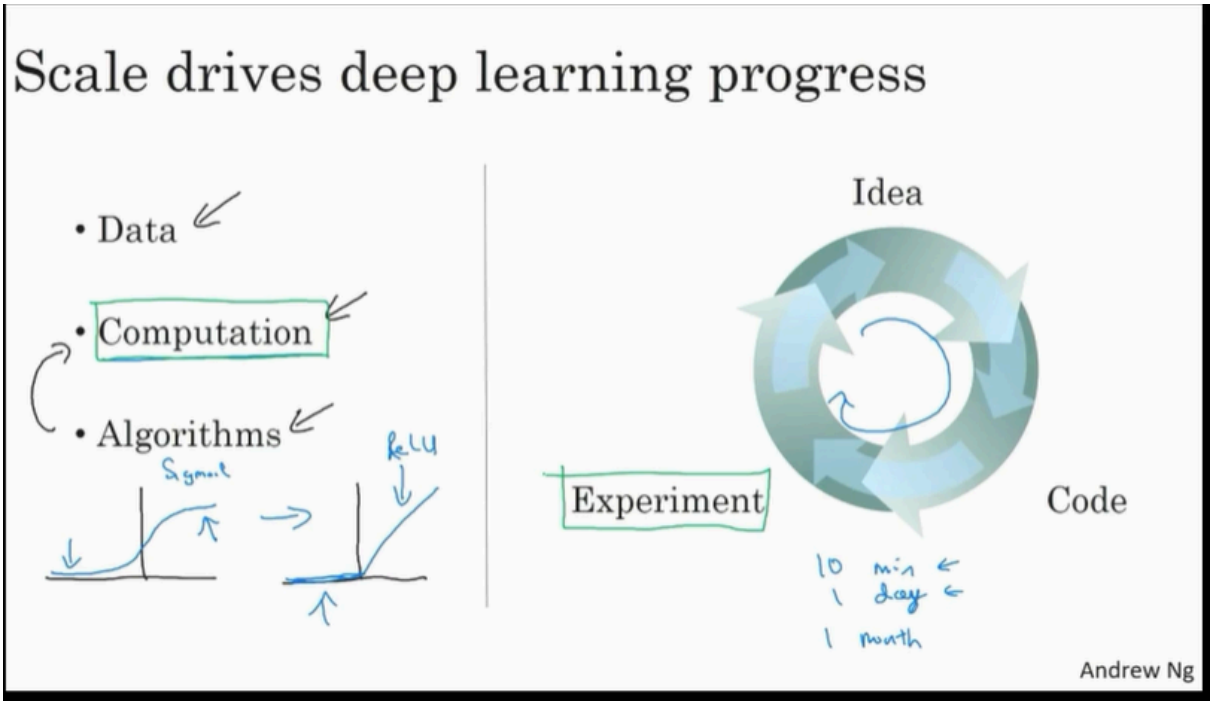
And you might also have seen pictures like this (one in the right). And you'll learn how to implement this in a later course. Recurrent neural networks are very good for this type of one-dimensional sequence data that has maybe a temporal component.



Why is Deep Learning taking off?



m: number of training examples



- Data
  - We can get more data day by day
- Computation
  - CPU, GPU
- Algorithms
  - Optimizer algorithms