

Welcome to the Deep Learning Specialization

courses in the sequence (Specialization):

part1 What is a neural network?

part2 supervised

part3 - why-is-deep-learning-taking-off

Part4 About this Course

课后题

Courses in the sequence (Specialization):

1. Neural Networks and Deep Learning
2. Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization like momentum armrest prop and the ad authorization algorithm.
3. Structuring your Machine Learning project.
train/dev/test
dev: development sets is also called holdout cross-validation sets
end 2 end deep learning
4. Convolutional Neural Networks
5. Natural Language Processing: Building sequence models
RNN (recurrent neural networks abbreviated RNNs) and LSTM

Introduction to Deep Learning

part1 What is a neural network?

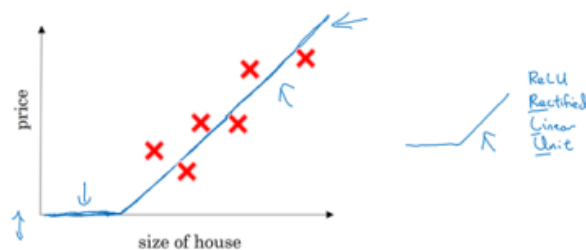
例子1: 房屋价格

Example 1 – single neural network

Given data about the size of houses on the real estate market and you want to fit a function that will predict their price. It is a linear regression problem because the price as a function of size is a continuous output.

We know the prices can never be negative so we are creating a function called Rectified Linear Unit (ReLU) which starts at zero.

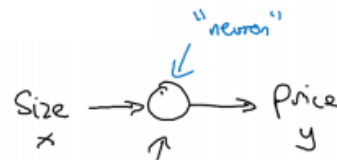
Housing Price Prediction



The input is the size of the house (x)

The output is the price (y)

The "neuron" implements the function ReLU (blue line)

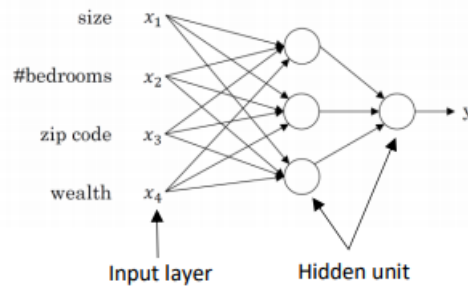


例子2: 房屋价格的多元神经网络

Example 2 – Multiple neural network

The price of a house can be affected by other features such as size, number of bedrooms, zip code and wealth. The role of the neural network is to predict the price and it will automatically generate the hidden units. We only need to give the inputs x and the output y .

Housing Price Prediction



每一个节点都是一个ReLU单元或者是非线性的单元

Part2 supervised Learning

监督学习的应用：

1. Computer vision has also made huge strides in the last several years, mostly due to deep learning. So you might input an image and want to output an index, say from 1 to 1,000 trying to tell you if this picture, it might be any one of, say a 1000 different images.
2. you might use that for photo tagging.
3. I think the recent progress in speech recognition has also been very exciting, where you can now input an audio clip to a neural network, and have it output a text transcript.
4. Machine translation has also made huge strides thanks to deep learning where now you can have a neural network input an English sentence and directly output say, a Chinese sentence.
5. And in autonomous driving, you might input an image, say a picture of what's in front of your car as well as some information from a radar, and based on that, maybe a neural network can be trained to tell you the position of the other cars on the road. So this becomes a key component in autonomous driving systems.

So a lot of the value creation through neural networks has been through cleverly

selecting what should be x and what should be y for your particular problem, and then fitting this supervised learning component into often a bigger system such as an autonomous vehicle. It turns out that slightly different types of neural networks are useful for different applications

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
<u>Audio</u>	Text transcript	Speech recognition
<u>English</u>	Chinese	Machine translation
<u>Image, Radar info</u>	Position of other cars	Autonomous driving

结构化数据和非结构化数据:

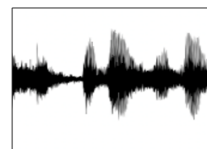
Supervised Learning

Structured Data

Size	#bedrooms	...	Price (1000\$s)
2104	3		400
1600	3		330
2400	3		369
:	:		:
3000	4		540

User Age	Ad Id	...	Click
41	93242		1
80	93287		0
18	87312		1
:	:		:
27	71244		1

Unstructured Data



Audio



Image

Four scores and seven years ago...

Text

part3 - why-is-deep-learning-taking-off

数据增长对于传统机器学习算法的增益不多，但是确定极大程度提高NN深度学习的效果

if you want to hit this very high level of performance, then you need two things:

1) first often you need to be able to train a big enough neural network in order to take advantage of the huge amount of data

2) second you need to be out here on the x axes, you do need a lot of data so we often say that scale has been driving deep learning progress

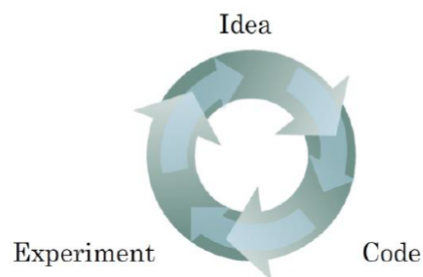
by scale I mean both the size of the neural network, we need just a new network, a lot of hidden units, a lot of parameters, a lot of connections, as well as scale of the data in fact.

today one of the most reliable ways to get better performance in the neural network is often to either train a bigger network or throw more data at it and that only works up to a point because eventually you run out of data or eventually then your network is so big that it takes too long to train but just improving scale has actually taken us a long way in the world of Deep Learning.

m代表数据集的数量或大小

non-stop process:

The process of training a neural network is iterative.



It could take a good amount of time to train a neural network, which affects your productivity. Faster computation helps to iterate and improve new algorithm.

为什么要创新算法创新来使得计算更加迅速？

sigmoid函数 在斜坡的地方的梯度几乎消失了，所以学习的速度非常慢，ReLU函数的梯度不会平滑收缩到0

加速了训练网络的循环，improve the idea much faster

Part4 About this Course

Outline of this Course

Week 1: Introduction

Week 2: Basics of Neural Network programming

Week 3: One hidden layer Neural Networks

Week 4: Deep Neural Networks

Andrew Ng

课后题

2. Which of these are reasons for Deep Learning recently taking off? (Check the three options that apply.)



We have access to a lot more computational power.

正确

Yes! The development of hardware, perhaps especially GPU computing, has significantly improved deep learning algorithms' performance.



Deep learning has resulted in significant improvements in important applications such as online advertising, speech recognition, and image recognition.

正确

These were all examples discussed in lecture 3.



Neural Networks are a brand new field.

这个选项的答案不正确

Neural Networks have been around for decades.



1 / 1 分

4. When an experienced deep learning engineer works on a new problem, they can usually use insight from previous problems to train a good model on the first try, without needing to iterate multiple times through different models. True/False?

☐ True

☒ False

正确

Yes. Finding the characteristics of a model is key to have good performance. Although experience can help, it requires multiple iterations to build a good model.