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Introduction to Deep Learning

Welcome



- AI is the new Electricity
- Electricity had once transformed countless industries: transportation, manufacturing, healthcare, communications, and more
- AI will now bring about an equally big transformation.

What you'll learn



Courses in this sequence (Specialization):

1. Neural Networks and Deep Learning
2. Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization
3. Structuring your Machine Learning project
4. Convolutional Neural Networks *CNN*
5. Natural Language Processing: Building sequence models
RNN, LSTM

train / dev / test
end-to-end

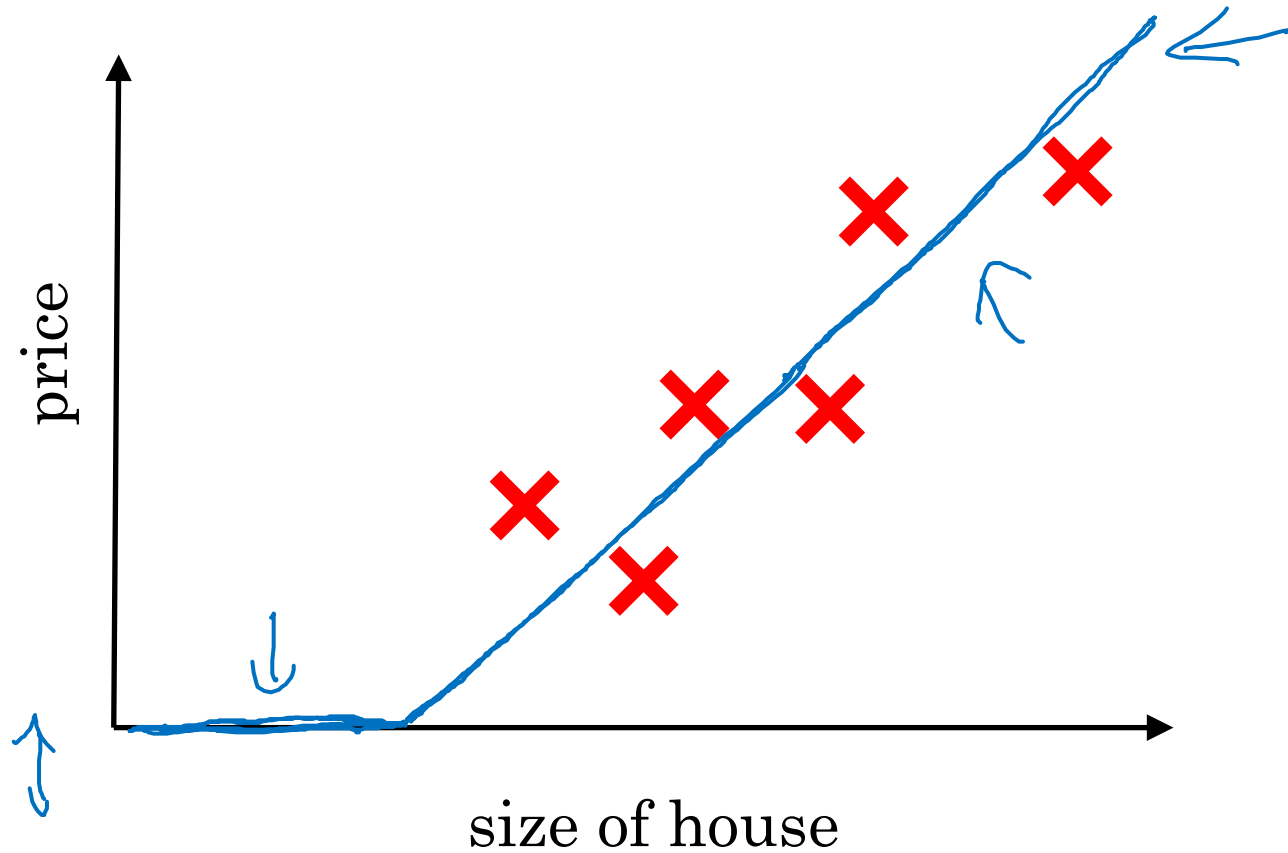


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Introduction to Deep Learning

What is a Neural Network?

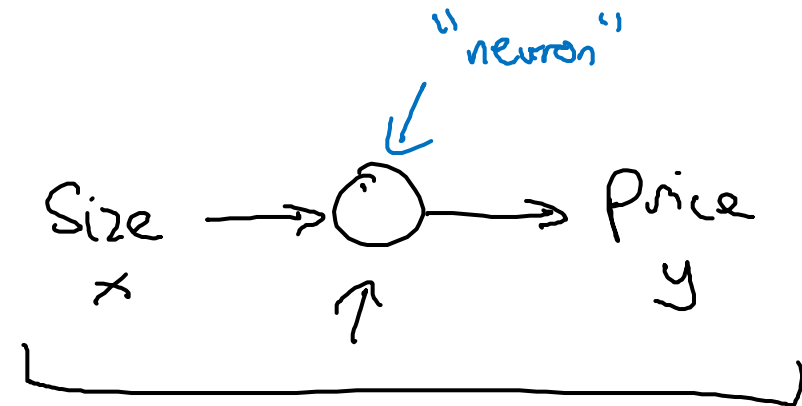
Housing Price Prediction



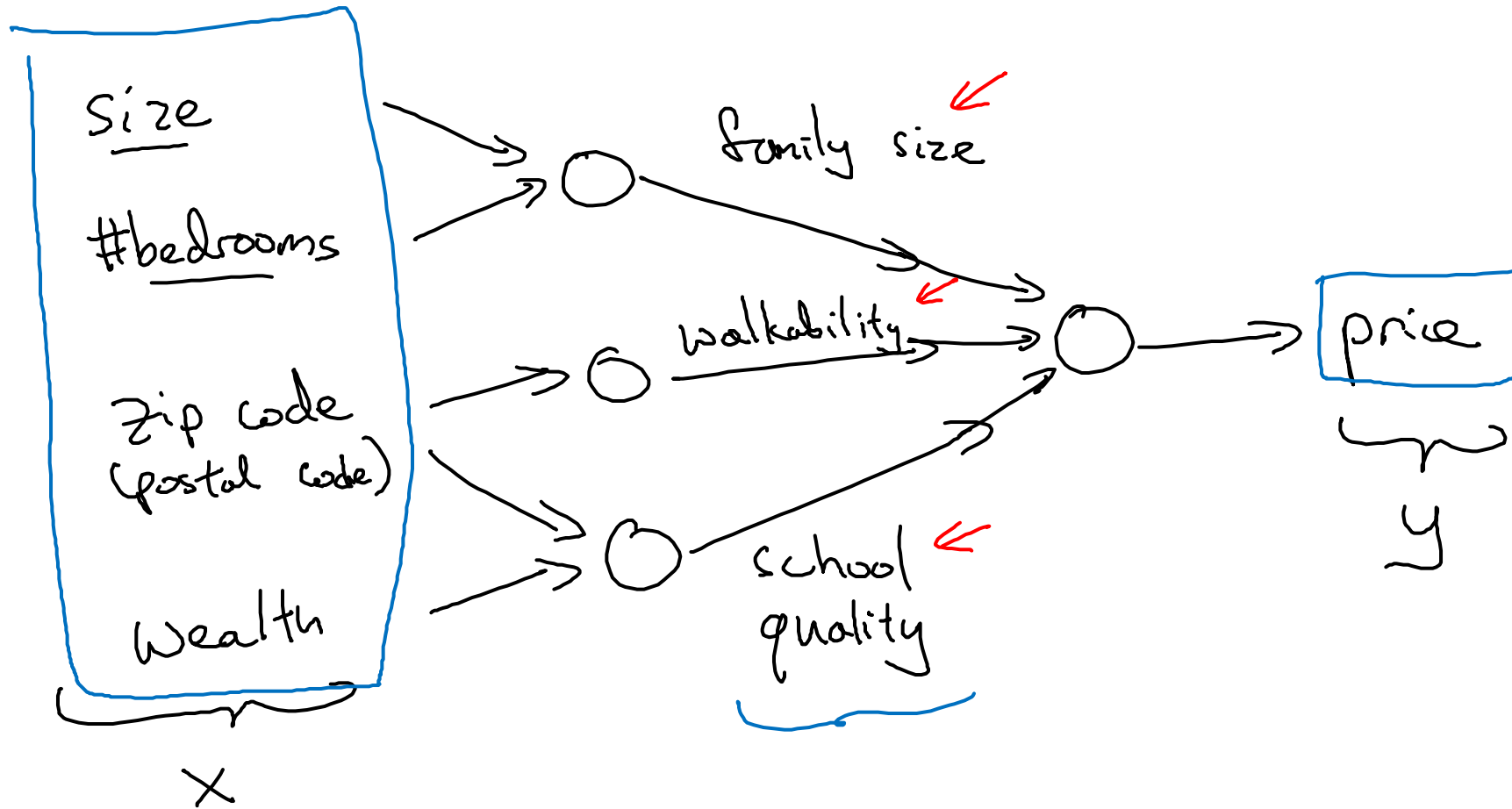
ReLU
Rectified
Linear
Unit



A hand-drawn graph of the ReLU function, showing a horizontal line at zero for negative inputs and a diagonal line with a slope of one for positive inputs. A blue arrow points to the diagonal segment.

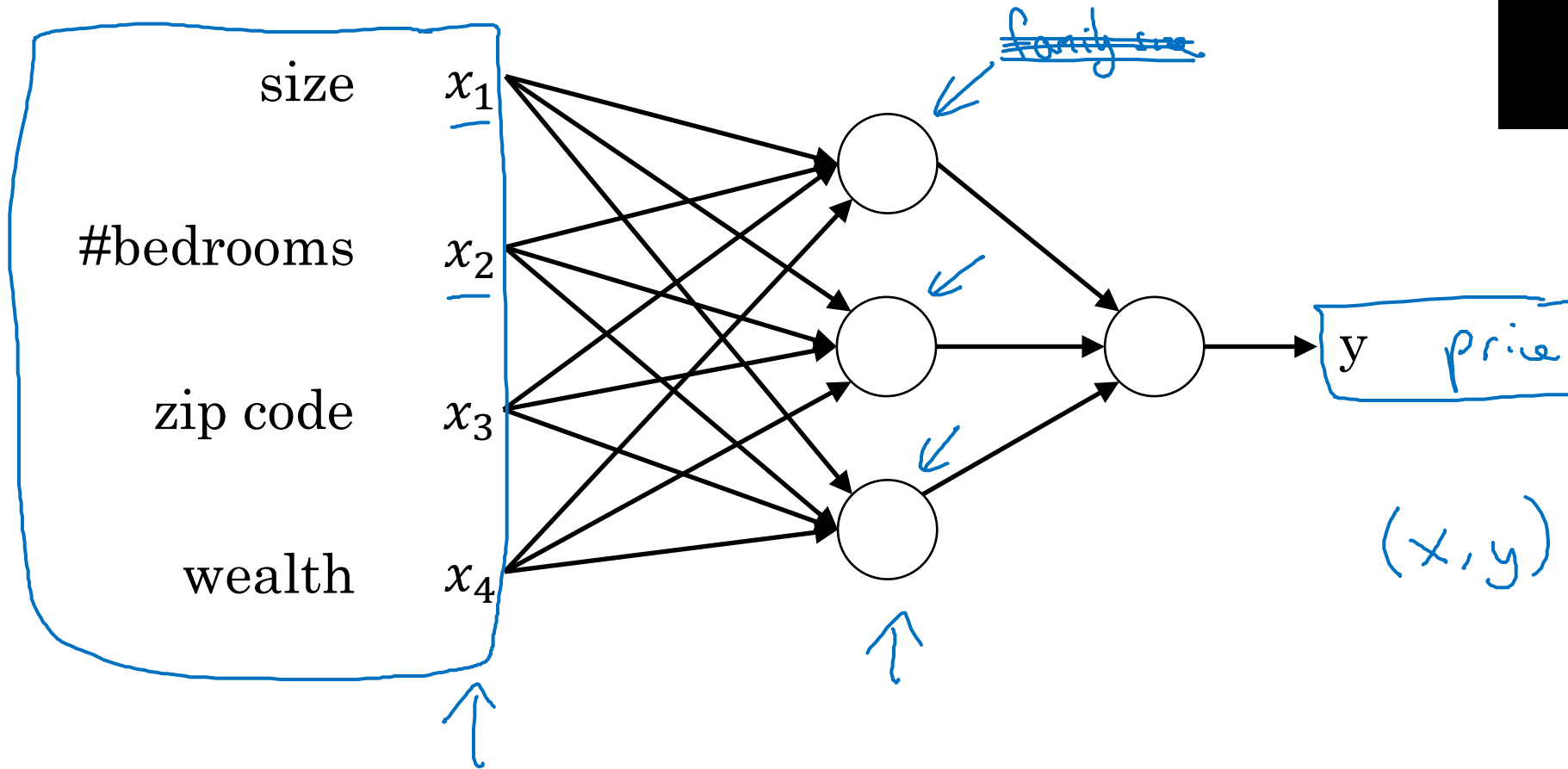


Housing Price Prediction



Housing Price Prediction

**Drawing of
previous Image**














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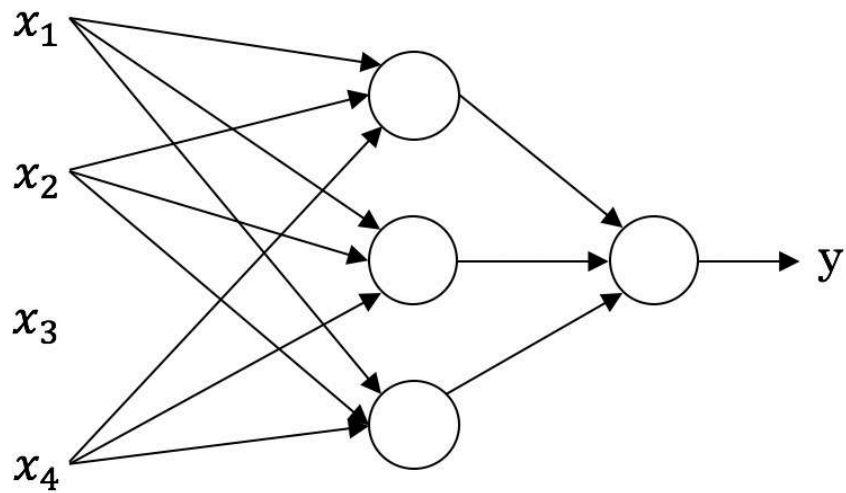
Introduction to Deep Learning

Supervised Learning with Neural Networks

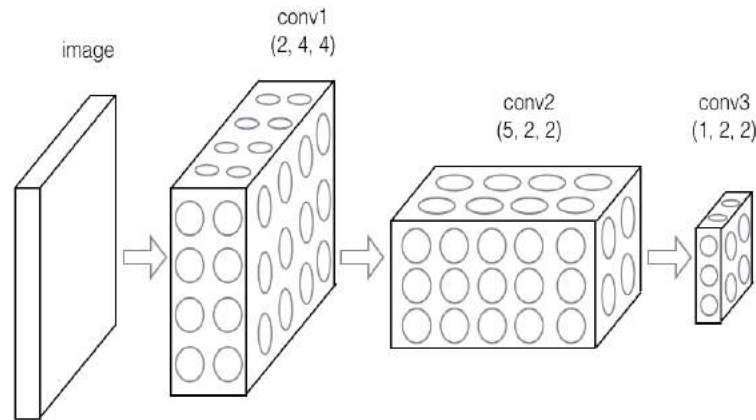
Supervised Learning

| 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</u> , <u>Radar info</u>  | Position of other cars  | Autonomous driving  |

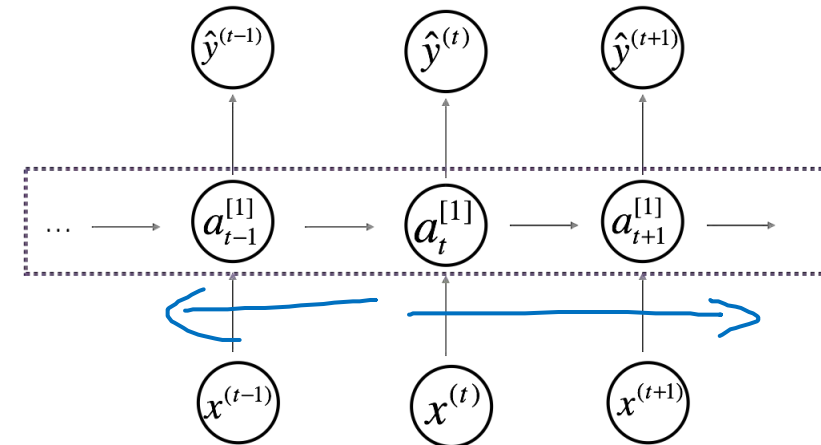
Neural Network examples



Standard NN



Convolutional NN



Recurrent NN

Supervised Learning

Structured Data

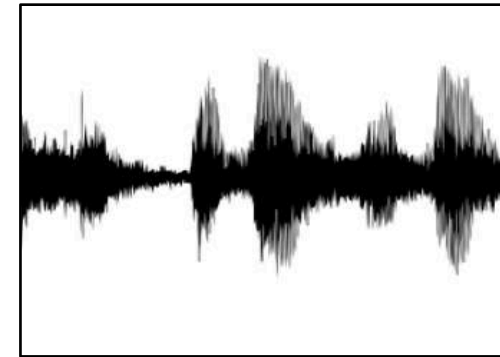
Can be represented
in a table

| Size | #bedrooms | ... | Price (1000\$) |
|------|-----------|-----|----------------|
| 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 |

NN are particularly good at interpreting unstructured data

Unstructured Data



Audio



Image

Four scores and seven
years ago...

Text

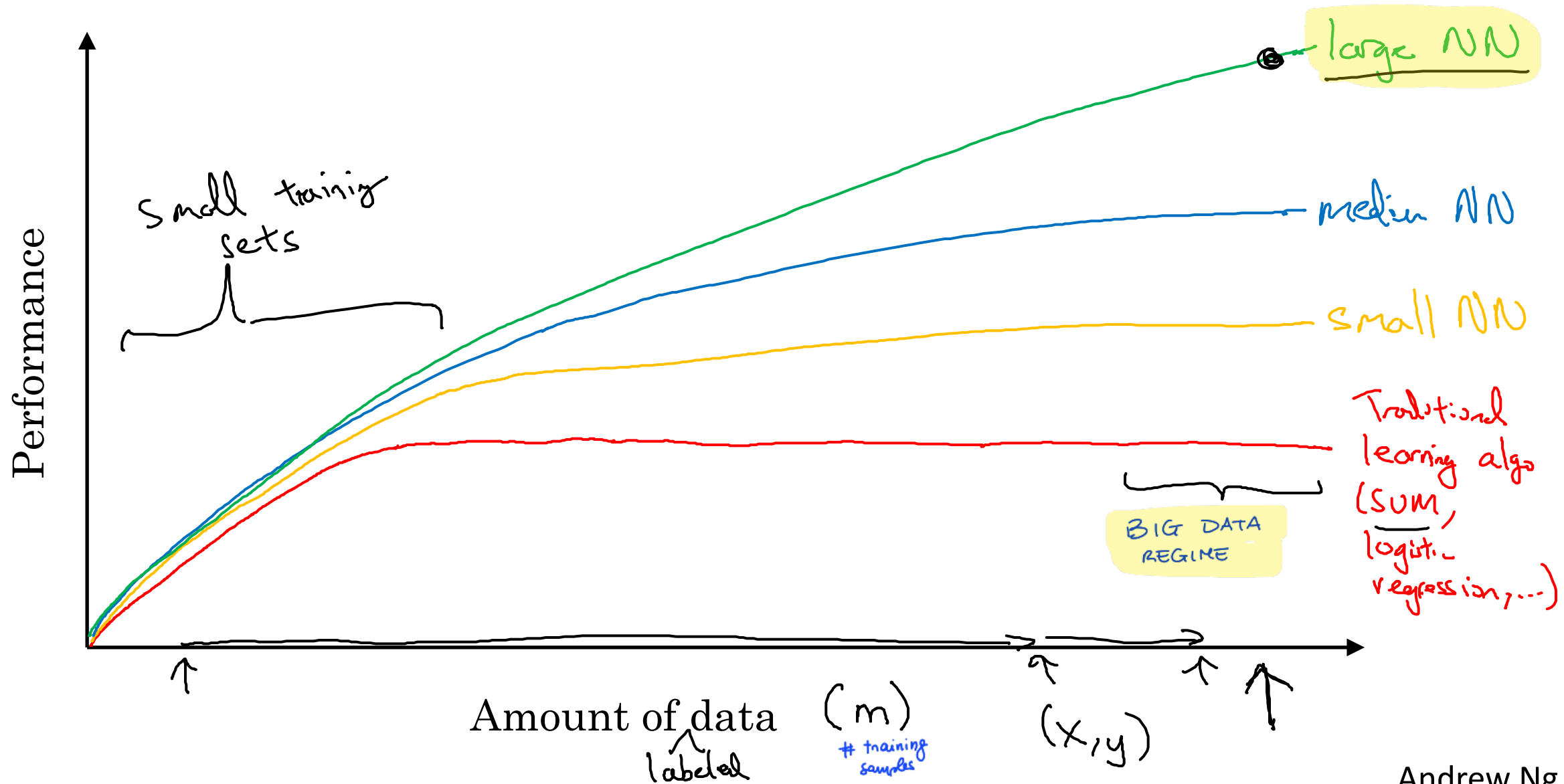


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Introduction to Neural Networks

Why is Deep Learning taking off?

Scale drives deep learning progress



Scale drives deep learning progress

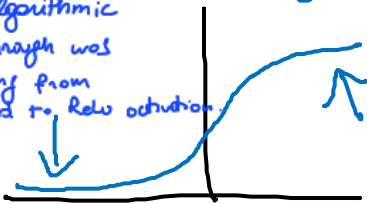
- Data ↙

- Computation ↙

- Algorithms ↙

Big algorithmic breakthrough was switching from sigmoid to ReLU activation.

Sigmoid



they reduce computational cost

ReLU

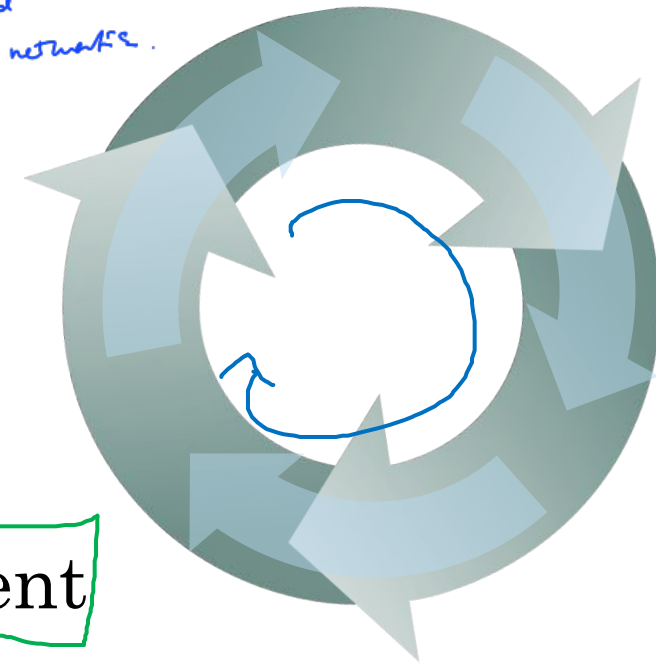


improvement because the gradient does not approach 0 in the positive region.

Faster computation has also helped speeding up the testing and development of new networks.

Experiment

Idea



Code

10 min ↙
1 day ↙
1 month




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Introduction to Neural Networks

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5. Natural Language Processing: Building sequence models

Outline of this Course

Week 1: Introduction

Week 2: Basics of Neural Network programming *forward and back-prop.*

Week 3: One hidden layer Neural Networks

Week 4: Deep Neural Networks








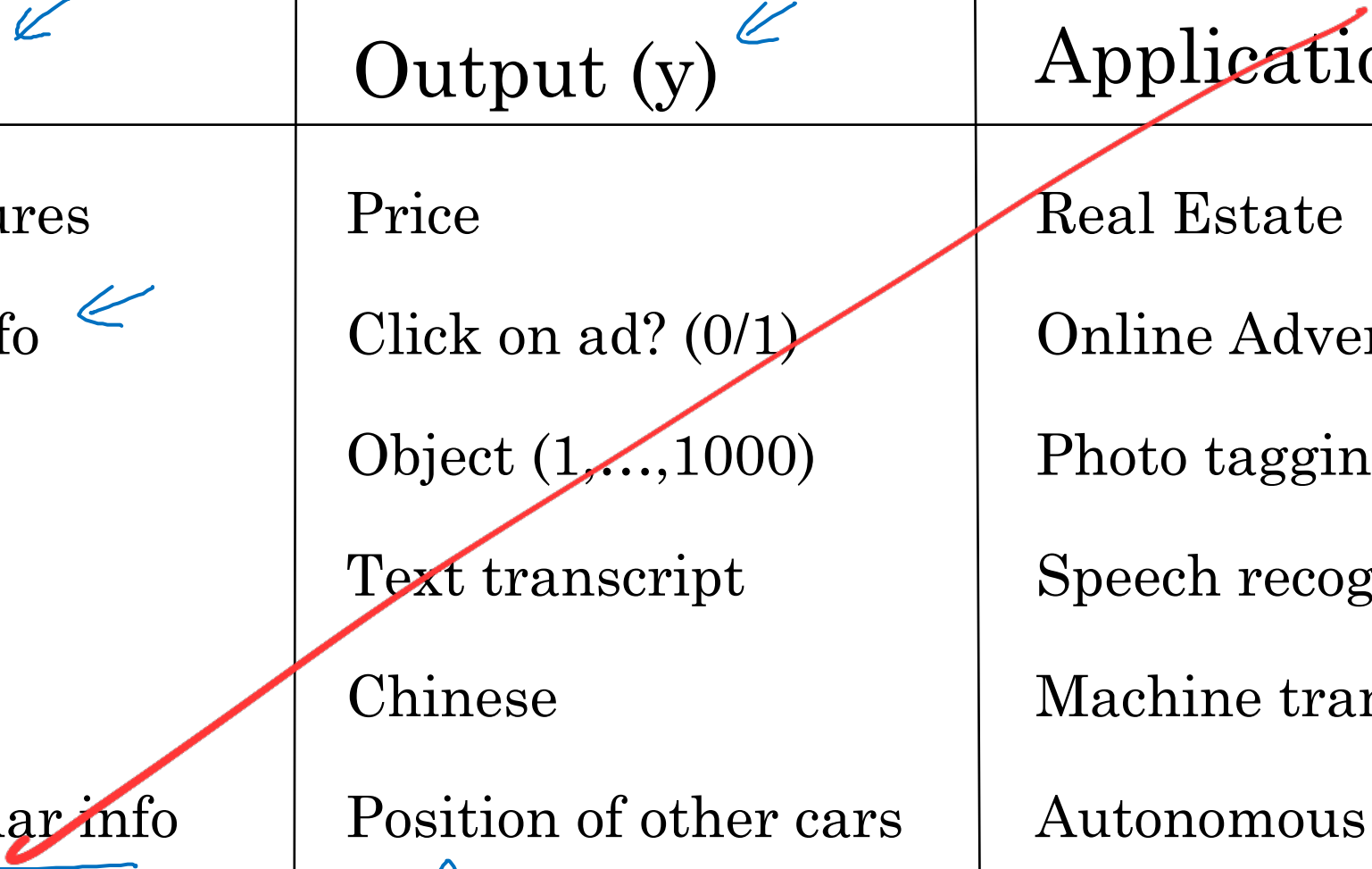
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Introduction to Deep Learning

Supervised Learning with Neural Networks

Supervised Learning

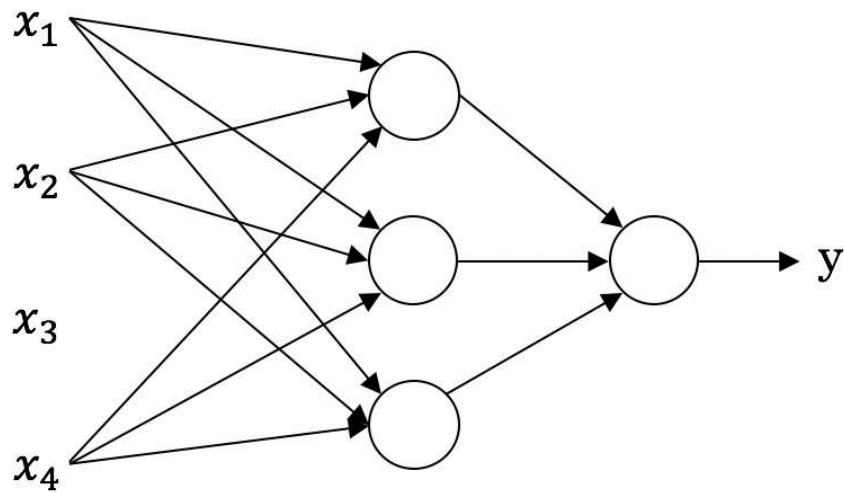
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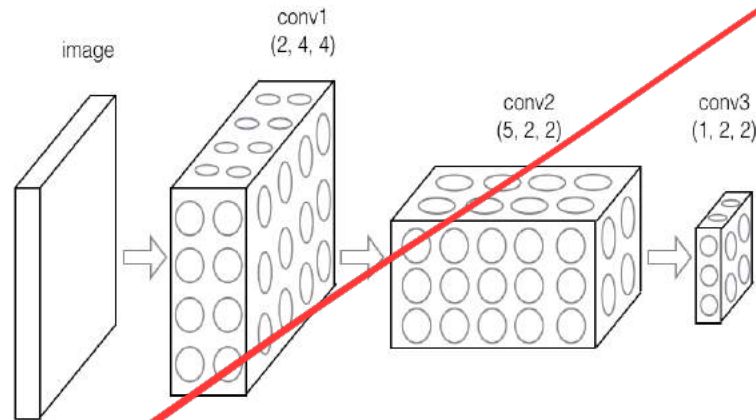
Handwritten annotations on the right side of the table:

- Real Estate and Online Advertising are grouped by a blue bracket and labeled Standard NN.
- Photo tagging is grouped by a blue bracket and labeled CNN.
- Speech recognition and Machine translation are grouped by a blue bracket and labeled RNN.
- Autonomous driving is grouped by a blue bracket and labeled Custom/Hybrid.

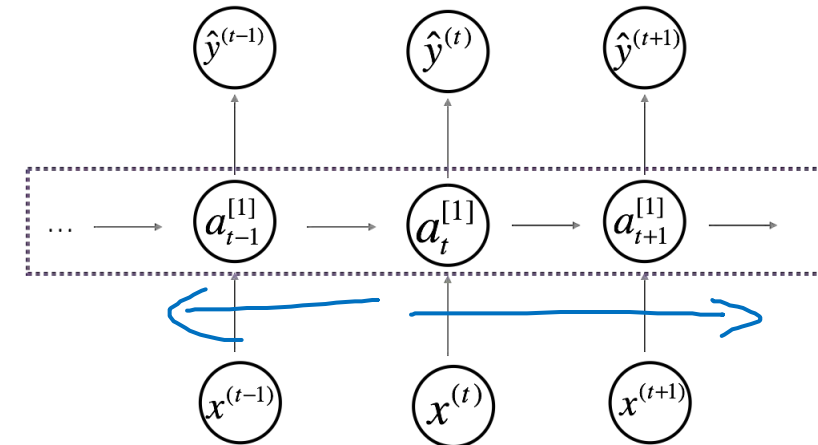
Neural Network examples



Standard NN



Convolutional NN



Recurrent NN

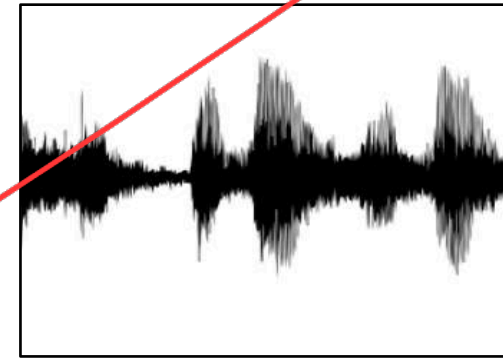
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Unstructured Data



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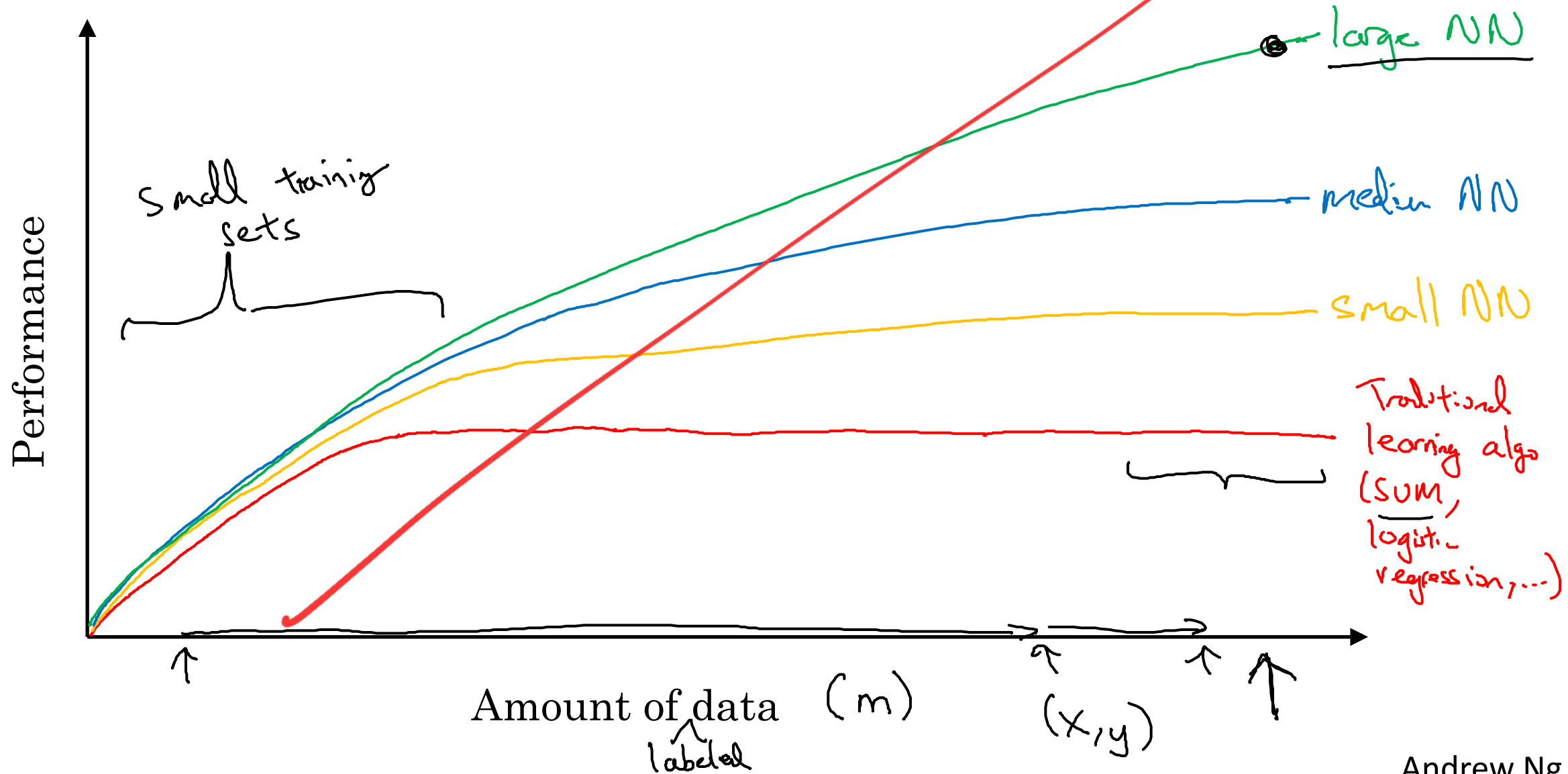


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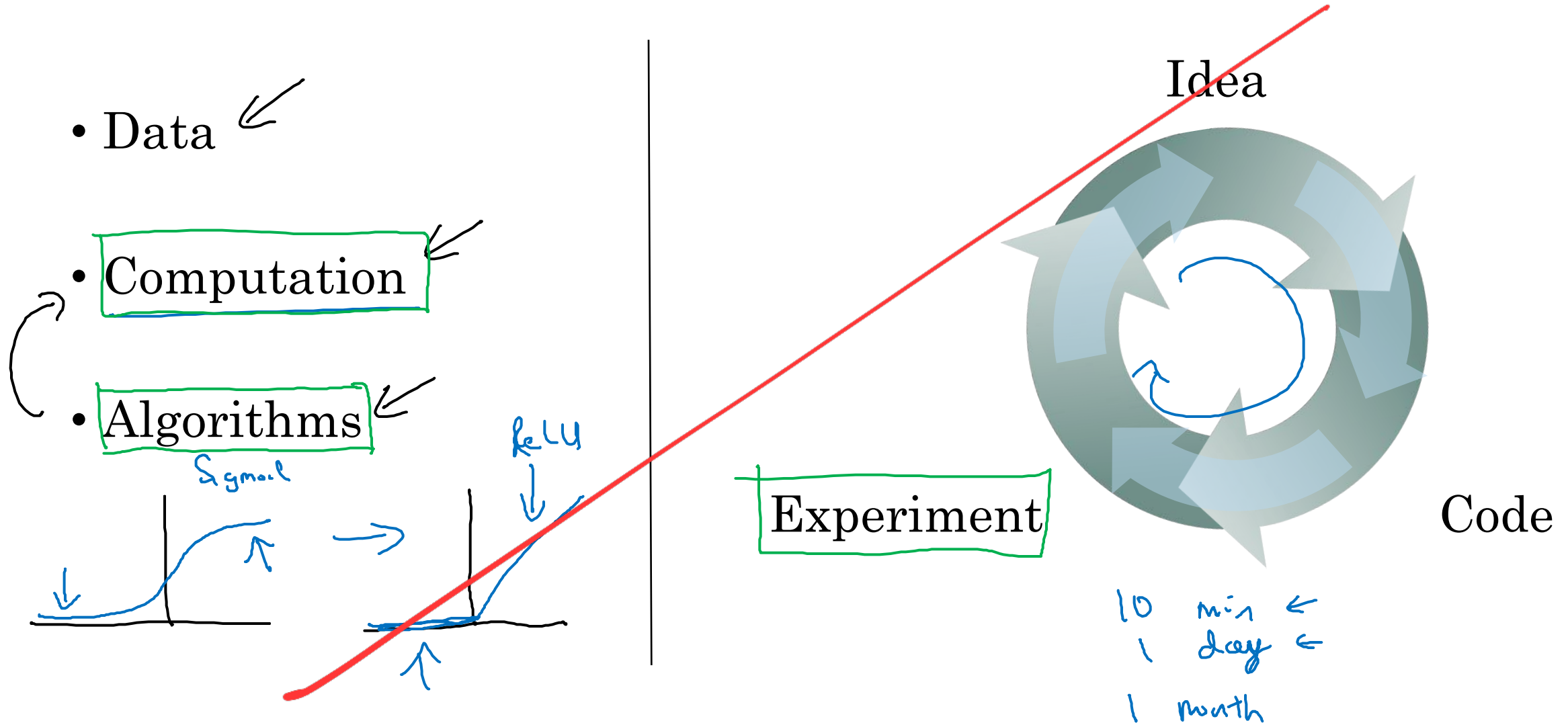
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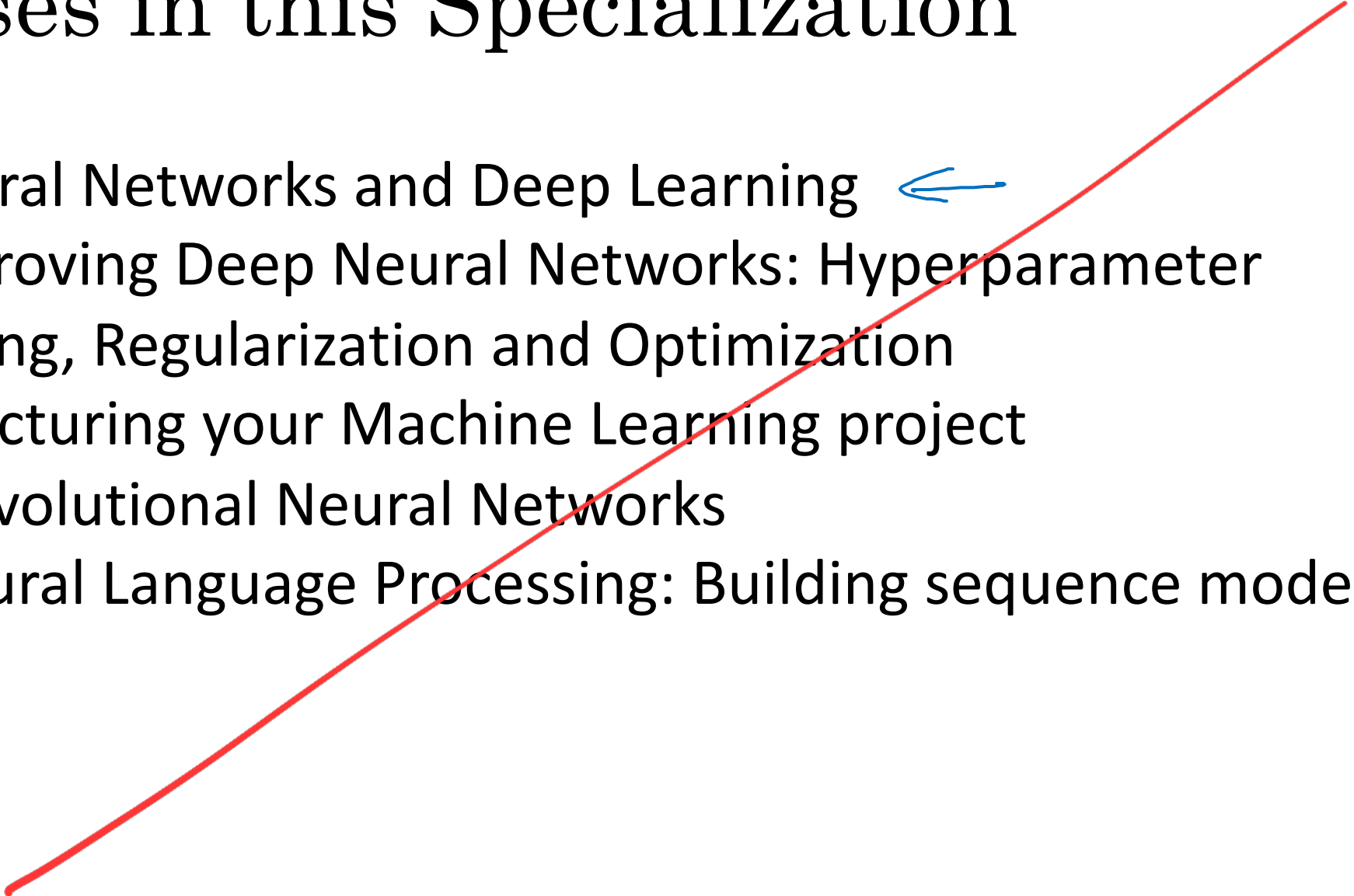


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