Introduction to Deep Learning

Welcome

deeplearning.ai
• 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
5. Natural Language Processing: Building sequence models

RNN, LSTM, CNN
Introduction to Deep Learning

What is a Neural Network?
Housing Price Prediction

![Diagram showing a linear relationship between the size of a house and its price.]

- Size of house vs. Price
- Linear relationship
- Red crosses indicating data points
- Diagram includes a neuron symbol and a ReLU (Rectified Linear Unit) function
- "neuron" label
- Size → Price connection
Housing Price Prediction

- Size
- #bedrooms
- Zip code (postal code)
- Wealth
- Family size
- Walkability
- School quality
- Price

$x$: 
$y$: 

Input features:
- Size
- #bedrooms
- Zip code
- Wealth

Output:
- Price
Housing Price Prediction

\[
\begin{align*}
&x_1: \text{size} \\
&x_2: \#\text{bedrooms} \\
&x_3: \text{zip code} \\
&x_4: \text{wealth} \\
&y: \text{price}
\end{align*}
\]
Introduction to Deep Learning

Supervised Learning with Neural Networks

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## Supervised Learning

<table>
<thead>
<tr>
<th>Input (x)</th>
<th>Output (y)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home features</td>
<td>Price</td>
<td>Real Estate</td>
</tr>
<tr>
<td>Ad, user info</td>
<td>Click on ad? (0/1)</td>
<td>Online Advertising</td>
</tr>
<tr>
<td>Image</td>
<td>Object (1,...,1000)</td>
<td>Photo tagging</td>
</tr>
<tr>
<td>Audio</td>
<td>Text transcript</td>
<td>Speech recognition</td>
</tr>
<tr>
<td>English</td>
<td>Chinese</td>
<td>Machine translation</td>
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<tr>
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Neural Network examples

Standard NN

Convolutional NN

Recurrent NN
Supervised Learning

Structured Data

<table>
<thead>
<tr>
<th>Size</th>
<th>#bedrooms</th>
<th>...</th>
<th>Price (1000$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2104</td>
<td>3</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>1600</td>
<td>3</td>
<td></td>
<td>330</td>
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<tr>
<td>2400</td>
<td>3</td>
<td></td>
<td>369</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3000</td>
<td>4</td>
<td></td>
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Unstructured Data

- Audio
- Image

Text

Four scores and seven years ago...
Introduction to Neural Networks

Why is Deep Learning taking off?

deeplearning.ai
Scale drives deep learning progress

Performance vs. Amount of data (m)

- Small training sets
- Small NN
- Median NN
- Large NN

Traditional learning algorithms (sum, logistic regression, ...)

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Scale drives deep learning progress

- Data
- Computation
- Algorithms

Idea

Experiment

Code

10 min < 1 day < 1 month
Introduction to Neural Networks

About this Course
deeplearning.ai
Courses in this Specialization

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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
Introduction to Deep Learning

Supervised Learning with Neural Networks
## Supervised Learning

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Neural Network examples

Standard NN  Convolutional NN  Recurrent NN
## Supervised Learning

### Structured Data

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### Unstructured Data

- **Audio**
- **Image**
- **Text**

### Unstructured Data Example

- Four scores and seven years ago...

### User Age, Ad Id, Click Data

<table>
<thead>
<tr>
<th>User Age</th>
<th>Ad Id</th>
<th>Click</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>93242</td>
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<td>80</td>
<td>93287</td>
<td>0</td>
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<tr>
<td>18</td>
<td>87312</td>
<td>1</td>
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<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>27</td>
<td>71244</td>
<td>1</td>
</tr>
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Introduction to Neural Networks

Why is Deep Learning taking off?
Scale drives deep learning progress

![Graph showing the relationship between the amount of data and performance.](image)

- Small training sets
- Medium NN
- Large NN

Traditional learning algorithms (sum, logistic regression, ...)

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Scale drives deep learning progress

- Data
- Computation
- Algorithms

Idea → Experiment → Code

10 min < 1 day < 1 month

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