School of
DATA
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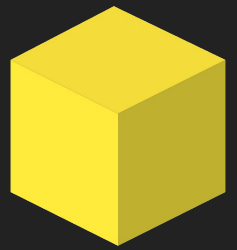
EXPLORE
ARTIFICIAL INTELLIGENCE



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Who are we?

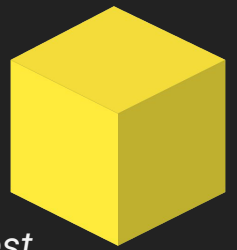
What do we do?
- *Courses in the field of data science*
- *Consultancy*
- *Meetups*

For who?
- *People who want to learn how to apply:*
  - *Machine Learning*
  - *Data analysis*
  - *Python/R*
- *For experts and beginners*

Courses in:
- *Machine learning*
- *Deep Learning*
- *Data Analysis*
- *Python*

Where:
- *Den Haag*
- *Rotterdam*
- *Amsterdam*

Reviews?
- *9.5/10 rating on Springest =)*



Website: https://schoolofdatascience.nl/

Machine Learning

Deep Learning in JavaScript with TensorFlow.

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Program

- Online examples
- Theory
  - What is Deep Learning?
  - Natural Language processing
  - Preprocess text
  - Natural Language model
- Code in action
  - Training
  - Using

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Online examples

My projects =)

https://www.ricksprojects.com/home

Nvidia

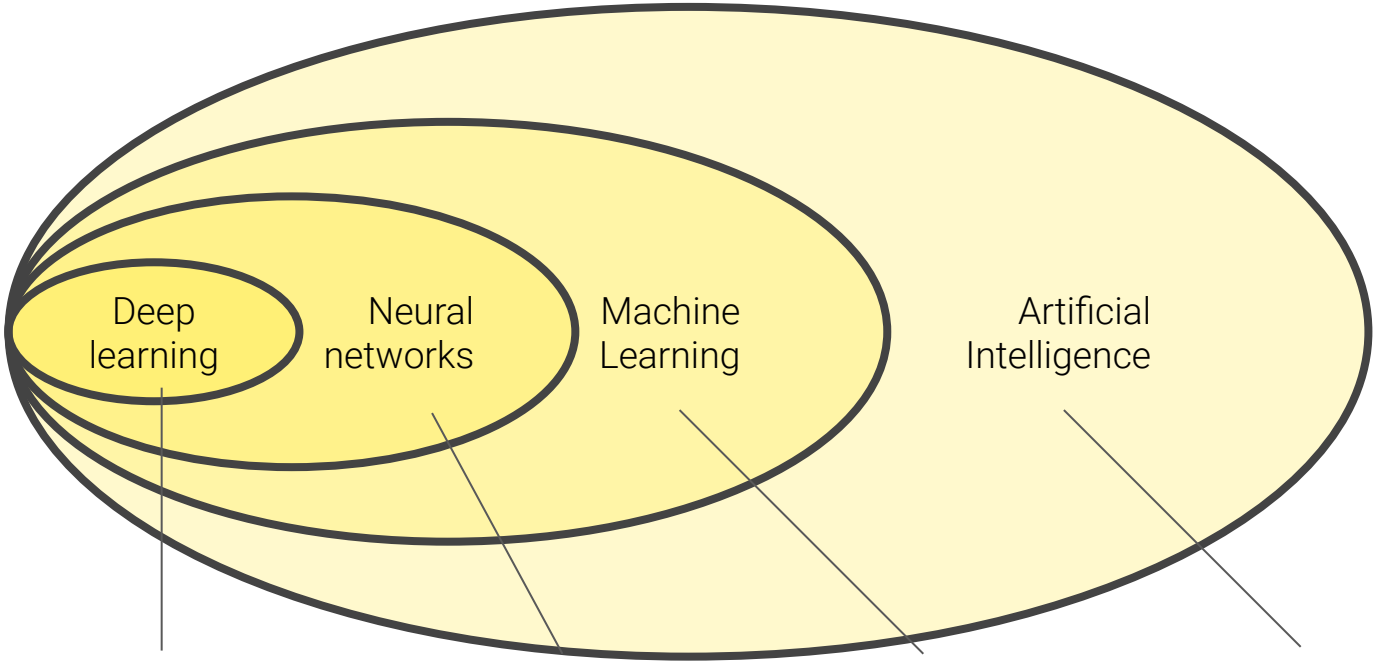
https://www.nvidia.com/en-us/research/ai-playground/

Google

https://www.tensorflow.org/js/demos

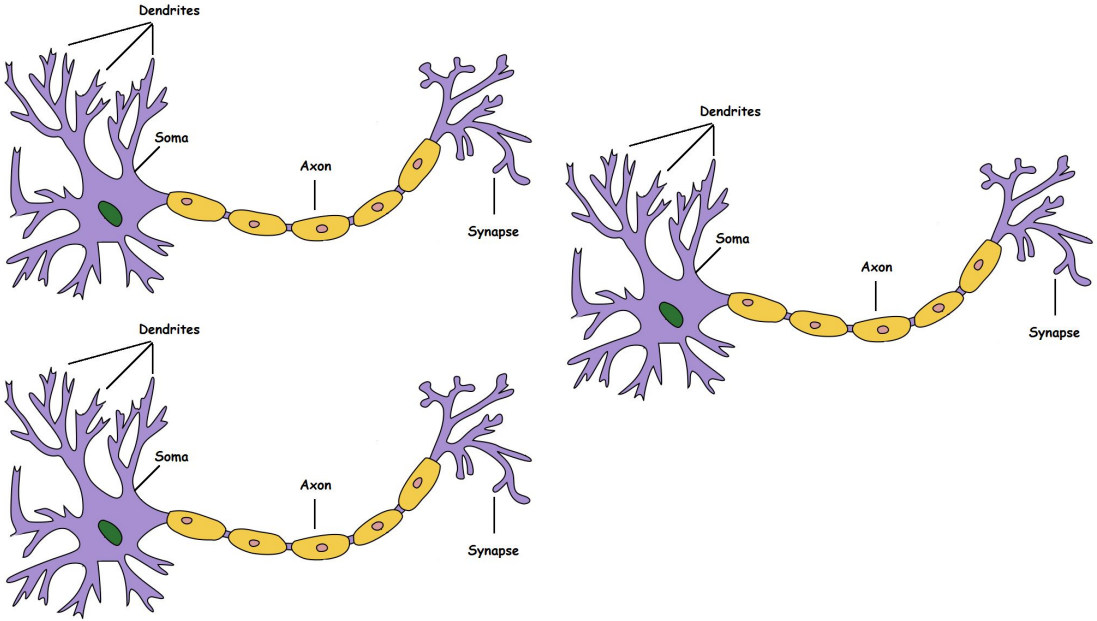
Who has experience with Machine Learning?

What is Deep Learning?



Who has heard about Deep Learning?

What is Deep Learning?



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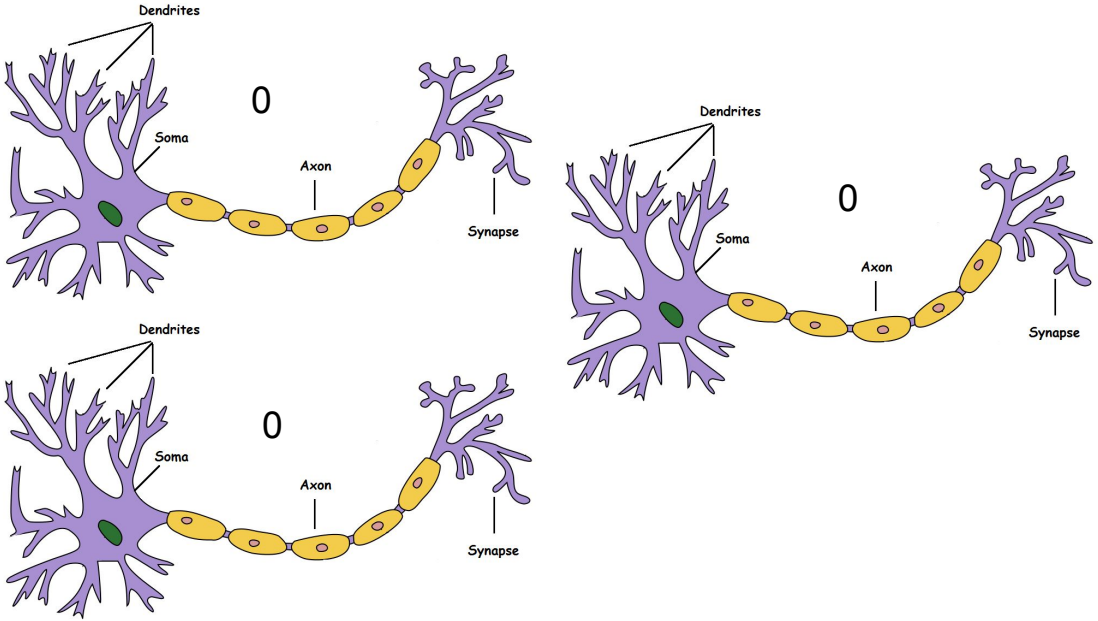
What is Deep Learning?



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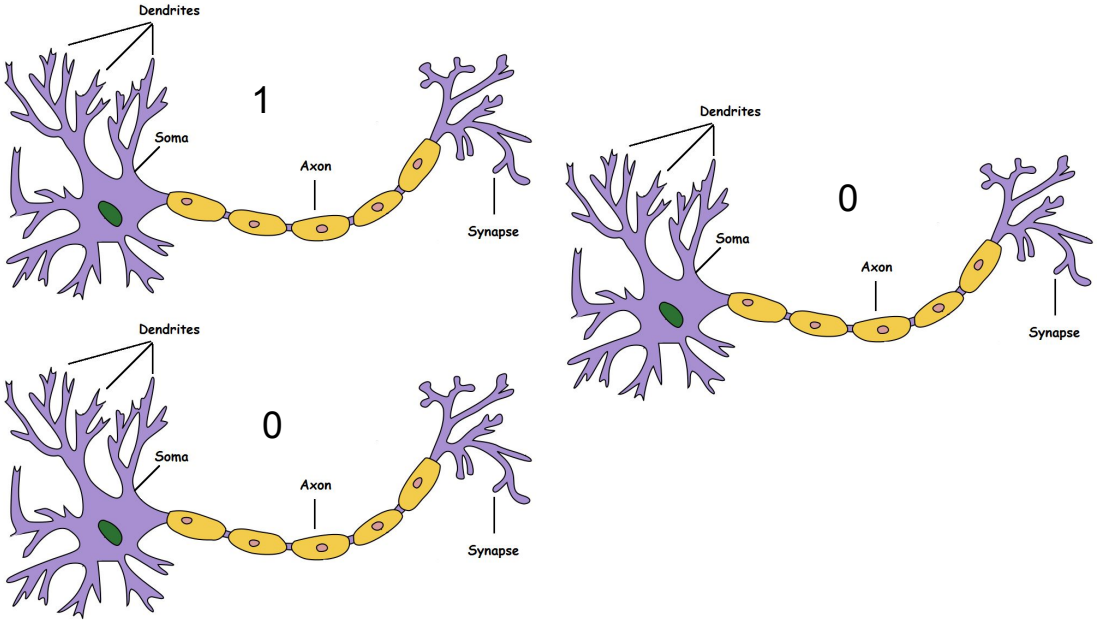
What is Deep Learning?



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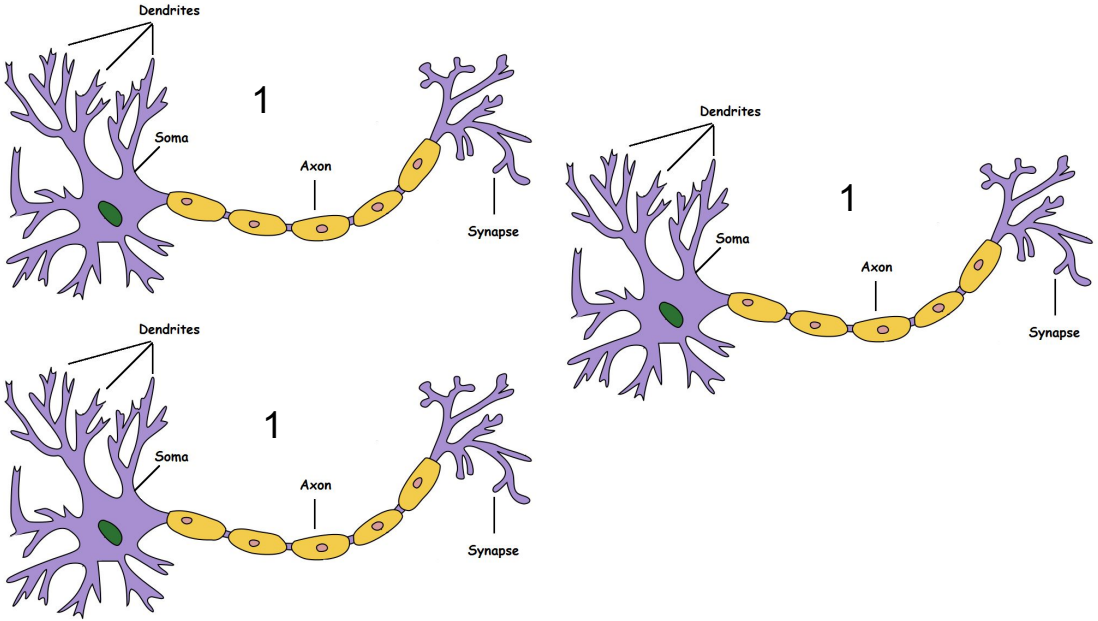
What is Deep Learning?



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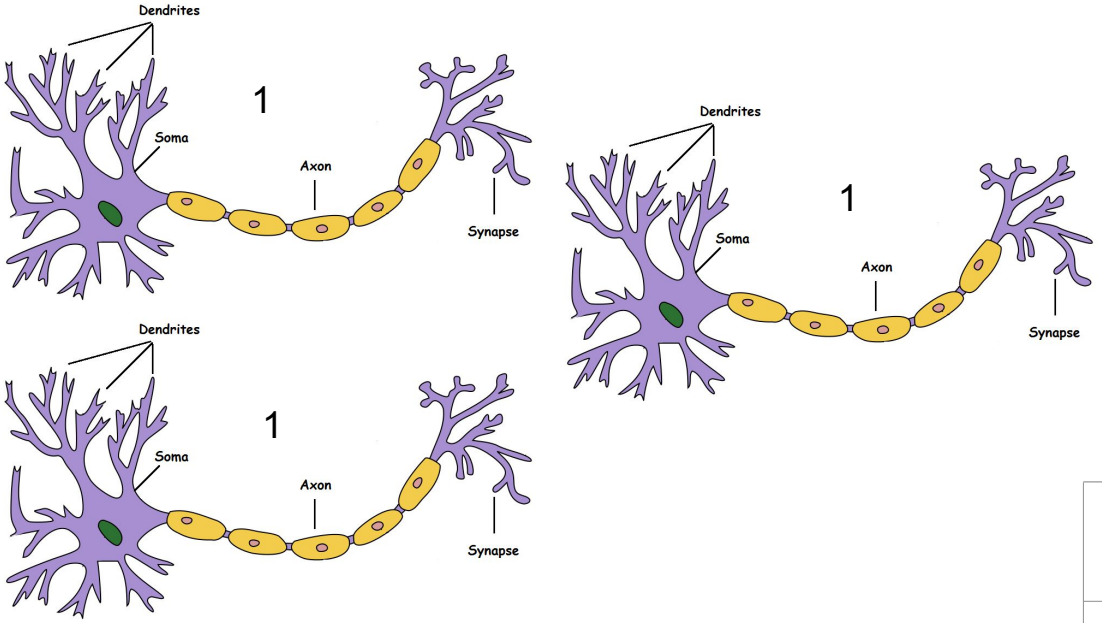
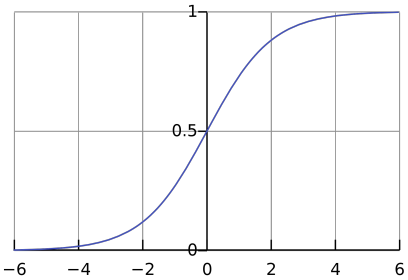
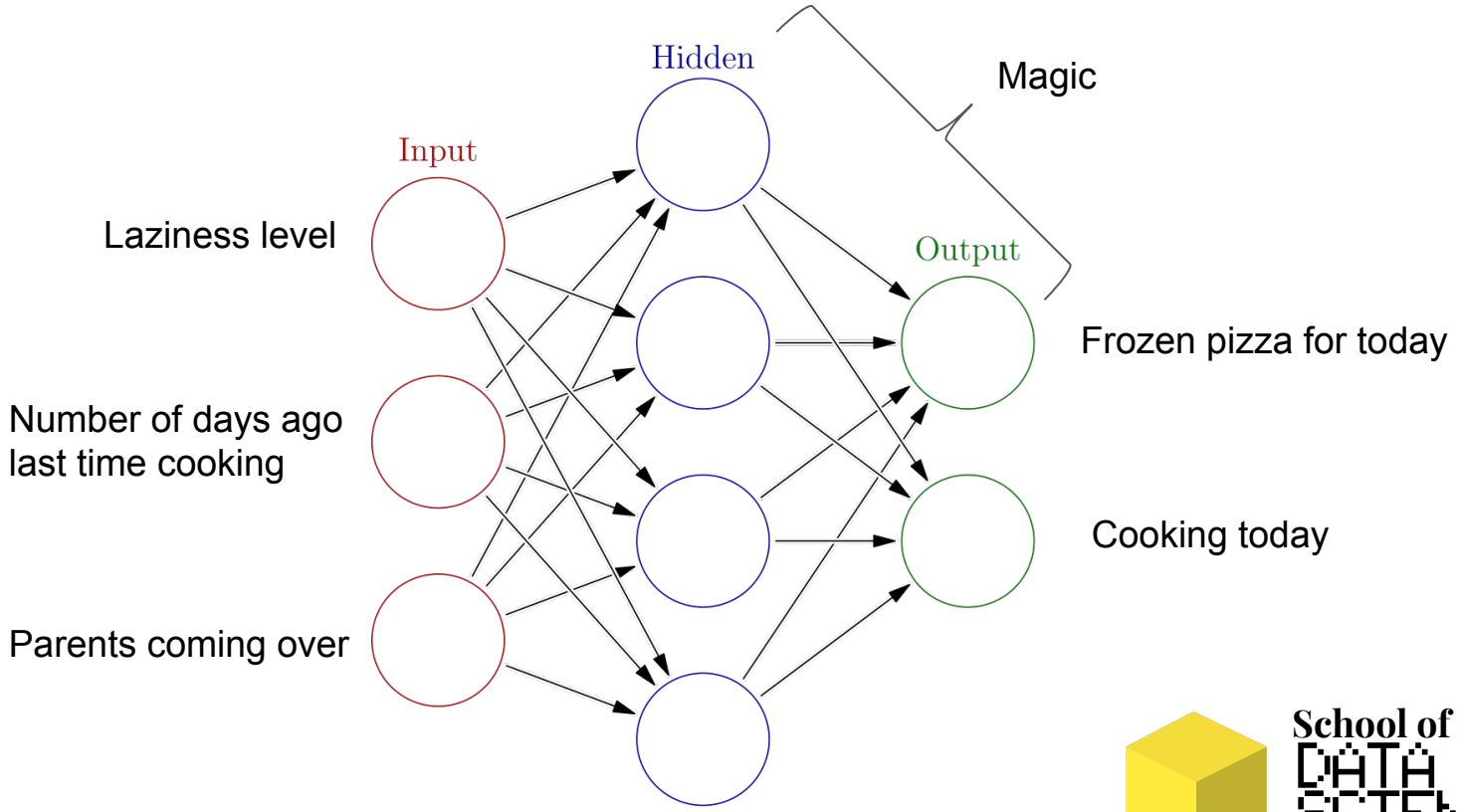
What is Deep Learning?





What is Deep Learning?



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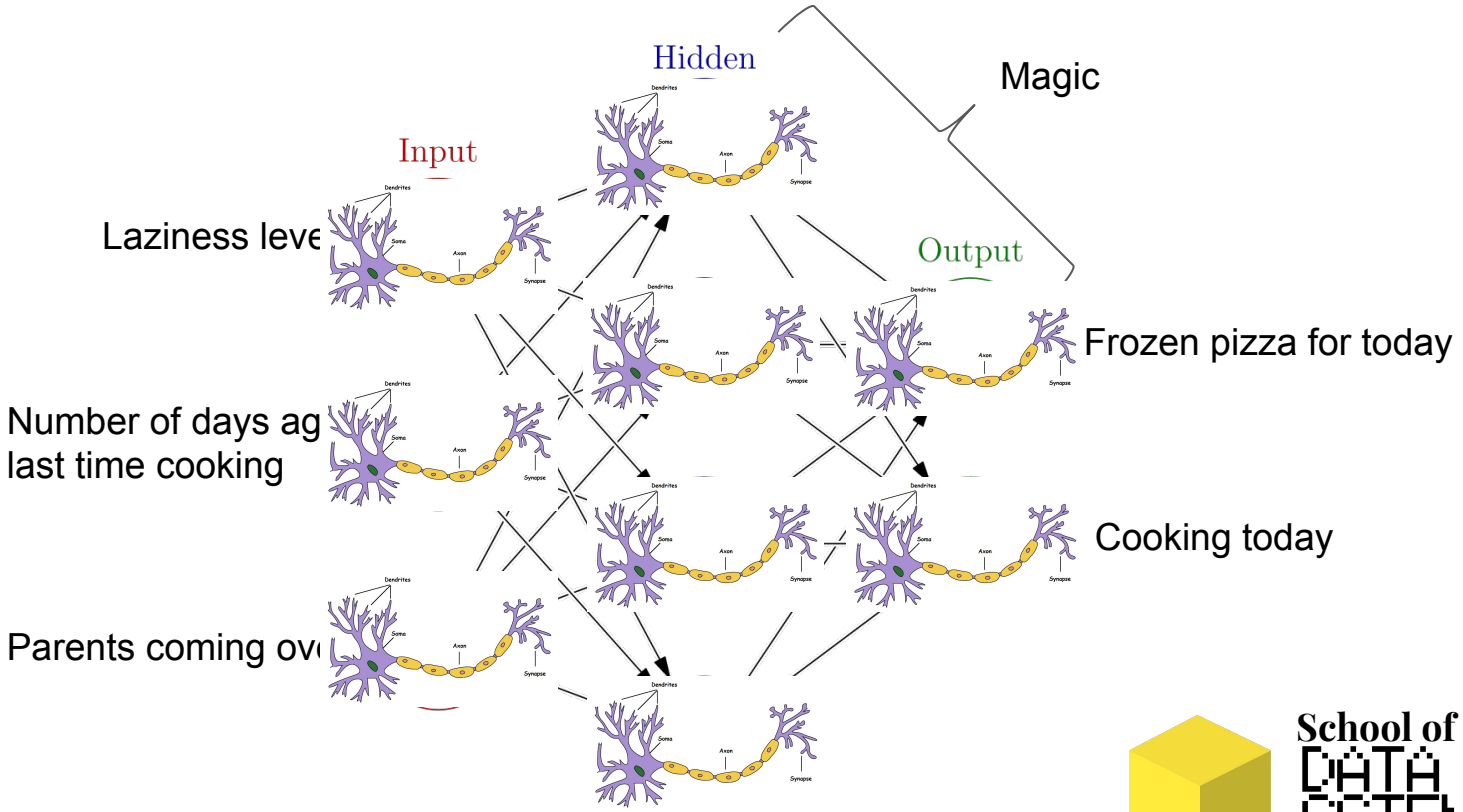
What is Deep Learning?



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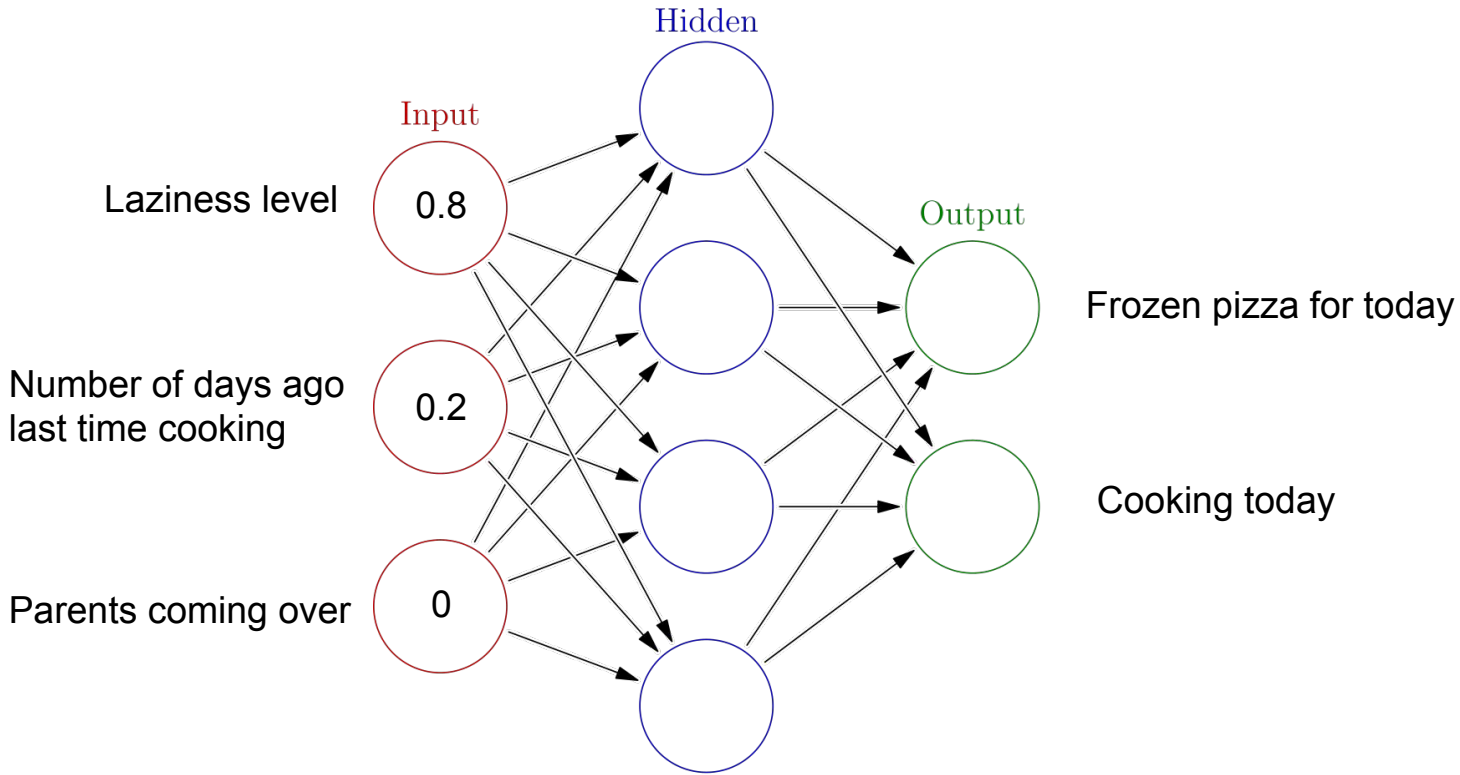
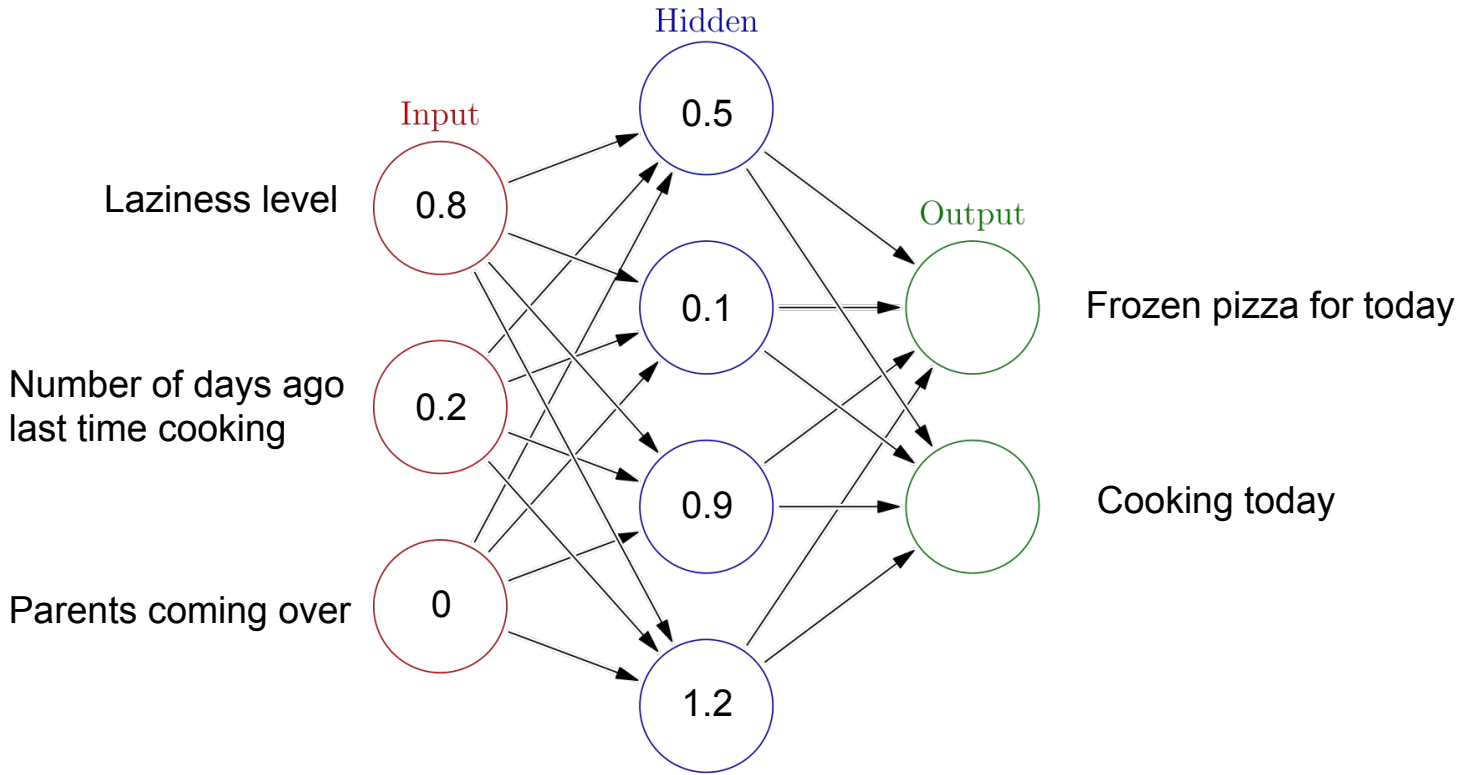
What is Deep Learning?

Node values



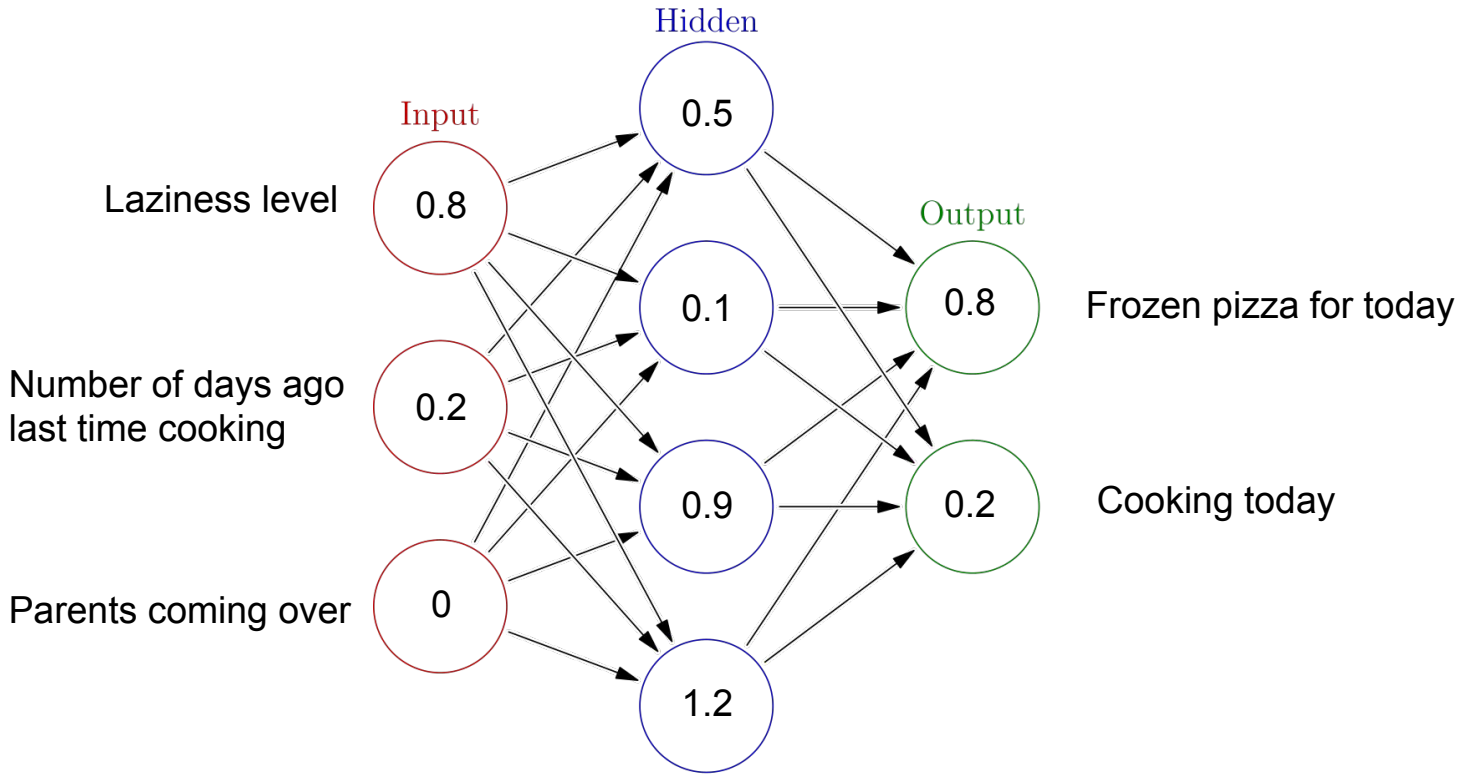
What is Deep Learning?

Node values



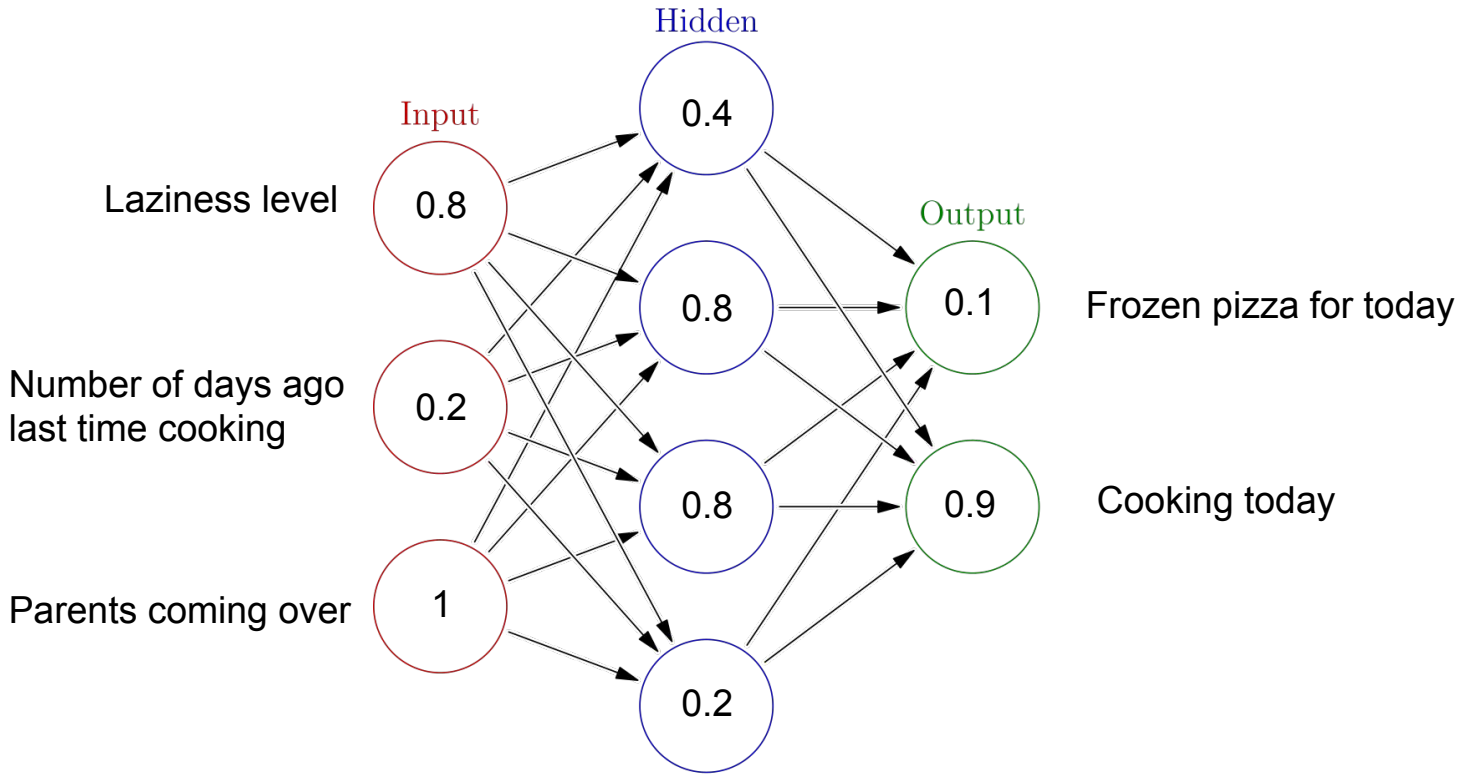
What is Deep Learning?

Node values



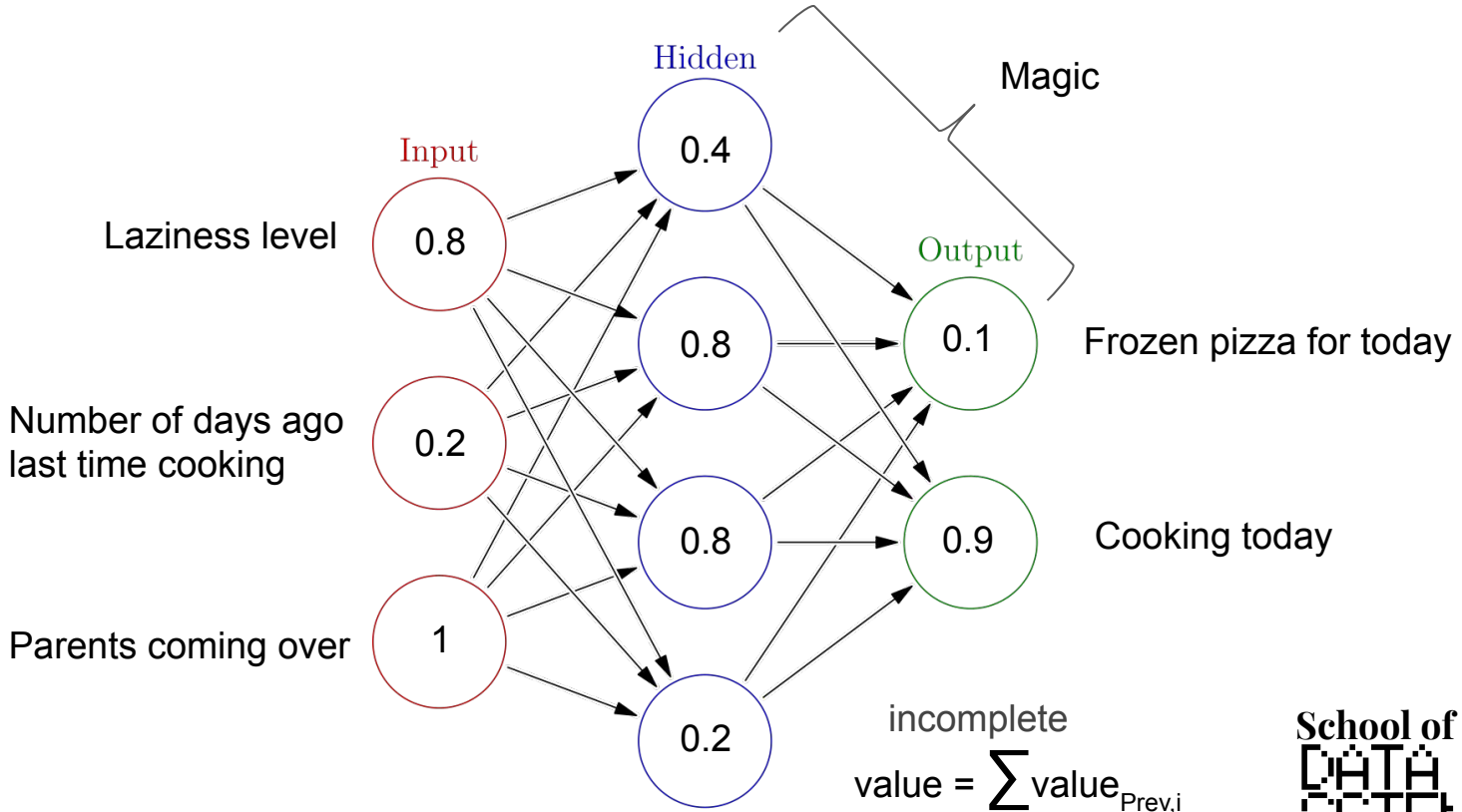
What is Deep Learning?

Node values



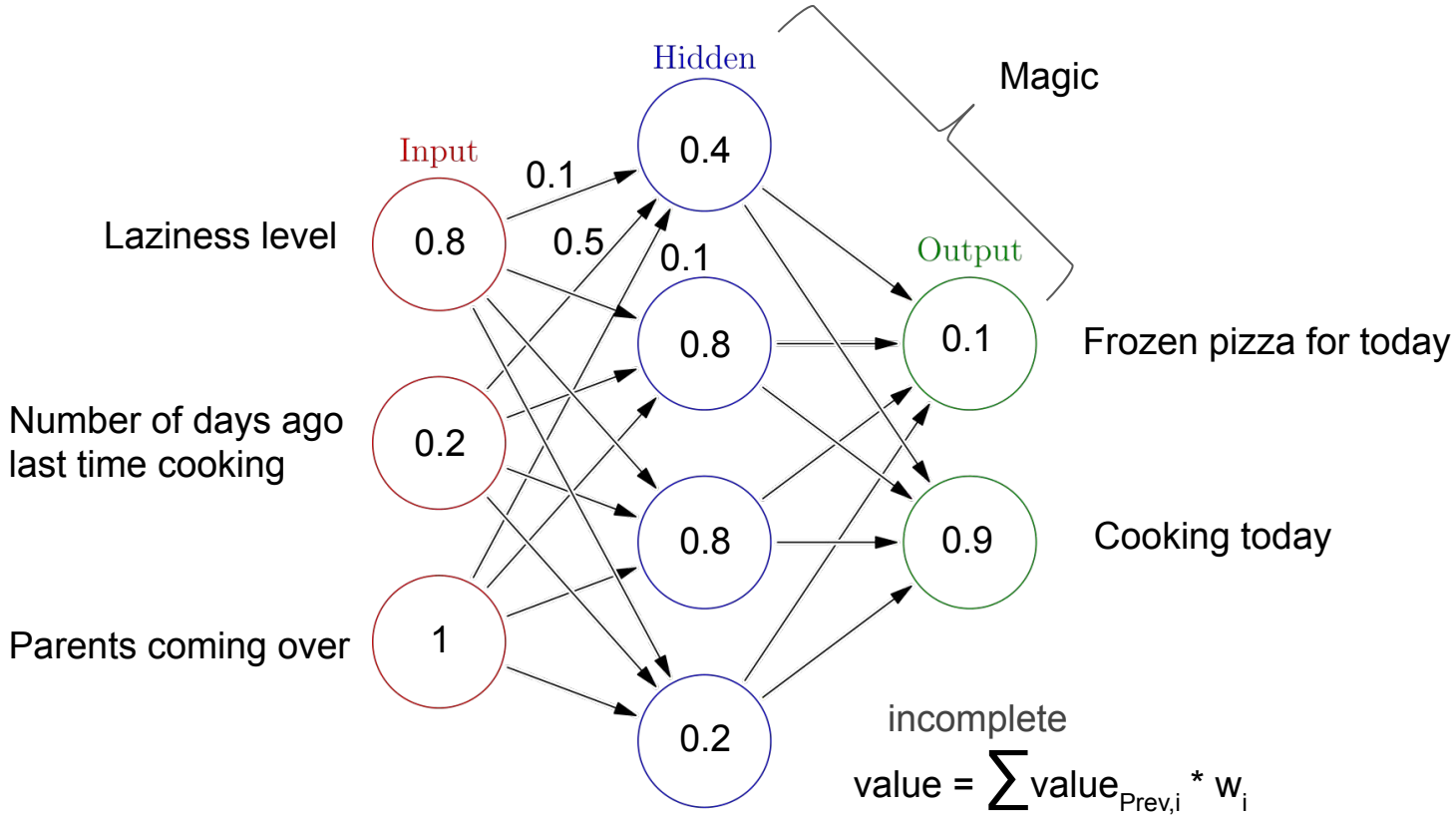
What is Deep Learning?

Node values



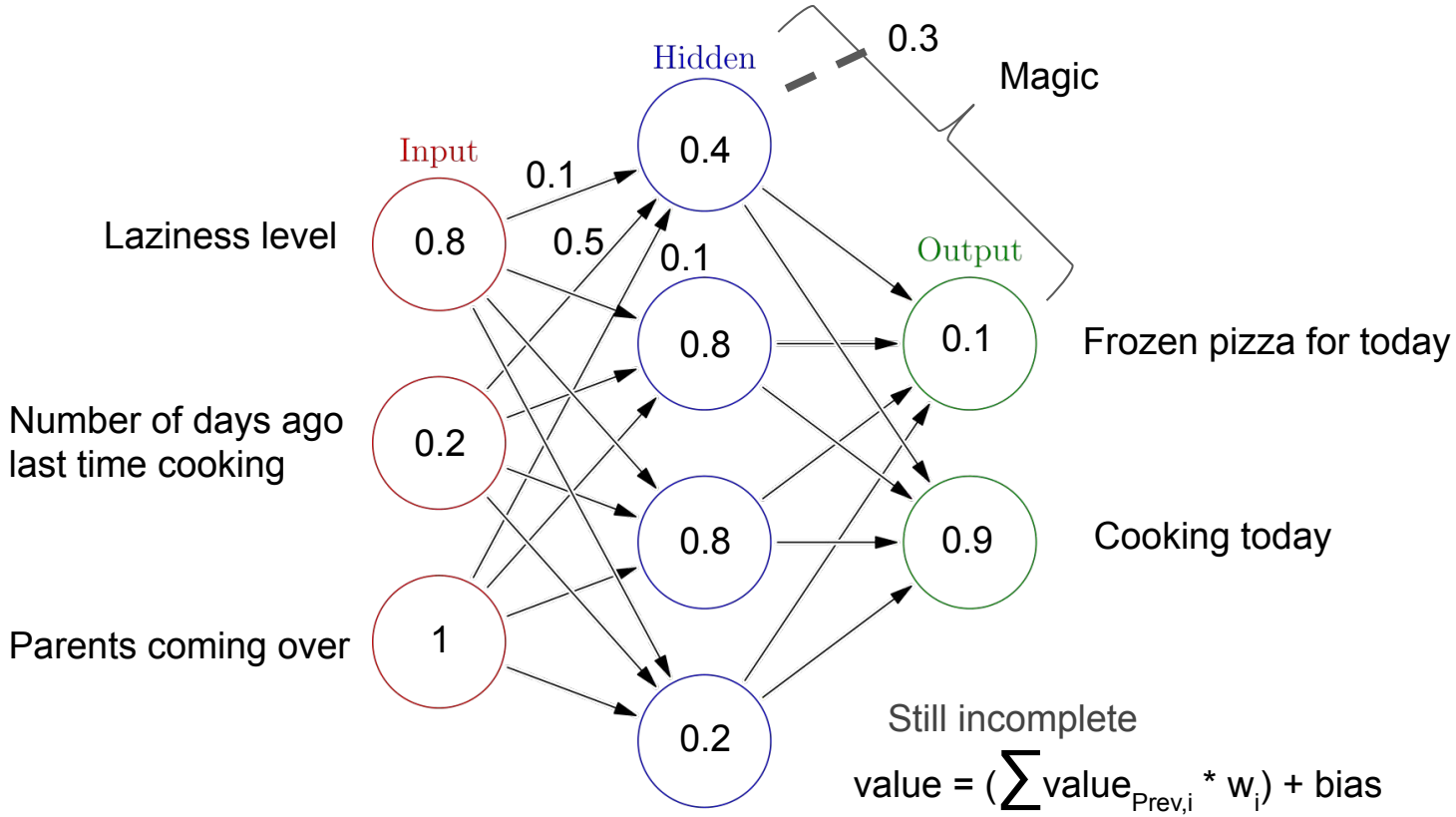
What is Deep Learning?

Weights



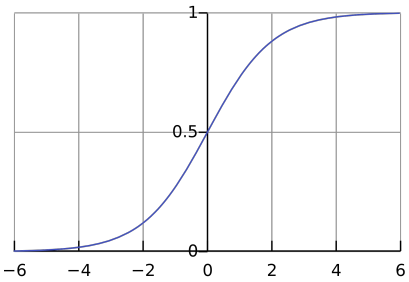
What is Deep Learning?

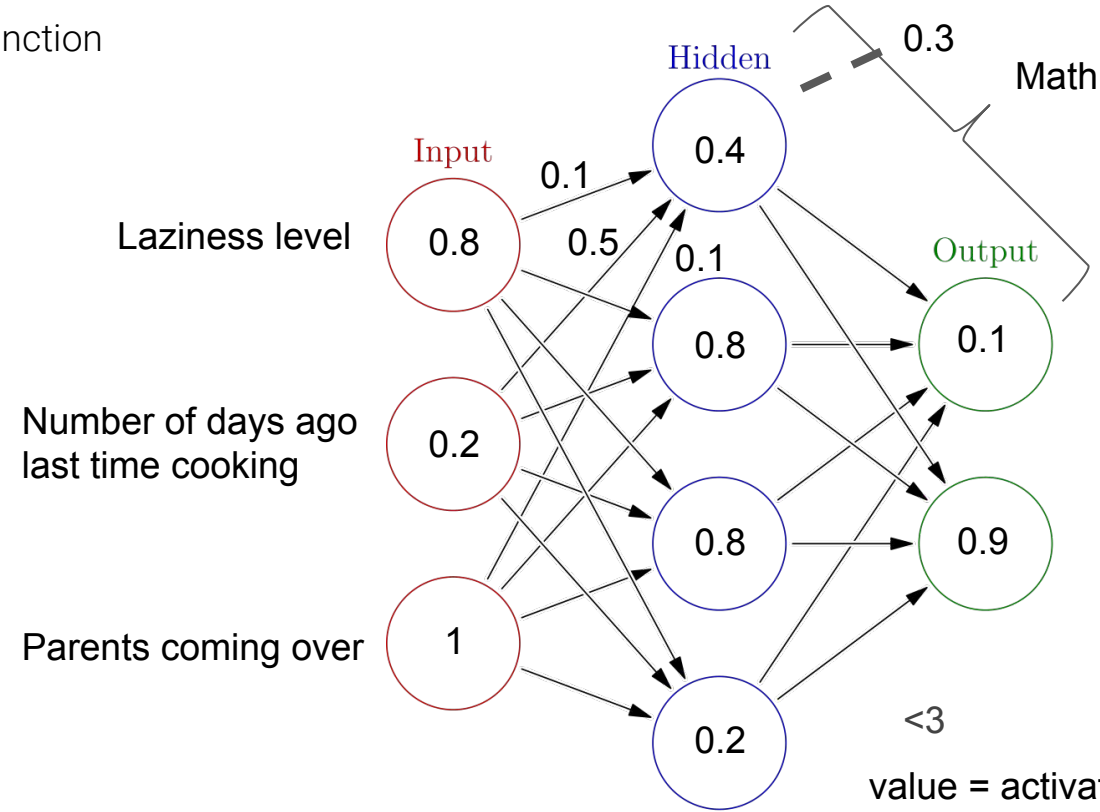
Bias



What is Deep Learning?

Activation function

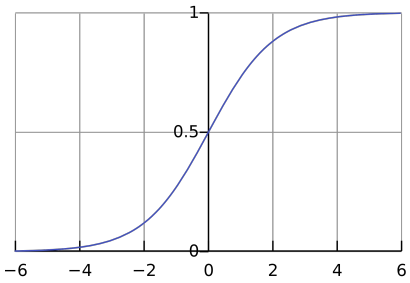


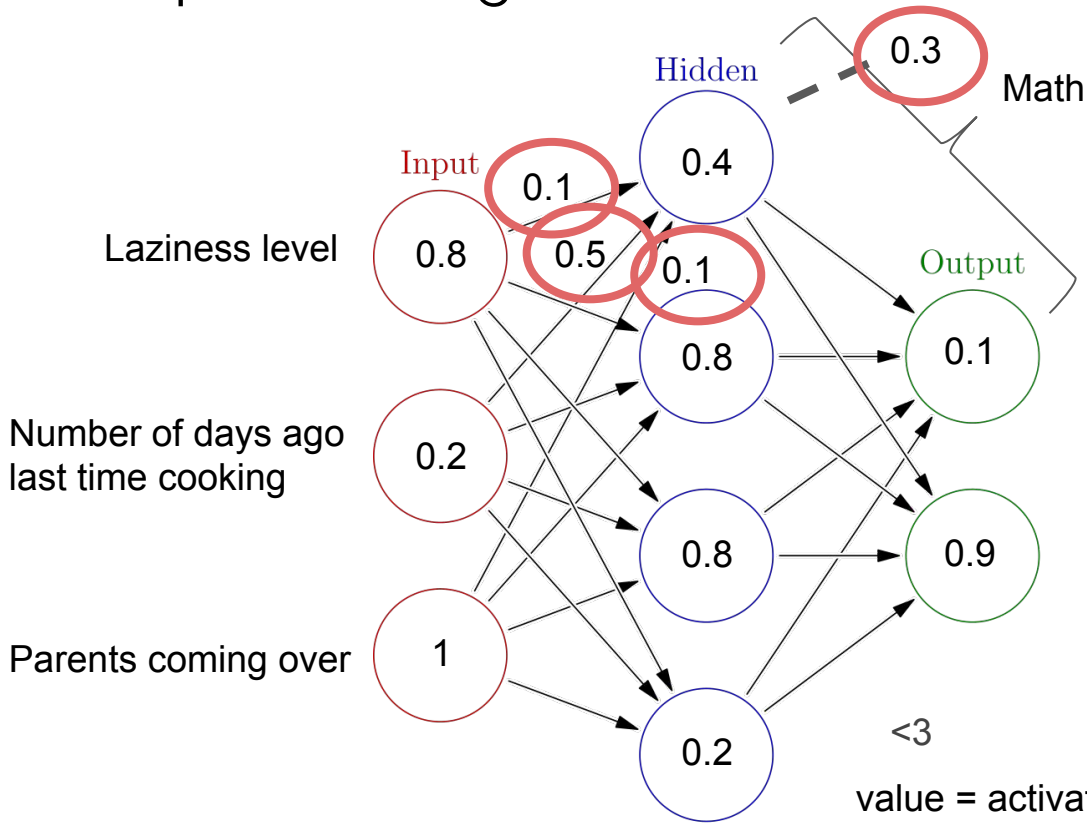


$$value = activation((\sum value_{Prev,i} * w_i) + bias)$$

What is Deep Learning?

Learning

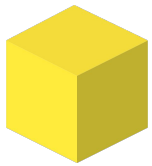




$$value = activation((\sum value_{Prev,i} * w_i) + bias)$$

What is Deep Learning?

- Neural networks are very flexible
- You can mold to into any shape you want to fit your problem



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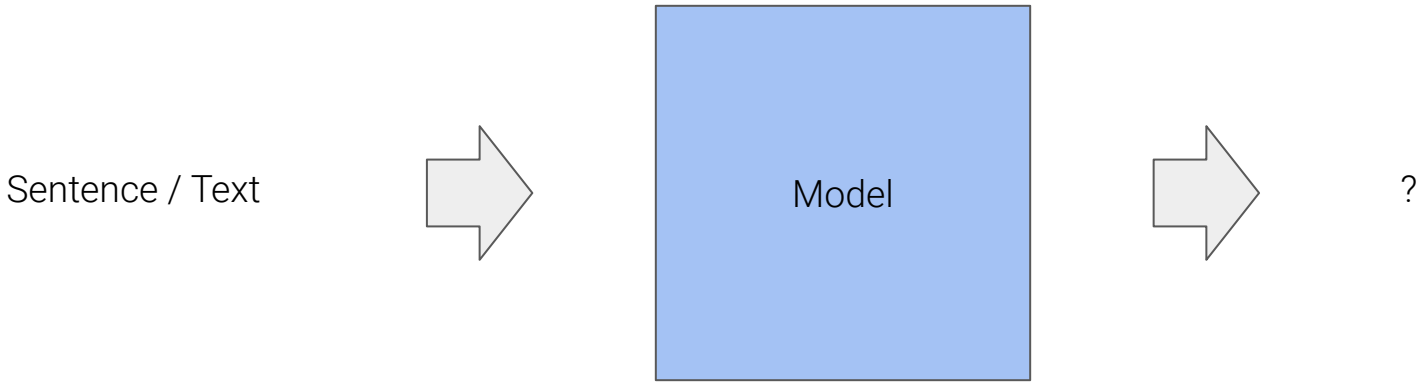
Preprocess text



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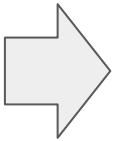
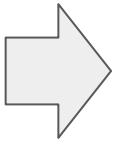
Preprocess text

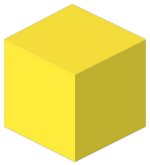
Sentence / Text



Model



- Translation
- Sentiment (positive/negative)
- Auto complete
- Decision
- Tags



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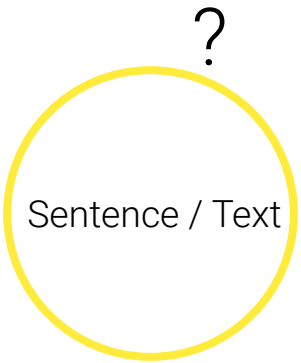
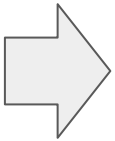
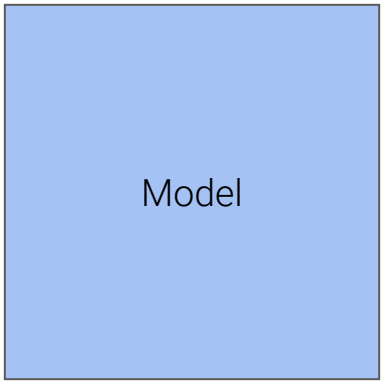
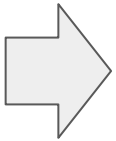
Preprocess text









- Translation
- Sentiment (positive/negative)
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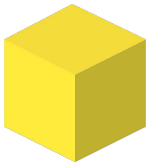

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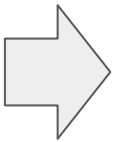
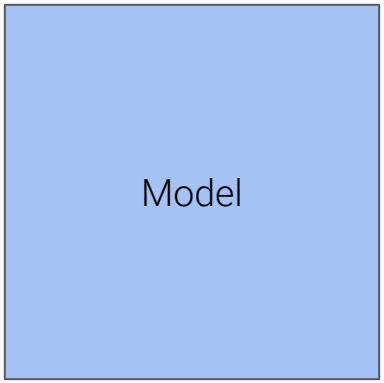
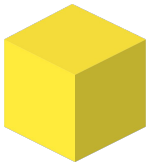
Preprocess text

- Letters
- Words
- Parts of words
  Example:
  Isn't - > Is + n't







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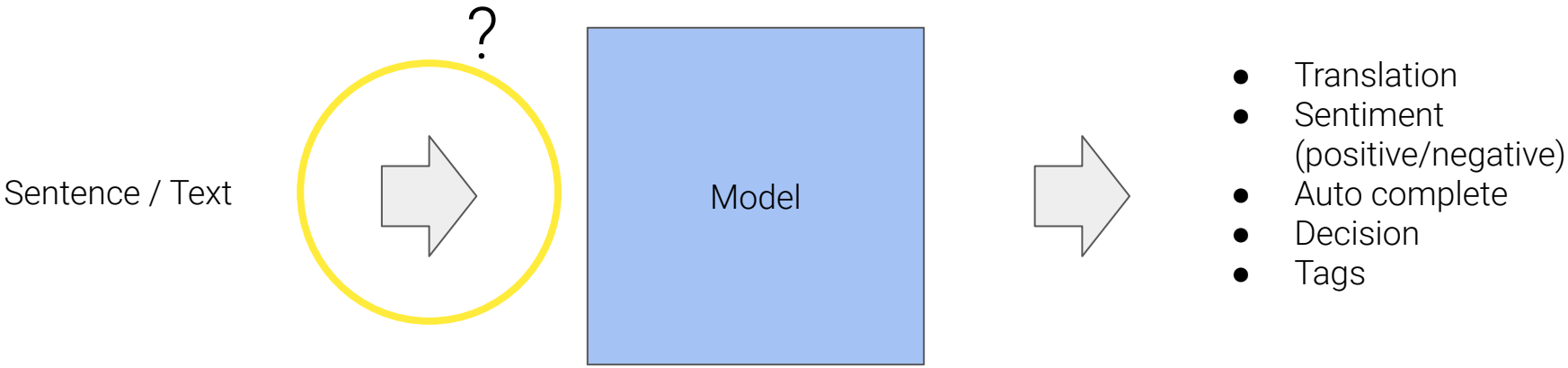
Preprocess text



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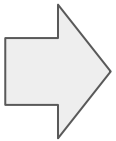
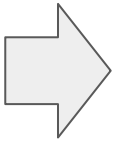
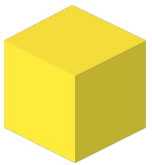
Preprocess text

Embedding)	Word/character		Vector
Bag of words)	Word		Word counts



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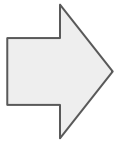
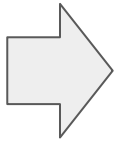
Preprocess text

Embedding) Word/character  Vector

Bag of words) Word  Word counts

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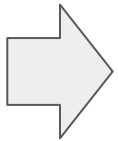
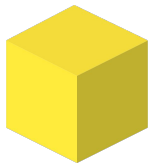
Preprocess text

Word/character  Vector

Who knows about vectors?



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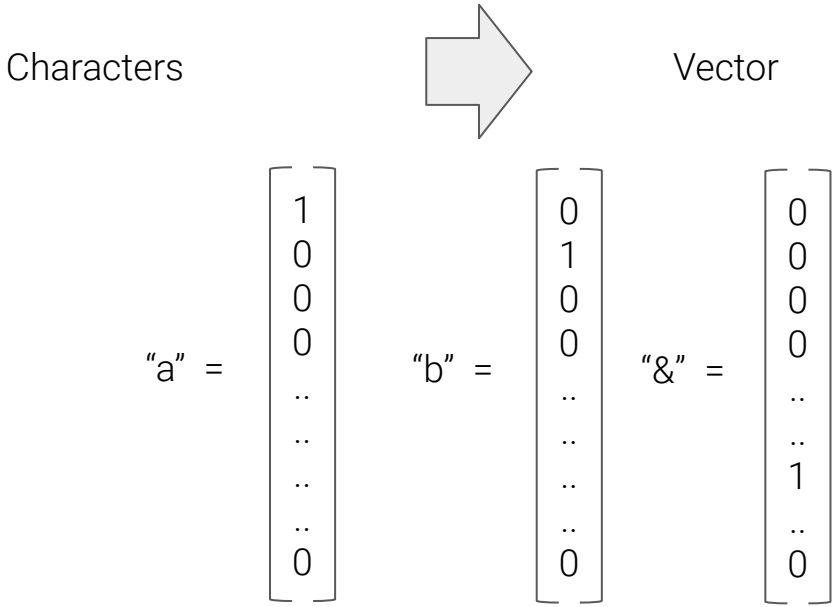
Preprocess text



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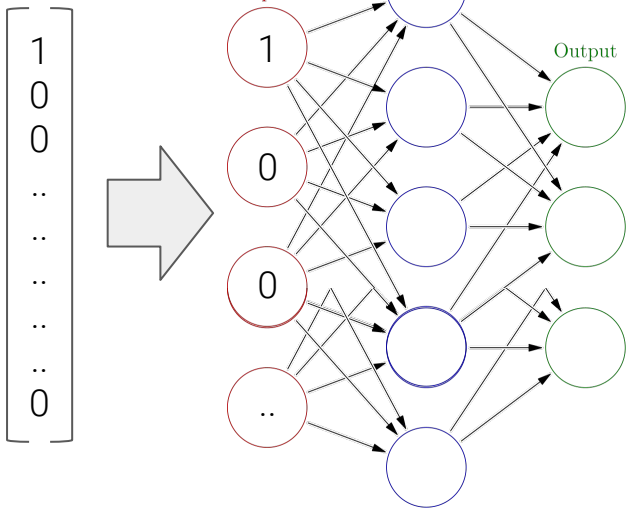
Preprocess text

Characters → Vector

Why vectors?

"a" =



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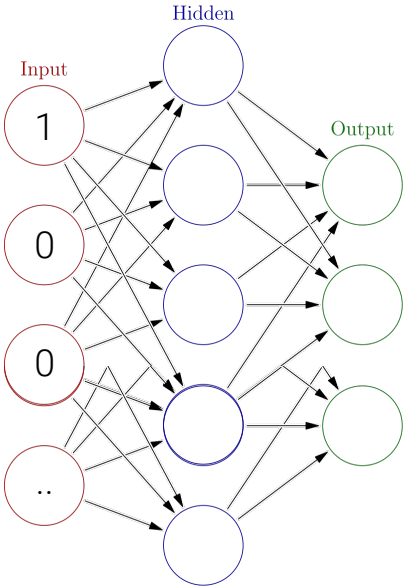
Preprocess text

Words → Vector

How do we insert a word in a neural network

“hello” =

1
0
0
..
..
..
..
..
0



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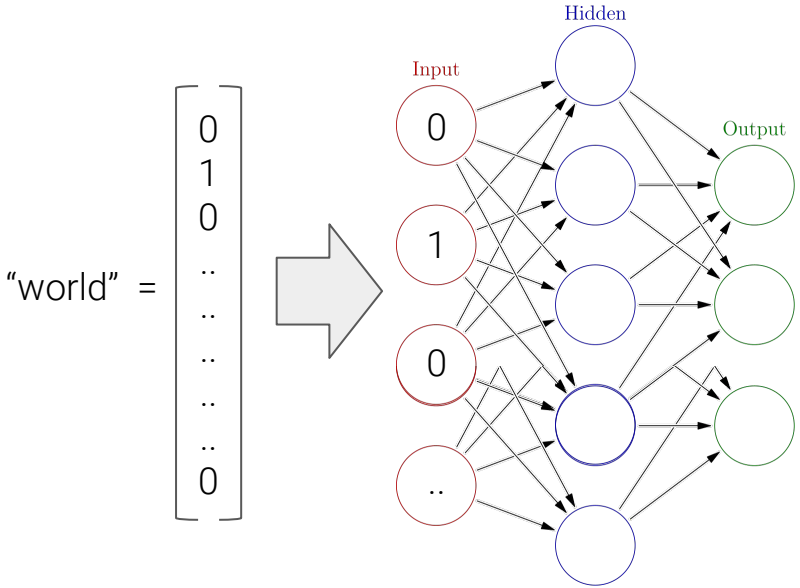
Preprocess text

Words → Vector

How do we insert a word in a neural network



Question:

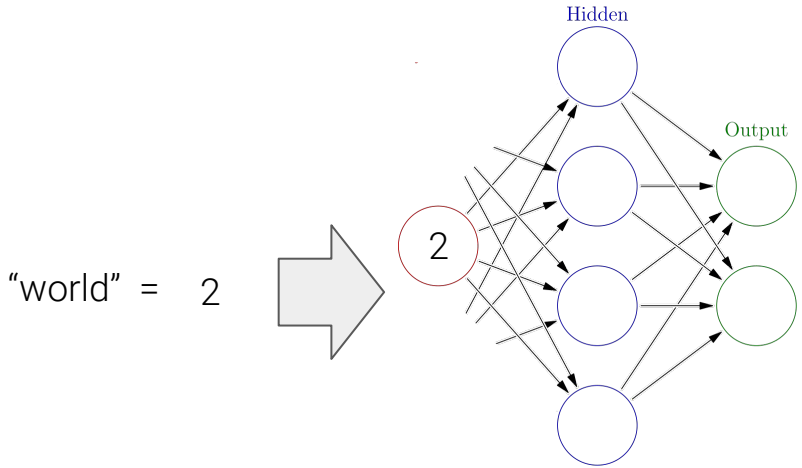
Should we do it like this?

- Would this work?
- What might be some problems?

Preprocess text

Words → Vector

How do we insert a word in a neural network



“world” = 2

Question:

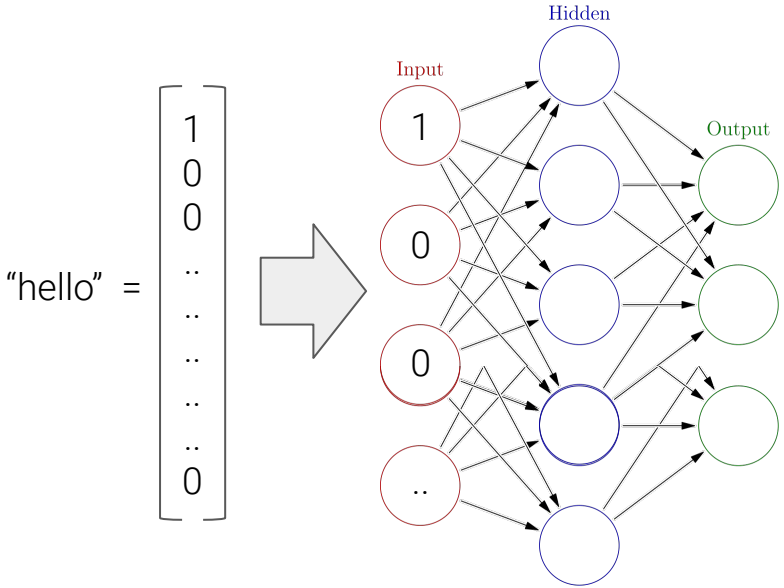
How about this?

- Would this work?
- What might be some problems?

Preprocess text

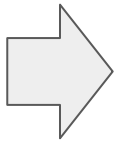
Words → Vector

How do we insert a word in a neural network

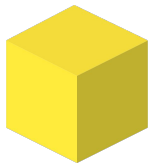


Question:
There are soooo many words… this vector will be enormous! Do we really do it like this?

Preprocess text

Words  Vector

Yes we do it like this! But with a small twist.



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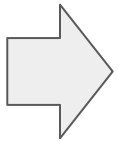
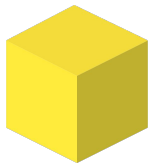
Preprocess text

Words  Vector

Yes we do it like this! But with a small twist.
The steps:

- Determine which words to include
  - Top 5000



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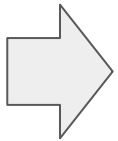
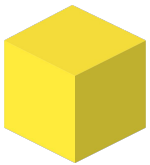
Preprocess text

Words  Vector

Yes we do it like this! But with a small twist.
The steps:

- Determine which words to include
  - Top 5000
- Give every word a value
  - Create a dictionary
  - Example
    - Hello: 1, world: 2, Erasmus: 3, was: 4, here: 5, … , cheesecake: 5000



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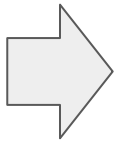
Preprocess text

Words  Vector

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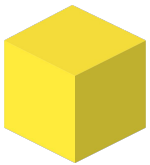
- Give every word a value
  - Create a dictionary
  - Example
    - Hello: 1, world: 2, Erasmus: 3, was: 4, here: 5, … , cheesecake: 5000
- Map these values to a smaller vector
  - Embedding



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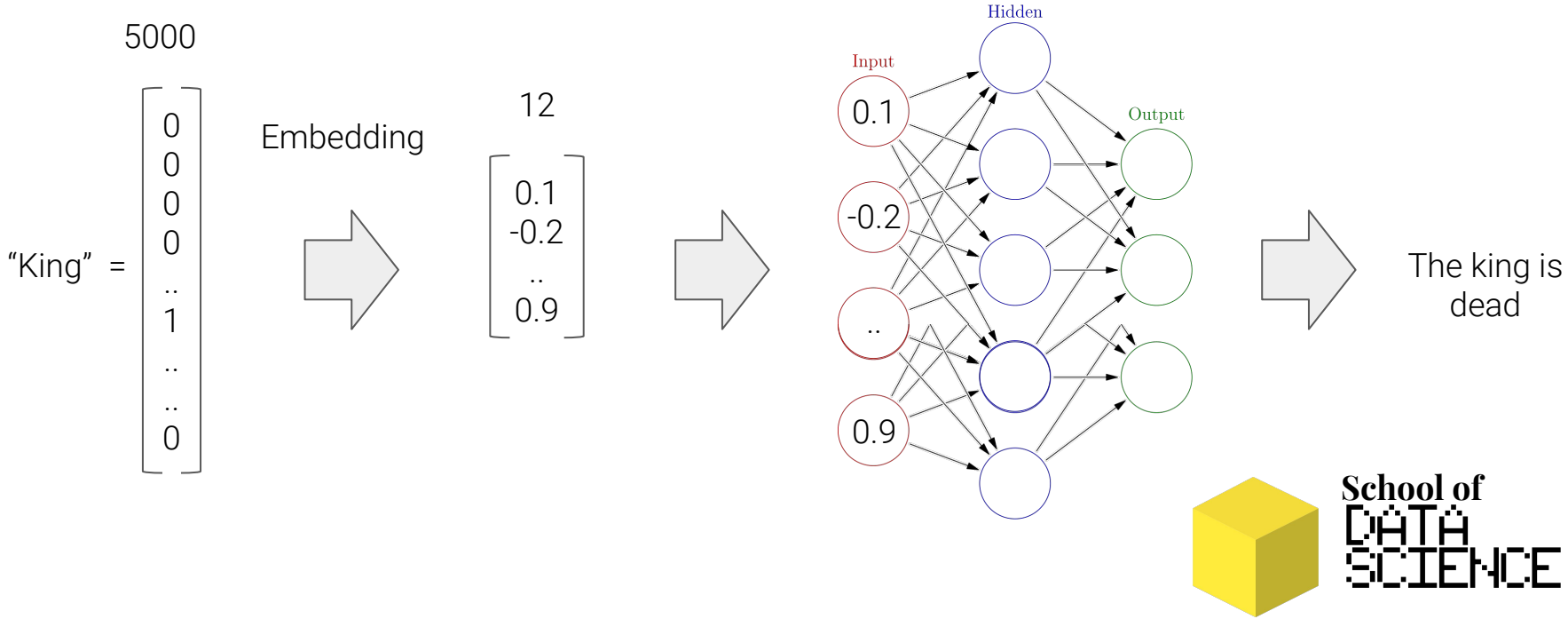
Preprocess text

Embedding layers are trained with your neural network



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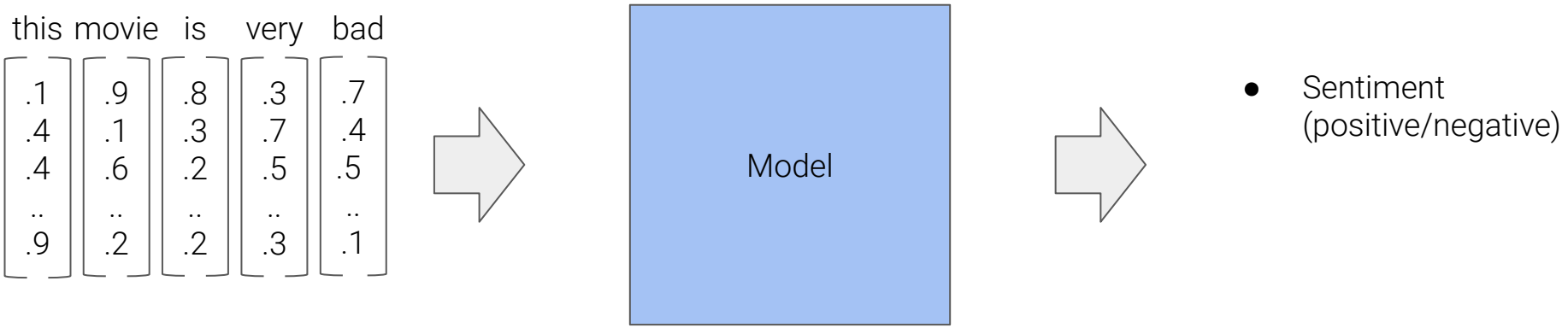
Natural Language models

Sentence



- Sentiment (positive/negative)

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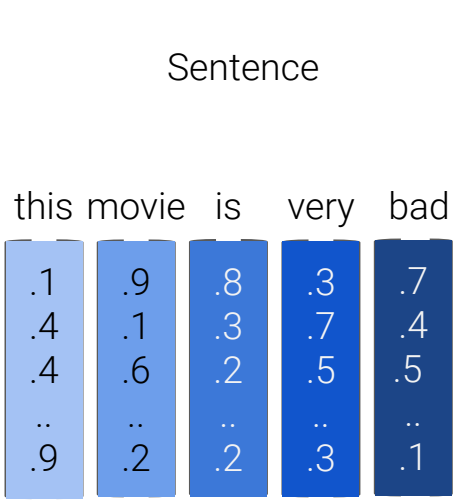
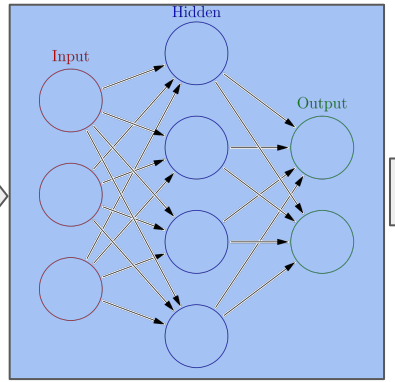
Natural Language models

Sentence



?



- Sentiment (positive/negative)

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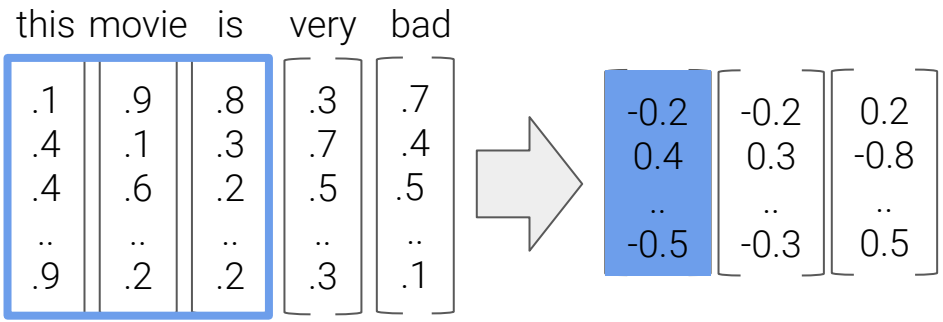
Natural Language models



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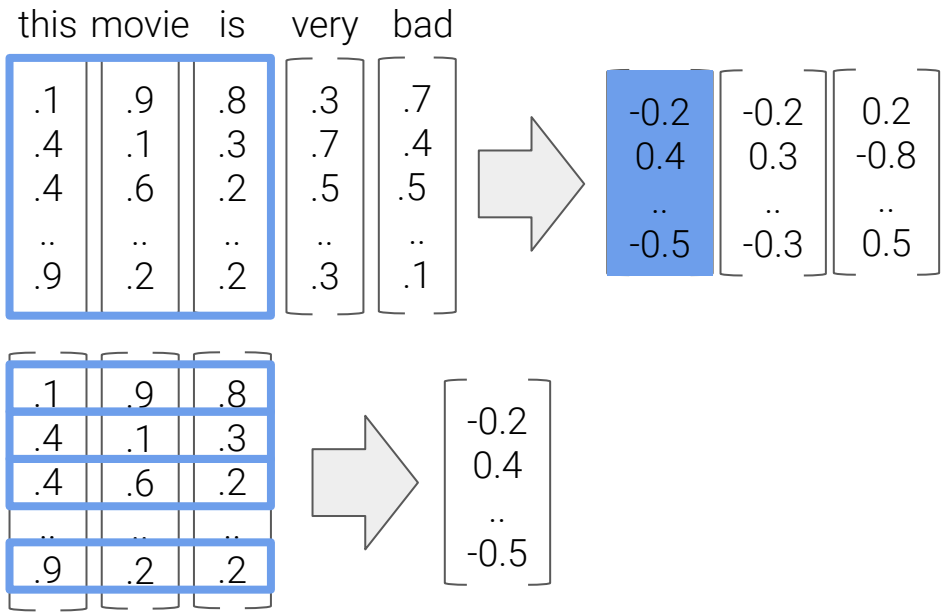
Natural Language models



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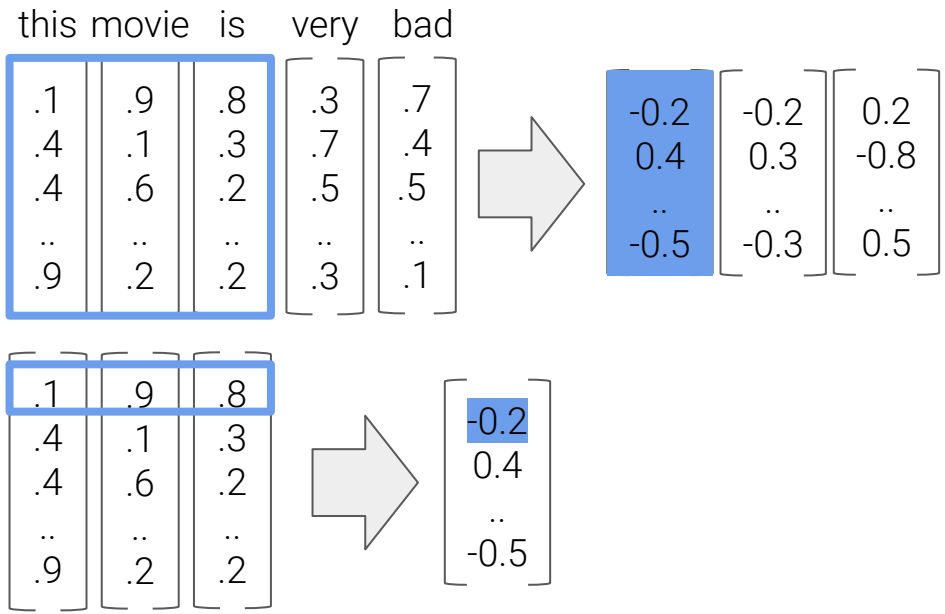
Natural Language models



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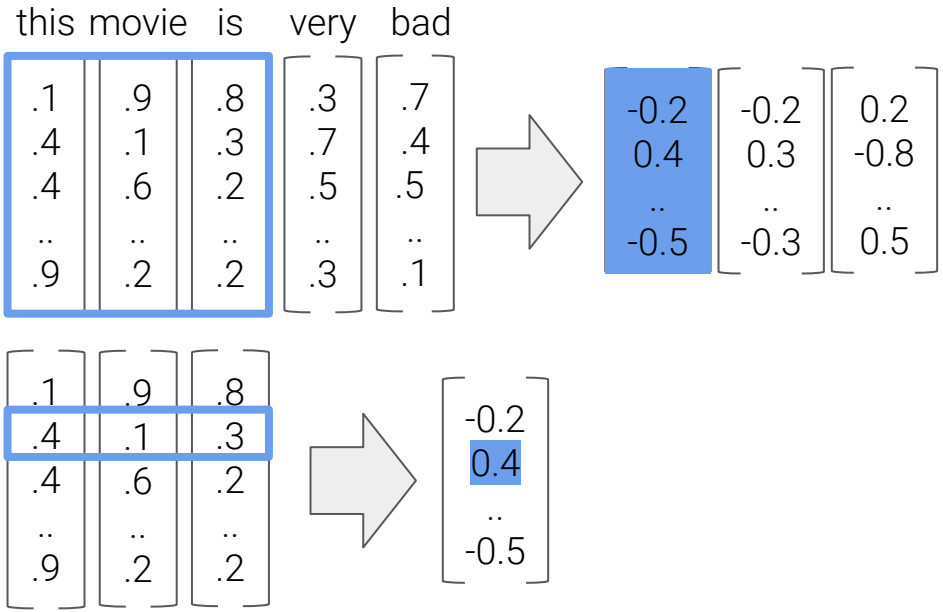
Natural Language models



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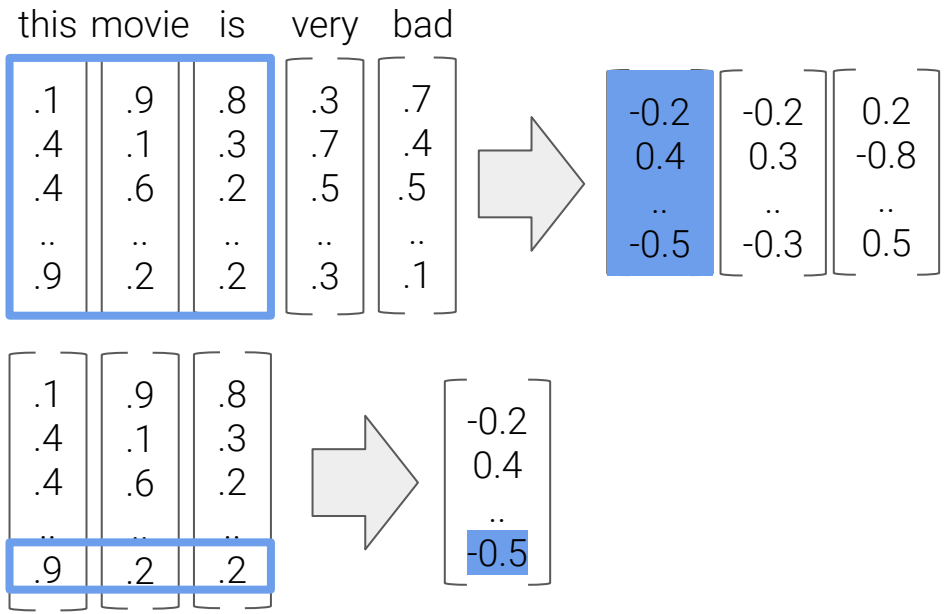
Natural Language models



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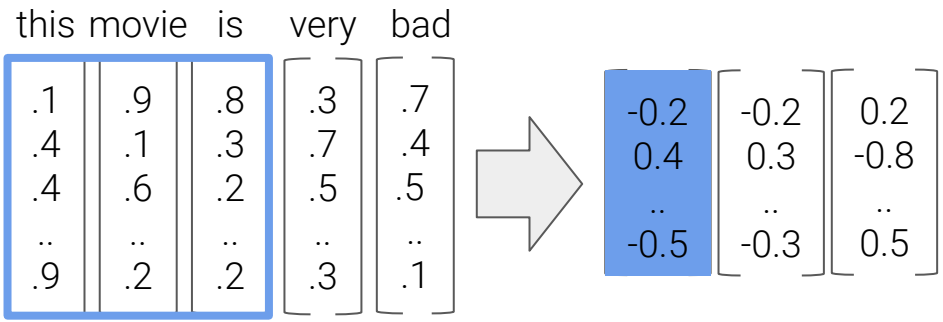
Natural Language models



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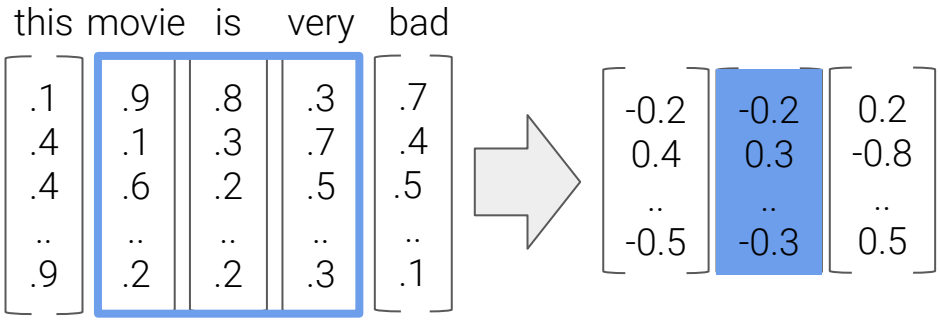
Natural Language models



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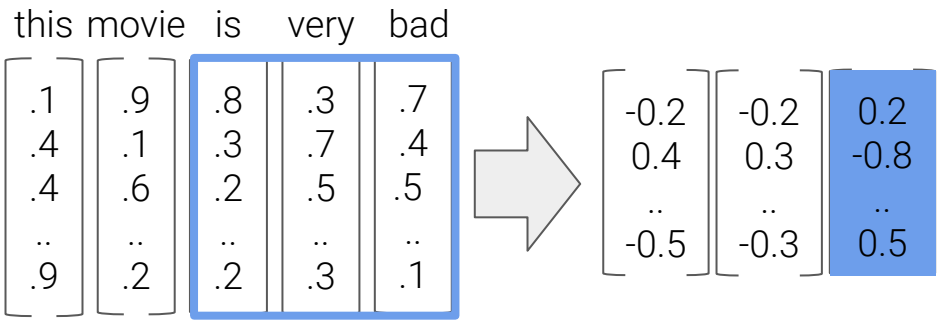
Natural Language models



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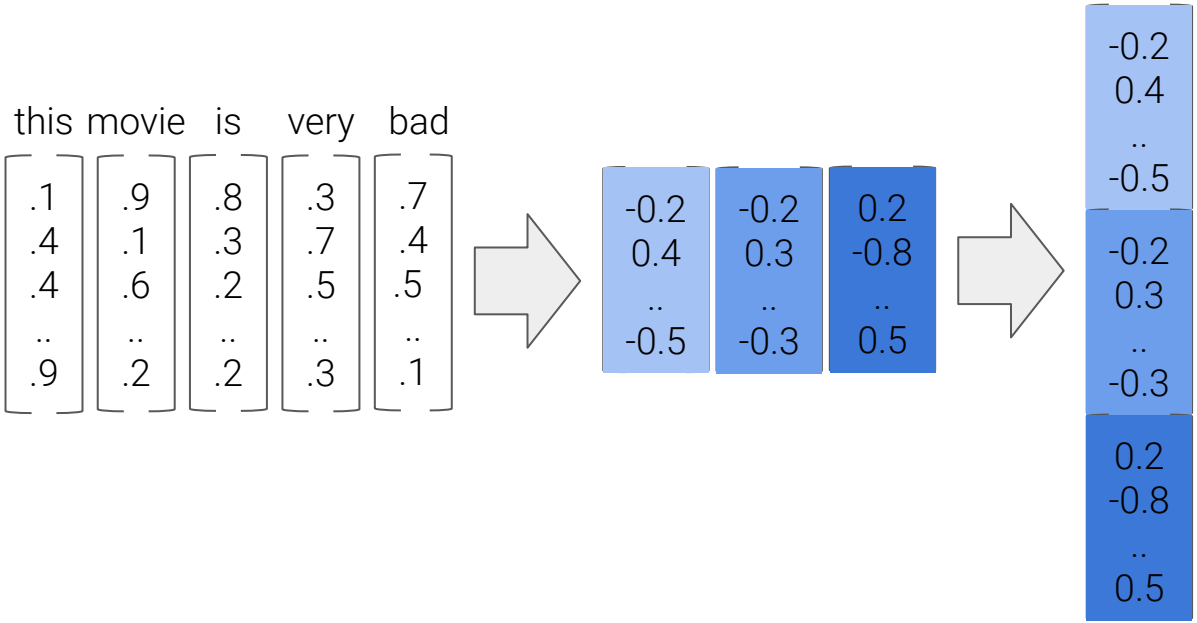
Natural Language models



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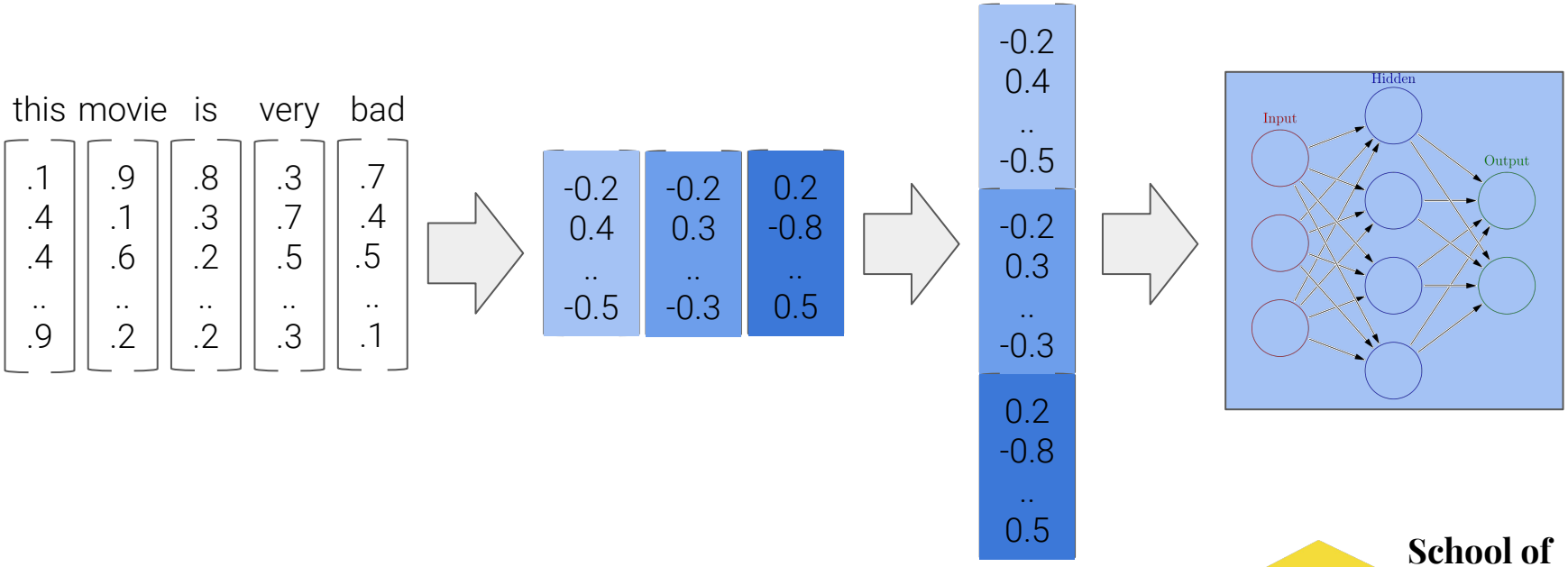
Natural Language models



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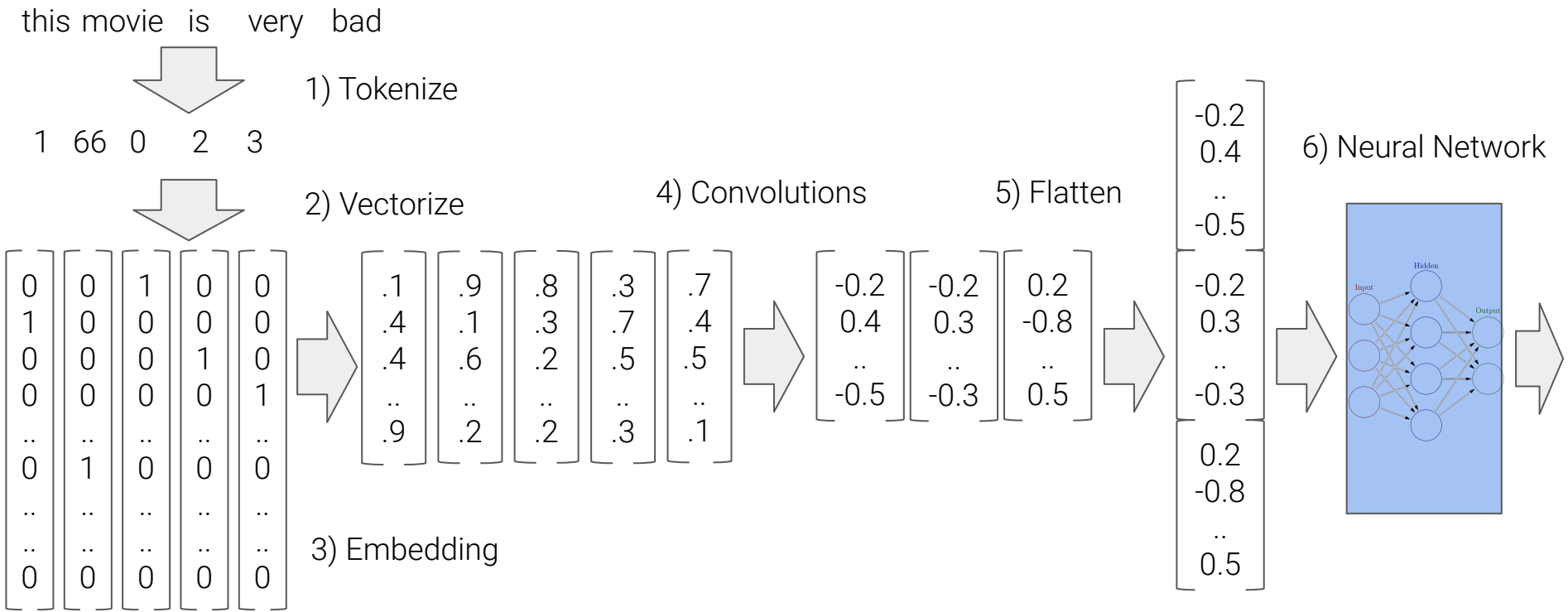
Natural Language models



Code in action

Main Deep Learning training language:

Main Deep Learning frameworks:

Code in action

Tensorflow has a **JavaScript** and a **Python** version!

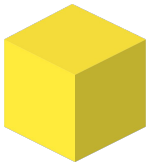
NOTE:

It's highly recommended to use **Python** for training the model instead of using **Javascript**!!

You can **convert** models made in **Python** to models for **JavaScript.**

https://www.tensorflow.org/js/guide/conversion

But let's use **NodeJS** for fun =)



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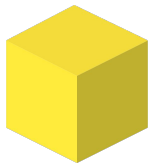
Code in action

0) Download data (download_data.txt)

https://ai.stanford.edu/~amaas/data/sentiment/



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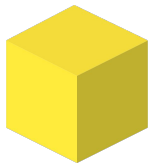
Code in action

1) Words -> Tokens (create_dictionary.js)

    Count all the words

    Give every words you want to keep a number

    Outputs: dictionary, inverse_dictionary



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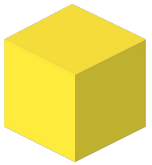
Code in action

2) Sentences -> Tokenize data (tokenize_text.js)

    X: “I love pie” -> [5, 231, 4231]

    y: positive -> 1

    Outputs: X_tokens, y_labels



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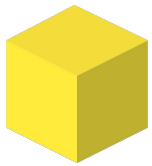
Code in action

3) Create and train the model (train_model.js)

   Outputs: Model



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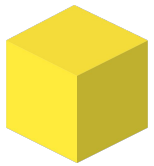
Code in action

4) Use it in the backend (use_model.js)



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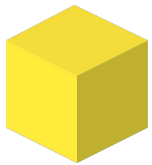
Code in action

5) Use it in your frontend (server.js)



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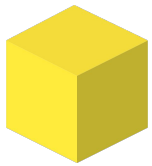
Code in action

6) Now it's your turn!

Steps:

1) Choose your model (Use my code or: https://www.tensorflow.org/js/models)
2) Run it
3) Adjust it
4) Show it (LinkedIn with #schoolofdatascience)



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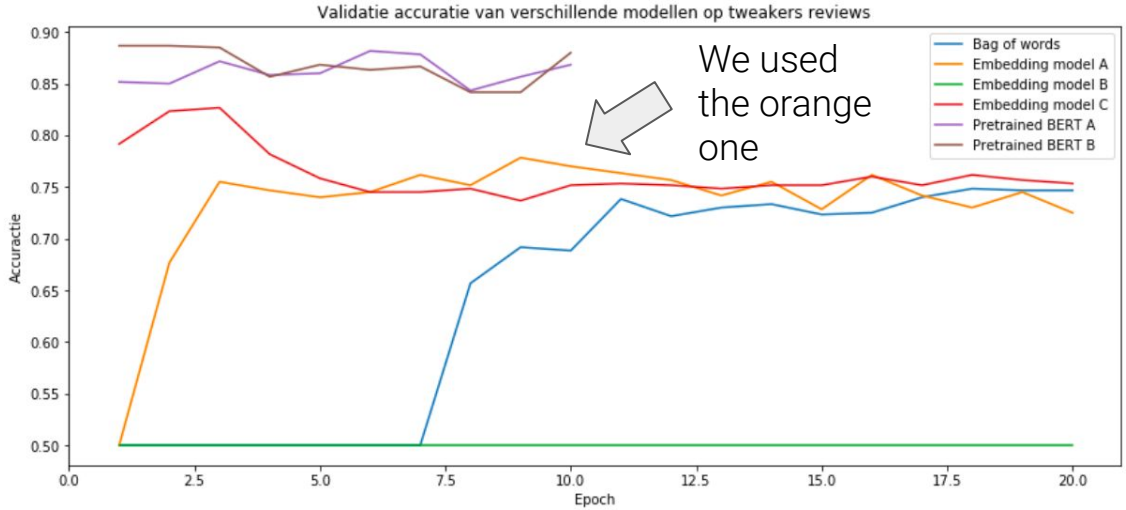
How to improve?

This model is oke but not great.

There are better models



Source: https://schoolofdatascience.nl/wat-artificiele-intelligentie-kan-met-tekst/

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How to improve?

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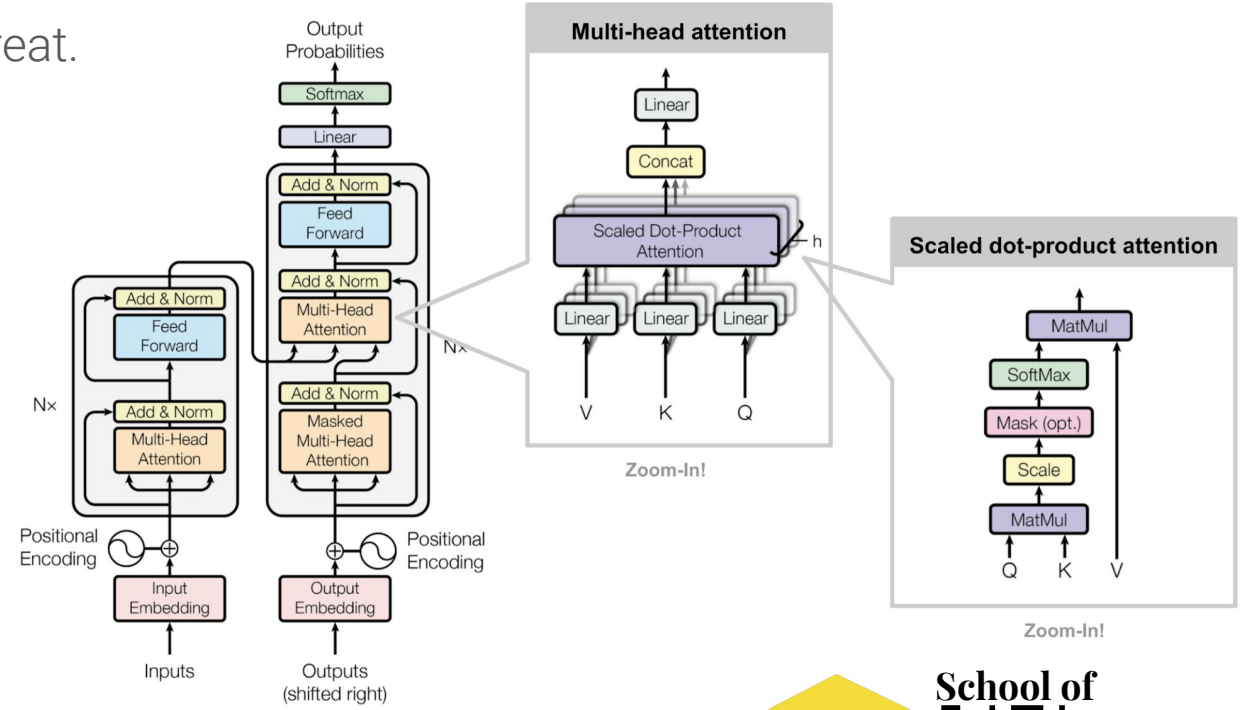
The transformer model:



Source: http://papers.nips.cc/paper/7181-attention-is-all-you-need.pdf

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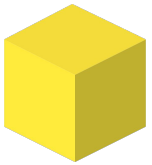
How to improve?

More models:
https://www.tensorflow.org/js/models

More examples:

https://www.tensorflow.org/js/demos



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FIN

What do we do?

- *Courses in the field of data science*
- *Consultancy*
- *Meetups*

For who?

- *People who want to learn how to apply:*
  - *Machine Learning*
  - *Data analysis*
  - *Python/R*
- *For experts and beginners*

Courses in:

- *Machine learning*
- *Deep Learning*
- *Data Analysis*
- *Python*

Where:

- *Den Haag*
- *Rotterdam*
- *Amsterdam*

Reviews?

- *9.5/10 rating on Springest =)*