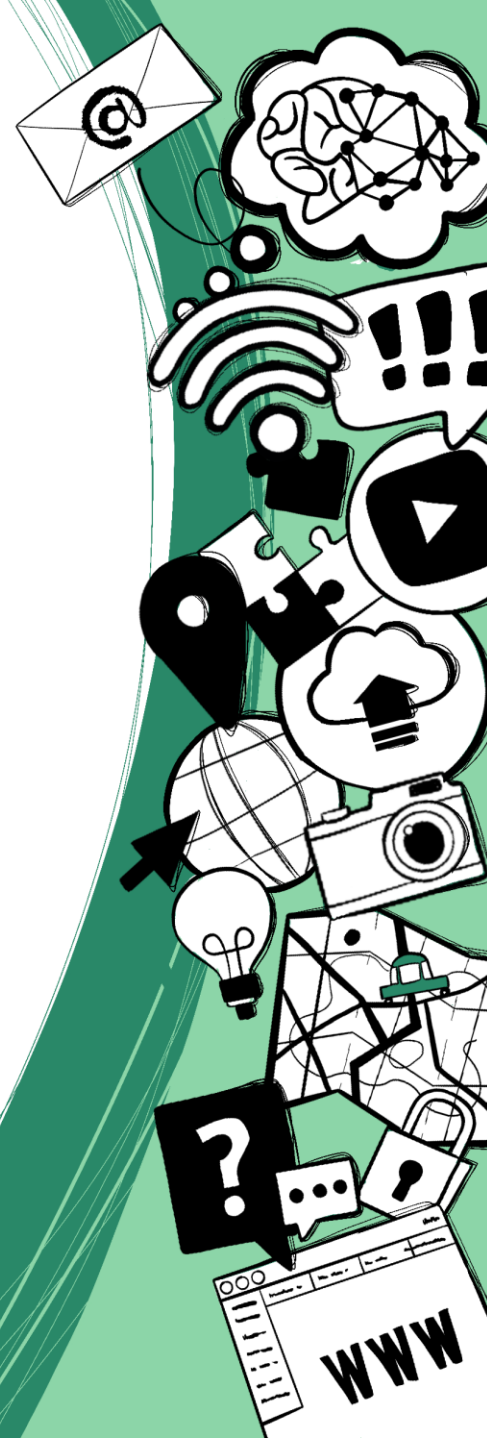
ENARIS

Supervised Learning Introduction



mobilis
interaktív kiállítási központ

TU Graz

OESTERREICHISCHE COMPUTER GESELLSCHAFT ®
AUSTRIAN COMPUTER SOCIETY

Interreg
Austria-Hungary 2014-2020
European Union – European Regional Development Fund

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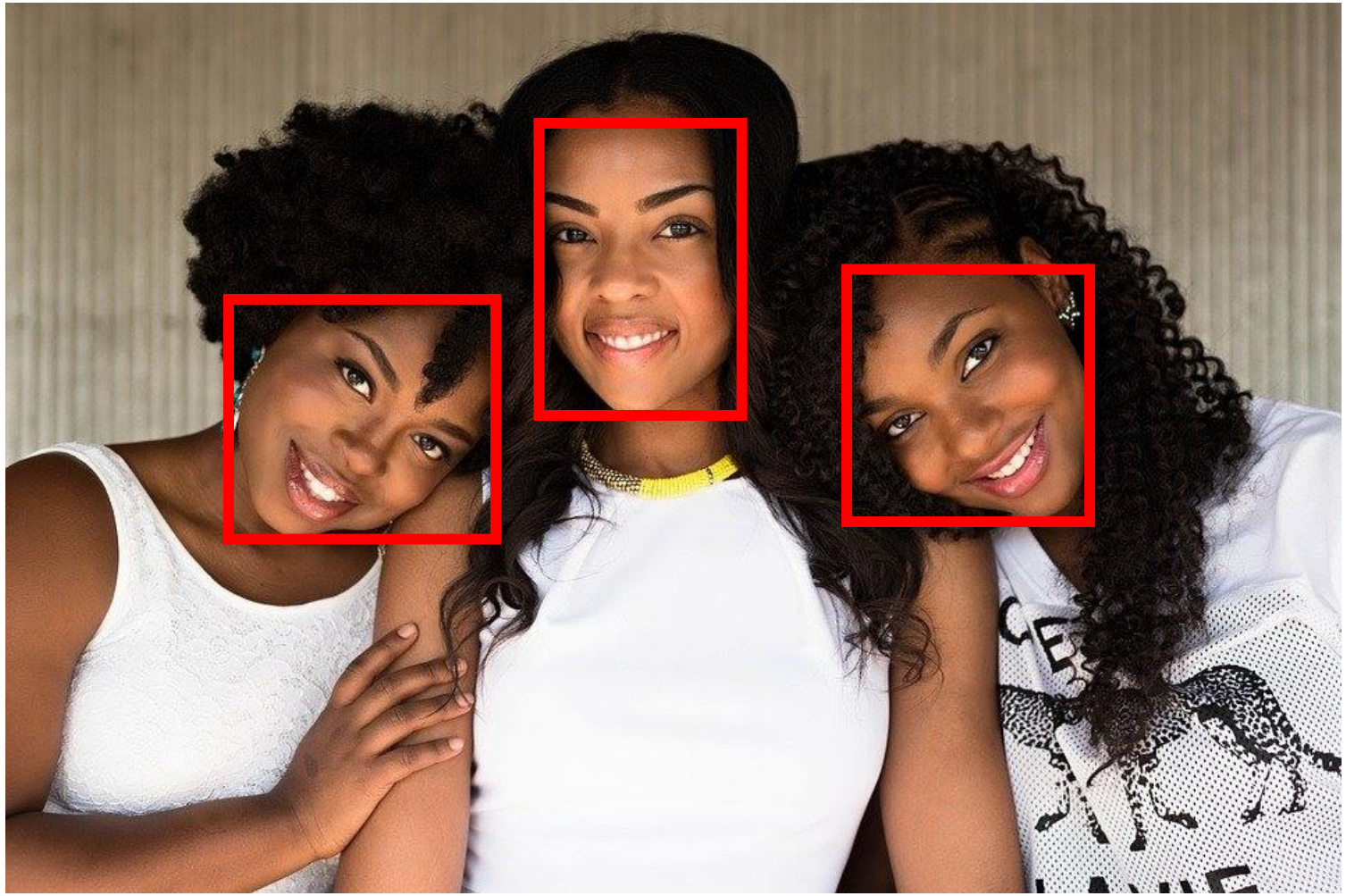
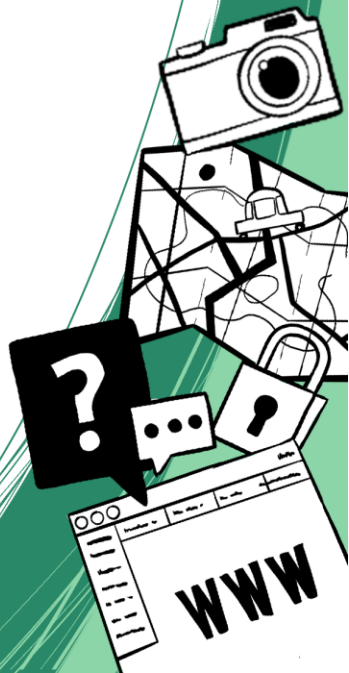
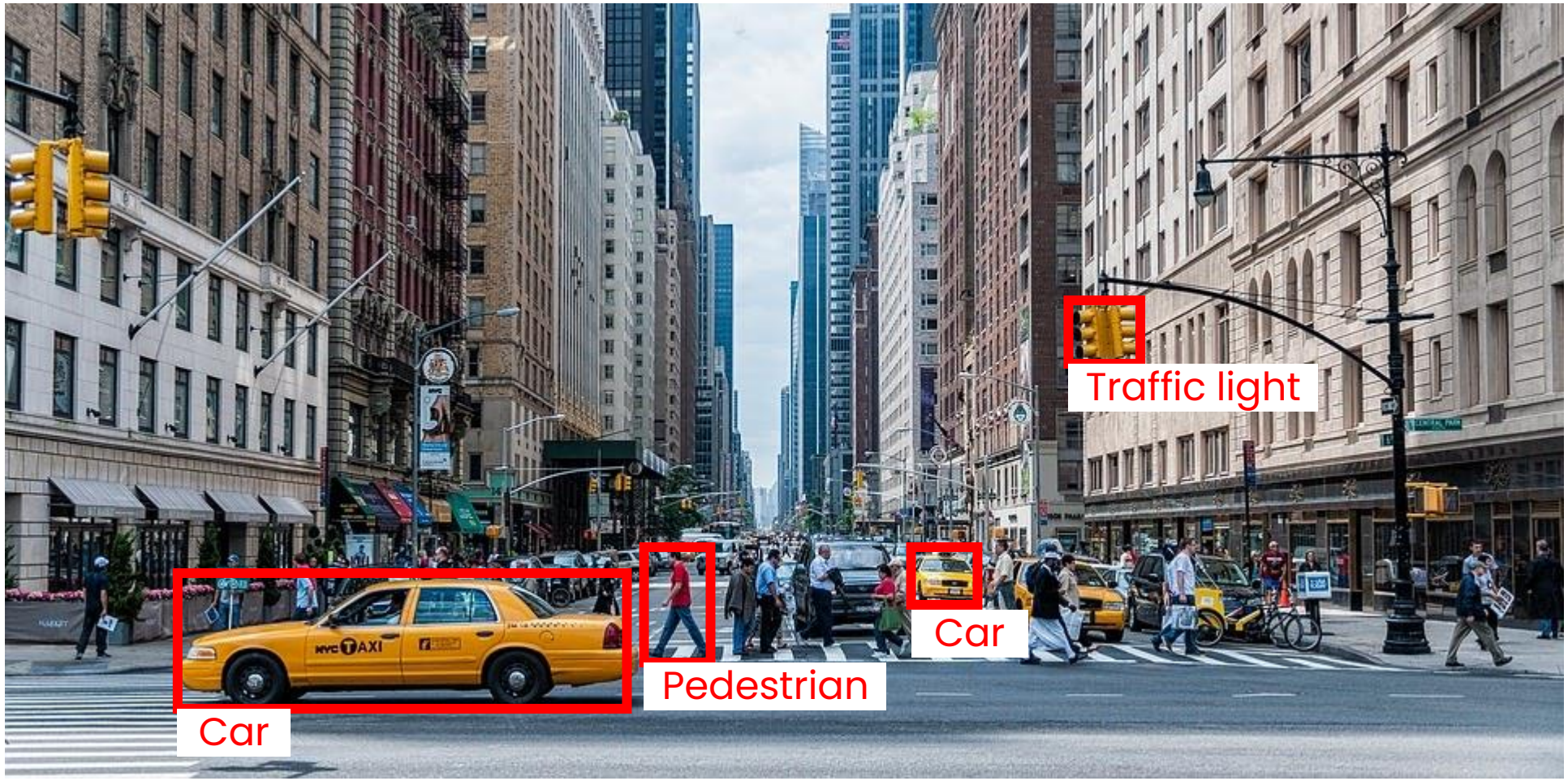
Supervised Learning Examples

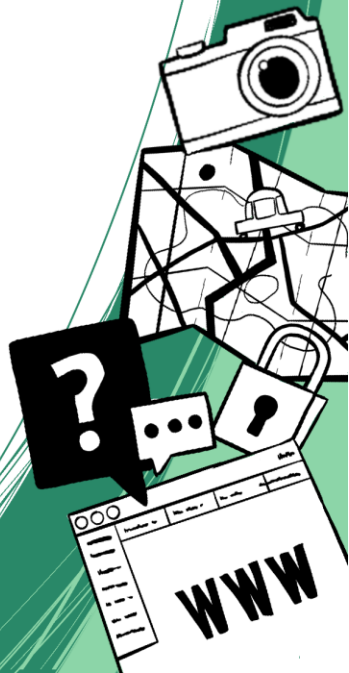
Detecting faces in images



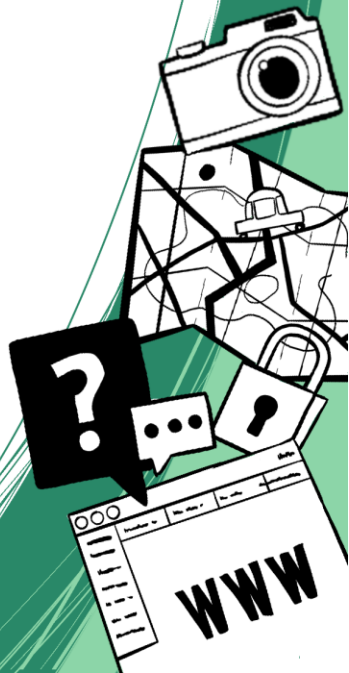


Classifying objects



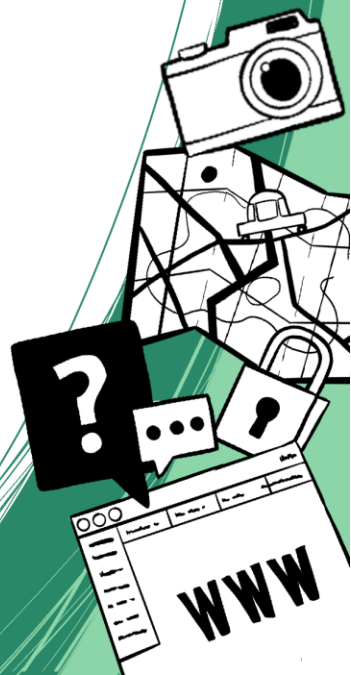


Detecting defects in objects

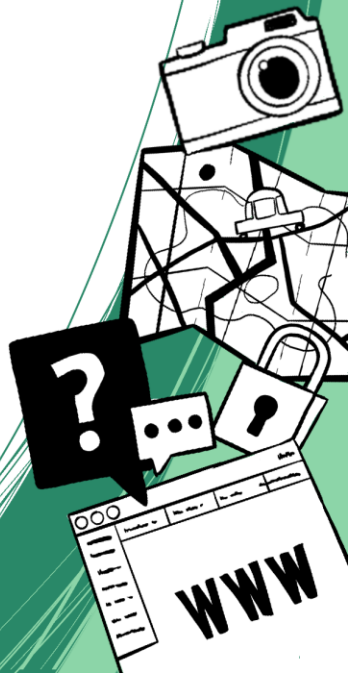


Recognising spoken words

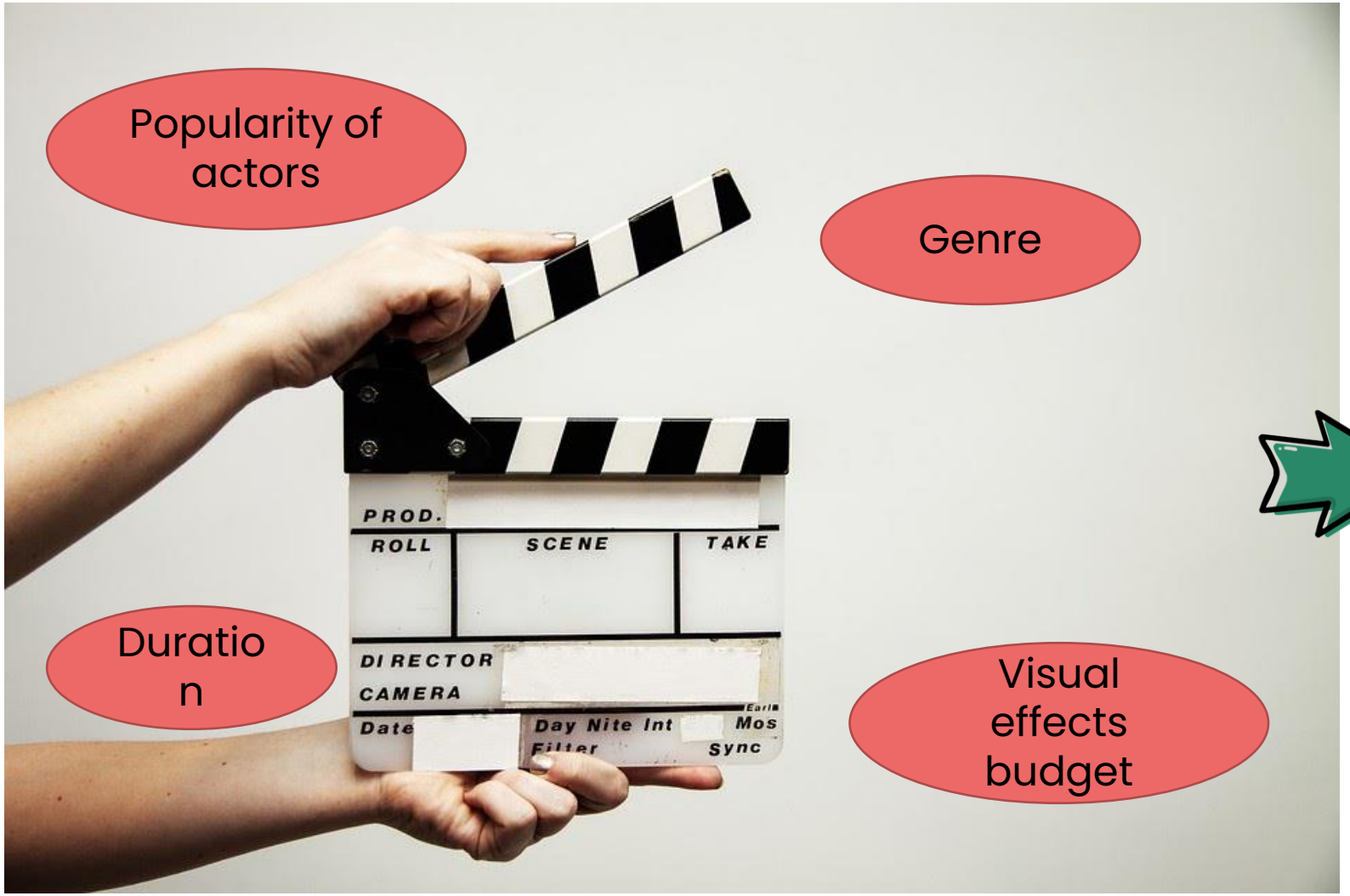
Transcript of spoken words



Detecting if an email is spam

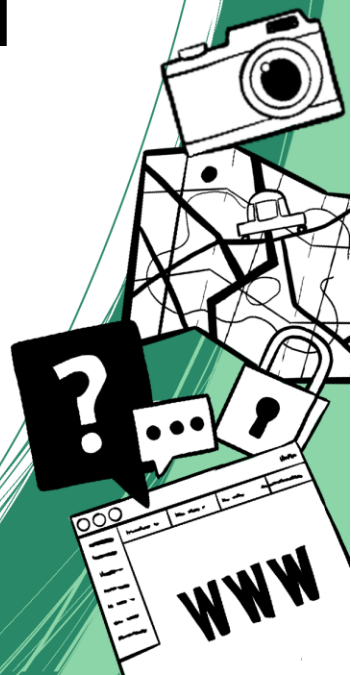


Predicting a movies revenue



Informations about a movie

Predicted revenue



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Supervised Learning as a Mapping Function

Mapping Function

Input → Supervised Learning Algorithm → Output

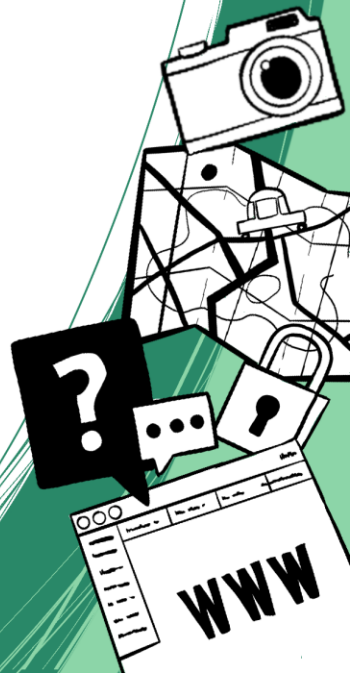
Mapping Function

Input Data

Supervised Learning Algorithm

Cat
Dog
Fish

Label / Class



Mapping Function

Congratulations!

You have won a price of **1.000.000€**

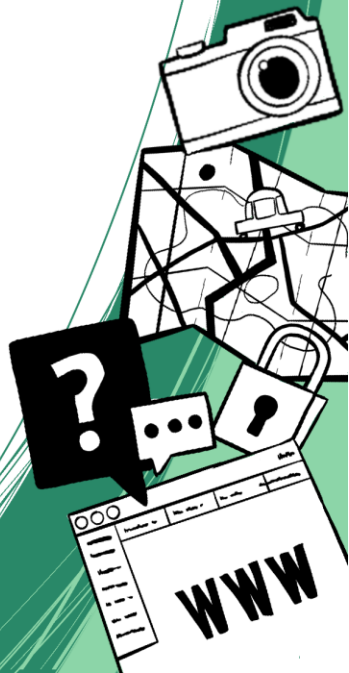
Click here to claim!!!

Supervised Learning Algorithm

Spam
Not Spam

Label / Class

Input Data



Mapping Function

Supervised Learning Algorithm

800.000€

Predicted Value

Input Data

https://thispersondoesnotexist.com

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Supervised Learning Definitions

Definitions

Supervised Learning Algorithm

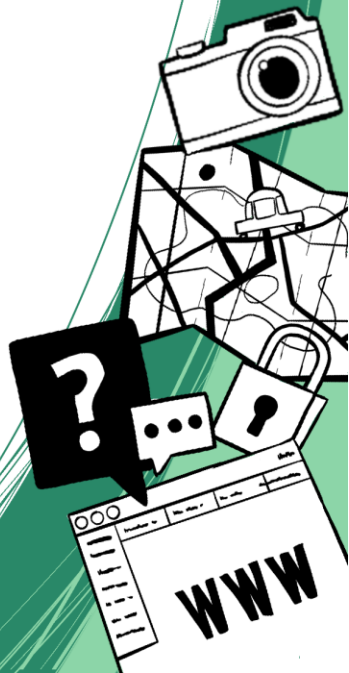
- Step by step description of a task
- Describes **how** the SL process works and what **additional information** it needs (**parameters**)
- Like a cooking recipe

Definitions

Parameters

- **Additional information** given by the programmer to adapt the **algorithm**
- Like the amount of sugar for making a cake which changes the sweetness of the result

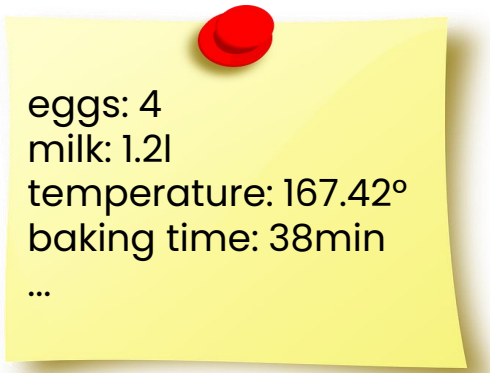
sugar: 500g
diameter: 30cm
lactose free: false

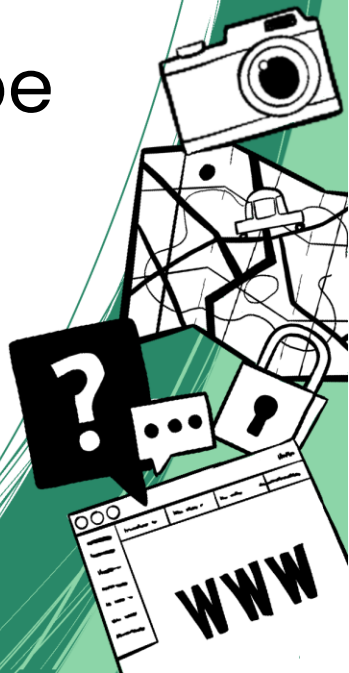


Definitions

Supervised Learning Model

- **Stores information** like parameters
- Is modified during an automated **training** process to optimize the result
- Like the amounts of different ingredients which can be changed to make a better recipe (but automatically updated insted of manually changed by the cook)

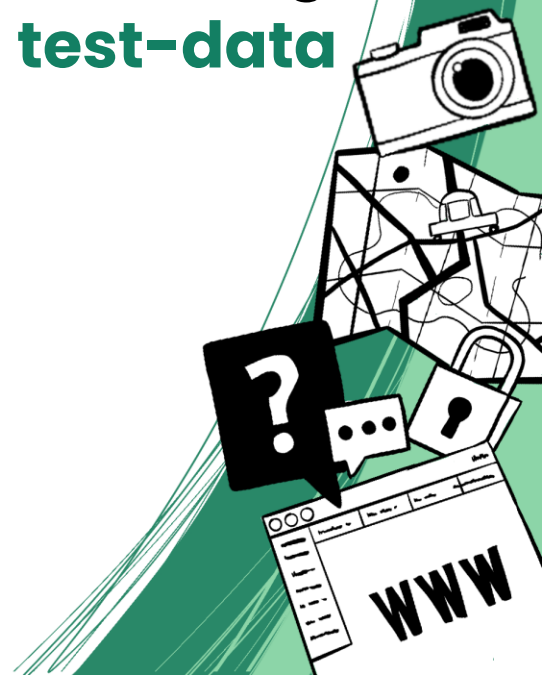




Definitions

Labelled Data

- **Set of data** containing input data as well as the correct output
  - Like a lot of **images** with corresponding **labels** like **cat** and **dog**
  - Generally split into two piles, the **trainings-data** and **test-data**



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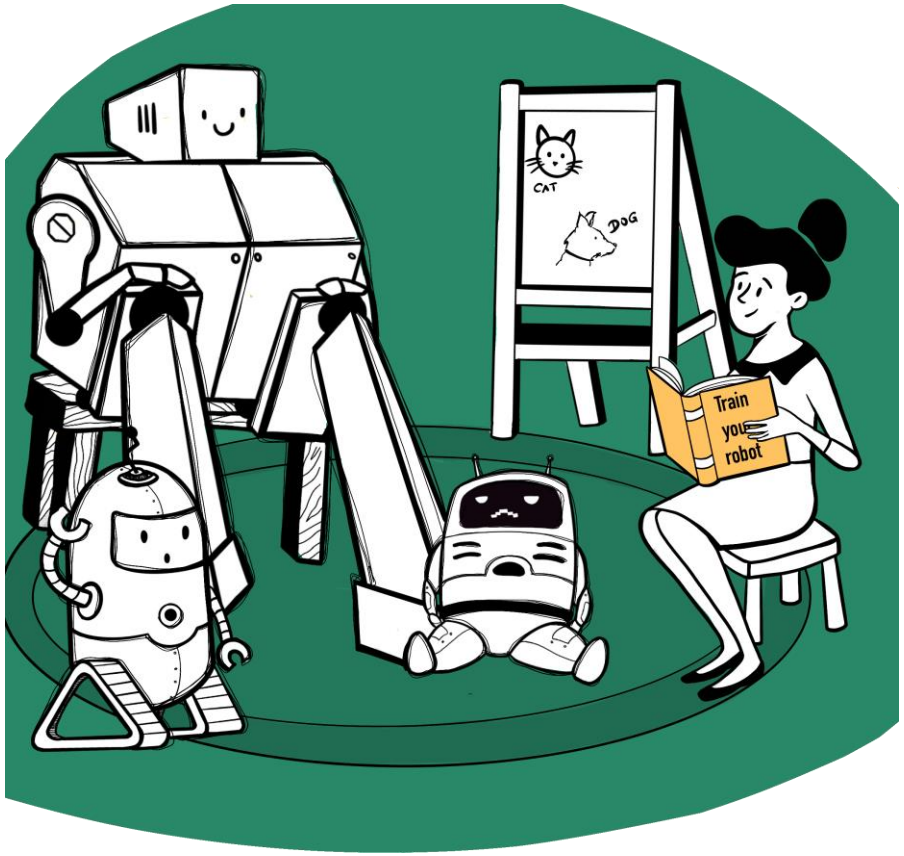
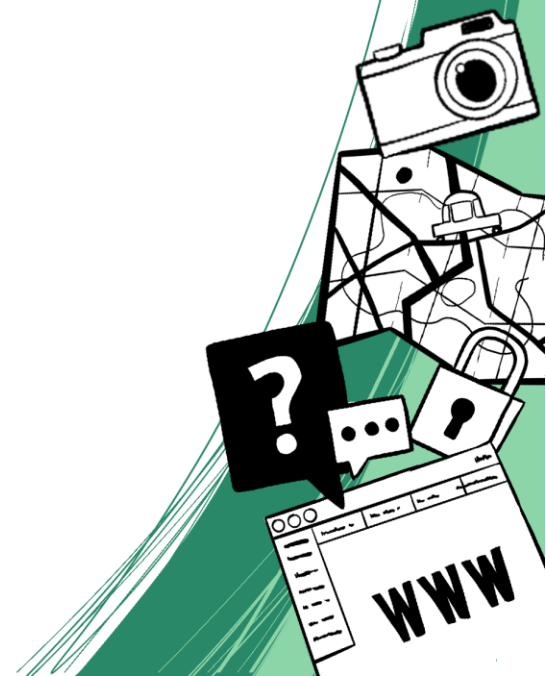
Supervised Learning Training

Training

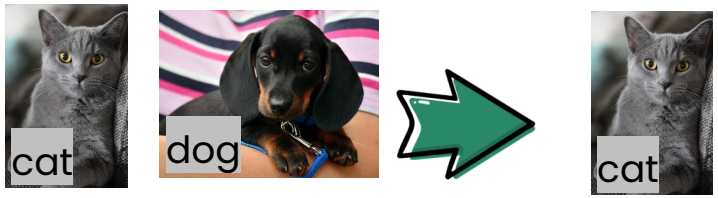
Training is the process of **teaching a model** what the correct answers (labels) are.





Training

1. Collect **labelled data** and split it into **trainings-data** and **test-data**

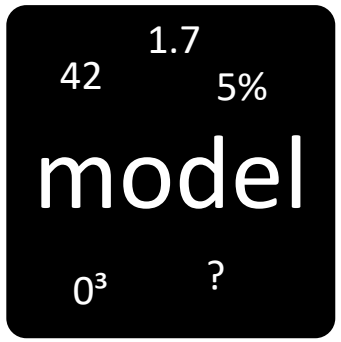


trainings-data

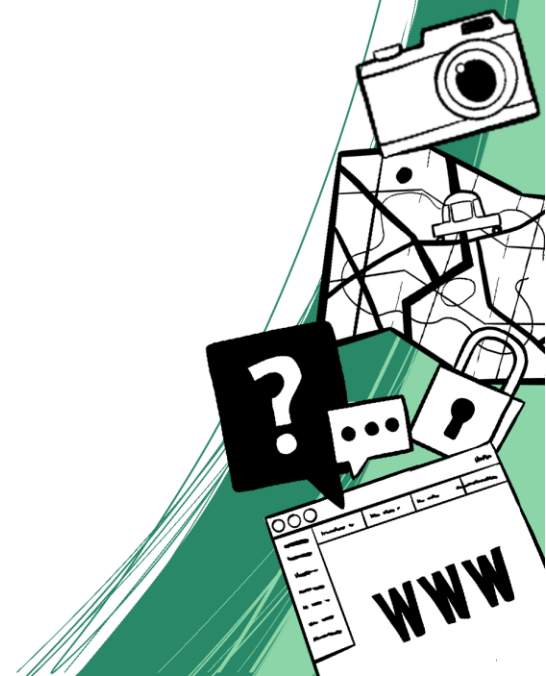
test-data

Training

1. Collect **labelled data** and split it into **trainings-data** and **test-data**
2. Choose **parameters** and initialize the **model** with random values

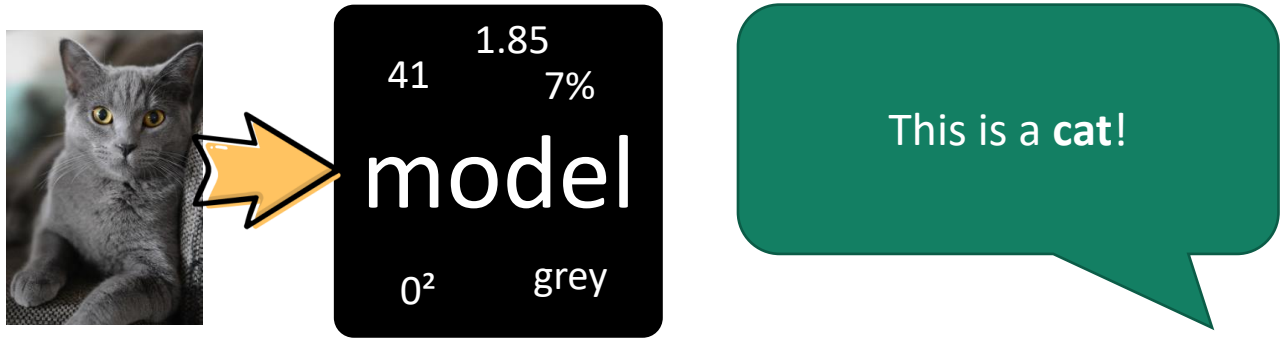


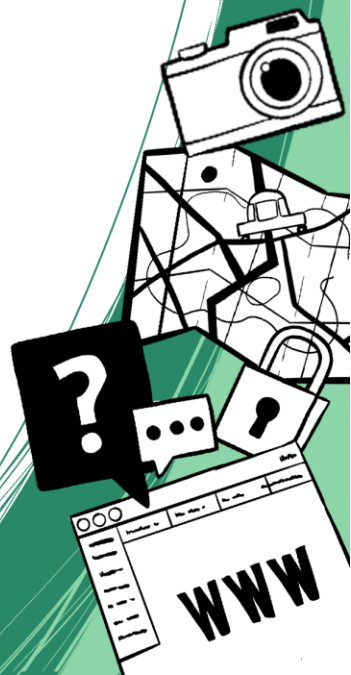
You will tell the difference between images of cats and dogs.



Training

1. Collect **labelled data** and split it into **trainings-data** and **test-data**
2. Choose **parameters** and initialize the **model** with random values
3. Repeat with the **training-data** (as often as defined by **parameters**):
   - For each input-data slightly change the **model** to better predict the given output





Training

1. Collect **labelled data** and split it into **trainings-data** and **test-data**
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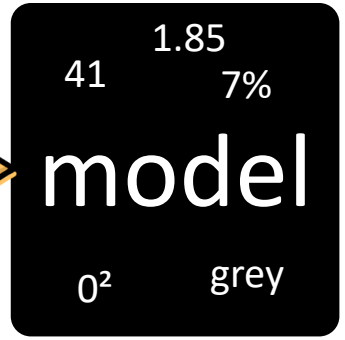
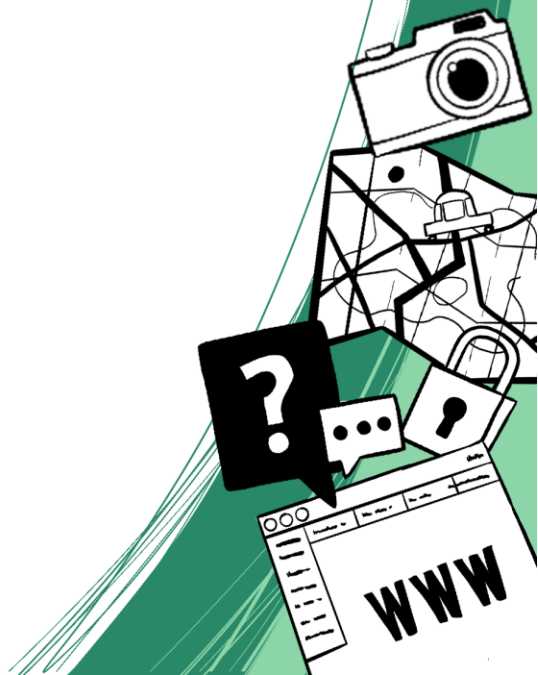
   - For each input-data slightly change the **model** to better predict the given output
4. Test the accuracy of your **model** using the **test-data**

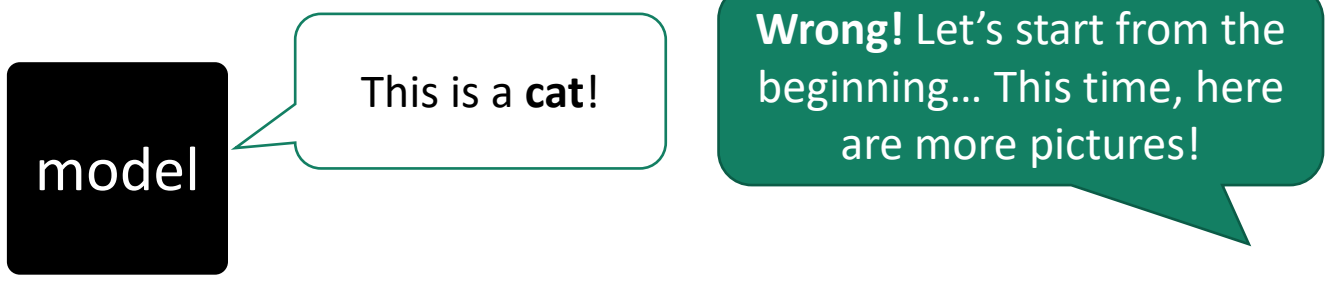


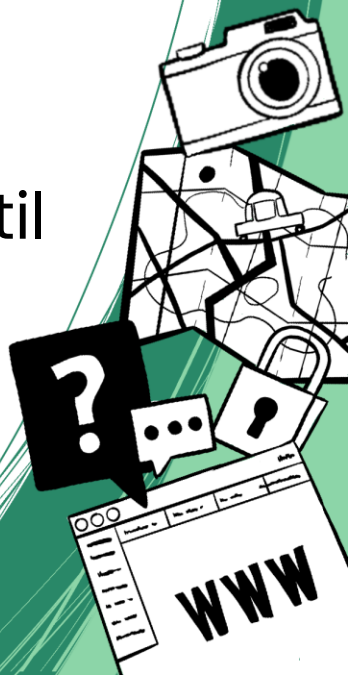
This is a **cat**!



Training

1. Collect **labelled data** and split it into **trainings-data** and **test-data**
2. Choose **parameters** and initialize the **model** with random values
3. Repeat with the **training-data** (as often as defined by **parameters**):
   - For each input-data slightly change the **model** to better predict the given output
4. Test the accuracy of your **model** using the **test-data**
5. Modify the **labelled data** or **parameters** and restart from 1. until you are satisfied with the result





Confused?

Try it yourself!