Applied Deep Learning

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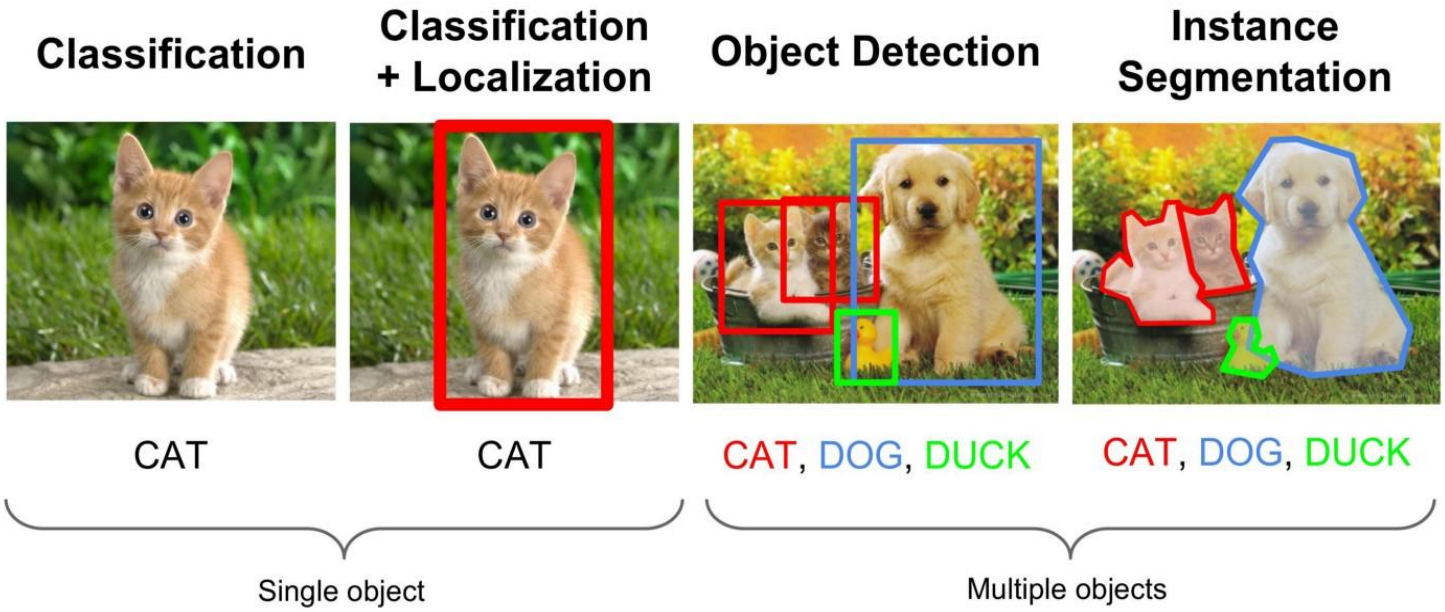
Overview of Session-2 :

- Introduction to Computer vision and Natural Language Processing
- Applications of CV and NLP
- Demos

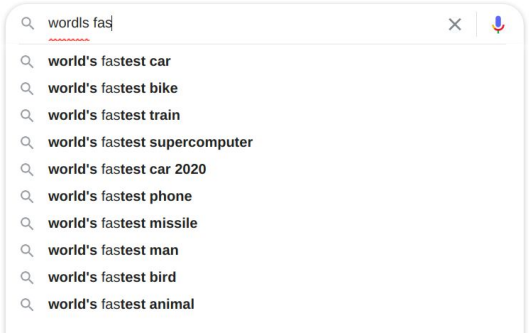
Computer Vision



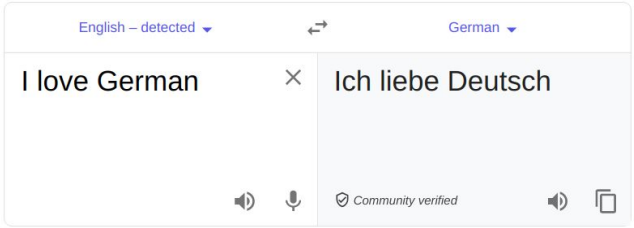
- Classification
- Detection
- Segmentation
- Generation
- And Lot more

Natural Language Processing

Search Autocorrect and Autocomplete



Language Translation

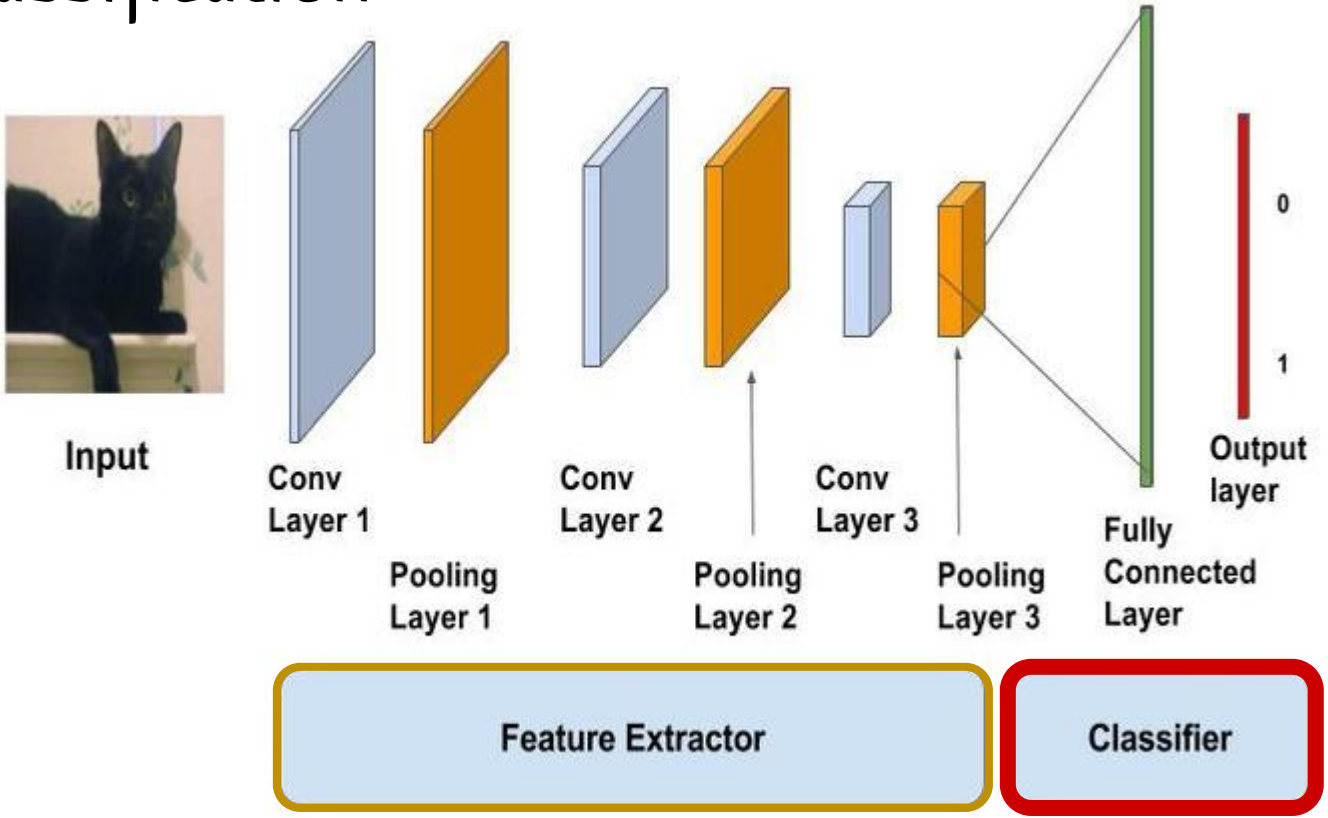


- Text Classification
- Chatbots
- Voice Assistants
- Social Media Analytics
- Advertisements
- Summarization
- And lot more

Image Classification

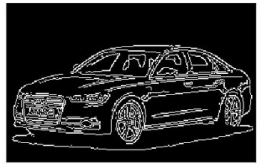
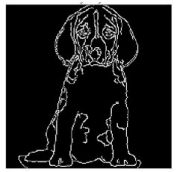
Image classification

Dataset
- Images
- Classes



Feature extraction

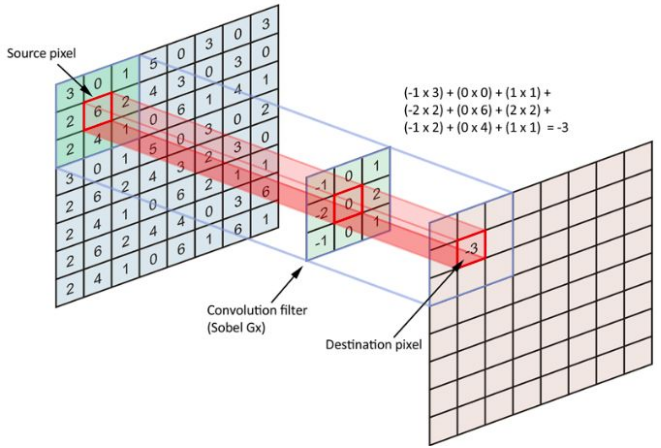


- HOG: Histogram of Oriented Gradients
- SIFT: Scale Invariant Feature Transform
- SURF: Speeded-Up Robust Feature
- **CNN: Convolution Neural Network**

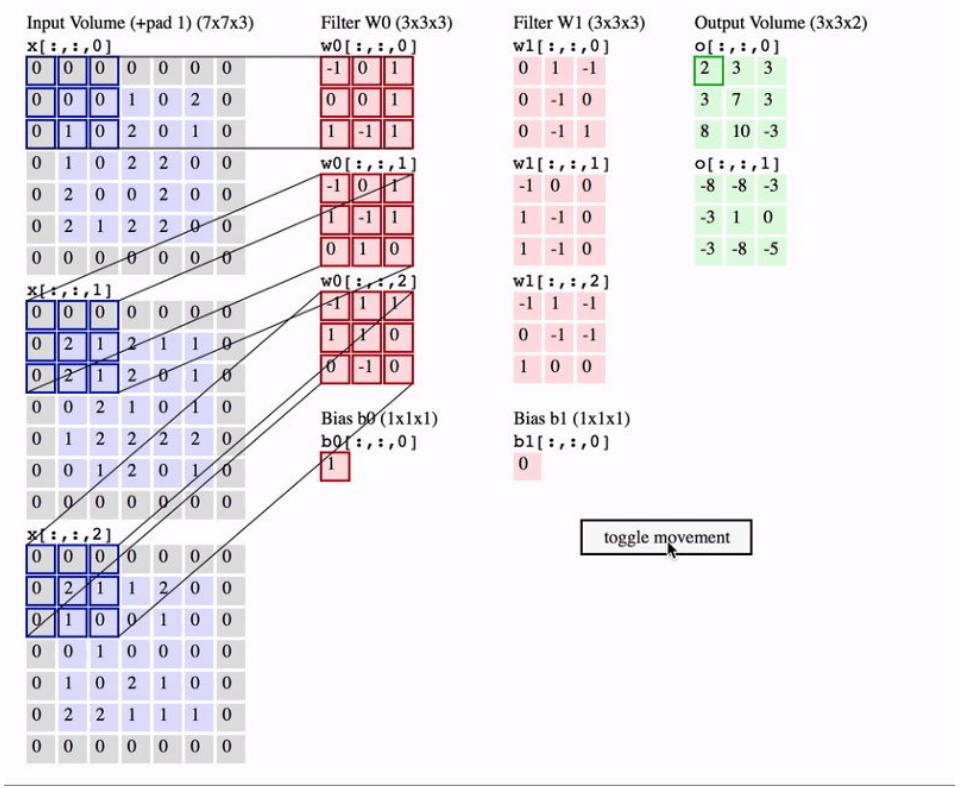
1x1	1x0	1x1	0	0
0x0	1x1	1x0	1	0
0x1	0x0	1x1	1	1
0	0	1	1	0
0	1	1	0	0

4		



https://setosa.io/ev/image-kernels/

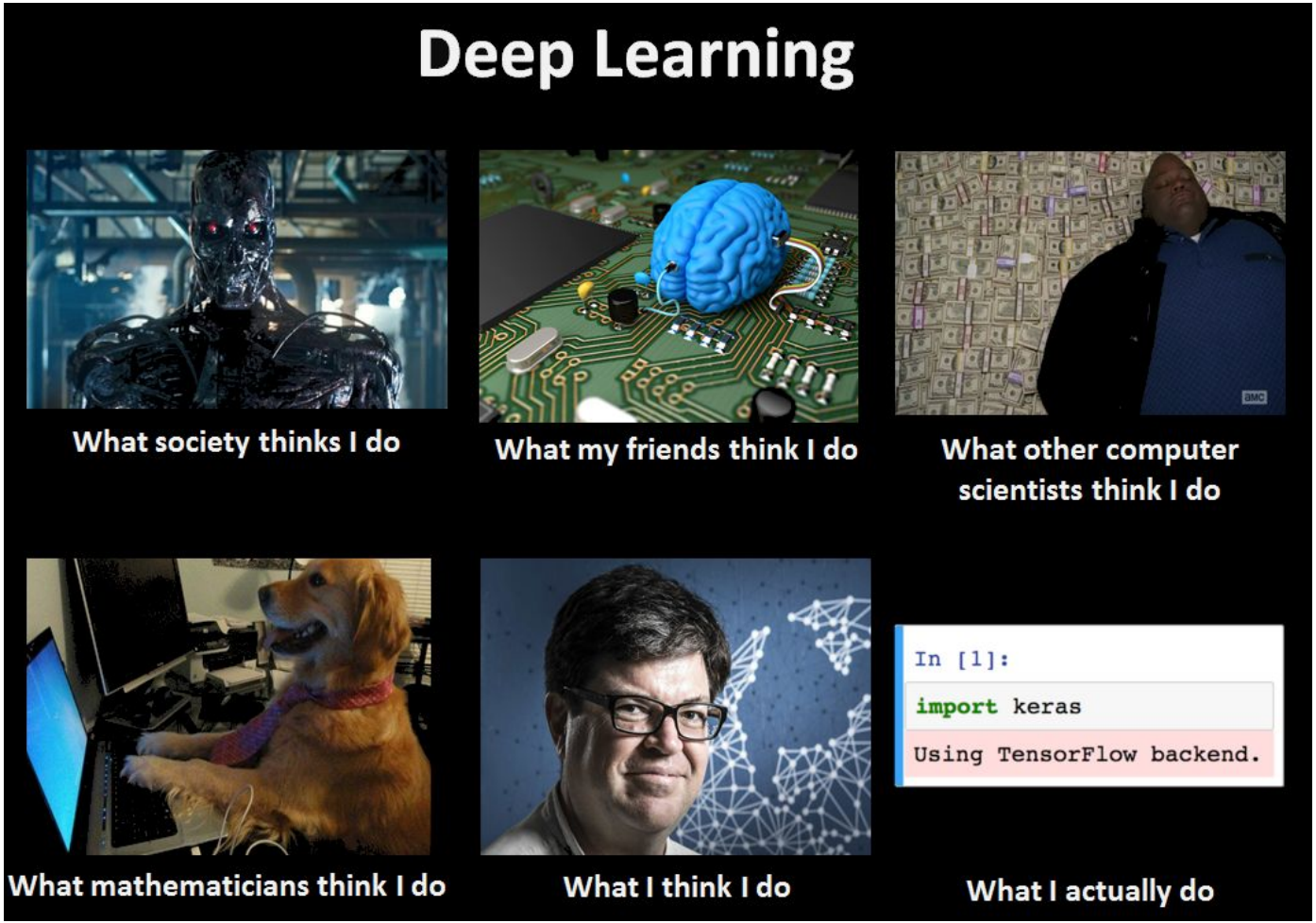
Convolution neural Network



https://poloclub.github.io/cnn-explainer/

Coding Session

Let's Deep Dive



Let's code...

https://www.youtube.com/watch?v=inN8seMm7UI

https://colab.research.google.com/

Google Colaboratory

https://colab.research.google.com/drive/13rPobfII6GsLyxIbTnO9EP0FexdAqoab?usp=sharing

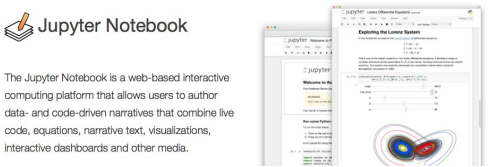


Image Classification : Walkthrough

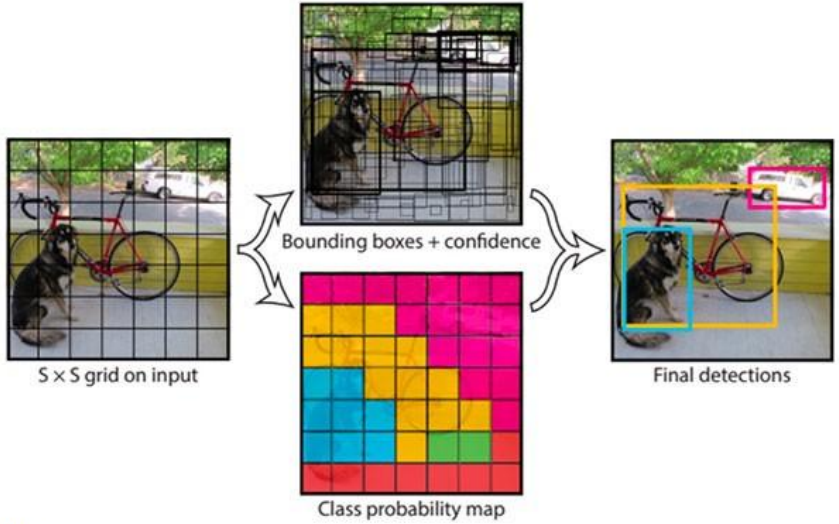
https://drive.google.com/file/d/1BCNFyTAVp8fTcN9mrmQRbFY-3afjRYkk/view?usp=sharing

Object Detection

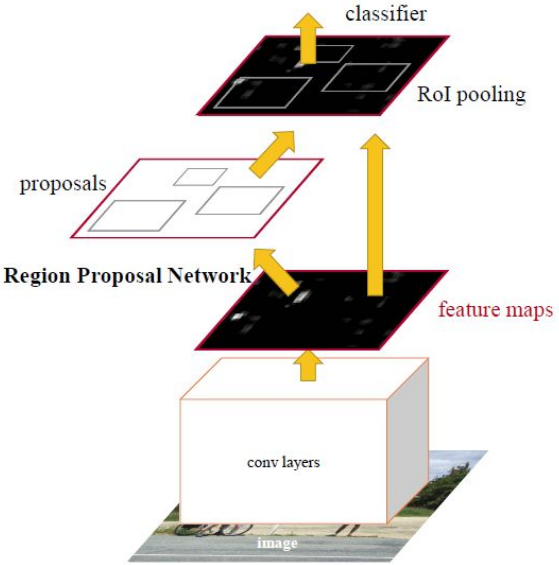
Object detection

Dataset

- Images
- Bounding Boxes(x,y,w,h)
- Classes



Region Proposal Network, providing a number of regions which are then passed to common DL based classification architectures.

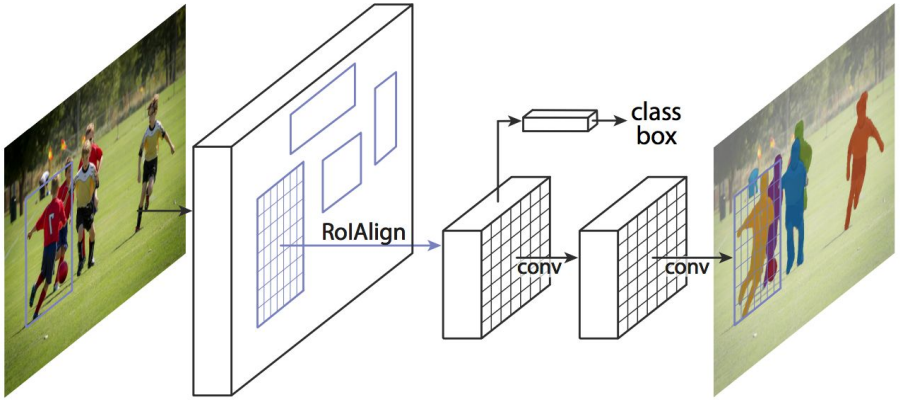


With the need of real time object detection, many one-step object detection architectures have been proposed, like YOLO, YOLOv2, YOLOv3, SSD, RetinaNet etc. which try to combine the detection and classification step.

Segmentation

Dataset

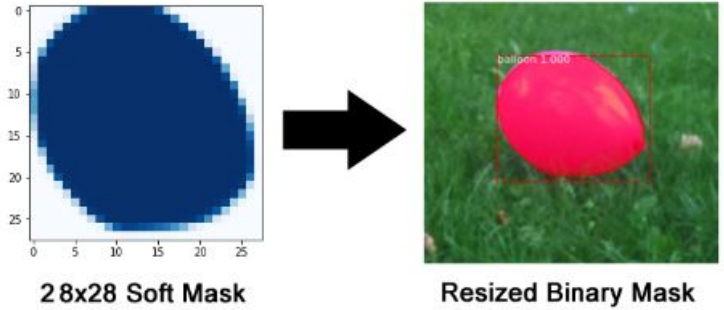
- Images
- Coordinates[list of (x,y)]
- Classes



Segmentation Masks

The mask branch is CNN that takes the positive regions selected by the ROI classifier and generates masks for them.

The generated masks are low resolution: 28x28 pixels. But they are soft masks, represented by float numbers, so they hold more details than binary masks.



Face recognition

[redacted]

Facebook automatically tags people in your photos that you have tagged before. I'm not sure if this is helpful or creepy! :P

Dataset

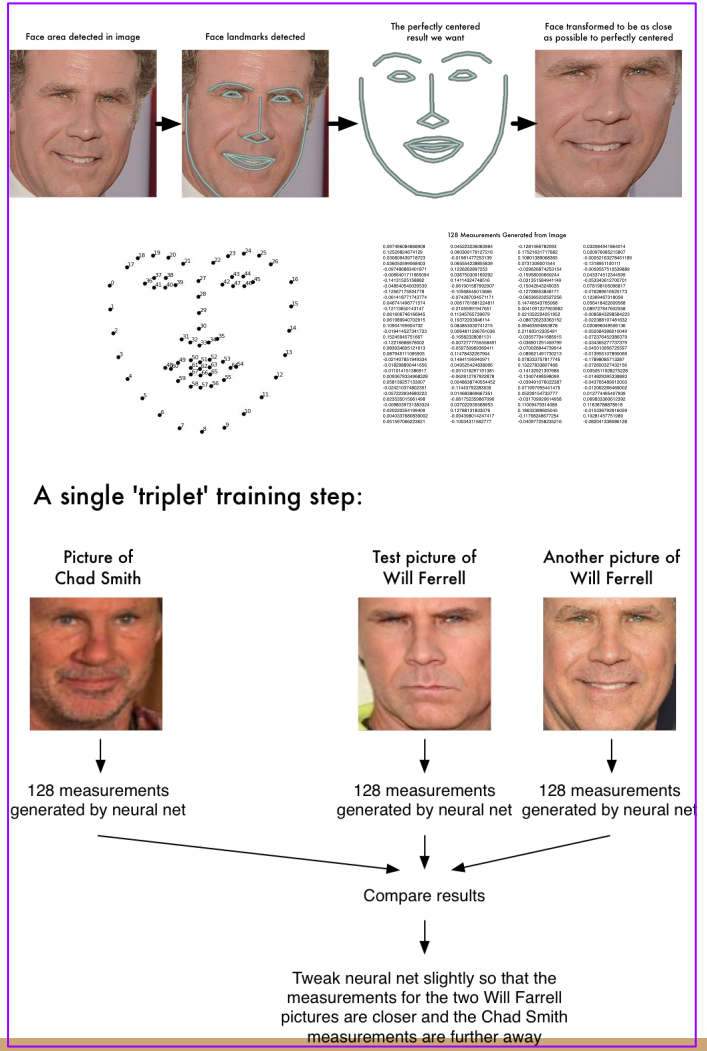
- Images
- Classes

Algorithm:

- Face Detection
- Face Alignment

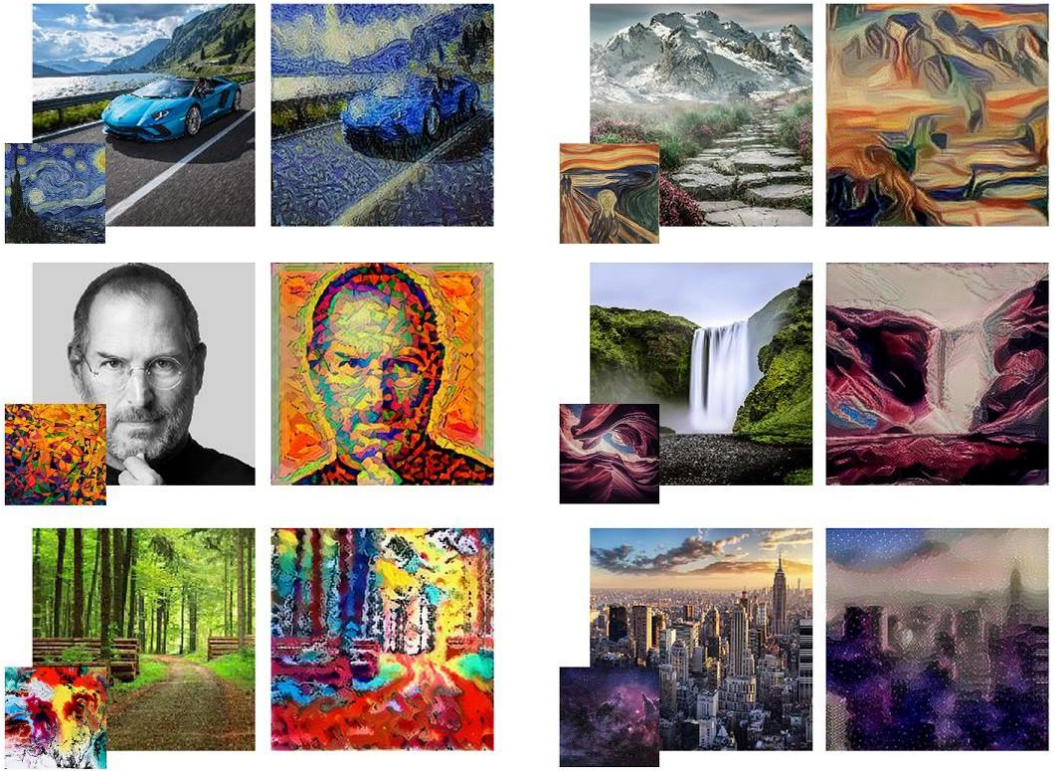
- DeepNet Model to extract features
  Pass the centered face image through a neural network that knows how to measure features of the face. Save those 128 measurements.

- *Testing new face : Extract 128 measurements and find the most similar match*



Style transfer

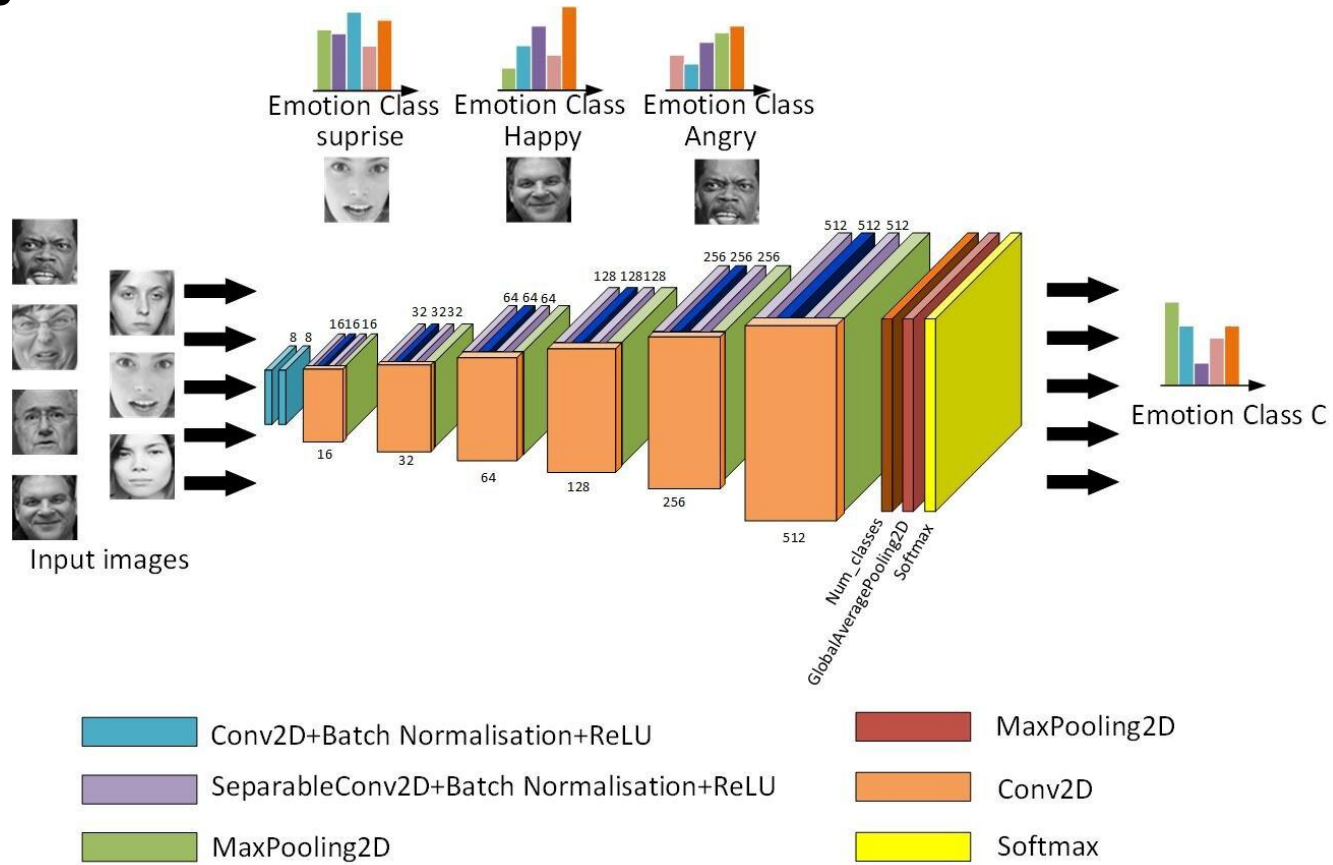
- Problem Statement
  - Given:
    - Content Image
    - Style Image
  - Result:
    - Stylized Image
- Algorithm
  - Feature Extraction of Content (A)
  - Feature Extraction of Style (B)
  - Merge Features(A+B)



https://reiinakano.com/arbitrary-image-stylization-tfjs/

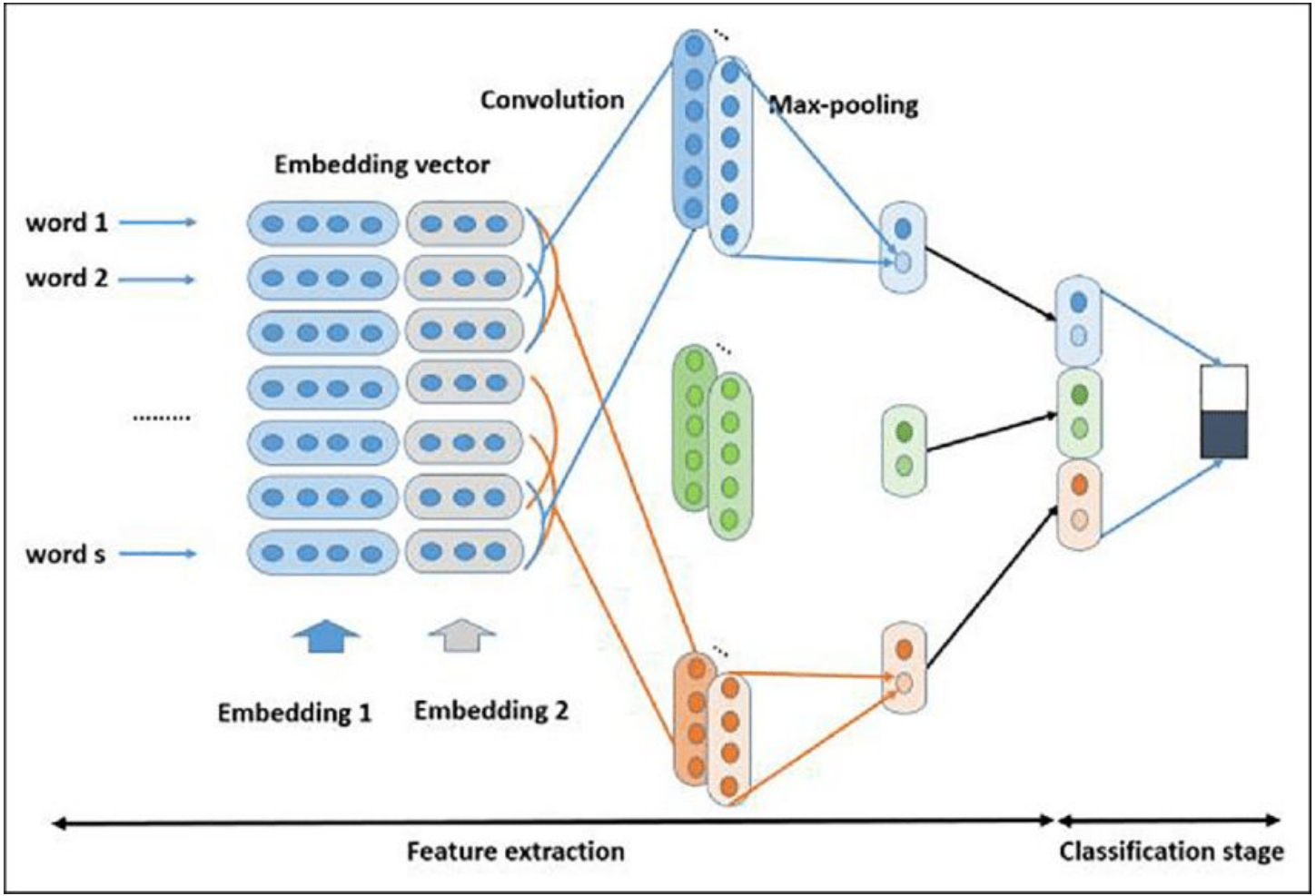
Image analytics

1. Problem Statement
2. Data Preparation
3. Choosing **model(s)**
   a. **Training**
   b. Evaluation / **Validation**
   c. Hyperparameter tuning
   d. Prediction/**Testing**
4. Combine Results
5. Presentation



Text Classification

Text Classification



Embedding Vector

- Word index
- TF-IDF
- word2vec
- Doc2vec
- Glove
- Transformers
- BERT

https://colab.research.google.com/drive/1gAS_eDzGRhEznUosanlUvjv-g96jfQZE#scrollTo=39CgD8t68Otg

Sentiment Analysis : Walkthrough

https://colab.research.google.com/github/agungsantoso/deep-learning-v2-pytorch/blob/master/sentiment-rnn/Sentiment_RNN_Exercise.ipynb#scrollTo=TT8spavKpmxH

References

- Computer Vision :
  - https://setosa.io/ev/image-kernels/
  - https://poloclub.github.io/cnn-explainer/
  - https://towardsdatascience.com/gentle-dive-into-math-behind-convolutional-neural-networks-79a07dd44cf9
  - https://reiinakano.com/arbitrary-image-stylization-tfjs/
  - https://engineering.matterport.com/splash-of-color-instance-segmentation-with-mask-r-cnn-and-tensorflow-7c761e238b46
  - https://github.com/ageitgey/face_recognition
  - https://medium.com/@manivannan_data/how-to-train-yolov2-to-detect-custom-objects-9010df784f36

References

- Natural Language Processing :
  - Text classification from scratch : https://colab.research.google.com/drive/1gAS_eDzGRhEznUosanlUvjv-g96jfQZE#scrollTo=39CgD8t68Otg
  - Sentiment Analysis with an RNN : https://colab.research.google.com/github/agungsantoso/deep-learning-v2-pytorch/blob/master/sentiment-rnn/Sentiment_RNN_Exercise.ipynb#scrollTo=TT8spavKpmxH

Overview of Session :

- Understanding of Deep Learning code
- CNN / Object Detection
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Thank you!

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