

Aprendizagem Computacional

Machine Learning

Departamento de Engenharia Informática
Universidade de Coimbra

2024

Professores

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- Horário de atendimento:
- Disponível em inforestudante
- Enviar email para confirmar presença

Aulas Práticas

- O aluno exercita em computador o uso dos algoritmos de aprendizagem computacional na resolução de problemas de complexidade média, efetuando simulações eventualmente por recurso a ferramentas

Avaliação Prática

- Desafio - 10.0%

Este trabalho é feito em grupo, na aula PL, com a monitorização do professor.

$\text{aval_problemas} = \text{nota_desafio} * \text{defesa_desafio}$

- Projeto - 30.0% (min 35%)

Realização fora das aulas com entrega de um relatório e defesa.

$\text{aval_projeto} = \text{nota_projeto} * \text{defesa_projeto}$

Grupos

- Grupos de até 2 alunos da mesma turma prática
- Devem inscrever-se na spreadsheet até à próxima aula
- https://bit.ly/AC_grupos24

Software

- Python
- Colab
- Jupyter
- Outros mais específicos (bibliotecas por exemplo) definidos aos longo do semestre

(demo colab, python)

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

Exemplos

MACHINE LEARNING USE EXAMPLES



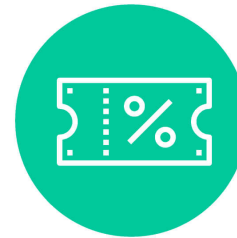
**THE SELF
DRIVING GOOGLE CAR**



**WEB SEARCH
RESULTS**



**SOCIAL LISTENING
APPLICATIONS**



**MARKET PRICING
MODELS**



**TEXT BASED SENTI-
MENT ANALYSIS**



**FRAUD
DETECTION**



**PATTERN
RECOGNITION**



**CREDIT
SCORING**



**PREDICTION
OF SUCCESS
AND FAILURE**



**ONLINE RECOMMENDATION
OR OFFERS ON BIG ECOM-
MERCE SITES
(AMAZON, NETFLIX)**

Text Classification

- <http://www.uclassify.com/>

Classify Text

I am very sad

Classify

👍 **Success** Show [REST XML URL](#)

negative



89%

positive

11%


Text Classification

- <http://www.uclassify.com/>

 **Hogwarts Houses**
by  DullDemon3

Classify Text

I like Harry Potter

 **Success** [Show REST XML URL](#)

Gryffindor	85%
Hufflepuff	7%
Slytherin	5%
Ravenclaw	3%

Image Classification

- <https://www.clarifai.com/models/image-recognition-ai>




PREDICTED CONCEPT	PROBABILITY
sunset	0.999
dawn	0.997
water	0.995
dusk	0.987
boat	0.984
reflection	0.977
sun	0.974
beach	0.974
composure	0.972

Image Classification

- Try this image (and others)

[https://www.thespruce.com/thmb/a1r-DEo9QIkZKLJp15zq2qmbMPg=/941x0/filters:no_upscale\(\):max_bytes\(150000\):strip_icc\(\)/oxeye-daisy-growing-guide-5190951-hero-baed472653934a6da8c8f86237dcf7bc.jpg](https://www.thespruce.com/thmb/a1r-DEo9QIkZKLJp15zq2qmbMPg=/941x0/filters:no_upscale():max_bytes(150000):strip_icc()/oxeye-daisy-growing-guide-5190951-hero-baed472653934a6da8c8f86237dcf7bc.jpg)



PREDICTED CONCEPT	PROBABILITY
chamomile	0.999
nature	0.998
summer	0.996
no person	0.993
flora	0.989
grass	0.986
rural	0.984
fair weather	0.983
field	0.982

Language related applications

Keyboard / mail agent / ...

I saw a catt

cat
car

Translation service / mail agent / ...

I saw a catt

Probably you meant I saw a cat

Translation service / mail agent / ...

I saw a ca|

car ←

Web search engine / ...

I saw a cat|

I saw a cat on the chair

I saw a cat running after a dog

I saw a cat in my dream

I saw a cat book

https://lena-voita.github.io/nlp_course/language_modeling.html

Automatic language translation

- Suppose we are translating a Chinese sentence:

他 向 记者 介绍了 主要 内容
He to reporters introduced main content

- Possible translations:

he introduced reporters to the main contents of the statement

he briefed to reporters the main contents of the statement

he briefed reporters on the main contents of the statement

Automatic language translation with app integration and video processing

- You can check this out at home:
 - Using a Translation App to Read Menus in Taiwan
<https://www.youtube.com/watch?v=qSD90CyAwXE&t=2s>

Amazon Inventory Management

- You can check this out at home:
 - <https://www.youtube.com/watch?v=zERrqLFotSY>

Google Translate Example - problems

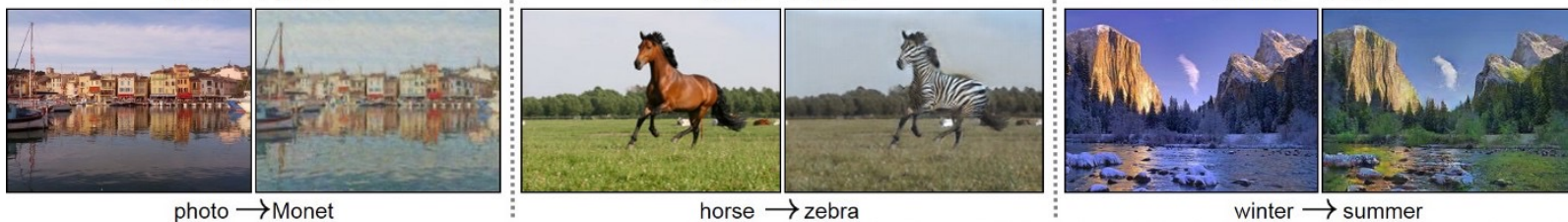
The image shows two instances of the Google Translate interface. The top instance shows an English input: "Please take back by steak, it is overcooked and I wanted it rare." The German output is: "Bitte nehmen Sie mit dem Steak zurück, es ist verkocht und ich wollte es selten." The bottom instance shows a German input: "Bitte nehmen Sie mit dem Steak zurück, es ist verkocht und ich wollte es selten." The English output is: "Please take back with the steak, it's overcooked and I rarely wanted it." Both examples highlight significant errors in the translation, particularly in the interpretation of the verb "nehmen" and the phrase "wollte es selten".

Language	Text
English - detected	Please take back by steak, it is overcooked and I wanted it rare.
German	Bitte nehmen Sie mit dem Steak zurück, es ist verkocht und ich wollte es selten.
German - detected	Bitte nehmen Sie mit dem Steak zurück, es ist verkocht und ich wollte es selten.
English	Please take back with the steak, it's overcooked and I rarely wanted it.

- Try this and think of different examples/languages.

Data Generation - GAN Lab

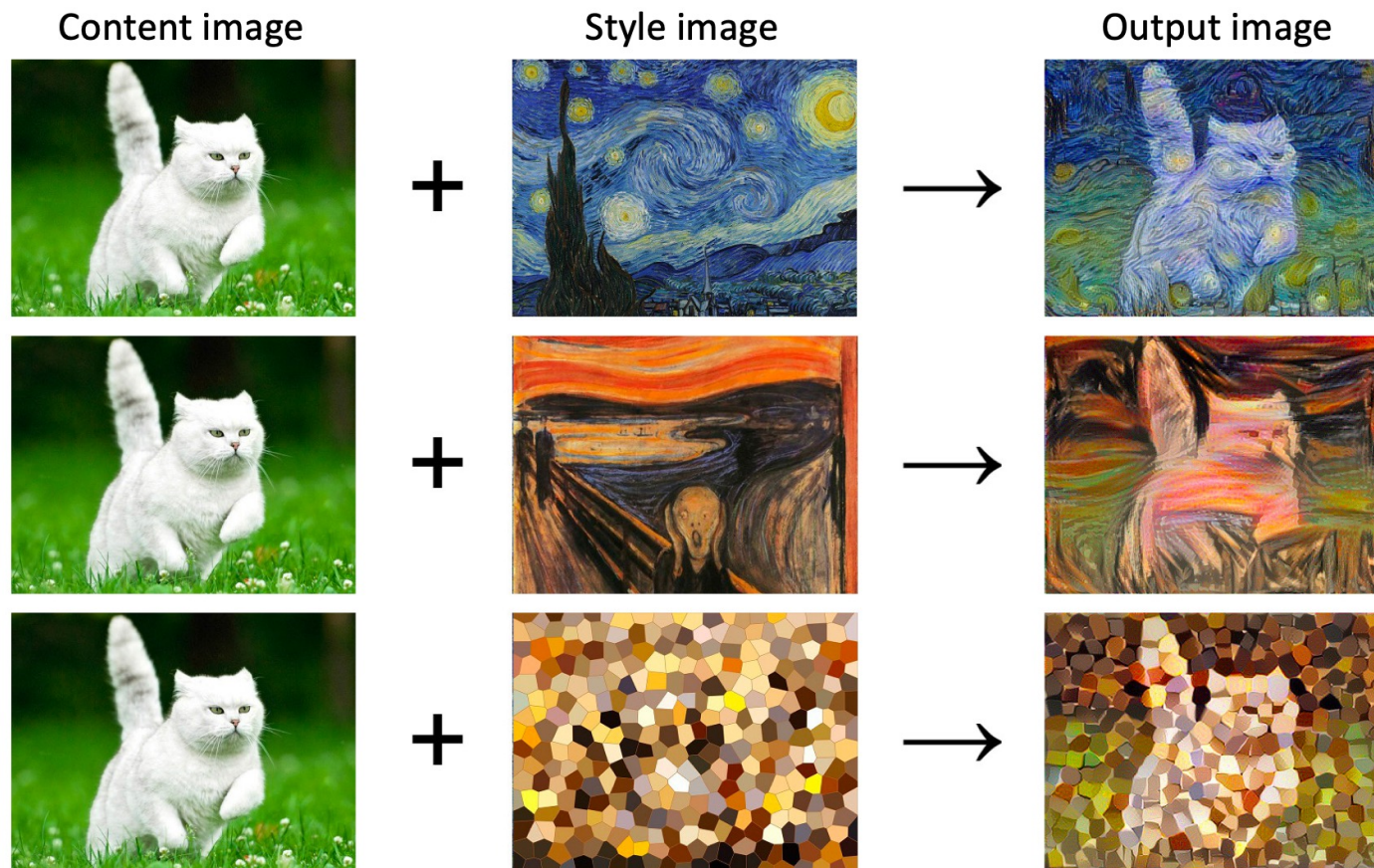
- <https://poloclub.github.io/ganlab/>



<https://medium.com/coding-blocks/introduction-to-cyclegans-1dbdb8fbe781>

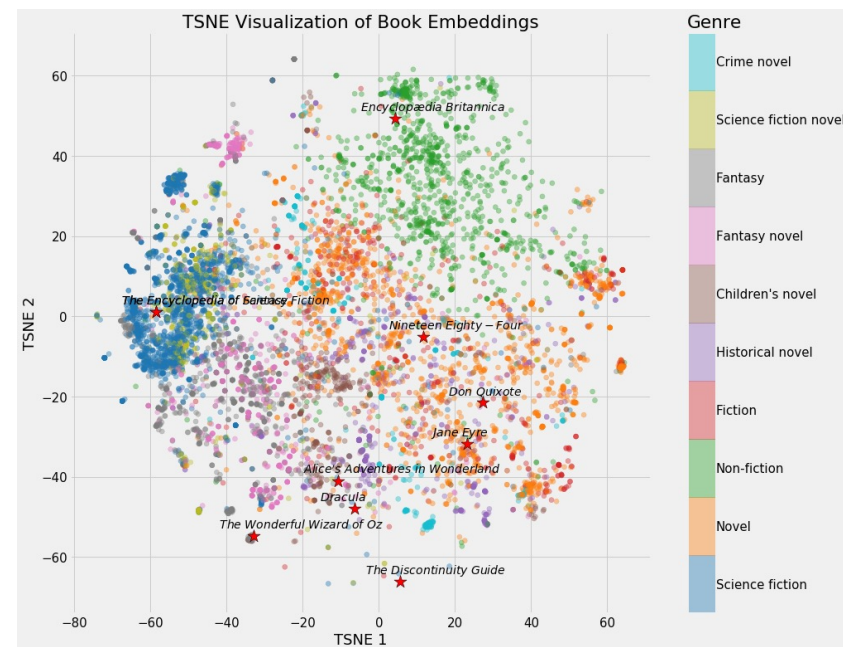
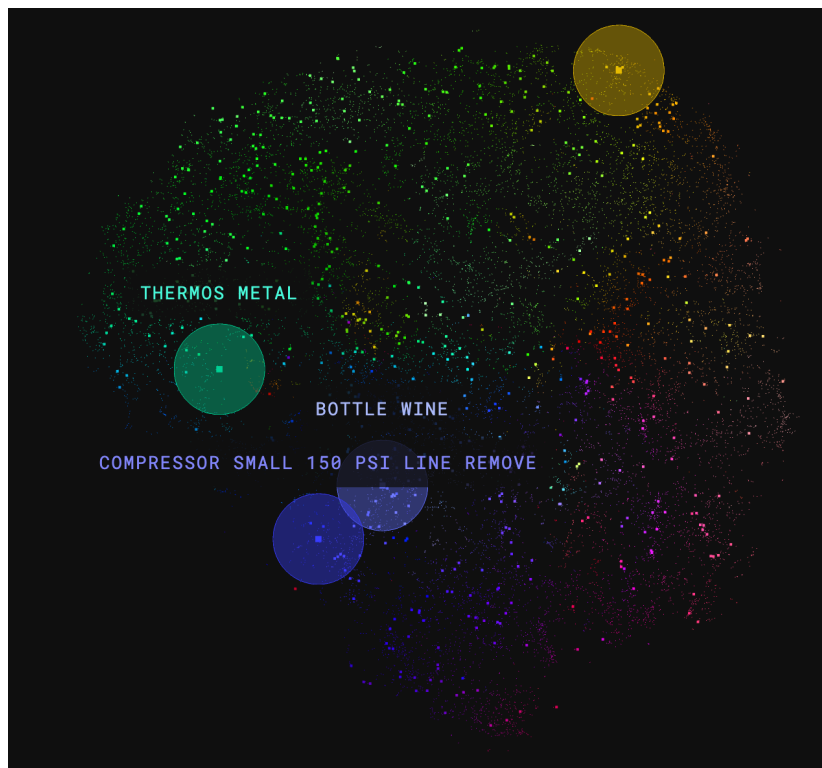
Data Generation - deepart.io

- <https://deepart.io/> (not online anymore?)



Data Embedding – Drum Machine

- <https://experiments.withgoogle.com/ai/drum-machine/view/>



Other interesting links

- <https://teachablemachine.withgoogle.com>
- <https://www.instagram.com/hidreley/>

Challenge

- Find different solutions/problems and propose them as project's ideas.