Artificial Intelligence
LABS

These artificial intelligence laboratories were prepared and realized by students of 3 E math+ class in 2023 of Liceo Scientifico Attilio Bertolucci of Parma with their math and physics teacher, supported by an external technician and another math and physics teacher. This work was realized for an exchange activity with Lycee Livet in Nantes.
These labs can be used for students (age 15-18) with basic ITC competence.

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Index of laboratories

Artificial intelligence

introduction to the topic

(video, kahoot and padlet to prepare similar to the one in the lab)
duration: 1 hour

LINK VIDEO AI:
https://drive.google.com/file/d/1UAOT9d9gzsBYTB0cc6k4Hu9UaACyVqax/view?usp=sharing
QR CODE:

 Quiz with KAHOOT:
https://drive.google.com/file/d/1GNG8eWfSHp2zjUUUkCD3mi0zZ9RSdk_o/view?usp=sharing
QR CODE:

NOW IT'S YOUR TURN!

Activity:

You have to do a research in groups (5) on the Internet.

You have to find some applications of AI in these different situations:

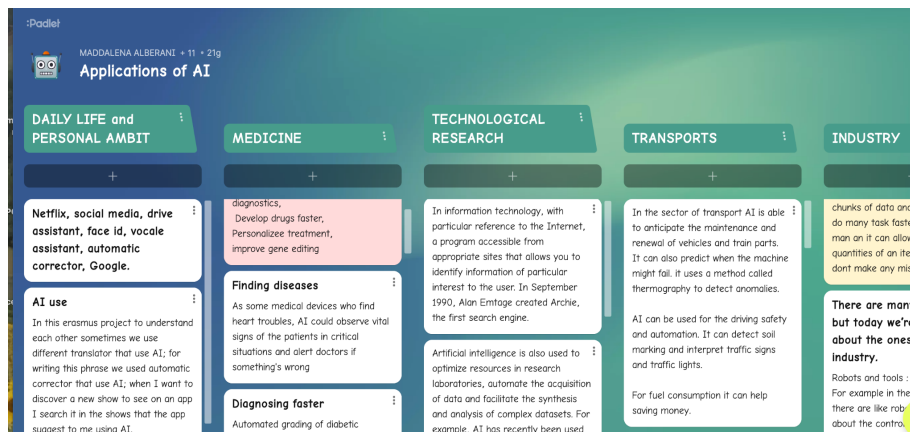DAILY LIFE and PERSONAL AMBIT

MEDICINE

TECHNOLOGICAL RESEARCH

TRANSPORTS

INDUSTRY

You have 20 minutes to research.

When you have finished write your answers in your section in this Padlet: (Create a Padlet like this one)

You can give the acces:

➔ with COMPUTER: https://bit.ly/etwpadletai

➔with your PHONE:

Chat GPT

duration: 1 hour

The goal of this lab is to evaluate the level of GPT chat writing goodness
1) Divide into teams and choose a topic such as:
   - Doping
   - World War I
2) Write a text on the same topic

3) Make GPT chat write a text indicating in detail the characteristics of the text to be obtained

At the end the other teams have to guess which text is written by you and which by ChatGPT.
You gain points if the other teams don't guess.

Vocal Recognition Lab

duration: 30'

With this lab you can understand how speech recognizers work,
 which is the process to turn speech into text and how this text is used to
look up information.

1) Voice recording: The first step is to record the user's voice through a
microphone. When the user speaks into the microphone, the voice is
recorded and sent to speech recognition software.

2) Sound Analysis: Once the speech recognition software receives audio, it
begins analyzing the sound to detect the user's voice and separate it from
background noise.

3) Speech detection: After analyzing the sound, the speech recognition
software tries to detect the words spoken by the user. This is done by
comparing the sound waves of the recorded audio with the waveforms of the
words in the database.

4) Text transcription: Once words have been detected, speech recognition
software transforms them into text. This process is done using a pattern
recognition algorithm that tries to match the detected words to the words in
the database.

5) Confirmation and correction: Finally, the speech recognition software
checks if the transcribed text is correct and asks the user to confirm or
correct any errors.

The lab:
we divide into groups,
chose a group leader
send him a google document to open on the phone. at this point a text in
English is projected onto the blackboard and the group leader will have to
transcribe it by dictating.
 The first one to get to the end without making a mistake wins.

Liceo Musicale
Attilio Bertolucci

eTwinning
Cofinancé par le
programme Erasmus+
de l'Union européenne

Lycée
Eugène
Livet
Nantes

Example of document:

Rewrite this text using your voice and your phones(try not to scream):

Karl Marx's book "Capital" is a fundamental work of Marxist economic theory. The text provides a critical analysis of the capitalist system, which Marx believes is inherently flawed due to its reliance on the exploitation of workers. Marx argues that under capitalism, the capitalist class extracts surplus value from workers by paying them less than the value of their labor. This leads to a class struggle between workers and capitalists, as workers seek to improve their conditions while capitalists strive to maintain their profits. Marx also discusses the concept of commodity fetishism, which refers to the way that under capitalism, goods are treated as if they have inherent value, rather than being seen as products of labor. Overall, "Capital" is a comprehensive and detailed examination of the workings of capitalism, and a foundational text in Marxist economics.

COLAB Stable Diffusion Lab

duration: 1,5 hours

Introduction to the lab

Google Colab is a free development environment for writing and running code in Python.

It offers access to powerful GPUs and TPUs, making it an ideal platform for machine learning and data analysis.

Users can collaborate in real time, upload and download files, and connect to external services like Google Drive.

Colab provides a range of built-in tools and libraries and allows users to install additional libraries. It also integrates with Google Cloud, providing access to a range of cloud-based services for storage, processing and deployment. Overall, Google Colab is a versatile and accessible platform for exploring new ideas and building applications on Python.

In this activity we'll use Google Colab to code a Stable Diffusion program to generate images.

1) Open the following link: https://bit.ly/etwimages

https://colab.research.google.com/github/huggingface/notebooks/blob/main/diffusers/stable_diffusion.ipynb

This page will open:

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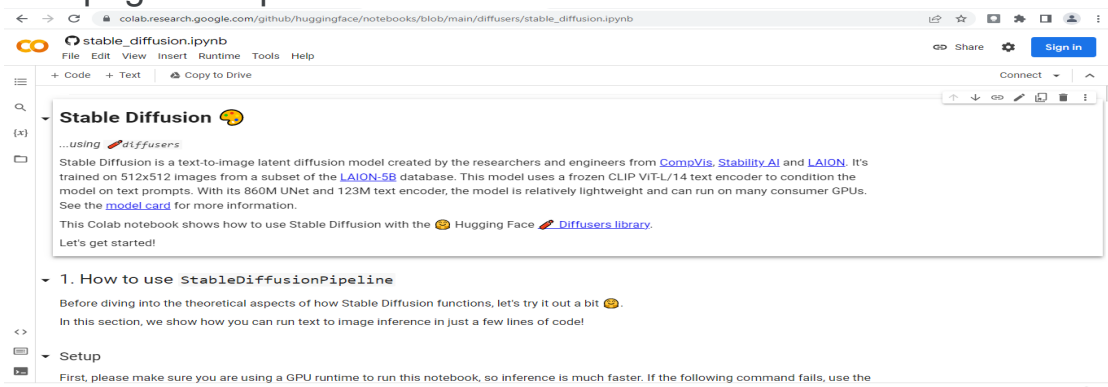
2) Click on "Sign in" at the top right of the screen and log in with a group member's Google account.

3) Since the computer is too slow and weak to program an artificial intelligence generating images, click "Connect" in the upper right corner to connect the computer to Google servers and wait for the connection, indicated by the indication of RAM and Disk.
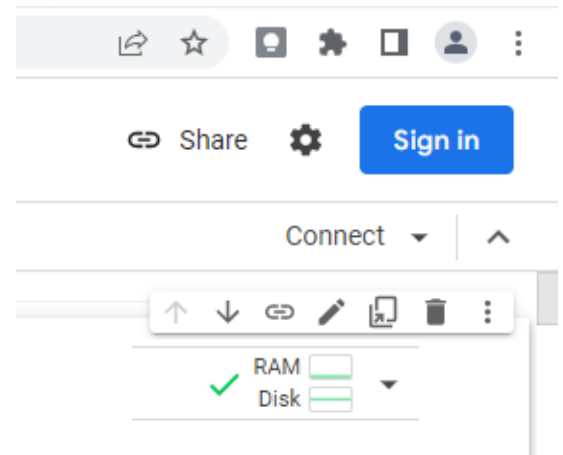
4) Click "Runtime" in the settings bar at the top of the screen.

Select
"Change runtime type" and set a GPU runtime (like in the picture).
Now you can start coding.

5) Start pressing PLAY to the left of every gray band indicated by these instructions to start the program fragments. Wait until you see the green checkmark on the side, which indicates the end of loading.

Next, you should install `diffusers` as well `scipy`, `ftfy` and `transformers`. `accelerate` is used to achieve much faster load

```
!pip install diffusers==0.11.1
!pip install transformers scipy ftfy accelerate
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting diffusers==0.11.1
  Downloading diffusers-0.11.1-py3-none-any.whl (524 kB)
  ──────────────────────────────────────── 524.9/524.9 KB 2.9 MB/s eta 0:00:00
Requirement already satisfied: requests in /usr/local/lib/python3.8/dist-packages (from diffusers==0.11.1) (2
Requirement already satisfied: numpy in /usr/local/lib/python3.8/dist-packages (from diffusers==0.11.1) (1.22
Collecting huggingface-hub>=0.10.0
  Downloading huggingface_hub-0.12.1-py3-none-any.whl (190 kB)
  ──────────────────────────────────────── 190.3/190.3 KB 22.4 MB/s eta 0:00:00
Requirement already satisfied: filelock in /usr/local/lib/python3.8/dist-packages (from diffusers==0.11.1) (3
Requirement already satisfied: Pillow in /usr/local/lib/python3.8/dist-packages (from diffusers==0.11.1) (8.4
Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.8/dist-packages (from diffusers==0
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.8/dist-packages (from diffusers==
Requirement already satisfied: packaging>=20.9 in /usr/local/lib/python3.8/dist-packages (from huggingface-hu
```

```
import torch
from diffusers import StableDiffusionPipeline

pipe = StableDiffusionPipeline.from_pretrained("CompVis/stable-diffusion-v1-4", torch_dtype=torch.float16)
```

```
Downloading (...)ain/model_index.json: 100%        543/543 [00:00<00:00, 14.3kB/s]
Fetching 20 files: 100%                            20/20 [00:56<00:00, 3.27s/it]
Downloading (...)cheduler_config.json: 100%        313/313 [00:00<00:00, 2.33kB/s]
Downloading (...)"pytorch_model.bin":: 100%        1.22G/1.22G [00:29<00:00, 54.5MB/s]
```

```
[4]  pipe = pipe.to("cuda")
```

6) Now you are ready to generate images. Remember to save your images. This is the effective program. PLAY this code fragment and generate an image:

```
prompt = "a photograph of an astronaut riding a horse"
image = pipe(prompt).images[0]  # image here is in [PIL format](https://pillow.readthedocs.io/en/stable/)

# Now to display an image you can either save it such as:
image.save(f"astronaut_rides_horse.png")

# or if you're in a google colab you can directly display it with
image
```

```
100%                                        50/50 [00:12<00:00, 5.21it/s]
```

Try different times to PLAY this program: What happens?

Running the above cell multiple times will give you a different image every time. If you want deterministic output you can pass a random seed to the pipeline. Every time you use the same seed you'll have the same image result.

7) PLAY this code:

```
[6] import torch

    generator = torch.Generator("cuda").manual_seed(1024)

    image = pipe(prompt, generator=generator).images[0]

    image
```


Try to change the variable "manual_seed": What happens?

You can change the number of inference steps using the num_inference_steps argument. In general, results are better the more steps you use. Stable Diffusion, being one of the latest models, works great with a relatively small number of steps, so we recommend using the default of 50. If you want faster results you can use a smaller number.
The following cell uses the same seed as before, but with fewer steps. Note how some details, such as the horse's head or the helmet, are less define realistic and less defined than in the previous image:

8) PLAY this code:

Try to increase the variable "num_inference_steps":What happens?

9) Add to the code of the point 8:
prompt = " "
Add a prompt into the " " sign.

Try to change the prompt, the variable "manual_seed" and the variable "num_inference_steps": What happens?

Now you have a complete stable diffusion program to create images.

STABLE DIFFUSION COMPETITION:
- Splitting into teams: groups of 4 people (2 italians and 2 french guys).
- The objective of the race is to change the prompt and the various steps in order to achieve the best possible image in a time of 15 minutes.
- Write all settings changed by photo or document.
- WARNING: remember to copy images and paste them in the COMPETITION slide in this link: https://bit.ly/etwcolab. Write your group number.
- The group that makes the best image wins.

Comics Lab

duration: 2 hours

In this workshop you can learn how to create a comic book or an illustrated story using artificial intelligence programs.

1) Create the text of the book or dialogues of the comic using chat Gpt, (ChatGPT - acronym of Generative Chat Pre-Trained Transform - is an artificial conversational intelligence, proposed to users in the form of chatbot.)
The Text theme is scientific invention
write 2 to 5 cartoons
ChatGPT is a large natural language model developed by OpenAI. Its functioning is based on machine learning and artificial intelligence. It has been trained on huge amounts of natural language texts from various sources, such as books, articles, and websites. When given a prompt or a question, ChatGPT uses its knowledge of language patterns and contextual understanding to generate a response that is relevant and coherent. It is capable of generating a wide range of responses, from informative to humorous, and can even carry on a conversation.

For using Gpt chat look at the following link:
https://bit.ly/etwgptchat

2) We use Colab to create images that will be used in the book or comic. For the use of the platform look at the following link:

https://bit.ly/etwcollab

- Now it is necessary to put together the text made with Chat gpt and the image created thanks to the use of Colab. To put the two parts together we use Canva.

Music Lab

duration: 2 hours

The goal of this lab is to create a song from the text to the sound base using A.I.

1) Text: written via the Gpt chat app, you give it a theme and directions and it writes the text
2) through the Uber Duck app the text is read melodically according to the genre and the selected voice
3) the Mubert app is used to create the sound base
4) bandlab is an app/site that combines the sound base with the text
The presentation at the link explains the steps to do on each site for the

Creation of the song.

https://drive.google.com/file/d/1PLGTlUzjnsssOGaOkF-mip1B9a8xxNy4/view?usp=sharing

Animation Lab

duration: 2 hours

The goal of this lab is to create animated images and videos
App used: Hydra
(since it is only present on the slides and the link cannot be found online, a Bit.ly is required, it simplifies the link, it must start with the acronym "ETW")

You can use the presentation at the link that explains step by step all the functions of Hydra, its operation and thow to operate.

https://drive.google.com/file/d/1BX_CSa6PB9yKn5qumRbbYhSZap_t1eab/view?usp=sharing

A second more specific part can be realized using this step by step presentation.

https://docs.google.com/presentation/d/1I4WytxTZwBSrEZLc_YFQ2IOmfFZYsSWIdLs0XKGr3lQ/edit?usp=share_link

Then you can change some values of the project at this link:
https://sites.google.com/iczola.istruzioneer.it/portici-da-sogno/home-page/portici-blu

After having presented the two presentations and having modified the project, students can be asked to try to create a new project with hydra (the facilitated version is recommended for first time creations).