Programme	PhD Program
Academic Year	2023/2024
Module/course code	
Delivery location	Paris
Language	English
Contact Hours	15
ECTS	??
Semester	1
Module name	AI for Research
Module leader	Pablo Winant
Professors / email address	Pablo Winant / pwinant@escp.eu

OUTLINE

I – Outline

Module/course summary

One objective of the course, will be to explore together through lectures and students contributions how GPT-4 in particular and Large Language Models (LLMs) in general can be used for producing research as a substitute to traditional natural language processing techniques (NLP).

Also, as Large Language Models become more versatile and are being increasingly used to inform real world decisions, part of the course will be devoted to recent research approaches designed to experimentally evaluate and practically control the behavior of AI as approximated by an LLM . We'll discuss both structural approaches (affecting the model building) and external approaches (taking AI as a black box and observing its behavior).

II – Assurance of Learning

This course participates in the acquisition/application/reinforcement of the programme´s learning competencies (LCs) and learning objectives (LOs) as follows:

Learning Competencies	Learning Objectives	Acquisition level
LC1: Being able to assess what kind of data analysis can be performed using GPT-4 or other large language models.	LO1a: identify and use common approaches for handling text in machine learning	E
	LO1b: use GPT prompt to perform supervised and unsupervised tasks	E
	LO1c: use finetuning to improve the quality of results	
LC2: Being comfortable with programming environment for data science	LO2a: setup and use a working python/vscode/maching environment	E
	LO2b: use machine learning libraries and LLM API(s) for text analysis	E
LC3: Identify capabilities and limits of large language models	LO3a: getting familiar with the structure of a LLM and some of its variants	I
	LO4: understand potential avenues to address current risks of LLMs	I

I= Introduction
E= Emphasis
R= Reinforcement

WHAT WILL I BE EXPECTED TO ACHIEVE?

Module/course objectives

Cf Outline section.

Skills

Cf Assurance of learning section.

Values and attitudes:

😄, 😊, 😀, 😃, 😍, 😆, 🥰, 🤩, 😁, 😇, 🤗, 😌, 🥳, 🌞, 🌈, 🎉, 👍, 💃, 🕺, ✨

HOW WILL I LEARN?

Delivery modes:

☒ 100% face to face	☐ 100% face to face/teaching materials on Blackboard	☐ Blended	☐ 100% online

Teaching Methods:

☒ Lectures	☐ Case studies	☐ Business Games	☐ Group Work	☒ Projects	☒ Tutorials

COURSE CONTENT

Precise content is subject to change as the course unfolds and will be revised on a yearly basis.

- **Session 1: From Natural Language Processing…**
  - quick refresher on
    - main NLP algorithms
    - NLP tasks (sentiment analysis, topic modeling…)
- **Session 2: … to Large Language Models**
  - introduction to LLM
  - data collection & best practices
  - presentation project 1 : *assessing* LLM performance vs traditional NLP
- **Session 3: What are Large Language Models made of?**
  - the main algorithmic developments behind GPT4
  - transfer learning and fine-tuning
- **Session 4: Behavior of Large Language Models**
  - risks associated to LLM
    - reliability
    - toxicity
    - disinformation
    - security
  - presentation project 2 : *measuring* LLM behaviour
- **Session 5: Research Frontiers: What's Next?**

All sessions will consist in 90 minutes lectures followed by tutorial sessions on computers or presentations.

HOW WILL I BE ASSESSED?

Module/course assessment components

Students will be asked to present / discuss recent research papers.

They will also be asked to work on two mini-projects:

- replicate a traditional NLP paper, perform the same analysis using GPT-4 and quantify the difference
- replicate an established behavioural experimental protocol (from psychology or economics) using GPT-4 as the “subject”

SUGGESTED READING LIST

- Natural Language Processing with Python, Steven Bird, Ewan Klein, and Edward Loper, 2009 Oreilly
- Speech and Language Processing, Daniel Jurafsky & James H. Martin. Draft 2023

A list of research papers to be discussed by students will be supplied during the course.