

DHUM 25A43 - 01

Investigating with AI

Welcome

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Discord



- #sciencespo-DHUM25A43
- <https://discord.gg/DDbh5AyHYH>

- Data scientist, researcher, consultant
- DHUM25A43 - Investigating with AI
- andrei.mogoutov@sciencespo.fr

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Alexis Perrier

- PhD TelecomParis 95'
- Data scientist, author, teacher
- alexis.perrier@gmail.com



The Course

What is this course about?

Data Science for Social Sciences: Applying data science techniques to social science research.

- **Data Search and Collection:** Searching, gathering, and transforming diverse datasets to create corpora and heterogeneous data collections.
- **Exploratory Data Analysis:** Exploring textual content, categories, temporal evolution, extracting names, topics, and their relationships.
- **Qualitative and Quantitative Results:** Combining qualitative insights with quantitative analysis and visual representation of findings.
- **Result Communication:** Presenting outcomes through interactive documents and websites.

Digital investigations with AI for social sciences

- **Powerful LLMs:** Revolutionizing data analysis, interpretation, and automation.
- **Impact on Data Science:** Enhancing efficiency, accuracy, and scalability of workflows.
- **Code Generation with LLM:** Quickly develop data analysis pipelines
- **Use of LLMs as an Autonomous Data Analysis Tool:** extract patterns, trends, and insights from raw data. Analysis of large datasets or documents
- **Accessible Methods:** Simplifying complex data processes with user-friendly tools.

Course Organization

- **Project-Oriented Approach:** Focus on applying concepts through real-world projects.
- **Workshop-Style Sessions:** Interactive, hands-on learning environment.
- **Collaborative Work:** Students work in groups to tackle selected themes and datasets.
- **Practical Focus:** Emphasis on skills development through guided exercises and demos.
- **Professor Assistance:** Direct support and feedback during project work.

Session Structure

Theoretical Introduction: Present existing methods (no advanced math or equations) and new AI-assisted approaches.

Technical Demo: Showcase practical applications of the methods introduced.

Practical Student Work:

- Groups of 3-4 students collaborate on selected themes and datasets.
- Hands-on project development with guidance from professors.

Course Evaluation

- group note (80%)
- public presentation
- individual : (20%)
- critical reflexion on your work and experience with IA
- write a personal SWOT report on your work with AI and propositions

Course outline - timeline

We have 12 classes, 2h each

We'll cover

- Background on Web and API
- Data: how to collect and process
- Machine Learning : training models for prediction
- NLP : analyzing text to extract information
- AI & LLMs
- Agents : combining LLMs for agency

Tools

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- **discord** for conversations
- **google drive** for documents
 - course material
 - ./slides
 - ./data
 - ./colab
 - student projects
 - ./projects

- **Google colab** notebooks for work

</div> <div> <div class="highlight large center"> All course material is available in google drive and on the discord channel </div> </div> </div>

Course Project

Project Presentation

Themes

- Climate change, energy
- AI - robotics
- Brain-computer interface
- Other issues...
- Data sources : media, social media, web, scientific publications, specific websites
(COP, IMDB, wikipedia, Kaggle datasets)

Comment 1 : These topics focus on future-oriented challenges and opportunities

Comment 2 : The issues are very broad; we need to refine them into precise research questions or subtopics to ensure project feasibility and a reasonable dataset size.

Project Organization

- Find and Formulate Research Questions
- Initial Validation of Projects - Feasibility Check, Relevance
- **Goal: Create a Website:** Design an engaging platform to showcase your report.
- **Creative Formats:** Present findings as a report or in unique forms, such as a movie script or other innovative approaches.
- Publish the website
- Organization: 3 to 4, groups with complementary skills
- Evaluation, expectations
- Primary exposé after a few classes
- Last class: final exposé in front of class and experts

Project

Start thinking about your project

Share your project definition

Create your team

Getting to know you

Please fill out this form

We'd like to know a bit more about you

So that we can adapt the course to meet your expectations

All questions are optional (except your email)

<https://forms.gle/1ksP3qtAk2F5N2gT8>

State of AI

A Thorough Recap of 2024

Things we learned about LLMs in 2024

by [Simon Willison](#).

<div class="note"> A lot has happened in the world of Large Language Models over the course of 2024. Here's a review of things we figured out about the field in the past twelve months, plus my attempt at identifying key themes and pivotal moments. </div>

Over 120 new models released in 2024!

Released Models 2024

- Open Source Models: 55
- API Only Models: 63

2024 AI Timeline

a Hugging Face Space

Chatbot Arena: LLMs vs LLMs

Where LLMs compete <https://lmarena.ai/?leaderboard>

<div class="note"> Total #models: 194. Total #votes: 2,557,144. Last updated: 2025-01-20.

Creative Writing: #models: 190 (98%) #votes: 385,176 (15%)

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2024

70 models from 18 organizations are now **performing** better than GPT4

- GPT-4 level models run on a laptop (not mine tho)
- Multimodal vision is common, audio and video are starting to emerge
- Prices have dropped => less energy
- EU AI act

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- **The Massive Multitask Language Understanding (MMLU)** : range of exam questions on academic subjects.
- **BIG-bench** : Beyond the Imitation Game
- **GPQA Diamond**: harder still, google proof,
 - PhDs domain experts reach 74% accuracy
- **LiveBench**: avoid contamination

and many others

- **Humanity's Last Exam**
- **CultureVLM**
- ...

</div> <div> <div class="highlight large"> It's becoming harder to find tasks that are difficult enough for the LLMs. </div>

AI vs Humans (March 2023)

How Smart is ChatGPT?

<div class="note"> GPT 4.0 has made impressive strides over GPT 3.5 but continues to struggle in certain subjects.








According to OpenAI, the essays that GPT-4 produced for these tests were graded by "qualified third-party contractors".

GPT attempted 10 programming contests 100 times each, but was unable to consistently find solutions to the more complex problems.

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Augmented LLMs

<div class="highlight large center"> It's no longer just about the model </div>

-  Web browsing
-  File upload - projects - knowledge base
-  Dynamic memory
-  Streaming
-  Function calling
-  speech
-  voice

2025 ?

<div style="color: red; font-weight: bold;">weekly updates</div>

- Models: DeepSeek-R1, OpenAI o3
- Stargate project ?!
- China vs US
- Massive deployment of AI in all Google and Microsoft services
- Platform evolutions : Anthropic, OpenAI, Gemini, ...
 - more features, connections, memory, protocols

2025 ?

Ethan Mollick : [Which AI to Use Now: An Updated Opinionated Guide](#)

<div class="note"> Comparison table showing different AI services, their capabilities, and recommended use cases. </div>

Emergence

the wetness of water isn't found in individual water molecules.

Weak Emergence: sophisticated but fundamentally different from human intelligence

- The observed abilities can still be **explained** by the underlying mechanisms,
- But their appearance is unexpected and simply difficult to predict.
- ~ modeling **traffic patterns** using the behavior of individual cars.

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Emergence - Jason Wei - OpenAI

137 emergent abilities of large language models — Jason Wei

As the size of the model increases, we see sudden improvements in its performance on certain tasks

for instance 3 digit addition

gradually increase size of model

- errors, errors, ..., errors, ...

and then suddenly

- correct

LLMs you can use

- Gemini (Colab)
- Gemini (aistudio.google.com)
- chatGPT (with memory)
- DeepSeek
- Claude.ai, (create a project)
- Gemini
- LLama
- ...

Google Colab

Google Colab

<div class="highlight"> Like google docs but also for executing code
Shareable, collaborative work

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A notebook is a series of executable cells

- code (python)
- text with Markdown

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

What you write

```
Simple Syntax

# Header 1

**this is bold**, not bold

[a link](https://sciencespo.fr)
```

What you get !

Simple Syntax

Header 1

this is bold, not bold

Demo

Movie Analysis

The dataset is available in the shared folder in google drive (csv file, google spreadsheet)

It contains information of a 1000 movies

- title
- description
- ranking (imdb, Meta)
- duration
- genres
- actors, director
- revenue

Demo

1. create a new notebook
2. upload the csv file
3. ask Gemini to
 - a. load the data
 - b. analyze the data
 - c. suggest & explain
 - d. extract information from the movie description
 - e. save the new data
4. share the notebook

Example of analysis notebook:

<https://colab.research.google.com/drive/1KWmqZRSg7O2gJEWtY8NroUYX68TLkEL9#scrollTo=yoLD0yLL0Phc>

Next time

Colab and AI

In Colab

- Load a dataset
- prompt Gemini on what questions you can ask on this dataset
- prompt Gemini to create the code to answer your questions

Create your Project

- Create your team
- Define your project
- Share your project definition
- Announce on the discord channel #sciencespo-dhum25a43 and we will create the related drive folders and subchannels

Need help ?

1. Ask an LLM

2. We are available on discord

a. if possible, please post in the course channel #sciencespo-dhum25a43 not in private messages, so all can contribute