# Preface

"The proper study of man is anything but himself, and it is through the study of language that we learn about our own nature." – J.R.R. Tolkien

Language is a foundation for humanity. It is through language that we have elevated ourselves, from the silence of nature. First we existed, then our essence was granted by a Voice. We shared with one another. We started telling each other stories, sometimes simply relaying information, sometime making things up. We elaborated ideas, started reasoning about them, turning them into plans. A sound became words – letters, semantics, lexicons – words transformed into writings, writing into books, books into cultures, cultures into civilizations. Leading us all the way to the current digital age, with the inter-connected-net of articles, blogs, images, videos. All this content that started to feed machines, eager to learn.

Ever since the release of an apparently harmless chatbot application, we have observed an acceleration in the development of language modeling. Artificial intelligence has marked a new epoch in our relationship with language. These models, built on the crunching of numbers by the largest supercomputers in the world, have enabled computers to understand and generate human language with unprecedented accuracy. The next wave that is gradually taking the human away from the conversational loop is AI agents. Agents build on large language models, but they can act autonomously, by using tools and carrying out entire workflows without necessarily needing tight supervision from end-users, such as browsing the web to perform research and analysis, to return detailed reports.

This book is designed to equip you with the knowledge and skills needed to harness the power of agents, opening new horizons in the field of artificial intelligence. Whether you are a seasoned developer or a curious enthusiast, this practical guide will help you navigate the complexities of building AI agents, transforming your ideas into reality.

## Who is this blog for

Ever heard of FOMO (Fear Of Missing Out)? This is probably what you are feeling with everything happening in the field of AI. Every month comes with something new, and it might feel overwhelming. You might not know where to start, as you probably wonder if and how it might affect your career. Then you are in the right place; I’ll make sure you find just what you need in this blog.

I am assuming that you are *NOT an AI expert* (quite the opposite actually). If you already have some notions of what machine learning means, those might prove useful as we go deeper into describing what Generative AI is and how it differs from the previous waves of AI.

You are probably *tech savvy*, with likely some background in scientific or technical studies. Don’t worry, I won’t use gory mathematical equations to explain the concepts manipulated in the blog. Instead, I’ll use concrete example of simple applications you can develop and tailor to your needs.

I’ll assume some *basic programming skills*, but no necessary experience with AI libraries like scikit-learn or pytorch. I would be good for you to have some basics of numeric, with libraries like numpy and pandas. Those should be easy to acquire. Overall, you should have some appetite for coding, as it will make this experience much more enjoyable and give you a deeper understanding of the concepts.

## About the author

I graduated from college with a degree in mechanical engineering. Some of the course that I really got into involved numerical analysis with Maple and Mathematica. But it’s only after my studies, that I started to learn about data science and machine learning. This was 2013 and the rise of online courses, so like many, I followed the Stanford course from Andrew Ng on Coursera[[1]](#footnote-1).

I discovered myself a passion about technical computing, and joined a French start-up called Scilab. They were spinning off from the French research to build a consulting business around open-source software. It ended up being an exciting but challenging journey, with some new cloud products roll out and an acquisition a few years later. As I was learning more about the ways of open-source, I encountered another programming language, Python, that I fell in love with.

Then in the beginning of 2020, as the world was starting to lock down, I got a call from a company in Boston to work on the famous software MATLAB, the leader in technical computing. A few years later, here I am, more passionate than ever about numeric and eager to learn about its new forms, mostly called AI now. And the best way to learn is to teach. So, buckle up, and let’s go for the ride!

*Disclaimer*: I have used ChatGPT to help me write this blog. But I would argue that the person who does not leverage AI to do her work is going to be left behind. Or said in a more politically correct tone: “You won’t be replaced by AI, but you’ll be replaced by someone using AI”. To read more about the potential of AI as an assistant, I’d recommend reading “Impromptu”.[[2]](#footnote-2)

## Setting up the Programming Environment

This section will guide you through the necessary tools, libraries, and hardware requirements, followed by a step-by-step setup process.

I’ll take as assumption that you are running on a Windows machine. Wherever there is a major difference in OS, I’ll try to make sure that I give explanations for the different platforms.

* Connect “LLMs with MATLAB”

Large Language Models (LLMs) with MATLAB[[3]](#footnote-3) (a.k.a. “LLMs with MATLAB”) is the official library provided by MathWorks for interacting with the OpenAI APIs as well as other LLMs. There are two ways you can install this library manually or programmatically:

1. Go to “Add-Ons” in the Home tab of MATLAB interface to open the Add-On Explorer.
2. Search “Large Language Models (LLMs) with MATLAB”.
3. Click “Add” to install the package.
4. Add it manually to your MATLAB path:

Or

folderName = 'llms-with-matlab';

if ~isfolder(folderName)

gitclone("github.com/matlab-deep-learning/llms-with-matlab");

else

disp('The folder already exists.');

end

addpath(genpath("llms-with-matlab")

* API Keys and Authentication (For OpenAI)

Obtain an API key from OpenAI by registering on their platform. Set up authentication by adding your API key to your environment variables with an .env file.

1. Create a new file in the editor:  
   >> edit .env
2. Type *OPENAI\_API\_KEY=<your key>* and save it as an .env file (the file won’t appear by default in the file browser in MATLAB Online, but you can change this setting)
3. Load your API key every time you start a new MATLAB session:

>> load(".env")

1. Retrieve your API key:

>> getenv("OPENAI\_API\_KEY")

* Test Installation

Verify your setup by running a small script to interact with the OpenAI API.

addpath("path/to/llms-with-matlab");

loadenv("path/to/.env");

client = openAIChat( ...

ApiKey=getenv("OPENAI\_API\_KEY"), ...

ModelName="gpt-4o-mini");

res = generate(client,"Say this is a test")

* Use MATLAB Online

Throughout this blog, we will use MATLAB Online[[4]](#footnote-4), which provides MATLAB, Simulink, and other commonly used toolboxes in the web browser. MATLAB Online is free for up to 20 hours a month without a license, hence it is one of the most accessible options. You can use it without the monthly cap if you have an existing commercial, academic, or home license. You can also use the desktop version of MATLAB. If you are new to MATLAB, create a MathWorks account to get access to MATLAB Online.

MATLAB Online always comes with the latest version of the MATLAB language and development environment. At the time of this writing, I am using 24b. MATLAB Online also provides a pre-installed version of Python (3.10 compatible with MATLAB 24b). Here is a table of the versions of Python compatible with MATLAB, should you choose to install everything locally[[5]](#footnote-5):

| **Release** | **Python versions supported** |
| --- | --- |
| R2024b | 3.9, 3.10, 3.11, 3.12 |
| R2024a | 3.9, 3.10, 3.11 |
| R2023b | 3.9, 3.10, 3.11 |
| R2023a | 3.8, 3.9, 3.10 |
| R2022b | 2.7, 3.8, 3.9, 3.10 |
| R2022a | 2.7, 3.8, 3.9 |

You can download Python from the official Python website[[6]](#footnote-6).

* Install Python packages in MATLAB Online[[7]](#footnote-7)

In my book about MATLAB with Python, I go over a simple way to install Python packages into MATLAB Online.

First you need to retrieve pip

>> websave("get-pip.py","https://bootstrap.pypa.io/get-pip.py");

>> !python get-pip.py

>> !python -m pip --version

pip 24.2 from /home/matlab/.local/lib/python3.10/site-packages/pip (python 3.10)

You can now simply install a package like langchain and transformers as such:

>> !python -m pip install langchain transformers

*LangChain*[[8]](#footnote-8) is useful for chaining language model calls and building complex applications. *Transformers[[9]](#footnote-9)* is a popular library for working with open-source AI models. You will learn about those packages later in the blog, and how to invoke them from MATLAB.

Bear in mind that the MATLAB Online environment is ephemeral, and that you will have to repeat this process each time you start a new session.

1. <https://www.coursera.org/specializations/machine-learning-introduction> [↑](#footnote-ref-1)
2. <https://www.impromptubook.com/> [↑](#footnote-ref-2)
3. <https://github.com/matlab-deep-learning/llms-with-matlab> [↑](#footnote-ref-3)
4. <https://www.mathworks.com/products/matlab-online.html> [↑](#footnote-ref-4)
5. <https://www.mathworks.com/support/requirements/python-compatibility.html> [↑](#footnote-ref-5)
6. [www.python.org](http://www.python.org) [↑](#footnote-ref-6)
7. <https://github.com/yanndebray/matlab-with-python-book/blob/main/8_Resources.md> [↑](#footnote-ref-7)
8. <https://www.langchain.com/> [↑](#footnote-ref-8)
9. <https://huggingface.co/docs/transformers> [↑](#footnote-ref-9)