Exploring Prompt Engineering with Python

Connect.it The Future of Python

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March 12th 2024

Outline

1. Welcome to Endava's Connect.IT
2. What are Large Language Models?
3. Prompt Engineering
   - Basic Techniques
4. Let's Code with Star Coder Model

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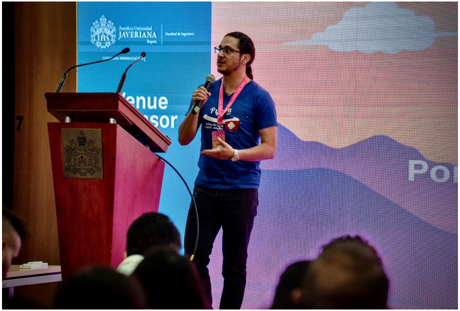
Welcome!

Endava's Connect.IT is a series of events that bring together the best minds in tech to discuss the latest trends and innovations in the industry.

Meet the Speaker II



2016 ~

- *PyCon Colombia* and *Python Bogotá* **Co-organizer**.
- Former **Software Engineer** and **Technical Leader** of Machine Learning and Data Science.
- **Professor** at *UD Francisco José de Caldas* and **MLOps Engineer** at *KLYM*.
- **Speaker** at IEEE conferences, colleges, meetups, . . .

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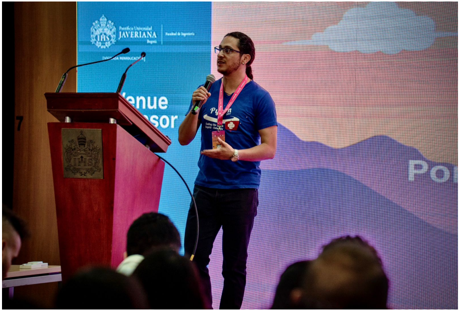

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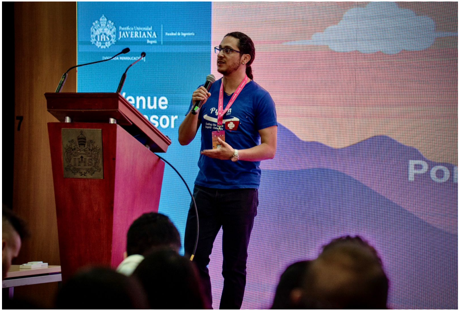

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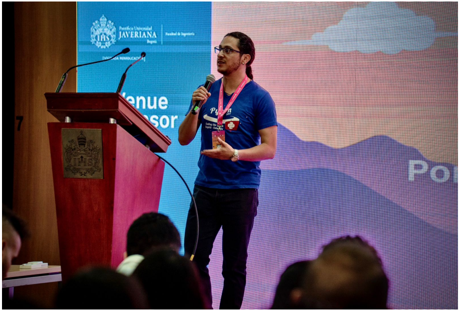

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Neural Networks and Natural Language Processing

80's → > 2000

Neural Networks

- **Artificial Neural Networks** are a computational model inspired by the human brain.
- They are based on a collection of connected units or nodes called **artificial neurons**.
- Each connection can **transmit a signal** from one artificial neuron to another.

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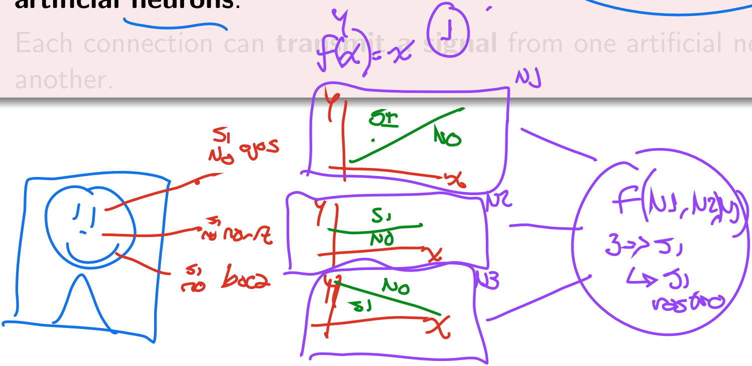

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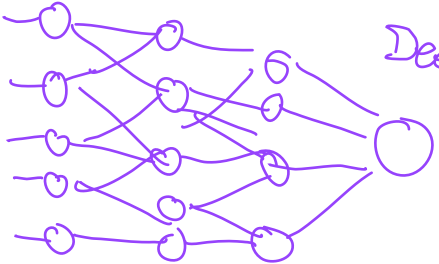


Deep Learning

Neural Networks and Natural Language Processing

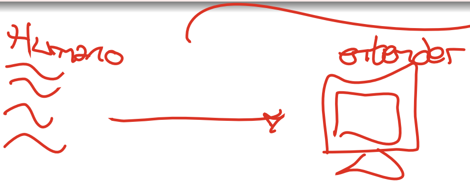
60's → >2008

Natural Language Processing

- **Natural Language Processing** (NLP) is a subfield of linguistics, computer science, and artificial intelligence.
- It is concerned with the interactions between computers and human language.

Sujeto + Verbo + Complemento

- In particular, the programming of computers to **process and analyze** large amounts of natural language data.



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Andrej Kaparty < ex-Tesla
OpenAI (ChatGPT)

Neural Networks and Natural Language Processing

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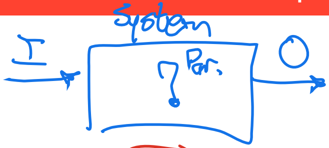
Inputs, Parameters, Outputs



token token2

Las naranjas som amarillas

In the context of LLMs, we can say that: 3 trillions

- **Inputs** are sequences of tokens.
- **Parameters** are weights and biases. 150 billions
- **Outputs** are sequences of tokens.

weight bias

$$f(x) = \hat{a}x + b$$

Las frutas co....

→ GPT-4

3 weeks ≈ 25000 gpu

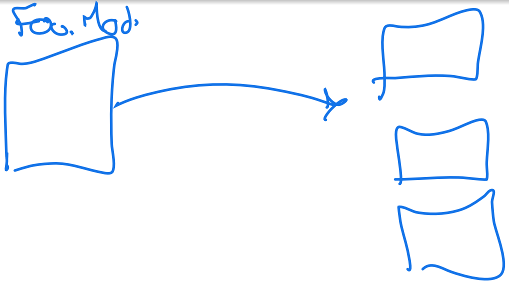
$ 190 millions USD

Foundational Models

What are foundational models?

- **Foundational models** are the first and largest language models.
- They are pre-trained on large corpora of text.
- They could be fine-tuned on specific tasks.

Few days



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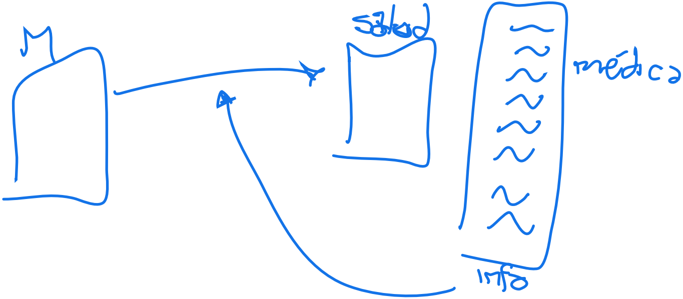

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Basic Concepts

What is Prompt Engineering?

- **Prompt engineering** is the process of designing and constructing prompts for large language models.
- Make the model more effective and efficient, also avoiding bias and unwanted outputs. . . or hallucinations.

Input
- question
- request

Basic Concepts

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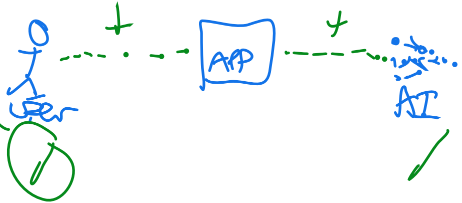
wrong response



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Chain of Thought Prompting

Keypoints

- **Chain of Thought Prompting** is a technique that involves prompting a model with a series of questions.
- The answers to the questions are used as inputs to subsequent questions.
- This technique is useful for eliciting detailed and coherent responses.

Q. código Python sumar?

A.
```
def sum(n1, n2):
    return n1+n2
```

Q. código python restar?

A.
```
def rest(n1, n2):
    return n1-n2
```

código Python multiplicar?

ENTER

↳
```
def mult(n1, n2):
    return n1*n2
```

Zero-Shot Prompting

- **Zero-shot prompting** is a technique that involves prompting a model with a single question.
- The model is expected to generate a coherent and relevant response.

¿ _ _ _ ? → ____

Few-Shot Prompting

- **Few-shot prompting** is a technique that involves prompting a model with a small number of examples.
- This technique is useful for eliciting specific and targeted responses.

Código Python sumar?

```
def sum(n1: int, n2: int) -> int:
    """
    """
    return n1+n2
```

Código Python restar?

```
def rest(n1: int, n2: int)->int:
    """
    """
    return n1-n2
```

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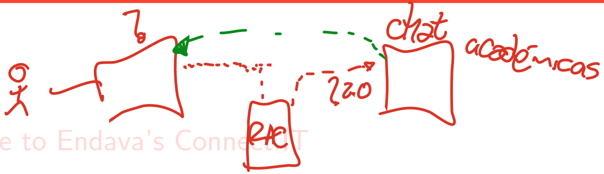

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Star Coder from Hugging Faces

- **Star Coder** is a large language model developed by Hugging Face.
- It is pre-trained on a large corpus of code. Also, it is fine-tuned on a large dataset of code.
- Star Coder 2 support more than 80 programming languages.
- The largest version of this *family* has 15B parameters. There are another versions of 3B and 7B parameters.
- Those versions had been trained using between three and four trillion of tokens. The Stack is used as main source of data.

Setup Python & Any IDE

- Here you need to have Python installed and VS Code and Jupyter Notebook extension.
- It works at any python version, but it is recommended to use python 3.10 or newer.
- As IDE, it is recommended to use VS Code. It is FOSS, and have a lot of useful extensions.
- The required packages are:

```
# no one
```

Open Assistant's Dataset. . . for your own chat assistant

Open Assistant's dataset is a large dataset of code that useful to make fine-tunning on Star Coder. It is available on Hugging Face's model hub.

Open Assistant's has more than 40000 conversations, switching roles between human and assistant.

Open Assistant's has a permissive licence and had been totally produced by humans.

Link: https://huggingface.co/datasets/OpenAssistant/oasst1

Steps to Make the Tests

1. Create an account at Hugging Face.
2. Create a bearer token, and install StarCoderEX extension in VS Code.
3. Open in the web browser the Code Llama Playground.
4. It is time to interact with the code generators.

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Let's Give a Shoot. . . or a few

Please, try next prompts:

1. *"Create in Python a function to sum two numbers."*
2. *"Create in Python a function called my_sum_2 to calculate the sum of two integer parameters called num_1 and num_2, adding doctring to the function."*

Let’s Give a Shoot. . . or a few

Create a multiplication function, but with another examples.

Q. Create in Python a function to calculate the sum of two numbers.

A.

```
def my_own_sum(num_1: int, num_2: int) -> int:
    """This method sums two numbers.
    Parameters:
    - num_1 (int): The first number to be added.
    - num_2 (int): The second number to be added.
    Returns:
    - int: The sum of the two numbers.
    """
    return num_1 + num_2
```

Let's Give a Shoot. . . or a few

Create a multiplication function, but with another examples.

Q. Create in Python a function to calculate the subtraction of two numbers.

```
A.  def my_own_subtract(num_1: int, num_2: int) -> int:
        """This method subtracts two numbers.
        Parameters:
        - num_1(int): The first number to be subtracted.
        - num_2(int): The second number to be subtracted.
        Returns:
        - int: The subtract of the two numbers.
        """
        return num_1 - num_2
```

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Thanks!!

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