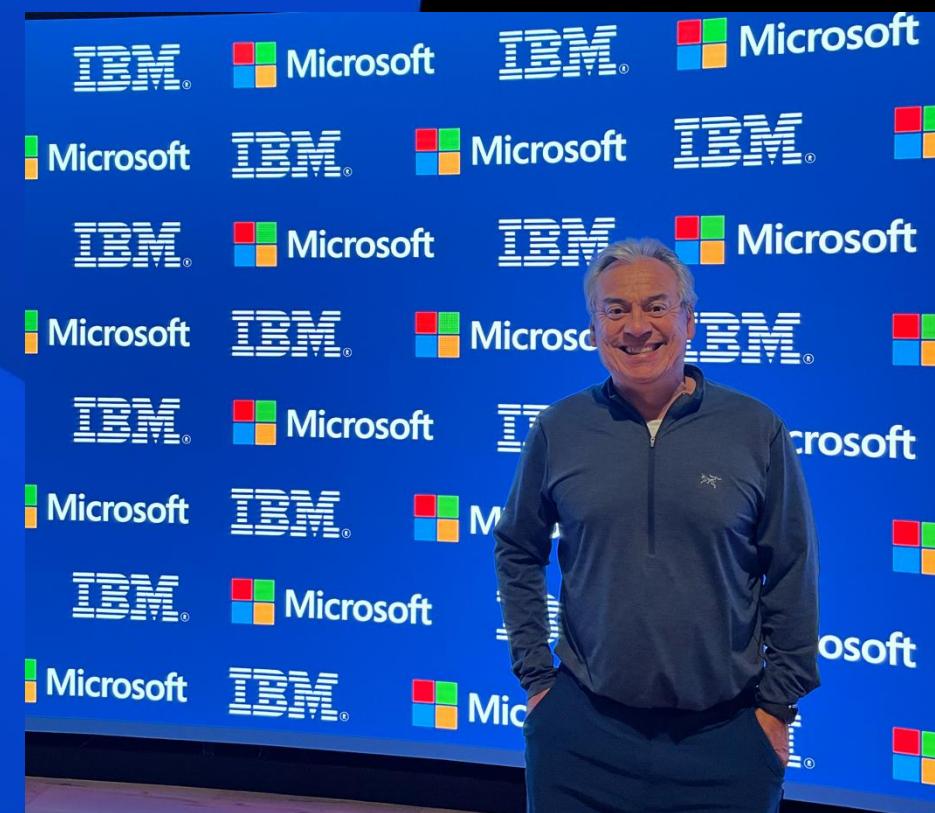


# The Future of AI: Transforming Our World Over the Next 5 Years

## AI Fundamentals

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<https://github.com/iportilla/tech>



# Disclaimer

- The views expressed **are my own** and not necessarily those of Ricoh USA or affiliated organizations.
- Information presented reflects my current understanding of AI, which is a rapidly evolving field.
- This presentation is for informational and educational purposes only.
- Content should not be considered professional advice.
- Interpretations of AI concepts may vary, and accuracy cannot be guaranteed.

# Objectives of This Talk

Upon completion of this lecture, you will understand:

- Primer on Artificial Intelligence (AI)
- Generative AI (GenAI) & Large Language Models (ChatGPT)
- GenAI @ Work
- Demonstrations

# Agenda

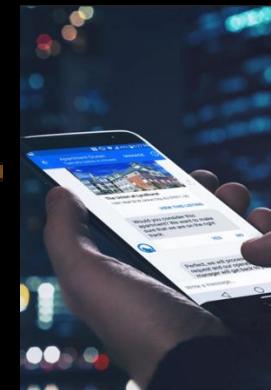
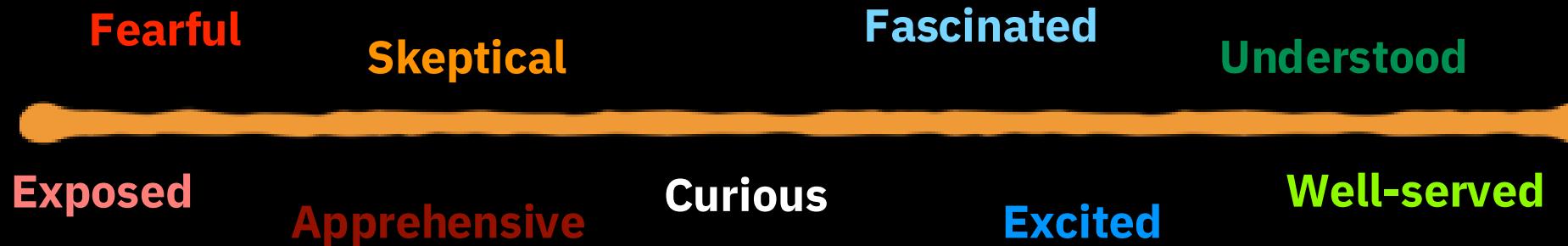
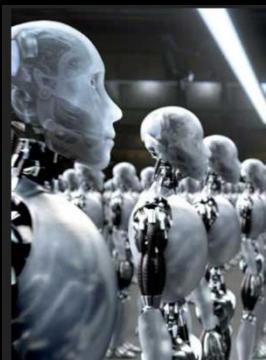
1. Artificial Intelligence
2. Coding w AI
3. Prompt Engineering
4. Look ahead

<https://github.com/iportilla/TECH>

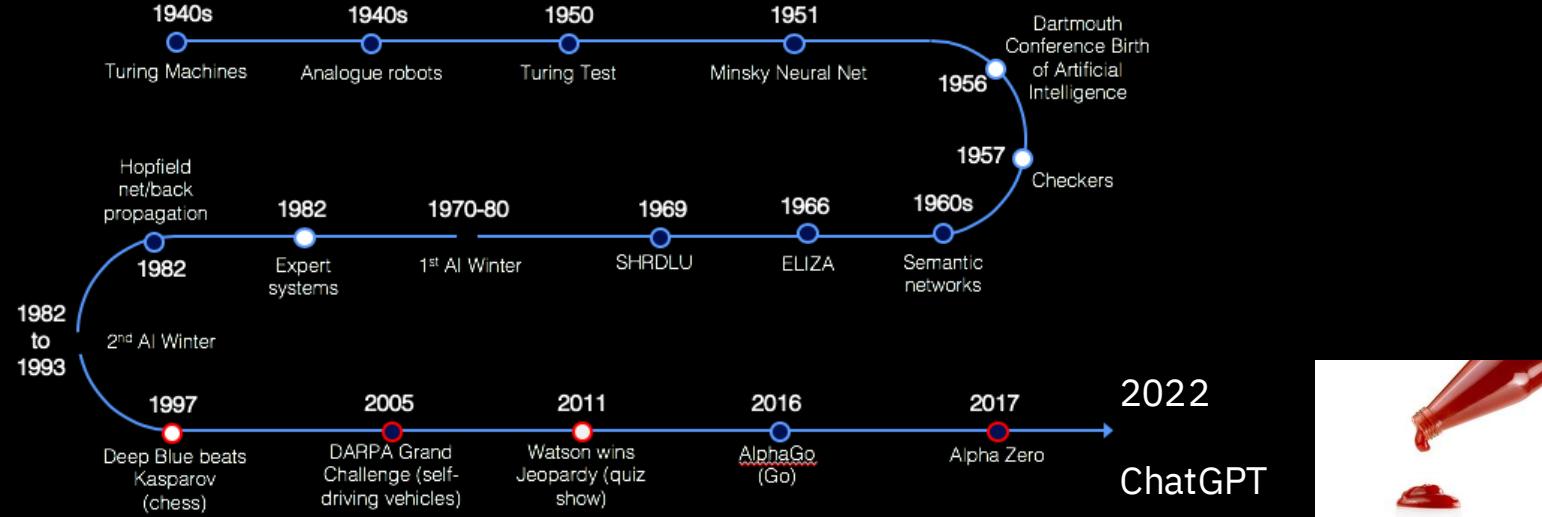
# What is AI?

# AI Perception

What do people feel about AI?

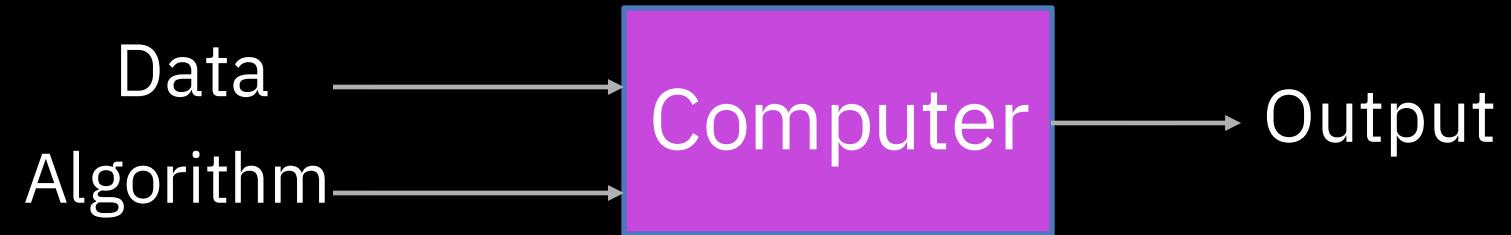


# A brief history of AI

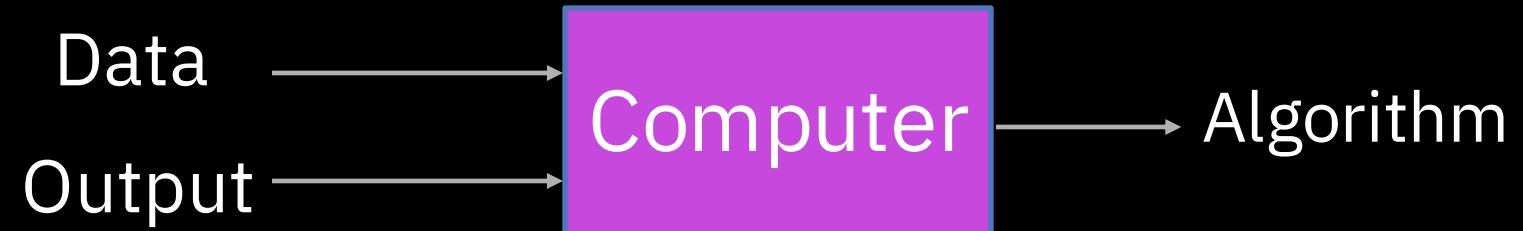


# Why Machine Learning?

Traditional Programming



AI-Machine Learning



ML provides systems the ability to automatically learn from experience  
(without being explicitly programmed)

# GenAI

Artificial Intelligence

Machine Learning

Deep Learning

Generative AI



**Artificial Intelligence**

Intelligence demonstrated by machines



**Machine Learning**

Learn from data



**Deep Learning**

Model after the human brain (Neural Networks)



**Generative AI**

Create new written, visual, and auditory content

# Generative AI

The best thing about AI is its ability to ...

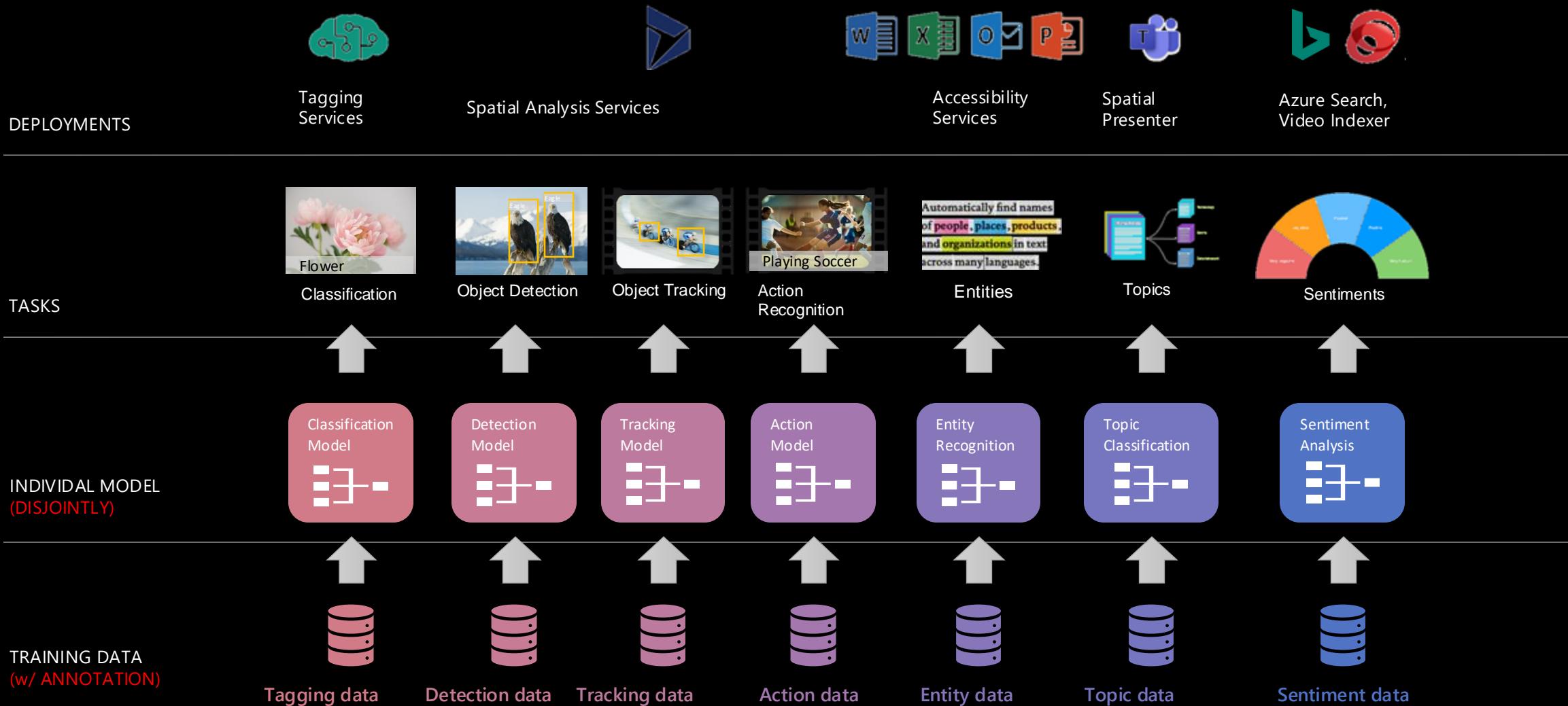
Adapt = 30%

Process = 22%

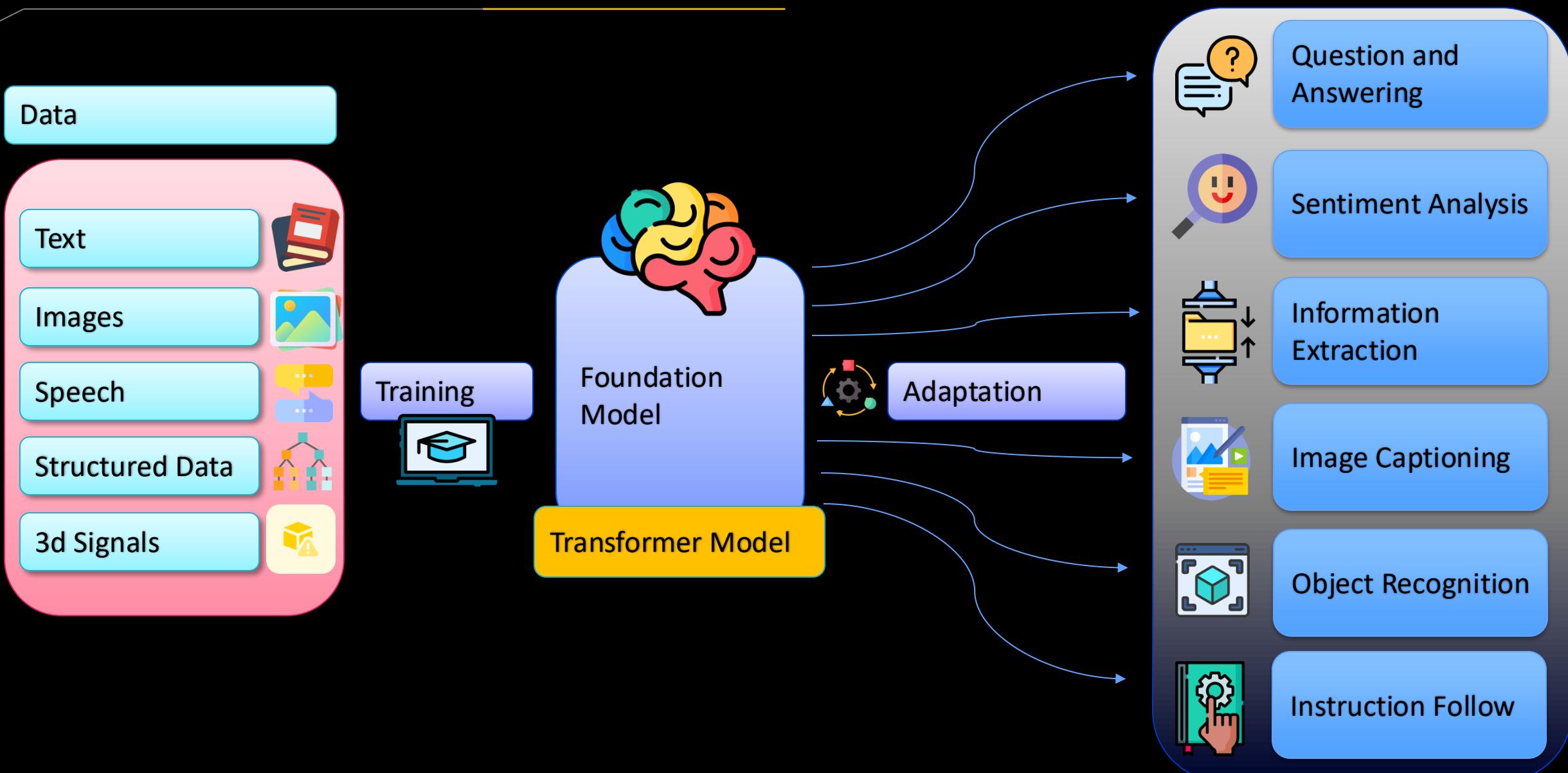
Analyze = 7%

# Traditional model development

High cost & slow deployment - Each service is trained disjointly



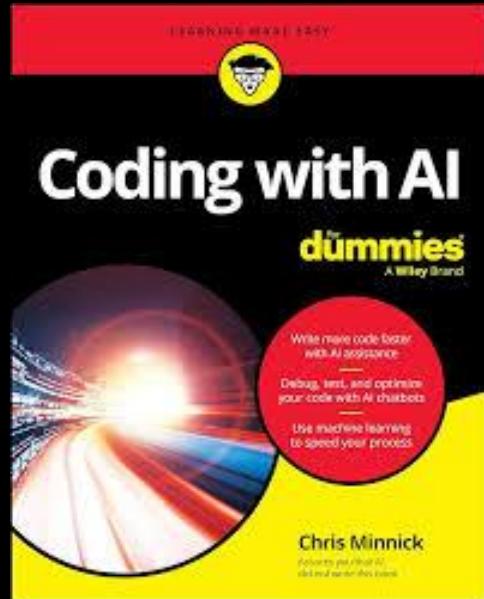
# Foundation Models



[https://platform.openai.com/playground?  
mode=complete](https://platform.openai.com/playground?mode=complete)

# Leveraging AI in Coding

Techniques, Tools, and Best Practices



## I. Techniques & Technologies

1. Benefits
2. Parsing ML/DL
3. AI coding tools
4. Coding w chatbots

## II. Using AI to write code

5. From plan to prototype
6. Formatting & improving code
7. Find, eliminate bugs
8. Translate & optimize code

## III. Test, Document & Maintain code

9. Testing your code
10. Documenting your code
11. Maintaining your code

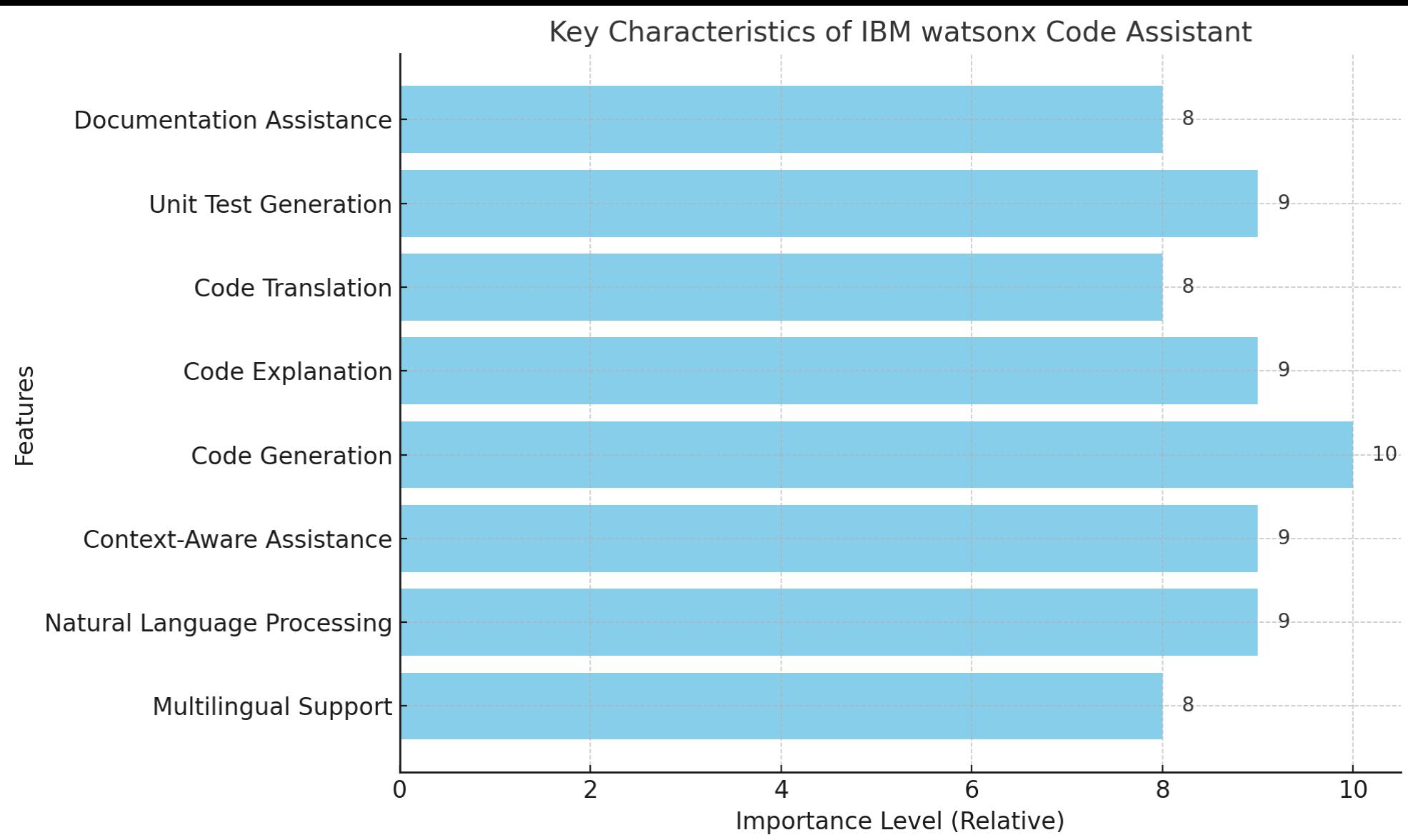
55% faster coding  
60% code acceptance  
75% less frustrated



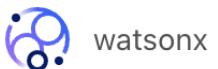
Aspect	IBM watsonx Code Assistant	GitHub Copilot									
Ease of Use	Highly accessible due to natural language prompts, suitable for all skill levels.	Easy to integrate with IDEs like VS Code and JetBrains tools.									
Supported Languages	Multilingual support (Python, Java, C++, Go, TypeScript, etc.).	Similar multilingual support with strengths in Python, JavaScript, and TypeScript.									
Code Explanation	Offers detailed explanations for existing code, making it great for understanding unfamiliar code.	Limited explanation capabilities; focuses more on code generation.									
Context-Awareness	Advanced context awareness for specific tasks and workflows.	<table border="1"><thead><tr><th>Developer Level</th><th>IBM watsonx Code Assistant</th><th>GitHub Copilot</th></tr></thead><tbody><tr><td>Junior Developers</td><td>- May feel overwhelming due to advanced features.- Enterprise focus may limit accessibility.</td><td>- Intuitive and easy to use.- Helps juniors learn coding patterns through autocompletion.</td></tr><tr><td>Senior Developers</td><td>- Tailored for advanced use cases, including cross-language projects and enterprise workflows.- Documentation and explanation aid in team collaboration.</td><td>- Limited advanced features.- Best for rapid prototyping and coding tasks rather than deep customization.</td></tr></tbody></table>	Developer Level	IBM watsonx Code Assistant	GitHub Copilot	Junior Developers	- May feel overwhelming due to advanced features.- Enterprise focus may limit accessibility.	- Intuitive and easy to use.- Helps juniors learn coding patterns through autocompletion.	Senior Developers	- Tailored for advanced use cases, including cross-language projects and enterprise workflows.- Documentation and explanation aid in team collaboration.	- Limited advanced features.- Best for rapid prototyping and coding tasks rather than deep customization.
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Integration	May require specific tools for integration, designed for IBM's ecosystem.	Seamless integration with GitHub repositories, VS Code, and JetBrains IDEs.									
Pricing	Enterprise-focused pricing; suitable for teams and large-scale projects.	Subscription-based pricing with free tiers for students and small projects.									
Customization	Allows customization for domain-specific tasks using IBM's Granite models.	Limited customization but supports open-source models.									
Best Use Cases	Enterprise-grade solutions, complex workflows, and teams needing high context-awareness and documentation.	Individual developers or teams looking for rapid prototyping and integration with GitHub workflows.									

# Code smarter, not harder: **watsonx** Code Assistant

## Agenda



# Code generation

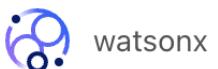


Hi, how can I help you today?

You

Write a Python script that connects to a MongoDB database, retrieves documents from a 'users' collection, and prints usernames and their corresponding email addresses.

:



# Assisted by watsonx Code Assistant  
import pymongo

# Connect to MongoDB  
client = pymongo.MongoClient("mongodb://localhost:27017/")

# Access the 'users' collection  
db = client["mydatabase"]  
collection = db["users"]

# Retrieve documents and print usernames and email addresses  
for document in collection.find():  
 print(f"Username: {document['username']}, Email: {document['email']}")

□

Note: This script assumes that a MongoDB database named 'mydatabase' exists on the local machine, and a 'users' collection with documents containing 'username' and 'email' fields.



# Code completion

primes.py 1 ● main.py 2 Settings

Users > jportilla > Downloads > primes.py > ...

```
1 #calculate primes less 100
2 #172.27.36.41:11434
3
4 def calculatePrimes(n):
5     primes = []
    for num in range(2, n+1):
        is_prime = True
        for i in range(2, int(num**0.5) + 1):
            if num % i == 0:
                is_prime = False
                break
        if is_prime:
            primes.append(num)
    return primes
```

# Code Explanation

Chat session 1

watsonx

Hi, how can I help you today?

You

main.py explain this code :

watsonx

This code is a Python script that uses the MLflow library to train a machine learning model. The script takes in several input arguments, including the path to the input data, the test-train ratio, the number of estimators, the learning rate, and the name of the registered model. The script starts by parsing the input arguments using the argparse module. It then starts a new MLflow run and enables autologging for the sklearn module.

Next, the script prepares the data by reading an Excel file using the pandas library, splitting the data into training and testing sets, and extracting the label column.

The script then trains a GradientBoostingClassifier model using the training data and logs the number of samples and features. It also logs the classification report for the predicted values.

Finally, the script registers the model with MLflow and saves it to a file. Overall, this code is a good example of how to use MLflow to train and register a machine learning model in Python.

Upvote

src > main.py > ...

```
10 ✓ def main():
11     """Main function of the script."""
12
13     # input and output arguments
14     parser = argparse.ArgumentParser()
15     parser.add_argument("--data", type=str, help="path to input data")
16     parser.add_argument("--test_train_ratio", type=float, required=False, default=0.25)
17     parser.add_argument("--n_estimators", required=False, default=100, type=int)
18     parser.add_argument("--learning_rate", required=False, default=0.1, type=float)
19     parser.add_argument("--registered_model_name", type=str, help="model name")
20     args = parser.parse_args()
21
22     # Start Logging
23     mlflow.start_run()
24
25     # enable autologging
26     mlflow.sklearn.autolog()
27
28 #####
29 #<prepare the data>
30 #####
31 print(" ".join(f'{k}={v}' for k, v in vars(args).items()))
32
33 print("input data:", args.data)
34
35 credit_df = pd.read_excel(args.data, header=1, index_col=0)
36
37 mlflow.log_metric("num_samples", credit_df.shape[0])
38 mlflow.log_metric("num_features", credit_df.shape[1] - 1)
39
40 ✓ train_df, test_df = train_test_split(
41     credit_df,
42     test_size=args.test_train_ratio,
43 )
44 #####
45 #</prepare the data>
```

# Code Translation

Chat session 1

AI

write similar function in java main.py :

watsonx

```
// Assisted by watsonx Code Assistant
//main.py
import os
import argparse
import pandas as pd
import mlflow
import mlflow.sklearn
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.metrics import classification_report
from sklearn.model_selection import train_test_split

def main():
    """Main function of the script."""

    // input and output arguments
    parser = argparse.ArgumentParser()
    parser.add_argument("--data", type=str, help="path to input data")
    parser.add_argument("--test_train_ratio", type=float, required=False, default=0.25)
    parser.add_argument("--n_estimators", required=False, default=100, type=int)
    parser.add_argument("--learning_rate", required=False, default=0.1, type=float)
    parser.add_argument("--registered_model_name", type=str, help="model name")
    args = parser.parse_args()

    // Start Logging
    mlflow.start_run()

    // enable autologging
    mlflow.sklearn.autolog()

#####
#<prepare the data>
#####
print(" ".join(f"{k}={v}" for k, v in vars(args).items()))

print("input data:", args.data)

credit_df = pd.read_excel(args.data, header=1, index_col=0)

mlflow.log_metric("num_samples", credit_df.shape[0])
mlflow.log_metric("num_features", credit_df.shape[1] - 1)

train_df, test_df = train_test_split(
    credit_df,
    test_size=args.test_train_ratio,
)
#####
#</prepare the data>
#####

#####
#<train the model>
#####
# Extracting the label column
y_train = train_df.pop("default payment next month")

# convert the dataframe values to array
X_train = train_df.values

# Extracting the label column
y_test = test_df.pop("default payment next month")

# convert the dataframe values to array
X_test = test_df.values
```

Enter / for commands

# Code Test

Chat session 1

Prompt library

- Develop a GoLang HTTP server that serves a simple REST API for managing a collection of books. Implement CRUD operations (Create, Read, Update, Delete) for book entities, storing data in an in-memory data structure.
- Develop JUnit test cases for a Java class that represents a simple calculator with methods for addition, subtraction, multiplication, and division.
- Write Golang test functions for a package that handles image processing. Include test cases for image resizing and format conversion.
- Write JUnit test cases for a Java class that implements a stack data structure. Include tests for push, pop, and peek operations, as well as handling edge cases such as an empty stack.
- Add comments to a C++ class representing a file handling utility. Include comments for methods handling file reading, writing, and error handling.

watsonx

Here's an example of JUnit test cases for a Java class that implements a stack data structure:

```
// Assisted by watsonx Code Assistant
import org.junit.jupiter.api.Test;
import static org.junit.jupiter.api.Assertions.*;

public class StackTest {

    Stack<Integer> stack = new Stack<>();

    @Test
    public void testPush() {
        stack.push(1);
        assertEquals(1, stack.peek());
        stack.push(2);
        assertEquals(2, stack.peek());
    }

    @Test
    public void testPop() {
        stack.push(1);
        stack.push(2);
        assertEquals(2, stack.pop());
        assertEquals(1, stack.pop());
    }

    @Test
    public void testPeek() {
        stack.push(1);
        assertEquals(1, stack.peek());
        stack.push(2);
        assertEquals(2, stack.peek());
    }

    @Test
    public void testEmptyStack() {
        Exception exception = assertThrows(Exception.class, () -> stack.peek());
        assertEquals("Stack is empty", exception.getMessage());
    }
}
```

# Code Translation

/translate from python to java main.py

:



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```
// Assisted by watsonx Code Assistant
import java.io.File;
import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.Paths;
import java.util.List;
import java.util.stream.Collectors;

public class Main {
    public static void main(String[] args) {
        String data = args[0];
        double testTrainRatio = Double.parseDouble(args[1]);
        int nEstimators = Integer.parseInt(args[2]);
        double learningRate = Double.parseDouble(args[3]);
        String registeredModelName = args[4];

        // Start Logging
        Mlflow.startRun();

        // enable autologging
        Mlflow.sklearn.autolog();

        // Prepare the data
        System.out.println("input data: " + data);
        List<String> lines = null;
        try {
            lines = Files.readAllLines(Paths.get(data));
        } catch (IOException e) {
            e.printStackTrace();
        }
        String csvData = String.join("\n", lines);
        String[] csvLines = csvData.split("\n");
        String[] header = csvLines[0].split(",");
        String[] dataLines = new String[csvLines.length - 1];
```

# Code Documentation

/document  
/docs

You

/document main.py :

watsonx

```
# Assisted by watsonx Code Assistant
def main():
    """Main function of the script.

Args:
    --data (str): path to input data
    --test_train_ratio (float): test/train split ratio (default: 0.25)
    --n_estimators (int): number of estimators (default: 100)
    --learning_rate (float): learning rate (default: 0.1)
    --registered_model_name (str): model name

Returns:
    None
    """
```

Like Dislike

# Prompt Engineering

# Copilot Prompt Best Practices

## Goal

What do you want from Copilot?

*"I want a list of 3-5 bullet points to prepare me..."*

## Context

Why do you need it and who is involved?

*"...for an upcoming meeting with [client], focusing on their current state and what they're looking to achieve."*

## Expectations

How should Copilot respond to best fulfill your request?

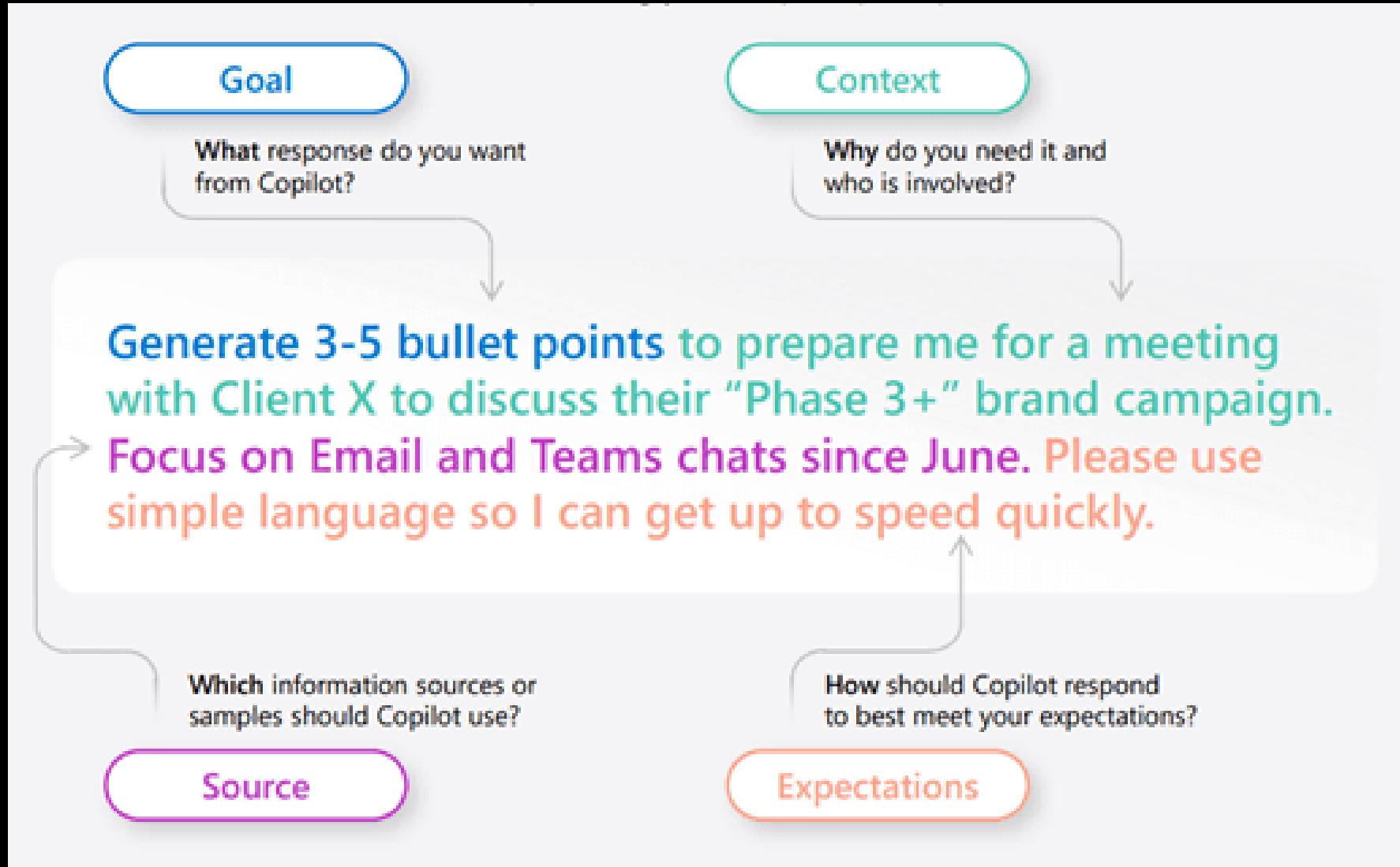
*"Respond with a tone that is friendly but authoritative..."*

## Source

What information or samples do you want Copilot to use?

*"... and focus on email and Teams chats with [people] over the last two weeks."*

# Copilot Prompt Best Practices



# Copilot Prompt Best Practices

**Prompt 1:** Write a blog post about sustainable practices in agriculture

**Prompt 2:** Craft a 1500-word blog post for a general audience interested in sustainability focusing on the significance and benefits of sustainable agricultural practices like organic farming and agroforestry. Include real-world examples, innovative technologies, and insights from reputable sources. Conclude with a reflection on the importance of these practices and a call for collective efforts to embrace them

[http://\[IP\]:3000/](http://[IP]:3000/)

# Text Classification

## Named Entity Recognition (Zero-Shot)

Extract the name and mailing address from this email:

Dear Kaylee,

It was great to talk to you at the seminar. I thought Jane's talk  
was quite good.

Thank you for the book. Here's my address 2111 Ash Lane,  
Boulder, CO 80301

Best,

Marilú

Name: Marilú

Mailing Address: 2111 Ash Lane, Boulder, CO 80301

# Text Classification

## Custom Named Entities (Few-Shot)

Extract job titles from the following sentences.

Sentence: Jane Doe has been working for Microsoft for 20 years as a Linux Engineer.

Job title: **Linux Engineer**

###

Sentence: Jane Doe has been working for Microsoft for 20 years and she loved it.

Job title: **none**

###

Sentence: Marc Simoncini | Director | Meetic

Job title: **Director**

###

Sentence: Damien is the CTO of Platform.sh, he was previously the CTO of Commerce Guys, a leading ecommerce provider.

Job title: **CTO**

# Text Classification

## Multi-Label Text Classification (Few-Shot)

The following is a list of movies and the **categories** they fall into:

Topgun: As students at the United States Navy's elite fighter weapons school compete to be best in the class, one daring young pilot learns a few things from a civilian instructor that are not taught in the classroom.

Category: **Drama, Action**

Hustle: A basketball scout discovers a phenomenal street ball player while in Spain and sees the prospect as his opportunity to get back into the NBA.

Category: **Comedy, Drama, Sport**

The Northman: From visionary director Robert Eggers comes The Northman, an action-filled epic that follows a young Viking prince on his quest to avenge his father's murder.

Category: **Action, Adventure, Drama**

# Abstractive Summarization

## Contact Center Summarization

Summarize this for a call center agent:

Agent: Thank you for calling ADM. Who am I am speaking to?

Customer: Hello, my name is Peter Smith. I own a small business and have some questions regarding payroll processing.

Agent: Good morning, Peter, before we get started may I ask you a few questions so that I better answer your questions today?

Customer: Thank you that is quite helpful. Are there specific regulations that I need to follow?

Agent: Certain aspects of payroll processing are regulated by the Internal Revenue Service (IRS) and the Department of Labor (DOL)

The agent is speaking to a customer named Peter Smith. Peter is asking for tips on manual payroll processing. The agent also informs Peter that certain aspects of payroll processing are regulated by the Internal Revenue Service (IRS) and the Department of Labor (DOL).

# Chain of Thought Pattern

# CoT Pattern

Q: A train is traveling at 60 miles per hour and needs to travel 120 miles. How long will the journey take?



Let's think step by step:

1. First, we know the train's speed is 60 miles per hour. This means in one hour, the train travels 60 miles.
2. Next, the total distance the train needs to cover is 120 miles.
3. To find the time it takes, we divide the total distance by the speed. This gives us:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{120 \text{ miles}}{60 \text{ miles per hour}} = 2 \text{ hours}$$

4. So, the train will take 2 hours to travel 120 miles.

# Few-Shot Reasoning (Human version)

## 1st Prompt

Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

Answer: The answer is 11.

The cafeteria has 23 apples. If they used 20 to make lunch and bought 6 more, how many do they have?

The answer is 27



## 2nd Prompt – Provide Reasoning

Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

Answer: Roger started with 5 balls. 2 cans of 3 tennis balls each is 6 tennis balls.  $5+6 = 11$ . The answer is 11.

The cafeteria has 23 apples. If they used 20 to make lunch and bought 6 more, how many do they have?

The cafeteria had 23 apples originally. They used 20 to make lunch. So they had  $23-20 = 3$ . They bought 6 more apples, so they have  $3 + 6 = 9$ . The answer is 9.



# Model Reasoning – Chain-of-Thought

## Before

What is the annual water demand of a single-family household containing four people who are at home an average of 200 days per year and use an average of 100 liters of water per day?

The annual water demand of a single-family household containing four people who are at home an average of 200 days per year and use an average of 100 liters of water per day is 8,000,000 liters per year..

## After

What is the annual water demand of a single-family household containing four people who are at home an average of 200 days per year and use an average of 100 liters of water per day?

Let's think step by step and explain the calculation step by step.

Step 1: Calculate the total number of days in a year:

There are 365 days in a year.

Step 2: Calculate the total number of days the family is at home:

The family is at home an average of 200 days per year.

Step 3: Calculate the total water demand of the family:

The family uses an average of 100 liters of water per day. Therefore, the total water demand of the family is  $100 \text{ liters} \times 200 \text{ days} = 20,000 \text{ liters per year}$ .

Step 4: Calculate the annual water demand of the single-family household:

The annual water demand of the single-family household is 20,000 liters per year.

# Chain of Thought Example:

## Planning a New Feature Launch

### Prompt:

“We’re planning to launch a new feature. Let’s outline a structured approach to ensure a successful launch. First, we’ll clarify the feature’s requirements. Next, we’ll list the development, testing, and deployment tasks. Then, we’ll define the timeline, assign resources, and anticipate potential risks. Finally, we’ll identify key milestones and checkpoints for monitoring progress.

### Chain of Thought Steps:

1. Define feature requirements and objectives.
2. Break down tasks by phase (development, testing, deployment).
3. Estimate timelines and allocate team resources.
4. Identify risks and create a mitigation plan.
5. Set milestones for tracking and accountability.

# Chain of Thought Example:

## Planning a New IT infrastructure upgrade

### Prompt:

“We're planning to implement a new IT infrastructure upgrade. Let's outline a structured approach to ensure a successful implementation.

### Chain of Thought Steps:

1. We'll define the technical specifications and objectives.
2. We will break down the tasks by phase, including design, development, and testing.
3. Then, we'll estimate the timelines and allocate team resources accordingly.
4. We'll also identify potential risks and create a mitigation plan.
5. Finally, we'll set milestones for tracking progress and ensuring accountability.

# Chain of Thought Example:

## Analyzing a Project Delay

### Prompt:

“Our project is behind schedule. To understand the cause, let's break down the possible factors contributing to this delay. First, let's list each phase of the project and its current status. Then, we'll evaluate any dependencies, resource issues, and task completion rates in each phase. Finally, we'll identify any specific bottlenecks and propose solutions.”

### Chain of Thought Steps:

1. List project phases and their statuses.
2. Identify key dependencies between tasks.
3. Evaluate resource allocation and team workload.
4. Pinpoint any bottlenecks or high-priority issues.
5. Suggest actions to recover from delays, such as re-allocating resources or reprioritizing tasks.

# Chain of Thought Example:

Designing and developing a new microcode function

## Prompt:

“We're planning to design and develop a new microcode function for an industrial-size printer. Let's outline a structured approach to ensure a successful implementation”

## Chain of Thought Steps:

1. We'll define the technical specifications and objectives of the new microcode function.
2. Next, we'll break down the tasks by phase, including design, development, and testing.
3. Then, we'll estimate the timelines and allocate team resources accordingly.
4. We'll also identify potential risks and create a mitigation plan.
5. Finally, we'll set milestones for tracking progress and ensuring accountability.

# Reason and Act Pattern

# ReACT Pattern

Q: Who was the 16th President of the United States, and in what year did they take office?



- **Thought:** I need to identify the 16th President of the United States and determine the year they took office. Let me look up who the 16th President was.
- **Action:** Search for "16th President of the United States."
- **Observation:** The 16th President was Abraham Lincoln.
- **Thought:** Now I need to find the year Abraham Lincoln took office. Let me look that up.
- **Action:** Search for "Abraham Lincoln inauguration year."
- **Observation:** Abraham Lincoln took office in 1861.

# ReACT Pattern

Q: Find the names of employees in the “Sales” department who have a salary greater than \$70,000.



- You are a database assistant. Use reasoning to determine the SQL query needed to answer the question. If additional information is needed, ask clarifying questions or state assumptions. Follow the format:
  - Thought: (Explain your reasoning)
  - Action: (Write or refine an SQL query)
  - Observation: (What you learn from executing the query or assumptions)
  - Final Answer: (Provide the final result if ready)

# ReACT Pattern

Q: Find the names of employees in the “Sales” department who have a salary greater than \$70,000.

Database Schema:

- Table: Employees
- Columns: EmployeeID, Name, Department, Salary

Question: Find the names of employees in the "Sales" department who have a salary greater than \$70,000.

# ReACT Pattern

Q: Find the names of employees in the “Sales” department who have a salary greater than \$70,000.

- Thought: I need to query the "Employees" table to find employees in the "Sales" department with a salary greater than \$70,000. The relevant columns are Name, Department, and Salary.
- Action: Write SQL query:

```
```sql
SELECT Name
FROM Employees
WHERE Department = 'Sales' AND Salary > 70000;
```

# ReAct Example:

## Handling a Scope Change

### Prompt:

“We have a last-minute scope change request from a client. Let’s reason through this scenario to decide if we should accept or defer it. First, we’ll assess how the change affects the current timeline, resources, and budget. Then, we’ll evaluate if there are any benefits to implementing the change now versus later. Finally, we’ll make a decision and outline the steps needed to communicate it to the client.”

### ReAct Steps:

- **Reasoning Step:** Evaluate how the scope change affects the project’s key metrics (timeline, resources, budget).
- **Action Step:** Decide whether to accept or defer the change.
- **Action Step:** Communicate the decision to the client, including reasoning and any alternative suggestions.

# ReAct Example:

## Evaluating a Project Risk

### Prompt:

“There’s a risk of a delay due to a supplier issue. Let’s carefully assess the impact of this risk and decide on a course of action. First, we’ll consider how critical this supplier is to our project timeline. Next, we’ll think of any backup suppliers or alternative solutions. Finally, we’ll either prepare a contingency plan or communicate with stakeholders about the risk.”

### ReAct Steps:

- **Reasoning Step:** Evaluate the dependency on this supplier and the delay’s potential impact on the timeline.
- **Reasoning Step:** Consider alternative suppliers or workarounds to minimize impact.
- **Action Step:** Decide whether to pursue a backup option or mitigate the risk in another way.
- **Action Step:** If needed, communicate the risk and contingency plan to stakeholders.

# ReAct Example:

Designing and developing a new microcode function

## Prompt:

“There’s a risk of a delay due to a supplier issue. Let’s carefully assess the impact of this risk and decide on a course of action.”

## ReAct Steps:

**Reasoning Step:** Evaluate the dependency on this supplier and the delay's potential impact on the timeline.

**Reasoning Step:** Consider alternative suppliers or workarounds to minimize impact.

**Action Step:** Decide whether to pursue a backup option or mitigate the risk in another way.

**Action Step:** If needed, communicate the risk and contingency plan to stakeholders.”

# Prompt Engineering Guide



1. Give clearer instructions



2. Split complex tasks into simpler subtasks



3. Structure the instruction to keep the model on task



4. Prompt the model to explain before answering



5. Ask for justifications of many possible answers, and then synthesize



6. Generate many outputs, and then use the model to pick the best one

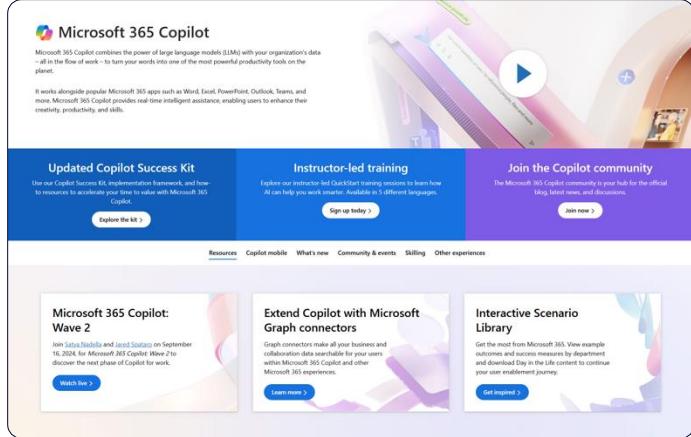


7. Fine-tune custom models to maximize performance



Look ahead

# Essential Copilot implementation resources



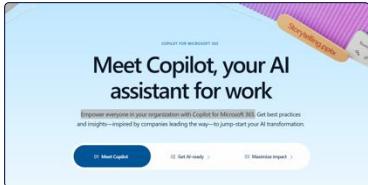
## [Microsoft 365 Copilot Hub](#)

Provides resources to help you drive the user enablement of Microsoft services:

- [\*\*Copilot Success Kit\*\*](#) – a holistic guide that helps you think through the Leadership, Human change, and Technical readiness implementation journeys.
- [\*\*Copilot Scenario Library\*\*](#) – provides business leaders inspiration on high-value scenarios to select, as well as KPIs they should measure for success.
- [\*\*Leading in the era of AI\*\*](#) – Practical guidance for leaders of all types to get the most from the adoption of AI capabilities.

## More resources

### [Meet Copilot](#)



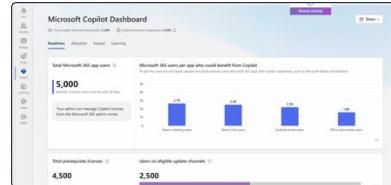
Empower everyone in your organization with Microsoft 365 Copilot.

### [Copilot Lab](#)



Learn the art of prompting.

### [Copilot Dashboard](#)



Business and IT leaders can plan their AI readiness, drive adoption, and measure impact.

# A day in the life of an IT Administrator



Available with:  
Microsoft 365 Copilot

Scenario level: ● ● ●  
[Buy](#)

Benefits

~1 hour per week

Areas of investment: Learning applications

Reducing alerts

7:30 am

Will arrives at the office and prompts Microsoft Copilot to check his emails and chats for any urgent issues. He uses Copilot in Outlook to draft replies confirming resolution for each issue.

Business Chat<sup>2</sup> Copilot in Outlook

Sample Prompt: **Summarize** any incidents that have been reported last night from my email and chat messages.

8:00 am

He attends the daily standup to discuss priorities for the day. During the meeting, Will uses Copilot in Teams to check for unanswered questions.

Copilot in Teams

Sample Prompt: **Tell me** if there are any unanswered questions and make some suggestions for questions that should be asked.

9:00 am

With no system issues to work on now, Will can revise a project plan. He commands Copilot in Word to fill in some missing sections.

Copilot in Word

Sample Prompt: **Create a paragraph** on system setting changes from the [Fabrikam system upgrade documentation].

4:00 pm

At the end of the day Will has some time to research new devices for the next laptop upgrade. He prompts Copilot to produce a report on the best laptops for business users.

Business Chat<sup>1</sup>

Sample Prompt: **What are the most popular** laptops for enterprise organizations this year?

3:00 pm

Will returns to Teams to catch up on a meeting he missed when he had to troubleshoot a server issue. He checks out the recap and asks for the key points and action items.

Copilot in Teams

Sample Prompt: **Summarize this meeting** and provide the key points and action items

1:30 pm

Will revises his presentation for a meeting with HR on his recommendations for a new employee experience solution. He uses Copilot to summarize the product webpage and then turns it into a slide.

Business Chat<sup>1</sup> Copilot in PowerPoint

Sample Prompt: **Add a slide** based on [copy summary of the web site]

Will  
is an IT  
Administrator at  
Contoso



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# Information Technology | Onboard and train new users

Available with:  
Microsoft 365 Copilot

Scenario level: Buy

KPIs impacted

✓ NSAT

✓ IT management costs

✓ Adoption

Value benefit

✓ Cost savings

✓ Employee experience

## 1. Adoption plan

Write a proposal with an adoption plan of a new product for the organization.



Sample Prompt: **Write a proposal** to my leadership with a request for them to approve the proposed adoption plan for "Viva Engage."

[Try in Copilot Lab: Summarize decision-maker info](#)

## 2. Sign offs

Request sign-offs from leadership on adoption plan.



Sample Prompt: Draft an email to **request sign-off** for the "Viva Engage" Adoption Plan.

## 3. Compliance

Consider required compliance tasks when rolling out a new product.



Sample Prompt: **Create a list** of general compliance tasks to do when rolling out a new product.

[Try in Copilot Lab: Create a list](#)

## 6. Training collection

Suggest a list of training materials to users for them to upskill on a new product that is recommended or assigned to users in Viva learning.



Sample Prompt: Create a **learning collection** about "Viva Engage."

## 5. Readiness assets

Create a FAQ list about a product so users can leverage these learnings.



Sample Prompt: **Create a set of FAQs** about "Viva Engage" that an end user who is new to using "Viva Engage" would find helpful.

[Try in Copilot Lab: Create an FAQ document](#)

## 4. Scenario library

Help users onboard to a product with a list of suggested hero scenarios, best practices, and prompts.



Sample Prompt: **Create a list** of hero scenarios and suggested prompts for "HR" professionals my organization to use Copilot in "Viva Engage."



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# Information Technology | Assisted device acquisition

Available with:  
Microsoft 365 Copilot and Copilot Studio

Scenario level: Extend

KPIs impacted

✓ NSAT

✓ IT management costs

Value benefit

✓ Cost savings

✓ Employee experience

## 1. Access device purchase app

Using a Teams app access a custom copilot agent built with Copilot Studio that assists users in selecting and ordering a new device.



Copilot Agent<sup>3</sup>  
Activity: In Teams open the Device Selection and Purchase app

## 2. Answer usage questions

Answer a series of questions about typical usage patterns. The app determines follow up questions based on the responses given.



Copilot Agent<sup>3</sup>  
Activity: Answer questions from the bot about applications used, mobility requirements, meeting requirements, etc.

## 3. Review recommendations

The app interprets the responses and uses additional information like the person's role to provide a selection of a few applicable devices from the preapproved vendor list with their capabilities and pricing.



Copilot Agent<sup>3</sup>  
Activity: Review the suggested devices and select the one that is most preferred.

## 4. Place order

## 5. Manager approval

After the selection is made, the app initiates the ordering process, which includes an approval process.

## 6. Tracking shipment

The app places the order with the device supplier and confirms the order and delivery data with the user via email. The user can track progress on the order via the app.



Copilot Agent<sup>3</sup>  
Activity: Use the Device Selection and Purchase app to track progress on the device delivery.



Copilot Agent<sup>3</sup>  
Activity: The manager uses the link to open the Teams app and approve the order.



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# Information Technology | IT helpdesk agent



Available with:  
Microsoft 365 Copilot and Copilot Studio

Scenario level: Extend

KPIs impacted

✓ NSAT

✓ IT management costs

Value benefit

✓ Cost savings

✓ Employee experience

## 1. Create an agent

Create a custom agent by describing what you want it to do, including instructions, including triggers, knowledge to pull answers from including links and support documentation, and actions such as creating a helpdesk ticket.



Activity: Create an agent in Copilot Studios by describing what you want it to do, and adding resources and actions for it to take, and triggers for different flows.



Activity: Add a link to an internal troubleshooting document Trigger and add a description “return answers about troubleshooting connection issues.”



Activity: Add a trigger to connect with your helpdesk ticketing tool “return answers on current tickets for this user”. Make responses more personalized under Topics in Adaptive Card.

## 6. Reporting

Use Copilot in Word to help draft a report on employee help topics to determine potential improvements.



Sample Prompt: **Draft a report** showing trends in employee help topics to help us understand where the most complaints are centered so we can improve these processes or offerings.



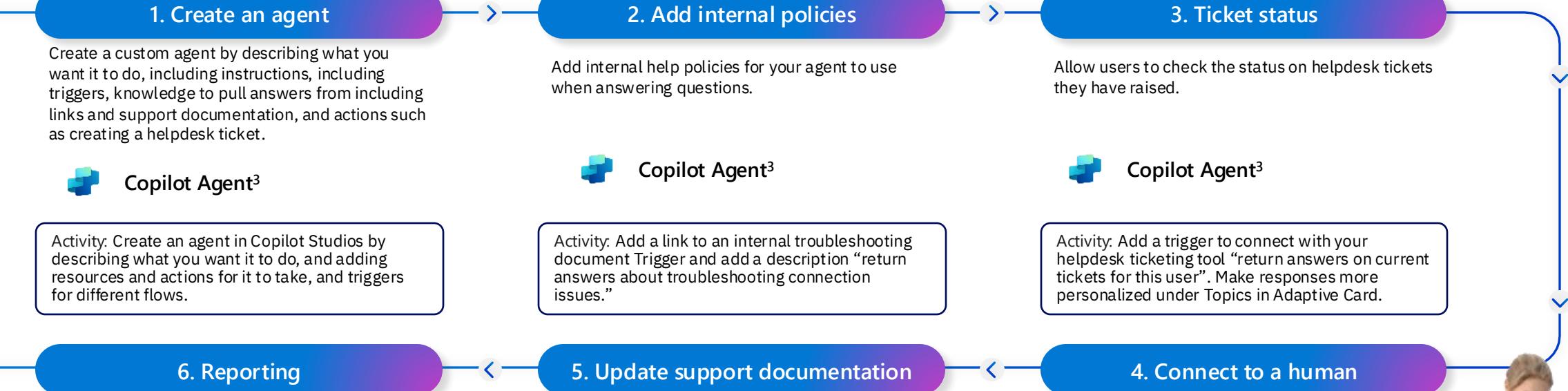
Sample Prompt: **Compare this support document with the feedback document** and recommend any updates or changes needed to address the feedback collected in the support document.

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# Information Technology | Perform a security incident investigation

Available with:  
Security Copilot

Scenario level: Buy

KPIs impacted

IT management costs

Application downtime

Value benefit

Cost savings

Employee experience

## 1. Summarize incident

A security analyst wants to get a summary of an incident in Defender XDR or Unified Security Operations Platform.

### Security Copilot

Prompt: Summarize Defender incident

<DEFENDER INCIDENT\_ID>

Activity in embedded: Or open the incident page and click on the INCIDENT in the Defender XDR portal or Unified SecOps platform

## 2. Guided response

The analyst wants to check how to respond to the incident.

### Security Copilot

Prompt: How to respond to this incident?

Activity in embedded: Guided response offers actions that can be taken to remediate the incident

## 3. IP reputation

The analyst wants to check if the IP address involved belongs to a known threat actor.

### Security Copilot

Prompt: What is the reputation for the IPv4 addresses observed in this incident?

## 6. Create report

Generate an incident report to document the incident and communicate with the leadership team.

### Security Copilot

Prompt: Write an executive report summarizing this investigation. It should be suited for non-technical audience.

## 5. Verify OS updates

The analyst checks to see if the impacted devices have the latest operating system updates.

### Security Copilot

Prompt: If any devices are listed in the previous output, show details from Intune on the one that checked in most recently. Especially indicate if it is current on all operating system updates.

## 4. Impacted devices

The analyst wants to check which user devices may be impacted by generating a KQL query.

### Security Copilot

Prompt: If a user is listed in the incident details, show which devices they have used recently and indicate whether they are compliant with policies.

Activity in embedded: Use the Generate KQL queries for advanced hunting option for a guided experience to



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# Information Technology | Evaluate and purchase a new IT solution

Available with:  
Microsoft 365 Copilot

Scenario level: Buy

KPIs impacted

IT management costs

Value benefit

Cost savings

Employee experience

## 1. Gather business requirements

Use Microsoft Copilot to aggregate multiple threads of conversations and create a holistic view of all essential business requirements for the new solution.



Sample Prompt: **Summarize my conversations** about [project name].

## 2. Research solutions

Quickly and accurately compare available solutions in market using Copilot.



Sample Prompt: Prepare a **summary of information** gathered from [website].

## 3. Create a build vs. buy analysis

Use Copilot in Excel to compare quotes from vendors and analyze key differences.



Sample Prompt: Add a column showing the deviation from the lowest number in the total cost column.

[Try in Copilot Lab. Get column ideas](#)

## 6. Create launch communication

Use Copilot in Outlook to easily draft an email announcing the new solution and thank contributors.



Action: **Use Coaching by Copilot** to ensure that it is clear, concise, and impactful and provide coaching tips.

## 5. Create a comparison chart

Use Copilot to create a comparison chart across all the vendor proposals you received.



Sample Prompt: **Create a comparison chart** with each company's proposal, with the company at the top of each column, and rows that compare cost, services provided, and timeline.

## 4. Create solution RFP

Draft RFP to the selected vendors using Copilot in Word, pulling in information from your emails, meeting notes, and presentations.



Sample Prompt: **Draft** a "request for proposal" using the attached files as reference: [email], [meeting recap], [presentation].



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# Information Technology | Update technology strategy

Available with:  
Microsoft 365 Copilot

Scenario level: Buy

KPIs impacted

✓ NSAT

✓ IT management costs

Value benefit

✓ Cost savings

✓ Employee experience

## 1. Conduct research

Research emerging technology and market trends from the web.



Sample Prompt: Create a summary of the latest trends and technology for "collaboration" and the tools that are be used.

## 2. Define strategy

Create a strategy document for how IT initiatives support business goals.



Sample Prompt: From this market research [include step 1 prompt as reference], draft a strategy document for how an IT initiative for "collaboration" can support business goals in my organization.

## 3. Business alignment

Align stakeholders across the organization on the technology strategy.



Sample Prompt: Draft a message to ask all stakeholders to review the technology strategy document and leave comments.

## 6. Plan

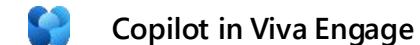
Plan projects, work items, and goals to support the key initiatives in the technology strategy document.



Sample Prompt: Set up a page based on [a loop template] and make it for "work items to support technology strategy"

## 5. Announce

Share the product strategy and OKRs with the organization.



Sample Prompt: Help me write a post to announce the publishing of the technology strategy documentation and OKRs to my organization.

## 4. OKRs

Draft Objectives and Key Results (OKRs) based on the technology strategy document.



Sample Prompt: Create OKRs from a document [Strategy document.docx]

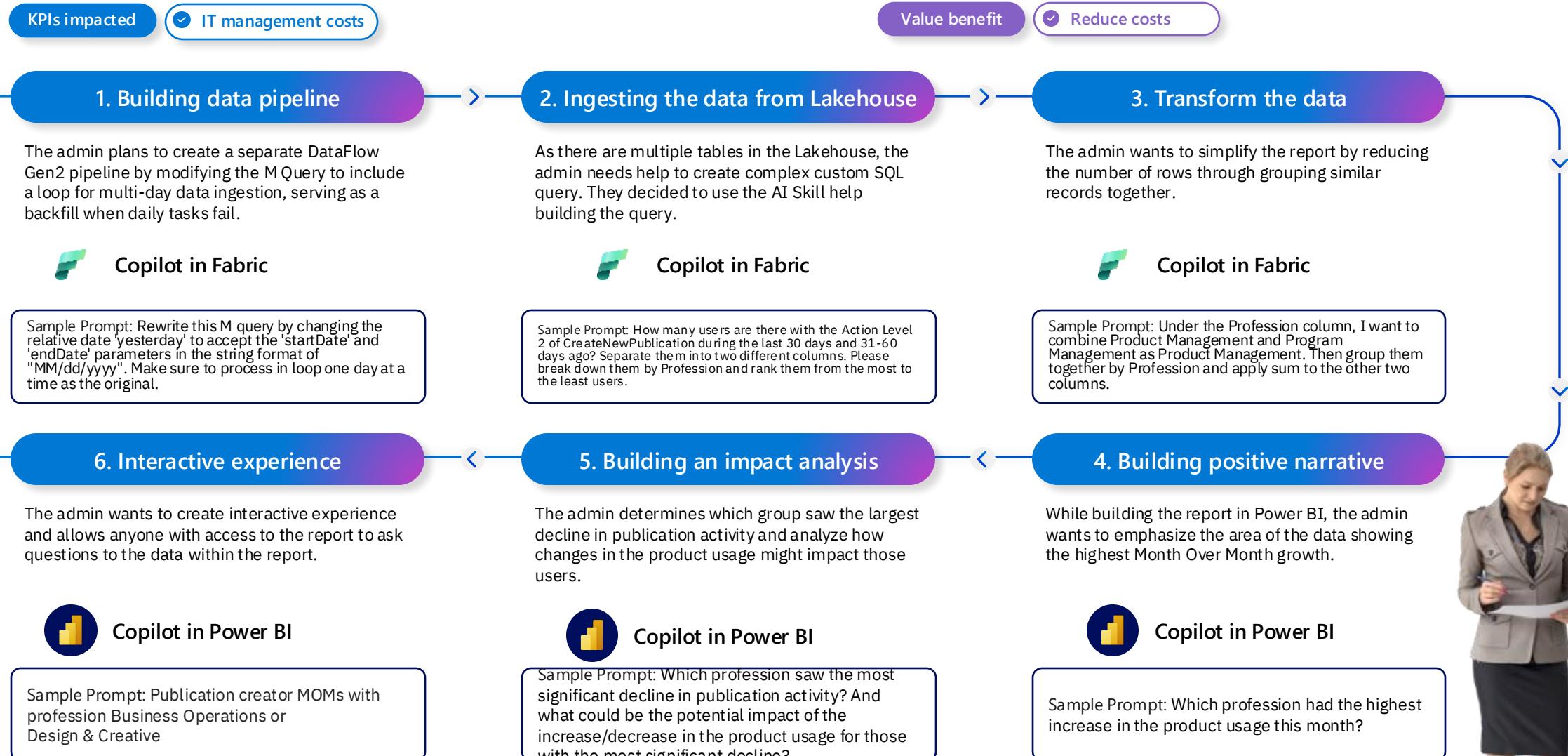


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# A day in the life of an IT Product Manager at Microsoft

Available with:  
Copilot for Service (includes Microsoft 365 Copilot)

Scenario level: Extend

Benefits ~1 hour Brainstorming new solutions ★ Faster responses, better insights and better communication

8:00 am

Joe uses Copilot to get up to speed on a support ticket and understand the service escalation he receives.



Action: Use the **case summary** to get up to speed on the support ticket and progress of service engagement.

9:00 am

Joe finds a gap in one service interaction and uses Copilot for Service to write a response to the user that helps speed up the service process.



Sample Prompt: **Write an email** in response to the customer question.

11:00 am

Joe reviews and approves the Statement of Work. Copilot in Word helps him highlight key deliverables, risks, and timelines using only a screen reader.



Sample Prompt: **Highlight key deliverables, risk and timelines** helping screen reader users review 16-page documents more effectively.

4:00 pm

Joe uses Copilot to write up a performance review summary referencing conversations, documents, and relevant info internally.



Sample Prompt: **Write a summary of my goals** helping prepare for performance review discussion.

3:00 pm

Joe uses Copilot to initiate a high-level service requirement slide based on a meeting recap.



Sample Prompt: **Create a presentation from** the meeting notes that outline the product charter.

2:00 pm

Joe participates in a sprint review and assigns work items to the workstream. He uses Copilot in Stream after the meeting to quickly document action items and expected timelines.



Sample Prompt: **Recap the meeting** helping me focus on the discussion and easily draft notes to help ensure on time follow-up.

Joe  
is a Senior  
Product Manager



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# Information Technology | General IT prompts (Microsoft Copilot only)



Available with:  
Microsoft Copilot

Scenario level:   
Start

KPIs impacted

IT management costs

Application downtime

Value benefit

Revenue growth

Employee experience

## 1. Research

Use Microsoft Copilot to stay up-to-date with the latest technologies and best practices through continued learning.

Copilot Chat<sup>1</sup>

Sample Prompt: I want to learn more about how to implement [tool, service]. **Provide a high-level outline** with guidance on how to implement, best practice set ups, how to get leader buy-in, etc.

Copilot Chat<sup>1</sup>

Sample Prompt: **Create a 2-page document detailing the architecture** of [system] in non-technical language. Be sure to incorporate key features, technologies, and a process diagram.

## 3. User training

When you choose to implement a new service or product to your organization, use Copilot to streamline the user training process.

Copilot Chat<sup>1</sup>

Sample Prompt: I am training new users on our [software, system, tool]. **Create an outline for a 30-minute training** including key concepts, demos, and best practices.

## 6. Code review

Ask Copilot to help fix issues that arise from a code review.

Copilot Chat<sup>1</sup>

Sample Prompt: **Rewrite this code** so that it will no longer have an error when the user picks an invalid product type. Also add comments and provide a summary of what it does: <code>

## 5. Backup and recovery

Copilot can help you create scripts to automate backup and recovery processes.

Copilot Chat<sup>1</sup>

Sample Prompt: **Provide an example of a PowerShell script** that takes daily snapshot backups of Azure Storage volumes, organizes logically, and removes snapshots older than 30 days for compliance.

## 4. IT inventory management

Use Copilot to help provide best practices on how manage IT inventory.

Copilot Chat<sup>1</sup>

Sample Prompt: **Outline the key information** needed for an IT asset inventory system and some suggestions for how to maintain these logs.

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Meta-prompting

My-day-prompt

AI Stacking

AI Comparison

# Meta-prompting

I want you to become my Prompt engineer. Your goal is to help me craft the best possible prompt for my needs.

The prompt will be used by you, copilot. You will follow the following process:

1. Your first response will be to ask me what the prompt should be about. I will provide my answer, but we will need to improve it through continual iterations by going through the next steps.
2. Based on my input, you will generate 2 sections.
  - a) Revised prompt (provide your rewritten prompt. It should be clear, concise, and easily understood by you)
  - b) Questions (ask any relevant questions pertaining to what additional information is needed from me to improve the prompt).
3. We will continue this iterative process with me providing additional information to you and you updating the prompt in the Revised prompt section until I say we are done

# My-day-prompt

Summarize my emails, Teams messages, and Teams Channel messages from the last workday. List action items in a dedicated column.

Suggest follow-ups, if possible, in a dedicated column.

The table should look like this: Type (Mail/Teams/Channel) | Topic | Summarization | Action Item | Follow-up.

If I have been directly mentioned, make the font of the topic bold.

# My-day-prompt

Here is the summary of your communications from the last workday:

Type	Topic	Summarization	Action Item	Follow-up
Mail	<b>Ivan Portilla, your daily digest contains 1 update across 1 space[EXTERNAL]</b>	You received a daily digest from Confluence with 1 update since Saturday, December 7, 2024. The top post was the Shikon/Ayame/Saber Weekly IT Report edited by James Doanes.	None	Check the Confluence space for more updates and view the changes made by James Doanes.

It seems there were no Teams messages or Teams Channel messages from the last workday.

Is there anything else you would like to know or any other way I can assist you?

 Copy

● 1 of 30 responses AI-generated content may be incorrect



Can you provide more details on the Confluence update?

Summarize my emails and messages from the last two workdays.

Check if there are any missed messages from Teams channels.

# AI Stacking

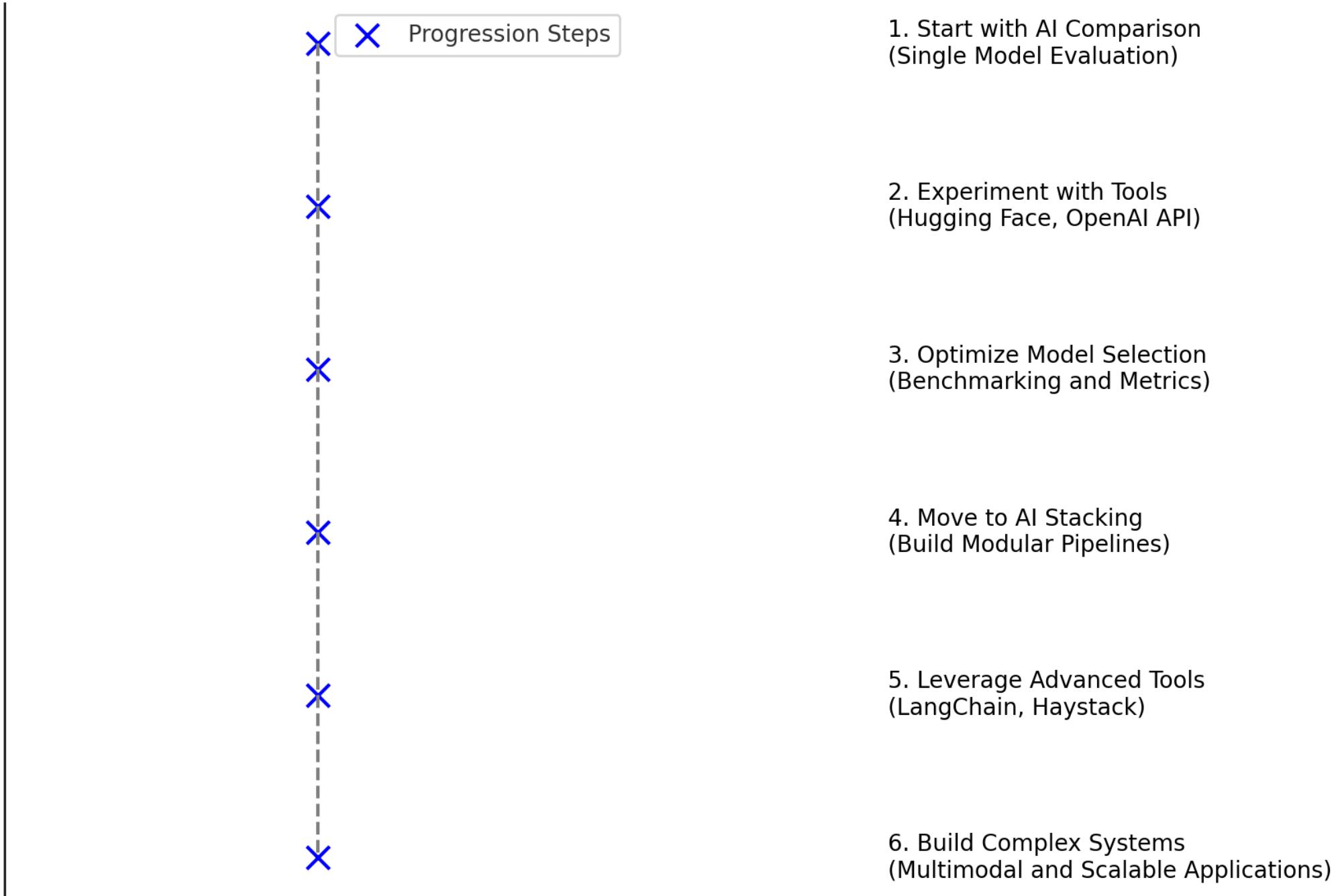
A technique of **combining multiple models, algorithms, or processes in a layered or modular way** to enhance performance, address specific challenges, or create more comprehensive AI applications.

# AI Comparison

Process of evaluating, benchmarking, or contrasting multiple AI models, techniques, or approaches within the domain of **Generative AI**.

Aspect	AI Stacking	AI Comparison
<b>Definition</b>	Combining multiple AI models, algorithms, or processes into a cohesive pipeline to enhance performance or achieve complex tasks.	Evaluating and contrasting AI models, algorithms, or techniques to identify the best option for a specific use case.
<b>Purpose</b>	To build layered, modular solutions that leverage the strengths of different models or methods.	To select the most suitable AI model or approach based on performance, efficiency, or domain-specific needs.
<b>Application</b>	Used in building systems like chatbots, RAG pipelines, or multimodal applications where multiple capabilities are needed.	Used in selecting a single AI model or architecture for a particular task or comparing performance across different models.
<b>Scope</b>	Focused on integrating multiple tools into a system.	Focused on evaluating individual models or techniques.
<b>Complexity</b>	Higher, as it involves managing multiple models and their interactions.	Lower, as it mainly involves testing and analyzing models.
<b>Efficiency</b>	Efficiency depends on the orchestration of stacked models and their resource usage.	Often more efficient since it seeks the best single model for a task.
<b>Outcome</b>	A robust, multi-capability system (e.g., a pipeline for document retrieval, summarization, and sentiment analysis).	A decision on which model or method performs best for a specific task (e.g., choosing GPT over Claude for text generation).
<b>Use Case Examples</b>	- A chatbot using both GPT-4 and a retrieval model for fact-based conversations. - A multimodal AI that integrates text, images, and audio.	- Benchmarking GPT vs. Claude for conversational AI. - Evaluating DALL-E vs. Stable Diffusion for image generation.
<b>Target Audience</b>	Developers building complex, multi-step AI systems.	Researchers or developers seeking the most efficient model for a single task.
<b>Tools</b>	LangChain, Haystack, orchestration tools like OpenAI plugins.	Benchmarking tools like Hugging Face Transformers, OpenAI Evals, MLPerf.

# Recommended Progression for New GenAI Developers



Q & A

# Resources

Copilot lab:

<https://copilot.cloud.microsoft/en-US/prompts>

<https://adoption.microsoft.com/en-us/copilot/success-kit/>

<https://adoption.microsoft.com/en-us/copilot-scenario-library/>

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