Microsoft

Operating AI Agents with Azure AI Foundry and Pydantic AI

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Session Speaker

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- Microsoft Learn Student Ambassador and Data Engineer Intern at Seven Peaks Software, Klong Toei, Bangkok, TH
- Speaker on Various International Stages such as PyCon TH, FOSSASIA, JavaScript Bangkok, etc.

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Charunthon Limseelo

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Operating AI Agents with Azure AI Foundry and Pydantic AI

Text generation

Gemma 3 to generate text, or other models for reasoning tasks

Multimodal to text

Gemma 3, or other models to explore the different types of input

Pydantic Framework

Explore the capabilities of building agents to perform tasks

Explore More Multimodal Models and usage of

GitHub Models

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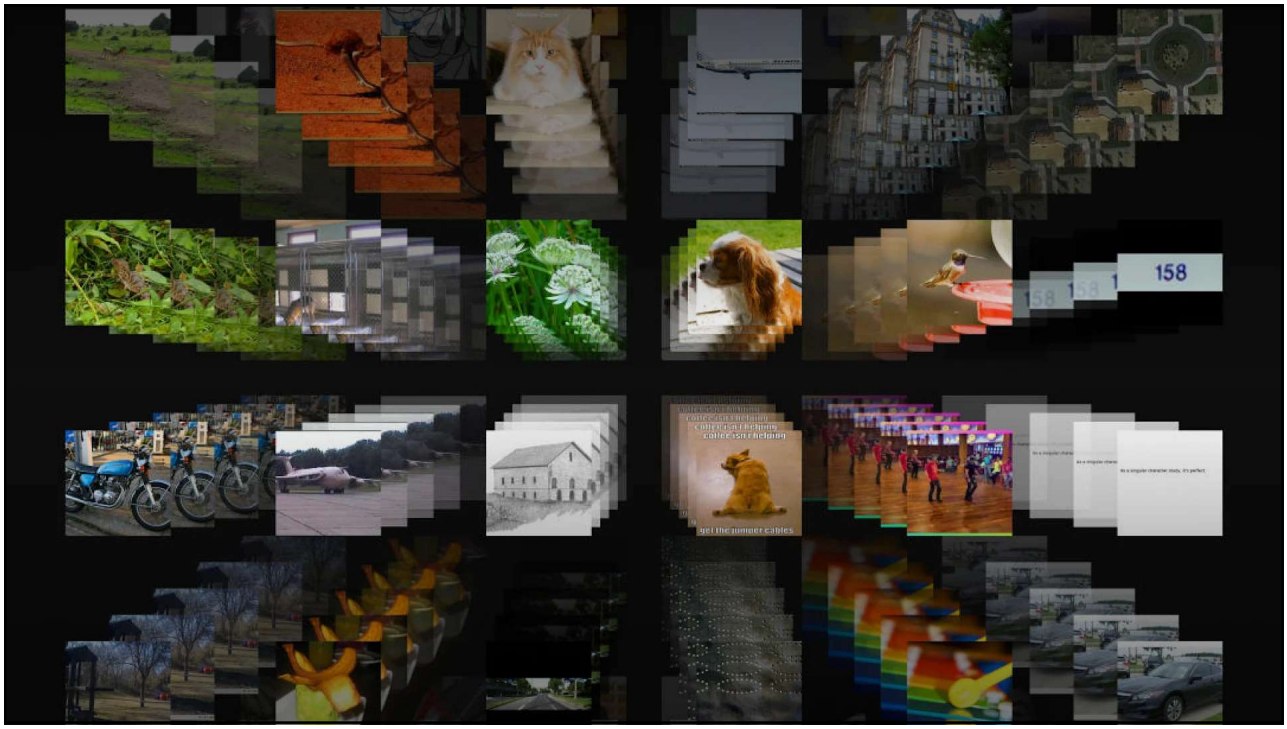

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Section 1

Overall Picture of Developing Vision Models in Nowadays

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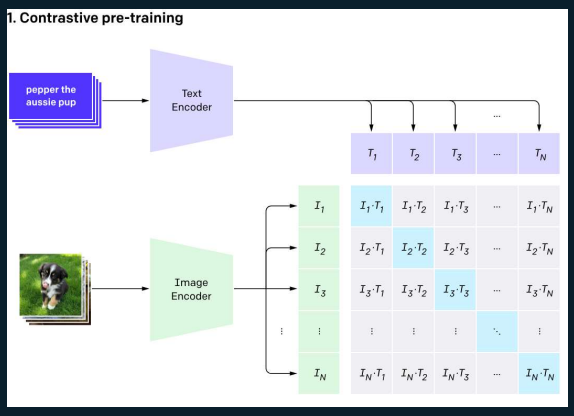
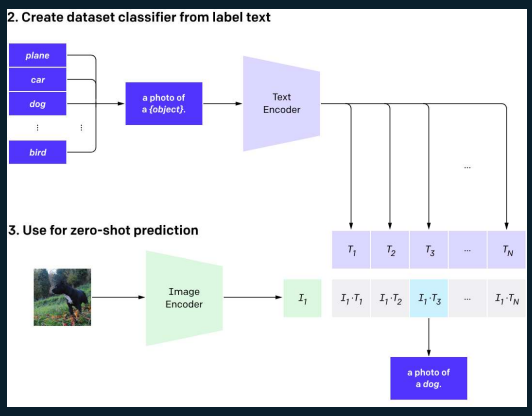
CLIP: Contrastive Language-Image Pre-training





CLIP pre-trains an image encoder and a text encoder to predict which images were paired with which texts in our dataset. We then use this behavior to turn CLIP into a zero-shot classifier. We convert all of a dataset's classes into captions such as "a photo of a dog" and predict the class of the caption CLIP estimates best pairs with a given image.

https://openai.com/index/clip/

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CLIP: Contrastive Language-Image Pre-training

CLIP performs well in recognizing common objects but struggles with abstract and systematic tasks like counting objects or estimating distances in images. In these cases, its zero-shot performance is only slightly better than random guessing. It also underperforms in fine-grained classification, such as distinguishing between car models, aircraft variants, or flower species.

Additionally, CLIP has poor generalization to images outside its pre-training dataset. For example, while it has strong OCR capabilities, its accuracy on handwritten digits in the MNIST dataset is only 88%, significantly lower than human accuracy of 99.75%. Furthermore, CLIP's zero-shot classifiers are sensitive to wording and phrasing, sometimes requiring trial-and-error prompt engineering to achieve optimal performance

https://openai.com/index/clip/

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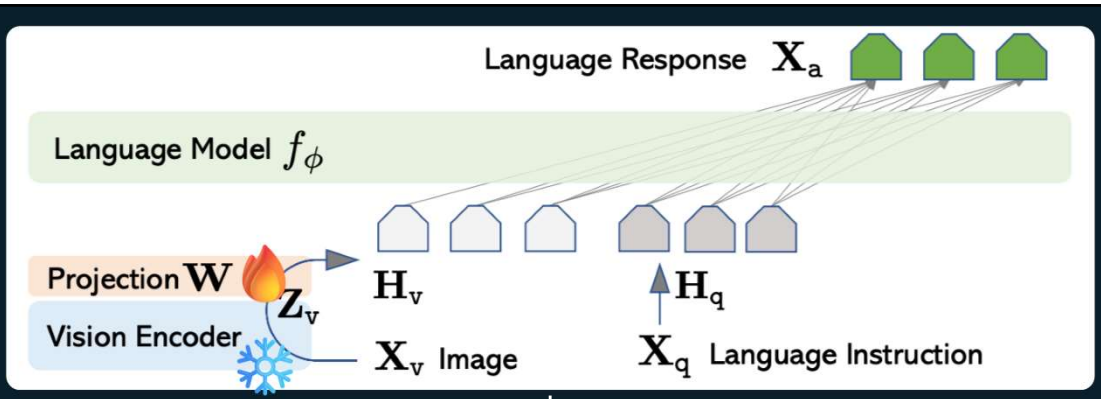
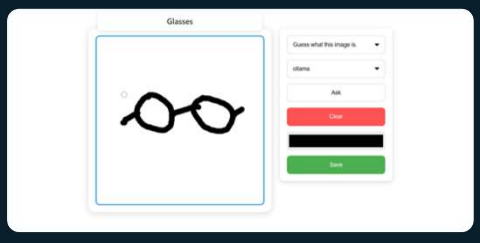
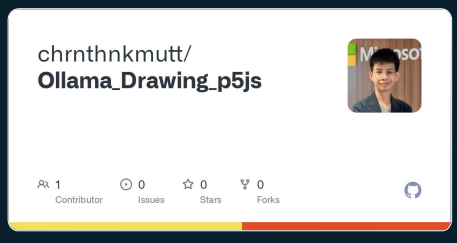


https://llava-vl.github.io/





https://github.com/chrnthnkmutt/Ollama_Drawing_p5js

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Section 2

Introducing OpenAI GPT-4.1

The latest iteration of the gpt-4o model family, specifically targeted for better coding and instruction following, making it better at handling complex technical and coding problems.

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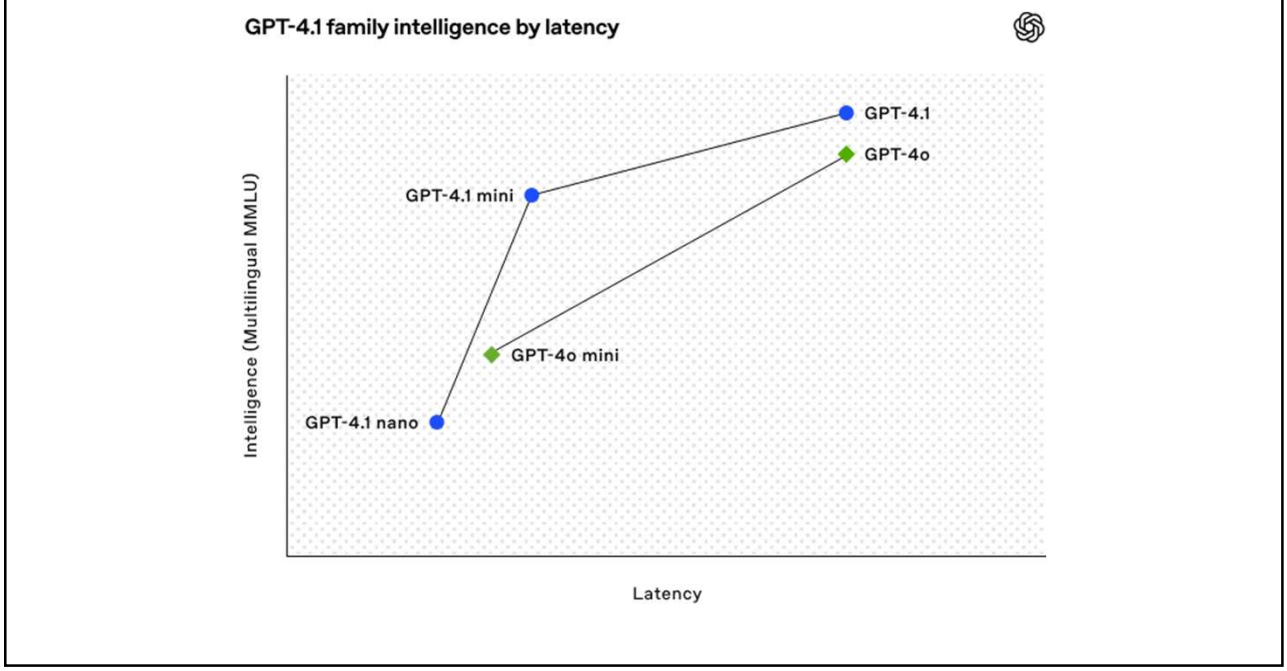

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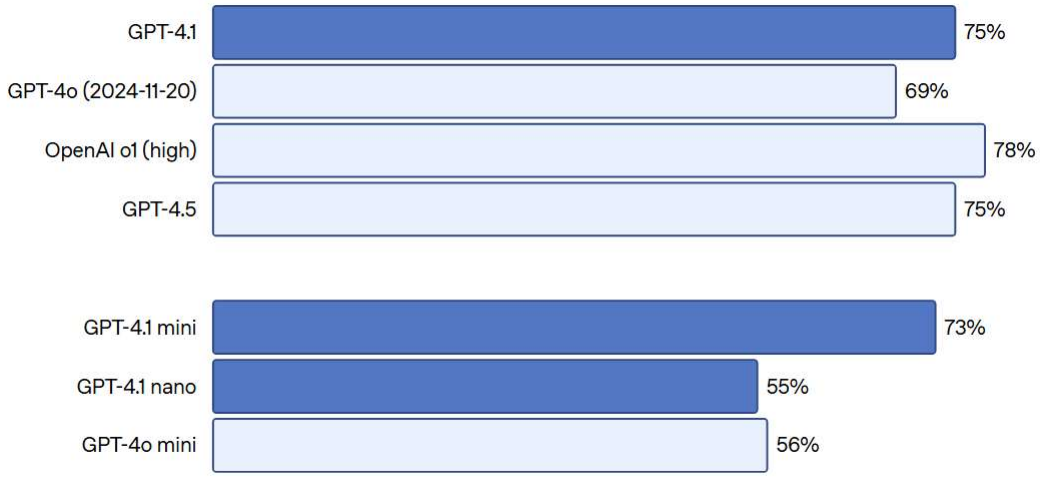
MMMU: Massive Multi-discipline Multimodal Understanding



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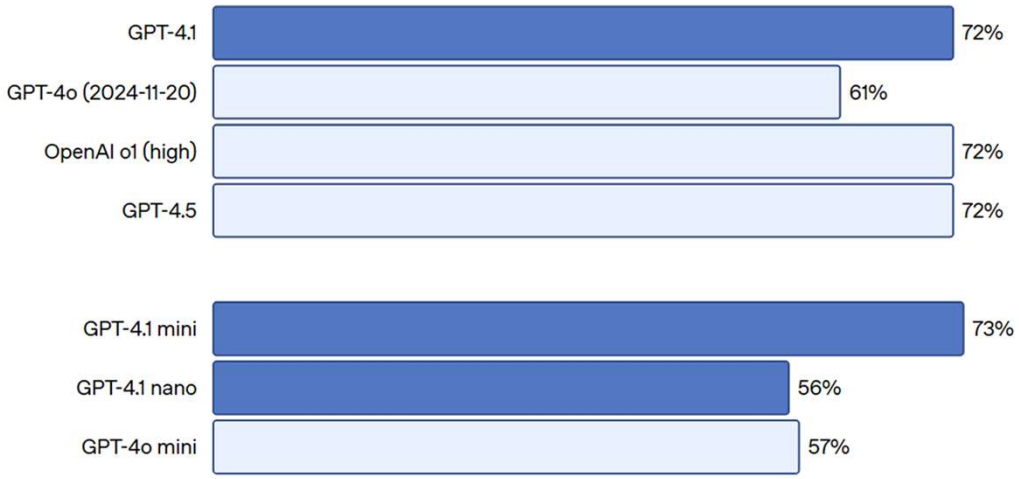
MathVista Accuracy (Act like Photomath, but better)



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Agent

An agent in LLM-based applications is an autonomous software entity leveraging large language models to perform specific tasks through natural language interaction.

- Independent
- Goal-focused
- Interactive

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What is Pydantic and Pydantic AI?

- **Pydantic** is the most widely used data validation library for Python.
- **PydanticAI** is a Python agent framework designed to make it less painful to build production grade applications with Generative AI.
- FastAPI revolutionized web development by offering an innovative and ergonomic design, built on the foundation of Pydantic.
- Similarly, virtually every agent framework and LLM library in Python uses Pydantic, yet when we began to use LLMs in Pydantic Logfire, we couldn't find anything that gave us the same feeling.

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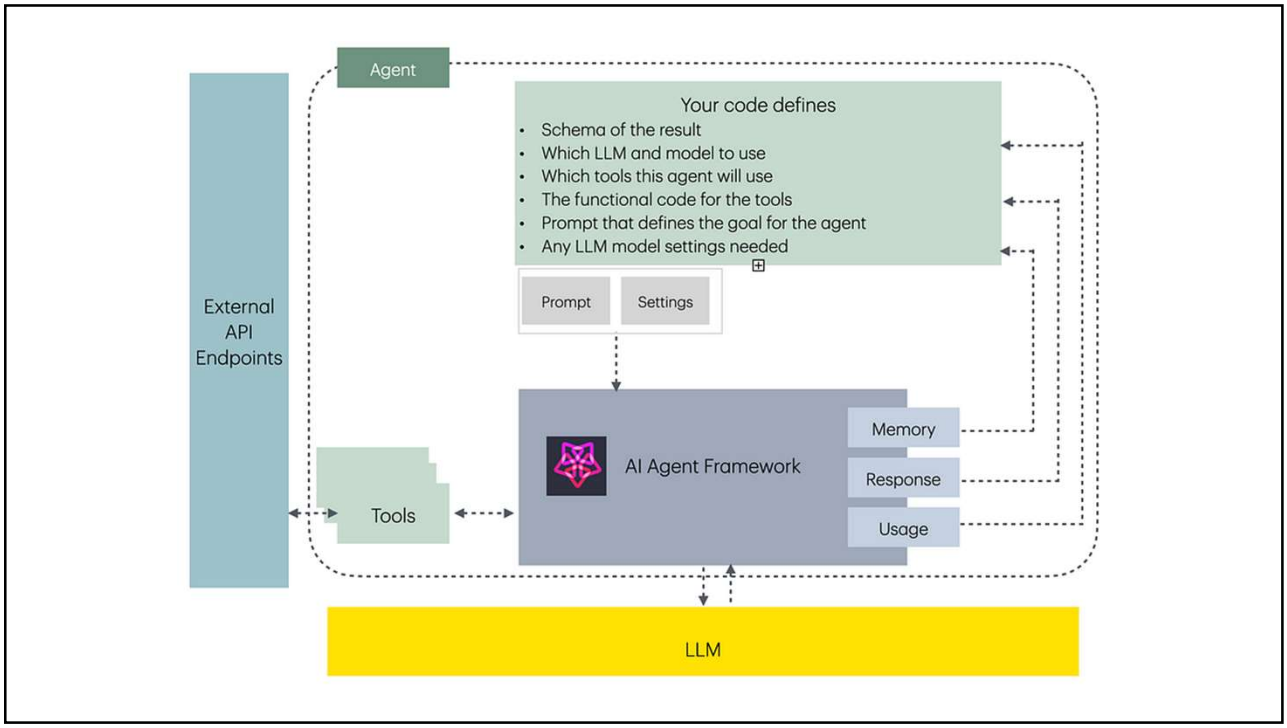

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Example Syntax of Inferencing OpenAI Models in with Pydantic AI

```python
from pydantic import BaseModel
from pydantic_ai import Agent
from pydantic_ai.models.openai import OpenAIModel
from pydantic_ai.providers.openai import OpenAIProvider
import os # Import the os module
from dotenv import load_dotenv
from openai import OpenAI

# Load environment variables
load_dotenv()

class CityLocation(BaseModel):
    city: str
    country: str

openai_api_key = os.environ.get("OPENAI_API_KEY")

openai_provider = OpenAIProvider(
    api_key=openai_api_key
)
```

Environment Setup/Import Packages

Environment Declaration

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Example Syntax of Inferencing OpenAI Models in with Pydantic AI

```python
openai_model = OpenAIModel(
    model_name='gpt-4o', # Changed model name for official OpenAI
    provider=openai_provider
)

agent = Agent(openai_model, output_type=CityLocation)

# Now this call will go to the official OpenAI API
result = agent.run_sync('Where were the olympics held in 2012?')

print(result.output)
# Expected output might look similar depending on the model response
# > city='London' country='United Kingdom'

print(result.usage())
# Usage details will reflect tokens used on the official OpenAI API
# """
# Usage(requests=1, request_tokens=XX, response_tokens=YY, total_tokens=ZZ, details=None)
# """
```

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Proposed Syntax of Inferencing Azure AI Models in with Pydantic AI

```
from pydantic_ai import Agent
from pydantic_ai.models.openai import OpenAIModel
from pydantic_ai.providers.azure import AzureProvider

model = OpenAIModel(
    'gpt-4o',
    provider=AzureProvider(
        azure_endpoint='your-azure-endpoint',
        api_version='your-api-version',
        api_key='your-api-key',
    ),
)
agent = Agent(model)
...
```

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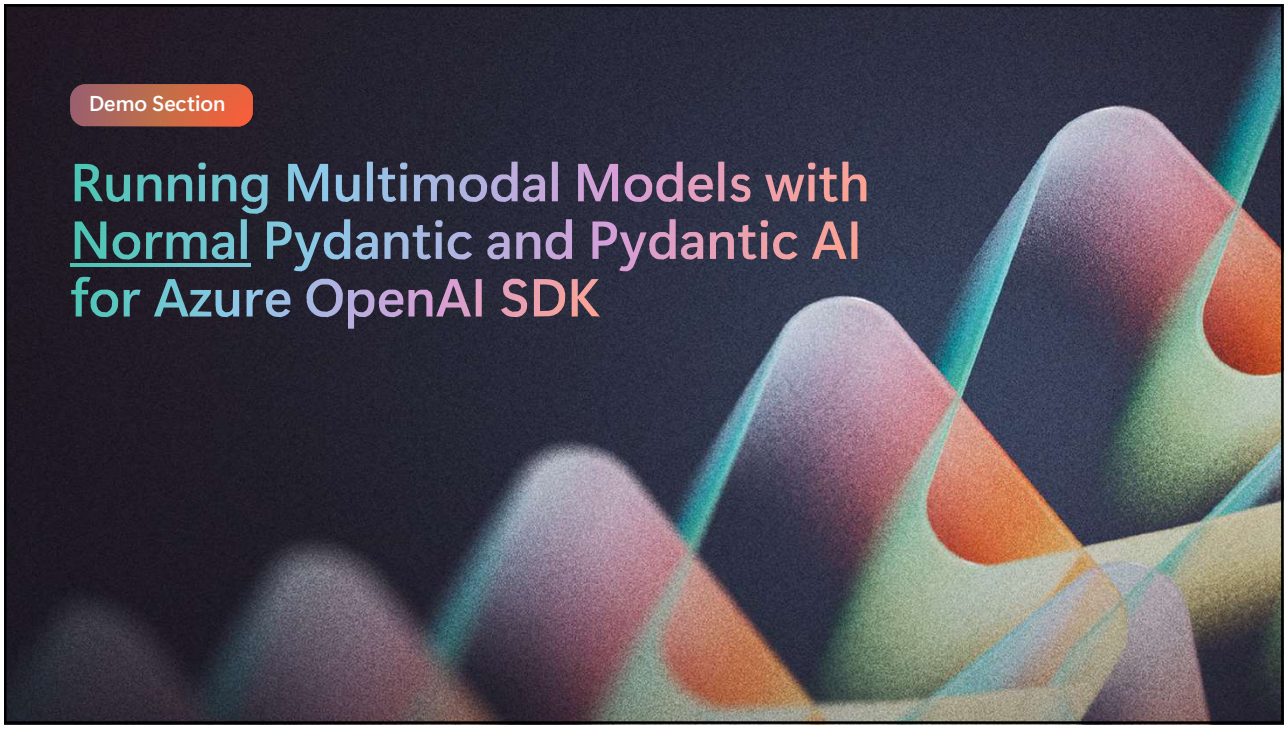

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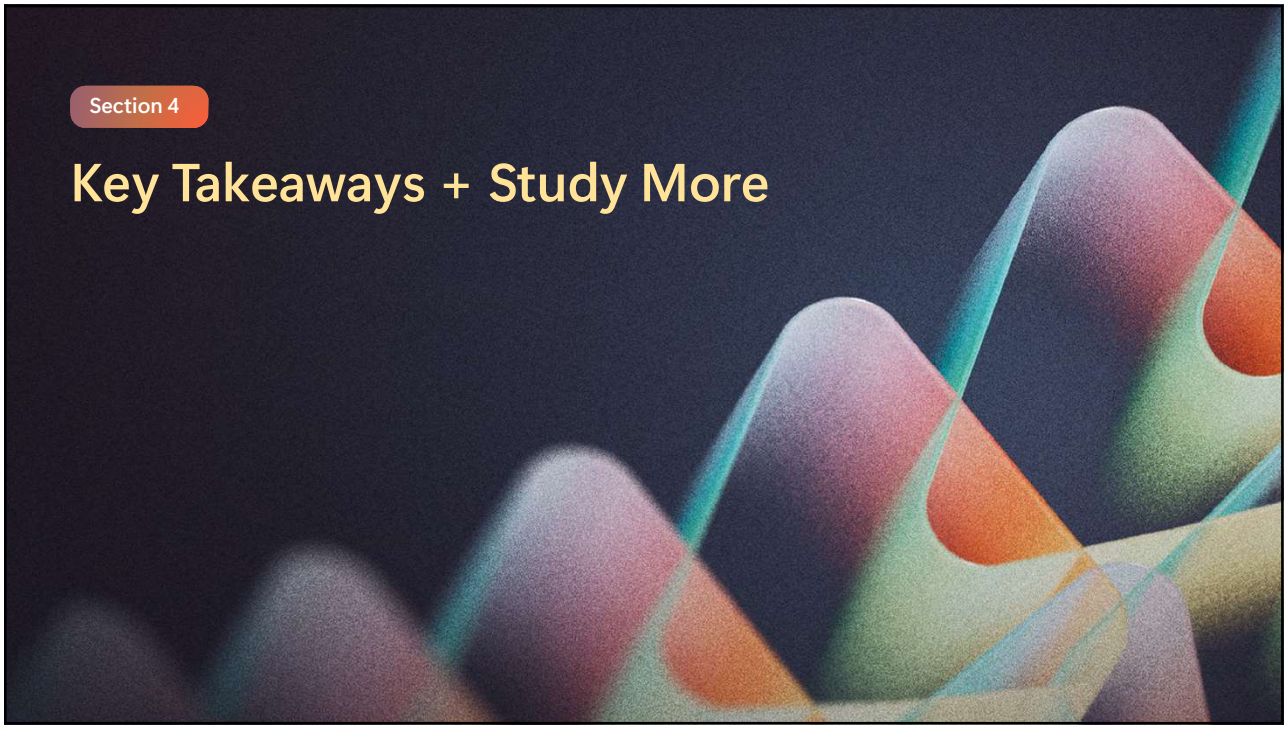

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Key Takeaways

- **Multimodal Capabilities**: Azure AI Foundry enables seamless interaction with AI models that process multiple types of data (text, images, etc.), enhancing AI-powered applications.
- **GitHub Model Integration**: Leveraging pre-trained AI models from GitHub simplifies deployment and experimentation, accelerating AI development within Azure.
- **Agent-Based AI Interactions**: Intelligent agents in Azure AI Foundry provide dynamic responses and automate workflows, creating more intuitive user experiences.
- **Custom Model Adaptation**: Developers can fine-tune and customize models to align with specific business needs, ensuring optimal AI performance.
- **Efficiency & Scalability**: Azure AI Foundry offers robust infrastructure to scale AI solutions efficiently, supporting enterprise-grade implementations.

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Resource

- Pydantic Documentation (OpenAI API on Ollama)
  - https://ollama.com/blog/structured-outputs
- Pydantic AI Documentation
  - https://ai.pydantic.dev/models/openai/#azure-ai-foundry
- GitHub Marketplace
  - github.com/marketplace/models
- GitHub Models in .NET with Semantic Kernel Blog
  - gh.io/ModelsSemanticKernel
- Build Generative AI apps with .NET and GitHub Models
  - gh.io/GitHubModelsandDotnet
- Microsoft Reactor: Prototyping AI Agents with GitHub Models
  - https://www.youtube.com/watch?v=LflBM3ntUSY

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Thank you 🙏

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Scan QR for resources

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