

WELCOME & AGENDA

1. Starting with the Prompt – AI basics with Semantic Kernel (lab instructor: Bill Wilder)
2. Applying RAG & Vector patterns (lab instructor: Jason Haley)
3. Creating AI Agents (lab instructor: Juan Pablo Garcia Gonzalez)
4. Here to help – Udai Ramachandran

```
gh repo clone
```

```
bostonazureai/semantic-kernel-dev-workshop
```

WELCOME

About the day

About the building

About the food (tea, coffee and lunch)

About the sponsor (Cloud Construct)

TODAY'S CREDENTIALS

Azure OpenAI, SQL DB, and Bing Search

**Part of Lab 0 – a one-line change in
Program.cs around line 12:**

```
password = "Banana31Banana31";
```



+31



then run the console app

ASAP please do the following

DOWNLOAD WORKSHOP LAB REPO:

<https://github.com/BostonAzureAI/semantic-kernel-dev-workshop>

- `gh repo clone BostonAzureAI/semantic-kernel-dev-workshop`
- `git clone https://github.com/BostonAzureAI/semantic-kernel-dev-workshop.git`

Navigate to Lab 0 (.../labs/**lab0**/src/start)

open in **VS Code**

Add password to Program.cs around line 12:

`password = "Banana31Banana31";`

Run console app:

`dotnet run`



Semantic Kernel Dev Workshop

Getting hands on with AI via SK and C#

31-Jan-2025

Bill Wilder

(one of four trainers here today)

Connect with Bill

linkedin.com/in/billwilder
blog.codingoutloud.com
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billw@devpartners.com

A Boston Azure AI event



CLOUD CONSTRUCT

Dev work for startups & established
Replatforms & new designs
Azure & AI
Project based & Asynch work available



c cloudCONSTRUCT
agency experience entrepreneurial spirit

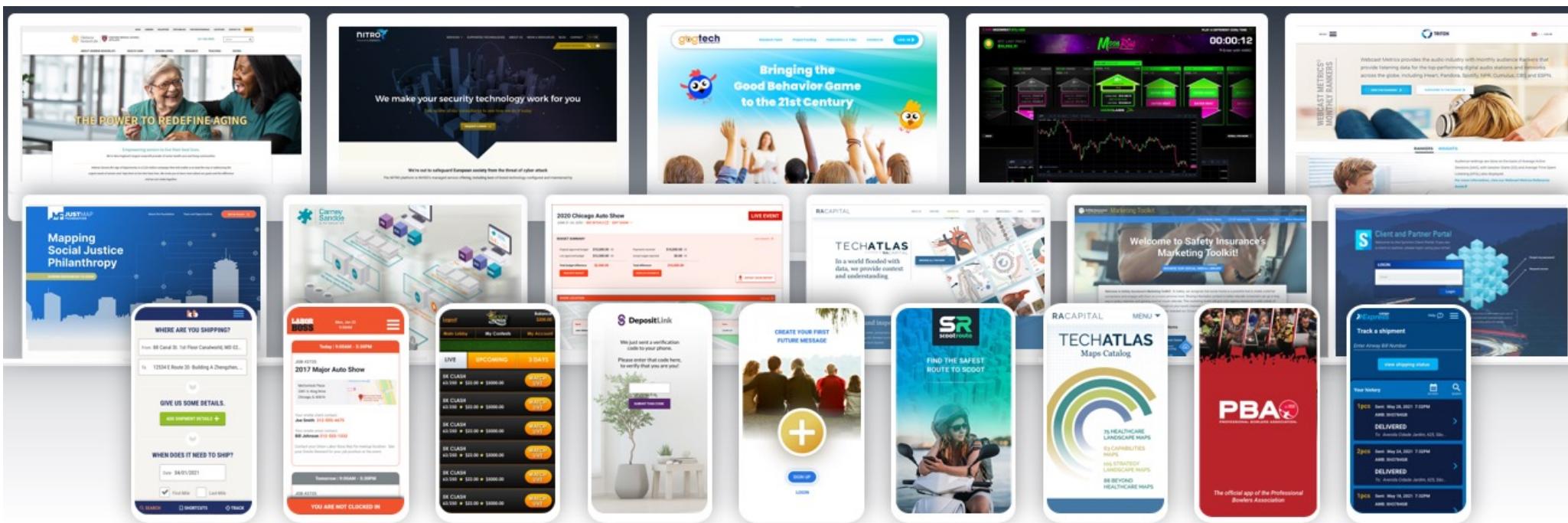
Contact:
mike@cloudconstruct.com



Thank you **Cloud Construct!**



<https://www.cloudconstruct.com/> | x.com/cloudconstruct



**ADMIRALS
BANK**

**Gabriel's
VAULT**

**MANNING
& NAPIER**

Bentley

**BRIGHTSPHERE
Investment Group**

gbg tech

The Power to Redefine Aging.
Hebrew SeniorLife
HARVARD MEDICAL SCHOOL
AFFILIATE

PBA
PROFESSIONAL BOWLERS ASSOCIATION

QS Investors

**Carney Sandoe
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Contact:
mike@cloudconstruct.com

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Dev work for startups & established

Replatforms & new designs

Azure & AI

Project based & Asynch work available

Contact:
mike@cloudconstruct.com

Background

- ✓ A Brief History of Artificial Intelligence
- ✓ Tokens
- ✓ Embeddings

A Brief History of Artificial Intelligence

- 1950s – term coined
- Next ~half-century – little progress
- Early 2000s – shift from languages/code (Lisp, Schema, hand-coded Expert Systems) → to data (Machine Learning)
- Machine Learning, a subset of AI field, gives rise to Neural Networks, which give rise to the Large Language Model (LLM) and Generative AI

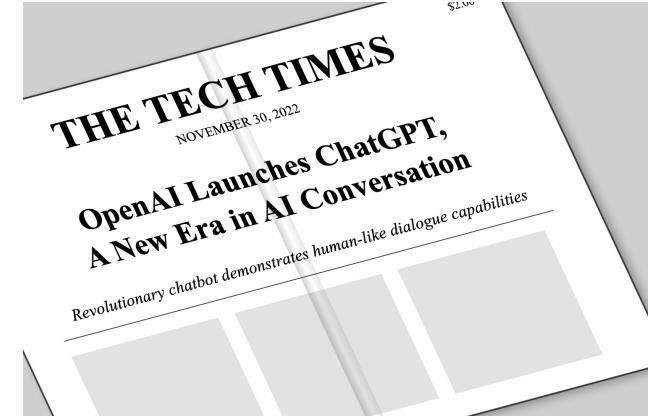
Traditional AI (1950s)

Machine Learning (2000s)

Generative AI & LLMs (2022)



New superpowers: Nov 2022



We all now have at our command capabilities that have not been possible before in the history of computers

👀 Let's look: <https://chatgpt.com/>

Tokens

A Token is:

- A unit of measurement
- Semantic (has meaning)
- Applies to human and artificial languages

A Tokenizer is a tool:

- Break text (C# code, an email, PDF, ...) into tokens

👀 Let's look: <https://platform.openai.com/tokenizer>

<https://platform.openai.com/tokenizer>

Tokens
116
Characters
559

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

[Text](#) [Token IDs](#)

12938, 2101, 5288, 1039, 73361, 11311, 21806, , 620, 10422, 11, 95114, 306, 51868, 11, 326, 484, 722, 1966, 553, 5371, 12629, 364, 10620, 1, 2212, 12721, 3656, 11, 11493, 5588, 484, 422, 813, 95114, 326, 813, 14024, 11, 665, 1701, 21, 402, 261, 2212, 15856, 40987, 328, 484, 3656, 13, 1416, 679, 3063, 316, 101172, 261, 19137, 328, 484, 3259, 11, 472, 261, 1721, 67525, 2475, 395, 2617, 1218, 2105, 10175, 1043, 8354, 484, 484, 10422, 3572, 4561, 13, 1225, 382, 57623, 38938, 326, 7937, 484, 581, 1757, 621, 495, 558]

[Text](#) [Token IDs](#)

<https://bostonazureai.org>
<https://BostonAzureAI.org>

12938, 2101, 5288, 1039, 73361, 11311, 21806, , 620, 10422, 11, 95114, 306, 51868, 11, 326, 484, 722, 1966, 553, 5371, 12629, 364, 10620, 1, 2212, 12721, 3656, 11, 11493, 5588, 484, 422, 813, 95114, 326, 813, 14024, 11, 665, 1701, 21, 402, 261, 2212, 15856, 40987, 328, 484, 3656,

Large Language Models (LLM)

- Generative AI is based on LLMs
- An LLM is a “next token” predictor/generator
- This is what makes it “generative” – it ***creates***

👀 Let's look: <https://chatgpt.com/>

Embeddings

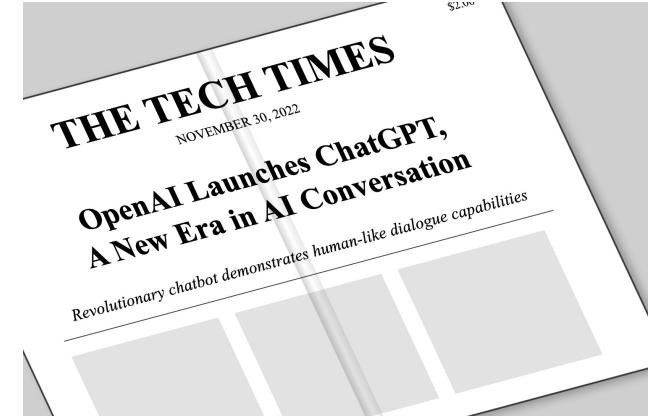
- Expressed as a vector (a bunch of floating point numbers, perhaps 1536 of them, or 256, or...)
- Semantically meaningful encoding of language
- Compare blocks of text by **MEANING**

👀 Let's look: <https://github.com/crankingai/cranking-vectors>

Semantic Kernel and Azure Open AI

- ✓ Semantic Kernel's role in the world
- ✓ Actors in this production: LLM, Tokens, Prompts
- ✓ First few labs

New superpowers: Nov 2022



We all now have at our command capabilities that have not been possible before in the history of computers

Today we'll look at ways to put it to work.

Semantic What?

- Semantic Kernel is an LLM-independent SDK for interacting with AI (LLM) services with enterprise robustness
- More portable/flexible than the LLM-specific SDKs (like OpenAI ChatGPT, Google Gemini, Anthropic Claude, ...)
- From “chatbot” => plugins => Agents => Processes
- RAG, Memory, Prompt
- Hooks for safety tools, observability, and more.

<https://www.nuget.org/packages/Microsoft.SemanticKernel/>
<https://github.com/microsoft/semantic-kernel>

Enterprise Scale



.NET 1.0



Python 1.0



Java 1.0



Python: the language for ML
and AI modeling.

C# and Java: the languages
for enterprise software. And
enterprise AI.

Why C# & .NET in a Pythonic world?

- Why **NOT** C#/.NET (and Java/JVM)?
- Great platforms and ecosystems...
- **Idiomatic .NET**, DI, Aspire-ready, .NET tools, ...
- Observable including OpenTelemetry (“OTel”) support
- Azure OpenAI, OpenAI, most other LLMs on Azure or available via network from SK
- SK very much *reduces* incentives to leave C# & .NET

Basic features are not so hard

Around 10 lines of meaningful code needed
to interact with the AI service.
NOT so complex.

Today we'll look also look at more complex
scenarios.

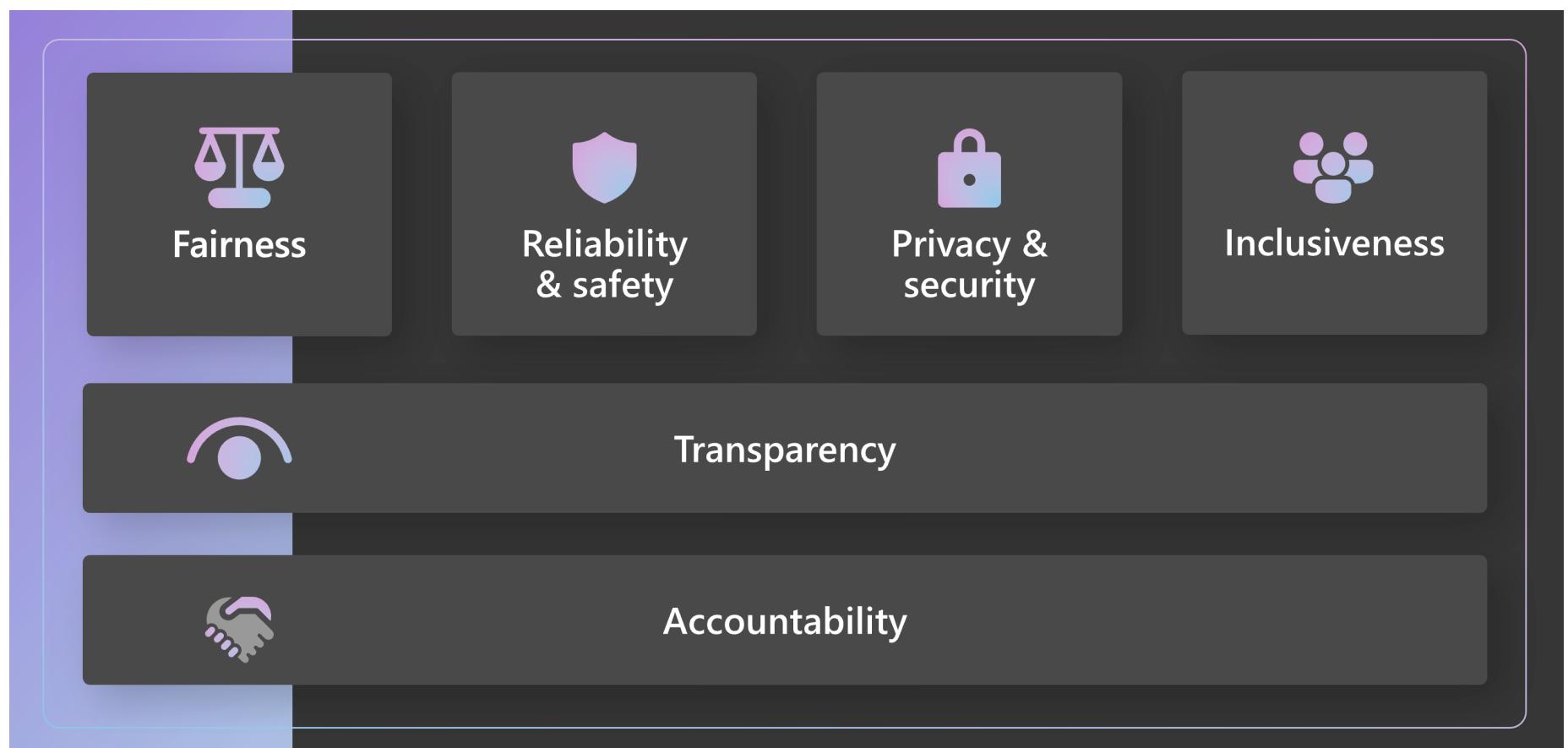
For your further exploration

Prompty.ai

1. <https://prompty.ai/>
2. <https://github.com/microsoft/prompty>
3. Extension
4. And more...



Microsoft's Responsible AI Principles



Safety first!

1. Prompt Shields

<https://learn.microsoft.com/en-us/azure/ai-services/content-safety/concepts/jailbreak-detection>

2. OWASP TOP 10 for LLMs

<https://genai.owasp.org/resource/owasp-top-10-for-l1m-applications-2025/>

Other Resources

- [Code map summary of Semantic Kernel .NET/C# APIs](#)
 - https://github.com/microsoft/semantic-kernel/blob/main/docs/code_maps/dotNET.pdf
- [Code map summary of Semantic Kernel Python APIs](#)
 - https://github.com/microsoft/semantic-kernel/blob/main/docs/code_maps/Python.pdf
- [Repo for above two code map summaries](#)
 - https://github.com/microsoft/semantic-kernel/blob/main/docs/code_maps



GitHub
Copilot

1. See **High-Level Summary of Labs**

<https://github.com/bostonazureai/rag-vector-agent-semantic-kernel?tab=readme-ov-file#high-level-summary-of-labs>

2. Install VS Code / VS extension

Dramatis Personae

ACTORS in this AI PRODUCTION

1. Large Language Model (LLM) – hosted services
 - API key, model name, endpoint (domain name)
 - Stateless (how is chat possible?)
 - Non-deterministic (can Temperature and Top-p fix that?)

Azure AI Foundry – our MaaS host!

The screenshot shows the Azure AI Foundry interface, specifically the Model catalog page. The top navigation bar includes links for Home, Model catalog, Get started, Playgrounds, Chat, Assistants, Real-time audio, Images, Completions, Tools, Fine-tuning, Azure OpenAI Evaluation, and Batch jobs. The Model catalog section is currently selected. The main content area features a heading "Find the right model to build your custom AI solution" and a search bar. Below the search bar is a grid of 15 model cards, each with a blue star icon and the model name. The models listed are:

- o1-preview (Chat completion)
- o1-mini (Chat completion)
- gpt-4o-realtime-preview (audio-generation)
- gpt-4o (Chat completion)
- gpt-4o-mini (Chat completion)
- gpt-4 (Chat completion)
- gpt-4-32k (Chat completion)
- text-embedding-3-large (Embeddings)
- text-embedding-3-small (Embeddings)
- tts (Text to speech)
- tts-hd (Text to speech)
- whisper (Speech recognition)
- dall-e-3 (Text to image)
- dall-e-2 (Text to image)
- text-embedding-ada-002 (Embedding)

ACTORS in this AI PRODUCTION

2. Tokens

- “a syllable”
- Prediction unit
- Billing unit

Tokens

Tokens	Characters
11	43

We need to stop anthropomorphizing ChatGPT.

in out

We need to stop

We need to stop anthrop

We need to stop anthropomorph

We need to stop anthropomorphizing

We need to stop anthropomorphizing Chat

We need to stop anthropomorphizing ChatG

We need to stop anthropomorphizing ChatGPT

We need to stop anthropomorphizing ChatGPT.

Token Count

```
>start% dotnet run
/Users/billdev/repos/devpartners/TRAINING/2025/foo/semantic-kernel-dev-workshop
Prompt: «In a single run-on sentence, introduce a famous programmer.»

info: Microsoft.SemanticKernel.Connectors.AzureOpenAI.AzureOpenAIChatCompletionClient[1]
      Prompt tokens: 19. Completion tokens: 43. Total tokens: 62.
Linus Torvalds, the creator of the Linux kernel and Git version control system
Finnish software engineer whose groundbreaking contributions have revolutionized
development and influenced countless technologies across the globe.
>start%
```

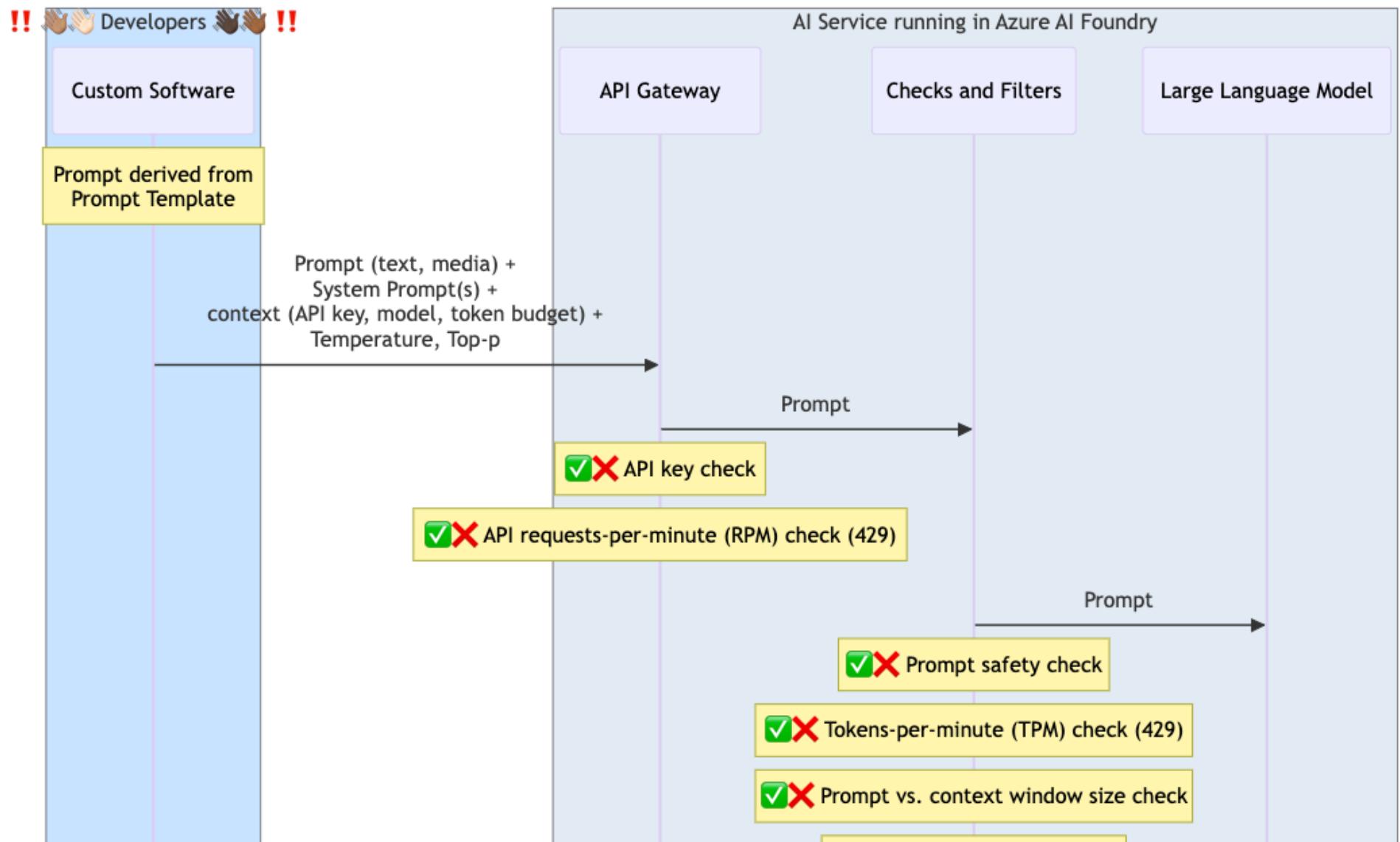
ACTORS in this AI PRODUCTION

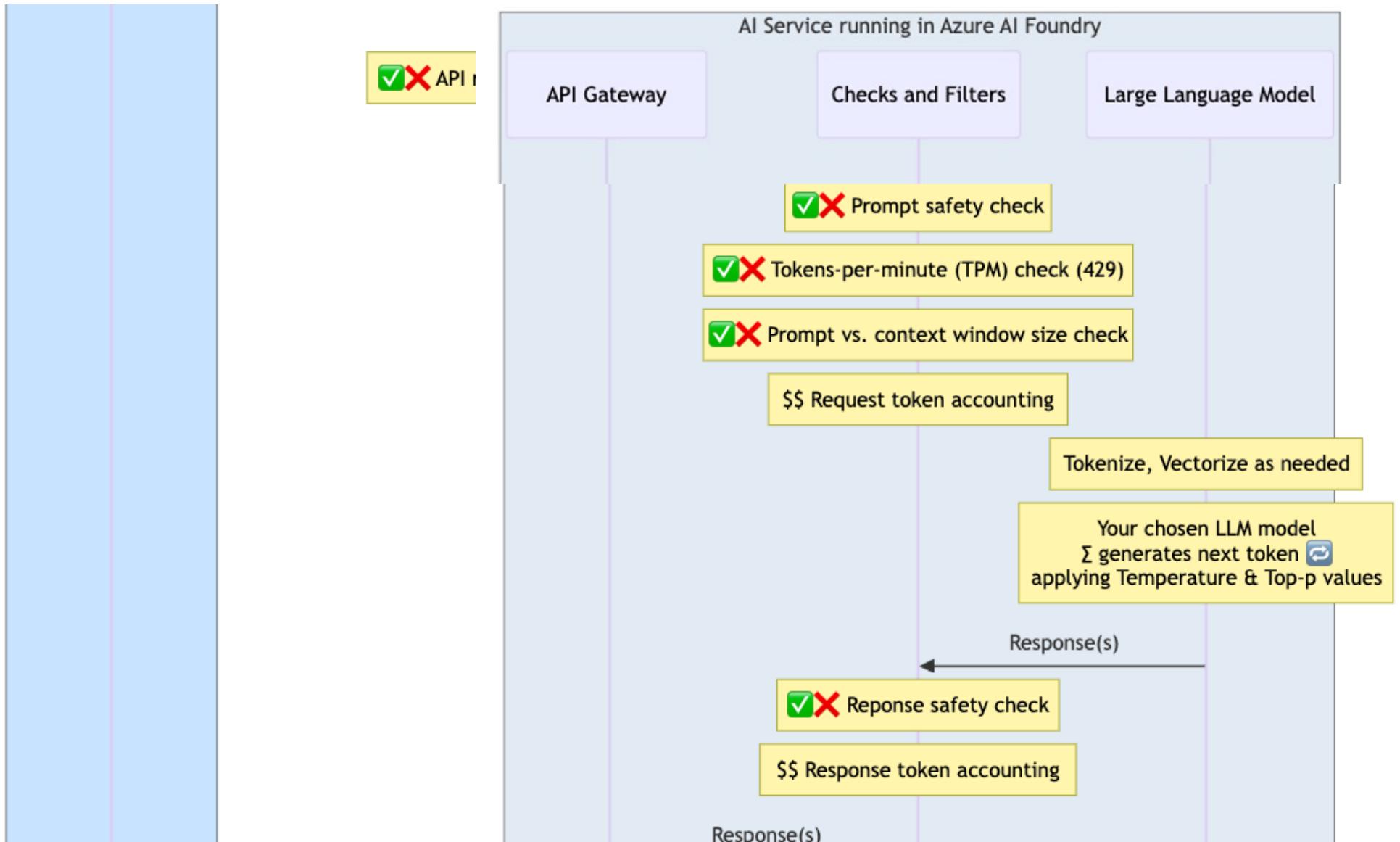
3. Prompts

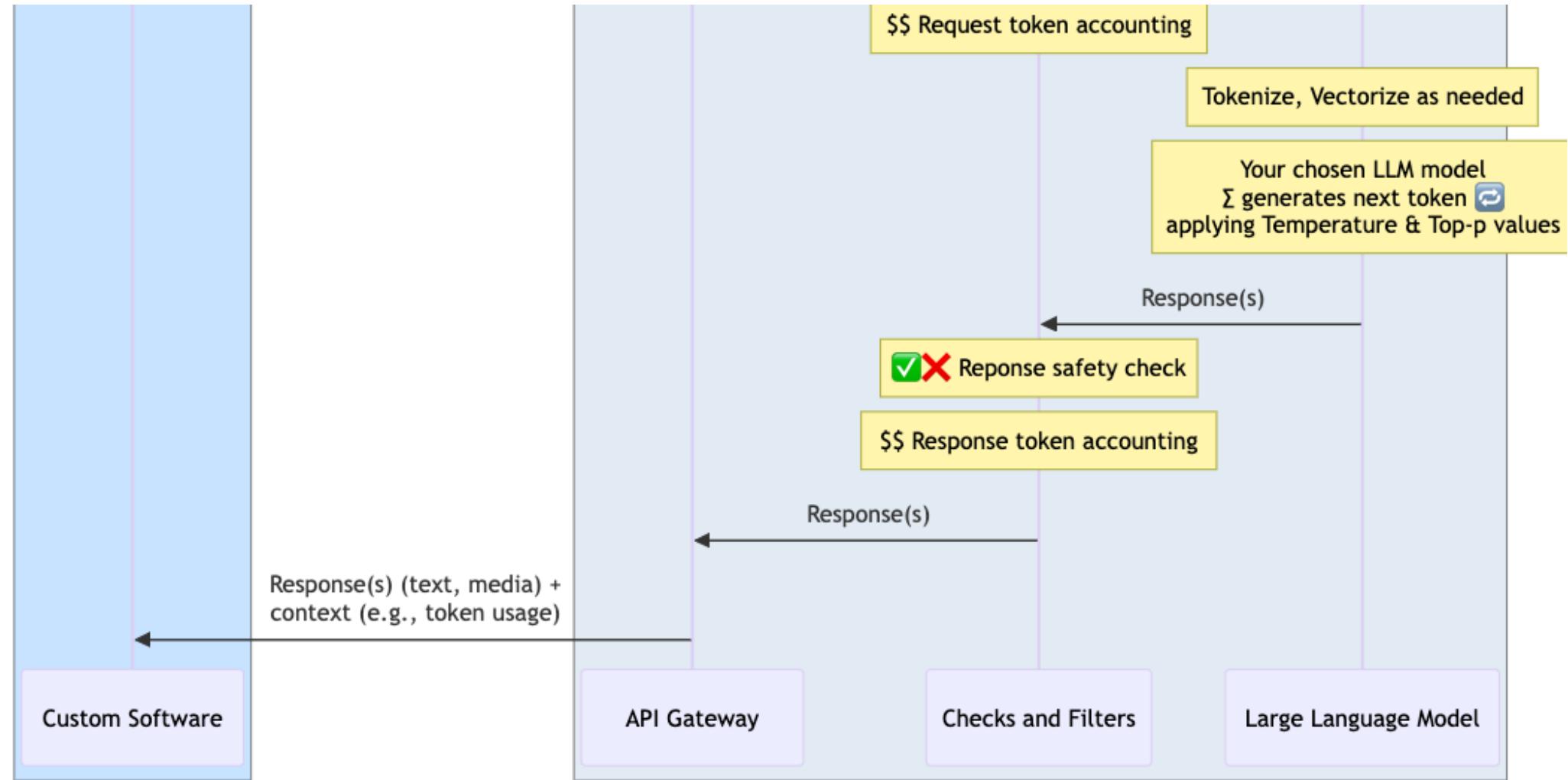
- Text
- Media
- Extra Grounding or Contextual Data (RAG, Native Functions)

Hero's The Prompt's Journey









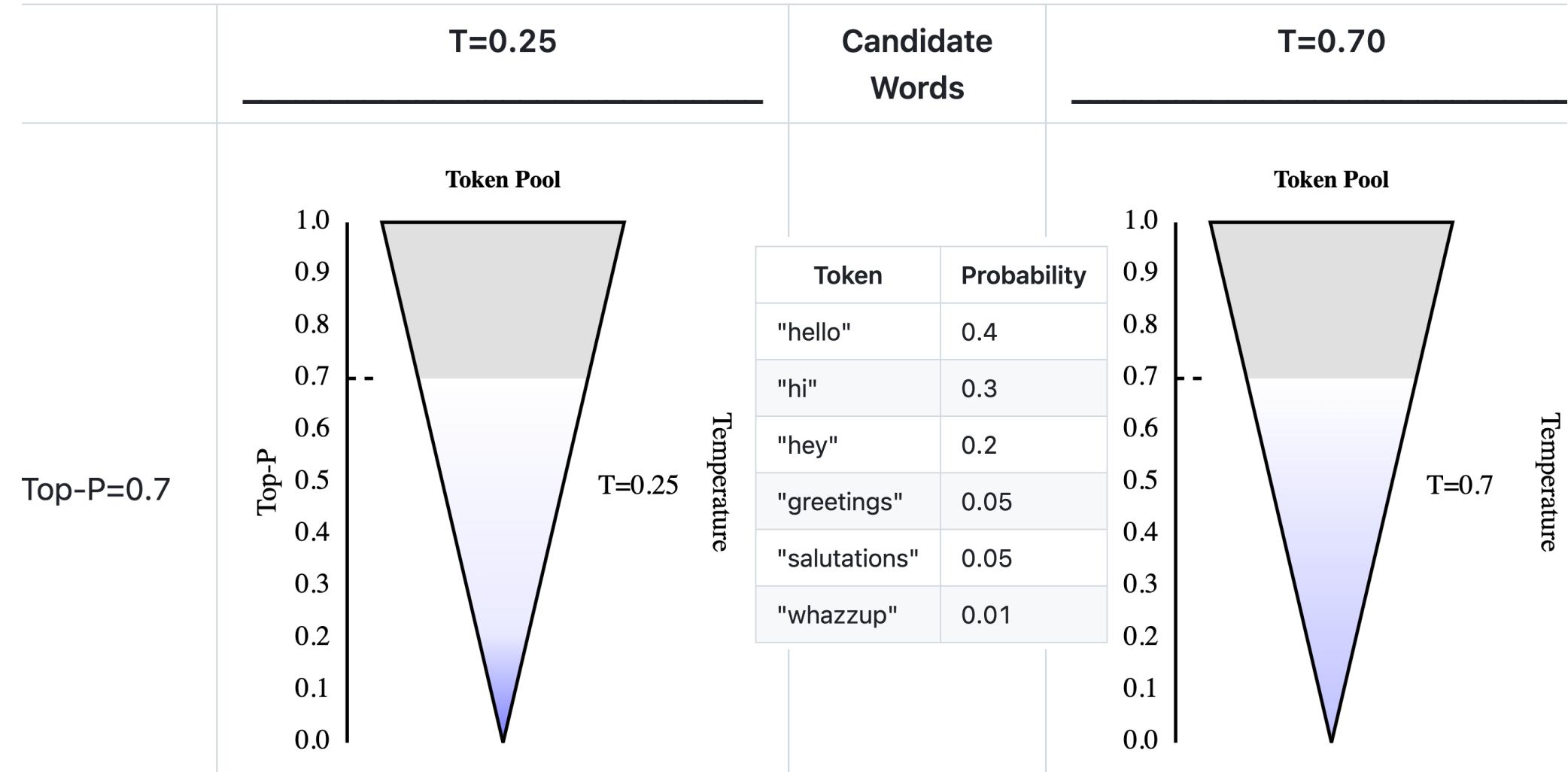
Prompt Engineering

Prompt Type	Description	Examples
Zero-shot (Lab 0)	Direct instruction without examples	<ul style="list-style-type: none">• How old is the president of the US• Translate “river” into Mandarin• Translate “நீ” into Mandarin
One-shot	Single example before the task	<i>'Hello' → '**Hello**'. Now make 'World' bold.</i>
Few-shot	Multiple examples to establish pattern	<i>Positive→Happy, Sad→Negative, Excited→[model completes]</i>
Chain of Thought	Step-by-step reasoning explanation	<i>Let's solve this step by step: \$25 shirt at 20% off = ?</i>
Role Prompting	Assign specific role/persona	<i>As an experienced chef, explain steak searing</i>
Task Decomposition (Lab 0)	Break complex tasks into subtasks	<i>See prompt in Lab 0</i>
Self-Consistency	Generate multiple solutions, select best	<i>Solve problem three ways to verify answer</i>
Template-based	For structured output, e.g., JSON	<i>Title: [X], Summary: [Y], Key Points: [Z]</i>

Prompt Executions Influencers

- The content of the prompt
 - See prior slide for Prompt Engineering techniques
 - Chat history, RAG, etc.
- The token probabilities in the model
 - Top-P influence
 - Temperature influence
- Available tokens
 - Max token for prompt
 - Context window for LLM

Top-P and Temperature



Let the Labs Begin!

```
|>start% dotnet run  
/Users/billdev/repos/devpartners/TRAINING/2025/foo/semantic-kernel-dev-workshop/labs/lab0/src/start  
Prompt: «In a single run-on sentence, introduce a famous programmer.»  


---

info: Microsoft.SemanticKernel.Connectors.AzureOpenAI.AzureOpenAIChatCompletionService[0]  
    Prompt tokens: 19. Completion tokens: 43. Total tokens: 62.  
Linus Torvalds, the creator of the Linux kernel and Git version control system, is a world-renowned  
Finnish software engineer whose groundbreaking contributions have revolutionized open-source softwar  
e development and influenced countless technologies across the globe.  
>start%
```

Go at your own pace

Ask questions

Take breaks

Find us at **github.com/bostonazureai**

```
gh repo clone  
bostonazureai/semantic-  
kernel-dev-workshop
```

Lab 0, Lab 1, Lab 2, then Jason ☺

Lab 0: Can we just access the dang API?

- Focus: Accessing APIs and running a simple SK console app.
- Objectives: Get local copies of API keys, run a simple SK console app.
- Simple Prompting.

Lab 1: Getting Started with Semantic Kernel

- Focus: Adding Semantic Kernel to an application, using Azure OpenAI, and creating prompt functions.
- Objectives: Demonstrate how to add Semantic Kernel to an existing application, use Semantic Kernel to chat with the Azure OpenAI LLM, define a prompt function and use it in an application, recognize the need for chat history and how to add it.
- Additional Exercises: Experiment with different Temperature values to see their influence.

Lab 2

Lab 2: Creating Semantic Kernel Plugins

- Focus: Creating native plugins and using web search plugins.
- Objectives: Implement a plugin with native C# code, use a plugin to give an LLM additional information, create a plugin that uses an LLM to rewrite a user query, utilize a Semantic Kernel plugin to perform a web search.
- Additional Exercises: Experiment with different plugin functions.

Let's Go!

Like in Hollywood,
don't call us, we'll call you!

<https://bit.ly/autoinvokefunc>



Questions?

Connect with Bill

Bill Wilder
@codingoutloud

blog.codingoutloud.com

linkedin.com/in/billwilder

See you at
Boston Azure



bostonazureai.org
[@bostonazureai](https://twitter.com/bostonazureai)



