

Why You Should Be Looking At Semantic Kernel To Build Your Copilot

Mike Yeager
CEO of CODE Consulting

About Mike Yeager

- CEO CODE Consulting
- Senior developer and manager
- AI project lead
- Writer & speaker
- MS Azure contributor

myeager@codemag.com





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Agenda



What is Semantic Kernel?

Why should I use a framework?

Which frameworks do I care about?

What’s in these frameworks?

Coding with Semantic Kernel!

What is Semantic Kernel?

Semantic Kernel is an open-source framework, created by Microsoft for working with LLMs and SLMs.

Semantic Kernel has been at the center of the copilot stack.

Why a Framework?

To handle more complex implementations in a generic way

To abstract the underlying LLMs, APIs and tooling

Which Frameworks to Care About?

- LangChain is the most popular LLM framework
  - https://docs.langchain.com/docs/
  - Implemented in Python and JavaScript/TypeScript
  - Powerful and mature – Losing favor
- Semantic Kernel is Microsoft's LLM framework
  - https://learn.microsoft.com/en-us/semantic-kernel/
  - https://github.com/microsoft/semantic-kernel
  - Implemented in .NET (C#), Python and Java
  - Powerful and Mature
- Microsoft.Extension.AI
  - https://learn.microsoft.com/en-us/dotnet/ai/ai-extensions

What’s in These Frameworks?



Create a library of prompts in a generic way (templating)

Create and use large contexts (grounding, RAG)

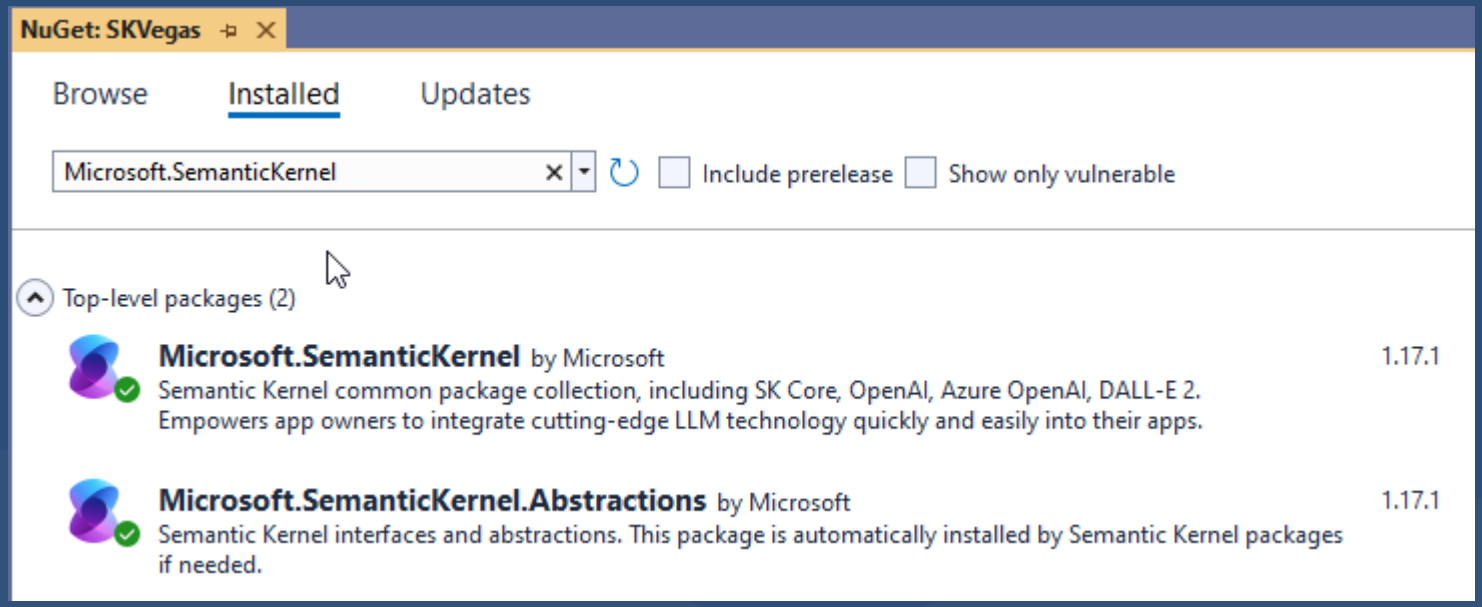
Integrate with external tools and systems (connectors/plugins)

Use automated function calling to achieve complex goals and to create agents

Agents

Introduction to Semantic Kernel

It's a NuGet package



https://github.com/microsoft/semantic-kernel

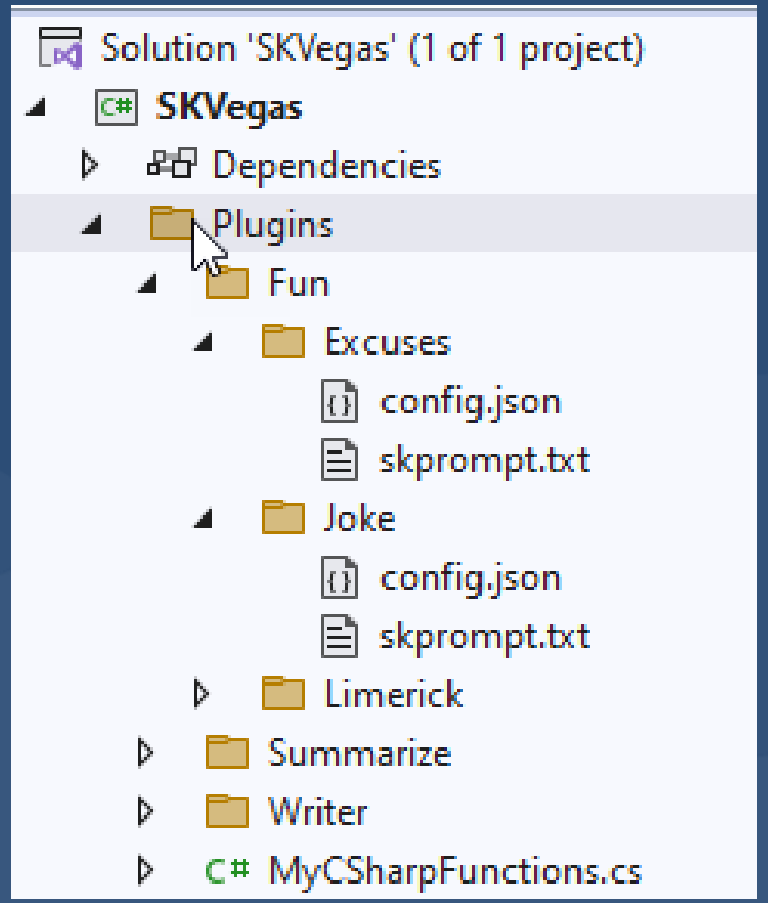
- Jupyter Notebook samples
- .NET samples
- Docs

Functions and Plugins

A Function is a prompt, templated prompt or native code

- Semantic Function
  - Inline
  - External
- Native Function

A Plugin is a set of Functions



Semantic Functions (Templated Prompts 1 of 2)

Text – like a mail merge document (skprompt.txt)

skprompt.txt | Program.cs

```
1  Generate a creative reason or excuse for the given event. Be
     creative and be funny. Let your imagination run wild.
2
3  Event:I am running late.
4  Excuse:I was being held ransom by giraffe gangsters.
5
6  Event:{{$input}}
```

Semantic Functions (Settings 2 of 2)

Settings for running the prompt (config.json)

config.json

Schema: https://json.schemastore.org/config.json

```
{
  "schema": 1,
  "description": "Turn a scenario into a creative or humorous excuse to send your boss"
  "type": "completion",
  "completion": {
    "max_tokens": 60,
    "temperature": 0.5,
    "top_p": 0.0,
    "presence_penalty": 0.0,
    "frequency_penalty": 0.0
  }
}
```

Prompty

A format for LLM prompts and settings.

Standardizes prompts and their execution into a single asset.

https://github.com/microsoft/prompty/blob/main/Prompty.yaml

Runtimes: Semantic Kernel, Langchain, Prompt flow, VS Code, Azure AI Studio, etc.

Language agnostic: Python, C#, TypeScript/JavaScript.

Prompty Example

joke.prompty

```
---
name: JokePrompt
description: Generate a funny joke
authors:
  - Mike Yeager
model:
  api: chat
  configuration:
    type: azure_openai
  parameters:
    max_tokens: 1000
    temperature: 0.9
    top_p: 0.0
    presence_penalty: 0.0
    frequency_penalty: 0.0
sample:
  subject: square dancing
  style: monty python
---


user:
# WRITE EXACTLY ONE JOKE or HUMOROUS STORY ABOUT THE SUBJECT BELOW

JOKE MUST BE:
- G RATED
- WORKPLACE/FAMILY SAFE

NO SEXISM, RACISM OR OTHER BIAS/BIGOTRY

BE CREATIVE AND FUNNY. I WANT TO LAUGH.

Incorporate the style suggestion, if provided: '{{style}}'

+++++
{{subject}}
+++++
```

Native Function (C# Code)

String as input

String as output

MyCSharpFunctions.cs

SKVegas

SKLasVegas.Functions.MyCSharpFunction

```
1  using Microsoft.SemanticKernel;
2  using System.ComponentModel;
3
4  namespace SKLasVegas.Functions;
5
   3 references
6  public class MyCSharpFunctions
7  {
8      [KernelFunction, Description("Return the first row of a qwerty keyboard")]
       0 references
9      public string Qwerty()
10     {
11         return "qwertyuiop";
12     }
13
14     [KernelFunction, Description("Return a string that's duplicated")]
       0 references
15     public string DupDup(string input)
16     {
17         return input + input;
18     }
19 }
20
```

Function Examples



Inline Functions

Basic Templated Functions

Native Functions

Prompty

A Brief Overview of RAG



RAG is a powerful way to provide more context for your ask

- a. k. a. How to get around prompt size limits & ground your models

Types of RAG

- Lexical (keyword) Search
- Semantic (vector/embeddings) Search
- Hybrid Search
- Knowledge Graphs
- SQL Queries

Plugins/Functions/Tools



3rd party functions give access to their systems & features

Added to catalogs with descriptions for you to use

E.g. Microsoft365, Microsoft Graph, Bing, Google, Slack

OpenAI “function definition”

https://platform.openai.com/docs/guides/function-calling

Model Context Protocol (MCP)

https://modelcontextprotocol.io/introduction

Automatic Function Calling



OpenAI introduced the ability for the LLM to invoke user-provided functions with callbacks.

Semantic Kernel automates the entire process.

Agents

Agents are instances of LLMs given a personality (specific instructions), and access to a specific set of tools.

You can think of an agent as a specialist with a particular set of skills.

Multiple agents can be used to accomplish complex goals, and they can be coordinated by a master agent whose skill is to coordinate other agents.

RECAP...

Create a library of prompts in a generic way (templating)

FUNCTIONS

Create and use large contexts (grounding)

RAG INTEGRATION

Integrate with external tools and systems

PLUGINS/TOOLS

Advanced ways to achieve a goal

Automatic Function Calling & Agents

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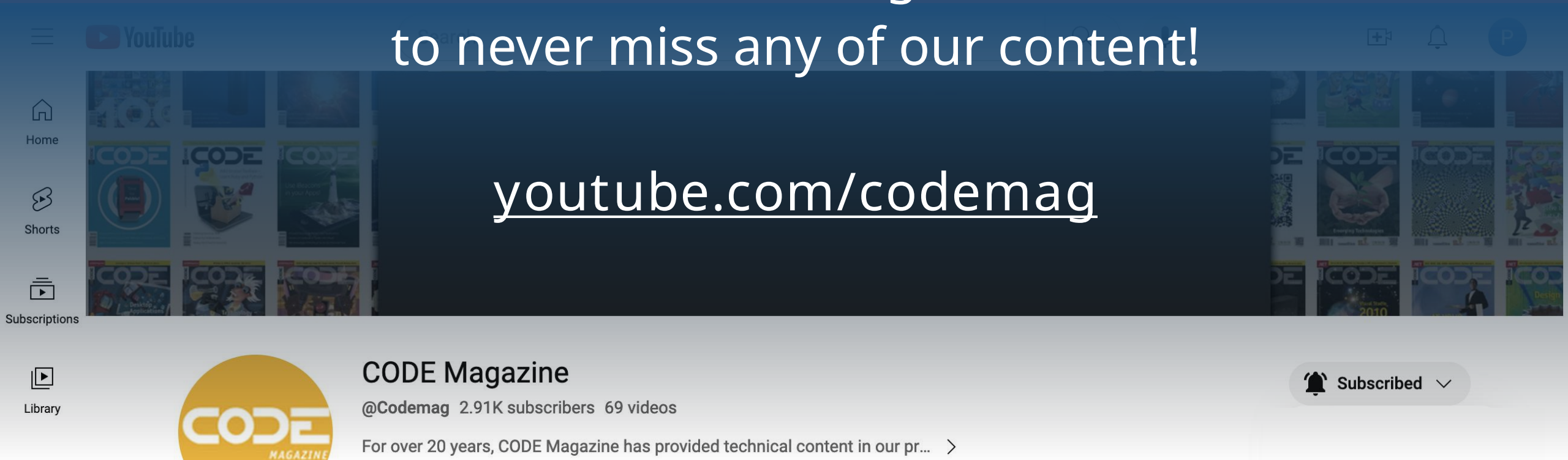
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