



# Microsoft Java Developer Conference 2024

Code. Cloud. Community.



# Semantic Kernel for Java



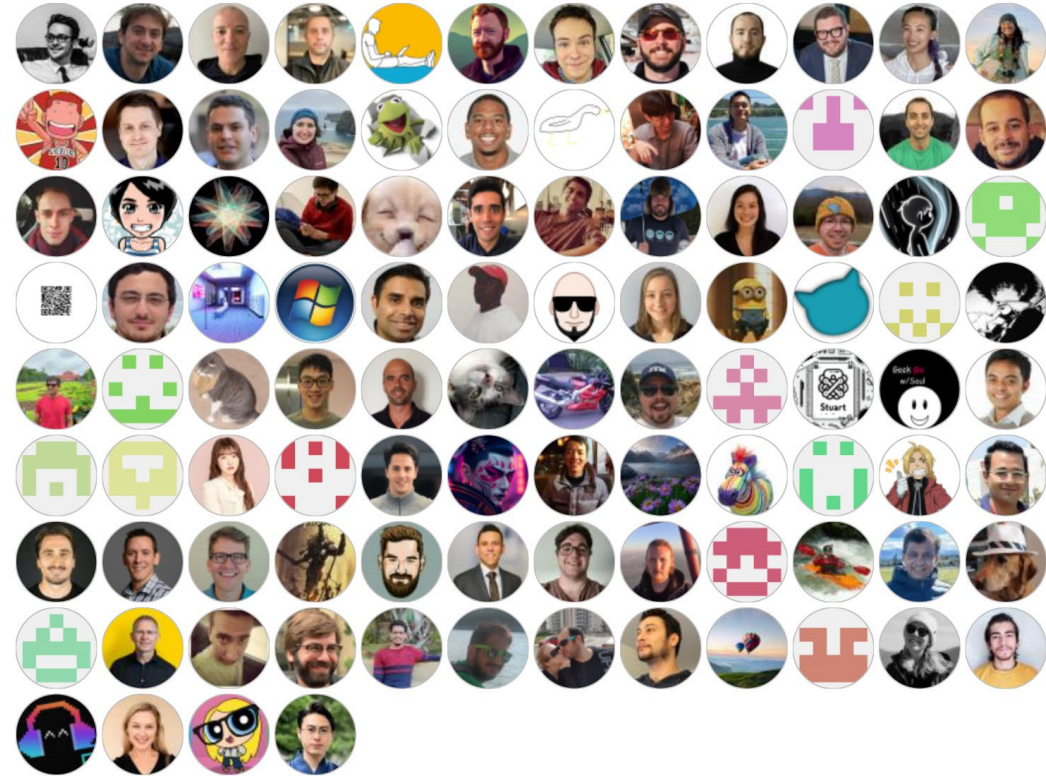
# Who We Are!



**Rory Preddy**  
Developer Advocate

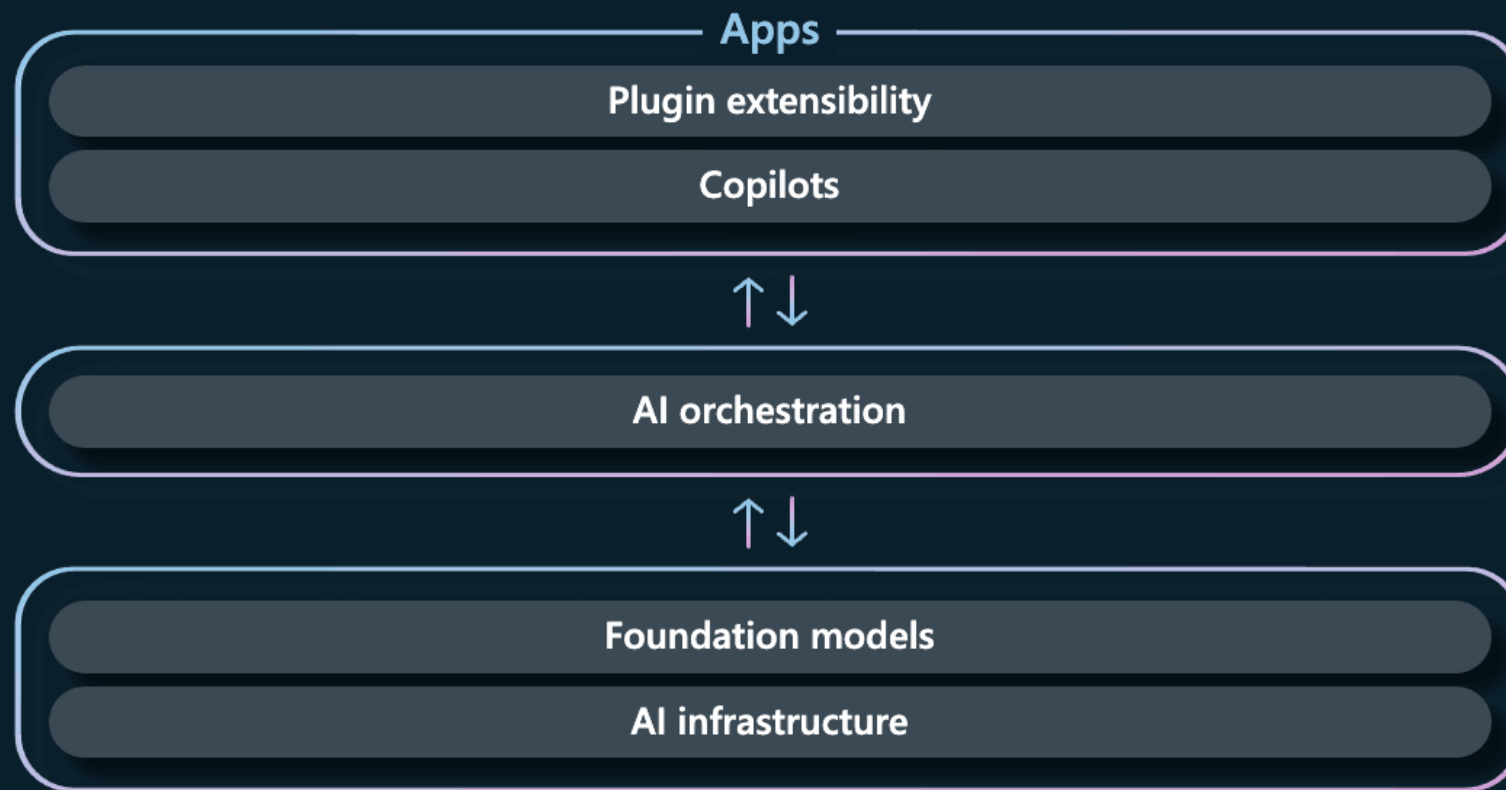
 rorypreddy

## Contributor Wall of Fame



<https://aka.ms/SKDiscord>

# Copilot stack



# How did we get here?

## Chatbot

Simple back-and-forth chats with a user.

## Copilot

Agents that work side-by-side with a user to complete a task.

## RAG

Retrieval augmentation generation for conversations grounded in real data.

## Fully autonomous

Agents that can respond to stimuli with minimal human intervention.

# What is Semantic Kernel (SK)?

Semantic Kernel is a lightweight open-source SDK that lets you **orchestrate** native code with LLMs.



# SK for Java

Java 8+ library

Available on Maven Central

Works on Android 8.0 API Level 26+

Popular Models

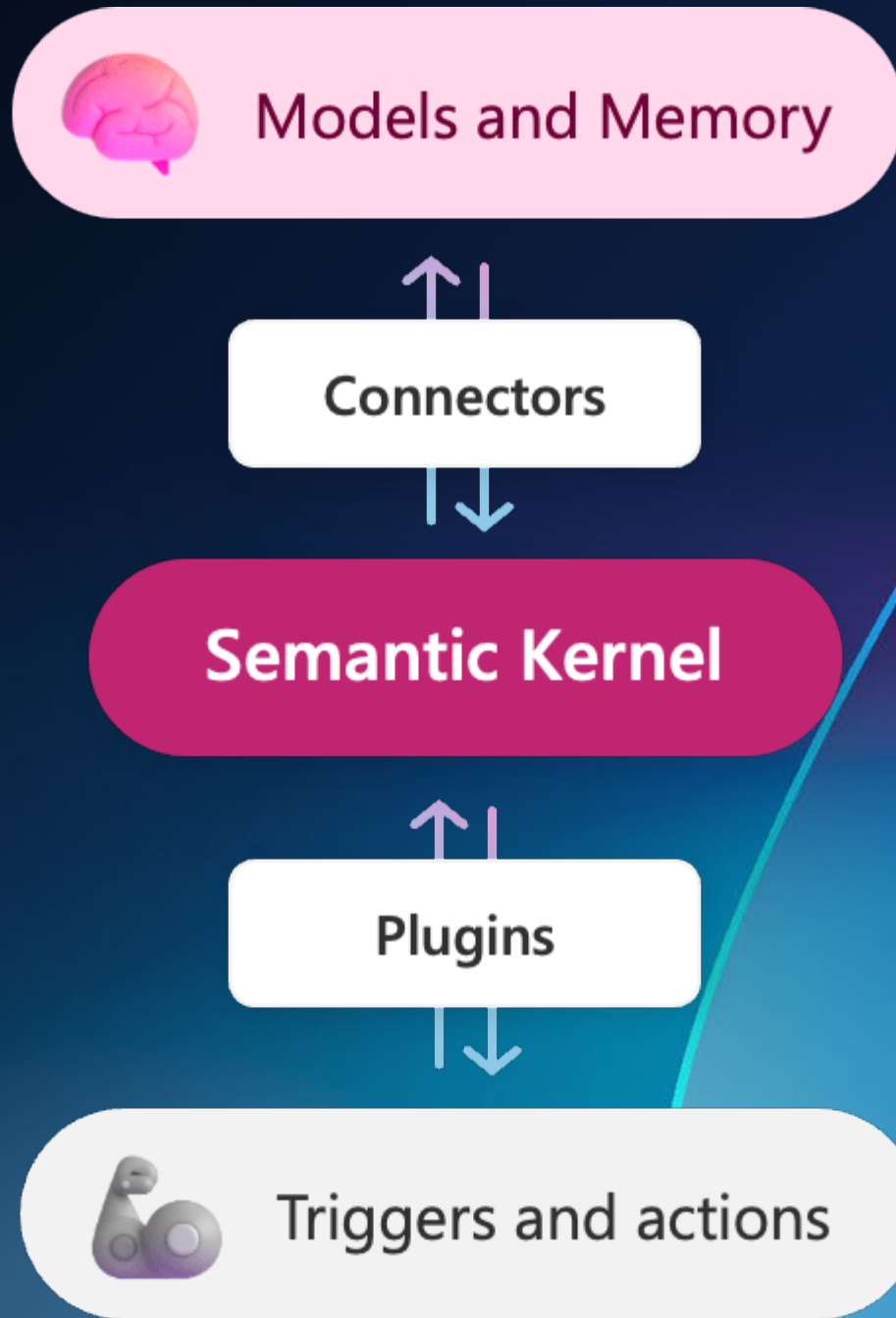
Open sourced on GitHub

MIT License

Samples available (based on Java 17+)

GraalVM Native Image (WIP)

# Concepts





# Create the Kernel

```
public Kernel kernel() throws ConfigurationException {
    // Create a memory for the kernel to store information
    var memory = SKBuilders.semanticTextMemory().build();

    // Load Open ai settings from the configuration file/properties/environment
    AzureOpenAISettings settings = new AzureOpenAISettings(SettingsMap.getDefault());

    // Create an OpenAI client
    OpenAIAsyncClient openAiClient = new OpenAIClientBuilder()
        .endpoint(settings.getEndpoint())
        .credential(new AzureKeyCredential(settings.getKey()))
        .buildAsyncClient();

    // Create a text completion service
    TextCompletion completion = SKBuilders.textCompletion()
        .withOpenAIClient(openAiClient)
        .withModelId(modelId:"text-davinci-003")
        .build();

    // Create a kernel
    return SKBuilders
        .kernel()
        .withMemory(memory)
        .withDefaultAIService(completion)
        .build();
}
```

## Writer plugin

Function	Description for model
Brainstorm	Given a goal or topic description generate a list of ideas.
EmailGen	Write an email from the given bullet points.
ShortPoem	Turn a scenario into a short and entertaining poem.
StoryGen	Generate a list of synopsis for a novel or novella with sub-chapters.
Translate	Translate the input into a language of your choice.

Can you write me a short poem about living in Dublin, Ireland and then create a story based on the poem?

Planner

**Copilot**  
Sure! Here's a story based on living along the Grand Canal in Dublin, Ireland...

# Skills (Plugins)

```
Kernel kernel = getKernel();

// Add a native function to the kernel that can call a search engine
SKFunctionsearch =kernel.importSkill(newSearchEngineSkill(), null).getFunction("search", null);

// Add a semantic skill that can summarize a block of text
SKFunctionsummarize =kernel.importSkillFromDirectory("SummarizeSkill", "./").getFunction("Summarize", null);

// Answer a question with a short summary as a result
kernel.runAsync("What's the tallest building in South America?", search, summarize);
```

# Memory Example

```
var facts = Arrays.asList(
    "My name is Andrea",
    "I work as a tourist operator",
    "I've been living in Seattle since 2005",
    "I visited France and Italy five times since 2015",
    "My family is from New York"
);

// Save facts to memory
for (int i = 0; i < facts.size(); i++) {
    var memory = kernel.getMemory();
    memory
        .saveInformationAsync(MEMORY_COLLECTION_NAME, facts.get(i), "info" + i, null, null)
        .block();
}
```

# Memory Example

```
// System prompt
String prompt = """
    Consider only the facts below when answering questions.
    About me: {{memory.recall 'where did I grow up?'}}
    About me: {{memory.recall 'where do I live?'}}
    Question: {{$input}}
    Answer:
    """;

...

// User prompt
SKContext result = kernel
    .invokeAsync("Do I live in the same town where I grew up?", context, null)
    .block();
```

# Query Results

RENDERED PROMPT:

Consider only the facts below when answering questions.

About me: **My family is from New York**

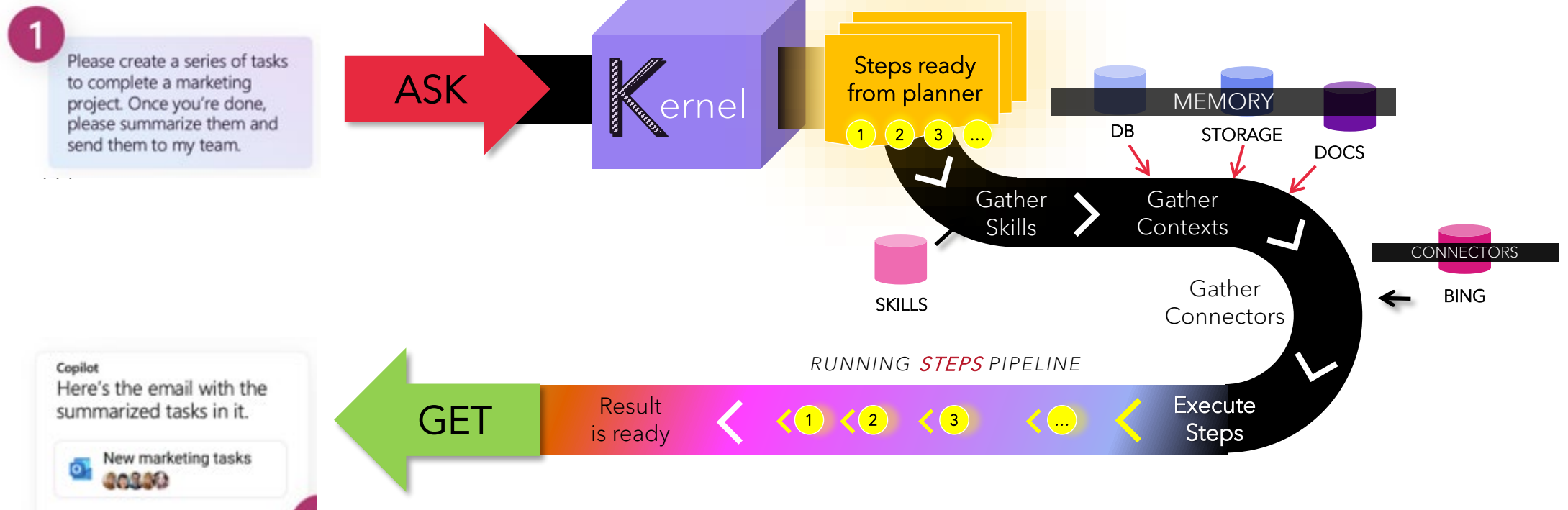
About me: **I've been living in Seattle since 2005**

Question: Do I live in the same town where I grew up?

Answer:

**No, I do not live in the same town where I grew up since my family is from New York and I have been living in Seattle since 2005.**

# SK Example



# The evolution of planners

## Generation 1

### Action planner

Choose the single best action for a goal

## Generation 2

### Sequential planner

Generate a complete plan to accomplish a goal

## Generation 3

### Stepwise planner

Iterate on a user's goal until it is complete.

*One* action

*Several* actions

*Many* actions



# Planner

```
// Add text skills into the planner
kernel.importSkill(new TextSkill(), "TextSkill");

// Create a plan to achieve the goal
var planner = new SequentialPlanner(kernel, null, null);
var plan = planner.createPlanAsync(
    | "Write a poem about John Doe, then translate it into Italian, then convert it to uppercase."
).block();

// Execute the plan
SKContext result = plan.invokeAsync().block();
```

# Code to Cloud Journey



## Application Code

- Which cloud services should I use with this code?
- What libraries do I need to reference?
- How should I set up my local dev environment?
- Provision infrastructure & services
- Configure infrastructure & services
- Roles & Permissions
- Infrastructure as Code
- Run locally (F5)
- Deploy to cloud
- Monitoring & Observability
- CI/CD pipeline

## Developer's Goal

App Running in the Cloud with CI/CD & monitoring



# Azure Developer CLI

```
azd init  
azd up  
azd monitor  
azd pipeline config
```

**azd commands**



**Your app**



**azd up**



**The cloud**


# Template Library

A community-contributed template gallery built to work with the Azure Developer CLI.

Not familiar with the Azure Developer CLI (azd)? [Learn more](#)

Viewing 2 templates for 'openai'

Sort by: Alphabetical (A - Z) ▾


 Microsoft Authored

## Java - ChatGPT + Enterprise data with Azure OpenAI and Cognitive Search

by Davide Antelmo

This repo is the java conversion of the well known chatGPT + Enterprise data code sample originally developed in python

Artificial Intelligence Azure App Service Bicep  
Azure Cognitive Search Java Azure OpenAI Service React.js

 Microsoft Authored

## Spring ChatGPT Application using Azure OpenAI on Azure Spring Apps

by Yi Liu

A sample that uses Java Spring framework to build ChatGPT-style application running in Azure Spring Apps.

Artificial Intelligence Azure Spring Apps Bicep

<https://aka.ms/awesome-azd>



During a performance review, your supervisor will discuss your performance over the past year and provide feedback on areas for improvement <sup>1</sup>. They will also provide you with an opportunity to discuss your goals and objectives for the upcoming year <sup>1</sup>. Performance reviews are a two-way dialogue between managers and employees <sup>1</sup>.

Citations: [1. employee\\_handbook.pdf#page=4](#)

Follow-up questions: *What is the process for scheduling a performance review?*

*How often are performance reviews conducted?*

*What are some common performance review ratings?*

Type a new question (e.g. does my plan cover annual eye exams?)

### Configure answer generation ✕

- Java Azure Open AI SDK
- Java Semantic Kernel - Memory
- Java Semantic Kernel - Orchestration

#### Semantic Kernel mode \*

Function Chaining ▾

#### Retrieve this many search results:

3 ▴ ▾

#### Exclude category

- Use semantic ranker for retrieval
- Use query-contextual summaries instead of whole documents
- Suggest follow-up questions

#### Retrieval mode \*

Vectors + Text (Hybrid) ▾

Close

**Demo**

[aka.ms/sk-code](https://aka.ms/sk-code)

## 1.0.0 Release Candidates

- OpenAI plugin spec
- Kernel hooks
- HandleBars Planner

<https://github.com/microsoft/semantic-kernel/tree/java-v1>

**Just released**





! findPotentialThingsWrong.prompt.yaml U x

! function2.prompt.yaml U



prompts &gt; ! findPotentialThingsWrong.prompt.yaml &gt; [ ] input\_variables &gt; {} 0 &gt; required

```
1 name: ShippingExpertAgent
2 description: Helps a user get information about a shipment
3 template: |
4   <message role="system">
5     ## Instructions
6     Help the user by providing information about their shipment.
7
8     ## Information about the shipment
9     {{ShippingPlugin-GetShipmentInformation shippingCode}}
10  </message>
11 template_format: handlebars
12 plugins:
13   include:
14     - ShippingPlugin
15 input_variables:
16   - name: shippingCode
17     description: The ID of the shipment
18     required: true
```



# Thank you



**Code**

[aka.ms/sk-code](https://aka.ms/sk-code)

**Docs**

[aka.ms/sk-jdconf](https://aka.ms/sk-jdconf)

**Tools**

[aka.ms/awesome-azd](https://aka.ms/awesome-azd)

**Discord**

[aka.ms/SKDiscord](https://aka.ms/SKDiscord)