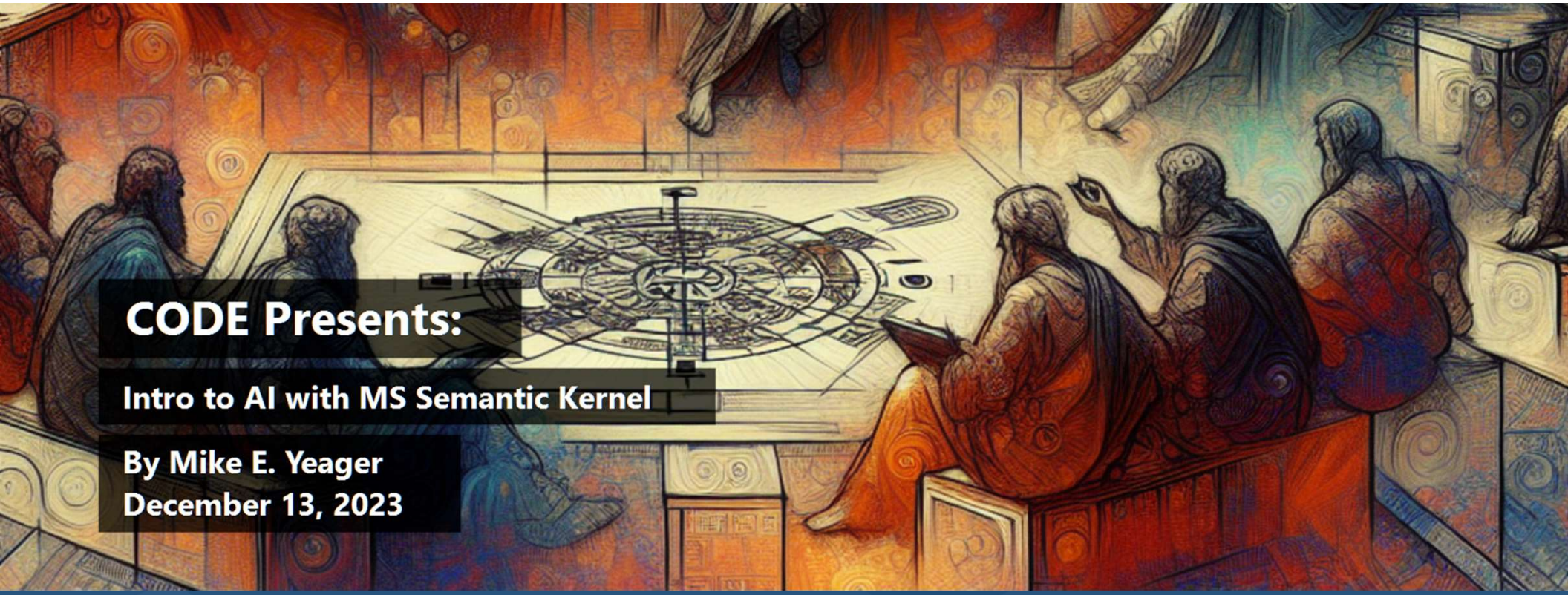

Mike Yeager
CEO of CODE Consulting

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About Mike Yeager

CEO of CODE Consulting

20+ years of professional experience developing software for different sectors

Author

Speaker

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30 Years of

"Helping People Build Better Software"

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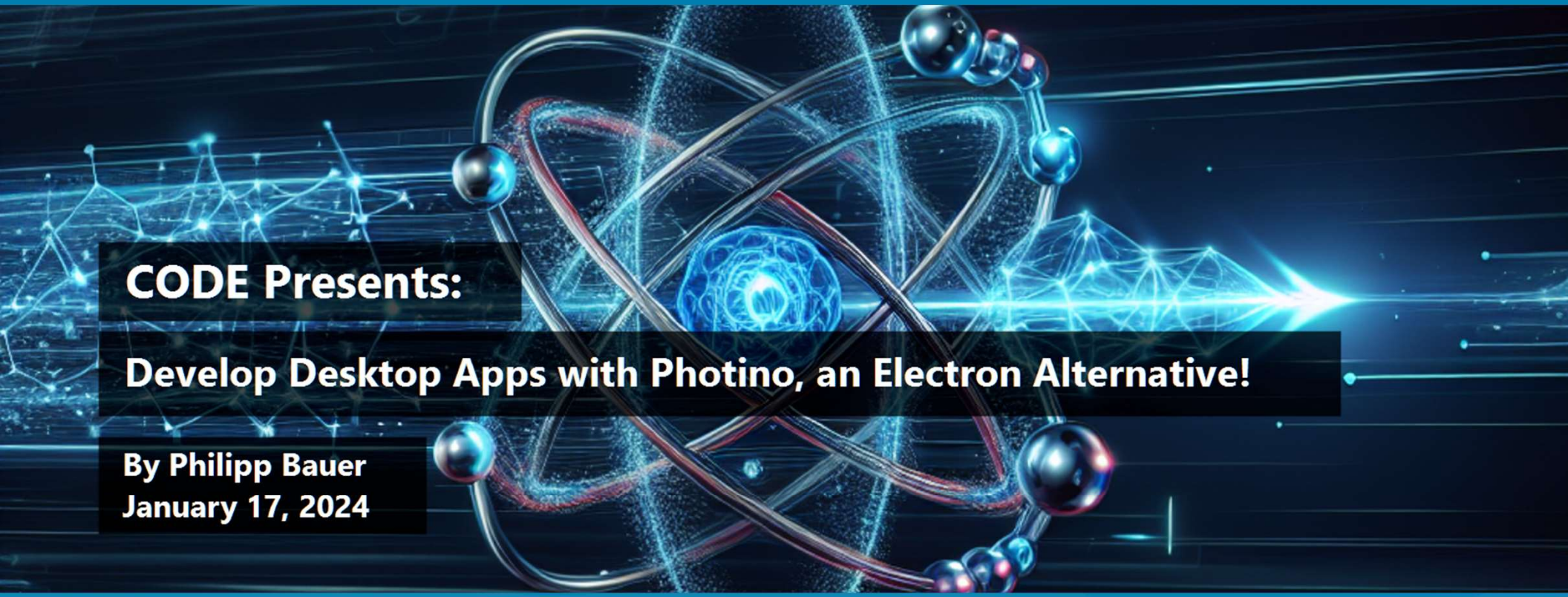

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Agenda

CODE PRESENTS

What is Semantic Kernel?

Why a framework?

Which frameworks do I care about?

What’s in these frameworks?

Introduction to Semantic Kernel – Coding!

What is Semantic Kernel?

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

Semantic Kernel is at the center of the copilot stack.

Why a framework?

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To handle more complex implementations in a generic way

To abstract the underlying LLMs, APIs and tooling

Which frameworks to care about?

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LangChain is the most popular LLM framework

- https://docs.langchain.com/docs/
- Implemented in Python and JavaScript/TypeScript
- Powerful and mature

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
- Incomplete, but moving fast

What’s in these frameworks?

CODE PRESENTS

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

Create and use large contexts (grounding, rag)

Integrate with external tools and systems (connectors/agents/plugins)

Utilities like text splitters & chunkers

Plan or “chain” prompts together to achieve a goal

Introduction to Semantic Kernel

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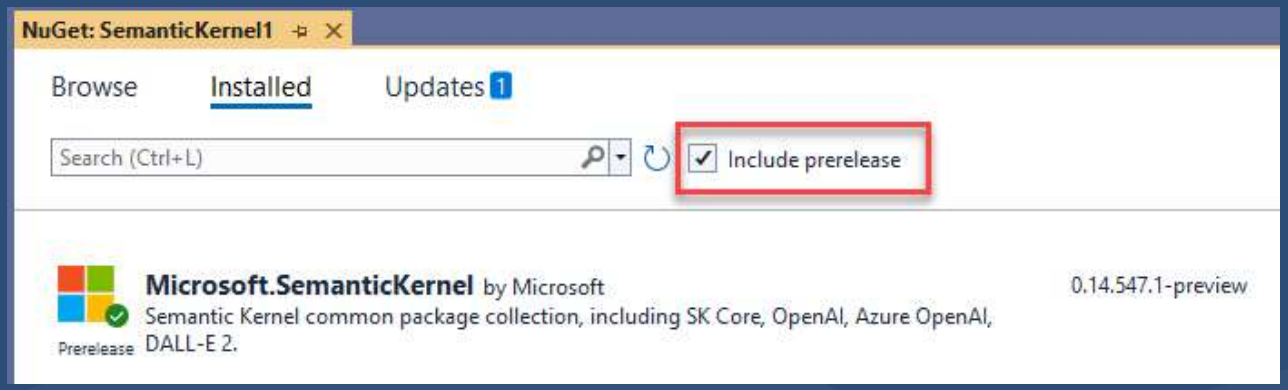
It’s a NuGet package



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

- Jupyter Notebook samples
- .NET and React! samples

Functions ~~and Skills~~

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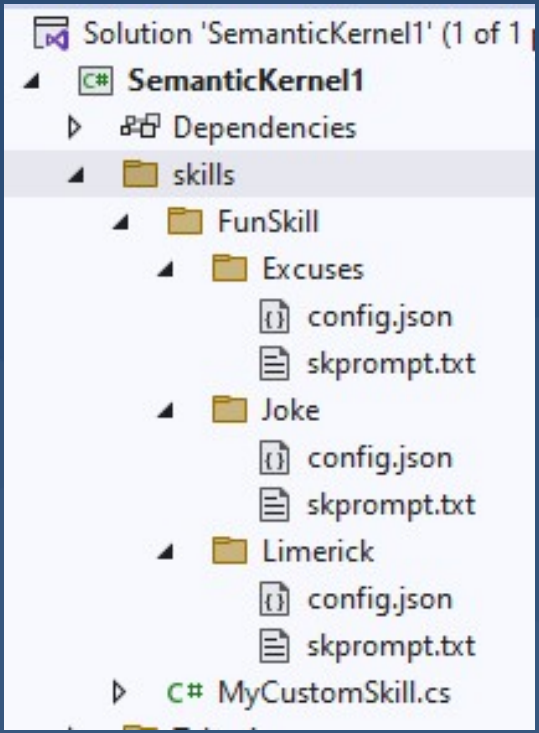
A Function is a prompt, templated prompt or native code

- Semantic Function
  - Inline
  - External
- Native Function

~~A Skill is a set of Functions~~



Semantic Functions (Templated Prompts 1 of 2)

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

skprompt.txt | Program.cs

```
Generate a creative reason or excuse for the given event. Be
  creative and be funny. Let your imagination run wild.

Event:I am running late.
Excuse:I was being held ransom by giraffe gangsters.

Event:{{$input}}
```

Semantic Functions (Settings 2 of 2)

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Settings for running the prompt (config.json)

config.json

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

```
1  {
2    "schema": 1,
3    "description": "Turn a scenario into a creative or humorous excuse to send your boss"
4    "type": "completion",
5    "completion": {
6      "max_tokens": 60,
7      "temperature": 0.5,
8      "top_p": 0.0,
9      "presence_penalty": 0.0,
10     "frequency_penalty": 0.0
11   }
12 }
```

Native Function (C# Code)

String as input

String as output

MyCustomSkill.cs

SemanticKernel1 | SemanticKernel1.skills.MyCSharpSkill

```
using Microsoft.SemanticKernel.SkillDefinition;

namespace SemanticKernel1.skills;

0 references
public class MyCSharpSkill
{
    [SKFunction("Return the first row of a qwerty keyboard")]
    0 references
    public string Qwerty(string input)
    {
        return "qwertyuiop";
    }

    [SKFunction("Return a string that's duplicated")]
    0 references
    public string DupDup(string text)
    {
        return text + text;
    }
}
```

Pipelines (Chaining)

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String as input

String as output

Default parameter name for templated functions: {{$input}}

“Caught in a whirlpool on the way to work my speedboat was!”

Function Examples

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Inline Functions

Basic Templated Functions

Native Functions

Pipelines (Chaining)

Memories

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Memories are a powerful way to provide broader context for your ask

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

Types of Memories

- Key-Value pairs
- Local Storage
- Semantic Memories (Embeddings)

Memory Examples

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Key-value pairs

Embeddings (vector databases)

Utilities (chunkers)

Plugins

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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

Plugins are just groups of native and/or sematic functions exposed by creating a JSON manifest following the OpenAI plugin specification

https://platform.openai.com/docs/plugins/getting-started

Plugins

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OpenAI Assistants are Plugins in SK

Access Ollama (local run LLMS)

Planner

There are actually a few planners:

- ActionPlanner (single step)
- SequentialPlanner
- StepwisePlanner (incremental planning)

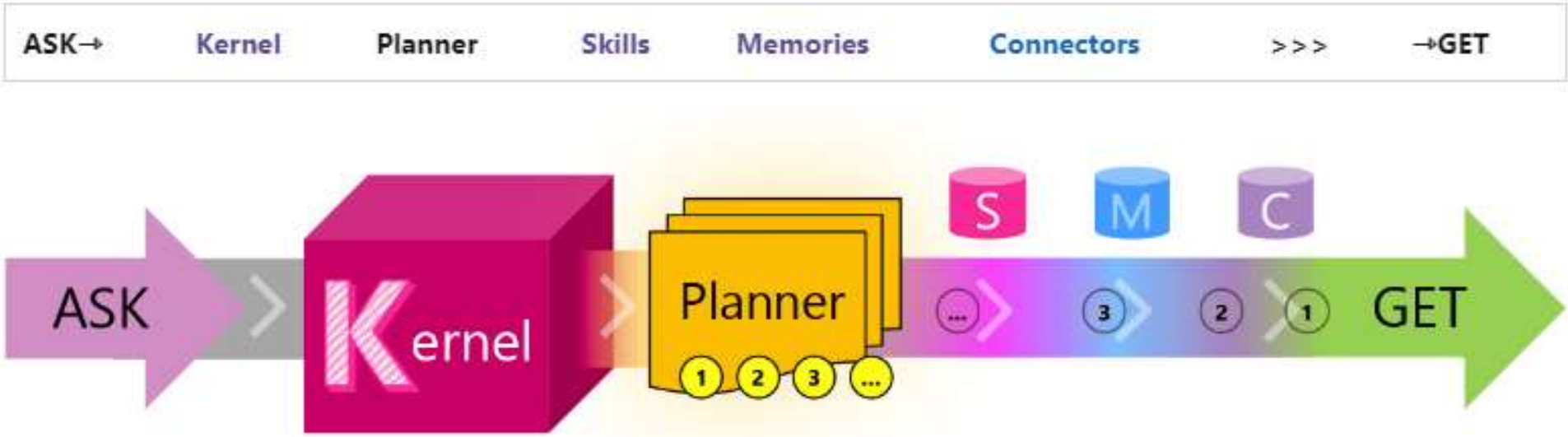
Planner

Because the planner has access to either a pre-defined library of pre-made skills and/or a dynamically defined set of skills it is able to fulfill an ASK with confidence. In addition, the planner calls upon memories to best situate the ASK's context and plugins to call APIs and to leverage other external capabilities.

Planner

The planner will operate within the skills it has available. In the event that a desired skill does not exist, the planner can suggest you create the skill. Or, depending upon the level of complexity the kernel can help you write the missing skill.

Planner



The *planner* works backwards from a goal that's provided from a user's *ASK*.

Planner Example

RECAP...

CODE PRESENTS

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

FUNCTIONS

Create and use large contexts (grounding)

MEMORY

Integrate with external tools and systems

PLUGINS

Plan or “chain” prompts together to achieve a goal

PLANNERS

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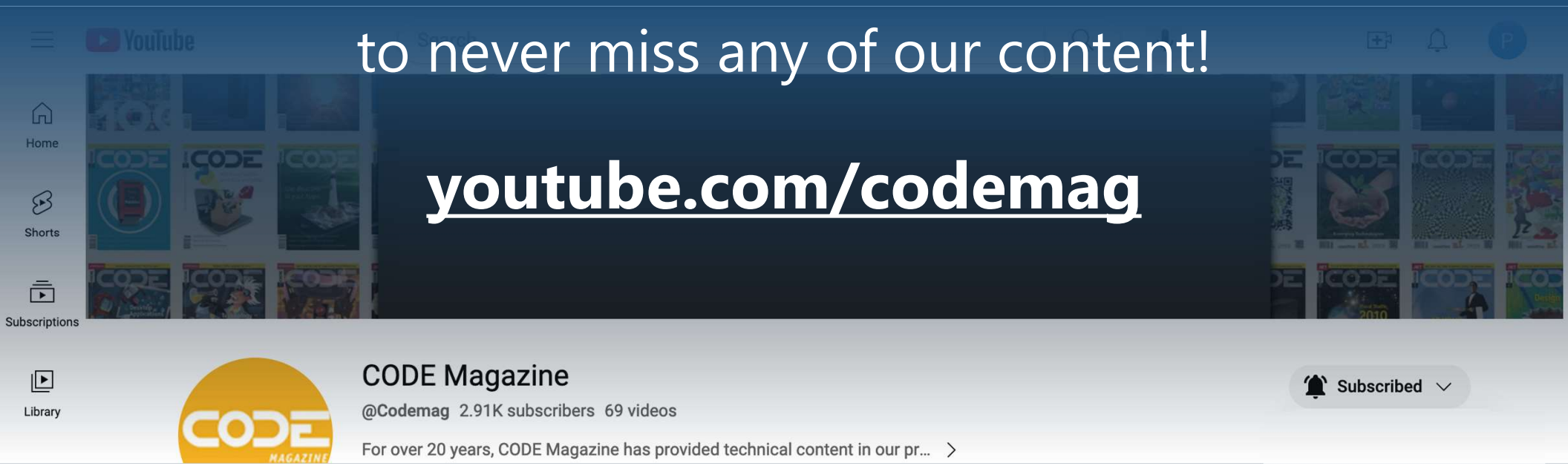

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