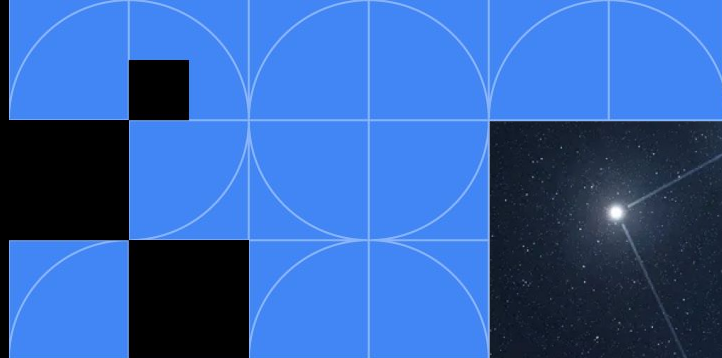


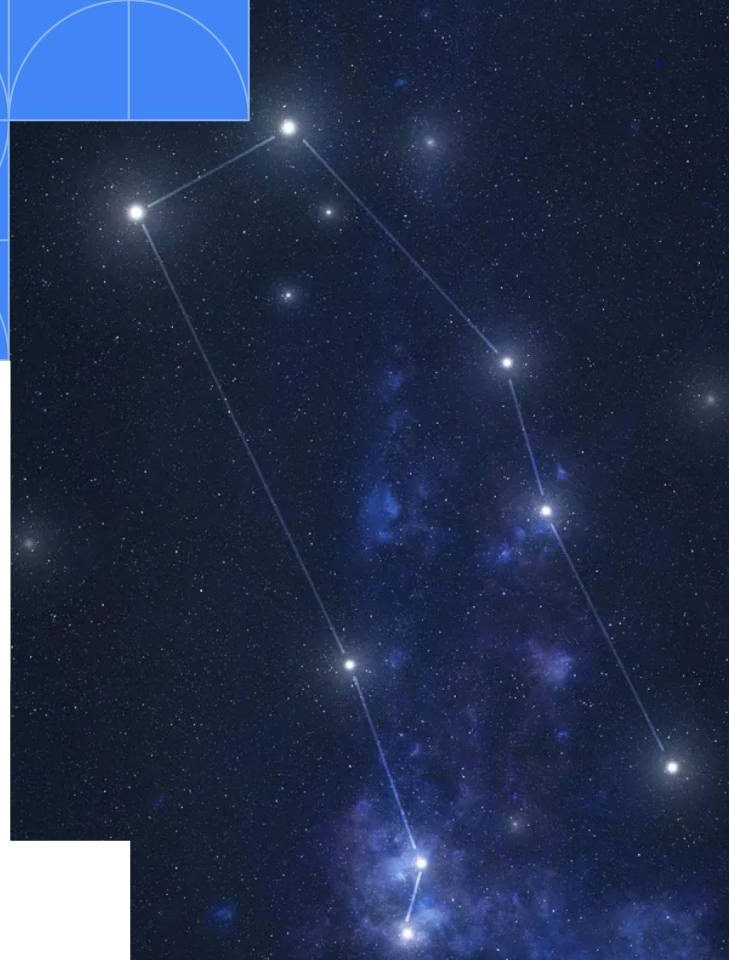
# Build with AI



## Intro to AI + Gemini 101



Google Developer Groups  
Capital Region



# Who am I?

ChengCheng Tan

- BA Linguistics & CS, **UCLA**
- MS CS HCI, **Stanford**
- **LLM + AI Safety**  
FAR AI Communications  
AISafety.info + chatbot
- Google WTM Ambassador

\* DISCLAIMER ideas presented here are my own



temperature Reinforcement frontier  
RLHF AI Learning models  
Pretrained Supervised video  
Learning Deep  
Gemini Generative AI Learning  
Claude vision Neural Networks  
GPT LLM tokens Multimodal  
API prompts Conversation Finetuned  
keys SDK Intruaction Tuned language NLP

# Build with AI



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Capital Region

## Intro to AI



# AI Map

## **Artificial Intelligence (AI)**

Create machines that can perform tasks with human-like abilities: reasoning, learning & problem-solving.

# AI Map

AI

GOFAI

Expert Systems

Planning Systems

Fuzzy Logic

**Machine Learning (ML)**

Learn patterns from data,  
without explicit programming.

# AI Map

AI

ML

Decision Trees

Random Forests

Gradient Boost

Naive Bayes

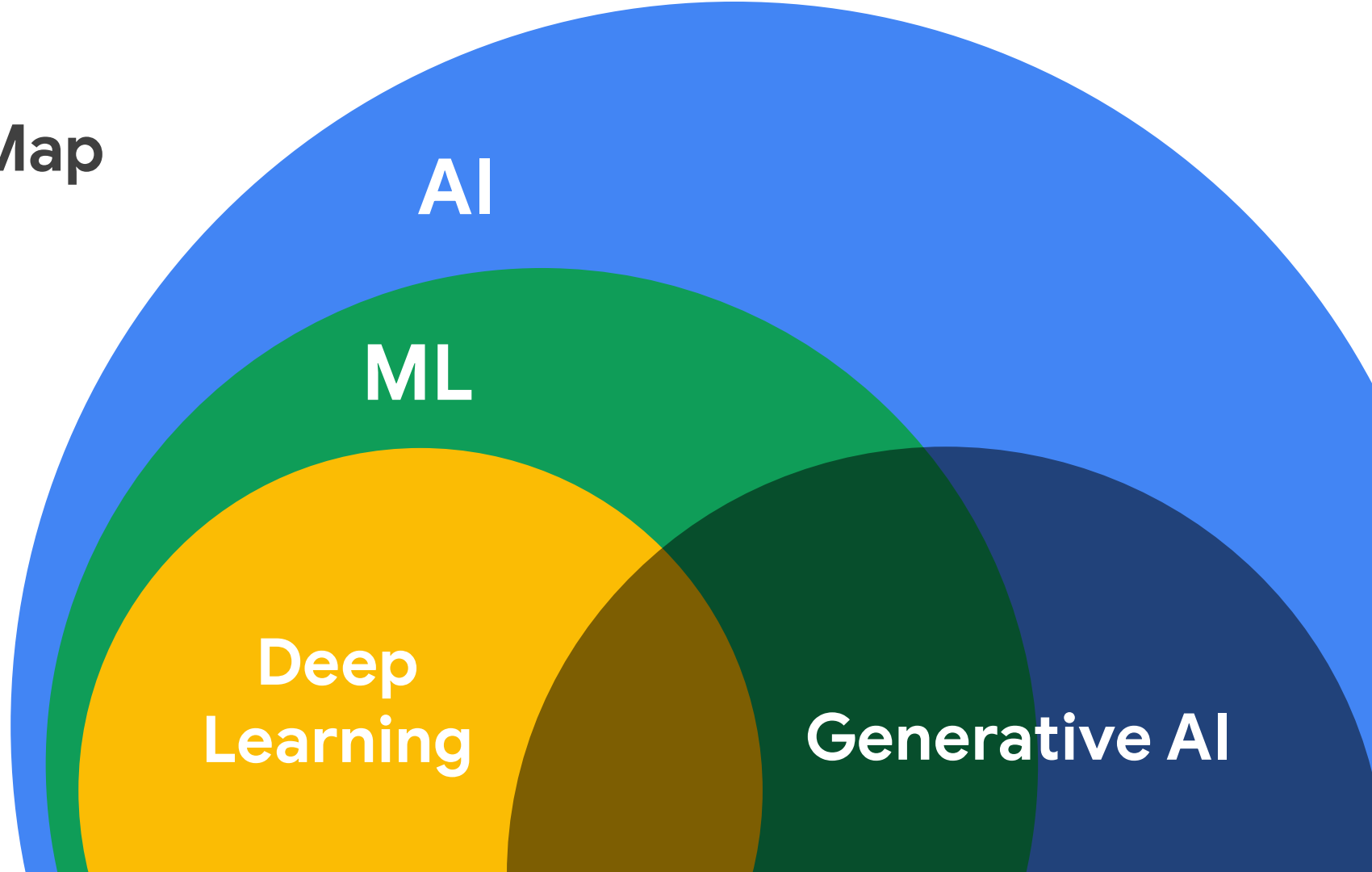
SVM

KNN

**Deep Learning**

Complex patterns with  
neural networks.

**AI Map**



**AI**

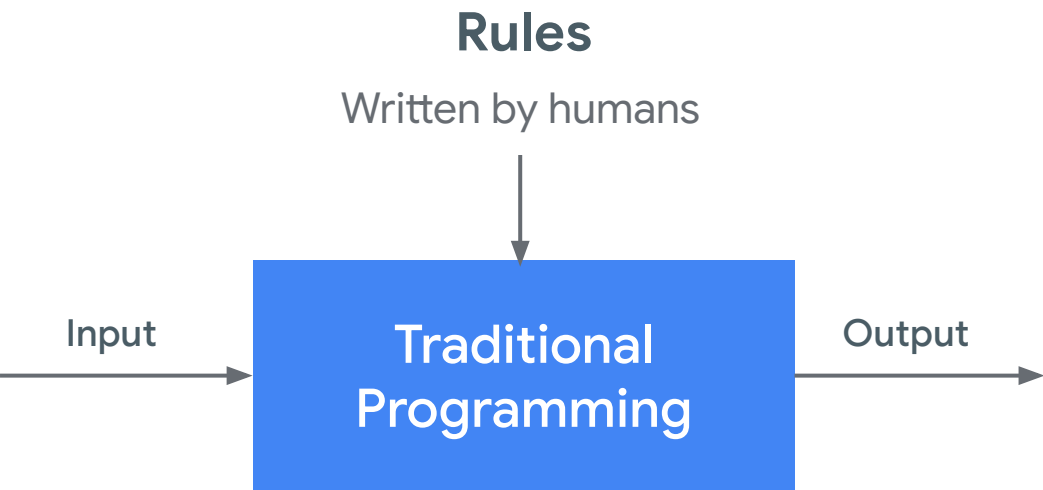
**ML**

**Deep  
Learning**

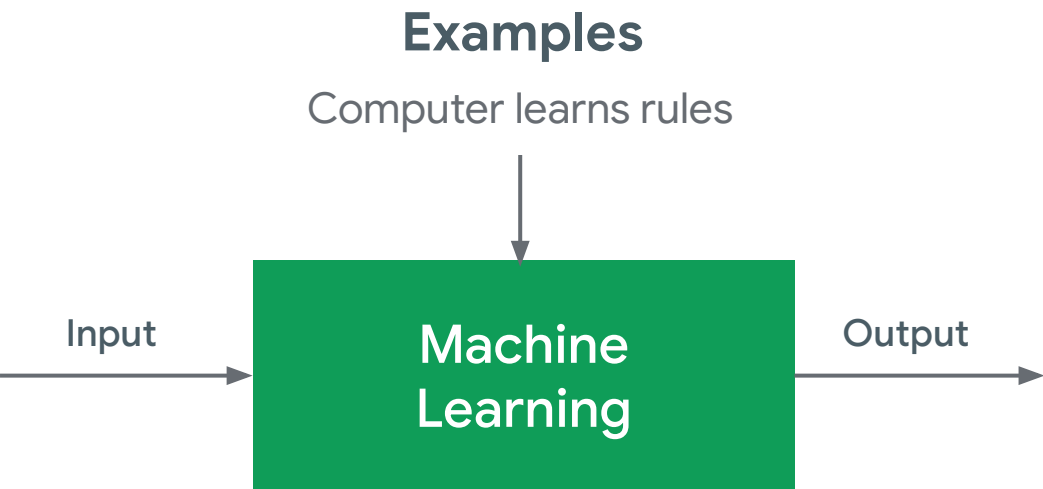
**Generative AI**



# Old GOFAI Way



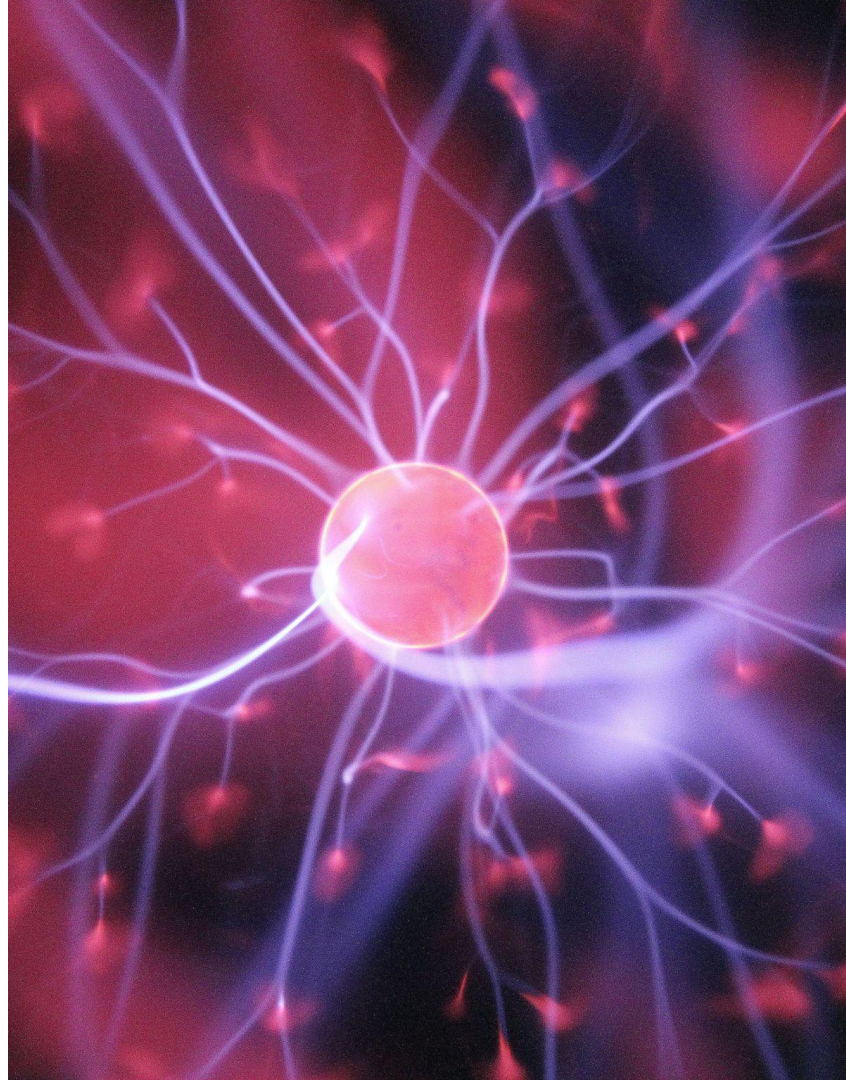
# New ML Way



# Neural Networks

Artificial neural networks (ANN) are inspired by connections in the [human brain](#).

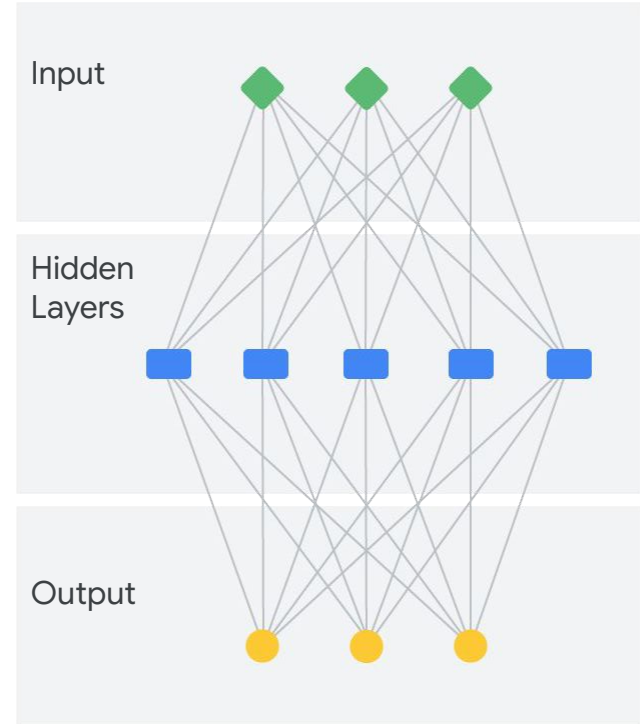
Can have one or more hidden layers.



# Neural Networks

Artificial neural networks (ANN) are inspired by connections in the [human brain](#).

Can have one or more hidden layers.  
Each node is a neuron or parameter.

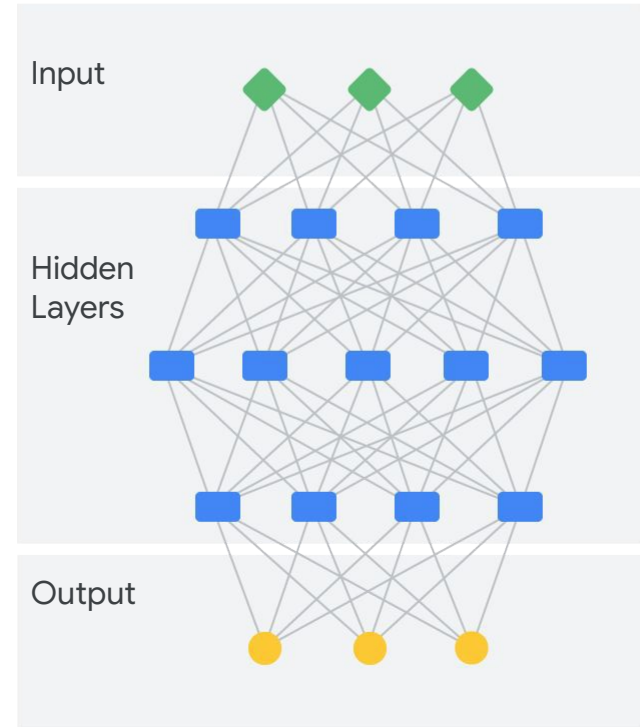




# Deep Learning

A **deep** neural network (DNN)  
with **multiple hidden layers**

Large foundational models have  
billions of neurons or parameters.



# AI Model Types



**Discriminative**  
Simple Output



**Generative**  
Complex Output

# Generative AI (GenAI)

AI that **generates content** for you.



Text



Code



Image



Speech



Video



3D

# Why now?

## Converging Forces

- Data
- Algorithms
- GPU Compute





# How does it work?



Language Models

Next word prediction



Image Generation

Denosing images

# Understanding the Excitement

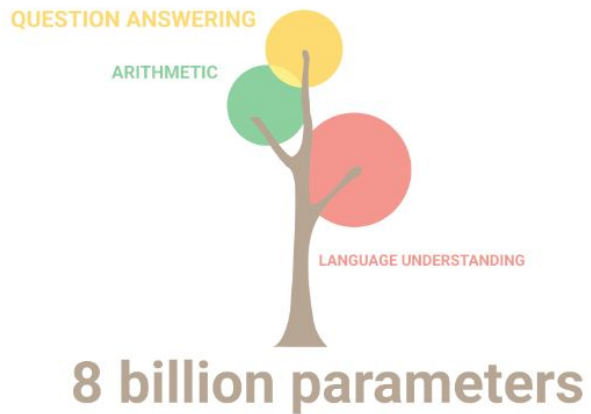


Narrow  
Specialists

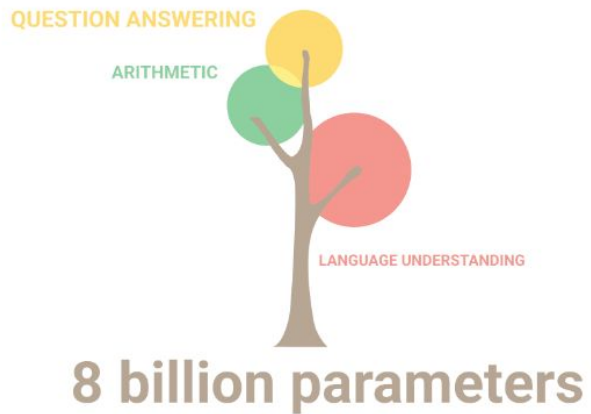


General  
Artificial General Intelligence (AGI)

# Emergent Abilities

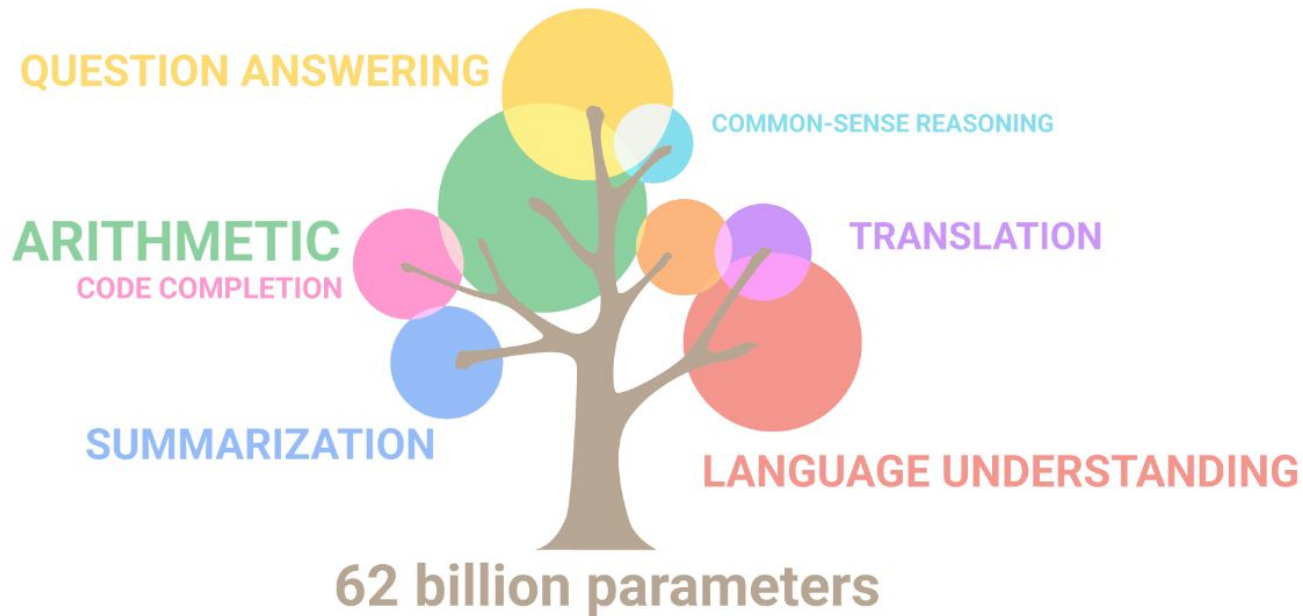


# Emergent Abilities





# Emergent Abilities



# Pre-trained Base

Generalist

VS

# Fine-tuned Models

Specialists



# RLHF:

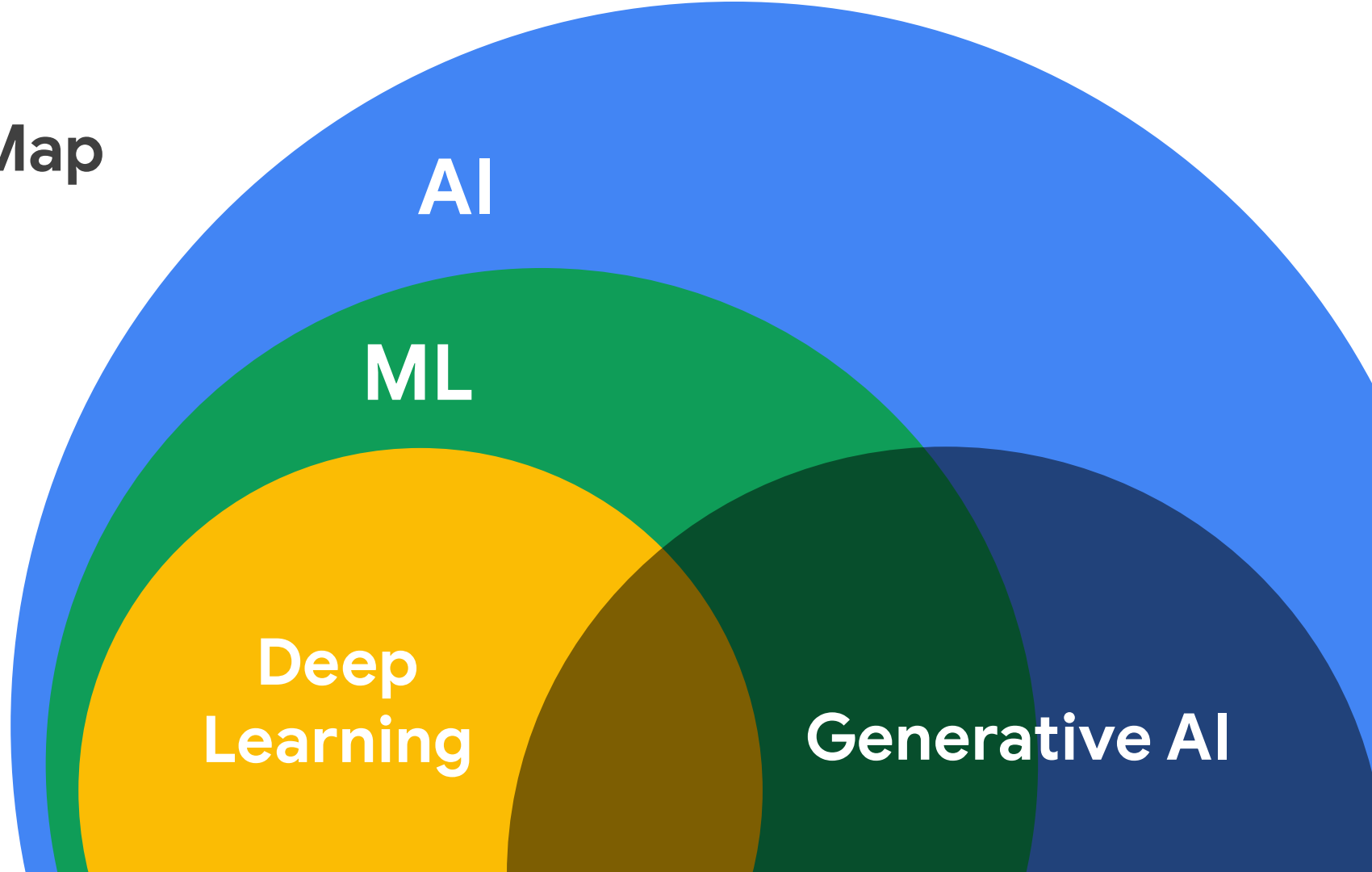
Reinforcement Learning  
from Human Feedback

Fine-tuned

- **Follow Instructions**
- **Conversations**



**AI Map**



**AI**

**ML**

**Deep  
Learning**

**Generative AI**



# Build with AI



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## Gemini 101

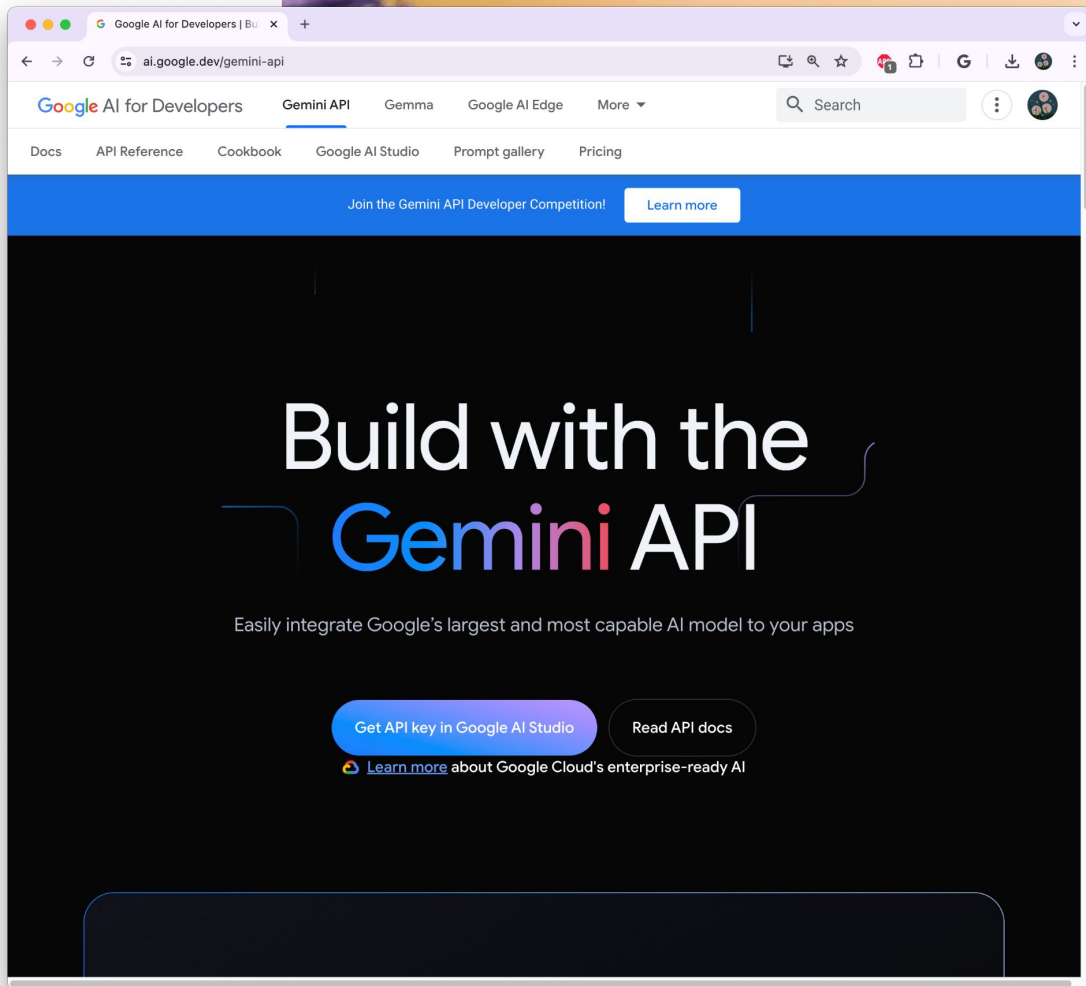
# Gemini

Generalized Multimodal  
Intelligence Network



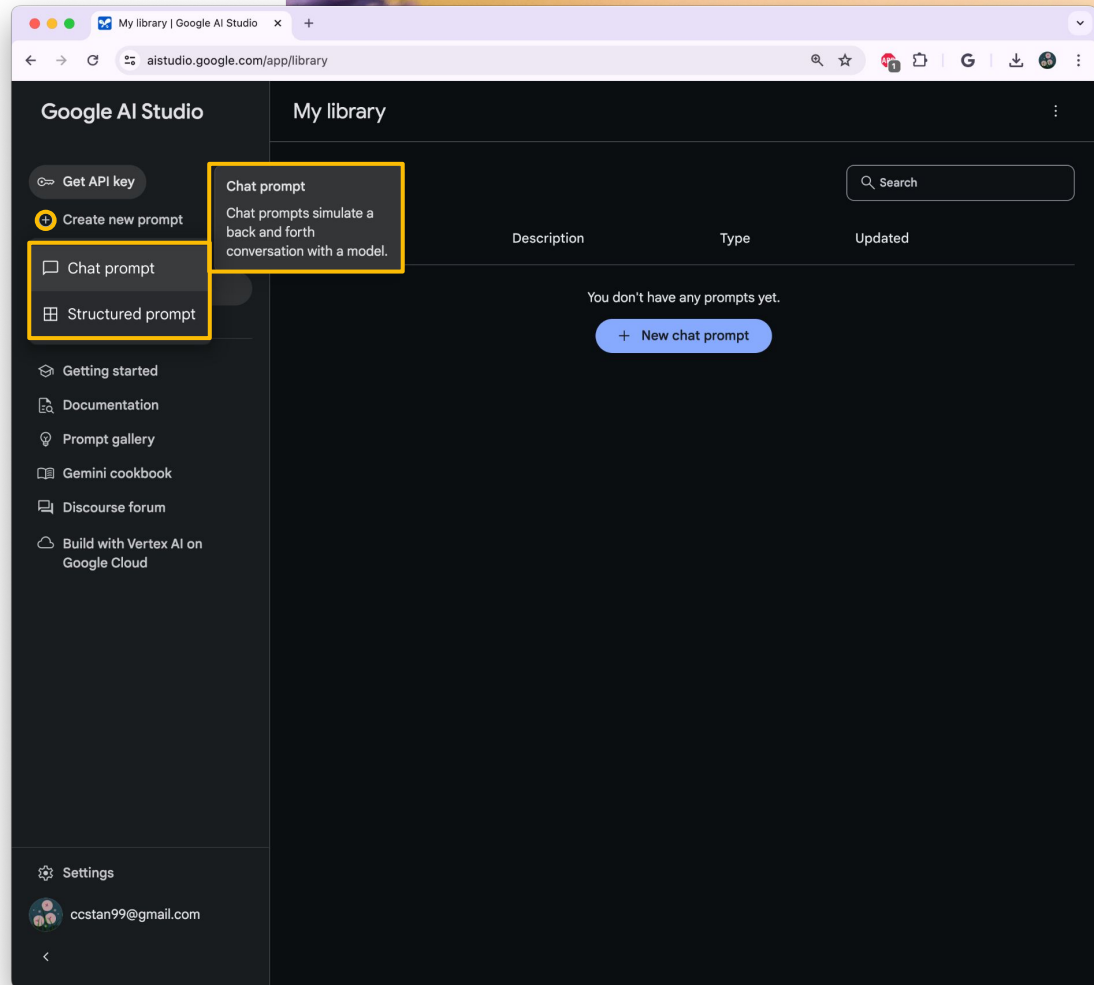
# Build with Gemini API

[ai.google.dev](https://ai.google.dev)



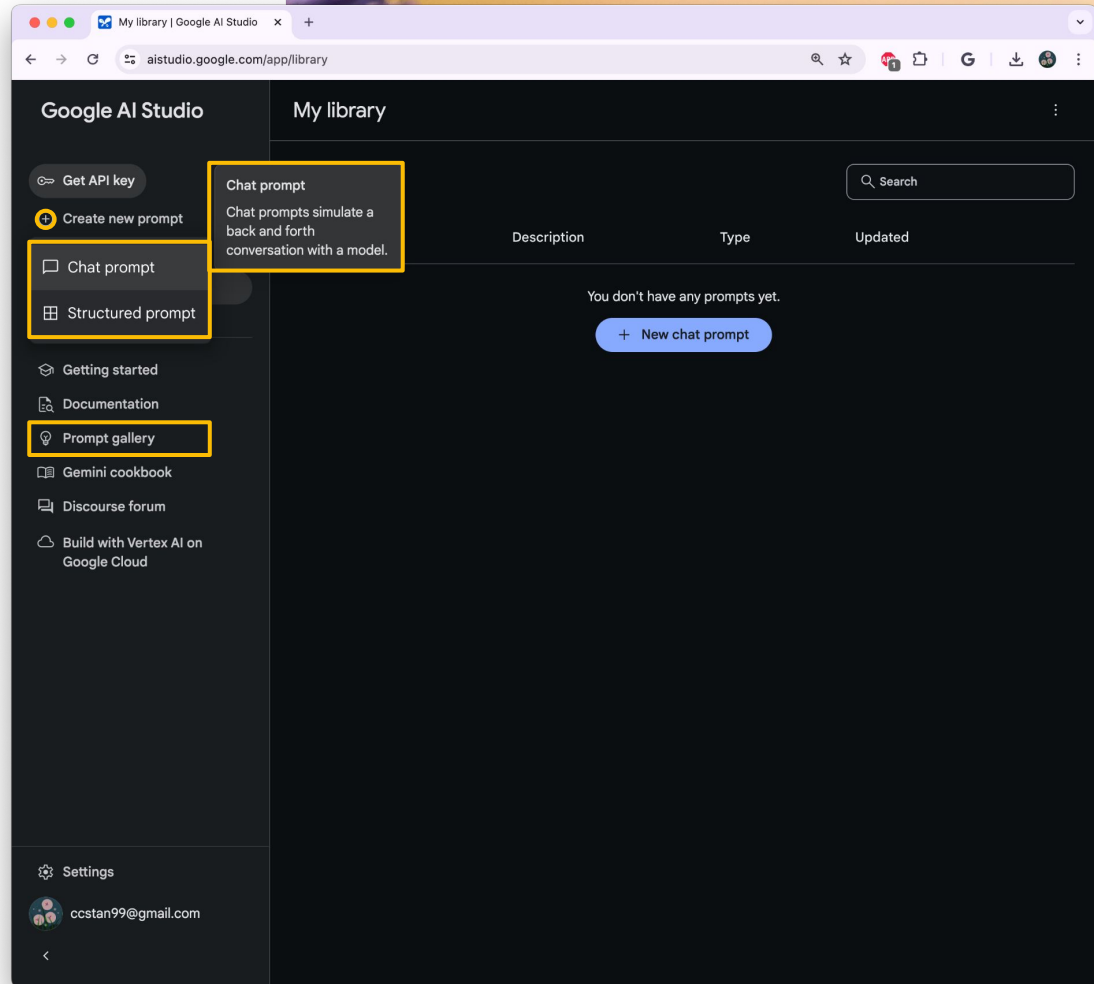
The screenshot shows a web browser window displaying the Gemini API developer page. The browser's address bar shows the URL `ai.google.dev/gemini-api`. The page header includes the Google AI for Developers logo and navigation links for Gemini API, Gemma, Google AI Edge, and More. Below the header is a blue banner with the text "Join the Gemini API Developer Competition!" and a "Learn more" button. The main content area features the heading "Build with the Gemini API" in large white text, with "Gemini" in a multi-colored font. Below the heading is the subtext "Easily integrate Google's largest and most capable AI model to your apps". At the bottom of the main content area, there are three buttons: "Get API key in Google AI Studio" (a blue button), "Read API docs" (a white button with a blue border), and a link "Learn more about Google Cloud's enterprise-ready AI" (a blue link with a small icon).

# Prototyping with Google AI Studio



# Prompts

- Create new
- Prompt gallery



# Run settings



- Model
- Temperature
- Safety

Marketing description writer


Insert: Image

Given an image of a product and its target audience, write an engaging marketing description

2 / 500 examples

INPUT	Product Image:	INPUT	Target Audience:	OUTPUT	Marketing Descri...
<input type="checkbox"/>		Mid-aged men			Introducing the epitome of power and sophistication - the sleek and captivating sports car. It's more than just a car; it's a symbol of your passion for life and your unwavering commitment to excellence. Embrace the thrill and indulge in the ultimate driving pleasure.
<input type="checkbox"/>		Environmentalists			Looking for a sustainable and eco-friendly way to get around? Look no further than this black bicycle. Biking is a great way to reduce your carbon footprint and improve your

Test your prompt

INPUT	Product Image:	INPUT	Target Audience:	OUTPUT	Marketing Description:
1		Athletes			Take your game to the next level with this high-quality basketball. Perfect for both indoor and outdoor courts, this ball is made with durable materials that can withstand even the most intense games. Whether you're a seasoned pro or just starting out, this basketball is perfect for anyone who loves the game.

Run settings

Model: Gemini 1.0 Pro Vision

Temperature: 0.9

Add stop sequence: Add stop...

Safety settings: Edit safety settings

Advanced settings

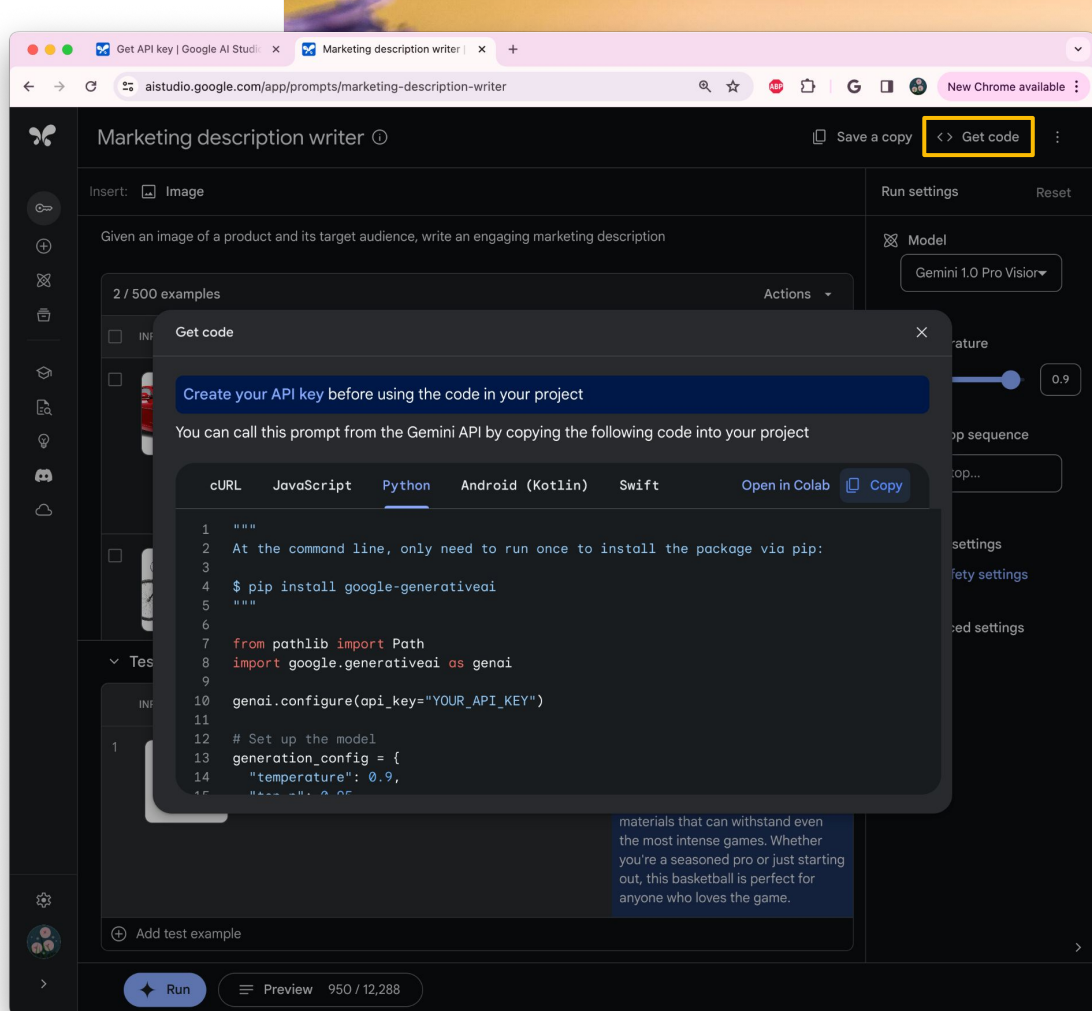
Run

Preview 950 / 12,288



# Get Code

- Choose Language
- Open in Colab
- Copy to Editor



The screenshot shows the Google AI Studio interface for the 'Marketing description writer' app. A 'Get code' modal is open, displaying instructions and code for using the Gemini API. The modal includes a warning to create an API key, a text prompt, and a code editor with Python code. The code includes instructions for installing the 'google-generativeai' package and configuring the API key. The background interface shows the app's settings, including the model 'Gemini 1.0 Pro Vision' and a temperature slider set to 0.9.

Marketing description writer

Save a copy <> Get code

Insert: Image

Run settings Reset

Model Gemini 1.0 Pro Vision

Temperature 0.9

2 / 500 examples Actions

Get code

Create your API key before using the code in your project

You can call this prompt from the Gemini API by copying the following code into your project

cURL JavaScript Python Android (Kotlin) Swift Open in Colab Copy

```
1 """
2 At the command line, only need to run once to install the package via pip:
3
4 $ pip install google-generativeai
5 """
6
7 from pathlib import Path
8 import google.generativeai as genai
9
10 genai.configure(api_key="YOUR_API_KEY")
11
12 # Set up the model
13 generation_config = {
14     "temperature": 0.9,
```

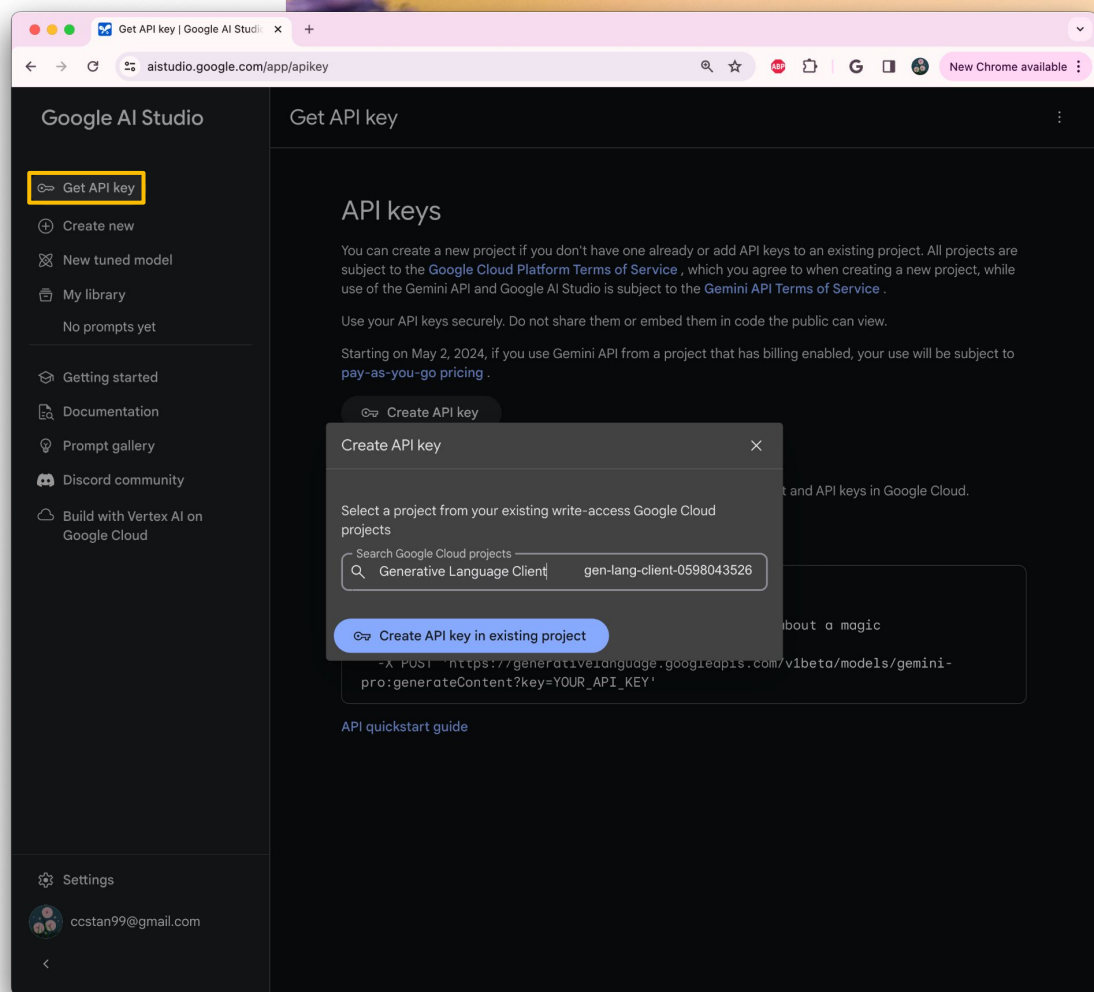
materials that can withstand even the most intense games. Whether you're a seasoned pro or just starting out, this basketball is perfect for anyone who loves the game.

Add test example

Run Preview 950 / 12,288

# Get API Key

## Treat like password



The screenshot shows the Google AI Studio interface in a browser. The left sidebar contains navigation options: 'Get API key' (highlighted with a yellow box), 'Create new', 'New tuned model', 'My library', 'Getting started', 'Documentation', 'Prompt gallery', 'Discord community', 'Build with Vertex AI on Google Cloud', and 'Settings'. The main content area is titled 'Get API key' and contains instructions on creating API keys. A 'Create API key' dialog box is open, prompting the user to 'Select a project from your existing write-access Google Cloud projects'. The search bar in the dialog shows 'Generative Language Client' and 'gen-lang-client-0598043526'. A blue button labeled 'Create API key in existing project' is highlighted. The browser's address bar shows 'aistudio.google.com/app/apikey'.

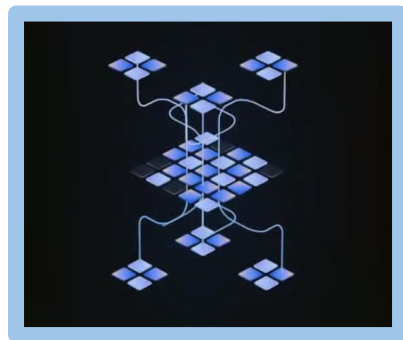


# Settings

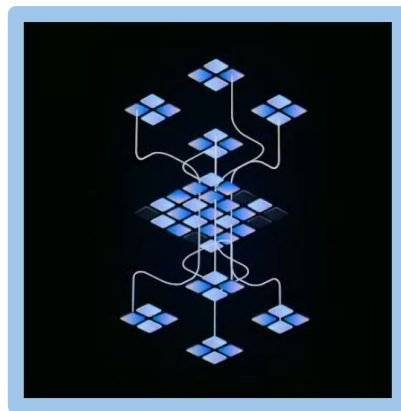
## Model Sizes



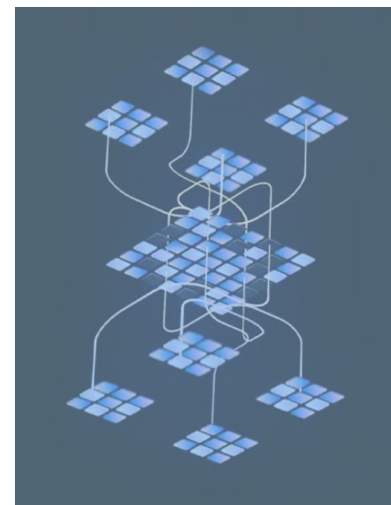
Nano



Flash



Pro



Ultra

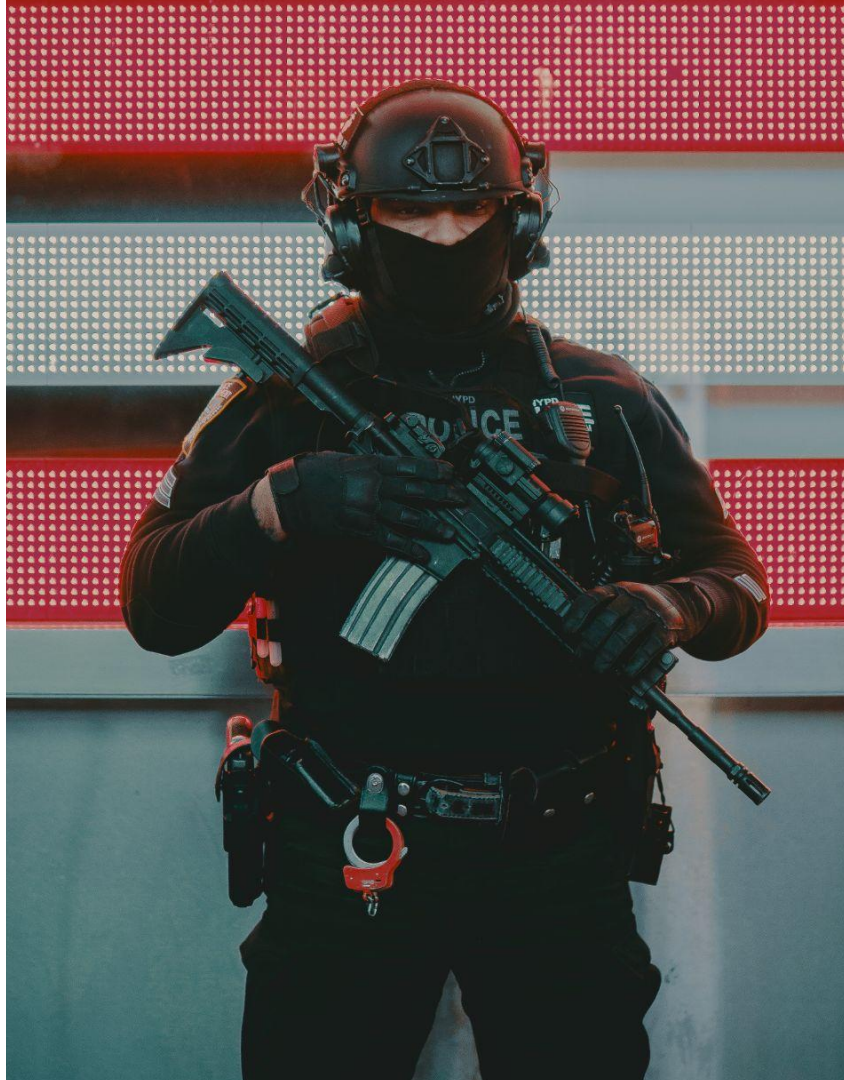


# Settings

## Safety Ratings

### Harm Categories

- Harassment
- Hate Speech
- Sexually Explicit
- Dangerous Content



# Settings

## Safety Ratings

### Harm Categories

- Harassment
- Hate Speech
- Sexually Explicit
- Dangerous Content

### Harm Probabilities

- HIGH
- MEDIUM
- LOW
- NEGLIGIBLE



# Build with AI



**“The hottest new  
programming language is  
English.”**

Andrej Karpathy  
OpenAI

# Prompt Engineering

- Clear & Specific Instructions
- Give Examples
- Step by Step



# REST APIs

Client libraries for

- Python
- JavaScript
- Android (Kotlin)
- Swift
- cURL



# Setup

Install & import libraries

```
$ pip install google-generativeai
```

```
import google.generativeai as genai  
genai.configure(api_key="<YOUR API KEY>")
```

# Generate Text

Text only prompt

```
model = genai.GenerativeModel('gemini-1.5-flash')

response = model.generate_content("Write a story about a
boy and a backpack.")
print(response.text)
```

# Generate Text

Text and image prompt

```
model = genai.GenerativeModel('gemini-1.5-flash')  
img = PIL.Image.open('image.jpg')  
response = model.generate_content(["Write a blog based  
on this photo.", img])  
print(response.text)
```



# Chat Conversations

For interactive applications

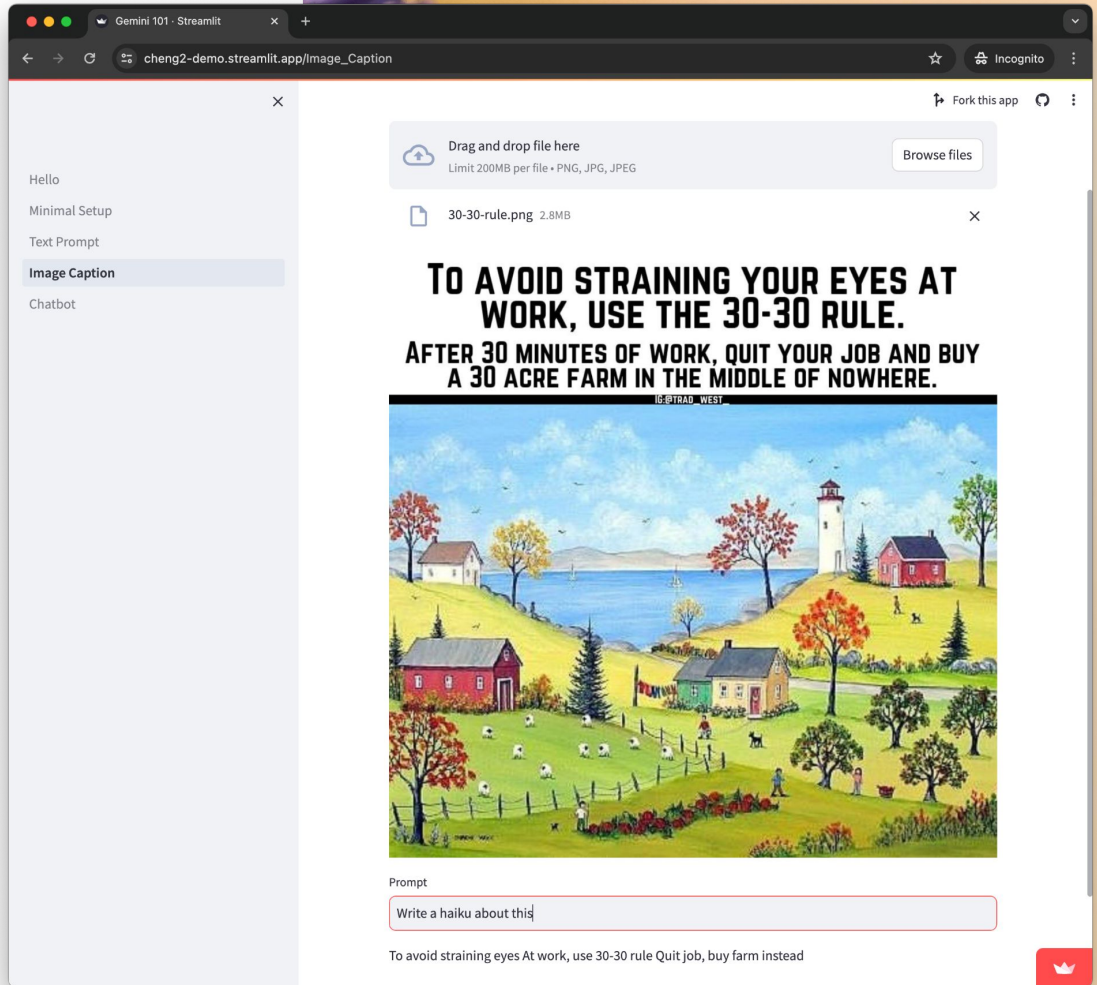
```
model = genai.GenerativeModel('gemini-1.5-flash')
chat = model.start_chat(history=[])

response = chat.send_message("Hello, how are you?")
print(response.text)
```

# Demo App

- Text Prompt
- Image Caption
- Chatbot

<https://cheng2-demo.streamlit.app>



Drag and drop file here  
Limit 200MB per file • PNG, JPG, JPEG

Browse files

30-30-rule.png 2.8MB

**TO AVOID STRAINING YOUR EYES AT WORK, USE THE 30-30 RULE. AFTER 30 MINUTES OF WORK, QUIT YOUR JOB AND BUY A 30 ACRE FARM IN THE MIDDLE OF NOWHERE.**

IG: @TRAD\_WEST

Prompt

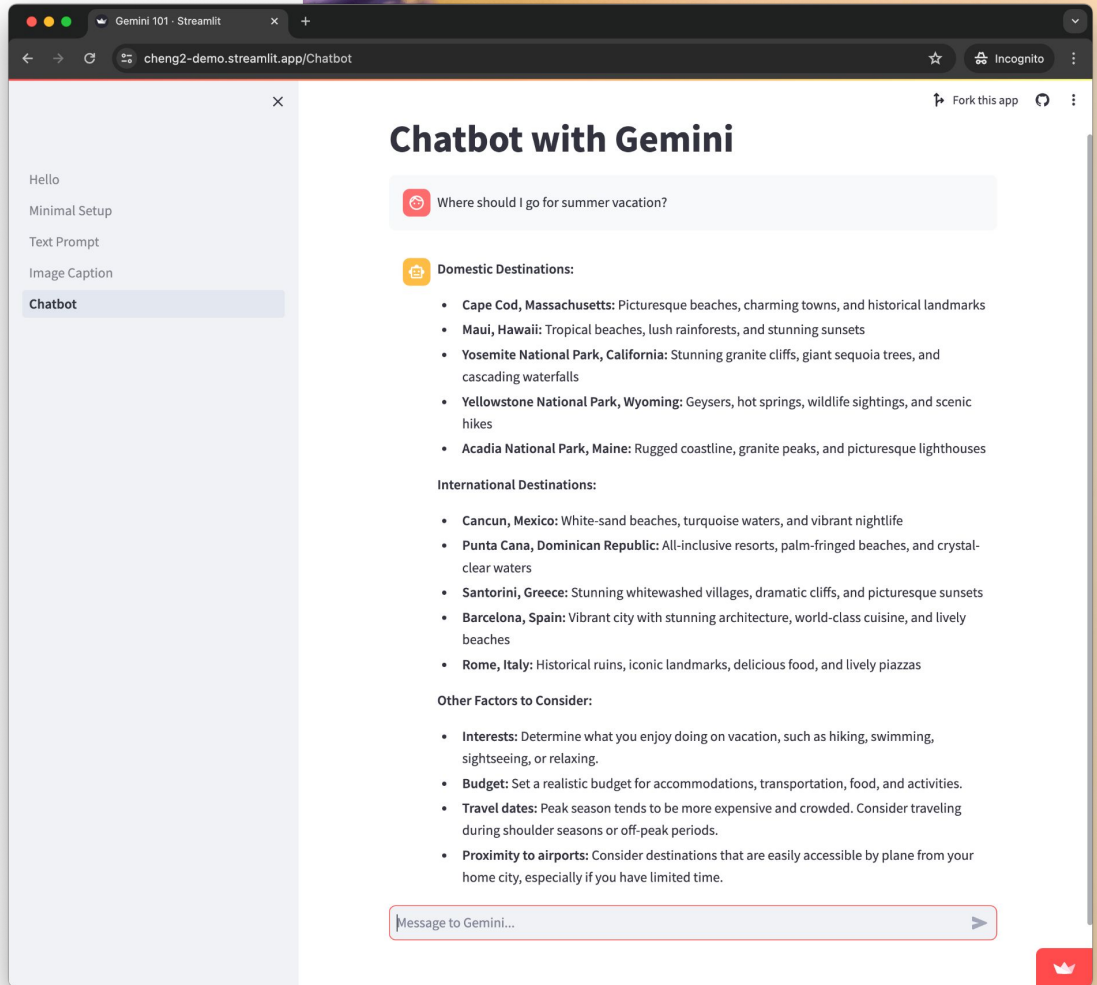
Write a haiku about this

To avoid straining eyes At work, use 30-30 rule Quit job, buy farm instead

# Demo App

- Text Prompt
- Image Caption
- Chatbot

<https://cheng2-demo.streamlit.app>



The screenshot shows a web browser window with the URL `cheng2-demo.streamlit.app/Chatbot`. The page title is "Chatbot with Gemini". On the left, a sidebar menu contains the following items: "Hello", "Minimal Setup", "Text Prompt", "Image Caption", and "Chatbot" (which is currently selected). The main content area displays a chatbot interface. At the top, there is a text input field containing the prompt "Where should I go for summer vacation?". Below this, the chatbot's response is shown, starting with a heading "Domestic Destinations:" followed by a bulleted list of travel recommendations:

- **Cape Cod, Massachusetts:** Picturesque beaches, charming towns, and historical landmarks
- **Maui, Hawaii:** Tropical beaches, lush rainforests, and stunning sunsets
- **Yosemite National Park, California:** Stunning granite cliffs, giant sequoia trees, and cascading waterfalls
- **Yellowstone National Park, Wyoming:** Geysers, hot springs, wildlife sightings, and scenic hikes
- **Acadia National Park, Maine:** Rugged coastline, granite peaks, and picturesque lighthouses

Below the domestic destinations, there is a section for "International Destinations:" with another bulleted list:

- **Cancun, Mexico:** White-sand beaches, turquoise waters, and vibrant nightlife
- **Punta Cana, Dominican Republic:** All-inclusive resorts, palm-fringed beaches, and crystal-clear waters
- **Santorini, Greece:** Stunning whitewashed villages, dramatic cliffs, and picturesque sunsets
- **Barcelona, Spain:** Vibrant city with stunning architecture, world-class cuisine, and lively beaches
- **Rome, Italy:** Historical ruins, iconic landmarks, delicious food, and lively piazzas

Finally, there is a section for "Other Factors to Consider:" with a bulleted list of considerations:

- **Interests:** Determine what you enjoy doing on vacation, such as hiking, swimming, sightseeing, or relaxing.
- **Budget:** Set a realistic budget for accommodations, transportation, food, and activities.
- **Travel dates:** Peak season tends to be more expensive and crowded. Consider traveling during shoulder seasons or off-peak periods.
- **Proximity to airports:** Consider destinations that are easily accessible by plane from your home city, especially if you have limited time.

At the bottom of the chatbot interface, there is a text input field labeled "Message to Gemini..." with a send button (a right-pointing arrow) to its right. In the bottom right corner of the browser window, there is a red button with a white crown icon.

# Build with AI



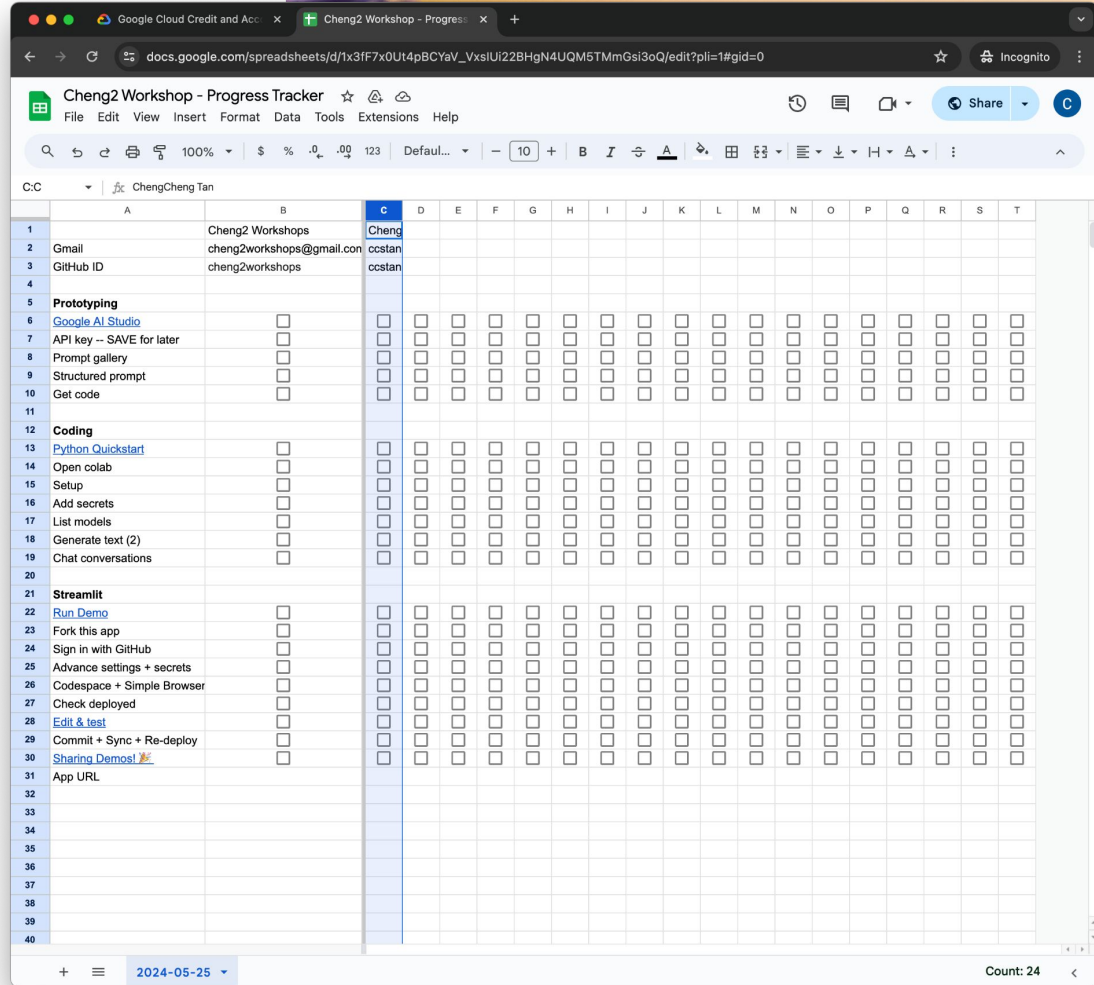
Google Developer Groups  
Capital Region

## Now Your Turn!

# Progress Tracker

1. Prototyping in Google AI Studio
2. Coding with Python Quickstart
3. Build & Deploy Streamlit App

[bit.ly/cheng2-workshop](https://bit.ly/cheng2-workshop)



The screenshot shows a Google Sheets spreadsheet with the following structure:

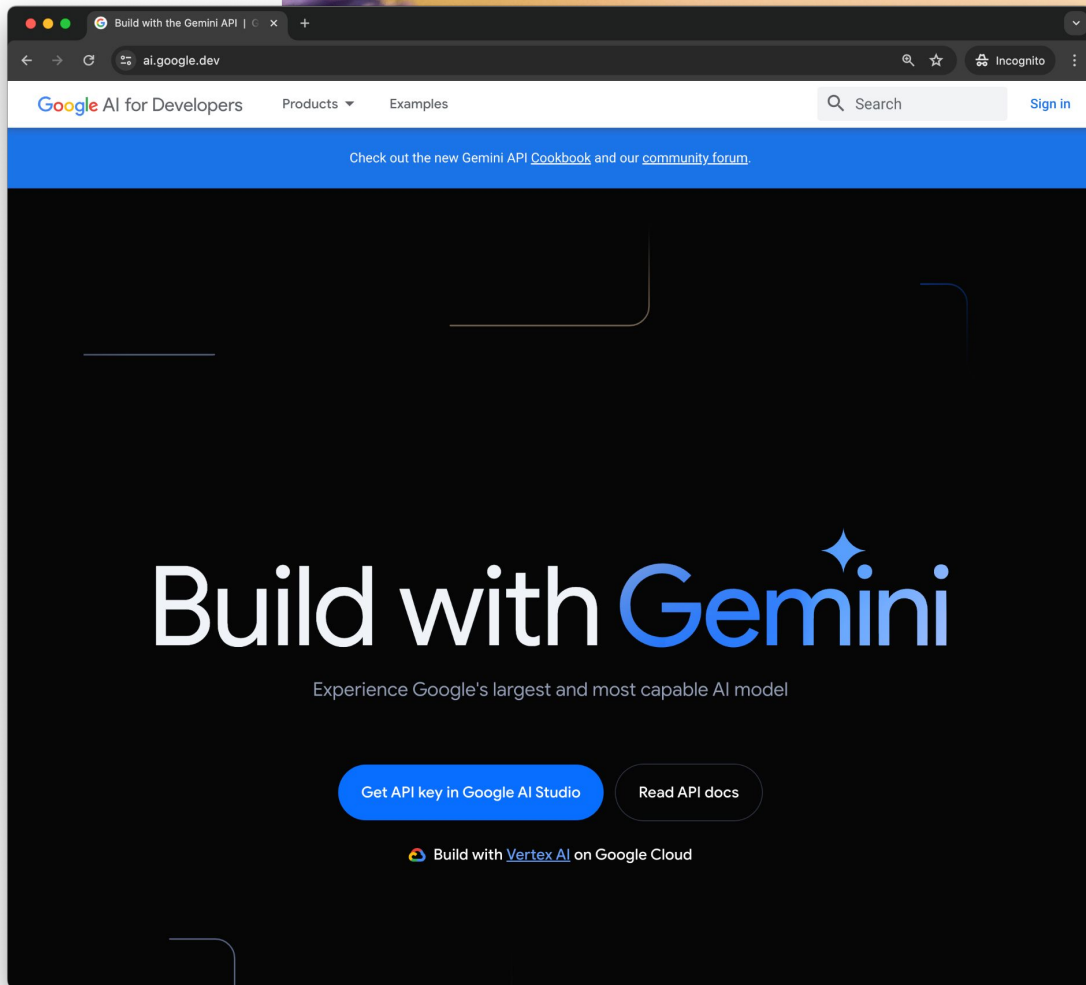
- Columns:** A through T.
- Rows:** 1 through 40.
- Row 1:** Headers for columns A through T.
- Row 2:** "Gmail" in column A, "cheng2workshops@gmail.com" in column B, "Cheng" in column C.
- Row 3:** "GitHub ID" in column A, "cheng2workshops" in column B, "ccstan" in column C.
- Row 5:** Section header "Prototyping".
- Row 6:** "Google AI Studio" in column A, checkbox in column B, checkbox in column C.
- Row 7:** "API key -- SAVE for later" in column A, checkbox in column B, checkbox in column C.
- Row 8:** "Prompt gallery" in column A, checkbox in column B, checkbox in column C.
- Row 9:** "Structured prompt" in column A, checkbox in column B, checkbox in column C.
- Row 10:** "Get code" in column A, checkbox in column B, checkbox in column C.
- Row 12:** Section header "Coding".
- Row 13:** "Python Quickstart" in column A, checkbox in column B, checkbox in column C.
- Row 14:** "Open colab" in column A, checkbox in column B, checkbox in column C.
- Row 15:** "Setup" in column A, checkbox in column B, checkbox in column C.
- Row 16:** "Add secrets" in column A, checkbox in column B, checkbox in column C.
- Row 17:** "List models" in column A, checkbox in column B, checkbox in column C.
- Row 18:** "Generate text (2)" in column A, checkbox in column B, checkbox in column C.
- Row 19:** "Chat conversations" in column A, checkbox in column B, checkbox in column C.
- Row 21:** Section header "Streamlit".
- Row 22:** "Run Demo" in column A, checkbox in column B, checkbox in column C.
- Row 23:** "Fork this app" in column A, checkbox in column B, checkbox in column C.
- Row 24:** "Sign in with GitHub" in column A, checkbox in column B, checkbox in column C.
- Row 25:** "Advance settings + secrets" in column A, checkbox in column B, checkbox in column C.
- Row 26:** "Codespace + Simple Browser" in column A, checkbox in column B, checkbox in column C.
- Row 27:** "Check deployed" in column A, checkbox in column B, checkbox in column C.
- Row 28:** "Edit & test" in column A, checkbox in column B, checkbox in column C.
- Row 29:** "Commit + Sync + Re-deploy" in column A, checkbox in column B, checkbox in column C.
- Row 30:** "Sharing Demos!" in column A, checkbox in column B, checkbox in column C.
- Row 31:** "App URL" in column A, checkbox in column B, checkbox in column C.

# Google AI Studio

- Prompt gallery
- Structured prompt
- Get code
- API key

ai.google.dev

 Google Developer Groups

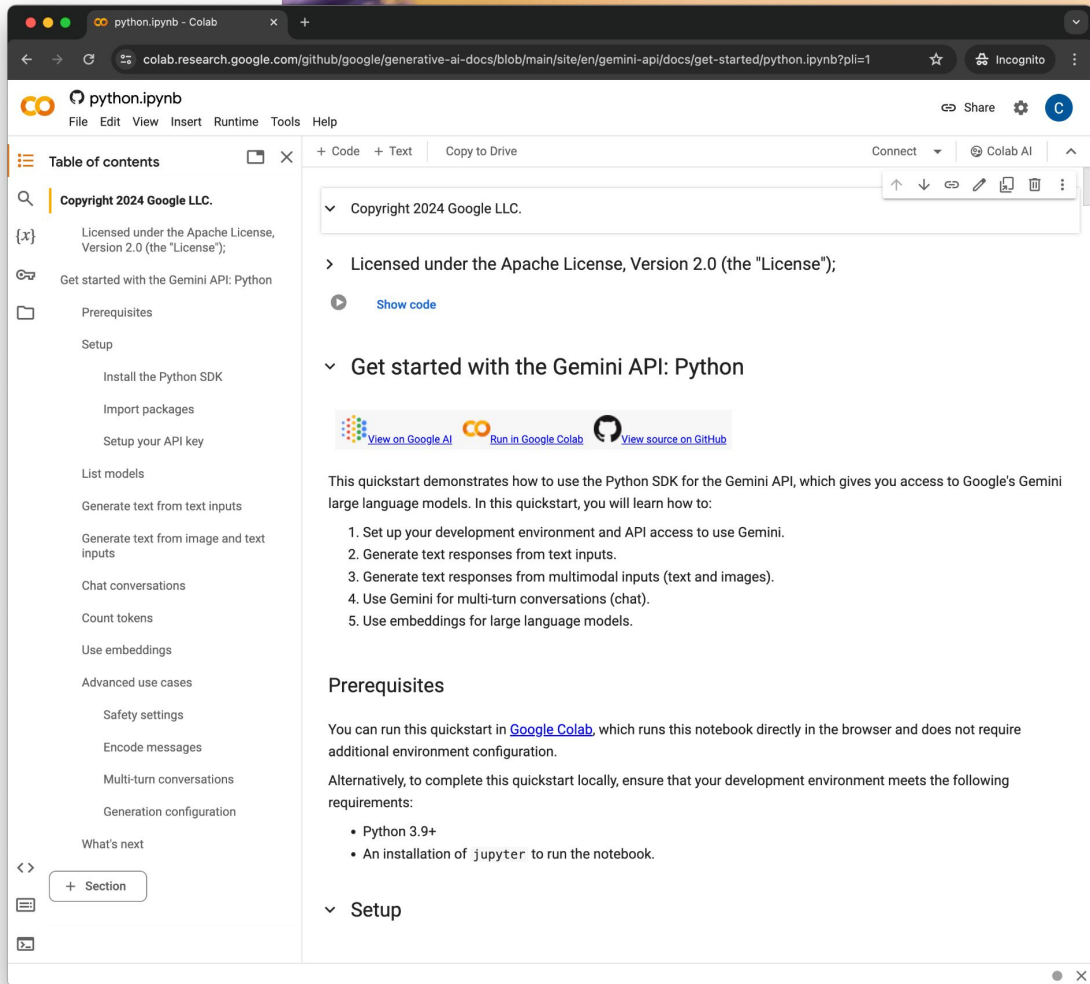




# Colab Notebook

- Setup
- Add secrets
- List models
- Generate text
- Chat conversations

[ai.google.dev/tutorials/  
python\\_quickstart](https://ai.google.dev/tutorials/python_quickstart)

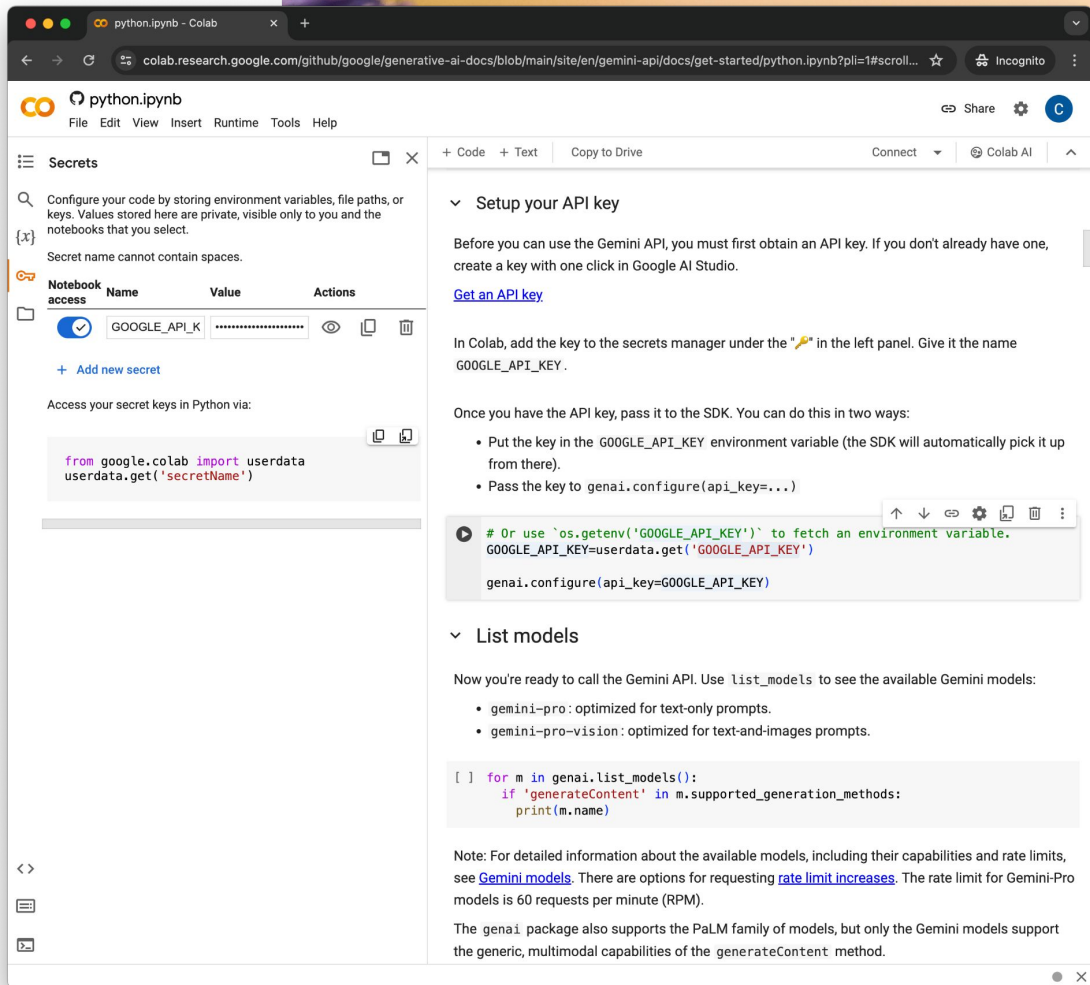


The screenshot shows a web browser window displaying a Google Colab notebook. The browser's address bar shows the URL: `colab.research.google.com/github/google/generative-ai-docs/blob/main/site/en/gemini-api/docs/get-started/python.ipynb?pli=1`. The notebook interface includes a top menu bar with options like 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. On the left, there is a 'Table of contents' sidebar with a search bar and a list of sections: 'Copyright 2024 Google LLC.', 'Get started with the Gemini API: Python', 'Prerequisites', 'Setup' (with sub-items: 'Install the Python SDK', 'Import packages', 'Setup your API key'), 'List models', 'Generate text from text inputs', 'Generate text from image and text inputs', 'Chat conversations', 'Count tokens', 'Use embeddings', 'Advanced use cases' (with sub-items: 'Safety settings', 'Encode messages', 'Multi-turn conversations', 'Generation configuration'), and 'What's next'. A '+ Section' button is visible at the bottom of the sidebar. The main content area shows the 'Copyright 2024 Google LLC.' section, which is expanded to show the license text: 'Licensed under the Apache License, Version 2.0 (the "License");'. Below this is a 'Show code' button. The next section is 'Get started with the Gemini API: Python', which contains three links: 'View on Google AI', 'Run in Google Colab', and 'View source on GitHub'. This section is followed by a paragraph explaining that the quickstart demonstrates how to use the Python SDK for the Gemini API, and a numbered list of five steps: 1. Set up your development environment and API access to use Gemini. 2. Generate text responses from text inputs. 3. Generate text responses from multimodal inputs (text and images). 4. Use Gemini for multi-turn conversations (chat). 5. Use embeddings for large language models. Below this is a 'Prerequisites' section with a paragraph stating that the quickstart can be run in Google Colab or locally, and a bulleted list of requirements: Python 3.9+ and an installation of jupyter. The 'Setup' section is partially visible at the bottom.

# Colab Notebook

- Setup
- Add secrets
- List models
- Generate text
- Chat conversations

[ai.google.dev/tutorials/  
python\\_quickstart](https://ai.google.dev/tutorials/python_quickstart)



The screenshot shows a Google Colab notebook interface. The left sidebar displays the 'Secrets' panel, which is used to manage environment variables. A secret named 'GOOGLE\_API\_KEY' is shown with a masked value. Below the secrets list, there is a code block for accessing the secret in Python:

```
from google.colab import userdata
userdata.get('secretName')
```

The main notebook area is titled 'Setup your API key'. It contains the following text and code:

Before you can use the Gemini API, you must first obtain an API key. If you don't already have one, create a key with one click in [Google AI Studio](#).

[Get an API key](#)

In Colab, add the key to the secrets manager under the "🔑" in the left panel. Give it the name `GOOGLE_API_KEY`.

Once you have the API key, pass it to the SDK. You can do this in two ways:

- Put the key in the `GOOGLE_API_KEY` environment variable (the SDK will automatically pick it up from there).
- Pass the key to `genai.configure(api_key=...)`

```
# Or use `os.getenv('GOOGLE_API_KEY')` to fetch an environment variable.
GOOGLE_API_KEY=userdata.get('GOOGLE_API_KEY')

genai.configure(api_key=GOOGLE_API_KEY)
```

Below this, the 'List models' section is shown:

Now you're ready to call the Gemini API. Use `list_models` to see the available Gemini models:

- `gemini-pro`: optimized for text-only prompts.
- `gemini-pro-vision`: optimized for text-and-images prompts.

```
[ ] for m in genai.list_models():
    if 'generateContent' in m.supported_generation_methods:
        print(m.name)
```

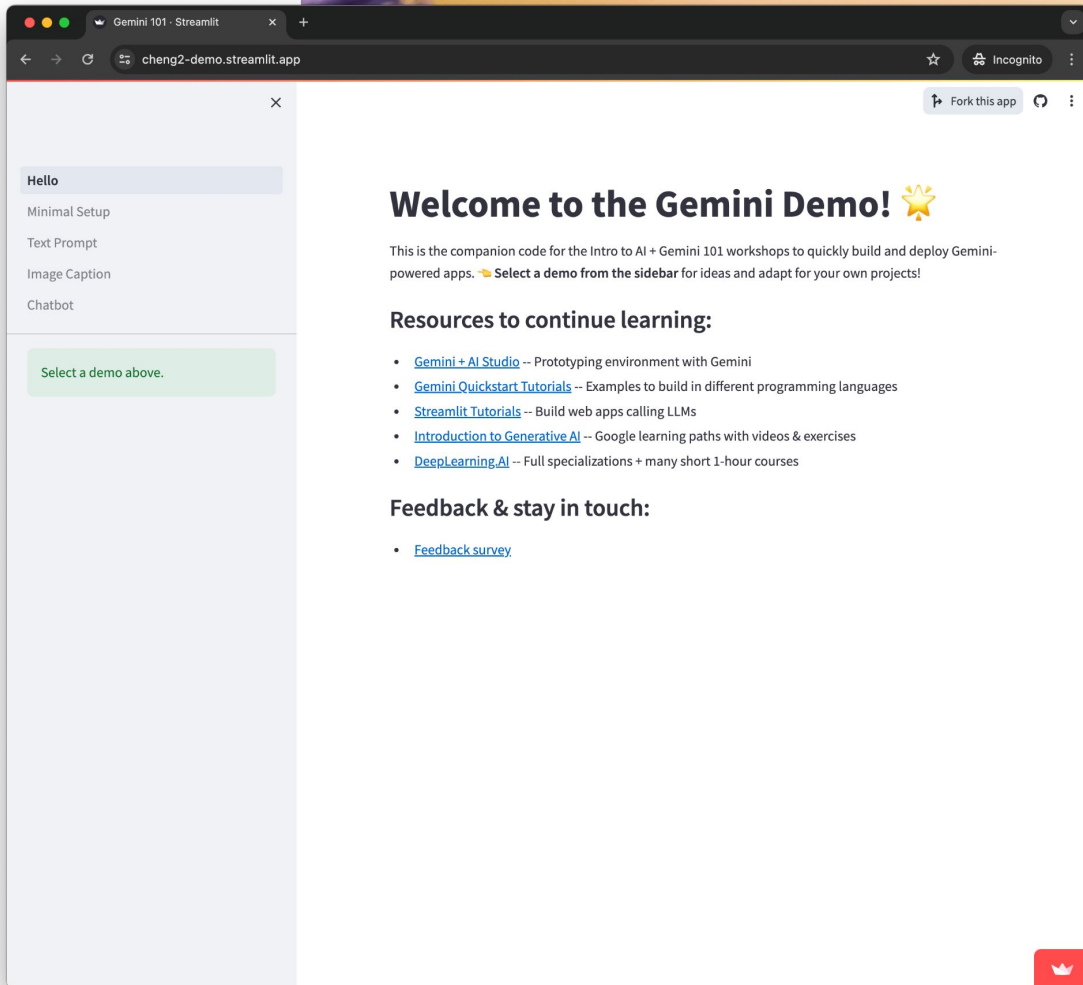
Note: For detailed information about the available models, including their capabilities and rate limits, see [Gemini models](#). There are options for requesting [rate limit increases](#). The rate limit for Gemini-Pro models is 60 requests per minute (RPM).

The `genai` package also supports the PaLM family of models, but only the Gemini models support the generic, multimodal capabilities of the `generateContent` method.

# Streamlit App

- Fork the app
- Sign in with GitHub
- Setup secrets
- Edit & test
- Deploy & share!

[https://  
cheng2-demo  
.streamlit.app](https://cheng2-demo.streamlit.app)



Gemini 101 - Streamlit

cheng2-demo.streamlit.app

Fork this app

## Hello

- Minimal Setup
- Text Prompt
- Image Caption
- Chatbot

Select a demo above.

## Welcome to the Gemini Demo! 🌟

This is the companion code for the Intro to AI + Gemini 101 workshops to quickly build and deploy Gemini-powered apps. 🚀 **Select a demo from the sidebar** for ideas and adapt for your own projects!

### Resources to continue learning:

- [Gemini + AI Studio](#) -- Prototyping environment with Gemini
- [Gemini Quickstart Tutorials](#) -- Examples to build in different programming languages
- [Streamlit Tutorials](#) -- Build web apps calling LLMs
- [Introduction to Generative AI](#) -- Google learning paths with videos & exercises
- [DeepLearning.AI](#) -- Full specializations + many short 1-hour courses

### Feedback & stay in touch:

- [Feedback survey](#)

# Resources

[bit.ly/cheng2-slides](https://bit.ly/cheng2-slides)

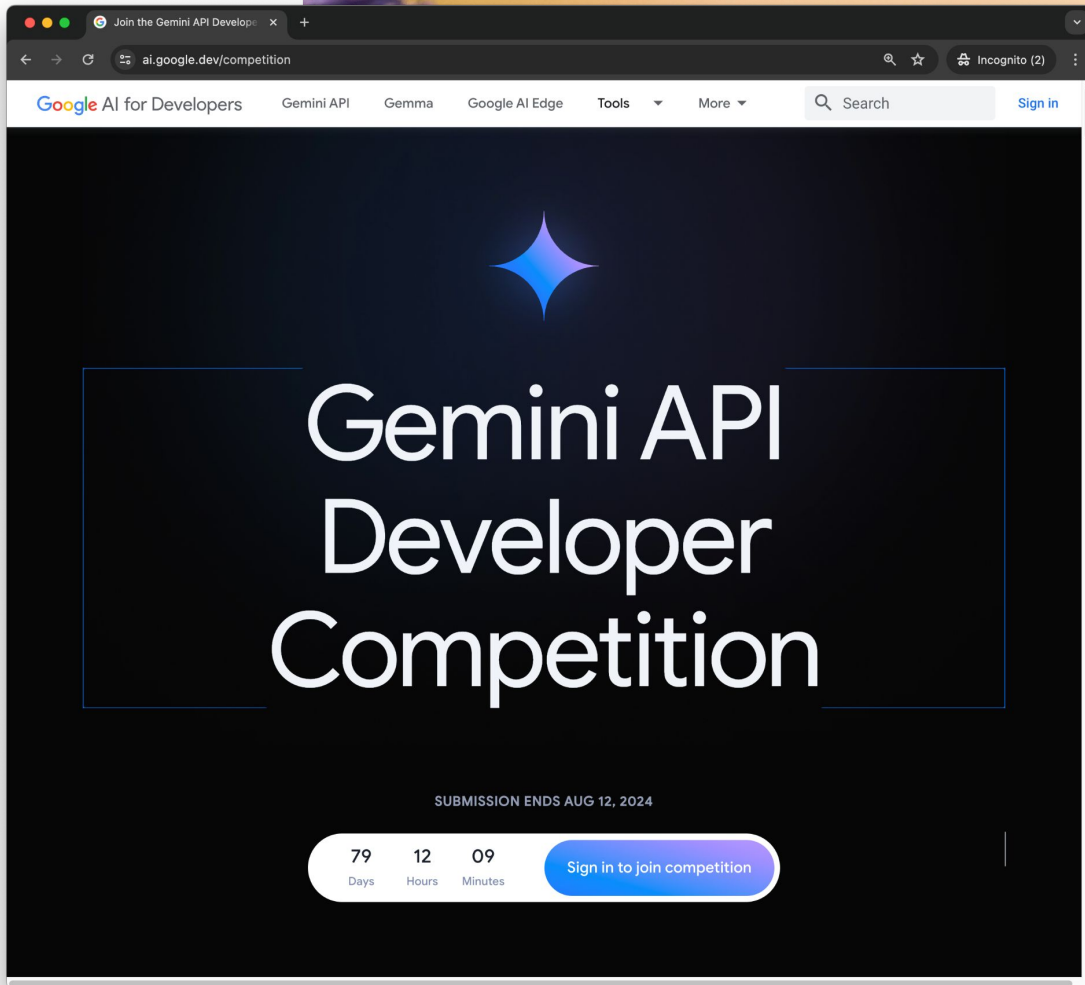
1. **Gemini + AI Studio**  
Prototyping environment with Gemini
2. **Gemini Quickstart Tutorials**  
Examples to build in different programming languages
3. **Streamlit Tutorials**  
Build web apps calling LLMs
4. **Introduction to Generative AI**  
Google learning paths with videos & exercises
5. **DeepLearning.AI**  
Full specializations + many short 1-hour courses



# Competition

- Gemini API Developer Competition
- Share +\$1 million in cash or other cool prizes
- Ends August 12
- Tag us if you submit

[ai.google.dev/competition](https://ai.google.dev/competition)

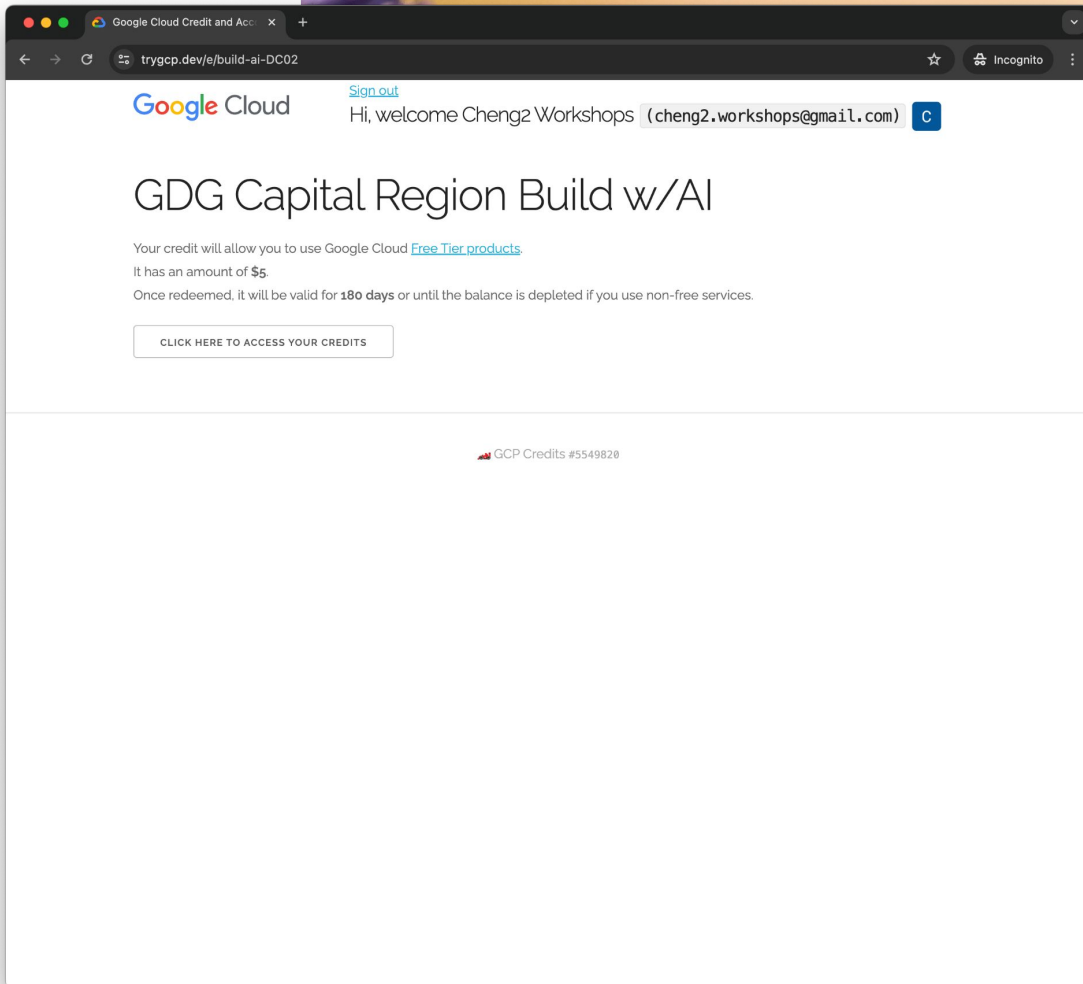



The screenshot shows a web browser window displaying the Gemini API Developer Competition landing page. The page features a dark background with a blue starburst graphic at the top center. The main heading reads "Gemini API Developer Competition" in large white text. Below the heading, it states "SUBMISSION ENDS AUG 12, 2024". A countdown timer shows 79 Days, 12 Hours, and 09 Minutes. A prominent blue button with white text says "Sign in to join competition". The browser's address bar shows "ai.google.dev/competition" and the page title is "Join the Gemini API Developer Competition". The navigation bar includes links for "Google AI for Developers", "Gemini API", "Gemma", "Google AI Edge", "Tools", and "More", along with a search bar and a "Sign in" link.

# Special Gift!

- Google Cloud Platform to use **Vertex AI**
- Free tier + credits
- **Google Cloud Innovators** Join for training with free Cloud Skills Boost

[trygcp.dev/e/build-ai-DC02](https://trygcp.dev/e/build-ai-DC02)




Google Cloud [Sign out](#)  
Hi, welcome Chengz Workshops (cheng2.workshops@gmail.com) 

## GDG Capital Region Build w/AI

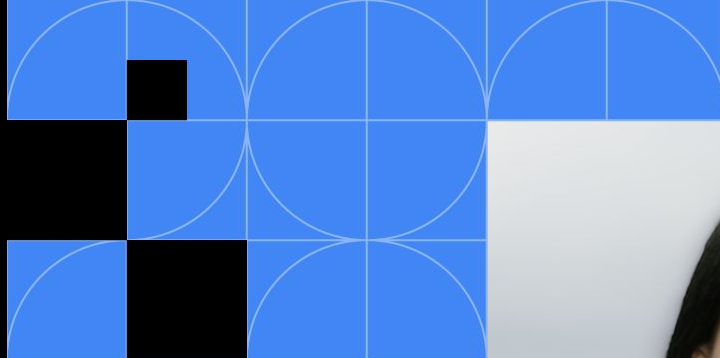
Your credit will allow you to use Google Cloud [Free Tier products](#).  
It has an amount of \$5.  
Once redeemed, it will be valid for **180 days** or until the balance is depleted if you use non-free services.

[CLICK HERE TO ACCESS YOUR CREDITS](#)

 GCP Credits #5549828



# Build with AI



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Google Developer Groups  
Capital Region



# Build with AI



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- Everything Everywhere All at Once (2022)
- Boy & Robot, Winter Plant, Granny images generated on stability.ai