

# **Google AI Studio: Crafting Smarter Outputs with Style**

**Prompt, tweak, and explore.  
Unleash AI, your way!**

# The Affordances of Google AI Studio



- ❖ **Prototyping:** Studio is a browser-based platform providing easy access and experimentation.
- ❖ **Model Selection:** You can easily switch between the latest models
- ❖ **Structured Output:** You can guide AI responses using input-output examples.
- ❖ **Temperature:** You can control the randomness of AI output - precision vs. creativity.
- ❖ **Function Calling:** You can extend AI capabilities by integrating functions such as APIs and calculators.
- ❖ **Grounding:** You can ensure the AI responses have access to real-world data.
- ❖ **Collaboration:** You can collaborate and share projects.



# Google AI Studio

# Catalogue of Terms used in Google AI Studio



Term	Explanation
<b>Gemini</b>	Family of generative AI models available on Google AI Studio, designed for tasks like text generation, image creation, and more.
<b>Prompt</b>	Input provided to the AI model to generate a response, which can be a question, statement, or code.
<b>Model Selection</b>	The process of choosing the appropriate AI model for a specific task based on its capabilities.
<b>Structured Output</b>	A feature that allows users to define the format of the AI's response for consistency and predictability.
<b>Temperature</b>	A setting that controls the randomness of the AI's response; lower values make outputs more deterministic, while higher values introduce variability.

# Catalogue of Terms used in Google AI Studio



Term	Explanation
<b>Function Calling</b>	A feature enabling the AI to call external functions or APIs, extending its capabilities beyond text generation.
<b>Grounding</b>	Enhance accuracy by linking your AI model to specific and reliable data sources within AI Studio. It helps the model base its answers on verifiable information.
<b>API Key</b>	Authenticates your access to AI Studio. You need a valid API key to run and deploy AI Studio projects.
<b>Prototype</b>	An initial, functional version of your AI application or project built within Google AI Studio.
<b>Export to Code</b>	The feature in Google AI Studio that lets you generate code (usually in Python) based on your created prototype. This code encapsulates the logic of your prompt, model interactions, and any grounding you've set up.

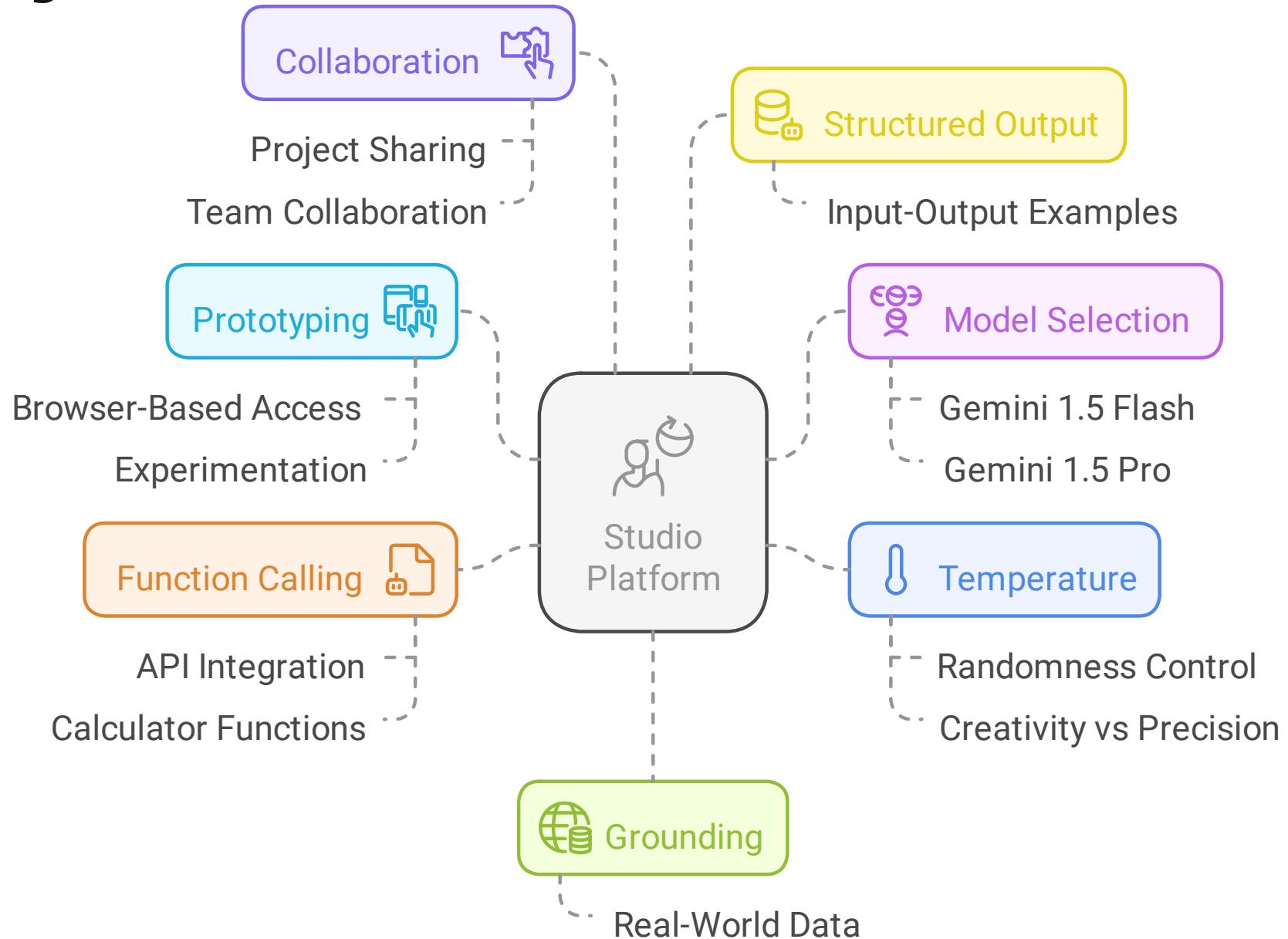
# Catalogue of Terms used in Google AI Studio



Term	Explanation
<b>Collaboration</b>	Enables multiple users to work together on the same AI Studio project.
<b>Safety Settings</b>	Controls the model's sensitivity to harmful or inappropriate content.
<b>Model Tuning</b>	The process of fine-tuning AI models for specific tasks or datasets to improve performance.
<b>Prompt Template</b>	A pre-defined structure for prompts that can be reused or shared across projects.
<b>System Instructions</b>	Guidelines or rules provided to the AI model to shape its behaviour or responses.



# Summary



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# Activity



# Kahoot!



# Models and Parameters

Google AI Studio

# Model Selection



Model Name	Model Code	Release Date	Launch Stage	Key Features
Gemini 2.5 Pro	gemini-2.5-pro-preview-03-25	April 9, 2025	Public Preview	Advanced reasoning, multimodal input, 1M token context window
Gemini 2.5 Flash	gemini-2.5-flash-preview-04-17	April 17, 2025	Public Preview	Hybrid reasoning with "thinking budget," optimized for speed and cost
Gemini 2.0 Flash	gemini-2.0-flash-001	February 5, 2025	General Availability	Multimodal input, text output, real-time streaming
Gemini 2.0 Flash-Lite	gemini-2.0-flash-lite-001	February 25, 2025	General Availability	Cost-efficient, low latency, text output
Gemini 2.0 Flash Thinking	gemini-2.0-flash-thinking-exp-01-21	January 21, 2025	Experimental	Enhanced reasoning capabilities

**Note:** Google creates, updates and retires models on a constant basis. This list is indicative as of **May 1, 2025**

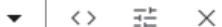
# Experiment with Models



Which answer is better? /



Gemini 1.5 Flash



## System Instructions

Optional tone and style instructions for the model

A man is found dead in a flat in Yishun. He's wet, barefoot, and there's a puddle near the window. Nothing is broken. Police rule it a murder. Why?

Give a brief, logical explanation — no guessing.

The puddle suggests he was thrown from a higher floor. The wet clothes and bare feet are consistent with this. Since nothing is broken, suggesting no forced entry or struggle inside, this points to a murder committed outside the flat.



Gemini 2.5 Pro Preview 03-25



## System Instructions

Optional tone and style instructions for the model

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Give a brief, logical explanation — no guessing.

## Thoughts (experimental)

Auto

Expand to view model thoughts

Here's the logical explanation:

The man was likely stabbed or killed with a large piece of ice (like an icicle or a specifically shaped block). The ice served as the murder weapon. After the murder, the ice melted, leaving the victim wet, creating the puddle near the window (perhaps where the body lay or the weapon was dropped/placed), and leaving no weapon behind. The lack of a conventional weapon, combined with the water evidence, points to a deliberate method intended to conceal the weapon, hence the ruling of murder.





# Parameter Tuning: Temperature

In the previous example of CoE price prediction, how should the temperature be set?

- ❖ **Adjust "Temperature" (0-2):** Lower temperature (near 0) = focused, predictable. Raise temperature (near 2) = highly creative, very varied, potentially less focused.
- ❖ **Temperature 0-1 (Accuracy Focus):** Use 0 - 1 for factual tasks, code, precision, and when you need reliable, consistent outputs. Closer to 0 is even more deterministic.
- ❖ **Temperature 1-2 (Creativity Boost):** Use 1 - 2 for brainstorming, creative writing, diverse ideas, and when you want more unexpected and imaginative results. Be aware outputs may be less coherent or factually accurate at very high temperatures.





# Parameter Tuning: Top P

- ❖ **Top P:** (also known as "nucleus sampling") is a parameter that controls how the language model selects the next word in a sequence. Think of it to fine-tune the balance between predictability and randomness.
- ❖ **How Top P Affects Output:**
  - **Low top p (e.g., 0.3):** The model focuses on the most likely words. Output is more predictable, less creative, and potentially repetitive. Good for tasks requiring factual accuracy or conciseness.
  - **High top p (e.g., 0.95):** The model considers a wider range of words, including less likely ones. Output is more creative, diverse, and potentially surprising. Good for brainstorming or creative writing but might be less coherent or accurate.
- ❖ **Imagine choosing toppings for a pizza.**
  - **Low Top P:** You pick from the most common toppings (pepperoni, mushrooms). Safe and predictable.
  - **High Top P:** You consider a wider range, including unusual toppings (durian, pineapple). More adventurous, but potentially less pleasing to everyone.





# Inference Parameter Tuning

**Activity**





# Activity 1: Inference Parameter Tuning

- ❖ Open Google Ai Studio and login.
- ❖ For this activity, use the Gemini 2.0 Pro Experimental model.
- ❖ As a team create a simple, but **unique** prompt.
- ❖ **Change the temperature only**, and observe the results.
- ❖ **Change the Top P only**, and observe the results.
- ❖ Complete the **Inference Parameter Tuning Activity** table. Refer to the separate **Activities** document.

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# Structured Output

Google AI Studio



# Structured Output

❖ Structured output enables you to generate data in organised formats like JSON, tables, and code, that are immediately usable in your applications and workflows.

- **Automation:** Automate data processing, analysis, and integration.
- **Efficiency:** Skip manual formatting and data wrangling.
- **Precision:** Get data in the exact format you need.
- **Integration:** Seamlessly connect with other tools and APIs.

❖ Requirements for using Structured Output

- **Clear Prompts:** Be very specific about the desired format and the data required.  
Examples: JSON, Table, Markdown, HTML.
- **Experiment:** Change the Temperature and Top P. Lower values usually reduce errors.
- **Validate Output:** Use a JSON validator or test code

# Structured Output: Sample



Prompt: *"Generate a JSON object for books, including title, author, ISBN, publisher. I need 3 books. They need not be actual references."*

```
[  
 {  
   "title": "The Whispering Mountains",  
   "author": "Anya Petrova",  
   "ISBN": "978-0321765723",  
   "publisher": "Mystic Press"  
 },  
 {  
   "title": "The Clockwork Heart",  
   "author": "Jasper Finch",  
   "ISBN": "978-1473228930",  
   "publisher": "Geargrind Publishing"  
 },  
 {  
   "title": "Beneath the Crimson Sky",  
   "author": "Elara Vance",  
   "ISBN": "978-0997151742",  
   "publisher": "Phoenixfire Books"  
 }]  
 ]
```



# Structured Output: Sample SQL

Prompt: *"Generate a MySQL script to create two tables, students and modules. The script must be runnable MySQL Data Definition Language (DDL). Give me two students, each with 2 modules as sample data."*

```
-- Create the students table
CREATE TABLE students (
    student_id INT AUTO_INCREMENT PRIMARY KEY,
    first_name VARCHAR(255) NOT NULL,
    last_name VARCHAR(255) NOT NULL,
    email VARCHAR(255) UNIQUE
);

-- Create the modules table
CREATE TABLE modules (
    module_id INT AUTO_INCREMENT PRIMARY KEY,
    module_name VARCHAR(255) NOT NULL,
    credits INT
);

-- Create a junction table to represent the many-to-many relationship
CREATE TABLE student_modules (
    student_id INT,
    module_id INT,
    FOREIGN KEY (student_id) REFERENCES students(student_id),
    FOREIGN KEY (module_id) REFERENCES modules(module_id),
    PRIMARY KEY (student_id, module_id) -- Composite key to prevent duplicates
);

-- Insert sample student data
INSERT INTO students (first_name, last_name, email) VALUES
('Alice', 'Smith', 'alice.smith@example.com'),
('Bob', 'Johnson', 'bob.johnson@example.com');

-- Insert sample module data
INSERT INTO modules (module_name, credits) VALUES
('Introduction to Programming', 10),
('Calculus I', 5),
('Linear Algebra', 5),
('Data Structures and Algorithms', 10);
```



# Structured Output

**Activity**

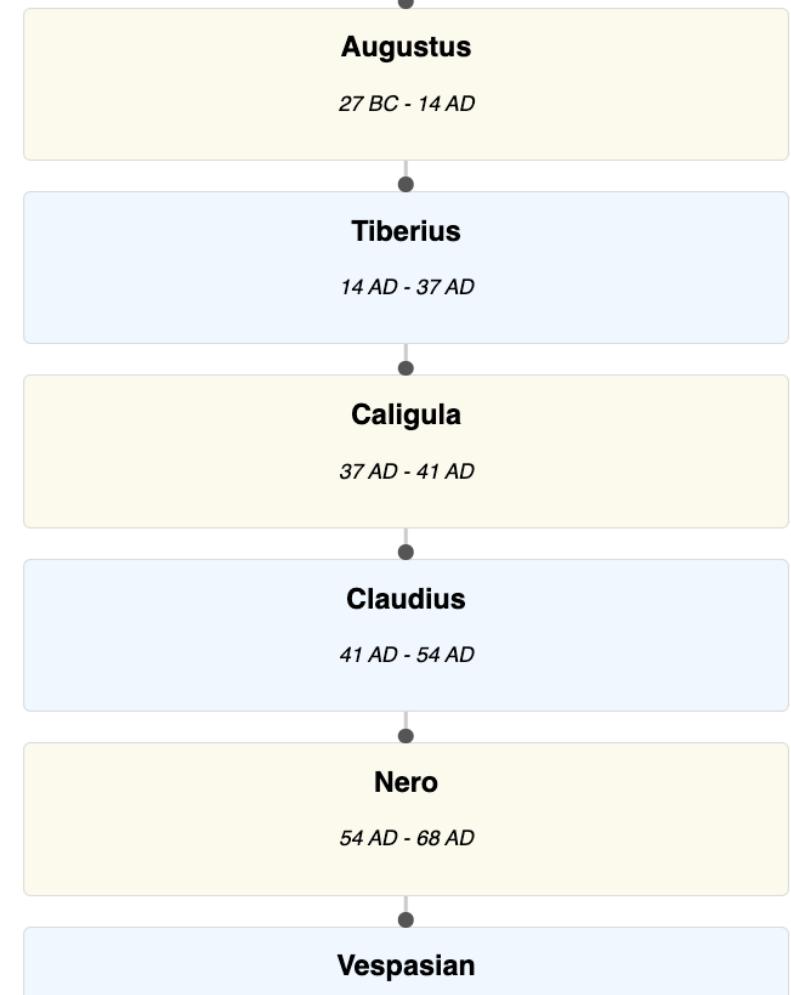




## Activity 2:

- 1) Create a prompt that generates normal paragraphed text. Modify the prompt to output JSON structured data.
- 2) Create a prompt to search for 2025 movie releases together with the movie title, director and expected release date. The prompt should create CSV output that can be saved to a CSV file using VSCode.
- 3) Create a prompt that will generate a HTML page with a timeline of Roman Emperors and the time of their rule. The HTML needs to be somewhat creative and use different colours. Do not modify the HTML directly but manipulate the output through prompts. Create, modify, copy to VSCode and run. Paste your result in the Activities document.

### Roman Empire Timeline



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# Activity 3: Bonus

- ❖ Create a prompt to generate the following worksheets for Grade 5 Chinese classes.

## ❖ Worksheet 1: Simple Sentences

1. 今天天气很好。 (Jīntiān tiānqì hěn hǎo.) - Today the weather is very good.
2. 我有一只猫。 (Wǒ yǒu yī zhī māo.) - I have a cat.
3. 学校在公园旁边。 (Xuéxiào zài gōngyuán pángbiān.) - The school is next to the park.
4. 我喜欢吃苹果。 (Wǒ xǐhuan chī píngguǒ.) - I like to eat apples.
5. 他每天都上学。 (Tā měitiān dōu shàngxué.) - He goes to school every day.

## ❖ Worksheet 2: Slightly More Complex Sentences

1. 我的朋友喜欢玩电脑游戏。 (Wǒ de péngyou xǐhuan wán diànnǎo yóuxì.) - My friend likes to play computer games.
2. 放学后，我们一起回家。 (Fàngxué hòu, wǒmen yìqǐ huí jiā.) - After school, we go home together.
3. 昨天晚上，我看了一部电影。 (Zuótiān wǎnshàng, wǒ kàn le yī bù diànyǐng.) - Last night, I watched a movie.
4. 这本故事书很有趣。 (Zhè běn gùshì shū hěn yǒuqù.) - This storybook is very interesting.
5. 下个星期，我们要去旅行。 (Xià ge xīngqí, wǒmen yào qù lǚxíng.) - Next week, we are going on a trip.



# Prompt Gallery

Google AI Studio



# Prompt Gallery

- ❖ Discover, create, and innovate with the Gemini Prompt Gallery in Google AI Studio. This resource offers:
  - **Explore diverse applications:** From simple questions to complex code, discover the breadth of Gemini's capabilities.
  - **Spark creativity and innovation:** Find inspiration for new and exciting AI projects.
  - **Overcome the blank page:** Get started quickly with pre-built prompts that you can adapt and customize.
  - **Learn by example:** See how others are using Gemini and unlock best practices for prompting.
  - **Stay up-to-date:** The gallery is continuously updated with the latest and greatest prompt examples.



# Prompt Gallery

**Activity**





# Activity 4: Prompt Gallery Jumpstart

- ❖ **1. Browse (2 min):** Open the Gemini Prompt Gallery in Google AI Studio and explore the examples. What catches your eye?
- ❖ **2. Adapt (2 min):** Pick one prompt and create 2-3 variations. Change the input, output, or add constraints.
- ❖ **3. Ideate (1 min):** How could you use this prompt type in your own projects? Jot down 1-2 ideas.

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# Lesson 05 Additional Resources

- ❖ **Google AI Studio Documentation:** The official documentation is a comprehensive resource covering everything from setup to advanced features.  
<https://cloud.google.com/vertex-ai/docs/workbench/introduction>
- ❖ **Google AI Studio Tutorials:** Practical, hands-on tutorials guide you through specific tasks and workflows. <https://developers.google.com/machine-learning/crash-course/vertex-ai-platform> (This link focuses on Vertex AI, but includes AI Platform Notebooks, which became Vertex AI Workbench User-Managed Notebooks, and many concepts overlap.)
- ❖ **Google Machine Learning Crash Course:** A beginner-friendly introduction to machine learning concepts with interactive exercises and coding examples (many usable in Colab which has a similar interface to AI Studio). <https://developers.google.com/machine-learning/crash-course>
- ❖ **YouTube Channels:** Search YouTube for channels dedicated to Google Cloud Platform, Vertex AI, or machine learning. Many creators offer helpful tutorials and walkthroughs specifically for AI Studio. (Search terms like "Google AI Studio Tutorial" will provide relevant results)



# Lesson 05

**Summary of Material Covered**



# Lesson 05 Review

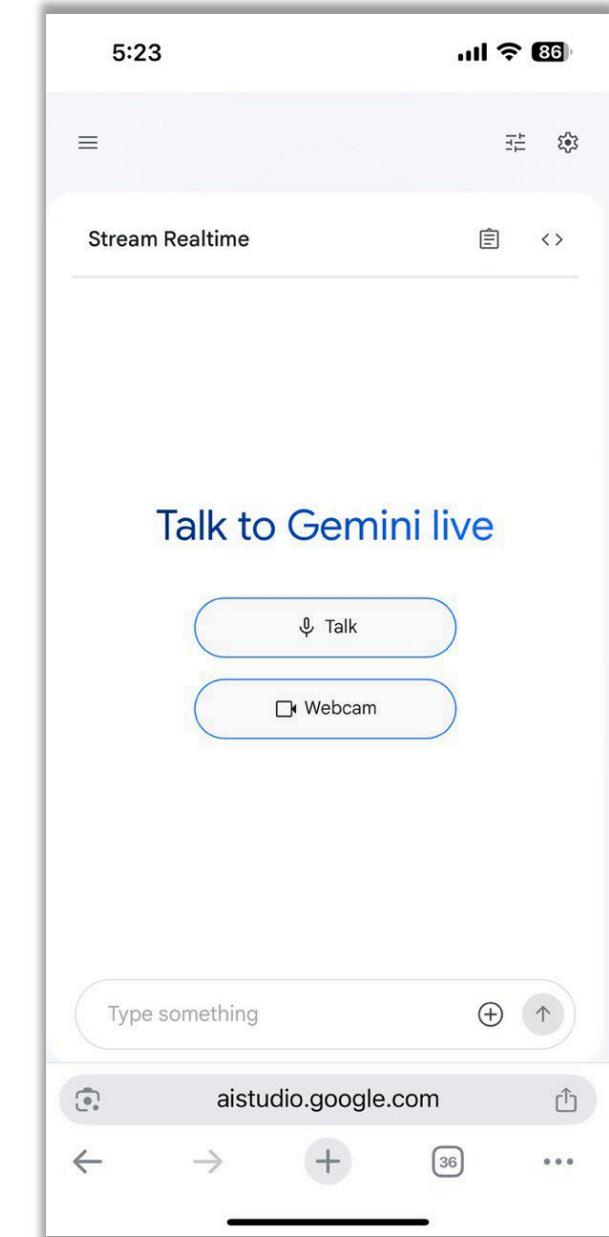
- ❖ Key Takeaways: Working with Generative AI in Google AI Studio
  - AI Studio Environment: Overview of the interface and capabilities.
  - AI Models: Model selection and suitability for various tasks.
  - Prompt Engineering: Crafting effective prompts and using the Prompt Gallery.
  - Parameter Tuning: Controlling output with temperature, top\_p, and grounding.
  - Structured Output: Generating JSON, tables, and code.



# Homework – Optional but fun!

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- ❖ Watch: [Change How You See the World](#)
- ❖ On your phone (**iPhone or Android**) use Chrome to browse to the following web site <https://aistudio.google.com>
- ❖ Leave the Gemini 2.0 Flash model selected
- ❖ From the hamburger menu on the top left, click on **Stream**
- ❖ Turn on your **microphone** and **camera**
- ❖ You now have **10 minutes** to explore your surroundings with Google AI Studio



# Thank you

School of Infocomm

C240 AI Essentials and Innovations

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