



Revision + Google AI Studio

Lecture 22 – HCCDA-AI

Course Progress: Where We Are and What's Ahead

- ✓ **Python**
 - ✓ • Python Fundamentals
- ✓ **Exploratory Data Analysis**
 - ✓ • NumPy
 - ✓ • Pandas
 - ✓ • Data Visualization
 - ✓ • Matplotlib
 - ✓ • Seaborn
- ✓ • **Machine Learning**
- ✓ • **Artificial Neural Networks**
- ✓ • **Deep Learning**
 - ✓ • Introduction to Deep Learning
 - ✓ • Convolutional Neural Networks (Deep Computer Vision)
 - ✓ • Transfer Learning
 - ✓ • Huawei Cloud Services (ModelArts)
 - ✓ • Computer Vision Applications (Classification, Detection, Segmentation)
 - ✓ • Sequence Learning (RNN, LSTM, GRU)
 - ✓ • Natural Language Processing
 - Deep Generative AI (Google AI Studio – Google Gen AI models)
 - Large Language Models
 - ...



Course Progress Overview

▪ Lecture 1:

- Introduction to Programming, Installation and Setup
- Variables, Data Types → *int, float, str, bool, list, tuple, dict*
- Conditional Statements → *if, if-else, if-elif-else*
- Loops → *while, for (range(), zip(), enumerate(), break, continue, pass)*

▪ Lecture 2:

- Functions, Types of arguments → *positional, keyword, *args*
- Programming Paradigms
- Object Oriented Programming: Classes, Objects, Attributes, Methods
- Constructor → `__init__` Method

▪ Lecture 3:

- Advanced OOP → (*Inheritance, Polymorphism, Abstraction, Encapsulation*)

▪ Lecture 4:

- Exception Handling, File Handling
- Exploratory Data Analysis, Python libraries overview for EDA
- NumPy Library → *numpy array, slicing, indexing* etc.

Course Progress Overview

▪ Lecture 5:

- Exploratory Data Analysis, Python libraries overview for EDA
- Pandas Library → *Series, DataFrame, indexing and selection*
- Handling missing data → *isnull(), fillna(), dropna()*
- Data Visualization with pandas, Lab → *Titanic dataset analysis*

▪ Lecture 6:

- Data Visualization → *Overview, Importance, what is data, sources of data*
- Common Types of Plots → *Bar, line, scatter, histogram, pie chart*
- Data Visualization Tools → *Matplotlib, Seaborn, Plotly*
- Advanced Plotting Techniques → *Subplots, 3D plots, Network Graphs, Choropleth Maps, Contour plots*
- Time Series Data, Interactive Visualization, Forecasting Stock Prices with LSTM

▪ Lecture 7:

- Machine Learning → *Traditional Programming vs. ML, Mathematics for ML*
- Types of ML → *Supervised, Unsupervised, Reinforcement Learning*
- Key Concepts → *Data and Features, Algorithms and Models, Training and Testing*
- Common Algorithms, Tools and Frameworks, Challenges and Limitations, Future Trends

Course Progress Overview

▪ Lecture 8:

- Simple Linear Regression
- Hypothesis $\rightarrow h_{\theta}(x) = \theta_0 + \theta_1 x$
- Cost Function, Gradient Descent algorithm, Gradient of cost function
- Code \rightarrow *Manual Implementation of Gradient Descent*

▪ Lecture 9:

- Version Control \rightarrow *Git, GitHub, What is Repository, Creating Repositories.*
- Updating repositories, .gitignore file, requirements.txt, Basic Git Flow
- Contributing to open source projects
- Multiple Linear Regression \rightarrow *Hypothesis, Cost Functions, Gradient Descent*

▪ Lecture 10:

- Normal Equation, Polynomial Regression, Code for Multiple Linear Regression
- Logistic Regression \rightarrow *Hypothesis, Sigmoid Function, Cost Function, Gradient Descent*
- Code for Logistic Regression

▪ Lecture 11:

- Regularization \rightarrow *The problem of overfitting*
- Practical Machine Learning with Scikit Learn

Course Progress Overview

▪ Lecture 12:

- Regression Project → *House Price Prediction*
- Feature Descriptors and Face Detection → *ORB, SIFT, Hough Transform, Haar Cascade*
- Classification Project → *Image Classification*

▪ Lecture 13:

- Artificial Neural Networks, Recent Resurgence of Neural Networks
- Evolution of Neural Networks → Biological Inspiration
- Neuron Models (logistic Unit), Activation functions
- Neural Network Training process → Forward propagation & Backward propagation
- **Code:** Implementation of Classification task (4 classes)

▪ Lecture 14:

- Huawei Cloud Services Overview
- Compute Services → Elastic Cloud Server (ECS)
- Storage Services → Object Storage Service (OBS)
- **KooLabs:** Lab01 → *Compute Services Practice*

Course Progress Overview

▪ Lecture 15:

- Introduction to Deep Learning, Deep learning in 2025
- Perceptron → The structural building block of deep learning
- The problem of overfitting → Regularization 1: *Dropout*, Regularization 2: *Early Stopping*
- Computer Vision, Impact of computer vision, What computer see
- Convolutional Neural Networks → Convolutional Layer, Pooling Layer, Flatten Layer, Dense Layer
- **Code:** *CNN model for Handwritten Digit classification*

▪ Lecture 16:

- Mid-term Exam
- Quiz - 1

▪ Lecture 17:

- Transfer Learning
- Challenges in Training custom DL models → Data, Training Time, Computational Resources, Expertise Requirements.
- Types of Transfer Learning → Feature Extraction & Fine Tuning
- Pre-trained Models → *LeNet5, AlexNet, VGG16, ResNet, InceptionNet, MobileNet, EfficientNet*
- **Projects:** *Pneumonia Classifier, Facial Emotion Recognition*

Course Progress Overview

▪ Lecture 18

- Huawei Cloud Services
- Computer Services → *Elastic Cloud Server (ECS)*, Storage Services → *Object Storage Service (OBS)*
- Network Services → *Virtual Private Cloud (VPC)*
- Huawei Cloud AI Services → *ModelArts, AI Gallery, API Services*
- **KooLab:** *ExeML for Food Classification*

▪ Lecture 19:

- Computer Vision Applications
- Image Classification → *EfficientNetV2, ConVNeXt, SwinTransformer*
- Object Detection: Two-Stage Detectors, One-Stage Detectors
- Segmentation: Types of Image Segmentation → Semantic, Instance, Panoptic

▪ Lecture 20:

- *Ultralytics* library
- **Code:** Object Detection Using YOLO → *in images & videos*
- **Project:** *Car Counter, People Counter*

Course Progress Overview

▪ Lecture 21:

- Sequence Learning → Deep Learning Models for Sequential Data
- Modeling Sequential Data before RNNs → *Frame by Frame Processing, Two Stream Networks, 3D Convolutional Neural Networks*
- Recurrent Neural Networks, RNN → Recurrent Neurons, Memory Cells (Hidden State)
- Long Short-term Memory, LSTM → LSTM Core idea, LSTM Cell Architecture
- Gated Recurrent Unit, GRU

▪ Lecture 22:

- Project: *PashtoWriter*
- Natural Language Processing, History and Evolution of NLP → from rule based to Deep Learning
- Mile stones in Modern Neural NLP
- **NLP Pipeline:** Text Pre-processing, Feature Extraction, Modeling/Learning

• Coming Up Next: **Large Language Models**

Google AI Studio

Google AI Studio

- Allows you to experiment with google gemini AI models.
- Google AI Studio is a free, web-based tool provided by Google.
- It allows you to **try out Google's Generative AI models (Gemini)** in your browser.
- You do not need coding or cloud setup, just sign in with your Google account.
- You can create an **API key** and use it in your projects (like our Streamlit app for *pashtowriter* or *youtube_video_transcript_summarizer*).

Google AI Studio

Four Features:

Chat, Stream, Generate media and Build

1. **Chat:**

- Google version of ChatGPT.

2. **Stream / Gemini Live:**

- Allows you to interact with the Gemini models live in real-time with talking, webcam and screen sharing.

3. **Generate Media:**










- Allows you to generate different kinds of media like images, videos using prompt.

4. **Build:**





- Build applications using Gemini AI models.

Google AI Studio - Chat



← → ↻ aistudio.google.com/prompts/new_chat ☆ 📄 🗑️ ⓘ ⋮




Chat Prompt

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Google AI Studio

Generate a scavenger hunt for street food around the city of Seoul, Korea →   Run Ctrl↵


What's new




URL context tool
Fetch information from web links



Native speech generation
Generate high quality text to speech with Gemini








Live audio-to-audio dialog
Try Gemini's natural, real-time dialog with audio and video inputs




Native image generation
Interleaved text-and-image generation with Gemini 2.0 Flash


Get API key **Studio** Dashboard Documentation ⌵ ⚙️

Run settings    

Gemini 2.5 Pro 


Token count 0 / 1,048,576


Temperature  1


Media resolution 


Default

Thinking

Thinking mode 

Set thinking budget 

Tools 

Structured output Edit 

Google AI Studio - Stream

The screenshot shows the Google AI Studio 'Stream Realtime' interface in a web browser. The address bar displays 'aistudio.google.com/live'. The main content area is titled 'Stream Realtime' and features a large text input field with the placeholder 'Start typing a prompt'. Above the input field, the text 'Talk to Gemini live' is displayed. Below the input field, there are three buttons: 'Talk' (with a microphone icon), 'Webcam' (with a camera icon), and 'Share Screen' (with a screen icon). To the right of the input field is a 'Run' button with a left arrow and 'Ctrl' key indicator. The right sidebar contains a 'Run settings' panel with various options: 'Gemini 2.5 Flash Preview Native...' (selected), 'Voice' set to 'Zephyr', 'Media resolution' set to '258 tokens / image', and three toggle switches for 'Turn coverage', 'Affective dialog', and 'Proactive audio'. Below these are sections for 'Session Context', 'Tools', and 'Function calling' (with an 'Edit' toggle).

Stream Realtime

Talk to Gemini live

Start typing a prompt

Talk Webcam Share Screen

Run Ctrl←

Run settings

Gemini 2.5 Flash Preview Native...

Voice

Zephyr

Media resolution

258 tokens / image

Turn coverage

Affective dialog

Proactive audio

Session Context

Tools

Function calling Edit

Google AI Studio – Generate Media

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Get API key **Studio** Dashboard Documentation ⌵ ⚙️

Create Generative Media

Explore models







Imagen
Our best image generation model yet, engineered for creativity




Gemini speech generation
Generate high quality text to speech with Gemini



Lyria RealTime
Interactively create, control, and perform music in the moment




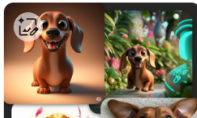
Veo
Create clips & animate images using generative video





Gemini image generation
Explore multimodal native image generation and editing

Or try some examples









Google AI Studio - Build

← → ↻ aistudio.google.com/apps ☆ 📄 🗑️ 🔍 ⋮

🔄 Get API key **Studio** Dashboard Documentation ⏏ ⚙️

Build apps with Gemini

Builds apps using the SDK without a key, try "an image generator that uses Imagen" (+) (↑)

+ Start from a template 🎮 Dynamic text game using Gemini < > Gemini powered code review 🔄 Imagen pixel art maker

Showcase Your apps Recent apps FAQ

Chat with Docs
Chat with Gemini to explore and understand the Gemini API documentation using the URL Context tool.

VibeCheck
Quickly batch test prompts with visual outputs.

Infinite Wiki
Explore an infinite wiki where every word is a hyperlink to descriptions generated in real-time.

Veo 3 Gallery
Explore a dynamic gallery, dive into examples and remix video prompts to generate your own unique variations

Google AI Studio – API Keys

- An **API** (Application Programming Interface) is a **bridge** that lets your program talk to another program or service.
- **Example:**
 - Your Python app → sends transcript to Google's servers (via API).
 - Google's AI model → sends back a summary.
- You do not need to know how Google's servers work, you just use the API to ask and receive results.



Project Ideas with AI Studio / Gemini API

1. Article Summarizer

- Paste a news article → get a short summary or key takeaways.

2. Email Assistant

- Paste a long email → get a polite reply draft.

3. Quiz Generator

- Paste lecture notes → app generates multiple-choice questions automatically.

4. AI Chatbot for Homework Help

- Simple chatbot that answers student questions using Gemini API.

5. Text → Presentation

- Paste raw text → app generates structured bullet points for slides.

6. Code Explainer

- Paste Python code → get a plain English explanation.

7. Story Generator

- Students give a theme → app generates a creative short story.

Thank You