ZENTRA – COAL SPECIALIST

# OVERVIEW

ZENTRA is an advanced AI tutor system built using modern NLP and ML tools to support students with x86 Assembly (Irvine32), Computer Organization, Information Retrieval, and study planning. Designed by H.Afsheen and Sehar T., ZENTRA rejects distractions, answers only educational queries, and can read your uploaded course PDFs to provide context-aware answers.

# Features

* Intent Classification: Understands and filters your intent (study-related, distractions, identity, etc.)
* PDF-Based Context Search: Uses TF-IDF and SBERT for finding best context from PDFs
* Semantic Search: Ranks and extracts relevant content from your custom PDFs
* x86 Assembly Code Generation: Clean, Irvine32-style MASM Assembly code on demand
* COAL Study Planner: Generates prioritized study plans using a reverse-topological graph of COAL topics
* Trained Intent Model: Built on MultinomialNB with enhanced JSON intent dataset
* Language-aware responses: Replies in Urdu/English depending on user input
* Distraction Rejection: Politely declines non-study queries
* Gradio Interface: Easy-to-use chatbot + planner UI

# Tech Stack

Gradio – For web-based chat + planner interface

Scikit-learn – For intent classification model

SentenceTransformer (SBERT) – For semantic PDF search

TF-IDF Vectorizer – Traditional document ranking

PyMuPDF – For extracting text from PDFs

OpenRouter GPT API – For final response generation using context

Pickle – For saving trained models

joblib – For optional model storage

# Installation

1. Clone the repository:

2. Install dependencies:

pip install -r requirements.txt

3. Add PDFs to `pdfs/` folder.

4. (Optional) Train the intent model:

python model.py

5. Run the app:

python zentra.py

# How It Works

* User enters a question in the Gradio chatbot.
* Intent Model classifies the input (e.g., code request, identity, distractions).
* If study-related, ZENTRA uses TF-IDF + SBERT to extract the best context from PDFs.
* Final input + context is sent to OpenRouter GPT for polished, strict academic responses.
* If the user activates the Study Planner, ZENTRA uses reverse importance scoring to suggest top COAL topics.

# API Key Setup

Replace the API key in `zentra.py` with your own OpenRouter key:

OPENROUTER\_API\_KEY = "your\_openrouter\_key\_here"

# FUTURE PLAN

* Website version
* Offline LLM support
* More COAL topics & debugging tools
* **Want to help?**  
  Contact: [**linkedin.com/in/hadia-a-2a5935350**](https://www.linkedin.com/in/hadia-a-2a5935350)

# License

This is a personal educational project. Not licensed for commercial use.

# NOTE:

Pdfs are not shared here.