Cogniview – Documentation

A Streamlit Web Application for Smart Data Exploration and AI-Powered Analysis

Project Title

Cogniview

An intelligent dashboard that helps users explore, visualize, and understand their datasets using automated summaries, visual insights, and an AI assistant that answers questions in natural language.

Overview

Cogniview is an interactive web-based tool built with Streamlit that allows users to:

- **Perform Exploratory Data Analysis (EDA)**
- **Generate interactive charts and summary statistics**
- **Ask plain English questions and receive Python code + answers**
- **Understand trends and patterns in their datasets instantly**
- **Work without writing any manual code**

Key Capabilities

- **Upload CSV or Excel datasets easily**
- **View data summary: rows, columns, missing values, memory usage**
- **Automatically generate charts like histograms, scatter plots, and heatmaps**
- **Ask queries like "What is the average rating?" and get results with code**
- **Use the app without needing any programming experience**

Workflow & Architecture

The flow of the Cogniview app is designed to be modular, intelligent, and easy to use. It handles data and user questions automatically through the following steps:

User Uploads Data

The user uploads a CSV or Excel file to start the process.

Metadata Generation

The app reads the dataset and extracts useful information such as column names, data types, number of rows and columns, missing values, and basic statistics.

AI Query Handler

The user types a question in plain English (e.g., "What is the average rating?"). This question is passed to a Large Language Model (LLM) that understands natural language.

Python Code Generation

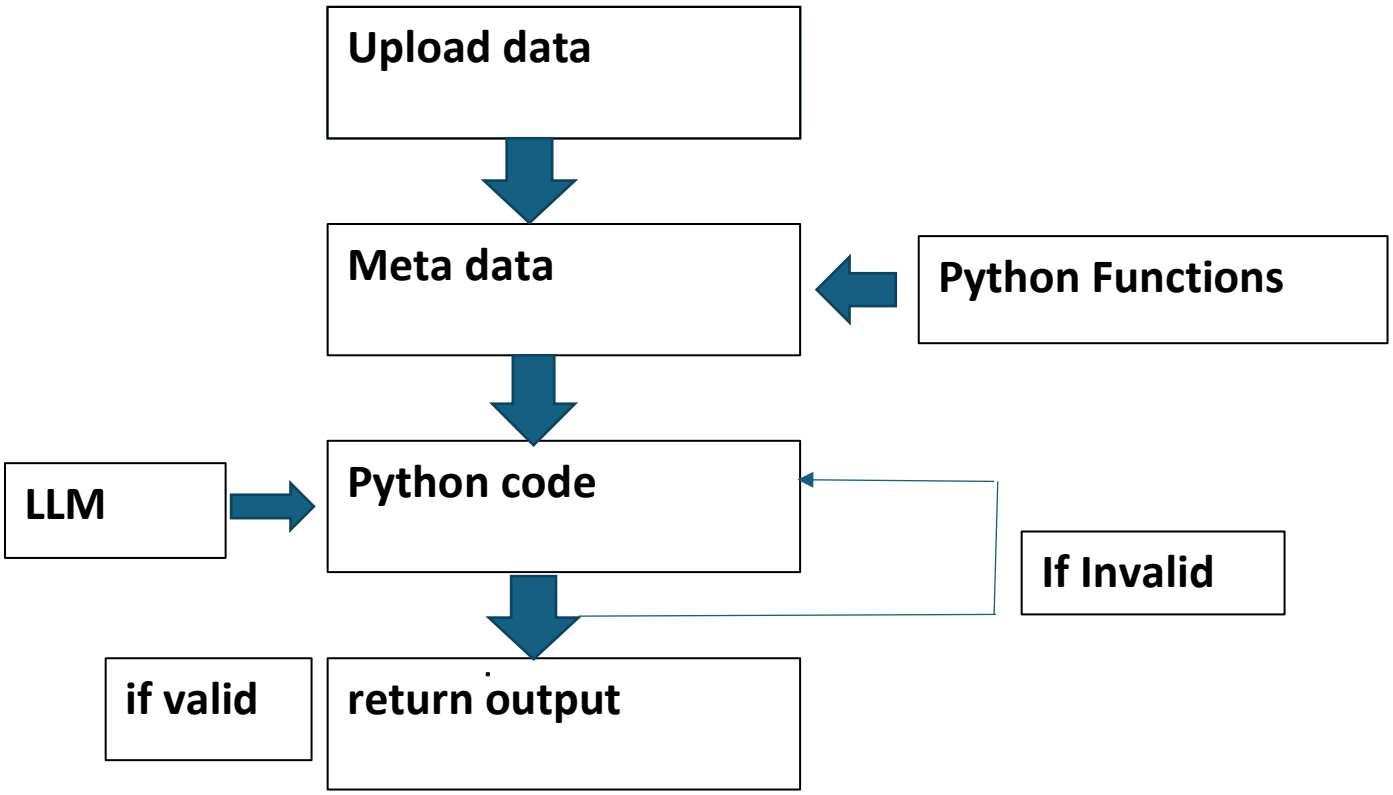
The LLM converts the question into valid Python (Pandas) code. If the first code fails or throws an error, the app automatically tries to regenerate the code up to three times.

Code Execution & Result Display

Once valid code is generated, the app runs it on the uploaded dataset. The result is shown to the user along with the Python code that was used to generate it.

Why This Workflow Works Well

- **Every step is clearly defined and happens in sequence**
- **The AI assistant removes the need for technical knowledge**
- **Users get full visibility — they see both the result and the code behind it**
- **Even if the first code attempt fails, the app fixes it automatically**



Features

1. Data Upload & Preprocessing

- **Supported file types: CSV and Excel**
- **Automatically reads uploaded dataset**
- **Detects encoding and loads data safely**
- **Displays filename, file size, rows, and columns**
- **Preprocessing includes:**
  - **Checking for missing values**
  - **Showing data types and null count**
  - **Generating a completeness score**

2. Streamlit Interface & Navigation

- **Sidebar for easy navigation**

- **Tabs include:**
  - **Overview**
  - **Data Upload**
  - **Analytics**
  - **AI Assistant**
- **Minimal, clean UI with responsive layout**
- **Memory-efficient — handles large files smoothly**

3. Exploratory Data Analysis (Analytics Tab)

- **Generates data insights using:**
  - **Summary statistics (`describe()`)**
  - **Null value charts**
  - **Correlation heatmap**
  - **Scatter plots for numeric relationships**
  - **Categorical distribution plots**
- **Automatically detects and categorizes columns**

4. AI Assistant

- **User types a question in plain English**
- **Backend uses LLM to generate Python (Pandas) code**
- **If code fails, retries up to 3 times**
- **Valid code is executed, and result is displayed**
- **Both code and output are shown for transparency**

Deployment & Usage

1. What You Need to Get Started

To run Cogniview, you just need a system with Python 3.8 or above installed.
The app uses some commonly used Python libraries like:

- **pandas, streamlit, matplotlib, seaborn**
- **langchain and ollama (for the AI assistant)**
- **plus a few built-in ones like re, os, and json**

All required packages can be installed together using a `requirements.txt` file.

2. How to Run the App

Once the setup is ready, running the app is simple:

- **Open your terminal**
- **Go to the folder where the app file (`cloud.py`) is located**
- **Run the app using Streamlit**
- **It will launch automatically in your browser**

The interface is clean, responsive, and easy to use — just upload a dataset and start exploring.

3. Where It Can Be Deployed

Cogniview can run both locally and online, depending on how it's being used:

- **If you're using only the basic features (uploading data, viewing summaries, and visualizing charts), you can deploy it easily on Streamlit Community Cloud or platforms like Render or Hugging Face Spaces.**
- **If you're using the AI Assistant (which relies on Ollama and large language models), it’s best to run the app locally or on a private server where you can install Ollama.**

This setup gives full flexibility — whether you're showing it as a demo or using it as a personal analysis tool.

Conclusion

- **Cogniview makes data analysis easy and fast**
- **Users can upload files and see instant summaries and charts**
- **No coding is needed — the AI assistant handles it**
- **Questions can be asked in plain English**
- **It's useful for both technical and non-technical users**