CSI3007 - ADVANCED PYTHON PROGRAMMING

LAB ACTIVITY – 20

Local Containerization (Docker Desktop)

G S VITHUN

22MID0099

Goal: To build and containerize a Streamlit-based web application named Logic Puzzle & Riddle Quiz, using Docker Desktop, ensuring consistent and portable deployment across different systems or cloud platforms.

Project Overview

Title-Logic Puzzle and Riddle Quiz Web Application using Docker Desktop

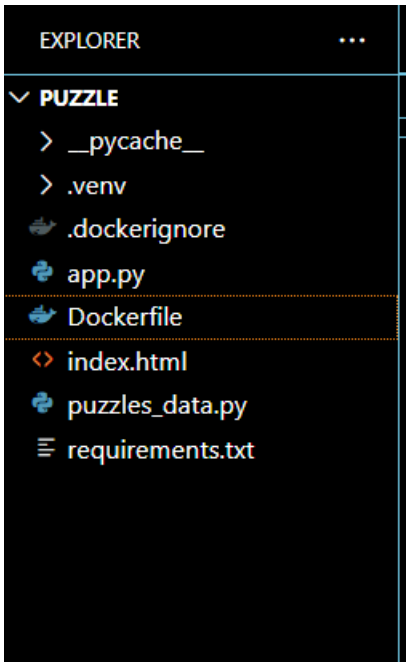
Aim: The aim of this experiment is to demonstrate how a Python Streamlit web application can be containerized using Docker Desktop, and to verify its functionality by building, running, and testing the container locally before pushing it to Docker Hub.

Features:

- **Difficulty Levels:** Choose from Easy, Medium, and Hard puzzle sets.
- **Interactive Questions:** Displays multiple-choice logic puzzles with explanations.
- **Instant Feedback:** Shows whether the chosen answer is correct or incorrect.
- **Explanations Provided:** Each puzzle includes a reasoning note for better understanding.
- **Session Handling:** Maintains user state within the quiz session.
- **Containerized Deployment:** Runs identically on any system via Docker.

Project Structure:

```
PUZZLE/
│
├── app.py              # Main Streamlit quiz app
├── puzzles_data.py     # Large dataset of 150+ riddles
├── requirements.txt    # Python dependencies
├── Dockerfile          # Docker configuration file
└── .dockerignore       # Files to exclude during image build
```



Core Component: Dockerfile

```
ENV PYTHONDONTWRITEBYTECODE=1 \
   PYTHONUNBUFFERED=1 \
   PIP_NO_CACHE_DIR=1 \
   PORT=8501 \
   STREAMLIT_SERVER_HEADLESS=true \
   STREAMLIT_BROWSER_GATHERUSAGESTATS=false

WORKDIR /app
COPY requirements.txt .
RUN pip install --no-cache-dir -r requirements.txt

COPY app.py puzzles_data.py ./

EXPOSE 8501
CMD ["bash","-lc","streamlit run app.py --server.address=0.0.0.0 --server.port=${PORT:-8501}"]
```

Build Process:

Step 1: Build Docker Image

docker build -t puzzle-quiz:latest .

Step 2: Run the Docker Container

docker run -d --name puzzle-quiz -p 8501:8501 puzzle-quiz:latest

Step 3: Access the Application

http://localhost:8501/

Step 4: Push to Docker Hub

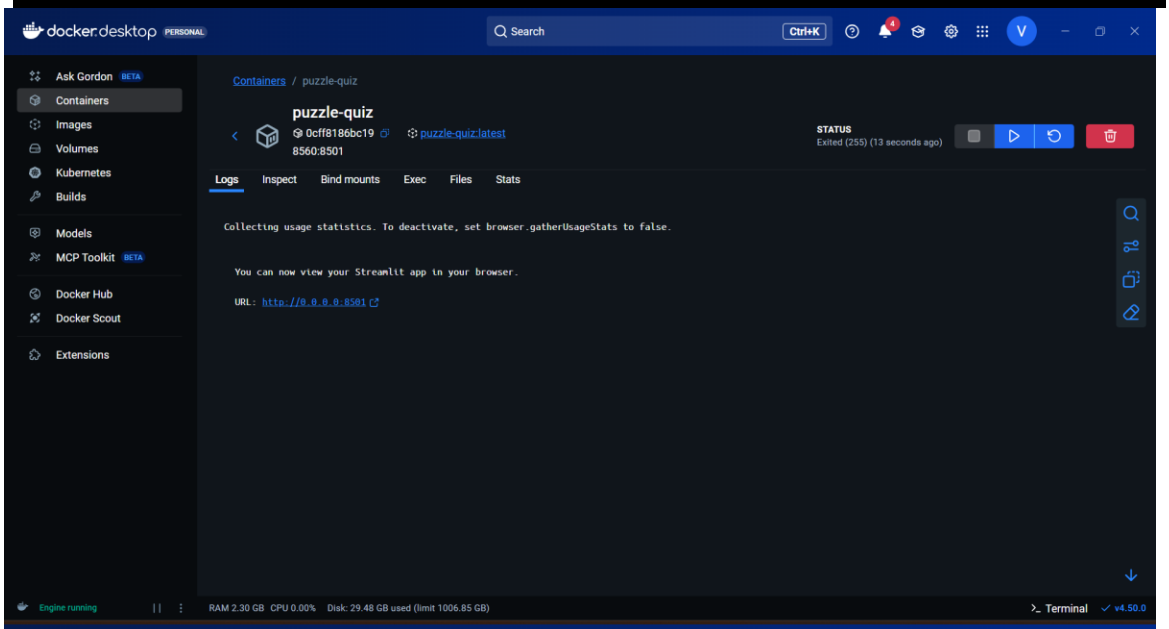
docker tag puzzle-quiz:latest vithun0099/puzzle-quiz:latest

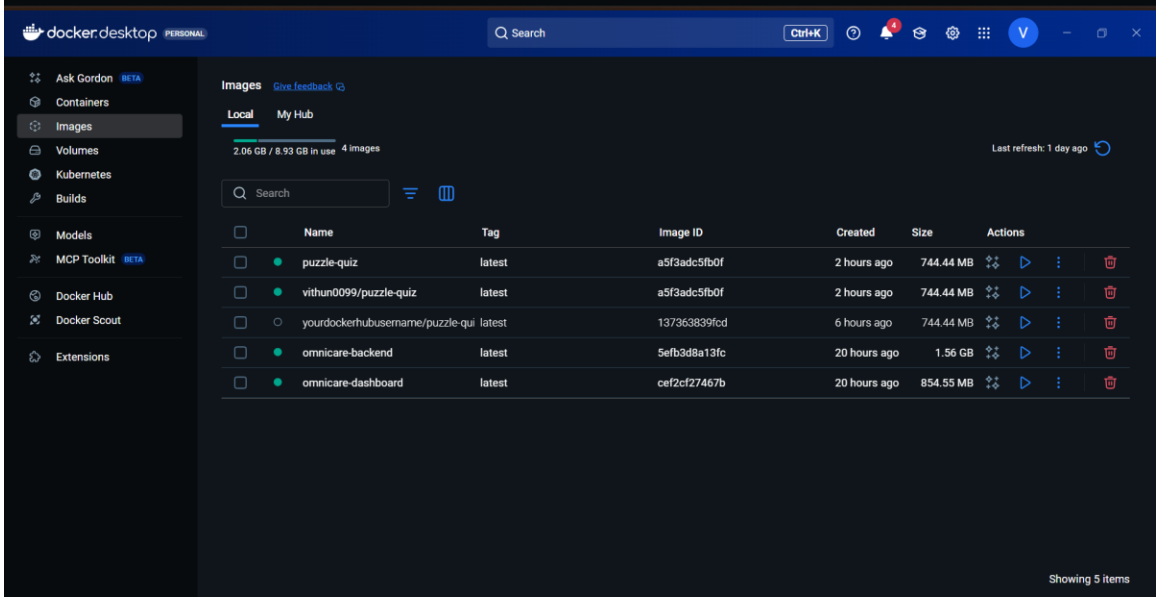
docker push vithun0099/puzzle-quiz:latest

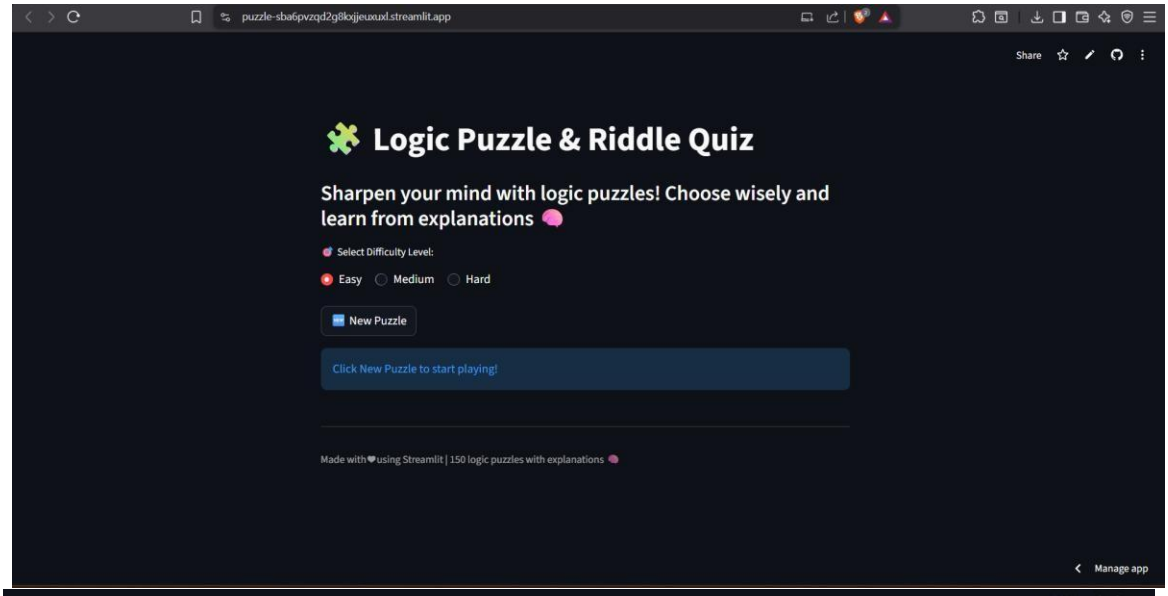
Welcome | app.py | puzzles_data.py | .dockerignore | requirements.txt | Dockerfile

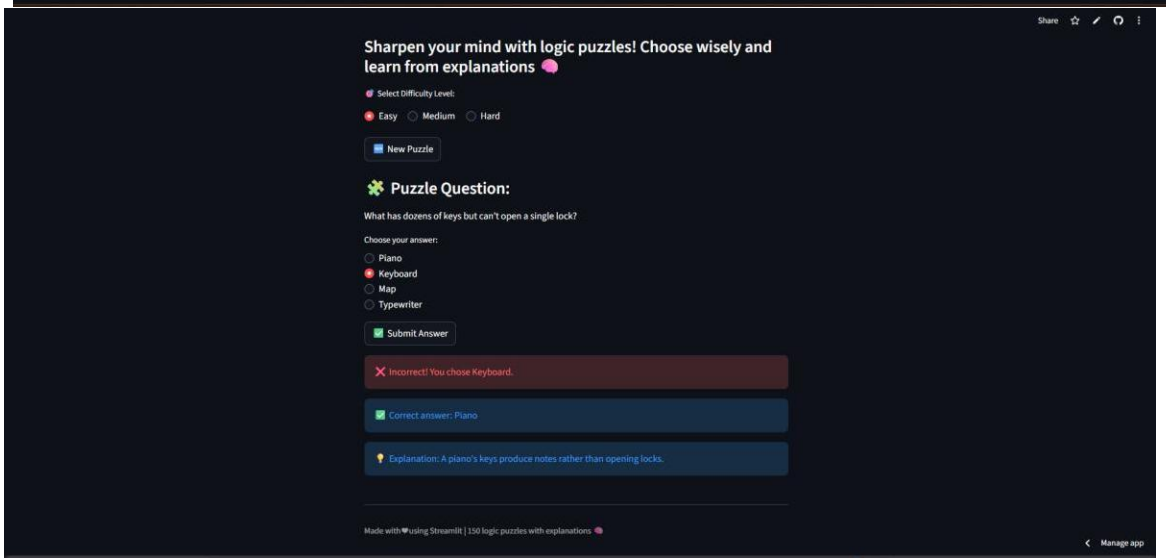
Dockerfile

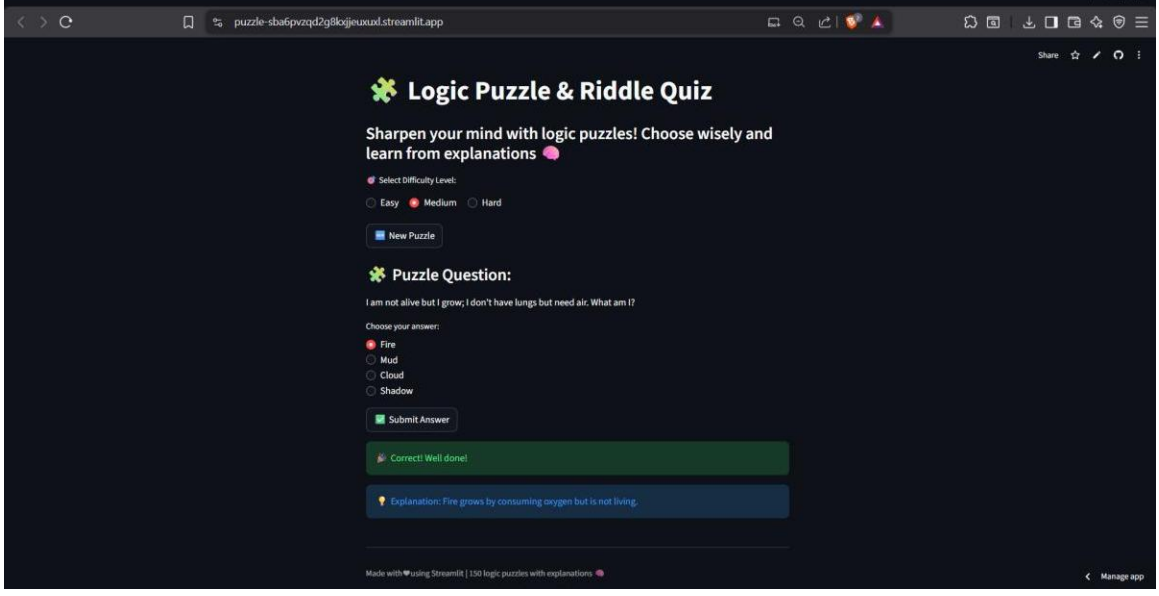
```
FROM python:3.11-slim

ENV PYTHONDONTWRITEBYTECODE=1 \
    PYTHONUNBUFFERED=1 \
    PIP_NO_CACHE_DIR=1 \
    PORT=8501

WORKDIR /app
COPY requirements.txt .
RUN pip install --no-cache-dir -r requirements.txt

COPY app.py puzzles_data.py ./

# Optional: Streamlit tweaks for proxies
ENV STREAMLIT_SERVER_HEADLESS=true \
    STREAMLIT_BROWSER_GATHERUSAGESTATS=false

EXPOSE 8501
# Use $PORT if provided by the platform, otherwise 8501
CMD bash -lc 'streamlit run app.py --server.address=0.0.0.0 --server.port=${PORT:-8501}'

```

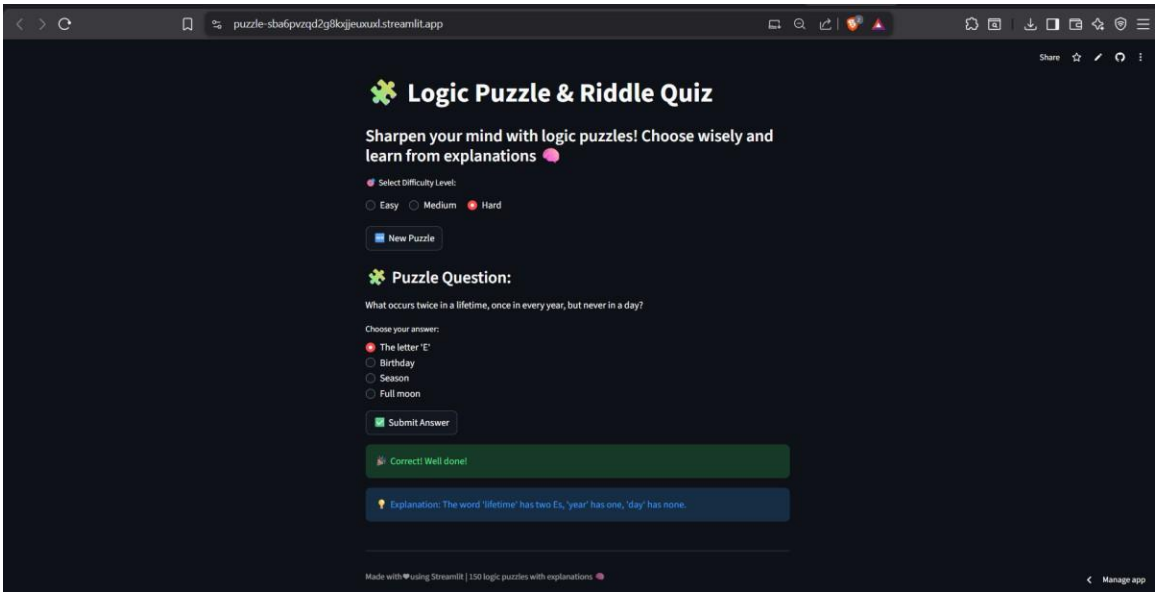





puzzle-sba6pvzqd2g8kxjjeuxuxl.streamlit.app
Share
Logic Puzzle & Riddle Quiz
Sharpen your mind with logic puzzles! Choose wisely and learn from explanations
Select Difficulty Level:
Easy
Medium
Hard
New Puzzle
Click New Puzzle to start playing!
Made with ❤ using Streamlit | 150 logic puzzles with explanations
Manage app


Share
Sharpen your mind with logic puzzles! Choose wisely and learn from explanations
Select Difficulty Level:
Easy
Medium
Hard
New Puzzle
Puzzle Question:
What has dozens of keys but can't open a single lock?
Choose your answer:
Piano
Keyboard
Map
Typewriter
Submit Answer
Incorrect! You chose Keyboard.
Correct answer: Piano
Explanation: A piano's keys produce notes rather than opening locks.
Made with ❤ using Streamlit | 150 logic puzzles with explanations
Manage app


puzzle-sba6pvzqd2g8kxjjeuxuxl.streamlit.app
Share
Logic Puzzle & Riddle Quiz
Sharpen your mind with logic puzzles! Choose wisely and learn from explanations
Select Difficulty Level:
Easy
Medium
Hard
New Puzzle
Puzzle Question:
I am not alive but I grow; I don't have lungs but need air. What am I?
Choose your answer:
Fire
Mud
Cloud
Shadow
Submit Answer
Correct! Well done!
Explanation: Fire grows by consuming oxygen but is not living.
Made with ❤ using Streamlit | 150 logic puzzles with explanations
Manage app



Conclusion:

The **Logic Puzzle & Riddle Quiz** Streamlit application was successfully containerized using Docker Desktop.

The Docker image was built, executed, and tested locally on port 8501, ensuring platform-independent functionality.

Finally, the image was pushed to Docker Hub (vithun0099/puzzle-quiz:latest), making it ready for deployment on cloud platforms such as Render or Google Cloud Run.

This experiment demonstrated how Docker provides **portability**, **consistency**, and **ease of deployment** for Python web applications.