Auto Handwritten Answer Script Evaluator

Github Link: https://github.com/siddBhandari/eval.ai

Eval.ai is an automated AI-powered application that can evaluate answer sc/OCRripts automatically and provides the marks obtained assessed from the evaluation scheme and the details assessment of the answers! eval.ai provides a unique value proposition to the education system with its cutting-edge technology, optimised for modern evaluation needs.

How it works:

1. Teachers Upload Answer Image and Evaluation Scheme
2. The App Analyzes the Sheets.
3. The App Provides Detailed Feedback and the marks obtained.

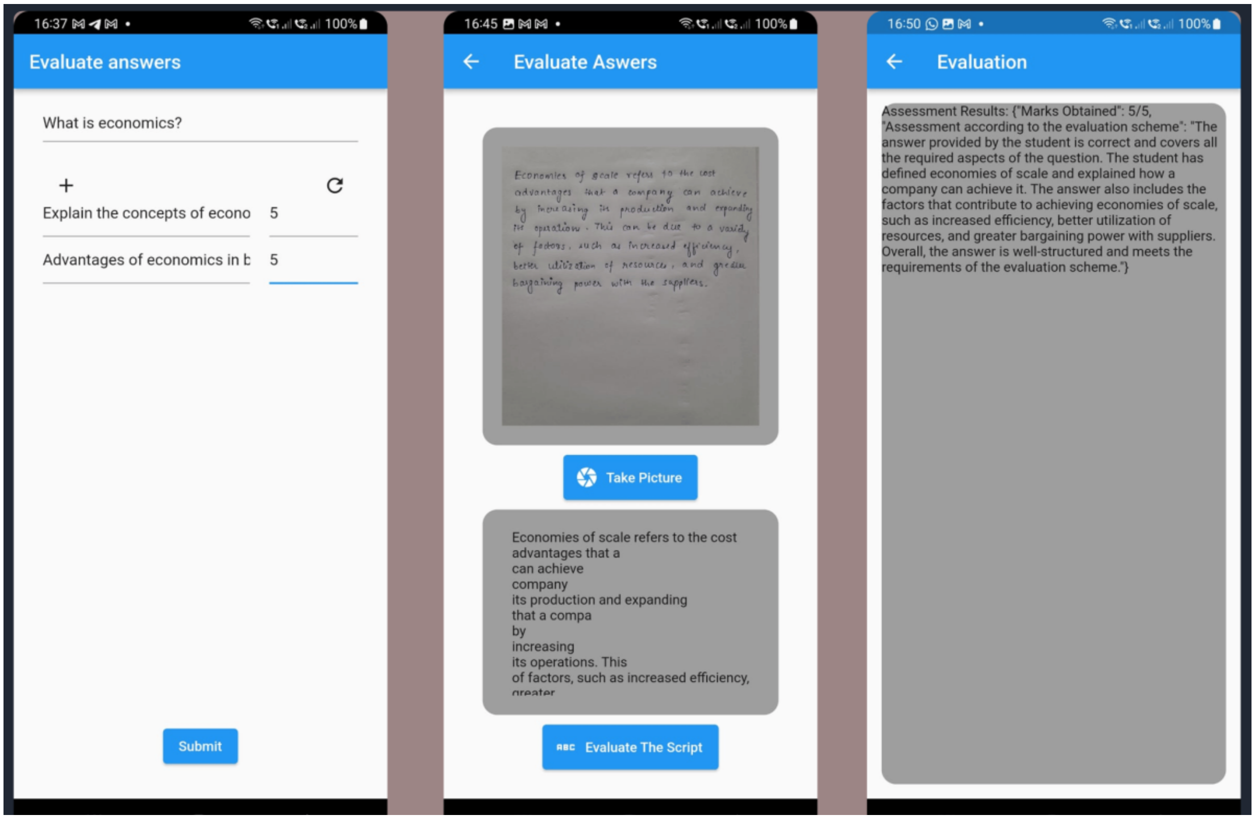
Benefits of using eval.ai:

- *Easy for Teachers:* Our application is designed to be user-friendly and straightforward, making it easy for teachers to navigate and use. Teachers can quickly upload answer images and evaluation schemes with just a few clicks, and the app takes care of the rest. This saves teachers valuable time and reduces the administrative burden associated with grading assignments.

- *Accurate and Detailed Assessment:* Our GPT-3 powered advanced system analyzes each answer sheet and provides a detailed assessment that accurately reflects the student's performance. This ensures that students receive accurate and detailed feedback that reflects their true performance.

- *Unbiased Evaluation:* Our evaluation system is completely unbiased and fair. We use different APIs to ensure that each answer sheet is evaluated objectively, without any bias or prejudice. This ensures that students receive a fair and unbiased assessment of their performance.

Snapshots:



What is economics?

Explain the concepts of econo 5

Advantages of economics in b 5

Economies of scale refers to the cost advantages that a company can achieve by increasing its production and expanding its operations. This can be due to a variety of factors, such as increased efficiency, better utilization of resources, and greater bargaining power with the suppliers.

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Assessment Results: {"Marks Obtained": 5/5, "Assessment according to the evaluation scheme": "The answer provided by the student is correct and covers all the required aspects of the question. The student has defined economies of scale and explained how a company can achieve it. The answer also includes the factors that contribute to achieving economies of scale, such as increased efficiency, better utilization of resources, and greater bargaining power with suppliers. Overall, the answer is well-structured and meets the requirements of the evaluation scheme."}

Tech Stack:

1. Flutter
2. OpenAI APIs
3. Google Cloud Vision APIs
4. FastAPI

Methodology:

A. *Flutter Frontend:*

- We have used Flutter StateFulWidgets to update and render our UI.
- Firstly, as soon as we open the app, we get a screen which says us to enter the main question and the marking scheme, the user can enter as many schemes as they want.
- The inputs are validated and made sure that they follow exactly the structure we want like it should not be empty, it should have a certain length etc.
- After this, we save all these rules and questions into a List and forward them to the next screen,

- Now in this screen, we can either take a snapshot of the answer script or type them manually in the TextField given,
- if we take the snapshot of the script, we give the taken image to an OCR model,
- the model gives us the text and during the entire process, we show a loading spinner to the frontend so that the user is notified that the process is being done.
- After this we get the text, we show it on a widget, once the user is satisfied with the text,
- they can proceed with the evaluation of the answer, again we show the loading spinner during the entire process.
- After this we get a response from the evaluation API, we show the response on the next screen with suggestions and the score.

B. GPT-3.5 Turbo API for Answer Evaluation:

- The Large Language Model expects a Prompt and following is the prompt design for the API.
- The prompt includes a question that is presented to the student, and this question is obtained from an API through the app interface.
- The student's answer is provided as a string that is generated by the handwriting recognition system implemented through the Google Vision API.
- The evaluation scheme for the answer is also obtained from the app interface through an API.
- The expected format of the output includes two fields:
  a. Marks Obtained: This field indicates the marks obtained by the student for their answer and is represented in the form of "x/y", where 'x' represents the marks obtained and 'y' represents the total marks allocated for the question.
  b. Assessment of the answer: This field provides a qualitative evaluation of the student's answer, and is represented as a string.
- All of these components are combined into a main_prompt which is then used as input to the GPT model for generating the final output.

  Below is an **Example Prompt** given to the GPT-3.5-Turbo

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Example Prompt:

main_prompt_1 = ''' Question: Describe the causes and effects of air pollution in
100-150 words.

Answer by a student:

Air pollution is a major problem that affects the environment and human health. There
are several causes of air pollution, including emissions from industries, vehicles,
and burning of fossil fuels. These activities release harmful chemicals into the air,
such as carbon monoxide, sulfur dioxide, and nitrogen oxides.
The effects of air pollution are far-reaching and can lead to serious health problems,
such as respiratory diseases, heart problems, and even cancer. In addition, air
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pollution can harm the environment by causing acid rain, damaging crops, and
contributing to climate change.



Evaluation scheme for the answer:

Identification of causes of air pollution (10 marks):
Full marks (10): Accurately identifies all major causes of air pollution, including
emissions from industries, vehicles, and burning of fossil fuels.
Partial marks (5-9): Identifies some causes of air pollution but misses some major
causes or provides incomplete information.
No marks (0-4): Does not identify any causes of air pollution or provides incorrect
information.
Explanation of effects of air pollution (10 marks):
Full marks (10): Provides a comprehensive and detailed explanation of the effects of
air pollution, including serious health problems, harm to the environment, and
contribution to climate change.
Partial marks (5-9): Provides some explanation of the effects of air pollution but
misses some key points or lacks detail.
No marks (0-4): Does not provide any explanation of the effects of air pollution or
provides incorrect information.
Coherence and organization (5 marks):
Full marks (5): The answer is well-organized and easy to follow, with a clear
introduction, body, and conclusion. Transitions between ideas are smooth and logical.
Partial marks (3-4): The answer is somewhat organized but lacks clarity in some areas
or has some awkward transitions.
No marks (0-2): The answer is poorly organized and difficult to follow.
Grammar and vocabulary (5 marks):
Full marks (5): The answer demonstrates a high level of grammatical accuracy and
varied vocabulary appropriate for the topic.
Partial marks (3-4): The answer has some grammatical errors or lacks variety in
vocabulary, but overall demonstrates a good command of language.
No marks (0-2): The answer has many grammatical errors or uses inappropriate
vocabulary, making it difficult to understand.

give output in the json format based on the evaluation scheme and assess the answer:


Assessment Results:

{
    "Marks Obtained": x/y (where x and y are integers and can be same),
    "Assessment according to the evaluation scheme": Assessment
}


'''
```

C. *Google Cloud Vision API for Handwriting OCR:*

- We used Google Cloud Vision API for Handwriting detection since their response is especially optimized for dense text and documents therefore the API was just perfect for our use case.

- The JSON Response includes page, block, paragraph, word, and break information of the captured Text.
- As we receive the Image encoded in base64 format from the request we decode it back and then pass it as a response to the Cloud Vision API.
- We then extract the handwritten text's content from the response object and then pass it, particularly to the frontend where the App displays it on the screen.

D. FastAPI Backend:

- FastAPI is a modern web framework for building RESTful APIs in Python.
- FastAPI also provides interactive documentation of all API's which reduce the overall development time.
- We created two API's '/OCR' and '/Evaluate' in the FastAPI backend which would be called by the flutter frontend whenever needed.
- The '/OCR' API is used to call the Cloud Vision API and '/Evaluate' is used to call the GPT-3.5 Turbo's API

Conclusion:

In conclusion, Eval.ai is an innovative and cutting-edge application that uses advanced technologies to provide an automated and accurate assessment of student answers. The app utilizes Flutter, OpenAI APIs, Google Cloud Vision APIs, and FastAPI to offer a seamless and user-friendly experience for teachers to upload answer images and evaluation schemes, while the app takes care of the rest. The GPT-3.5 Turbo API is used for answer evaluation, which generates accurate and detailed feedback for students. The Google Cloud Vision API is used for Handwriting OCR, providing an optimized response for dense text and documents. The FastAPI backend provides RESTful APIs for the OCR and evaluation processes, with interactive documentation that reduces overall development time. With its unbiased evaluation and detailed assessment, Eval.ai offers a unique value proposition to the education system, optimizing it for modern evaluation needs.

It was a pleasure to participate in the hackathon and we particularly enjoyed working on the development of an auto answer script evaluator. We would like to express our gratitude to the organizers for providing us with this opportunity.