BATCH #5

Q-Sol

As the name suggests: “an Equation Solver”

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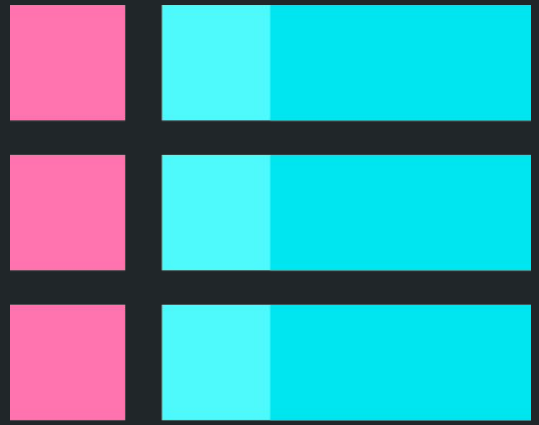

Meet our team

Guide

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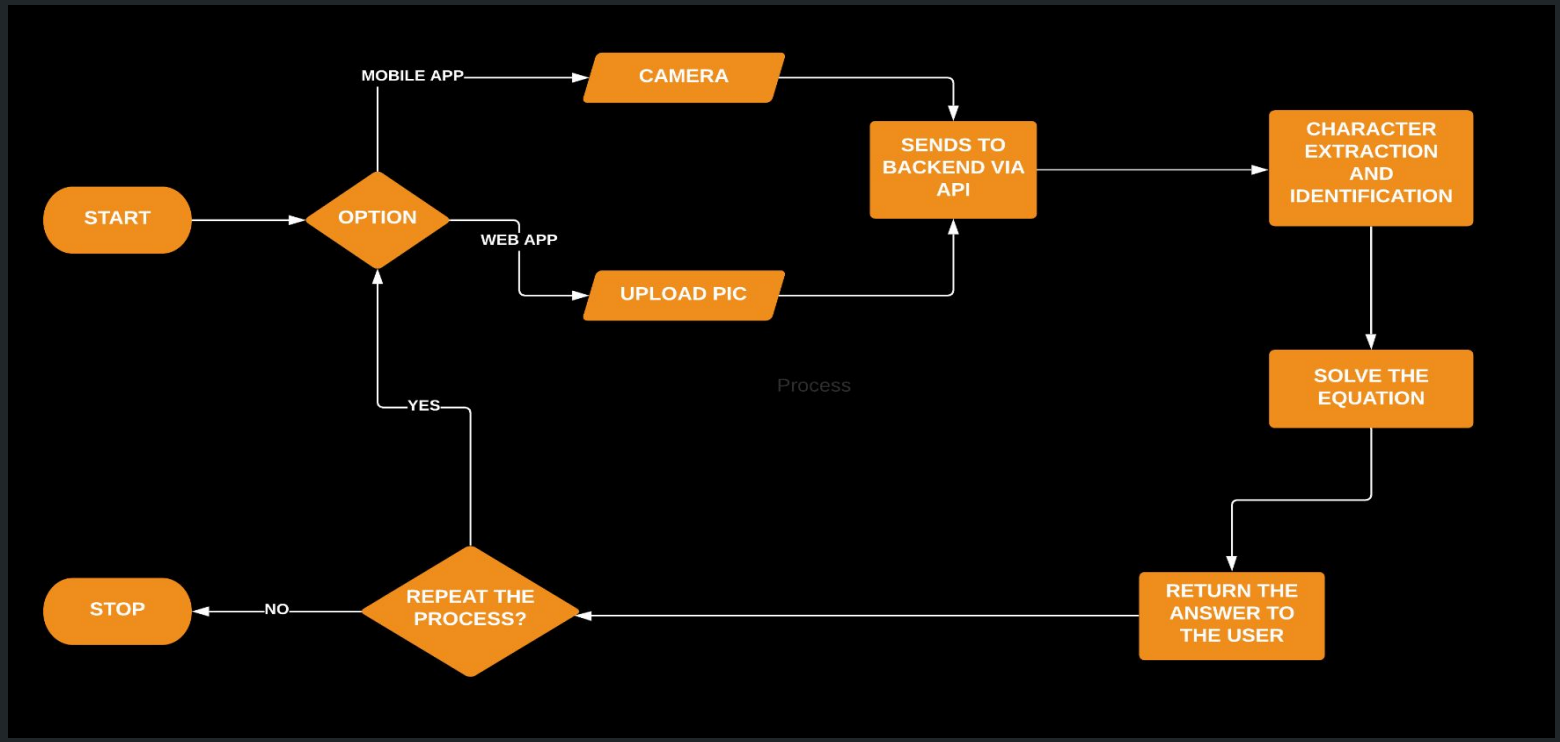
What’s our Project

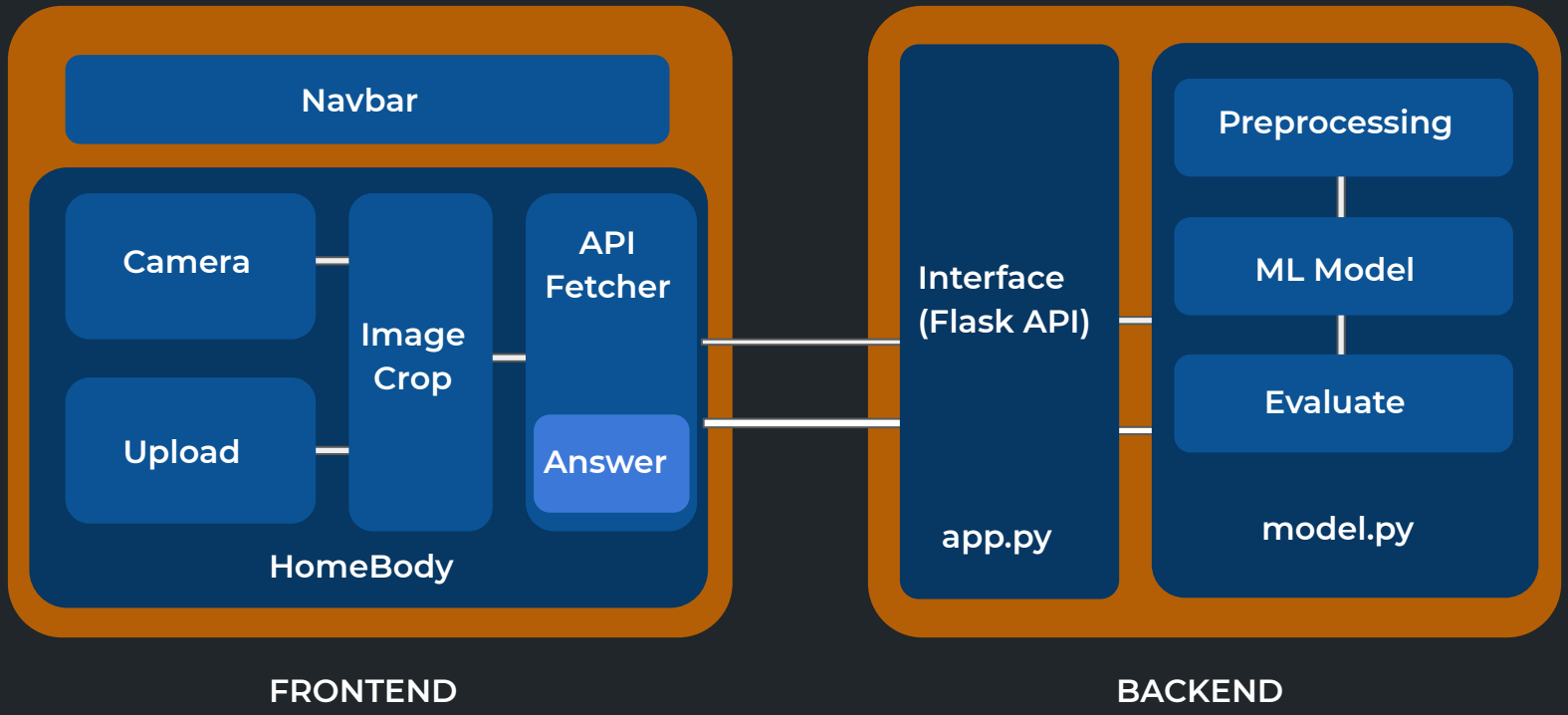
- EQ-sol is an application where the user scans handwritten mathematical equations, and the corresponding solutions are displayed by the application.

- Some of the features include:
  - Simple expressions
  - Linear equations (dev)
  - Quadratic equations (dev)

UML Diagram (LucidChart)



Project Block Diagram

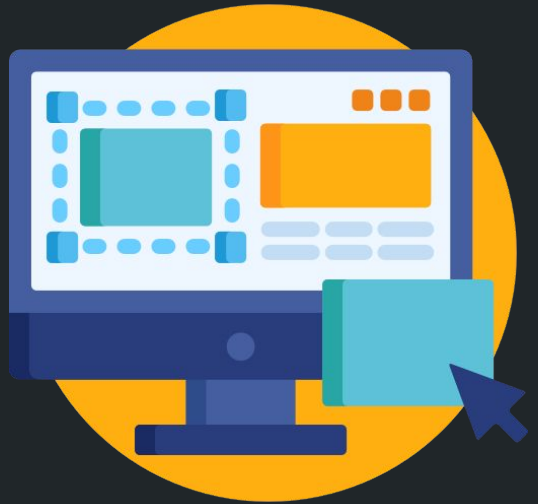


Front End

- The front end is developed using ReactJS and its modules

- The two main features are:
  - Upload or Drop images using react-dropzone
  - Take a picture via webcam using the react-webcam module

- In both cases, cropping - using react-image-crop is included to enhance user experience.

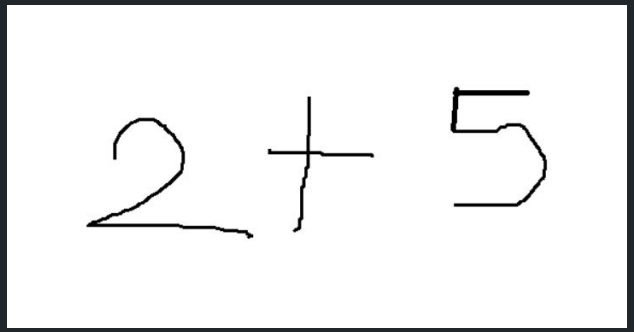


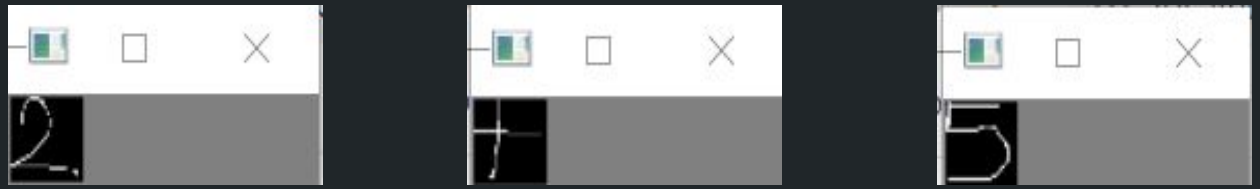
Front End - Display

Back End

- The back end is implemented using Python, Keras and OpenCV
- OpenCV performs character segmentation and binarization
- The Keras model is used to predict the segmented characters and returns the result as a string
- This string is solved and is sent back to the frontend for display

Back End - Preprocessing



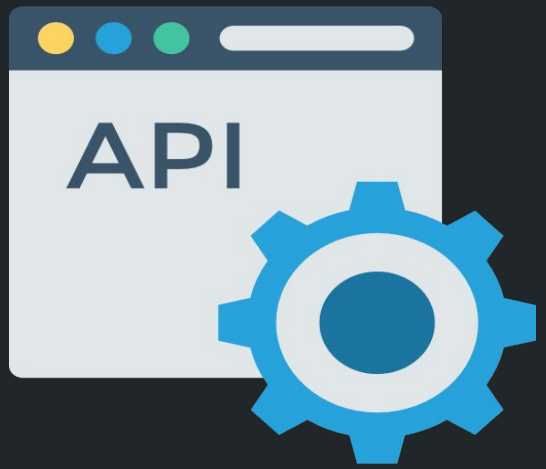


Back End - ML Model features

- Type -> Sequential Model
- Two Convolution 2D layers -> for feature extraction
- Two Max Pooling Layers -> for dimension reduction
- One drop out layer -> to avoid overfitting

Interfacing

- The interfacing is implemented using Flask.
- Also used modules like flask-cors for supporting Restful API.
- From the frontend side, Flask API is called using fetch() with POST method sending the cropped image.
- In the interface , the image is saved in server and passed to backend.



LIVE DEMO

Further work

- Fixing a bug that occurs while reading the ‘=’ symbol
- Adding the functionality of linear and quadratic equations
- Improving the accuracy of the model to hit at least 95%
- Fixing an issue that arises when the background is an off-white colour

References

- Reference paper -> https://www.researchgate.net/publication/326710549_Recognition_and_Solution_for_Handwritten_Equation_Using_Convolutional_Neural_Network
- Dataset (EMNIST) -> https://www.nist.gov/itl/products-and-services/emnist-dataset
- Other references -> https://aihubprojects.com/handwriting-recognition-using-cnn-ai-projects/ https://www.geeksforgeeks.org/handwritten-equation-solver-in-python/ https://github.com/sabari205/Equation-Solver

THANK YOU