착수 보고서

Smart E-mail 편지지 Project

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1. Background and objectives of the project

1.1 The target problem

With the advancement of technologies, including the invention of computers and the consequent surge of phenomena such as external hard drives and cloud storage, the necessity for a more reliable way of storing data has increased. In response to the change of the way data is stored, the conversion of data from a handwritten format to a digitized version had become preferable and eventually taken place. While doing so, it became known that the process of typing out the contents of a handwritten document is extremely inefficient and tedious. In light of this realization, a way of simplifying this task was devised, which included the use of a machine learning algorithm. To do so, experts that devised the algorithm, taught a computer to recognize handwriting. Likewise, we are intent on using a similar algorithm for our project.

The main goal of our project is being able to recognize the entire content of a letter to consequently send its contents to a particular address that is indicated within the letter. There are many reasons as to why doing such a project in the first place might come as handy: one being the liquidation, despite being a partial solution, of the necessity to type out the contents of a handwritten document manually and the other being the reduction in time needed to convert a handwritten text into a digitized one, to list the few. Some people might even be better off writing on paper to convey thoughts, which can also come as handy to people that are required to fill documents electronically but prefer writing on paper. Our system is undoubtedly confined to certain limitations, like the primary language on which the handwriting recognition algorithm operates or a particular format of a letter. However, in future, we strive to tune on improving this system by introducing new potential features to further expand the number of services offered by our system.

1.2 Project goals

1) Implement a user-friendly interface
2) Implement a platform that enables users to upload images to be further processed by a machine learning algorithm
3) Implement an efficient machine learning algorithm that can recognize handwritten text
4) Learn more about image processing and deepen our knowledge about machine learning
5) Produce a complete working product by the end of graduation project that can be further improved
6) Gain experience of making a project in a collaborative environment

2. Requirement analysis

1) Scanning device: camera, scanner, etc.
2) Data:

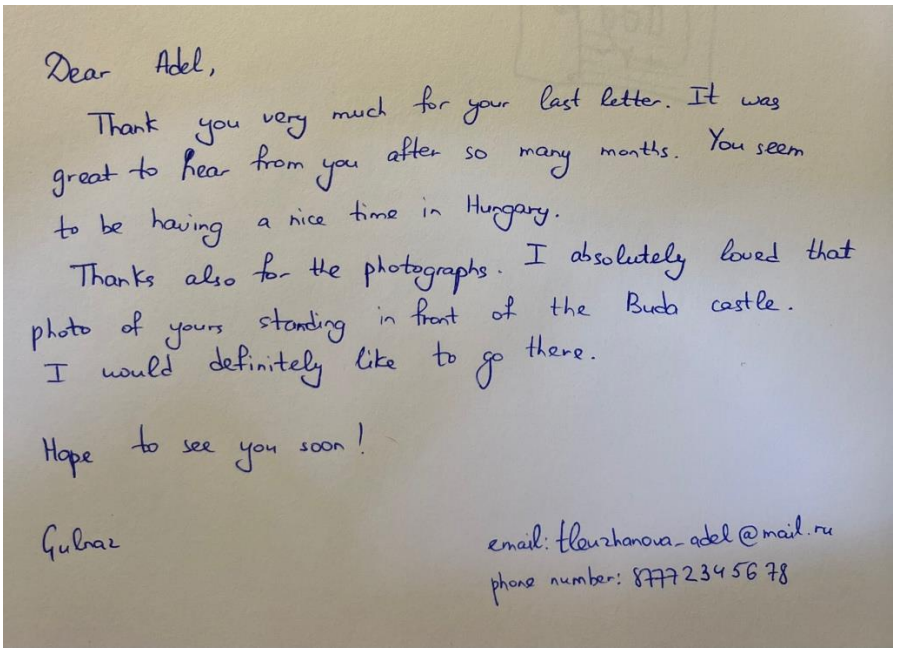


Figure 1. An example of the handwritten letter

Database: MySQL (to save uploaded letters)

Dataset: IAM Handwriting Dataset (11500+ words)

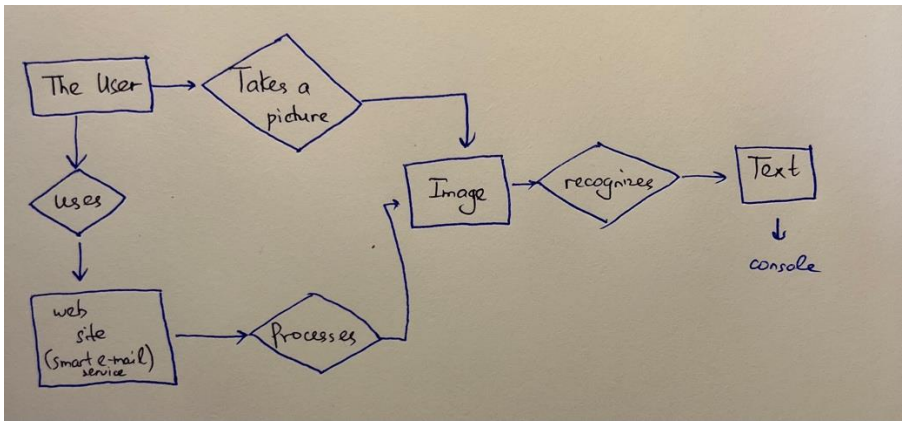
3. Constraints

Even though computers are able to successfully analyze and process images most of the time, it is impossible for them to always impeccably predict the outcome. There are a number of factors that cause faults in the processing of an image. For example, since, in our case, the algorithm is limited to English only, words written in different languages might cause errors. Similarly, if the image of a letter is of low quality and the contents cannot be clearly seen because of blurredness, letters that might seem similar from afar or contain strokes that can be easily mistaken or rendered unseen, can be processed faultily by a computer. Errors might as well occur due to one's failure to correctly place a word or if it is shifted in a particular direction, that is, if someone tends to write on paper in a way that the words are placed at different angles, squeezed tight, or slanted. In that case, a computer might not recognize the word or individual letters correctly. Besides that, faults may be caused by the background color, presence of lines on a piece of paper, mess resulted from ink blots, etc. Hence, in order to minimize the occurrence of faults related to all the causes stated priorly, some limitations were defined, like the format of the letter, the type of paper used, the rotation of an image, the language in which letter is written, and generally the handwriting style.

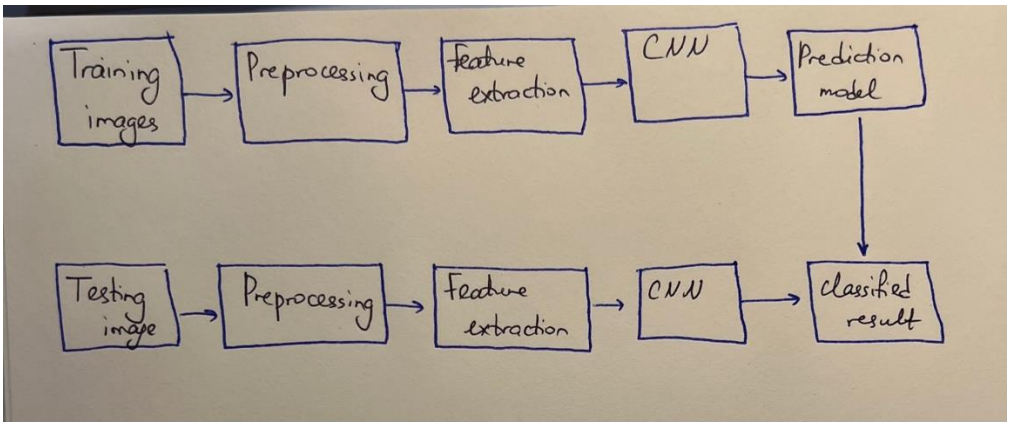
4. Development

Main technologies and tools:

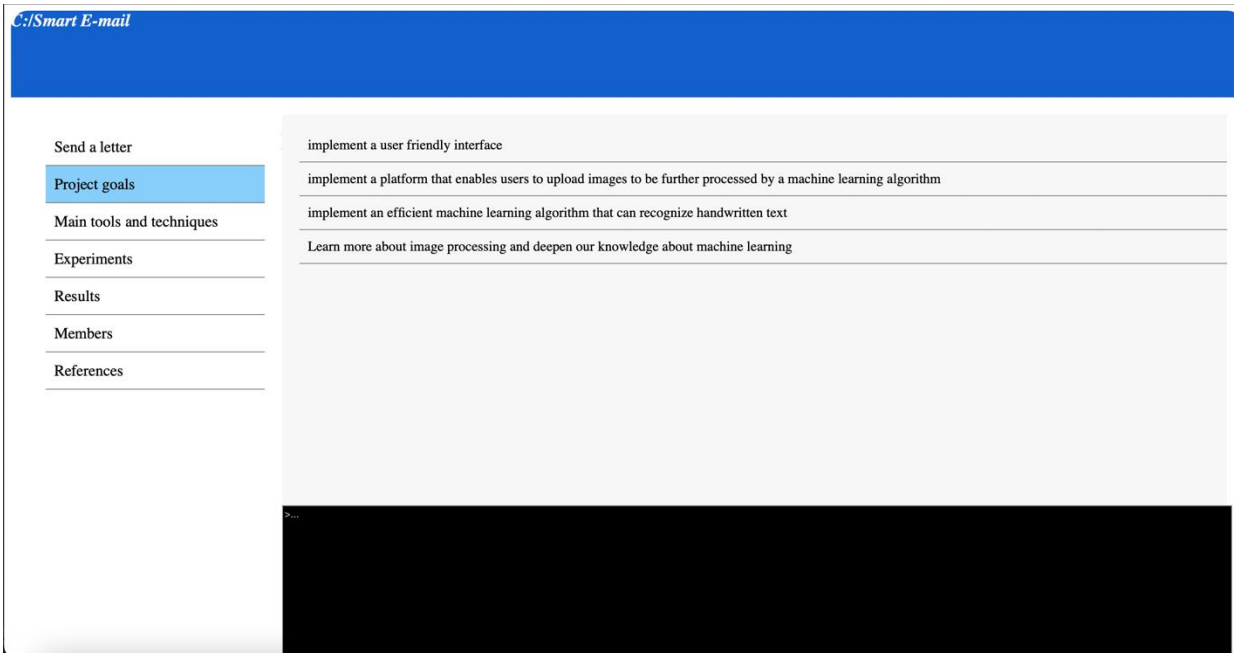
1) Python: packages (TensorFlow, cv2, etc.)
2) PHP
3) Database: MariaDB (MySQL)



Recognition process (briefly):



Website design:



5. Development schedule and role distribution

May		June				July				August				September			
3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
Learning new ml tools and practice																	
				Data preprocessing, implement a simple version of the system													
							Interim report prep.										
										Minimizing errors in prediction model and implement more complex version of the project							

										Testing and improving the project							
														Final report prep.			
																	Presentation

Member`s role:

Name	Role
Oborotov Iliya	• Work on character segmentation and prediction • Project testing and checking possible cases of input
Yerzhanov Zineden	• Website implementation (db connection) • Develop a model architecture using Python libraries
Kaztayeva Gulnaz	• Develop a model architecture using Python libraries • Implement character recognition with OCR techniques
Common	• Data preprocessing • Web site implementation(design) • Writing reports • Presentation