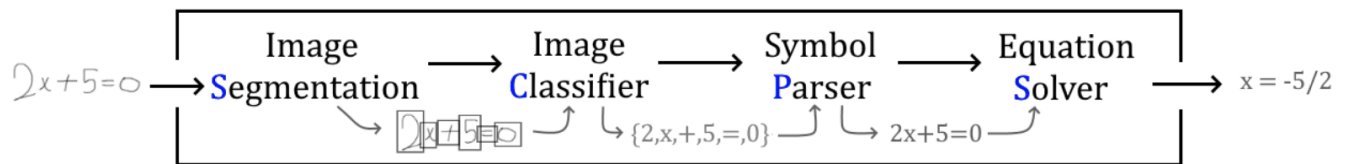


Automated Handwritten Math Solver via SCPS

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1 Problem Statement

The project is on solving handwritten mathematical problems. Through image detection, image classification, symbol parsing, and equation solving, our model solves simple math problems including simple addition, subtraction, multiplication, division, linear equations, and can ideally be extended to math involving polynomial equations, exponents, roots, integrals, and more. Our model works by parsing through the image to predict the written equation. When detecting the image, it must consider the symbol representation, segmentation between each symbol, classification of each segmented symbol, expression parsing. Then, the parsed equation is put into an equation solver and the final result is outputted.



2 Dataset Description

The [HASyV2](#) dataset contains over 150,000 different images of handwritten mathematical symbols. We can use this set to train the model to recognize individual symbols. We can supplement this dataset with the [MINST](#) dataset to make number recognition more accurate. This dataset has 70,000 handwritten numbers. After number and symbol recognition is completed, we can use the [InfyMCCDB-2](#), which contains around 20,000 handwritten mathematical expressions, to segment the images into each individual symbol.

3 Goals

- Image segmentation: This model should first process images as necessary and be able to segment the image into different components (numbers) so that each segment can then be fed into the image classifier.
- Image classifier model: We build the image classifier model by training the classifier on the combined MNIST and symbol dataset. This image classifier should be able to convert a single image into its symbol form.
- Symbol parser: The symbol parser reads each symbol outputted from the image classifier and be able to turn it into a formal equation that can be solved in the equation solver. It should additionally do equation validation to ensure that it can be solved.
- Equation solver: This solver will read the equation given from the symbol parser and output a result. This part could use an external library.

4 Timeline

Week 3	• Study potential techniques
Week 4	• Build and test image segmentation model
Week 5	• Train and test classifier model
Week 6	• Develop symbol parsing
Week 8	• Build Equation solver
Week 9	• Final touches and code cleanup