**Cover Letter for EIE4512 Final Project 2023**

***Part A: Completed by Students***

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| Paper  ID |  | Student Name | Group 1 | Topic Area | Image Recognition |
| Title: | Handwritten Digit and Signal Recognition for Children | | | | |
| Abstract  （200-300 words） | Abstract  Handwritten mathematical expression recognition and verification is a pivotal area within digital image processing and artificial intelligence. This project focuses on developing an intuitive and engaging system to verify the correctness of handwritten arithmetic expressions specifically designed for children. The system processes images of handwritten equations involving numbers from 0 to 9 and basic arithmetic operators (addition, subtraction, multiplication, and division), recognizes the digits and operators, evaluates the expression, and determines the correctness of the provided answer.  The user interface (UI) of this system is tailored to be visually appealing and user-friendly for young children, incorporating elements that make the interaction more enjoyable. The dataset for training the recognition model consists of handwritten arithmetic expressions collected from children up to the age of 12. Each image in the dataset contains a complete equation, allowing the model to learn effectively from the varied handwriting styles of young children.  The recognition process involves four primary steps. First, the system reads the image from the frontend's handwriting board. Second, image pre-processing is conducted using OpenCV, where the image is converted to grayscale, Gaussian blur is applied, edges are detected using the Canny edge detector, and dilation and erosion operations are performed. Third, contour detection is utilized to retrieve and process the contours in the image, isolating and adjusting the boundaries of the regions of interest. These regions are then classified using a pre-trained Convolutional Neural Network (CNN) model. Finally, the recognition results are displayed on the frontend, providing immediate feedback to the user.  This project aims to integrate this algorithm with a graphical user interface (GUI) to create a comprehensive electronic teaching tool for children, facilitating the learning of arithmetic in an engaging and interactive manner. | | | | |

***Part B: Completed by Course Staff***

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| Review Comments from TAs | | | | Paper Rating | |  | | |
| (Based on initial paper)  Got some concerns.  -----------------  (Update based on final submission)  I like the paper. | | | | | | | | |
| TOTAL: \_\_\_\_\_\_\_\_\_ Score in details: | | | | | | | | |
| Proposal (20%) | Paper (50%): | | Presentation (30%): | | Bonus: | | | |
| TA-in-charge |  | Instructor’s Signature | |  | | | Date | Dec. \_\_\_  2022 |