School of Electrical and Information Engineering
University of the Witwatersrand, Johannesburg
ELEN4002/4012: EIE Investigation (Capstone Project) 2022

Tender Bid for Project Number: 22p64

Project Title: Toys are a child's best friend
Group Number: 22G51

Project Overview: *(give a brief outline of how you will approach the investigation.)*

The aim of this project is to design as system which would in theory be applied to children's toys to help kids in their early development. The system would accomplish this by teaching the child about its surroundings and emotions. To do this the system would need to not only identify objects and facial expression, but also detect speech patterns in order to have a basic conversation. To make these image classifications of objects and facial expressions, image processing needs to be done. To do this the data set of images needs to be processed, annotated and generic for ML image processing. Computer vision (CV) will then be used with these images to create a training set of data for the machine learning algorithms. With the system able to identify objects, it now needs to be able to detect speech. To do this, sampled sound data needs to be preprocessed into an effect training set before being read into a neural network to develop an ASR system. Once the system can convert speech to text, the system must then interpret that text. By making use of an NLP tool text simplification and information retrieval can be performed. A set of basic classifications such as greetings, questions and scanning can be done to allow for basic conversation

Preliminary Budget & Resources:

Budget:
This project has no need for a budget as there is nothing that needs to be purchased to perform the steps outlined in the project overview. The project also has the benefit of being able to be completed remotely.

Resources:
Python and matlab
Sample sounds
Image data

Weekly Milestones: *(give specific deliverables for each week.)*

1. **Week 1: Planning and setup**
   The project specifications need to be clearly defined and understood. Basic setup for the three different machine learning systems needs to be done.
2. **Week 2: Data collection and processing**
   All three different systems namely image processing, speech to text recognition and text interpretation need training data. To do this preprocessing of sample sounds, imaging and text needs to be underwent so that a model to operate the systems together can be designed.
3. **Week 3: Algorithms and setup**
   Each system will have an algorithm chosen to best process the training sets. A model will then be created to bridge the different systems to one another.
4. **Week 4: Algorithm refinement and application**
   The final solutions should be developed, all bugs need to have been removed and testing will begin.
5. **Week 5: Processing and evaluation.**
   Evaluation of system and shortcoming will be noted.

Risks and Mitigation:

1. **Time management:**
   This project has numerous deliverables, the time constraint does put pressure on the whole task. To mitigate this the students are currently doing a Machine learning and AI course to prepare themselves.
2. **Bias:**
   Bias is a serious problem which can cause extreme inaccuracies. To mitigate this all forms of bias, need to be understood in the early stages of the project so that it can be avoided when choosing algorithms and selecting applicable data.
3. **Data quantity and quality:**
   There are three different systems to be trained specifically sample sound needs to be adequate as different pronunciations of words can affect the training and classification processes. To mitigate this extensive and large data sets will be used in the training process.

- Once complete, save as pdf before submitting – no other format will be accepted.
*- Any submission longer than **1 page** will be recorded as a non-submission and an SP warning will be issued.*