

Ali Boukrich

STUDENT, MASTER OF SCIENCE IN INFORMATION
TECHNOLOGY

Speech recognition by training a Convolutional Neural Network (CNN)

Using embedded devices for machine learning is still relatively new, and a subset of TensorFlow, called "TensorFlow Lite" has been developed to allow us to run model inferences on smaller, lower-powered devices such as single board computers and microcontrollers. Speech recognition (SR), on the other hand, is getting better at simulating human speech processing. The complicated structure of the deep neural networks (DNNs) on which SR is built, however, obfuscates the operation of SR to a great extent. In recent years, self-supervised learning has become popular as a method for learning general data representations from unlabeled samples and fine-tuning the model using labelled data. This has worked particularly well for natural language processing and is a hot topic in computer vision research.

This research proposes an innovative and dependable voice recognition approach to help people communicate effectively with machines in real-time. The work provided here is an example of how to use TensorFlow and Keras to

train a Convolutional Neural Network (CNN) to recognize the sound of a word (for example, "stop" or "Tadashi, start the car"). It also includes a Python example that utilises TensorFlow Lite to conduct inference on the training model on a Raspberry Pi to recognize the spoken phrase.

Improvement and additional work are required because this model is far from complete. Words that are similar to "stop," such as "stuff," can activate the wake word action. Furthermore, if the model is not trained on silence or ambient noise, the absence of spoken words can increase the output probability above what is required. Finally, our sliding window mechanism is rudimentary: it needs recalculating MFCCs from the same 0.5-second pieces of audio, and it may activate on variations of the wake word, such as "stopped" or "stopping." However, this is a wonderful place to start if you want to pursue more research in this area.

Research Advisor: Dr. Baidya Saha,
Assistant Professor