

Utilizing Machine Learning Algorithms on Microcontroller to Enhance Edge Computing for Sound Regression Applications

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Internet of Things (IoT) became very popular in the recent decade, due to its simplicity and remote accessibility. Machine learning (ML) plays a major role in developing the IoTs to work without human intervention. These unmanned technologies perform with improved functionality and high efficiency. For human sound recognition systems to achieve higher accuracy, more efficient computing devices with a continuous internet connection are required. This article presents an application of sound regression ML algorithms and the edge computing technique without using the internet. The edge computing technique helps transfer the sound regression machine learning model from the microcontroller to another device. The TensorFlow ML algorithm running in the microcontroller was used to create the noise regression model. This ML model is the framework used to train the dataset. 16000 voice samples were used to train the sound capture ML model. In this sound regression ML model, voice was categorized into four categories: forward, backward, left, and right. This trained sound regression model is run on the MagicBit development board (including the ESP32 microcontroller). Also, the ML model and the human voice were compared and found to be similar. An I2C microphone is used to capture human sounds on the MagicBit development board. With a test set comprising 50 samples, the system successfully recognized 46 samples correctly. This demonstrates an accuracy rate of 92%. The results have proven that the trained data sets were correctly matched with the input voice. The next step was transmitting the sound to another device. The ESP32 supported ESP-NOW communication protocol was used to transmit the detected sound to the Magic Key development board (including the ESP32 microcontroller). Hence, the results prove high efficient functionality of the system, and it underscores the fact that this operation doesn't depend on internet connectivity; only power is needed.

Keywords: Machine Learning (ML), Edge Computing, Tensorflow, Microcontroller, Sound Recognition

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