Real-time Identification of Simple and Extended Musical Chords using Artificial Neural Networks

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ABSTRACT

Musical chords are fundamental to musical harmony and are named due to their importance. For most people, accurately identifying or naming musical chords by ear is a difficult task requiring high levels of skill and training. A neural network that aimed to identify musical chord names from their component notes in real-time was thus programmed. A dataset of 37 chord types with 12 notes each was used to train the neural network. Two sessions of training were conducted: one with 10,000 epochs and another with 20,000. Validation and training accuracy data were obtained after every session, and response time data was obtained by testing the network on manual MIDI inputs of chords randomly selected from the dataset. Peak accuracies of 0.2% and 7.5% were obtained on the validation and training datasets respectively. Overfitting on the training dataset was observed, suggesting that the task of choosing between 444 different chords is too complex for a neural network to perform. A left-tailed T-test for one mean ($n = 30$, $\alpha = 0.05$) was carried out on response times on randomly selected chords from the dataset and showed that the neural network responded significantly more quickly (4.9 ms) than a standard of 40 ms for real-time use. The use of a different machine learning algorithm is recommended, as is using fewer chord types and other input formats such as audio. Chord identification algorithms may be implemented on devices or software for the purposes of music education.

Keywords: music information retrieval, harmony, GPU, musical note