VIOLIN'S SIGNATURE: LEVERAGING AUDIO FEATURES AND MACHINE LEARNING FOR VIOLIN FINGERPRINTING

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ABSTRACT

Identifying individual instruments of the same type from their recordings is a rarely addressed challenge. This paper explores violin sound identification using two datasets of recordings, featuring multiple violinists playing multiple violins. Several long-term audio features were compared, and their performance in violin classification was evaluated using classical machine learning algorithms. Among these features, long-term MFCCs demonstrated the ability to distinguish individual violins, even with player-induced variability, enabling reliable violin recognition. Additionally, the influence of key parameters—such as the number of violinists and choice of musical excerpts—on classification performance was analyzed. These findings offer guidelines for optimizing future data collection aimed at capturing a violin's unique sound signature.

1. INTRODUCTION

2. METHODS

2.1 Dataset

In 2024, a dataset was created at the Paris Conservatoire (CNSMDP), involving thirteen violinists and three violins. The participants were invited to freely explore each instrument before recording a chromatic scale and selected excerpts from the classical violin repertoire. The excerpts included pieces by Bach (Allemande), Mozart (Concerto No. 3), Tchaikovsky (Concerto), Sibelius (Concerto), and Glazunov (Concerto). All recordings were conducted under consistent conditions in a large recording studio at the CNSM. The distance between the performer and the microphone (a pair of DPA 4006) was kept constant, and a sample rate of 48 kHz was used throughout the sessions.

2.2 Audio features

2.2.1 Long Time Average Spectra (LTAS)

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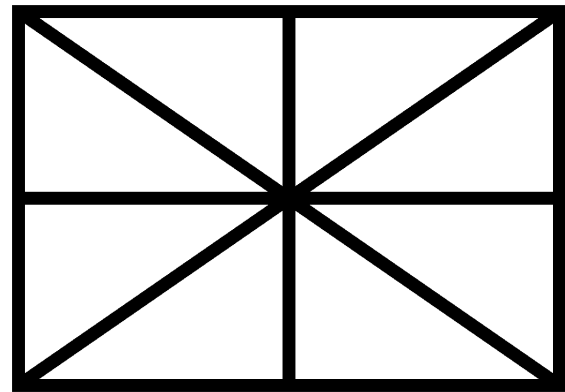
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12. REFERENCES

[1] A. Author and B. Author, "The title of the conference paper," in *Proc. of the 18th Int. Society for Music Information Retrieval Conf.*, Suzhou, China, 2017, pp. 111–117.

[2] A. Someone, B. Someone, and C. Someone, "The title of the journal paper," *Journal of New Music Research*, vol. A, no. B, pp. 111–222, September 2010.

[3] O. Person, *Title of the Book*. Montréal, Canada: McGill-Queen's University Press, 2021.

[4] F. Person and S. Person, "Title of a chapter this book," in *A Book Containing Delightful Chapters*, A. G. Editor, Ed. Tokyo, Japan: The Publisher, 2009, pp. 58–102.