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Dissertation submitted to the Faculty of the

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Doctor of Philosophy

in

Your Department

Your Advisor, Chair

First Committee

Second Committee

Third Committee

Last Committee

December 4, 2020

Blacksburg, Virginia

Keywords: Some Keywords, Subject matter, etc.

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ABSTRACT

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GENERAL AUDIENCE ABSTRACT

You are also required as of Spring 2016 to include a general audience abstract. This should be geared towards individuals outside of your field that may be reading seeking information about your work. You should avoid language that is particular to your field and clearly define any terms that may have special meaning in your discipline.

Dedicated to Virginia Tech.

Acknowledgments

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Chapter 1

Introduction

In 1952 L.A. Hiller and L.M Issacson ushered forth a new era of the study of both music and computer science when they introduced the Illiac Suite – the first composition that was created solely by a computer [1]. What we'll refer to broadly as Computer Music (CM) research has continued to see impressive advancements since the introduction of the Illiac Suite in several different domains, including musical composition[2], instrument and sound synthesis[3], and musical analysis[4]. CM research presents a unique challenge to both musicology and computer science due to the highly subjective nature of music paired with the strong quantitative and mathematical nature of computer science. However, music is also inherently mathematical and contains a strong hierarchical structure from which powerful patterns emerge - how it is that these common patterns lead to such a highly subjective human experience is outside of the scope of this work. It is perhaps due to the inherently paradoxical nature of music that it creates such an interesting set of problems to study, particularly from a computational perspective. In the authors opinion, this problem set is one of the most worthwhile to study in the current day, and should receive more focus in the research literature.

To reach such a point, it is necessary to view the field from the lens of Artificially Intelligent musical systems that are able to reason themselves about music. In general, Artificially Intelligent systems have seen immense progress in the last decade due to the rise of Machine Learning (particularly with Deep Learning) and it's applications in several different domains.

Music has been one of these domains and has seen impressive advances in several musical tasks such as musical composition[5], and musical analysis[4].

One of the more intriguing problems in computer music is the creation of an expressive performance generation system. There are several commercially available notation and playback software systems [1] that are able to automatically generate musical performances from a purely symbolic musical representation in the form of a score (more commonly known as sheet music). The systems are built based on a predefined set of rules that create deterministic performances given a score. Although the performances are technically an ”accurate” rendering of the score, they don’t contain the *human* element. That is, they contain a straight and deterministic mapping between a note marked in a score and its corresponding position in the associated performance. In such systems, there is no *expression* of the performance. As such, these systems produce robotic-sounding performances that are offputting to human listeners [2].

These simple performance generation systems do not render ”expressive” because they don’t account for performance features that add the human element. Such features include variations in tempo, timing, and dynamics (TODO: Add a reference to a later section that will go over each feature in detail). A performer of a composition uses each of these features of the performance to add a unique interpretation of the piece. This interpretation (or expression) is responsible for providing the ”human” element of musical performance.

This poses the question of whether or not a computer system can create expressive performances that are close to actual human performance (or even creating a completely new style of expression that a human cannot). This has been an active area of computer music research since the 1980s [6]. This thesis is a further exploration of the current research

[1] `musescore.com` and `www.finalemusic.com`

[2] an example performance can be heard from musescore

with a particular emphasis on applying the current state of the art Deep Neural Network architectures from Natural Language Processing (NLP) research to the problem domain and understanding their effects.

Here is a test for overleaf

Chapter 2

How to input figures

Here shows to insert figures and cite figures in the main text.

Figure 2.1: Picture of Lena

Picture of lena is shown in Fig. 2.1.

Chapter 3

How to input tables

Here shows how we could input the table.

Table 3.1: Registered pore morphology variables

metric 1	metric 2	metric 3	metric 4	metric 5	metric 6	metric 7
a	b	c	d	e	f	g

You could also cite the table 3.1 in this way.

Chapter 4

How to input references

In this chapter, I will discuss how I arrange the references that I feel make life much easier. You could have other ways if you prefer.

I will take this reference as an example.

Wu, Ziling, Tekin Bicer, Zhengchun Liu, Vincent De Andrade, Yunhui Zhu, and Ian T. Foster. "Deep Learning-based Low-dose Tomography Reconstruction with Hybrid-dose Measurements." arXiv preprint arXiv:2009.13589 (2020).

If you use 'google scholar' search this article, here is what coming out from this search.

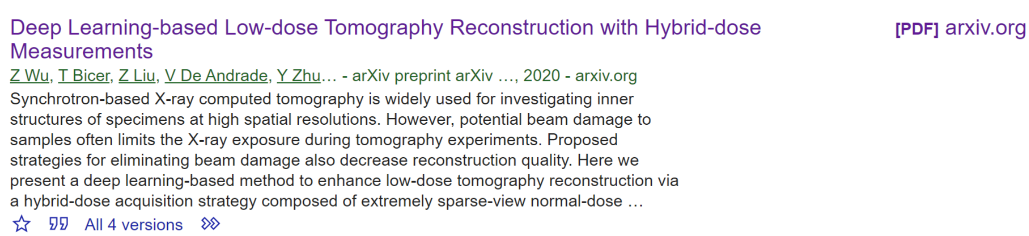

Figure 4.1: Google scholar search results

After you click the symbol circled out in red shown in Fig. 4.2, multiple cite options will come out. You could click the BibTex in green box and you could get the format to cite this article in a new page. You could copy all text in the new page to the 'ref.bib' file in the reference folder and it is ready to cite [7] now.

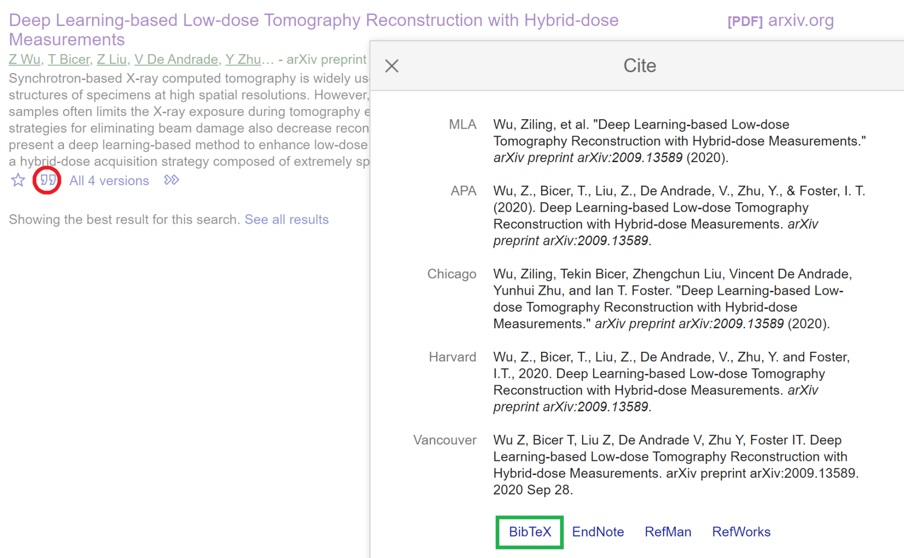

Figure 4.2: Google scholar search results

Appendices

Appendix A

Appendices I

A.1 A1

A.2 A2

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