Designing and Performing with Live Coding Languages for Signal Processing and Machine Intelligence on the Web

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ABSTRACT

This workshop will give participants the opportunity to learn how to design their own live coding mini-languages and perform with them. Participants will get familiar with *Sema* [1], our live coding language design system, a user-friendly, web-based toolkit that provides an accessible entry point to signal processing, machine learning and machine listening. Participants will engage hands-on with our system and learn how these techniques can be used in the exciting domain of live coding musical performance. Additionally, the workshop will include a reflection and group discussion about participants' experience with the system and techniques, new features and improvements.

1. INTRODUCTION

Recent advances in machine learning and machine listening show great potential to support musical composition and performance. Such emerging technologies may disrupt the paradigm for music making by shifting it from instrumental to conversational and collaborative. However, despite the formidable advances that are continuously succeeding, machine learning and machine listening represent complex computational techniques which can be difficult to understand by non-computer science creative coders.

This workshop is part of the MIMIC research project, which explores how machine learning and machine listening can be designed in a user-friendly way and provide for live coding, rapid prototyping and fast development cycles of musical applications. We build upon recent user research in Web-based technologies for creative audio processing and interactive machine learning [2], deep and transfer learning [3], [4], and live coding language design [5][6].

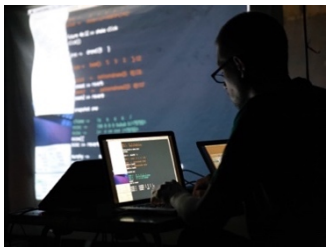
2. DESCRIPTION

This workshop will introduce the role that machine learning and machine listening technologies can have in live coding performance [6] through language design. Participants will get familiar with our live coding language design environment and language design techniques, preparing them to work in the creation of their own live coding languages. Participants will learn how to express sound and music concepts using signal processing expressions. They will experiment with selected machine learning models and machine listening JavaScript classes and explore some of their direct benefits, including beat detection, pattern detection and generation.

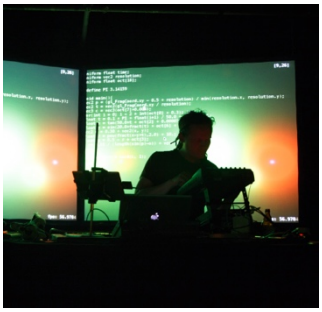
Participants will gain understanding about workflows in our system that will allow then to develop their own live code language using language design techniques. For instance, they will learn how to create, inspect and change language specifications to generate language parsers. Participants will also explore practical techniques for performing with the live code mini languages they have constructed or customised, including live coding with interactive machine learning and pre-trained generative models.

Additionally, the workshop will include a group discussion about participants' experience learning and using our system. As a result of this workshop, we believe participants will gain a better understanding of what signal processing, machine learning machine listening are in the context of live coding language design and performance.

3. BIOGRAPHY



Thor Magnusson is a worker in rhythm, frequencies and intensities. His research interests include musical improvisation, new technologies for musical expression, live coding, musical notation and digital scores, artificial intelligence and computational creativity, programming education, and the philosophy of technology. These topics have come together in the ixiQuarks, ixi lang, and the Threnoscope live coding systems he has developed. As well as performing and writing about music, he lectures in music at the University of Sussex, Brighton.



Chris Kiefer is a computer-musician and musical instrument designer, specialising in musician-computer interaction, physical computing, and machine learning. He performs with custom-made instruments including malleable foam interfaces, touch screen software, interactive sculptures

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and a modified self-resonating cello. Chris' work also concentrates on machine learning and signal processing for audio and interaction, with a particular emphasis on nonlinear and dynamical systems.

Francisco Bernardo is a computer scientist, an interactive media artist and a multi-instrumentalist. His research is focused on human-computer interaction approaches to toolkits that broaden and accelerate user innovation with interactive machine learning. Francisco has been working in applied research projects at the intersection of art and innovation, front-end software engineering, interaction design and greenfield product management.

4. ACKNOWLEDGMENTS

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