Ontology based Machine Learning in Semantic Audio Applications

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Abstract: Semantic Audio aims to associate audio and music content with meaningful labels and descriptions. It is an emerging technological and research field in the confluence of signal processing, machine learning, including deep learning, and formal knowledge representation. Semantic Audio can facilitate the detection of acoustic events in complex environments, the recognition of beat, tempo, chords or keys in music recordings or the creation of smart ecosystems and environments, for instance, to enhance audience and performer interaction. Semantic Audio can bring together creators, distributors and consumers in the music value chain in intuitive new ways. Ontologies play a crucial role in enabling complex Semantic Audio applications by providing shared conceptual models that enable combining different data sources and heterogeneous services using Semantic Web technologies. The benefit of using these techniques have been demonstrated in several large projects recently, including Audio Commons, an ecosystem built around Creative Commons audio content. In this talk, I will first outline fundamental principles in Semantic Audio analysis and introduce important concepts in representing audio and music data. Specific demonstrators will be discussed in the areas of smart audio content ecosystems, music recommendation, intelligent audio production and the application of IoT principles in musical interaction. I will discuss how machine learning and the use of ontologies in tandem benefit specific applications, and talk about challenges in fusing audio and semantic technologies as well as the opportunities they call forth.

1. Short Biography

Dr George Fazekas is a Senior Lecturer (Associate Prof.) in Digital Media at the Centre for Digital Music, Queen Mary, University of London (QMUL). He holds a BSc, MSc and PhD degree in Electrical Engineering. He is an investigator of UKRI's £6.5M Centre for Doctoral Training in Artificial Intelligence and Music (AIM CDT). He published over 140 academic papers in the fields of Music Information Retrieval, Semantic Web, Ontologies, Deep Learning and Semantic Audio, including an award winning paper on transfer

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learning. Fazekas has participated in research and knowledge transfer projects as researcher, developer and at management level. He was QMUL's Principal Investigator on the H2020 Audio Commons project (grant no. 688382, EUR 2.9M, 2016-2019) which received best score by expert reviewers of the European Commission, and Co-I of additional research projects and industrial grants worth over £410K, including the JISC funded Shared Open Vocabularies for Audio Research and Retrieval. He worked with BBC R&D to create mood-based music recommendation systems in the nationally funded Making Musical Mood Metadata project. He was general chair of ACM's Audio Mostly 2017 and papers co-chair and committee leader of the AES 53rd International Conference on Semantic Audio. He is a regular reviewer for IEEE Transactions, JNMR and others. He is a member oforganising the IEEE, ACM, BCS and AES and received the Citation Award of the AES for his work on the Semantic Audio Analysis Technical Committee.