

# Con Espressione! AI, Machine Learning, and Music

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## Abstract

Music is an important art form and channel of human expression, and digital music has become a huge economic market. With literally billions of music and audio files in the digital domain, there is a big potential for AI and machine learning to make an impact -- technologically, economically, and also artistically. Accordingly, musical informatics has become a large and vibrant research field, focused around topics and communities such as Music Information Retrieval (MIR) and Sound and Music Computing (SMC).

In this talk, I will briefly give some impressions of what computers and AI can already do with music, thanks to latest developments in fields like machine learning. For example, we will see systems that learn to identify and track beat and rhythm in complex music [1] or follow and synchronise with live music concerts in the concert hall [2]. A specific focus of the presentation, however, will be on AI and machine learning as tools for studying a very complex and subtle musical art: expressive performance. This is part of a large research project, generously funded by the European Research Council (ERC) [3], whose grand goal is to develop computer models that are aware of some of the expressive dimensions of music, the dimensions that really touch us as human listeners. The general motivation for this research has been laid out in a recent scientific 'manifesto' [4].

In particular, I will introduce a family of computational, machine-learning-based models of expressive music performance [5], demonstrating how careful modeling of scores and performances, along with deep neural networks, can permit computers to learn to play music with a "human touch", and at the same time give us insight into this complex art. The audience will be subjected to a little musical experiment which may, or may not, yield a surprising result. We will see that in this way, AI and machine learning can not only produce useful new technologies for the digital audio and music world, but also make contributions to other sciences such as musicology [6].

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**Biography**

Gerhard Widmer is Professor and Head of the Institute of Computational Perception at Johannes Kepler University, Linz, Austria; deputy director the LIT AI Lab at the Linz Institute of Technology; and leads the Intelligent Music Processing and Machine Learning Group at the Austrian Research Institute for Artificial Intelligence, Vienna, Austria. He has been awarded Austria's highest research awards, and currently holds an ERC Advanced Grant.