

*Ada's Song* for mezzo-soprano, ensemble, and interactive 'piano machine'

Ada Lovelace is credited with the first published imaginings of Artificial Intelligence (AI) applied in the creation of music: she chose composition as an example in which “mutual fundamental relations could be expressed by those of the abstract science of operations”, such that a machine could “compose elaborate and scientific pieces of music of any degree of complexity or extent.” Over 150 years later, we are still exploring questions about the nature of music made using AI, its “complexity or extent”: what distinct qualities may be achieved using AI beyond verisimilitude to human composition; and what may music created using AI may be able to tell us about how humans learn to compose, how style is formulated, and the nature of expressivity.

Taking Ada Lovelace's theorization of notions of AI, its possibilities – including composing music - and limitations as a prompt, *Ada's Song* is an exploration of AI-Assisted Composition and its relationship to interpretation and expressivity in music. First of all, AI was used in the composition of a score, in a process related to my previous compositions 'interpreting' existing pieces of music. In this process, I choose a piece of repertoire, find multiple recordings of it, mix these recordings together, and then make a transcription of this mix, using various means to heighten the differences between them. For this occasion, I chose Henry Purcell's *Hosanna to the highest*: the fluidity of the melody over the regularly repeating ground pattern, its rendering of a poetic and unusual text, and the large degree of difference in its (not particularly numerous) interpretations all made it an interesting subject for an exploration of expressivity. Rather than manually mixing the different recordings together, I used a similarity algorithm to automatically match note-by-note segments of several recordings to one instrumental transcription without voice. This caused a radical re-ordering of the notes, as various instantiations of the melody over the repeated ground became shuffled, such that the harmonic progression was preserved but the sung text was completely re-ordered, creating new melodic relationships and combinations of words. Text from Ada Lovelace's own letters was then mapped onto the newly-created text. A second AI process was then applied, to automatically orchestrate the newly created phrases.

In addition to using AI to generate musical material, this work employs a 'piano machine' in an attempt to make real-time machine learning processes visible and tangible, while exploring the particularities of human expression: a machine-learning processes 'listens' to the instrumentalists during the performance and responds by 'playing' the piano through an automata system according to what they have 'learned', not just in terms of what notes have been played, but how they have been performed. Music created by the machine-learning process is thus physically distinct from the performance of the musicians, yet inscribes itself in the sonic world of the instrumentarium of the ensemble. Marta Fontanals-Simmons plays a key role in this process, as the machine-learning system also generates new material for her to sing in real-time; her interpretation of this new material will in turn influence the piano machine's musical responses over the course of the performance. Rendering human expressivity perceptible in machine-learning processes and highlighting the performer's agency in determining the results of it is in keeping with Ada Lovelace's theorization of the relationship between humans and that which we programme: “The Analytical Engine has no pretensions to originate anything. It can do *whatever we know how to order it to perform.*” Her recognition of human responsibility and agency is one of the many vitally important aspects of her work in our present time.

This work is dedicated to Marta Fontanals-Simmons, with gratitude for her spirit of experimentation and invention.