



CHARLES UNIVERSITY
Faculty of mathematics
and physics

Eliška Janásková, M.S. Thesis
Statistical machine learning with applications in music

Supervisor Report

January 29, 2020

The main goals of this work as stated by the project task was following: “This work aims to review the current state of the art in statistical machine learning and apply it to music composition. The thesis should first briefly describe the general methods of statistical machine learning. Second, thesis should survey the existing methods applied in machine generated music.” The thesis addresses both parts of the project, the first half provides relatively detailed survey of the statistical methods used in machine learning. The second part applies these methods to music generation. Specifically, the learning ensemble were the main Beatles melodies that were used in training the music generation using the program Magenta.

This shows the versatility of the author who was able to grasp both the theoretical aspects of machine learning and its practical application which required mastering programming language Python and its working environment. From the resulting generated artificial melodies, it seems that the current technology is not yet capable of replicating the composition at the level of original Beatles. What statistical features make the computer generated melodies different is documented in the thesis. My short impression is that human melodies tend to evolve mostly on neighbouring notes in a given scale with relatively long monotone sequences (making melodies a non-markovian process). In contrast, computer generated melodies jump more and keep less monotonicity which makes it less aesthetically pleasing. This is documented in the thesis by the transition matrix of notes in both the original Beatles and the computer generated melodies. In addition, the length of notes have distinct pattern for both original and computer generated melodies.

In conclusion, I believe that Mrs. Janásková successfully fulfilled the diploma thesis task and that all possible limitations of the work are due to the fact of the difficult nature of the project and the fact that the current state of the art that does not allow to go far beyond what is described in the thesis. There are several possible

extensions that could have been included in the thesis – one example is to train the computer to produce different (and short – a small number of notes) alternative endings to some widely known melodies and check the statistical frequency of the resulting endings. A more ambitious addition to the project would be to include a rating algorithm that would evaluate the quality of the composition and thus produce a filter that would immediately discard low quality generated melodies, but this turned out to be a task far beyond this thesis.

Summary: The thesis satisfies conditions of a master thesis and I recommend that it is **accepted as such**.



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