Instrumenting Pianos and Using Artificial Intelligence to Interpret Pianists' Mood

Key Project Consultant/Contact:
Max Salman (Founder - OPUS)
m4salman@uwaterloo.ca 519.888.4567 — x38524

Description: Campus pianos at the University of Waterloo have successfully demonstrated that the pragmatic and proactive use of musical instruments in an open space can have a significant impact on mood. Noticeably on Reddit and other online forums, one can find examples of UWaterloo community members interacting with outdoor pianos, part of the Open Pianos On University Campuses (OPUS) program. The program intends to expand its reach by placing pianos indoors, so that learners may access these open pianos during the Winter months.

For this project, an FYDP team will be tasked with procuring instrumentation, ideally piezometers, and install them at various locations on the piano. These piezometers will measure the pressure at various points on a piano while it is played. These measurements can then be processed through an algorithm that would, through artificial intelligence, detect the mood of the music being played. Additionally, the pianos may be instrumented with microphones to see if the algorithm detect in similar fashion compared to the piezometers.

Additionally, the piezometers can be processed in real-time through a Raspberry Pi, and interfaced with a screen, to display the waves generated at various points on a piano as it is being played. Another use of the display is to indicate to the piano player if they are playing too loud.

The time line of this project should ideally be five or six months to complete and analyze the use and to determine the efficacy of piezometers versus microphones. If there is extra time available in the project, it would be beneficial to the community to wirelessly interface the Raspberry Pi to the internet on Campus, and to develop a UWaterloo hosted streaming service of the pianos, such that someone in Engineering 7, may listen to music being played in the Hagey Hall Hub via the internet.

Executive Summary: Campus pianos at the University of Waterloo have successfully demonstrated that the pragmatic and proactive use of musical instruments in an open space can have a significant impact on mood. Noticeably on Reddit and other online forums, one can find examples of UWaterloo community members interacting with outdoor pianos, part of the Open Pianos On University Campuses (OPUS) program. The program intends to expand its reach by placing pianos indoors, so that UWaterloo community members may access these open pianos during the Winter months. For this project, an FYDP team will be tasked with designing a system that will measure the vibrations at various spots on an indoor piano, and will have to, in real-time, display the measured waves, and inform the player if they are playing too loudly. The system must also be able to determine, using artificial intelligence, the player's mood based on the song they are playing. Since this project is linked to a an open music platform, another goal of the project would be to set up a wireless live-stream of the piano to the internet, and to be able to listen to the music from anywhere in the world.