**SoC Summer 2022 Final Documentation**

**Musify -Music development through A.I.**

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**Keywords** (Include 7 or more keywords that will help others find your documentation easily)

*Musify, Piano, Music, TensorFlow, MIDI, Kaggle, Artificial Intelligence*

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**Brief Description**

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| **Musify**- Music development through Artificial Intelligence  This project combined the fields of Piano Music notes and Machine Learning to create and train a music generation model to produce new music files.  The coding Language used was Python and model was developed using Jupyter Notebook IDE.  We make use of Long Short-Term Memory, popularly known as LSTM which is a variant of Recurrent Neural Networks (RNNs) that can capture the long-term dependencies in the input sequence.  Various libraries have been used in this project including NumPy, Pandas, TensorFlow, Music21, Keras , tqdm.  We have made use of MIDI files to extract data about the notes and chords that are present in the music. Using this data, the Machine Learning model is then developed, trained, and tested, using TensorFlow and new notes are predicted by model based on the input data provided, thus new music is generated. |

**Progress**

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| In the Introductory Meet I got to know the basic essence of the project & what exactly we are going to do throughout this Project.  In the 1st 2 weeks I started with basic python learning using video links provided by our mentors. I started learning variables, lists, tuples, dictionary, loops, conditions & then applied them to form functions.  In Review Meet 1 we discussed our progress and decided on further proceedings.  I watched the videos and learnt about the various libraries of python and how they made the computation easier & saved a lot of time. NumPy, Pandas were used for operations on Arrays and matplotlib used to represent them in form of graphs of several types. Then I discussed my doubts with mentor and got a grip over using these libraries.  In review meet 2 we discussed our doubts with Mentor and after that I started with TensorFlow, the primary software we intended to employ to carry out our project. TensorFlow was quite tricky for me to understand. I then turned to my mentors for assistance and inquired about how deep we should dive into TensorFlow at this stage. So, I just did the basics of TensorFlow and read an article on how simple machine learning models can be created to generate Music.  Then we entered the last phase of our project. We started with the implementation of our code after learning all about the libraries and packages we would be using in it.  Our mentors posted a link to the code that had to be implemented along with a description of the code's various steps. I first tried to understand the code, then I tweaked portions of the code before implementing them. I first faced a few issues during implementation, but they got resolved after discussing with mentors & I was able to properly run the code and generate a unique music file.  Overall, it was a great learning experience for me. |

**Results**

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| I have successfully built an automatic music generation model using music files of different composers.  Here are the links to various files in my project:  **GitHub Repository (**Collection of all the Files used in the project and made during Learning Process)  https://github.com/madhavgupta6803/Soc-Project.git  **Generated music file https://drive.google.com/file/d/1npwrQi6Fau-yKpMIazjpLAYjE-WCpfhH/view?usp=sharing**  Presentation - https://docs.google.com/presentation/d/1PvSoX7qbQS0Io0r7kzTZY60uDOjBKXGZ/edit?usp=sharing&ouid=111918792702601518533&rtpof=true&sd=true  Video - https://drive.google.com/file/d/1zPBKJKBZH5bmmVjyL1DKEEhYP-lt27hC/view?usp=sharing |

**Learning Value**

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| Through this learning project, I developed a lot of skills.   * Basics of Python * Different useful libraries of Python- NumPy, Pandas, Matplotlib, Sklearn , TensorFlow package * Basic concepts used in Machine Learning & Artificial Intelligence like core learning algorithms, deep learning with neural networks. * Training and testing simple Machine Learning models. |

**Software used**

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| I used Jupyter Notebook IDE for learning and practicing python libraries as well as tweaking the code for the project. Visual Studio Code for python basics.  Used Google Colab to learn Tensor Flow. |

**Suggestions for others**

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| I would say that focus on basic python learning and understand the syntax instead of directly jumping to its libraries or Tensor Flow package as it might be overwhelming at the beginning. |

**References and Citations**

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| I have referred to my mentor’s GitHub repository.  **Link to the repository** https://github.com/abhijit-kr/MUSIFY---Music-Composition-using-AI  **Link to the dataset for MIDI files**  https://www.kaggle.com/datasets/soumikrakshit/classical-music-midi |

**Disclaimer**

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| **Fair Use Disclaimer**: Fair use of GitHub Repository ( <https://github.com/abhijit-kr/MUSIFY---Music-Composition-using-AI.git>) Prepared by my mentors. So, I give credits to Abhijeet, Amit, and Soumya for making this repository which helped a lot in the making of the project. |

**Licenses**

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| **Visual Studio code Open**-source  **Jupyter Notebook Free** to use and open Source  **Google Colab** Free to use |