1. Problem statement: Restate the initial project that you proposed in deliverable one in 2 - 3 sentences. Be sure to refer back to this problem statement in the following questions.

   The amplitude values of a set of MIDI tracks obtained from the Internet are used to train a LSTM model that is able to generate music. The LSTM model is used as that it is able to learn "long term dependencies".

2. Data Preprocessing: Confirm the dataset you are working with. State any changes from the initial dataset you chose. Discuss the content of the dataset (number of samples, labels, etc). Describe and justify your data preprocessing methods.

   The dataset mentioned in deliverable 1 contains about 800 MIDI tracks, and the sample size can be easily increased or decreased based on the project's need.

   Music21 will be used to preprocess the data, as it is able to read MIDI files and break them down into segments of notes. There are two types of objects that we would like to split our data into : chord and note. The note objects contain the basic information of the notes, including their time values and pitch. The chord objects contain the set of notes that are allowed to be played at a certain time interval.

3. Machine learning model: In the first deliverable, you proposed a model for your project. If you decided to change your model, explain why. Restate your chosen model and elaborate on the design decisions. Report the following:

   1. Discuss the framework and tools that you used for your model. Explain your choice. Provide architecture graphs as appropriate. - Justify any decision about training/validation/test splits, regularization techniques, optimization tricks, setting hyper-parameters, etc.
   2. Description of validation methods How did you test your model? Is your model overfitting or underfitting?)
      The model is severely overfitting due to the dataset being too small.
   3. Did you face any challenges implementing the model? If so, how did you solve it?

   At this point, don't forget to save your trained weights! You will need them for the integration and/or testing your model!

      1. Keras and Music21 will be used to implement the model.
      2. Training/validation/test split ratio will be 70%/15%/15%, as this ratio is balanced between feeding sufficient data to train the model, and helping us to decide which model is the most accurate one for generalizing unseen data
      3. The model is severely overfitting due to the dataset being too small. There are 3 things that I will do to deal with this:
         - Implementing RNN regularization methods (weight decay, batch normalization etc.)
         - Expanding the dataset(!)
         - Adding a small amount of noises

4. Preliminary results: In this section, you will focus on the performance of your model. Confirm the metric discussed in Deliverable 1. Present a detailed analysis of your results, providing graphs as appropriate. In addition to an evaluation metric, discuss the overall performance of the model and the feasibility of the project with these results. Remember, graphs are beautiful and we love them!

   So far, the performance of the model is still dissatisfactory as it is still overfitting. One example to show this is that the music generated by this model contains repeated melodies. This is a very significant problem that must be dealt with at once.

Reference:

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