1. Introduction
   1. Goal of the project: Compose music using a Hidden Markov Model
   2. Motivation
      1. Lots of theory that goes into the composition of music, some of this is captured in things such as notes.
      2. However, a Hidden Markov model could be used to capture….all of the hidden things
      3. Is it possible to compose music that sounds pretty good using Hidden Markov Models?
2. Methods
   1. Classical piano pieces
      1. One instrument, more instruments would be more complicated
   2. First Order HMM
      1. Graphical model of this
      2. See class notes for derivation
   3. Second Order HMM
      1. Graphical model of this
      2. Incorporating information from the previous two states
         1. Progression of the song can build over multiple notes as opposed to just one note
      3. See paper reference for derivation
      4. Ideally would include more states, but this would be computationally more intense
   4. HMM with Two Hidden States
      1. Graphical model for this
      2. Now includes a meta-state that can capture more overall structure as opposed to sequential structure
      3. Overall musicality of the piece
3. Results
   1. Results of Super Official Survey
      1. First Order HMM
      2. Second Order HMM
      3. HMM with Two Hidden States
   2. Comparison of sheet music
   3. Screen shot of GarageBand
   4. Time plot of comparing velocity for training and composed song
      1. Color coded by note?
   5. Measuring the similarity between songs?
      1. See paper
4. Further Work
   1. Ways to incorporate more than one instrument
   2. Higher than a second order HMM

-Use beta to find the topics, this is a k x v matrix