

MUSIC 80L
Artificial Intelligence and Music
Summer 2017
T/Th 1:00pm - 4:30pm
David Kant

CONTACT

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* office hours by appointment

OVERVIEW

Music 80L Artificial Intelligence and Music is an introduction to the fundamental concepts of musical artificial intelligence and generative music systems. The course explores the ways in which composers and musicians have interacted with the concept of artificial intelligence historically as well as contemporary trends in musical AI. The course covers basic introductions to related concepts in linguistics, mathematics, computer science, and machine learning. Topics include decision trees, grammars, neural networks, genetic algorithms, Markov models, dynamical systems, machine listening, song generation, automatic radio, music cognition, and interactive systems. Previous experience in one or more of these fields is helpful but not required. Students produce a project based on one of the models presented in class. General Education Codes: MF, T-6 Natural Sciences or Humanities and Arts, A. Instructor: David Kant, dkant@ucsc.edu

TEXTBOOKS

All of the course readings will be available online through Canvas or as electronics resources from the library.

SOFTWARE

Access to a computer is necessary. We will see examples in a number of different softwares and music programming languages, but the main working language for the class will be Python and the Jupyter Notebook. Prior programming experience is not required.

WORK

There will be weekly readings, weekly listenings, weekly assignments, and one final project:

- **Assignments** are short technical and/or creative exercises that reinforce the concepts introduced in class. Most of the the weekly assignments will be completed in the Python programming language. Submit assignments on-line through Canvas. Late assignments will lose 10% for each day late. I will review the solutions in class.
- The **Final Project** is to create a musical artificial intelligence. You are encouraged to work in groups and collaborate with peers who have complementary skill sets to yours. You will (1) decide what task your musical AI performs (2) what constitutes intelligence (3) justify why (4) and demonstrate that your musical AI fulfills this. **START THINKING ABOUT THE PROJECTS NOW and keep them in mind as the course progresses!** Submit projects on-line through Canvas. Late assignments will lose 10% for each day late.

GRADING

Your grade will be determined by weekly assignments, a final project, participation during in-class workshops, and attendance. Specific criteria and expectations for assignments and projects will be given as they are assigned.

1. 50% - final project
2. 30% - weekly assignments
3. 20% - class participation

Attendance is mandatory! You may miss two classes without affecting your grade, and then you will lose one letter grade for every two additional absences. If you cannot make class for some reason please **contact me in advance** and check with your classmates to catch up on missed material.

Check Canvas **regularly!** I will update the Canvas syllabus every week with an outline of what was covered in class, including links to readings, examples, slides, and additional resources. I will post class **examples**, class **lecture slides**, and additional **resources** (for supplemental information and tools).

UNITS

1. History and Background
 - History of Automated Composition
 - Intro to AI / What is AI / History of AI / AI techniques
 - Musical Representations: notation, sound and timbre, waveforms, spectrograms
2. Probability, Rules, and Constrained Decision Making
 - Probability Distributions
 - Conditional Probability
 - Search Methods for Problem Solving
 - Stochastic Music
 - Modeling Style
3. Emergence and Complexity
 - A-life
 - Genetic Algorithms
 - Particle Systems
 - Fractals
 - Cellular Automata
 - Grammars
3. Listening
 - Machine Listening
 - Music Information Retrieval
 - Interactive Systems
 - Affective Computing
4. Learning
 - The return of Neural Networks
 - Machine Learning
 - Current Trends and Applications in Musical AI