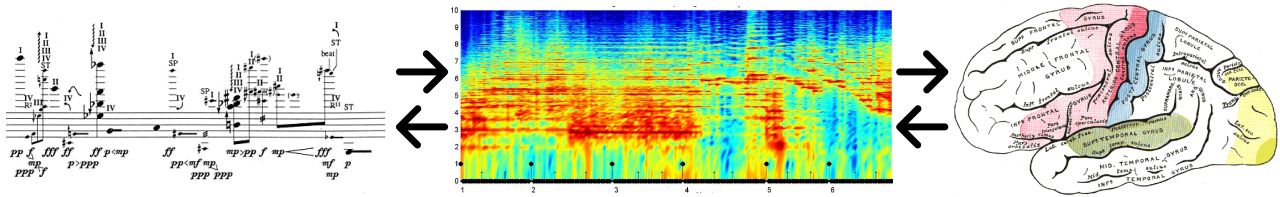


Music 102: Music, Information, Neuroscience



Prof. [Michael Casey](#), Dartmouth College, 12F: Tuesdays 2:30-5:30, Seminar Room, Hallgarten Hall.

Course Description

This course covers theory and practice of music audio information systems with an emphasis on creative and emerging applications. Topics include information theory, audio feature extraction methods, metric spaces, similarity methods, mathematical and computational models of music, probability and statistics of music feature spaces, machine learning and decision support systems, links between surface-levels and deep structure in music, comparative analysis of music collections, audio and multimedia search engines, creative systems, scalability to large audio collections, and modeling of human music cognition using EEG and fMRI data.

Assessment

Criteria	Allocation
Weekly Assignments (Analyses / Creative)	25%
Reading/preparedness and participation in group discussions	25%
Mid-term project presentation	10%
Final project presentation and writeup (~4-page conference paper: e.g. ISMIR, NIME, SMC, SMPC)	40%

Final grade: <50%=Fail, 50%-59%=LP, 60%-89%=P, 90%-100%=HP

Syllabus

Week	Date	Title	Topics	Resources
Week 1	09-11-12	Information	Features, Vector/Matrix, Spectrum, Critical Bands, Cepstrum, Timbre/Noise	Slides: Slides 1 Readings: Reading 1 Analysis: Lab 1 :
Week 2	09-18-12	Similarity	Distance matrix, Identity, Dynamics, Structure, Alignment, Corpus, Creative MIR I	Slides: Slides 2 Readings: Analysis Lab: Lab 2
Week 3	09-25-12	Machine Learning	Regression, SVD, k-NN / Naive Bayes / SVM, MIR Applications	Slides: Slides 3 Readings: Reading (Onset, Beat) Analysis / Creativity Lab: Lab 3
Week 4a	10-02-12	Pulse	Onsets, Beats, Tempo, Synchrony, Creative MIR II, Intro to Projects	Slides: Week 4a Readings: Reading (PLCA) Analysis Lab: Lab 4 (DUE OCT 16th)
Week 4b	10-04-12	Pitch	Chroma, Harmonicity, Dissonance, F0 Melody/Bass, Tonal Dynamics, SMS, Feature-Based Synthesis	Slides: Week 4b Readings: Analysis Lab:
Week 5	10-09-12	Machine Hearing I	Independent and latent components: NMF, PLCA, SI-PLCA, Separated Features, Source Separation	Slides: Week 5 Readings: Analysis Lab:
Week 6	10-16-12	Machine Hearing II	Auditory Scene Analysis, Multi F0, Transcription, Spatial Cues	Slides: Week 6 Readings: Analysis / Creativity Lab:

Week 7	10-23-12	Neuroscience & MIR 1 Prediction and Decoding	Mid-Term Student Presentations. fMRI, MVPA, fMRI + MIR, Neural Decoding of Music	Readings: Analysis Lab:
Week 8	10-30-12	Cognitive-MIR	Cognition of Affect, Emotion, Information Dynamics, Mood, Intent	Readings: Analysis Lab:
Week 9	11-06-12	Neuroscience & MIR 2 Anticipation	EEG, ERPs, Novelty, Musical Applications	Readings: Analysis / Creativity Lab:
Week 10	11-13-12	Neuroscience & MIR 3 Reconstruction	Audio synthesis from fMRI + MIR	Readings: Analysis / Creativity Lab:
Week 11	11-20-12	Student Project Presentations	Final Projects: 15 minute presentation, 5 mins questions	*

Technical Resources

This course will require use of Matlab or Python to complete assignments. No previous experience with these platforms required. Tutorials will be provided.

- [Matlab V7+ \(Available from Dartmouth\)](#)
- [MIR Toolbox \(Matlab\)](#)
- [Netlab ML Toolbox \(Matlab\)](#)
- [Python / Pylab \(Free\) *Recommended](#)
- [Bregman MIR Toolbox \(Python\) *Recommended](#)
- [PyMVPA ML Toolbox \(Python\) *Recommended](#)
- [PyML Toolbox \(Python\)](#)
- [Supercollider3, SC-MIR Toolbox](#)