INFO I546: Music Information Processing: Symbolic

Fall 2009

Instructor C. Raphael (craphael@indiana.edu)

Classes TR 1:00 – 2:15 Music Library 340

Office Informatics 315 856-1849

Office Hours MW 4:00-5:00 and by appt.

Web Page http://www.music.informatics.indiana.edu/courses/I546/

Course Material

This course deals with the algorithmic annotation, understanding, recognition, visualization, and categorization of music in symbolic (score-like) form, as well as methodology to accomplish these tasks. Particular applications will be taken from key finding, harmonic analysis, note spelling, rhythm recognition, expressive melody synthesis, meter induction, instrument fingering, melody morphing, and various classification problems such as genre or composer identification. The methodology we will employ will be probabilistic and will include ideas from machine learning such as optimal classifiers and hidden Markov models. Students will have computing assignments in R (similar to Matlab) and will occasionally present solutions. We will employ the "learn by doing" method throughout the course. The course will be supported by readings of various papers and tutorials, as well as a set of notes class that that appear on the course web page.

Prerequisites While we will make little or no use of calculus itself, the level of mathematical sophistication is roughly equivalent to one year of college-level calculus. A wide variety of different classes may satisfy this prerequisite. Students should have some experience with some variety of programming, as well as significant interest and practical experience with some aspect of music such as performance, composition or theory. This course tends to attract students with diverse backgrounds. If you are wondering if this course is appropriate for you, please discuss the matter with me.

Computing

The program *R* can be downloaded from
http://cran.r-project.org/
for Windows, MacOS and Linux platforms.

Homework There will be regular homework assignments consisting primarily of computing exercises in R with applications to various aspects of music analysis.

Grading

Homework	50 %
Class Participation	25 %
Final Project	25 %

Course Material

1. Music as Data: Exploratory Data Analysis and Visualization
    (a) Pitch and Length Distributions
    (b) Composer or Genre Scatterplots
    (c) Tempo Curves
2. Probabilistic Classification
    (a) Basic Probability
    (b) Bayes Classifiers
3. Music Classification ("Bag of Notes" Model)
    (a) Key Recognition
    (b) Meter Analysis and Entropy
    (c) Composer/Genre Classification
4. Sequence-Based Music Analysis
    (a) Dynamic Programming
        i. Instrumental Fingering
        ii. Automatic Voice leading
    (b) Markov Chains and Hidden Markov Models
    (c) Harmonic Parsing
    (d) Expressive Synthesis of Melody
    (e) Melody Morphing and Music Generation
5. Analysis of Musical Timing
    (a) Tempo following (known rhythm)
    (b) Rhythm Recognition and Ockam's Razor
    (c) Modeling Rhythmic Expression