Computational Music Analysis: Symbolic

Syllabus

Course Details

Course Number: MUSI 4460/6204
Credits: 3 credit hours
Location: West Village 277

Instructor Information

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Office Location: Couch 203B
Office Hours: TBD and by appointment

Course Description

In this course we will perform computational analysis, modeling, and visualization of high-level musical structures (e.g., melody, harmony, form, cadences, style...) using symbolic representations of musical information (e.g., digital scores, performance data), as well as extra-musical data and metadata. In doing so, we will gain greater understanding of the methodological challenges in the fields of computational musicology and MIR, develop skills for approaching complex musicological problems, and work towards instilling hypothesis-driven mindsets in approaching many kinds of projects and tasks in music technology.

This course will introduce you to the motivations, methodologies, and literature of computer-based music research with an emphasis on computational musicology. The class will be of interest to anyone wishing to enhance their music research skills using computers, and to anyone who may be interested in a career involving any form of music data analysis. This course will take a critical perspective to computational approaches to music scholarship. We will ask: What are the strengths and weaknesses of digital music analysis and representation in general? What are the strengths and weaknesses of specific techniques and tools? What are the cultural, historical, and epistemological assumptions of different digital representations of music, and the tools used to analyze them? Students will not only gain knowledge and skills in symbolic computational analysis, but will also learn topics and methods that enhance the musicological foundations for research in music psychology and music information retrieval.

Course Objetive and Learning Outcomes

Student learning outcomes include developing a deeper familiarity with symbolic data, especially humdrum format, and manipulation of symbolic musical data, including transcribing, visualizing, grouping, sorting, querying, evaluating, and modeling. Students will expand upon basic coding skills (this course will be exclusively in R). This course will focus primarily on addressing specific musicological (or musical) questions through the analysis of symbolic musical and extramusical data.

In this class, you will learn to:

- Identify the strengths, weaknesses, problems, and challenges in computational musicology and digital music research more broadly.
- Have greater familiarity with the principle data forms and techniques in symbolic computational analysis.
- Apply the fundamentals of computational and empirical analysis to musical data (and beyond).

- Design, evaluate, and carry out a replication or original project in computational musicology.
- Use digital musicology tools and libraries for conducting musical analysis.
- Quantitatively evaluate a musicological hypothesis.

Prerequisites

This course assumes a basic level of musical literacy. Students should have experience performing and writing about music, and should have a basic knowledge of the fundamental concepts of Western music theory. Knowledge of Western music theory and notation will be extremely helpful. Non-music students are welcome only if they can demonstrate sufficient familiarity and fluidity with these topics and skills.

Course Texts

There will be no specific texts for this class. Reference materials and assigned readings will be online and provided through Canvas.

Software

The assignments and projects will rely on the use of R files (.R; .Rmd) or plain text files. Installation instructions will be provided. These softwares are open source and free to use.

Course Format and Workload

This class will meet twice weekly for in-person lecture and activities. **Note that there will be no hybrid options, and class content will not be recorded.** Please note that the health and saftey of all students is a priority. As such, if you are feeling sick, please DO NOT come to class, but do notify your instructors, so that we may direct you as to how to best catch up. All lecture materials will be posted to Canvas. Regular attendance and participation in class activities, discussions, and presentations is mandatory for the full *Participation* grade. Assignments and projects will require significant additional time outside of class. You can expect to spend an average of two hours per week on assignments, readings, and activities per week for this class, and up to four hours per week for midterm and final projects.

Homework and Assignments

Short coding assignments will be given (mostly) biweekly, or sometimes weekly. There will be approximately 6 assignments in total worth a total of 50% of the grade. Homework assignments MUST be turned in by the deadline (even if it is incomplete). Students will have a 48 hour grace period to upload modifications or updates. Anything submitted after the 48 hour grace period is subject to a 10% penalty per calendar day. Homework or assignments turned in more than one week late will not be accepted unless prior arrangements were made.

Students enrolled in the `4460` Section will engage in the same topics and same level of rigor but will be held to a lower grading standard. An A grade for students enrolled in the undergraduate section of the course is 85% (a B grade is 75% and so on.)

Projects

Midterm

The midterm will be an in-class exam testing your fluency with the representations, tools, and readings assigned, as well as "big-picture" understanding of concepts, topics, or frameworks covered in class or through the readings.

Final

The final project for this class will be a hypothesis-driven original analysis OR a replication study of a musicological (or musical) question or problem using corpus methods, with deliverables including a paper writeup of the motivation, methodological details, analysis and results, including visualizations and evaluation, as well as the code and data required to carry out and evaluate the analysis.

The final project will include a presentation of your work to your peers. Final presentations and papers will be due at the final exam slot for this class.

Grading

Analysis Assignments	50
Reading Assignments	15
Midterm	10
Final	20
Participation	5

Class Schedule(tentative)

Week	**Major Topic**
Week 1 — Aug.25	**Intro comp. musicology**
	Motivations & philosophy; Intro to field
Week 2 — Sept.1	**Melody**
	What is a corpus for? Representations, Intro kern
Week 3 — Sept.8	**History of CM**
	Grouping, shifting, comparing data
Week 4 — Sept.15	**Hypothesis testing**
	Contextualizing data, first replication study
Week 5 — Sept.22	**Rhythm & meter**
	nPVI
Week 6 — Sept.29	**Reliability and Validity**
	Corpus building
Week 7 — Oct.6	**Syncopation**
	`No class Tues. (Fall Break)`
Week 8 — Oct.13	**Midterm**
Week 9 — Oct.20	**Harmony**
	Probability and information theory
Week 10 — Oct.27	**Form & Structure**
	Voice leading, Segmentation
Week 11 — Nov.3	**Cross-cultural approaches**
Week 12 — Nov.10	**Perceptual modeling**
	Patterns & Similarity
Week 13 — Nov.17	**TBD**
Week 14 — Nov.24	**TBD**
	`No class Thurs. (Thanksgiving Break)`
Week 15 — Dec.1	**Current challenges in CM**
Week 16 — Dec.8	**Final project workshops**
Exam Week — Dec.15	**Final project presentations (2:40-5:30pm)**

Generative AI Use Policy

In this course, the use of Generative AI tools (such as ChatGPT, Claude, or Gemini) is permitted as part of your learning process, so long as it is not abused (e.g., plagiarism) or used as a crutch. While the tool may be used to help with brainstorming, or even revising or suggesting code, understand that the AI tools will be of limited help to you in this course. This course uses specialized software with a small, niche user base, and AI tools' knowledge of it is typically incorrect. For any activity, assignment, or task in this course, you are strongly encouraged to work through it using the documentation, your instructor, and your peers before relying on an AI tool.

ALL submitted assignments and projects must include a brief AI Usage Statement outlining:

- Which tools were used
- When they were used or in what context
- What prompts were given to the AI
- How the AI output informed or shaped your final submission

This includes "no usage at all" if that is the case. **Any code or written material copied or adapted from an AI tool must be explicitly identified as such at the point it appears in your submission or else you risk being flagged for academic misconduct.**

Academic Integrity

Students must do their own work on assignments, projects, or quizzes unless collaboration is explicitly specified and by the instructor. Students caught cheating will receive zero credit for that assignment/project/quiz and may be subject to further sanctions through the Office of Student Integrity. As a reminder, copying code (or written work) from online is considered plagiarism. If you are unsure whether materials you found online can be used (or in what format), always check with your instructor. Students are expected to abide by the Georgia Tech Honor Code and avoid any instances of academic misconduct, including but not limited to:

1. Possessing, using, or exchanging improperly acquired written or oral information in the preparation of a paper, presentation, project, or quiz.
2. Substitution of material that is wholly or substantially identical to that created or published by another individual or individuals.
3. False claims of performance or work that has been submitted by the student.

Please refer to the published Georgia Institute of Technology Academic Honor Code for further information:

- http://www.policylibrary.gatech.edu/student-affairs/academic-honor-code

Statement Regarding Students with Disabilities

In accordance with the Americans with Disabilities Act, students with bona fide disabilities will be afforded reasonable accommodation. The Office of Disabilities Services will certify a disability and advise faculty members of reasonable accommodations. The web site for a student requesting accommodation is:

- https://disabilityservices.gatech.edu/

Academic Grievance Policy

Students should first discuss any concerns with the relevant faculty member; if it is not possible to come to resolution with the faculty member, students may then report the matter to the appropriate administrator (Chair or Associate Chair or Director of Studies) of the department of instruction, or refer to the GT Academic Grievance Policy page below, which provides information on how to file a report:

- https://provost.gatech.edu/reporting-units/conflict-resolution-ombuds/academic-grievance-policy

Modified Operations Poligy

With developments and improvements to digital instruction over the past few years, the Institute has developed policies to leverage digital learning as much as reasonably possible. The policy sets forth requirements, procedures, and responsibilities related to the scheduling of digital instruction and/or make-up classes due to the modification of campus operations, closing of campus, or the necessary closing of instructional spaces for any reason (including but not limited to emergencies, such as inclement weather, power outages, or other infrastructure failures). Students should await communications from their instructors regarding delivery of their classes during that period based upon the Digital Learning Days for Modified Campus Operations Policy. Students should follow guidance and/or directions provided by the Office of the Vice President for Student Engagement and Well-Being regarding student activities, events, programs and services.