ICCCM 2025 Hackathon Proposal

Mapping the Evolving Purpose of Music Analysis: A Network-Based Exploration

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Problem Statement

Music theory has developed alongside the history of music. Music analysis has done likewise. What, then, will be the relationship between music analysis and music theory going forward, and what will be the purpose of music analysis?

This hackathon addresses that question not in abstract terms, but by exploring how analysts today define their analytical purposes, and how these purposes are connected through shared means—including theories, methods, tools, and datasets.

Through a community survey conducted among ICCCM participants, we are collecting entries that include:

- An analytical purpose
- A corresponding analytical means, which may be a theory, method, tool, dataset, or other resource

Each entry represents a practical analytical pairing:

> "I use/will use [mean] X in order to [purpose] Y."

By aggregating and analysing these entries, we aim to construct a network of purposes connected via shared means, revealing how contemporary analytical goals are structured, interrelated, and potentially evolving.

Task Overview

1. Conduct a community survey

Through a community survey conducted among ICCCM participants, we are collecting entries that include:

- An analytical purpose, selected from a set of broad functional categories (e.g. Extract Structural Patterns, Generate Musical Material), with the option to enter a custom purpose if needed
- A corresponding analytical means—which may be a theory, method, tool, dataset, or other resource

The survey may be completed either in advance of the hackathon (preferably), or during the session itself.

Participants are encouraged to submit multiple entries if they:

- Use multiple means for a single purpose
- Apply the same means to different purposes

Survey Link: https://forms.gle/92HaBs973yHj4Nbd7

2. Code and Visualise the Structure of Analytical Purposes

Using the survey data, participants will:

1. Build a bipartite graph linking analytical purposes and means
2. Project the bipartite graph onto the purpose layer, so that two purposes are connected if they share a mean
3. Create a purpose–purpose network that shows how different goals of music analysis are connected in practice
4. Visualise the network using NetworkX, Cytoscape, or other tools

By analysing how different purposes are linked through common means, this exploration aims to:

- Uncover conceptual clusters within the analysis community
- Identify central or bridging purposes that connect different traditions
- Observe emerging or isolated goals, potentially pointing to new directions for music theory and analysis

(Appendix) Background

Below is a brief outline of music analysis[1] and one common purpose associated with each historical period, from the medieval era to the present day[2].

Early Period: Theory dictates analysis

One common purpose: To validate music against established theoretical norms (e.g. counterpoint, consonance rules)

Method: Prescriptive, rule-based analysis (e.g. checking for modal usage, voice-leading errors)

Example: Zarlino's counterpoint theory codified "correct" usage of intervals, analysis was used to check compliance.

[Note] Alongside this prescriptive role, some traditions also emphasised rhetorical or affective functions of music, showing that analysis was not limited to rule-checking.

Theorists and Works	Contribution	Link
Filippo de Vitry : Ars Nova (c. 1322)	Codified new rhythmic notation, laying the groundwork for greater rhythmic complexity and independence of voices.	Plantinga (1961) PDF
Gioseffo Zarlino : Le Istitutioni harmoniche (1558)	Systematised Renaissance counterpoint and harmony; defined major and minor triads, and the use of consonance and dissonance.	Brandeis Special Collections

[1] This is a simplified overview to provide context for the hackathon's focus on the purpose and method of music analysis. It does not attempt to be exhaustive or to represent all perspectives.

[2] Music analysis encompasses a wide range of methods, traditions, and epistemological approaches, including ethnomusicological, phenomenological, and digital-humanities perspectives, which are beyond the scope of this brief outline.

Pre-Modern: Analysis Drives Theory

One common purpose: To reveal the expressive logic or "genius" of a composition

Method: Close reading, form analysis, harmonic function (e.g. Rameau, Schenker)

Example: Schenkerian analysis highlights structural unity as a purpose; the method involves reduction to underlying structure.

[Note] Other approaches in this period stressed hermeneutics, aesthetics, or performance practice, indicating that analysis did not serve only structural or formal purposes.

Theorists /Analysts and Works	**Contribution**	**Link**
Jean-Philippe Rameau : Traité de l'harmonie (1722)	Introduced the concepts of the fundamental bass and chord inversions, laying the foundation for functional harmony.	Google Books
Hugo Riemann	Developed the theory of harmonic function (Tonic, Dominant, Subdominant) and created the Tonnetz to visualise chordal relationships.	Archive.org PDF
Heinrich Schenker : Schenkerian Analysis	Proposed that the surface complexity of a piece is an elaboration of an underlying fundamental structure (Ursatz).	Schenker Guide

Modern Era: Mutual Interaction

One common purpose: To describe or model musical phenomena that elude traditional theory (e.g. atonality, cognition, computation)

Method: Algorithmic analysis, cognitive modelling, set theory, topological mapping, etc.

Example: Pitch-Class Set Theory serves the purpose of analysing non-tonal music. The method involves representing pitches as numerical classes and classifying their sets based on structural similarity.

[Note] Today, multiple strands coexist, ranging from culturally informed and ethnographic analysis to computational and mathematical models.

Tonal and Post-Tonal Theories

Theory/Framework	**Description**	**Link**
Pitch-Class Set Theory	A method for analysing atonal music by grouping pitches into "sets" to uncover underlying structural patterns.	Forte (PDF)
Neo-Riemannian Theory	Reinterprets Riemann's Tonnetz, emphasising parsimonious voice-leading between chords in chromatic harmony.	Open Music Theory

Cognitive Science Approaches

Approach	**Description**
GTTM (Generative Theory of Tonal Music)	Applies generative linguistics to model how listeners mentally structure tonal music. MIT Press
Music Cognition Psychology	Investigates how listeners perceive, process, and emotionally respond to music through behavioural experiments.
Neuromusicology	Uses brain imaging (e.g., fMRI, EEG) to study the neural mechanisms underlying music perception and performance.
Evolutionary Musicology	Explores the biological origins of music and its functions in human evolution.

Computational and Mathematical Approaches

Approach	Description
Computational Musicology	Uses algorithms and data processing to analyse musical structure, often applied in Music Information Retrieval.
Mathematical Music Theory	Models musical structures using tools from set theory, algebra, and category theory.
Geometrical Music Theory	Visualises musical relationships using geometric spaces (e.g., tori, the Tonnetz).

Tools and Datasets

Tool/Dataset	Description	Link
music21	Python toolkit for computer-aided musicology and music theory analysis.	MIT music21
Humdrum Toolkit	Software suite for encoding, analysing, and visualising symbolic music data.	Humdrum
Pitch-Class Set Analysis	Educational resource for set theory analysis and PC set classifications.	Mt. Allison PC Set
ISMIR Dataset List	Curated list of public datasets for Music Information Retrieval research.	ISMIR Resources
MAESTRO	Dataset of piano performances with aligned audio and MIDI data.	Magenta
Million Song Dataset	Large-scale dataset for music information retrieval and machine learning.	MSD

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