

Tutorial 3

Scales, Chords, and Cadences: Practical Music Theory for MIR Researchers

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Abstract

Much pitch-related MIR research builds either implicitly or explicitly on music-theoretic domain knowledge. Unfortunately, music theory is an esoteric discipline, with many of its canonical organizational principles presented in textbooks with dozens of classical musical examples and little indication of how these principles can be applied to other musical traditions. This tutorial will introduce fundamental pitch-related concepts in music theory for the ISMIR community and relate them to tasks associated with melodic, chord, and structural audio analysis for a range of musical styles. It will include sections on the scales, chords, and cadences routinely associated with Western art music of the common-practice tradition (~1650-1900), as well as non-Western folk musics and the popular music traditions of the twentieth and twenty-first centuries. The three sections will be broken down as follows, with both lecture and hands-on coding demonstration components:

- Scales
 - Scale formation (octave equivalence, mathematical properties)
 - Scale and mode types (western and non-Western)
 - Implications for scale and key identification, automatic melody extraction
- Chords
 - Types (triads, seventh chords, extensions)
 - Representation schemes (e.g., chord labeling)
 - Syntactic principles (e.g., functional harmony, grammars)
 - Implications for automatic chord recognition, pattern discovery
- Cadences
 - Types
 - Linear/voice-leading patterns
 - Relationship to large-scale formal types (phrases, themes, sonata, etc.)
 - Implications for cadence discovery/classification, automatic segmentation

This tutorial will be of interest to a broad range of the ISMIR community, but will be of specific interest to MIR researchers with limited formal training in music theory. This workshop assumes a basic understanding of musical notation, but does not assume prior knowledge of Western music theory. It will be accessible to researchers new to the field, but will also be of interest to experienced researchers hoping to incorporate more music-theoretically based models into their research.

Biographies of Presenters

Johanna Devaney is an Assistant Professor at Brooklyn College and the CUNY Graduate Center, where she teaches courses in data analysis, music technology, music theory, and sonic arts. Her research focuses on interdisciplinary approaches to the study of musical performance, with a particular focus on the relationship between pitch structure and intonation in the singing voice. More broadly, she examines the ways in which recorded performances can be used to model performance and develops computational tools to facilitate this, primarily the Automatic Music Performance Analysis and Comparison Toolkit (AMPACT). Johanna has been active in the ISMIR community since 2008, giving the WiMIR keynote in 2020 and currently serving on the TISMIR editorial board. She holds a PhD in Music Technology from McGill University.

David R. W. Sears is an Assistant Professor of Interdisciplinary Arts and Co-Director of the Performing Arts Research Lab at Texas Tech University, where he teaches courses in arts psychology, arts informatics, and music theory. His current research examines the structural parallels between music and language using both behavioral and computational methods, with a particular emphasis on the many topics associated with pitch structure, including scale theory, tonality, harmony, cadence, and musical form. Recent publications appear in his [Google Scholar profile](#). He holds a PhD in music theory from McGill University.

Daniel Shanahan is an Associate Professor of Music Theory and Cognition at Ohio State University. He is interested in studying musical transmission, musical communication, and jazz improvisation, and likes to explore these topics with both experimental and computational tools. Daniel's work has been published in *Music Perception*, *The Journal of New Music*

Research, *Musicae Scientiae*, and many other outlets. He is an editor of the forthcoming Oxford Handbook of Corpus Studies in Music and has been managing editor of *Empirical Musicology Review* since 2012, serving as the journal co-editor since 2016. He also serves on the editorial boards of *Music Theory Spectrum*, *Musicae Scientiae*, and *Indiana Theory Review*. He holds a PhD in music theory from the University of Dublin, Trinity College.