Computational Musicology
(previously called Symbolic Music Analysis)

CS 275B/Music 254
Course context

- **Music 253/CS 275A** Symbolic Musical Information (Data)
  - Principles of *encoding* music
    - Notation
    - MIDI/sound
    - “Logical” content (intro)

- **Music 254/CS 275B** Symbolic Music Analysis
  - Principles of *decoding* musical data sets
    - **Query** = data *extraction*
    - **Analysis** = data *evaluation*
    - **Style simulation** = data *manipulation, synthesis*
Elements of the course

› Classroom portion:
  › Query:  *Themefinder* (melody)
  › Analysis:  *Humdrum* (harmony, rhythm, melody, perceptual items)
  › Style simulation:  Models by David Cope and others

› Project part:
  (a) Review of previous work
  (b) Select research topic
  (c) Select data and tools
  (d) Conduct research, make reports
  (3) Present talk and submit write-up
Topic schedule

- **Musical topics:**
  - Melody; data sources; similarity
  - Harmony; current work
  - Rhythm; current work

- **Methodological topics (vary from year to year):**
  - Week 5
  - Week 6
  - Week 7
  - Week 8
Symbolic Musical **Information Scheme**

- **No universal code**
- **No universal translator**

- **Notation** (Finale, SCORE, MuseScore)
- **Logical data** (kern)
- **Sound** (MIDI)
- **Data interchange**
- **Contextual information**

No universal code
No universal translator

Musical data
Symbolic Musical Analysis: Applications

- Query/retrieval
- Procedural analysis
- Musical style
- Data interchange
- Contextual information
Symbolic data repositories (on site)

- Humdrum
  - Encoded materials (c2500)
  - Keyboard music, ethnic repertories
  - Verovio Humdrum viewer: score editing, viewing

- MuseData
  - Encoded, curated fullscores (c1200)
  - Symphonies, concertos, sonatas
  - Online viewing and editing

- ThemeFinder
  - Encoded incipits (c100,000)
  - Classical, folk, Renaissance
Data resources at CCARH

- **Monophonic resource**
  - Essen database (folk music)
  - Themefinder repertories

- **Polyphonic resource**
  - KernScores (keyboard)
  - MuseData (chamber, orchestral)


2. Schubert, Franz (1797-1828), Symphony No. 4 in C Minor, "Tragic", 4th Movement, 1st Theme

3. Weber, Carl Maria Von (1786-1826), Peter Schmoll und Seine Nachbaren, Overture, 1st Theme

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KernScores

A library of virtual musical scores in the Humdrum **kern** data format.
Total holdings: 7,866,496 notes in 108,703 files.

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A guided tour of the KernScores website  Online Humdrum Editor
Recent additions to the KernScores library  CCARH Humdrum Portal
Data Collection Highlights  Contribute kern scores
Query (Retrieval) via **Themefinder**

### Search form

<table>
<thead>
<tr>
<th>Field</th>
<th>Option</th>
<th>Description</th>
</tr>
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<tr>
<td><strong>Repertory</strong></td>
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<td>Type of music to search</td>
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<tr>
<td><strong>Pitch</strong></td>
<td></td>
<td>A-G, sharp#, flat--</td>
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<tr>
<td><strong>Interval</strong></td>
<td></td>
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<tr>
<td><strong>Degree</strong></td>
<td></td>
<td>up=/, down=, unison=--</td>
</tr>
<tr>
<td><strong>Gross Contour</strong></td>
<td></td>
<td>up step=a, up leap=0, down step=a, down leap=0, same=--</td>
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<tr>
<td><strong>Refined Contour</strong></td>
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<tr>
<td><strong>Location</strong></td>
<td>beginning or anywhere</td>
<td>Beginning or anywhere in theme</td>
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<tr>
<td><strong>Key</strong></td>
<td>Any, mode</td>
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</tr>
<tr>
<td><strong>Meter</strong></td>
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</tbody>
</table>

### Responses


2. Schubert, Franz (1797-1828), Symphony No. 4 in C Minor, "Tragic", 4th Movement, 1st Theme

3. Weber, Carl Maria Von (1786-1826), Peter Schmoll und Seine Nachbaren, Overture, 1st Theme
Music search

Meta-data vs Semantic searching

Generic objects
- fruit
- jars
- cloths

Specific objects
- peaches
- vase
- apricot

Basic colors
- blue
- green
- white

Specific colors
- teal (blue)
- forest (green)
- off-white

Categories

Gradations

http://amico.org/home.html

Amico (1997-2005)
Metadata vs richer metadata

- Gracenote: backbone of Apple Music
- Pandora: classification system for eight humanly-defined traits
Feature depiction, extraction

Voices, textures

Articulation, dynamics

From the work of Steven Malinowski

Tonal relations

Off the grid
Malinowski video track to accompany Donald Knuth’s Fantasia Apocalyptica (Piteå 2018)
Musical style (analysis)

**Score-based:**
- conventional
- Schenkerian (graphical)

**Performance-based:** event-based, comparative analyses
DNA-sequencing algorithms

Dang Vu: feature propagation in improvised Vietnamese chamber music (adaptation of genetic analysis sw)

Horse hemoglobin > music (Gene2Music, UCLA)
Recent work in music and AI

- Current examples and their approaches
- Overwhelmingly focused on generating new works
- Overwhelmingly dependent on audio data
Musical style (simulation)

Work of David Cope (UCSC)

- Concerts
- Website
- Books
- Recordings
- Polemics