# jSymbolic in 2019: Updates and Improvements

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# Introduction to jSymbolic

- jSymbolic is software that extracts features from symbolic music files (MIDI or MEI)
- A feature is a piece of statistical information that characterizes some aspect of a piece of music using a simple, consistent measurement
  - Each feature is expressed as one or more simple numerical values
  - Features can reveal meaningful patterns in music at a macro scale

# Uses of features

- Training classification models with machine learning
- Statistical feature analysis
- Content-based searches
  - e.g. SIMSSA DB

# jSymbolic's features (1/2)

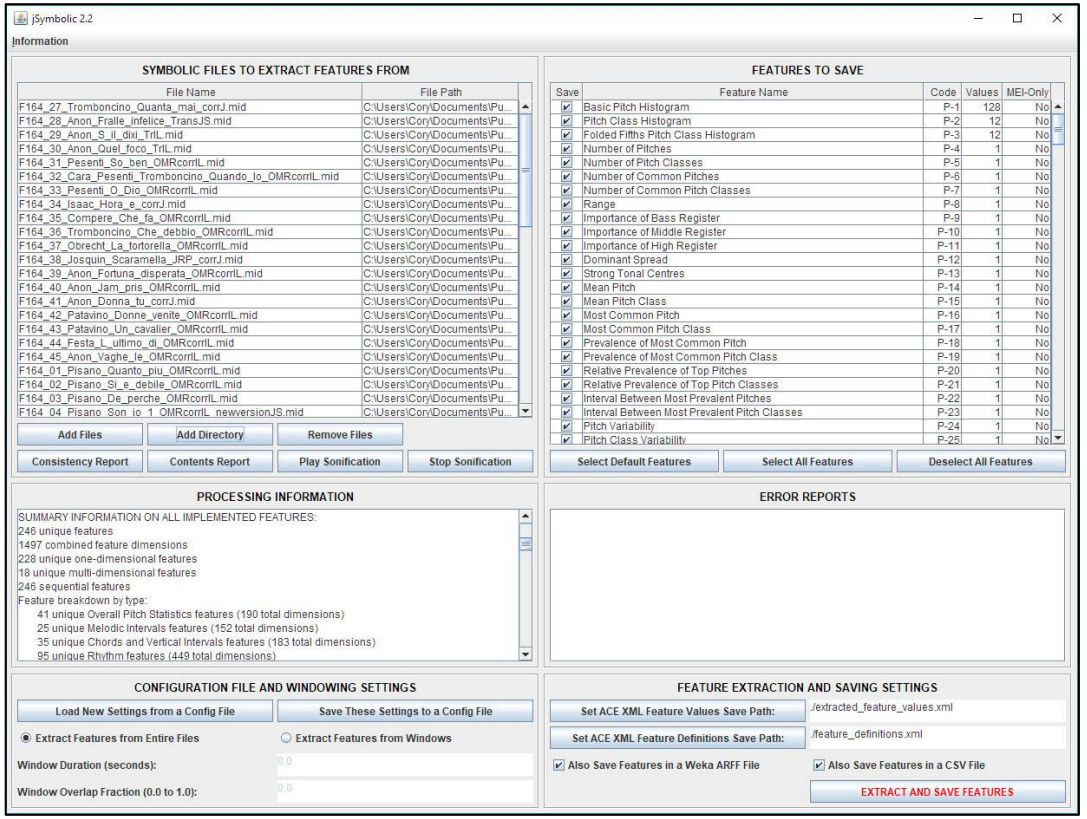
- The current 2018 release version (2.2) extracts 246 unique features
  - 1497 distinct values when multi-dimensional features (e.g. histograms) are expanded

# jSymbolic's features (2/2)

- Feature types include:
  - Pitch statistics
    - e.g. Range
  - Melody / horizontal intervals
    - e.g. Most Common Melodic Interval
  - Chords / vertical intervals
    - e.g. Vertical Minor Third Prevalence
  - Texture
    - e.g. Parallel Motion
  - Rhythm
    - e.g. Note Density per Quarter Note
  - Instrumentation
    - e.g. Note Prevalence of Unpitched Instruments
  - Dynamics
    - e.g. Variation of Dynamics

# User interfaces

- Graphical user interface
- Command-line interface
- Java API
- Rodan workflow for distributed processing



# New interface developments in 2019

- Expanded the already extensive tutorial and manual
- Expanded multilingual support
- Feature summary stat reports
- Many miscellaneous interface improvements

# Extensibility

- jSymbolic is designed to encourage researchers to add their own bespoke features
  - Modular plug-in feature design
  - Easy to iteratively build new features of increasing sophistication by incorporating values of already-implemented features in new features
- jSymbolic's feature catalogue has already expanded greatly
  - The original 2006 jSymbolic 1.0 had 160 features, compared to the 2018 jSymbolic 2.2's 246 features
  - Tristano Tenaglia implemented a good share of these new features from 2015 to 2016

# New features in 2019

- Rían Adamian has already implemented 190 additional new unique features this summer (comprising 422 new feature values) :
  - 8 new pitch statistics features
  - 19 new rhythmic features
  - 112 new melody / horizontal interval features
  - 43 new chords / vertical interval features
  - 10 new instrumentation features
- There are now 436 unique features in total

# Cory Monster want MORE FEATURES!

https://register.myrunti.me/sesamestreetrun/

# Features areas remaining to be more fully explored by jSymbolic

- Local melodic transitions longer than one horizontal interval and strings of horizontal patterns
- Local chord transitions and strings of vertical patterns
  - Current vertical features aggregate vertical intervals independently of what directly precedes and follows them
- Local rhythmic transitions and strings of rhythmic patterns
  - Current rhythmic features aggregate attacks, rhythmic values and rests independently of what directly precedes and follows them
- Complex textural behaviour
  - e.g. measures of imitation

# Infrastructure needed to do this

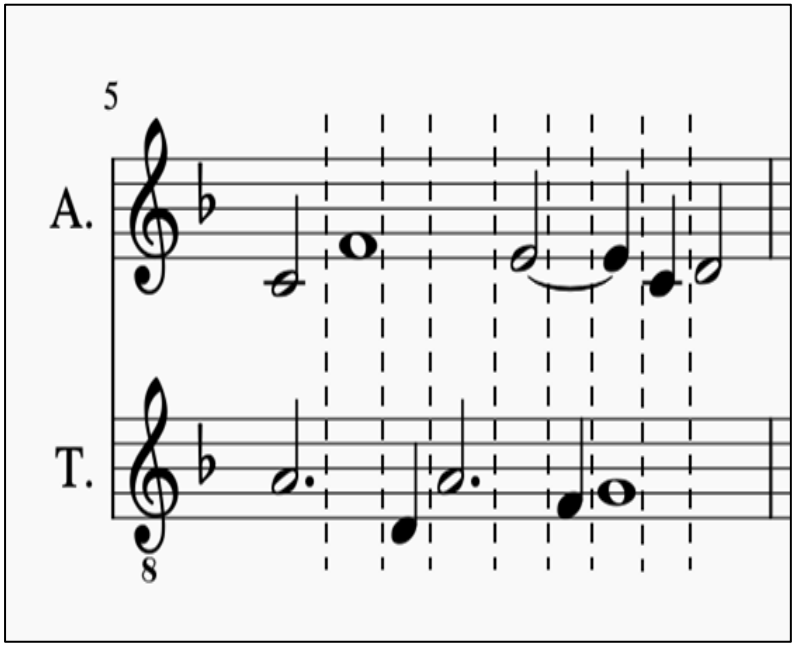
- Note onset slices

https://en.wikipedia.org/wiki/Salami

- N-grams

# Note onset slices (1/2)

- A slice consists of vertical groups of notes sounding simultaneously
- A new slice is started every time a new (pitched) note attack occurs
- There are various (non-deli) flavours:
  - e.g. a slice may only contain notes starting at the beginning of the slice
  - e.g. a slice may also contain notes held from previous slices
  - e.g. a slice may omit notes that are only held for less than some fraction of the slice

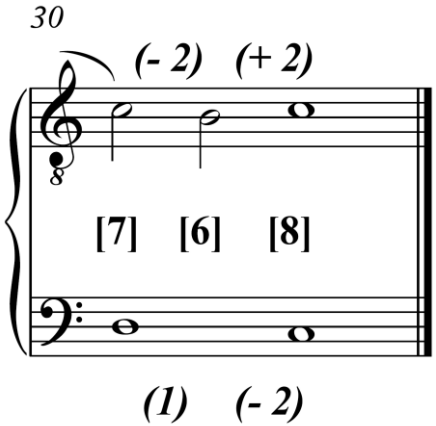


# Note onset slices (2/2)

- Note onset slices provide grouped units of notes that permit the calculation of new features associated with:
  - Local harmonic transitions
  - Local melodic transitions
  - Local rhythmic transitions
  - Sophisticated textural behaviour
- Sets of such transitions can also be used to construct . . .

# N-grams

- N-grams encode sequences of *n* note onset slices
- Can be related to:
  - Harmonic sequences
  - Melodic sequences
  - Rhythmic sequences
- Examples:
  - 7-6-8 is a 3-gram showing the vertical intervals between outer voices
  - [7] (1 -2) [6] (-2 2) [8] is a 3-gram that also encodes melodic transitions in the outer voices
- There can be many varieties of n-grams



# Current jSymbolic development status

- A variety of note onset slice and n-gram implementation are already implemented and undergoing code review and testing
- We are designing features we can extract from them
  - e.g. textural features
    - Such as density of imitation
  - e.g. features looking at general n-gram distributions
    - Such as histogram statistics
  - e.g. features looking at selected n-grams expected to be meaningful
    - Such as cadential patterns

https://www.pinterest.ca/pin/584693964102162828/


to tell us about any features you think could be usefully added to jSymbolic!

# Thanks for your attention!

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- **SIMSSA:** https://simssa.ca


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