

Dig that Lick: Exploring Patterns in Jazz Solos

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Digging into Data Conference, 29 January, 2020



Hochschule für Musik
FRANZ LISZT Weimar

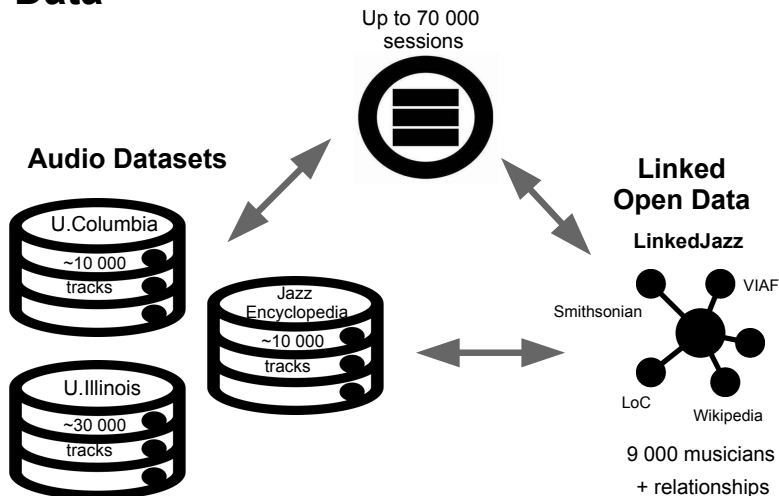


The *Dig that Lick* Project (2017-2019)

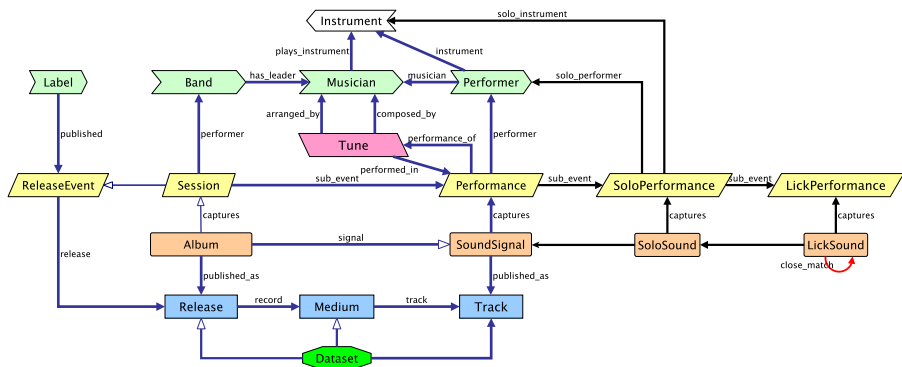
- Full title: *Dig that lick: Analysing large-scale data for melodic patterns in jazz performances*
- Enhance existing **infrastructures** for the deployment of semantic audio analyses over large collections
- Facilitate access to large audio and metadata collections via **interfaces** for content selection, semantic analysis, and aggregation
- Use the developed infrastructure to **analyse the use of melodic patterns in a large jazz corpus**
- Relate analytic results to background knowledge to **trace and interpret musical influence** across time, space, cultures and societies
- Convince musicologists (!)

Data

Discographies



Metadata Ontology for Jazz



(Automatic) Metadata Cleaning

Named Entity Resolution

Charlie Parker	39805	b
Charley Parker	3371	el-b
Чарли Паркер	76	synt-b
Charlie “Bird” Parker	70	fretless-b
Charlie Parker and Dizzy Gillespie	10	string-b
Charlie Parker Quartet	9	fretless-el-b
Charlie Parker Quintet	8	el-fretless-b
Charlie Parker and his Orchestra	8	keyboard-b
Charlie Parker All Stars	5	amplified-b
	4	bass

ca. early spring 1946

Disambiguation




Bill Evans (p) \neq Bill Evans (ss)

Reconciliation

Armstrong, Louis, 1901-1971

Armstrong, Louis, 1900-1971

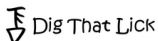
Automatic Main Melody Extraction

- Task: estimate the notes of the **main melody** from the complex mixture of melody and accompaniment
 - e.g. in jazz, the part played by the soloist
 - Useful for transcription, pattern extraction, recognising tunes, searching collections
- Main melody estimation algorithms usually have two stages:
 - **Computing a salience representation:** a time-frequency representation where the main melody pitches are salient
 - **Exploiting temporal information** to track pitch over time
- We trained a neural network to recognise main melody notes (convolutional-recurrent neural network with source-filter non-negative matrix factorisation pretraining)
- Results: generally successful, with some missed and extra notes, octave errors and semitone errors — Orig:  Est:  Mix: 

- Importance of **patterns** to **jazz** is well evidenced
 - Ethnographic: how musicians learn and use licks
 - Psychological: role of licks in improvisation
 - General: fan-generated YouTube videos illustrate patterns, e.g. the remarkably popular 7-note pattern known simply as “The Lick”
- Patterns can be melodic (absolute pitch, relative pitch – i.e. relative to key or local chords), rhythmic (absolute durations or relative to metrical structure), or both; here we focus on pitch
- Expressed as **n-grams**
- Must meet minimum criteria (played multiple times, in multiple tracks, by multiple people)
- Levenshtein (edit) distance used for exact or inexact matching

- 1000 tracks selected randomly from jazz collections (100 per decade from 1920-2019)
- Note tracks automatically extracted from monophonic solos
- 1700 solos, 6M pitch n-gram instances, 5.6M interval n-grams
- Metadata expressed in RDF using a bespoke ontology and accessed via SPARQL requests
- Metadata used to filter searches and shown in results
- Similarity search combines DTL1000 with the Weimar Jazz Database, Charlie Parker Omnibook and Essen Folk Song Collection

Pattern Search: List Results



Switch to **Pattern search**

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Pattern Similarity Search



Similarity search

Pattern

-1,-2,-1,3,3,3,-1,-2

Transformation

Semitone Intervals

Pin pattern elements

First Last

Search

Options

Minimum similarity (80%)



Maximum length difference

2

Maximum edit distance

1

Minimum frequency

2

Keep overlapping instances

Within single phrase

Preserve contour (ascending)

Preserve pitch range (9)

Databases

Dig That Lick

Metadata filter

Weimar Jazz Database

Metadata filter

Charlie Parker Omnibook

EsAC Folksong Database

Found 82 similar (15 unique) pattern instances:

(44) (38)



#	Pattern	Performer	Title	Recording year	Instrument	Style	Similarity	Edit distance	
1	-1,-2,-1,3,3,3,-1,-2 (8)								
		Abraham Burton	Without a song	2013	Tenor saxophone	Hardbop	1.00	0	
		Art Pepper	How high the moon	1980	Alto saxophone	Cool	1.00	0	
		Charlie Parker	Donna Lee	1947	Alto saxophone	Bebop	1.00	0	
		Charlie Parker	Ko-Ko	1945	Alto saxophone	Bebop	1.00	0	
		Dexter Gordon	Cheese Cake	1962	Tenor saxophone	Hardbop	1.00	0	
		Dexter Gordon	Society Red	1961	Tenor saxophone	Hardbop	1.00	0	

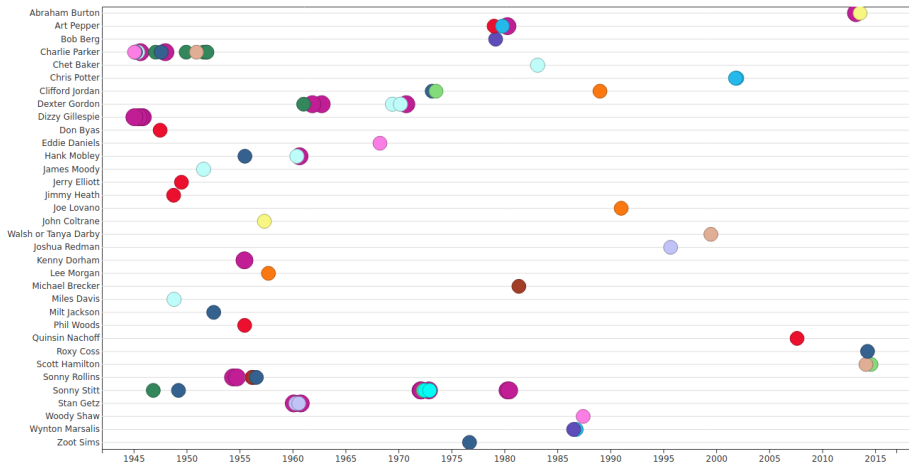
Show columns

Raw frequency Pitch range Contour Start position Duration

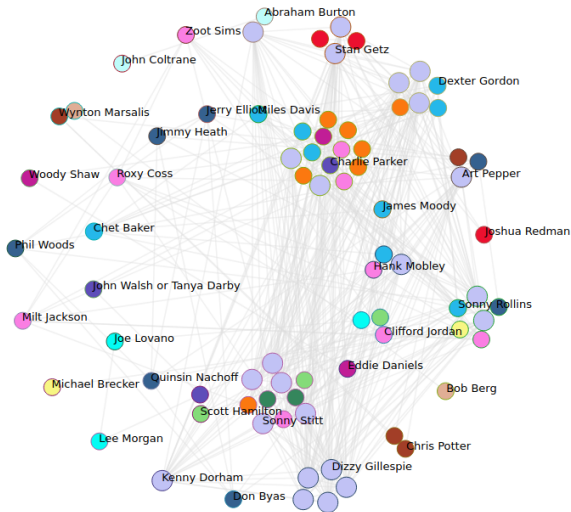
Group by

Pattern Performer

Pattern Similarity Search: Timeline Results



Pattern Similarity Search: Graphical Results



- Data and interfaces for exploring melodic patterns in jazz solos
 - Multiple databases (human and automatic transcriptions, collections)
 - Audio and symbolic data
 - Metadata filters to constrain cultural context
- Challenges: data coverage and reliability
 - Limited availability of data, especially contextual metadata
 - Current methods only address monophonic instruments
 - Automatic transcription and metadata processing are error-prone
- Useful tools for case studies
 - To discover and trace the history of patterns
 - To investigate how jazz musicians draw on each other
 - To draw conclusions about influence of race, class, and value

Publications and Presentations



D. Başaran, S. Essid, and G. Peeters, *Main melody estimation with source-filter NMF and CRNN*, 19th International Society for Music Information Retrieval Conference, 2018, pp. 82–89.



K. Frieler, D. Başaran, F. Höger, H.-C. Crayencour, G. Peeters, and S. Dixon, *Don't hide in the frames: Note- and pattern-based evaluation of automated melody extraction algorithms*, 6th International Conference on Digital Libraries for Musicology, 2019.



K. Frieler, F. Höger, and M. Pfeiderer, *Anatomy of a lick: Structure and variants, history and transmission*, Book of Abstracts of the Digital Humanities Conference, 2019.



_____, *Towards a history of melodic patterns in jazz performance*, 6th Rhythm Changes Conference, 2019.



K. Frieler, F. Höger, M. Pfeiderer, and S. Dixon, *Two web applications for exploring melodic patterns in jazz solos*, 19th International Society for Music Information Retrieval Conference, 2018, pp. 777–783.



K. Frieler, *Constructing jazz lines: Taxonomy, vocabulary, grammar*, Jazzforschung heute: Themen, Methoden, Perspektiven (W.-G. Zaddach M. Pfeiderer, ed.), Edition EMVAS, Berlin, 2019, pp. 103–132.



K. Gabbard, *What we are digging out of the data?*, 6th Rhythm Changes Conference, 2019.



F. Höger, K. Frieler, M. Pfeiderer, and S. Dixon, *Dig that lick: Exploring melodic patterns in jazz improvisation*, 20th International Society for Music Information Retrieval Conference: Late Breaking Demo, 2019.



G. Solis and L. Henry, *Chasing the trane: Quantifying the social journey of a coltrane solo*, 6th Rhythm Changes Conference, 2019.



T. Weyde, D. Wolff, S. Dixon, P. Proutskova, H.-C. Crayencour, J.B.L. Smith, G. Peeters, and D. Başaran, *Dig that lick: A technical primer for big data jazz studies*, 6th Rhythm Changes Conference, 2019.

Acknowledgements



This research was funded under the Trans-Atlantic Program Digging into Data Challenge with the support of the UK Economic and Social Research Council (ES/R004005/1), the French National Research Agency (ANR-16-DATA-0005), the German Research Foundation (PF 669/9-1), and the US National Endowment for the Humanities (NEH-HJ-253587-17).

