It all starts with….

…combined with some serious procrastination

Recording : http://imslp.org/wiki/Special:ReverseLookup/346055

An Introduction to Music Information Retrieval:

Musicological Implications

What it says on the tin

The promise of music information retrieval

Are we there yet?

What it really says on the inside!

The promise of music information retrieval

Are we there yet?

A Brief Professional History

J. Stephen Downie

3 July 2017

Buckle Up

A zillion more slides to go!

Some Key Facts about Me

- Curious
- Love music, its theory and its history
- World-class procrastinator
- Love extensions of all sorts
- Hate practicing
- Love collaborations
- Hate practicing

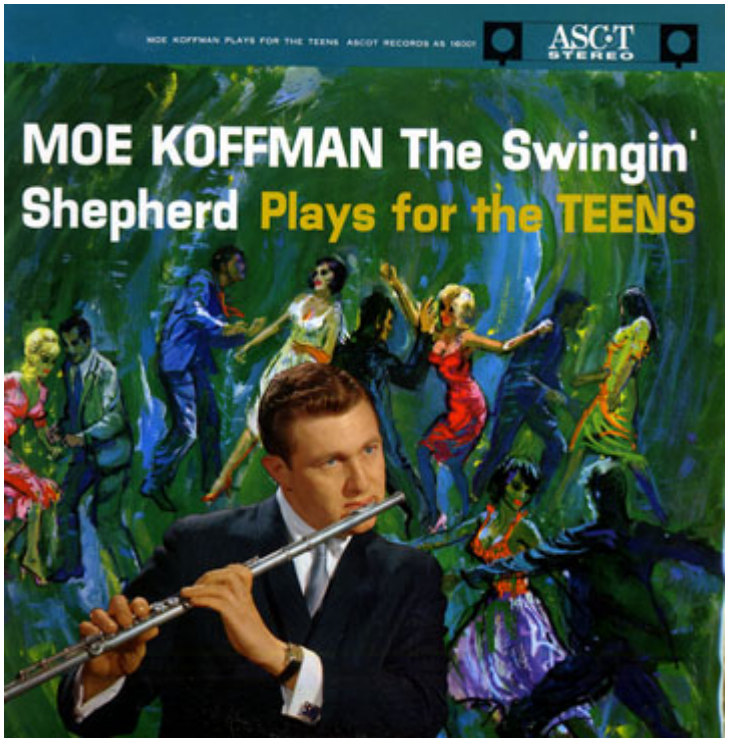
Some More Key Facts about Me

- Things I am not:
  - Computer scientist
  - Engineer
  - Musicologist
  - Musician

Some Other Key Facts about Me

- Things I am:
  - Academic
  - Administrator
  - Researcher
  - Professor of Library and Information Science
  - Pub Enthusiast

Two Big Motivators



Off to University

Misspent Undergrad….

Oops…

Flute jury time already?

What, no extensions?

I need to find something easy to play…

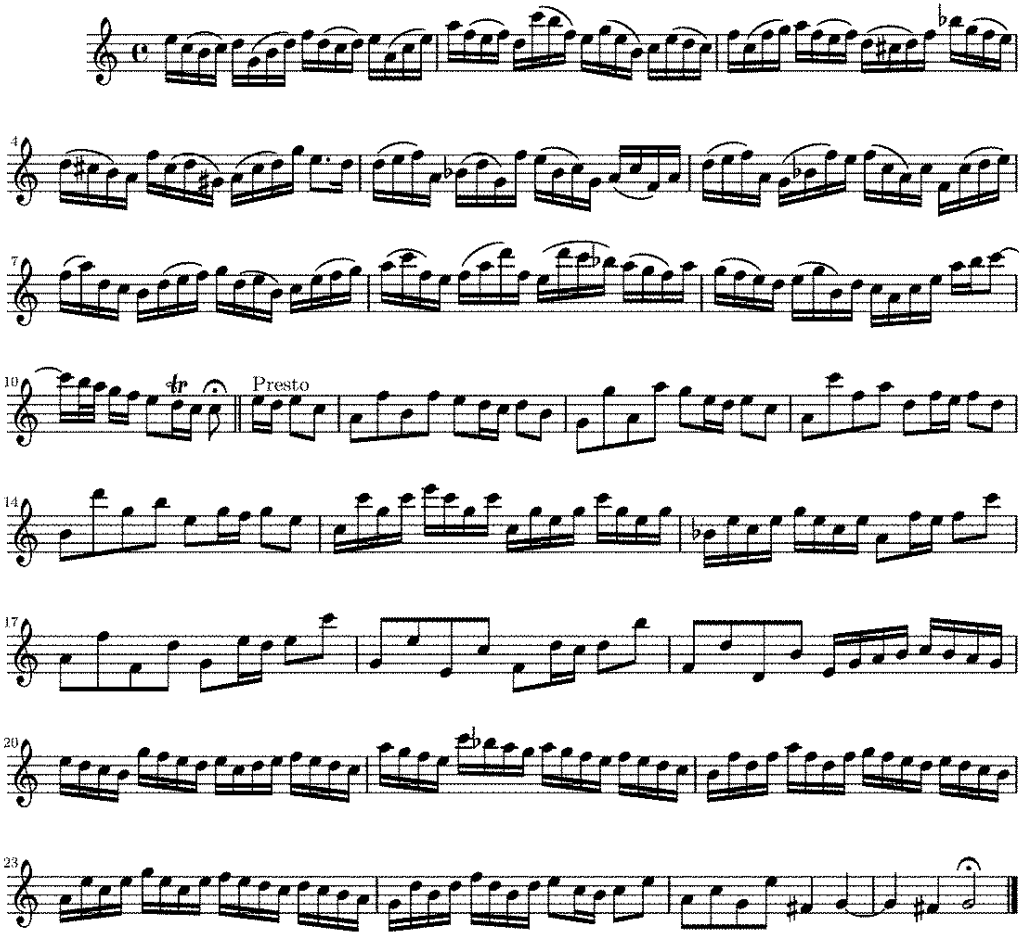
ASAP!!!!

Sonate

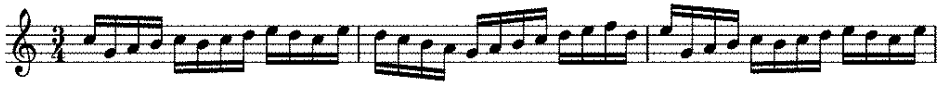
C major

J.S. Bach
BWV 1033

Andante



Allegro



Exciting New Career Opportunities

Off to UWO Library School

New Educational Opportunities

The PhD Thesis

- *Evaluating a Simple Approach to Music Information Retrieval: Conceiving Melodic N-grams as Text*

- 9354 Folksongs as test collection (McNab's modified version of the Essen Collection)

- Premise 1: Apply principle of parsimony (simple first, existing IR techniques)
- Premise 2: Enough information in an monophonic, interval-only, representation to make effective retrieval possible (highly reductionist)

Primary Components (Pt. 1)

- Music interval = letter
- N-gram of intervals = word

Experimental Factors:

- N-gram Length (4-,5-, and 6-grams)
- Query Length (6, 8, and 10 intervals)
- Query Location (*Incipit*, Random)
- Query Quality (Perfect, Error)
- Classification (Intervals grouped into class of size 3, 7, 15, and unclassified (as given))

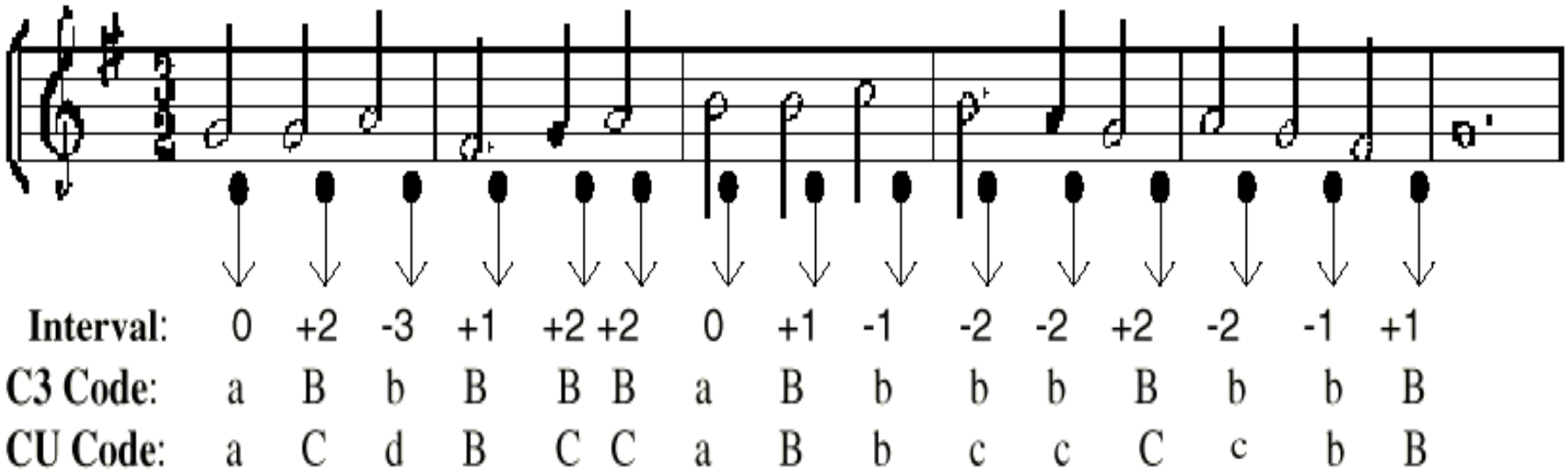
Primary Components (Pt. 2)

- Phase 1: Informetric Analyses
  - “stopwords”
  - distribution model fitting
  - term discrimination
  - entropy, etc.
- Phase II: IR Experiments
  - built test database/query set for each combination of factors
  - used Salton’s famous SMART text retrieval system
  - used traditional *tf * idf* term weighting
  - used traditional cosine correlation coefficient for ranking
  - used IR measures of normalized precision and recall

Experimental Design

				QLOC											
				Incipit						Random					
Cell N = 30				QQUAL						QQUAL					
				Perfect			Error			Perfect			Error		
				CLASS			CLASS			CLASS			CLASS		
				7	15	CU	7	15	CU	7	15	CU	7	15	CU
QLEN	6	NLEN	4												
			5												
			6												
	8	NLEN	4												
			5												
			6												
	10	NLEN	4												
			5												
			6												

Mapping Interval to Letters Example

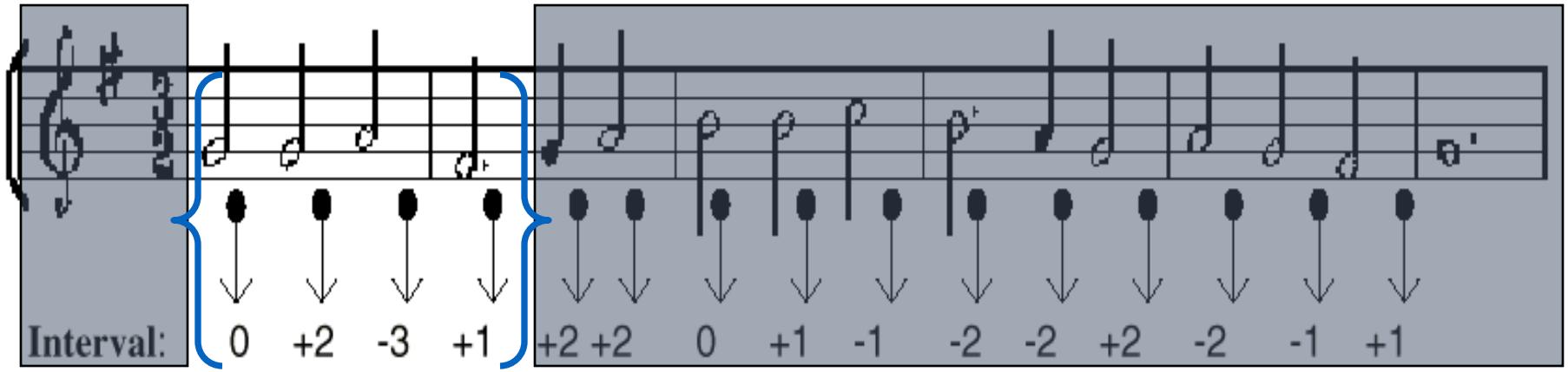


Interval:	0	+2	-3	+1	+2	+2	0	+1	-1	-2	-2	+2	-2	-1	+1
C3 Code:	a	B	b	B	B	B	a	B	b	b	b	B	b	b	B
CU Code:	a	C	d	B	C	C	a	B	b	c	c	C	c	b	B

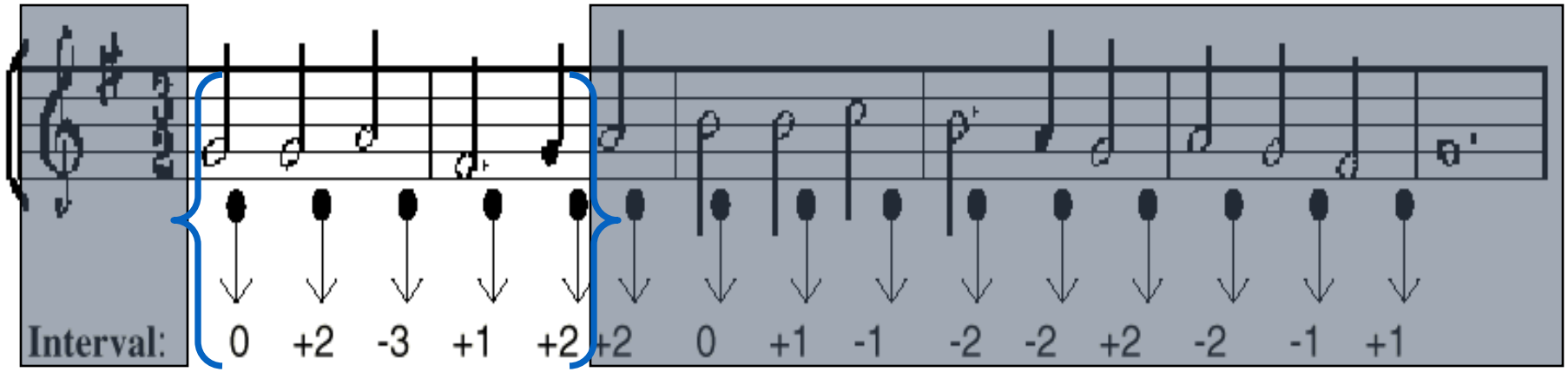
C3= Parsons' Repeat, Up, Down: Contour->Lossy, but forgiving of errors

CU=Unclassified intervals converted to alpha equivalents->Precise, but not forgiving of errors

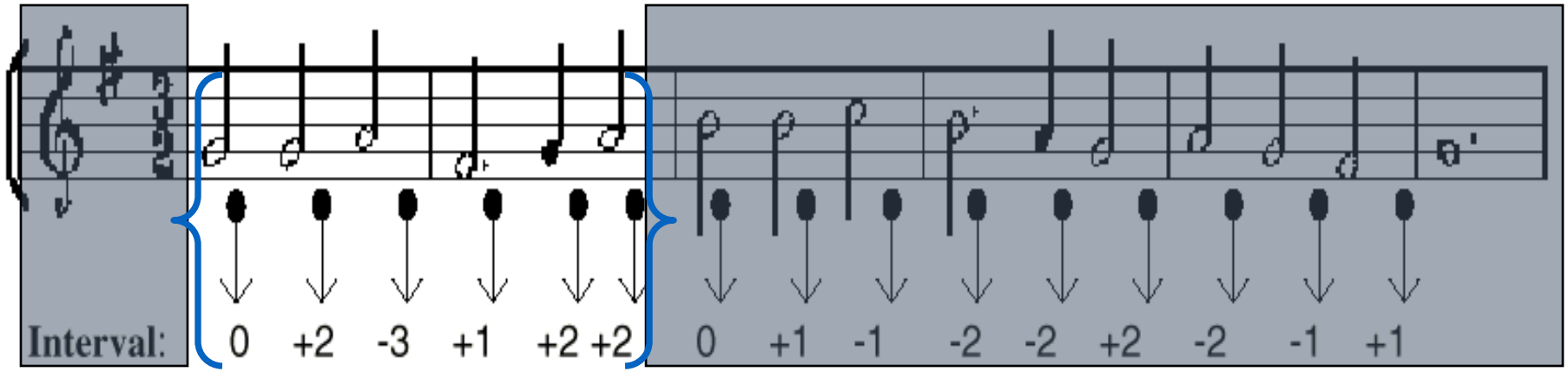
Building the Indexes: 4-gram Window



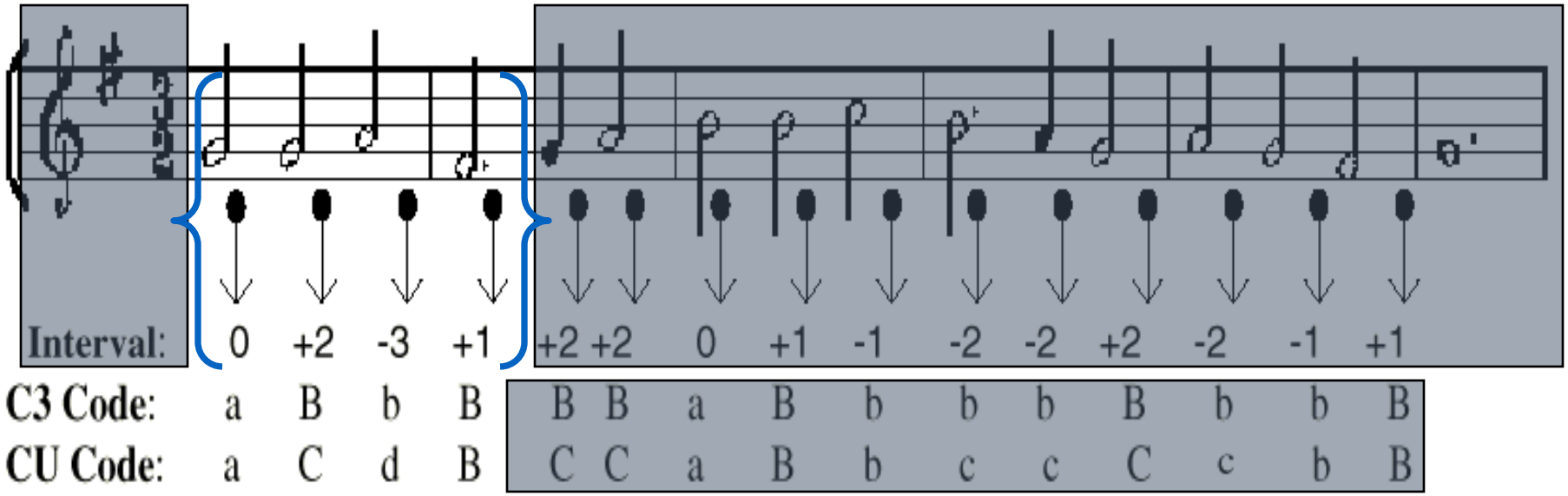
Building the Indexes: 5-gram Window



Building the Indexes: 6-gram Window



4-gram Indexing Example (Pt. 1)



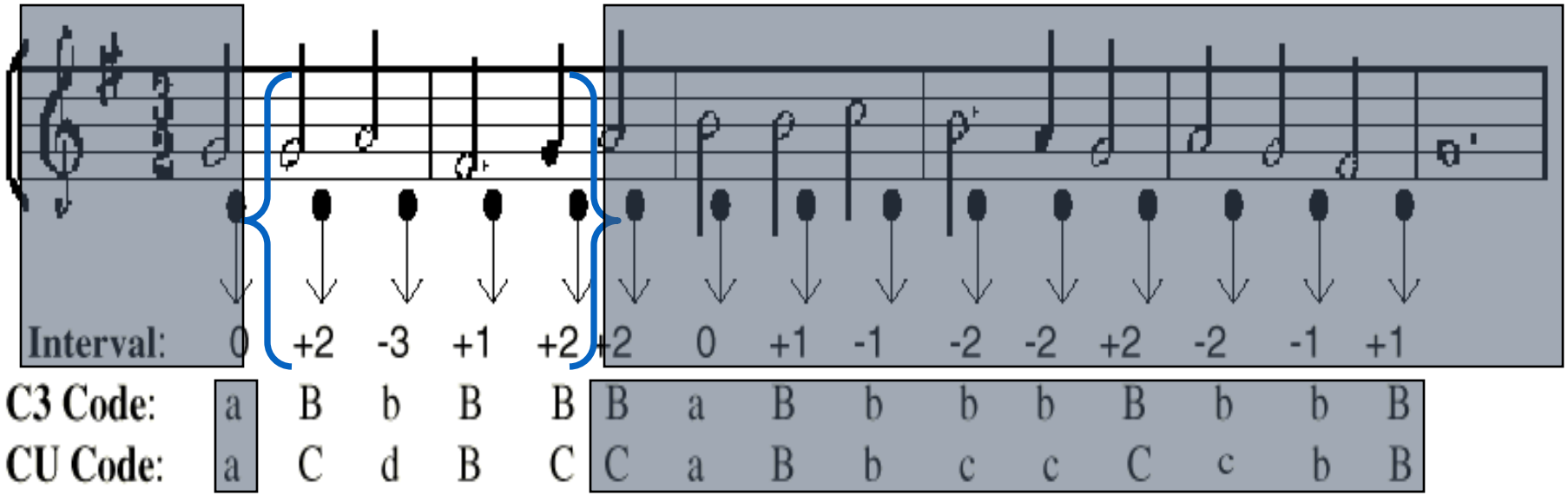
C3L4 Entry

CUL4 Entry

aBbB

aCdB

4-gram Indexing Example (Pt. 2)



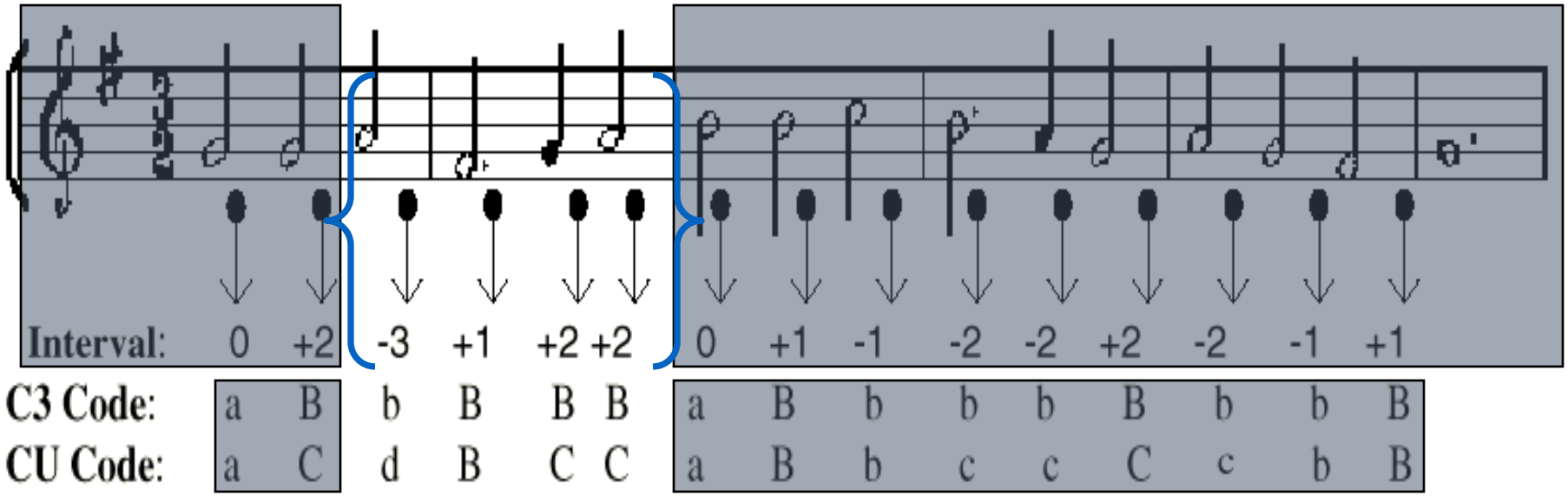
C3L4 Entry

CUL4 Entry

aBbB ***BbBB***

aCdB ***CdBC***

4-gram Indexing Example (Pt. 3)



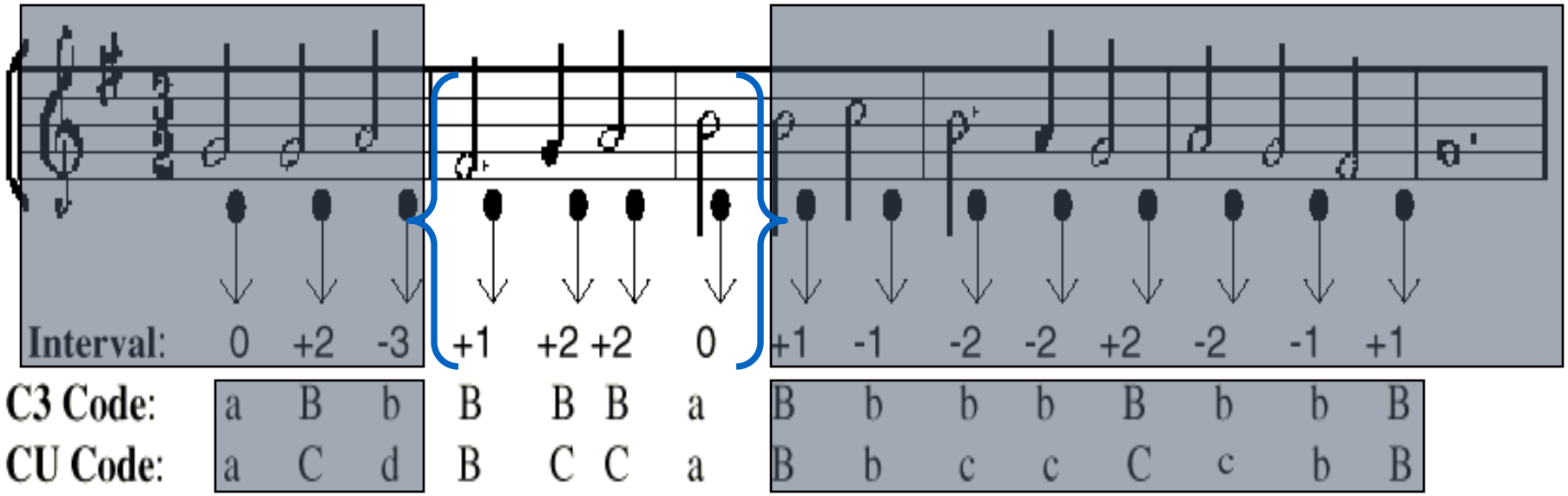
C3L4 Entry

CUL4 Entry

aBbB BbBB ***bBBB***

aCdB CdBC ***dBCC***

4-gram Indexing Example (Pt. 4)



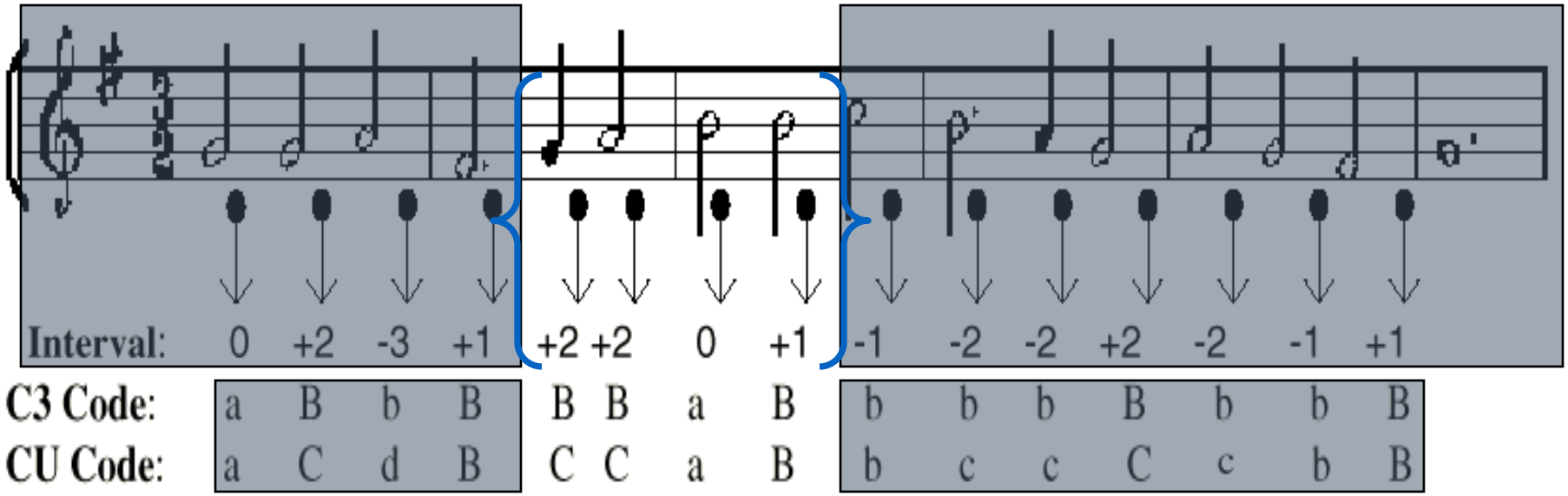
C3L4 Entry

CUL4 Entry

aBbB BbBB bBBB ***BBBa***

aCdB CdBC dBCC ***BCCa***

4-gram Indexing Example (Pt. 5)



C3L4 Entry

CUL4 Entry

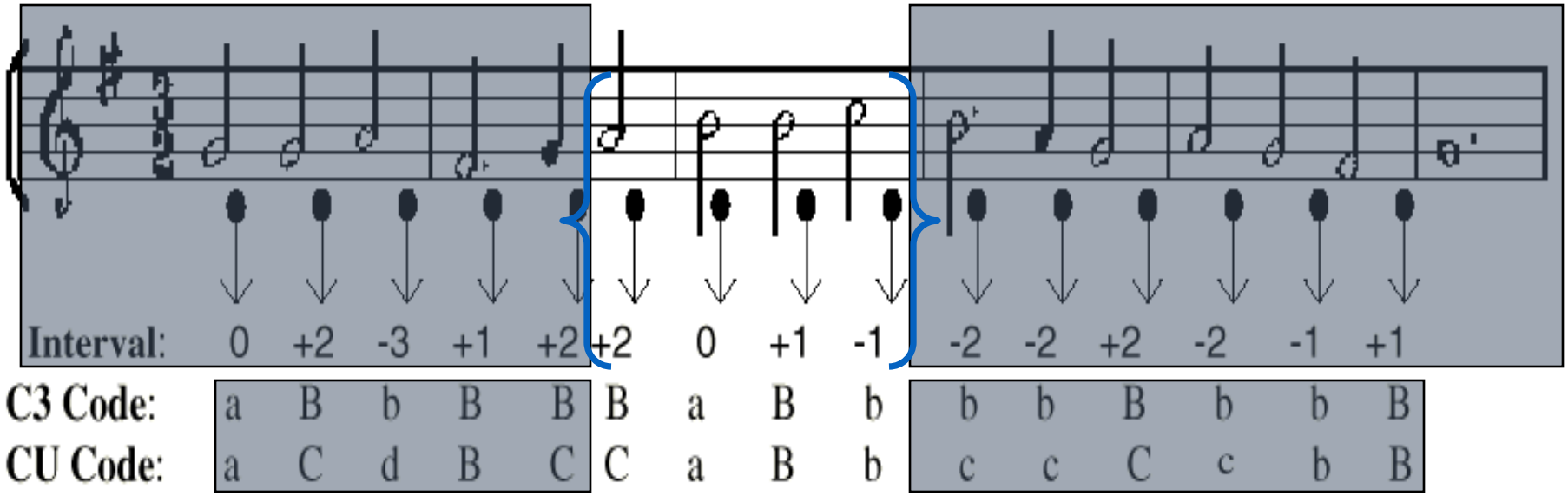
aBbB BbBB bBBB BBBa

BBaB

aCdB CdBC dBCC BCCa

CCaB

4-gram Indexing Example (Pt. 6)



C3L4 Entry

CUL4 Entry

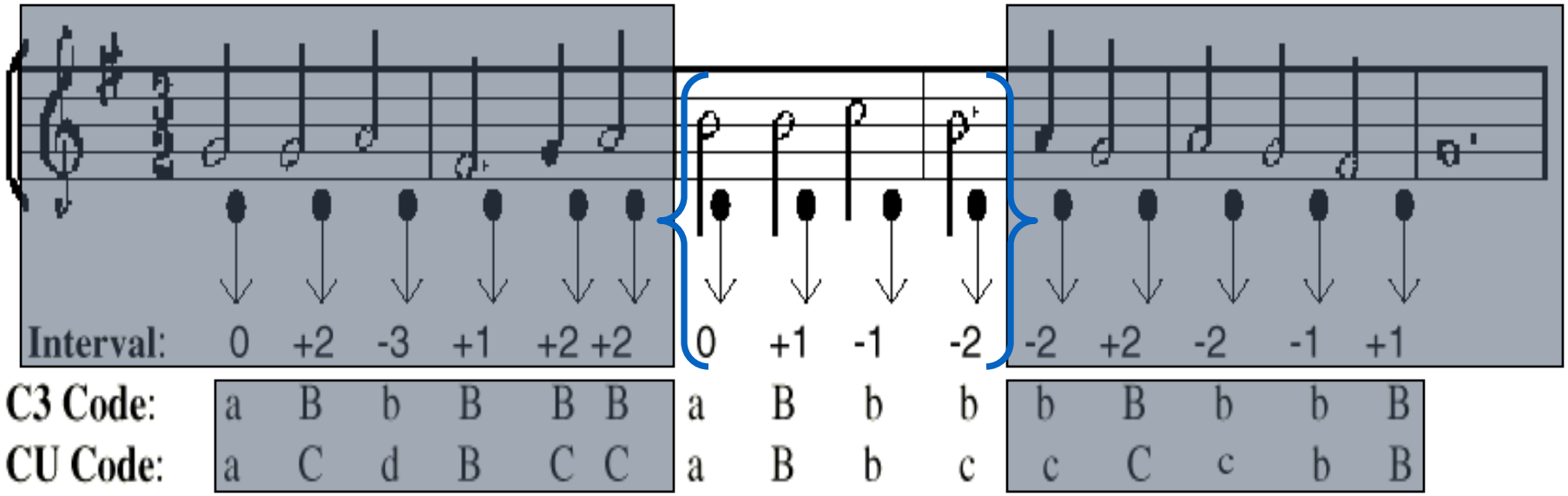
aBbB BbBB bBBB BBBa

BBaB ***BaBb***

aCdB CdBC dBCC BCCa

CCaB ***CaBb***

4-gram Indexing Example (Pt. 7)



C3L4 Entry

CUL4 Entry

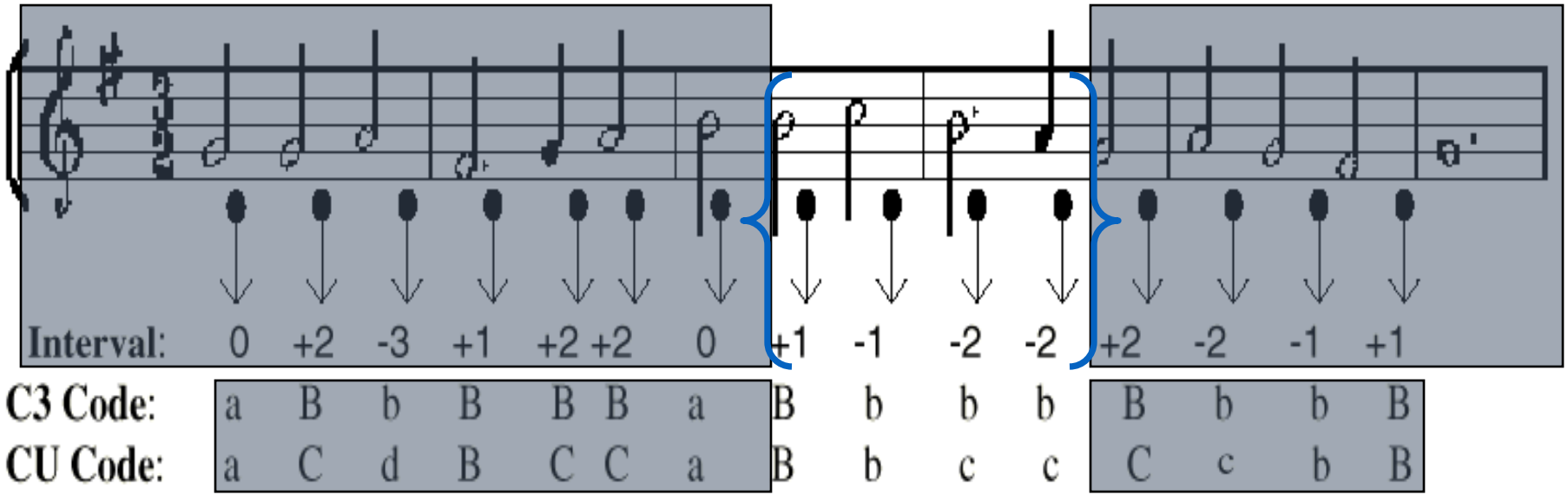
aBbB BbBB bBBB BBBa

BBaB BaBb ***aBbb***

aCdB CdBC dBCC BCCa

CCaB CaBb ***aBbc***

4-gram Indexing Example (Pt. 8)

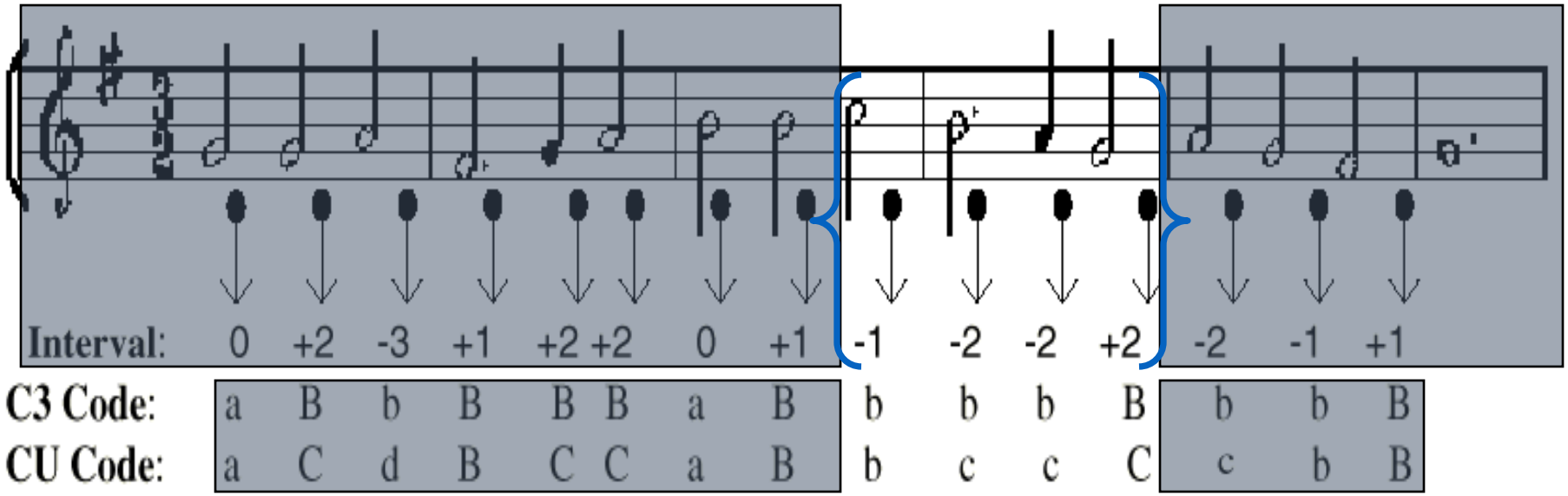


C3L4 Entry

CUL4 Entry

aBbB	BbBB	bBBB	BBBa	aCdB	CdBC	dBCC	BCCa
BBaB	BaBb	aBbb	***Bbbb***	CCaB	CaBb	aBbc	***Bbcc***

4-gram Indexing Example (Pt. 9)

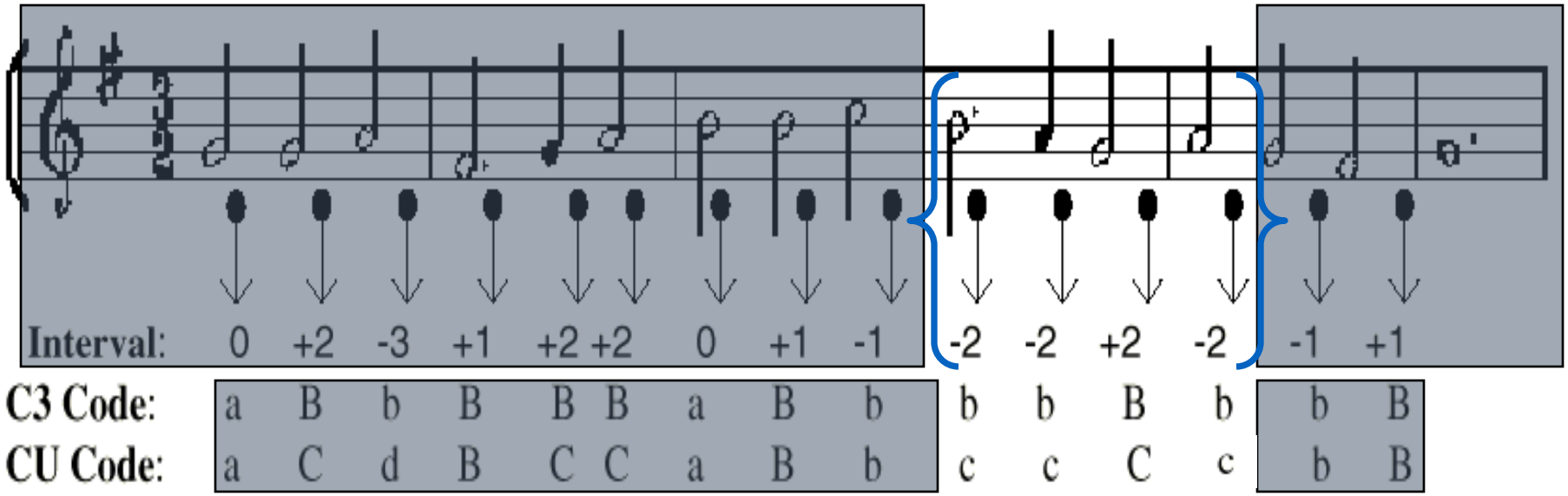


C3L4 Entry

CUL4 Entry

aBbB	BbBB	bBBB	BBBa	aCdB	CdBC	dBCC	BCCa
BBaB	BaBb	aBbb	Bbbb	CCaB	CaBb	aBbc	Bbcc
bbbB				***bccC***			

4-gram Indexing Example (Pt. 10)

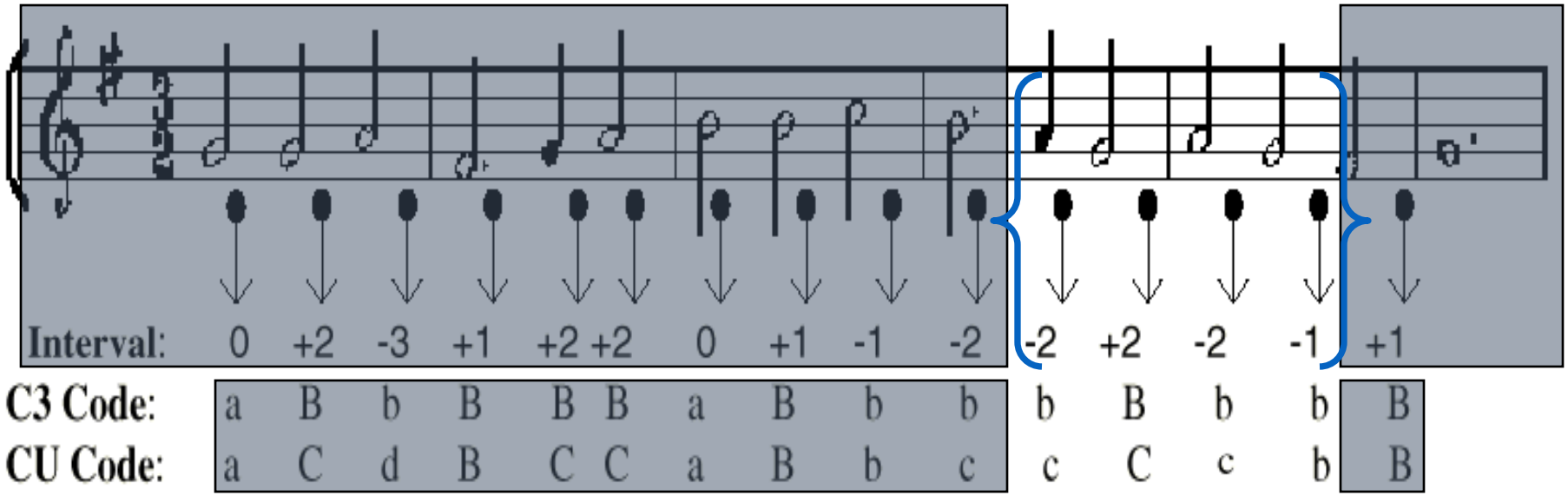


C3L4 Entry

CUL4 Entry

aBbB	BbBB	bBBB	BBBa	aCdB	CdBC	dBCC	BCCa
BBaB	BaBb	aBbb	Bbbb	CCaB	CaBb	aBbc	Bbcc
bbbB	***bbBb***			bccC	***ccCc***		

4-gram Indexing Example (Pt. 11)

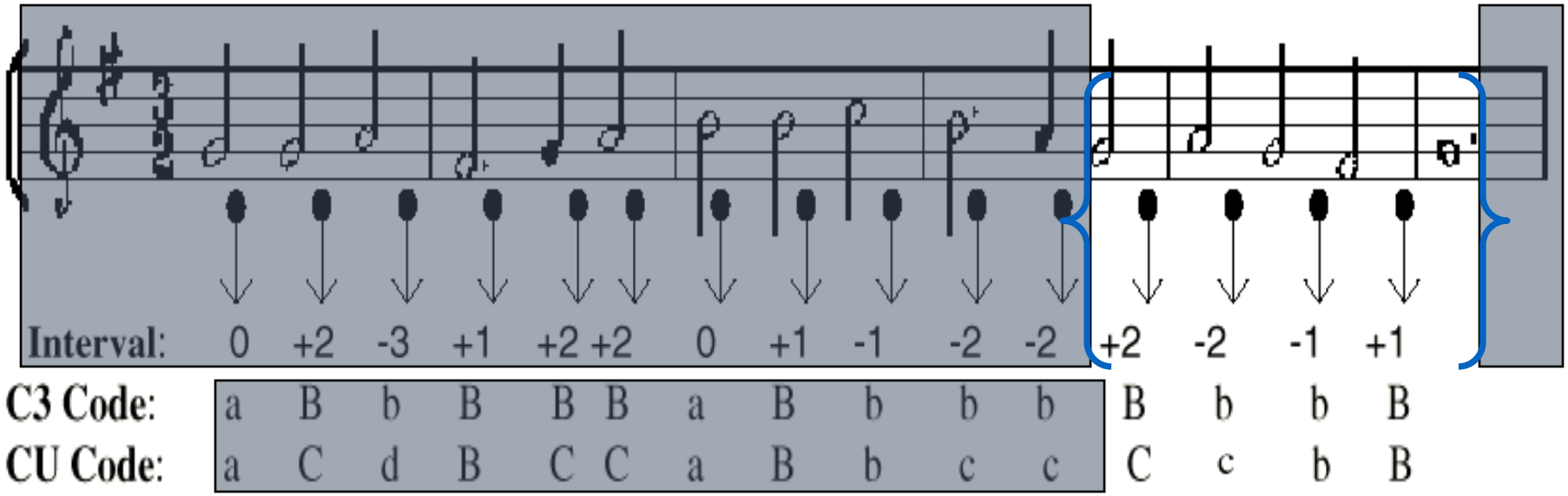


C3L4 Entry

CUL4 Entry

aBbB	BbBB	bBBB	BBBa	aCdB	CdBC	dBCC	BCCa
BBaB	BaBb	aBbb	Bbbb	CCaB	CaBb	aBbc	Bbcc
bbbB	bbBb	***bBbb***		bccC	ccCc	***cCcb***	

4-gram Indexing Example (Pt. 12)



C3L4 Entry

CUL4 Entry

aBbB	BbBB	bBBB	BBBa	aCdB	CdBC	dBCC	BCCa
BBaB	BaBb	aBbb	Bbbb	CCaB	CaBb	aBbc	Bbcc
bbbB	bbBb	bBbb	***BbbB***	bccC	ccCc	cCcb	***CcbB***

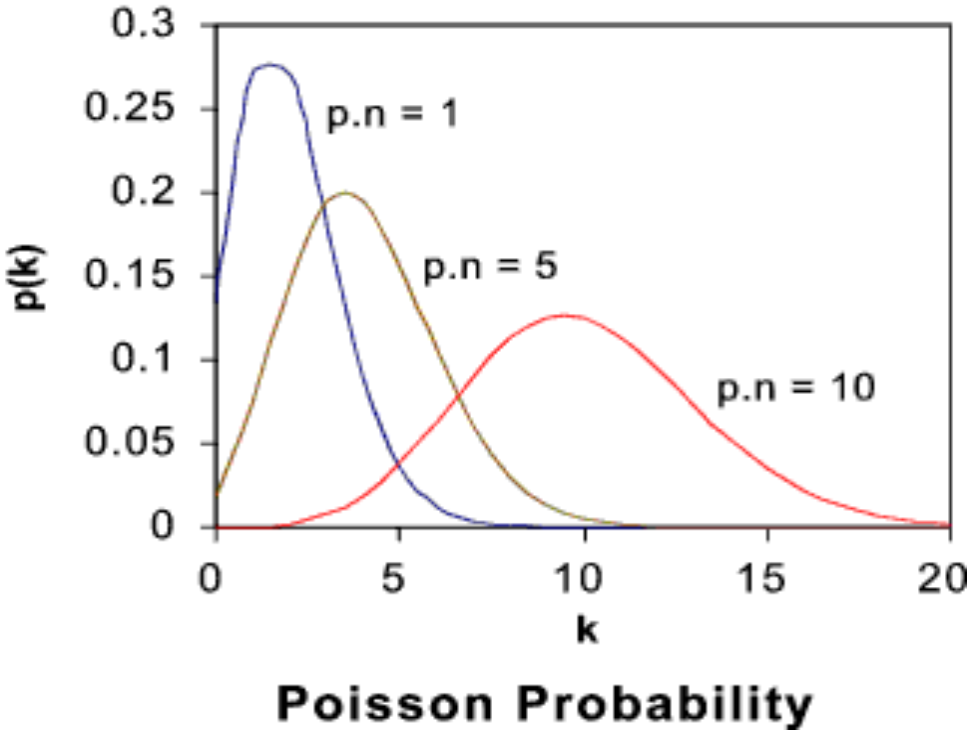
Informetric Properties: Model Fitting

Zero-truncated Generalized Inverse Gaussian-Poisson (GIGP) distribution:

$$f^*(x) = \frac{(1-\theta)^{\gamma/2}}{K_\gamma(\alpha[1-\theta]^{1/2})} \frac{(\alpha\theta/2)^x}{x!} K_{x+\gamma}(\alpha) \times \left[1 - \frac{(1-\theta)^{\gamma/2}}{K_\gamma(\alpha[1-\theta]^{1/2})} K_\gamma(\alpha)\right]^{-1},$$

$$x = 1, 2, 3, \ldots$$

where $f^*(x)$ indicates the zero truncation (as above), K_γ denotes the modified Bessel function of order γ (see Burrell and Fenton 1993), α, θ, and γ are constants determined by the data



Poisson Probability

Informetric Analyses: General Findings

- N-grams hold many similarities to text “words”
- Some combinations of n-gram length and classification scheme have properties similar to, or better than, than text:
  - GIGP model fitting
  - Term weights (IDF values)
  - Entropy values
  - Discrimination values, Lack of stopwords
- Notwithstanding the above, question remains: “What does a melodic n-gram *mean*?”

Retrieval Experiments: General Findings

- Level of fault tolerance noted with shorter n-grams
- Lack of fault tolerance using classification schemes
- Strong interaction of Query Length, N-gram Length, Query Quality
- Overall, surprisingly effective retrieval noted:
  - With errors: CUL4 index with longer queries
  - Without errors: CUL6 index with longer queries
- Notwithstanding encouraging results, data set was limited in scope and queries were simulated

Off to the Cornfields of Illinois

Off to the Cornfields of Illinois

Important Events in MIREX (aka My) History

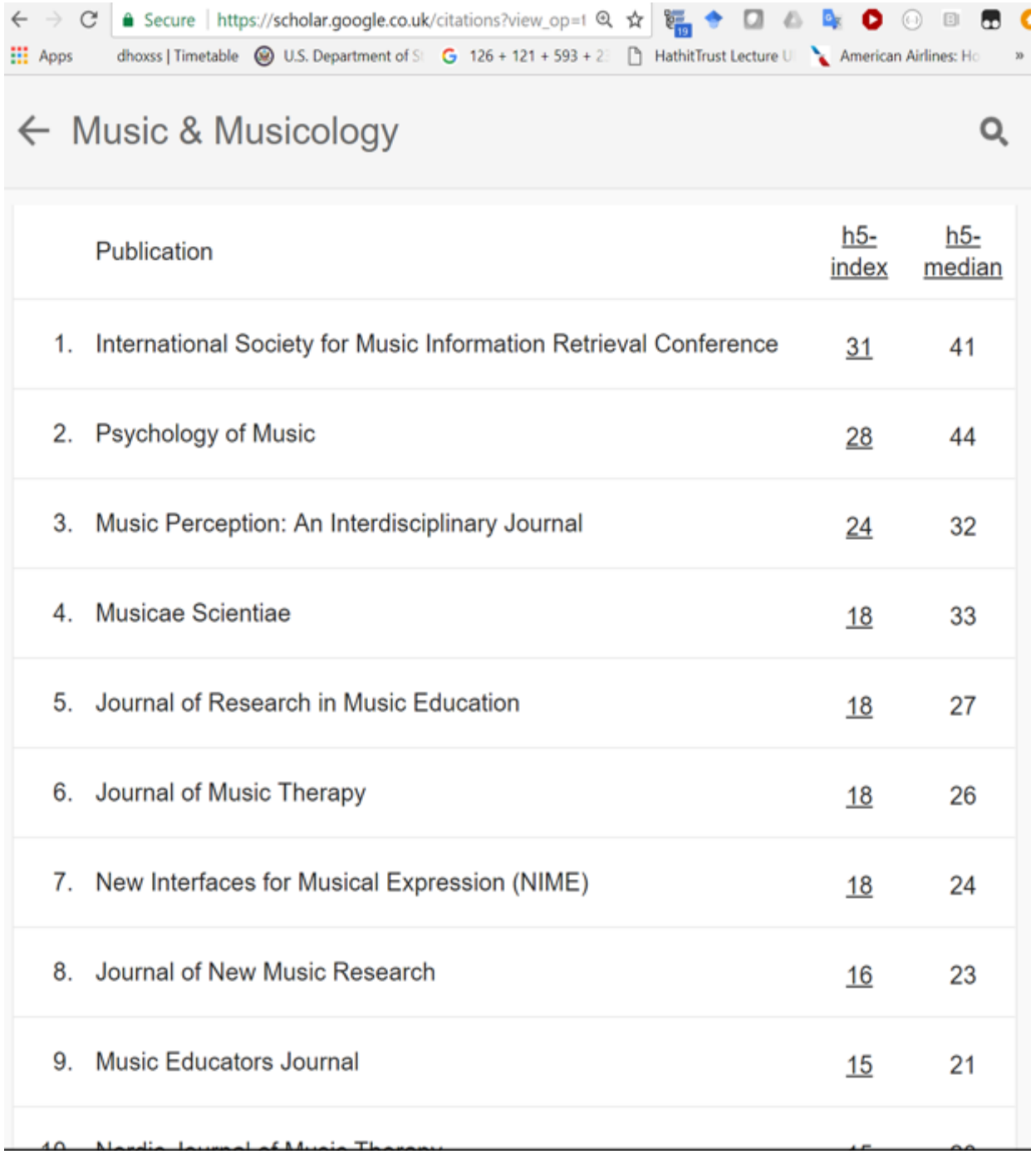
1999	**Music retrieval workshop at SIGIR proposed a range of evaluation scenarios**
2000	First ISMIR held at Plymouth with participants holding brainstorming sessions
2001	ISMIR at Indiana University; "Bloomington Manifesto" on evaluation published
2002	Planning grant from the Andrew W. Mellon Foundation awarded
2002	ISMIR at Paris hosted special evaluation workshop
2003	SIGIR at Toronto held Workshop on the Evaluation of Music Information Retrieval Systems
2003	Andrew W. Mellon Foundation and NSF funding awarded
2004	Audio Description Contest run at ISMIR Barcelona
2005	First MIREX plenary session held at ISMIR London
2008	NEMA project funded by the Andrew W. Mellon Foundation
2009	SALAMI funded by the NSF, SSHRC and JISC
2012	MIREX:NG project funded by the Andrew W. Mellon Foundation

Reflecting on MIREX
(A personal paradigm shift)

MIREX 2015 TASKS	
Grand Challenge 2015: Jamendo Dataset	Audio Tempo Estimation
Grand Challenge 2015: J-DISC Dataset	Audio Train/Test tasks
Audio Beat Tracking	Discovery of Repeated Themes & Sections
Audio Chord Estimation	Audio Downbeat Estimation
Audio Cover Song Identification	Query by Singing/Humming
Multiple Fundamental Frequency Estimation & Tracking	Real-time Audio to Score Alignment (aka. Score Following)
Audio Fingerprint	Singing Voice Separation
Audio Key detection	Structural Segmentation
Audio Melody Extraction	Symbolic Melodic Similarity
Audio Onset detection	Set List Identification
Music/Speech Classification and Detection	

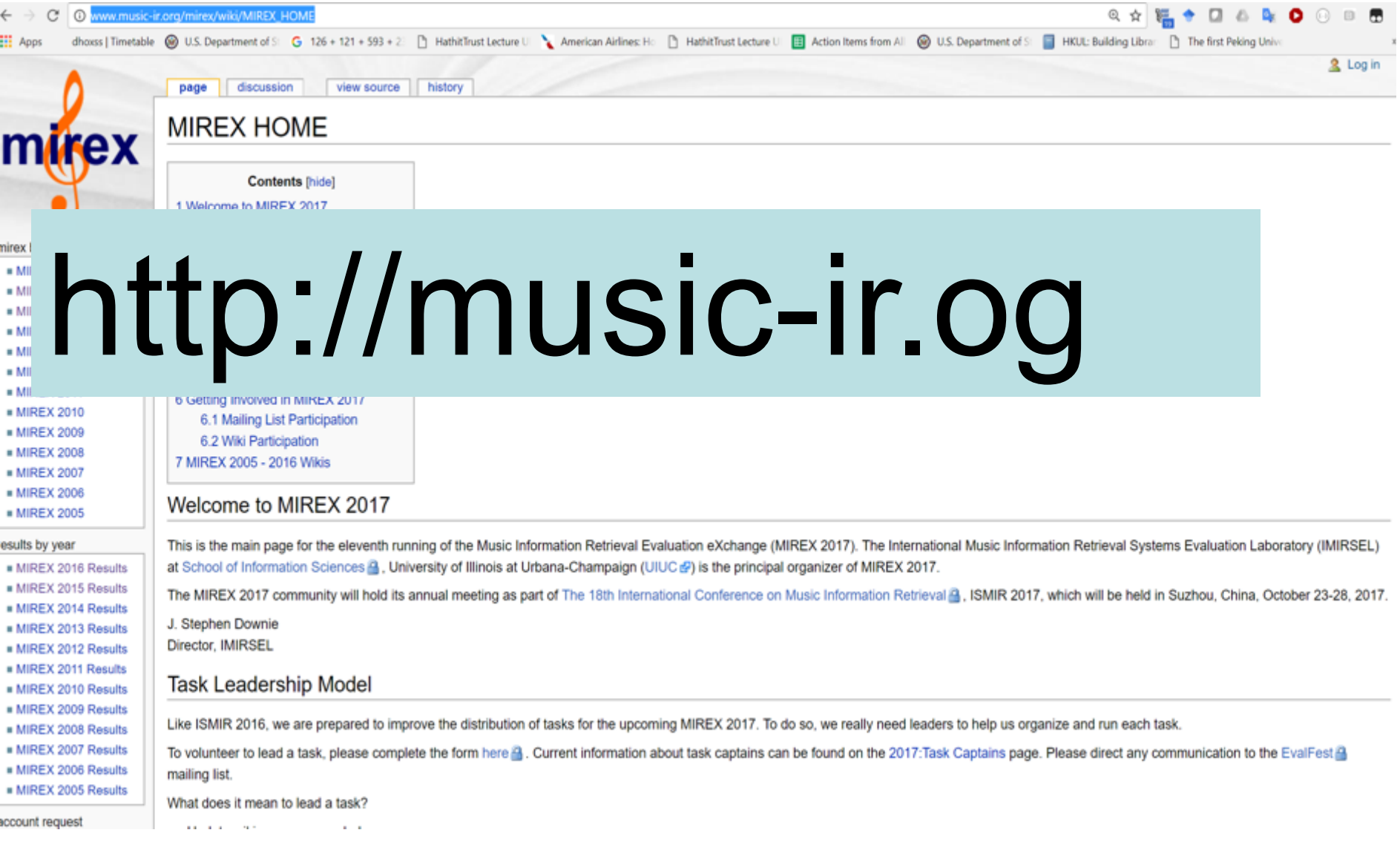
ISMIR


ismir.net
Apps
dhoxss | Timetable
U.S. Department of S
126 + 121 + 593 + 2
HathiTrust Lecture U
American Airlines: H
HathiTrust Lecture U
Action Items from Al
U.S. Department of S
HKUL: Building Libra
The first Peking Univ
ISMIR
http://ismir.net
International Society for Music Information Retrieval
Membership
Contact
Who are we?
The International Society for Music Information Retrieval (ISMIR) is a non-profit organisation which, among other things, oversees the organisation of the ISMIR Conference. The ISMIR conference is held annually and is the world's leading research forum on processing, searching, organising and accessing music-related data.
The Society reports recent activities at the yearly ISMIR Community Meeting (held during the Conference). The slide deck for the 2016 community meeting may be accessed at this link.
Be a part of the Community!
Between conferences, there are multiple ways to stay involved!
Become an official member of the Society.
As a non-profit organization, members are eligible to receive discounted registration at conferences and voting rights at the annual business meeting.
Join the ISMIR Community group.
Since its inception in 2000, the ISMIR community mailing list has grown into a forum of over 1,800 members from across the world, and routinely receives announcements about conferences, career opportunities, concerts, and wide variety of other issues relevant to music information retrieval.
Get involved with Women in MIR (WiMIR) Group.
Despite the expanding reach of science and technology, there remains a stark imbalance between the number of female and male researchers in those fields. Regardless of gender or orientation, the WiMIR group is comprised of those interested in taking a more active role in building a better support system, improving visibility, and



	Publication	h5-index	h5-median
1.	International Society for Music Information Retrieval Conference	31	41
2.	Psychology of Music	28	44
3.	Music Perception: An Interdisciplinary Journal	24	32
4.	Musicae Scientiae	18	33
5.	Journal of Research in Music Education	18	27
6.	Journal of Music Therapy	18	26
7.	New Interfaces for Musical Expression (NIME)	18	24
8.	Journal of New Music Research	16	23
9.	Music Educators Journal	15	21
10.	Nordic Journal of Music Therapy		

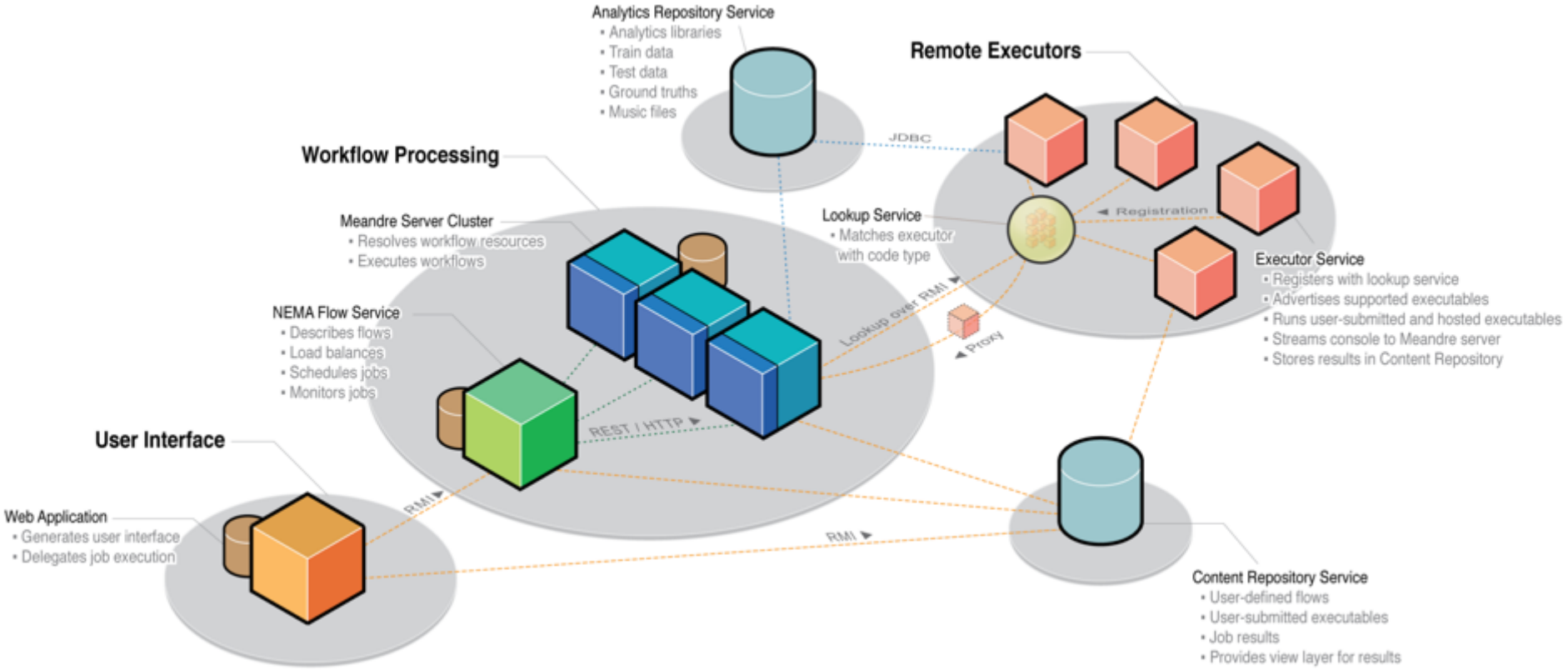
MIREX



http://music-ir.og

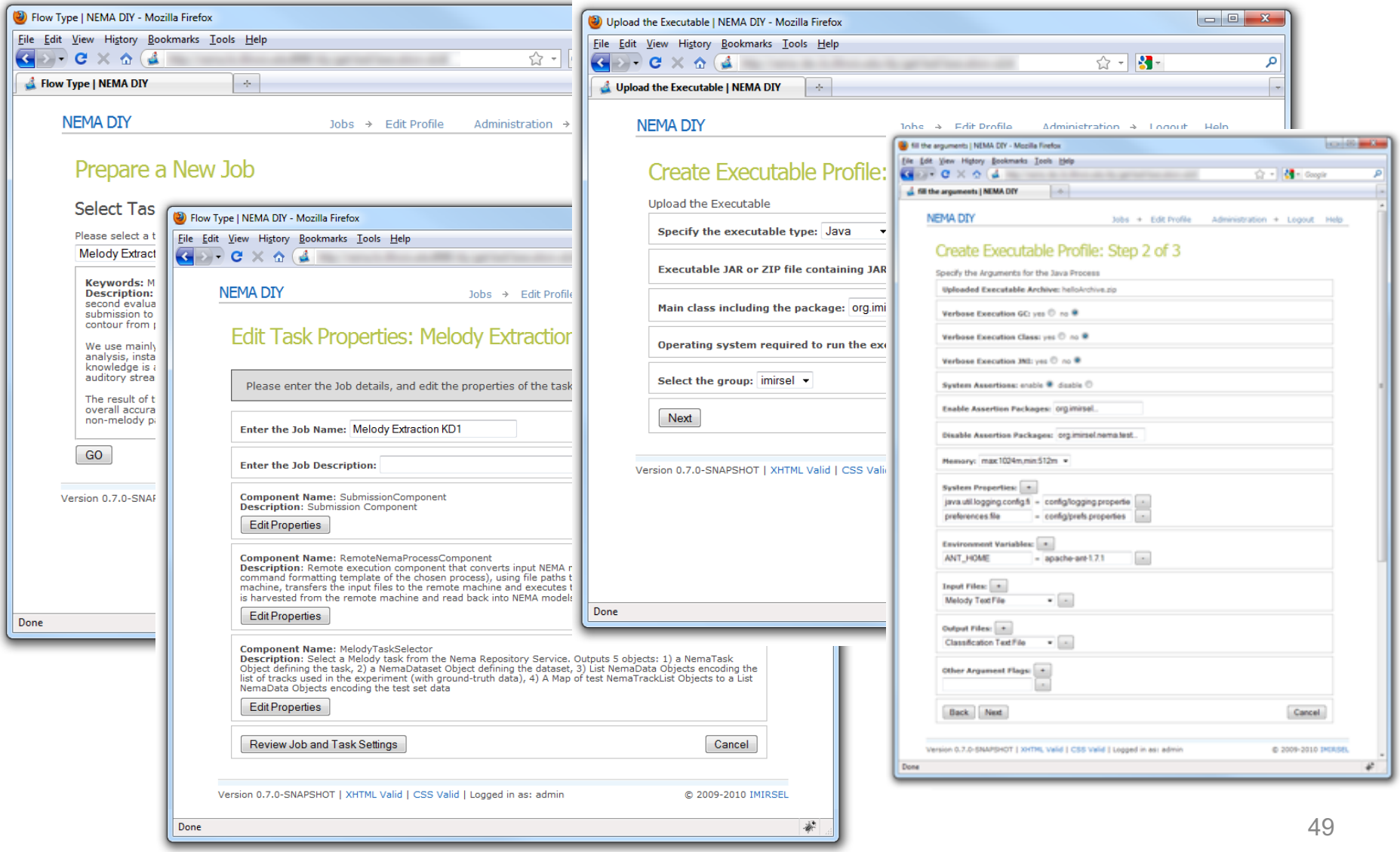
Networked Environment for Music Analysis

NEMA



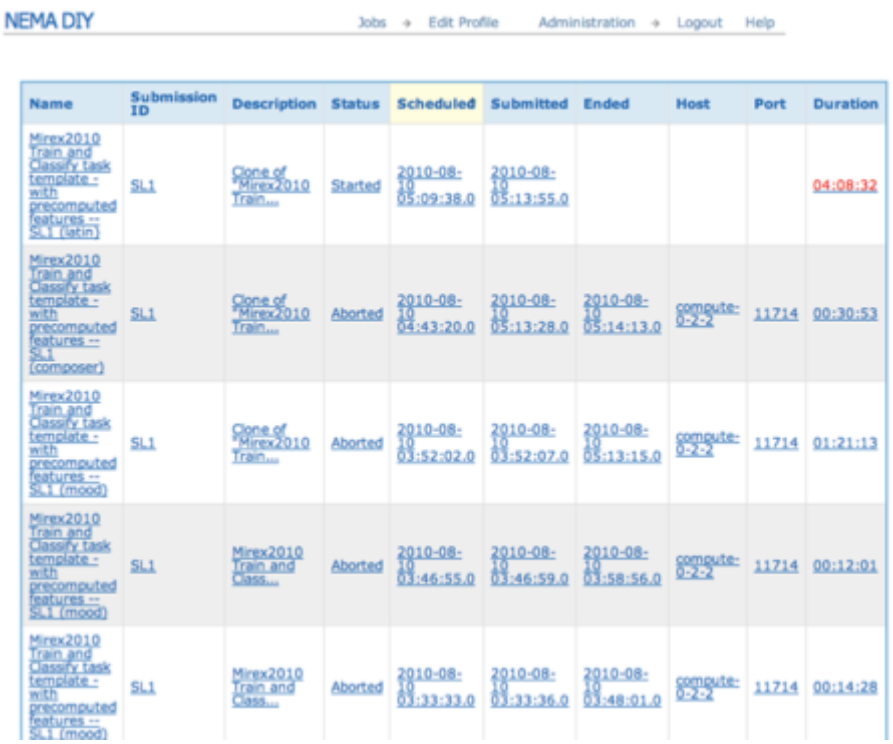
Networked Environment for Music Analysis

NEMA DIY Interface

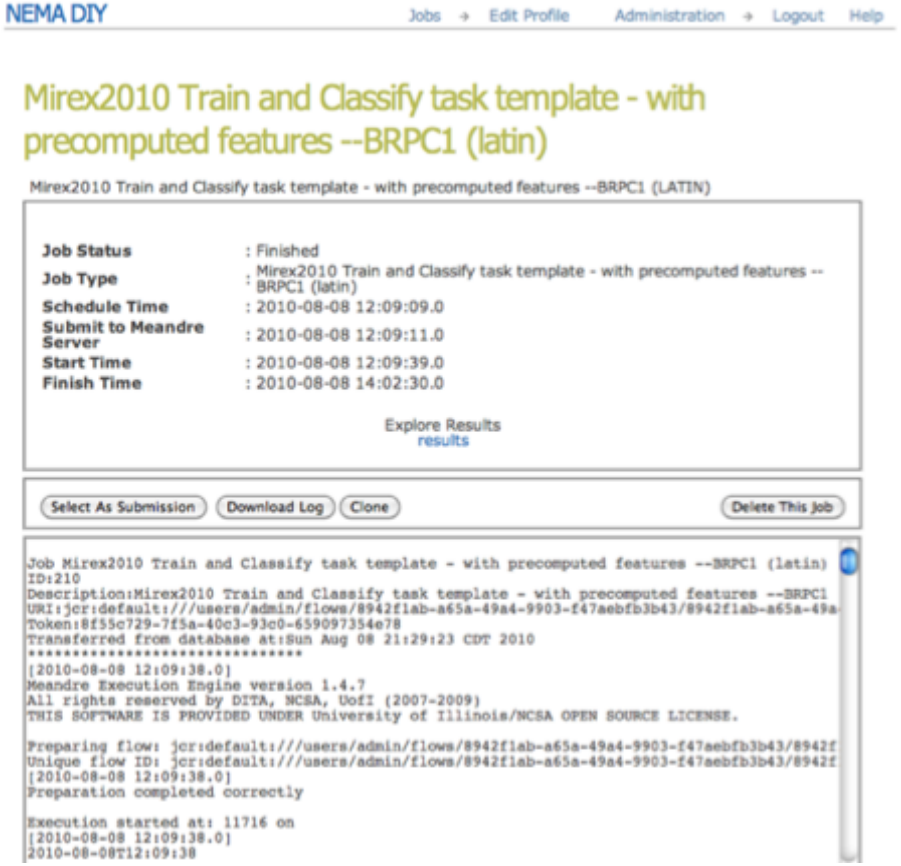


Networked Environment for Music Analysis

NEMA DIY Interface



Name	Submission ID	Description	Status	Scheduled	Submitted	Ended	Host	Port	Duration
Mirex2010 Train and Classify task template - with precomputed features -- SL1 (latin)	SL1	Clone of "Mirex2010 Train...	Started	2010-08-10 05:09:38.0	2010-08-10 05:13:55.0				04:08:32
Mirex2010 Train and Classify task template - with precomputed features -- SL1 (composer)	SL1	Clone of "Mirex2010 Train...	Aborted	2010-08-10 04:43:20.0	2010-08-10 05:13:28.0	2010-08-10 05:14:13.0	compute-0-2-2	11714	00:30:53
Mirex2010 Train and Classify task template - with precomputed features -- SL1 (mood)	SL1	Clone of "Mirex2010 Train...	Aborted	2010-08-10 03:52:02.0	2010-08-10 03:52:07.0	2010-08-10 05:13:15.0	compute-0-2-2	11714	01:21:13
Mirex2010 Train and Classify task template - with precomputed features -- SL1 (mood)	SL1	Mirex2010 Train and Class...	Aborted	2010-08-10 03:46:55.0	2010-08-10 03:46:59.0	2010-08-10 03:58:56.0	compute-0-2-2	11714	00:12:01
Mirex2010 Train and Classify task template - with precomputed features -- SL1 (mood)	SL1	Mirex2010 Train and Class...	Aborted	2010-08-10 03:33:33.0	2010-08-10 03:33:36.0	2010-08-10 03:48:01.0	compute-0-2-2	11714	00:14:28



Evaluation Reports

MIREX 2010: Audio Chord Description - MIREX09 Dataset

Introduction | Summary | Detailed Evaluation Metrics | RRHS1 | RRHS2 | PVM1 | PP1 | MD1 | KO1 | EW1 | MK1 | OFG1 | EW4
EW2 | EW3 | UUOS1 | MM1 | CWB1 | Comparative plots | Significance Tests | Raw data files

Introduction

Description

Field	Value
Task ID	17
Task Name	MIREX 2010: Audio Chord Description - MIREX09 Dataset
Task Description	Chord transcription task requiring participants to annotate and segment the chord events in the MIREX09chord transcription dataset. Please note that: • Evaluations are performed at the triad level, • results for both pretrained algorithms and algorithms trained and tested under 3 fold cross-validation are reported here. • pretrained algorithms are likely to have been trained on the evaluation dataset hence they are expected to achieve higher results than algorithms evaluated on held out data.
Subject Metadata ID	26
Subject Metadata Name	Chord label sequence
Dataset ID	33
Dataset Name	MIREX09 Chord
Dataset Description	MIREX 2009 Chord transcription dataset composed of Christopher Harte's Beatles dataset (C4DM, Queen Mary's University of London) and Matthias Mauch's Queen and Zweieck dataset (C4DM, Queen Mary's University of London)
Date report generated	Aug 6, 2010 7:56:08 PM

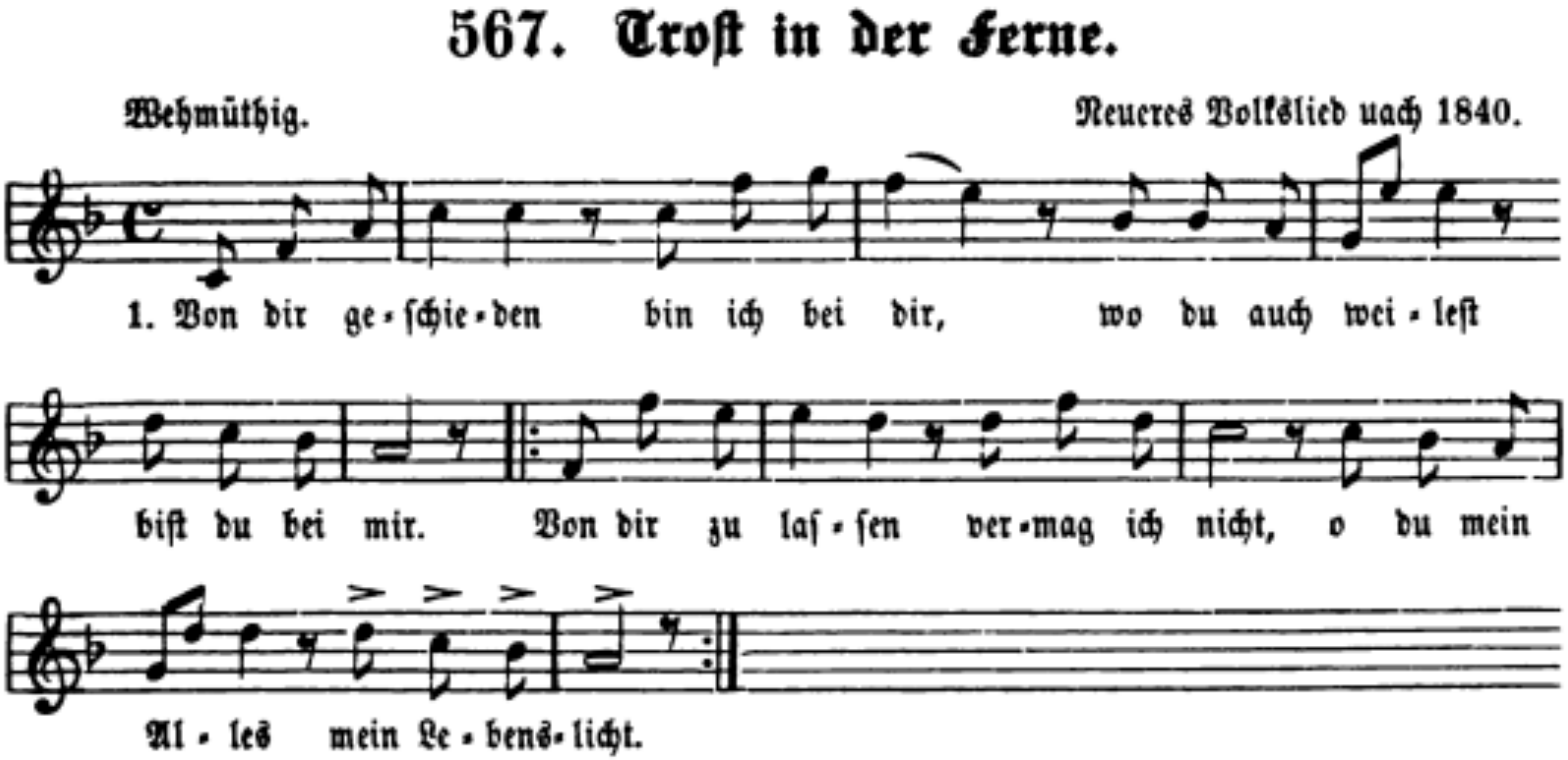
Legend [top]

Submission code	Submission name	Abstract PDF	Contributors
CWB1	ChordID	PDF	Taemin Cho, Ron Weiss, Juan Bello
EW1	LabROSA Chord Train/Test 2010	PDF	Daniel Ellis, Adrian Weller

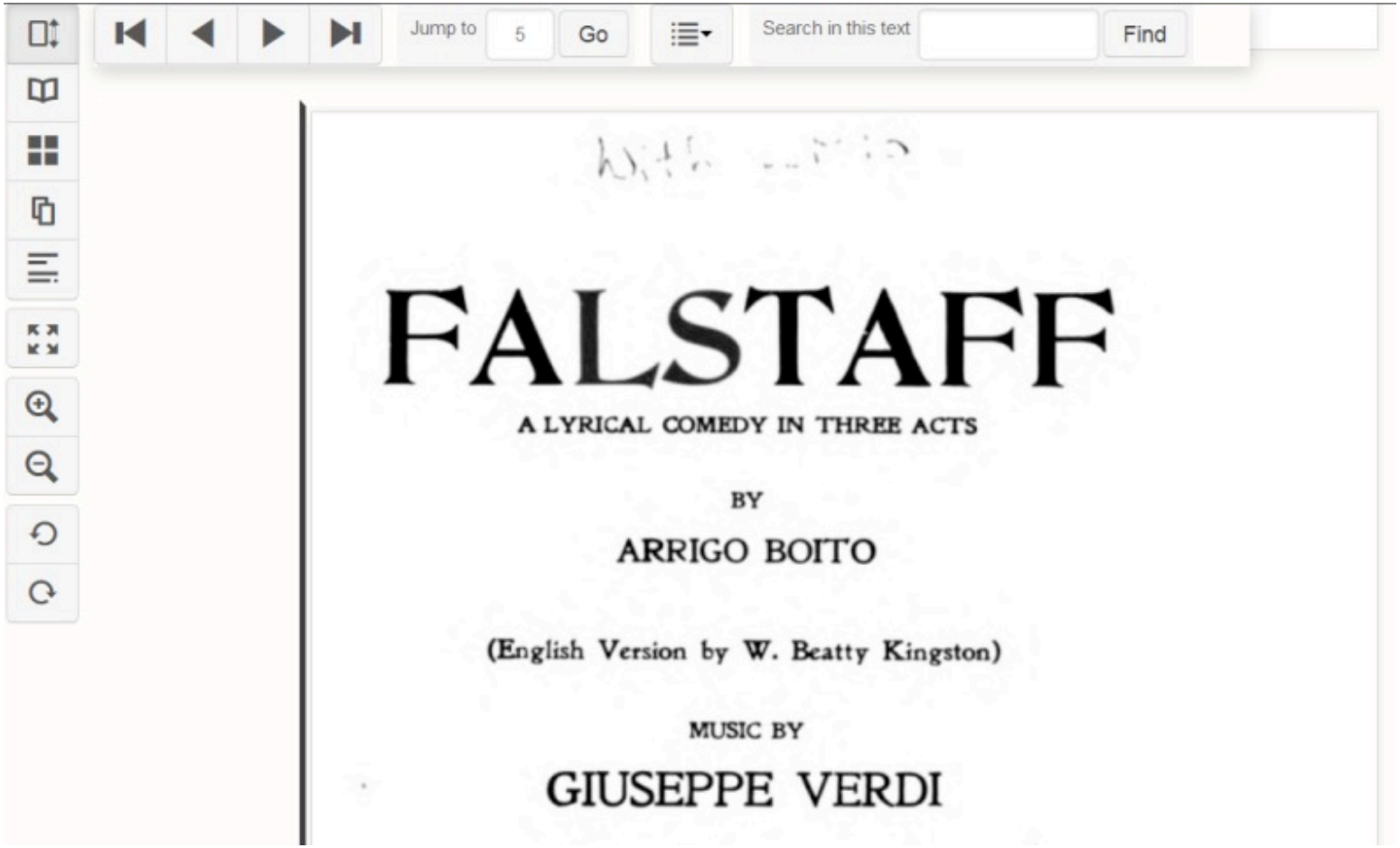
The HathiTrust Research Center:

Providing Analytic Access to the Hathitrust Digital Library's 5.5 Billion Pages

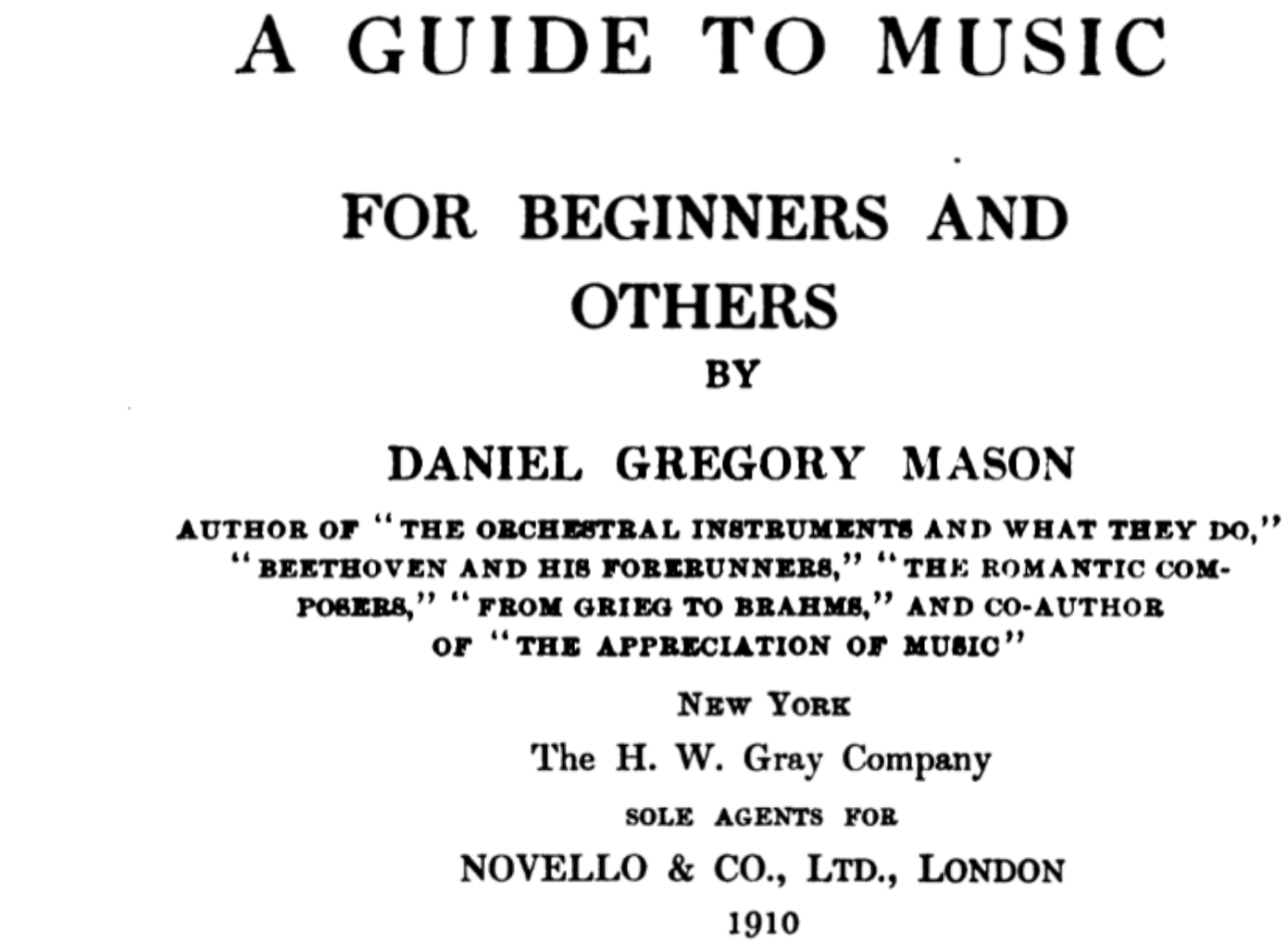
Music Content in HathiTrust Scores



Music Content in HathiTrust Program Notes



Music Content in HathiTrust – Instruction /Study



A GUIDE TO MUSIC

FOR BEGINNERS AND OTHERS

BY

DANIEL GREGORY MASON

AUTHOR OF "THE ORCHESTRAL INSTRUMENTS AND WHAT THEY DO," "BEETHOVEN AND HIS FOREBUNNERS," "THE ROMANTIC COMPOSERS," "FROM GRIEG TO BRAHMS," AND CO-AUTHOR OF "THE APPRECIATION OF MUSIC"

NEW YORK

The H. W. Gray Company

SOLE AGENTS FOR

NOVELLO & CO., LTD., LONDON

1910

HathiTrust is...

- A trusted digital preservation service enabling the broadest possible access worldwide.
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- A distributed set of services operated by different members (California Digital Library, Illinois, Indiana, Michigan).
- A range of programs enabled by the large scale collection of digitized materials.

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University of Florida
University of Houston
University of Illinois
University of Illinois at Chicago
The University of Iowa
University of Maryland
University of Massachusetts
University of Miami
University of Michigan
University of Minnesota
University of Missouri
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Universidad Complutense de Madrid
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University of British Columbia
University of Arizona
University of Calgary
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- Irvine
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- Riverside
- San Diego
- San Francisco
- Santa Barbara
- Santa Cruz

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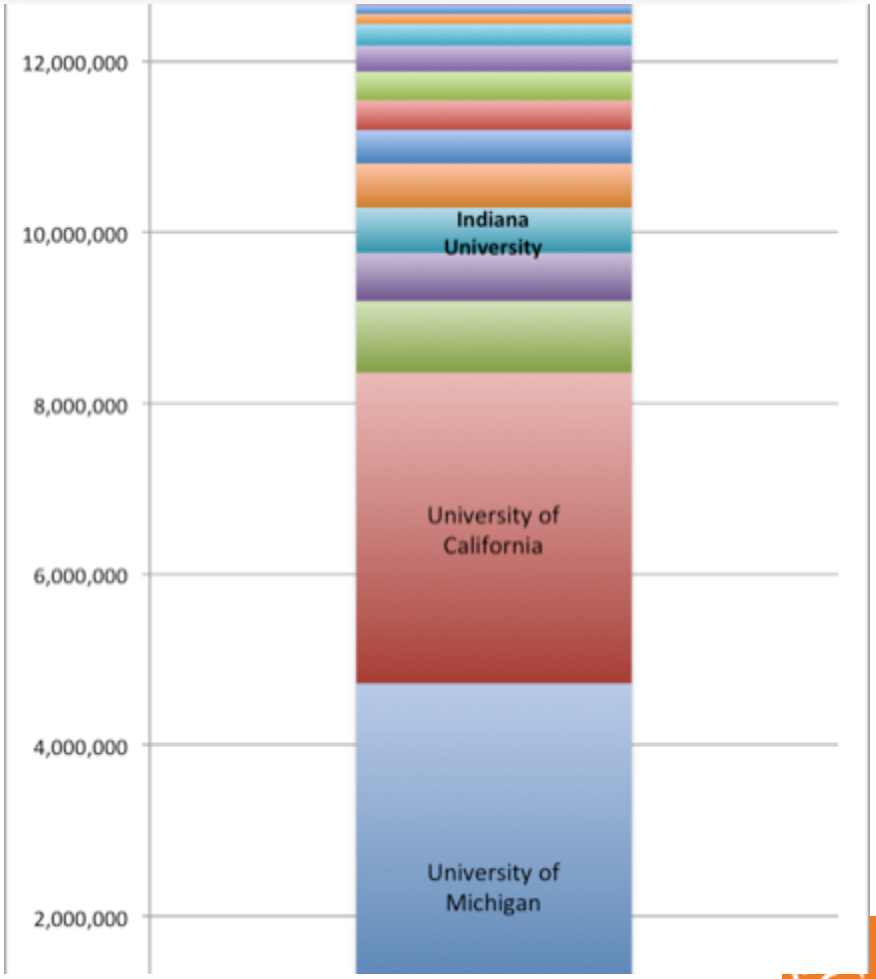
University of Connecticut
University of Delaware
University of Florida
University of Houston
University of Illinois
University of Illinois at Chicago
The University of Iowa
University of Maryland
University of Massachusetts
University of Miami
University of Michigan
University of Minnesota
University of Missouri
University of Nebraska-Lincoln
The University of North Carolina at Chapel Hill
University of Notre Dame
University of Oklahoma
University of Pennsylvania
University of Pittsburgh
University of Queensland
University of Tennessee,Knoxvile
University of Utah
University of Virginia
University of Washington
University of Wisconsin-Madison
Utah State University
Wake Forest University
Washington University
Yale University Library

HathiTrust “Wow” Numbers

- 13,776,566 total volumes
- 6,867,676 book titles
- 355,106 serial titles
- 4,821,798,100 pages
- 618 terabytes
- 163 miles (262 km)
- 11,193 tons
- 5,369,893 volumes(~39% of total) in the public domain

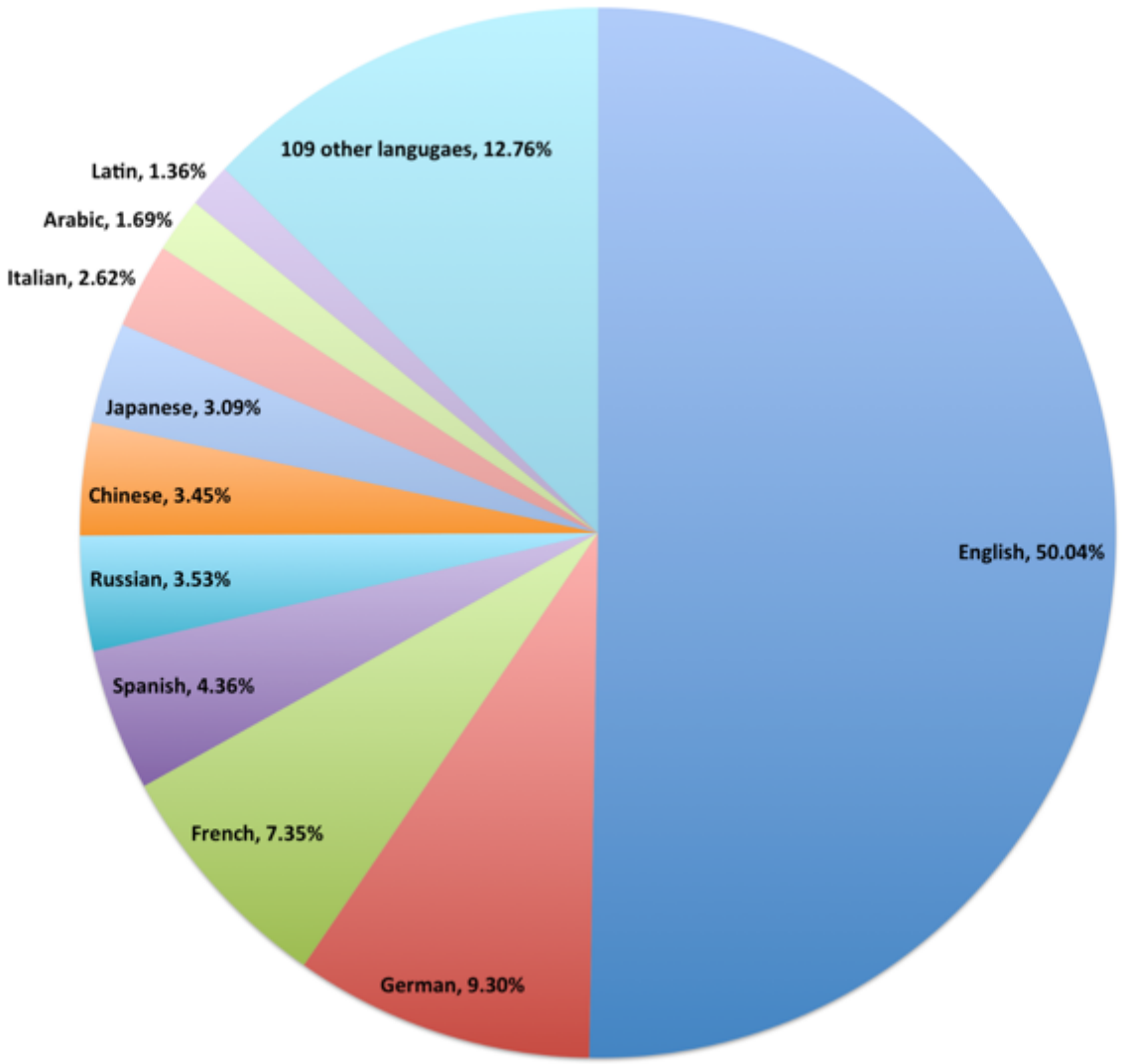
Contributions by Library, Apr 2015

Institution	Volumes
University of Michigan	4,722,050
University of California	3,639,937
Harvard University	838,122
University of Wisconsin	561,534
Indiana University	**529,798**
Cornell University	515,753
Penn State	389,247
University of Illinois	348,946
University of Minnesota	334,249
New York Public Library	304,610
Princeton University	252,841
Universidad Complutense	117,322
Library of Congress	108,892
Keio University	90,122
University of Alberta	76,106
Ohio State	74,525
Columbia University	73,396
Northwestern University	57,000
University of Chicago	56,981
University of Virginia	51,207

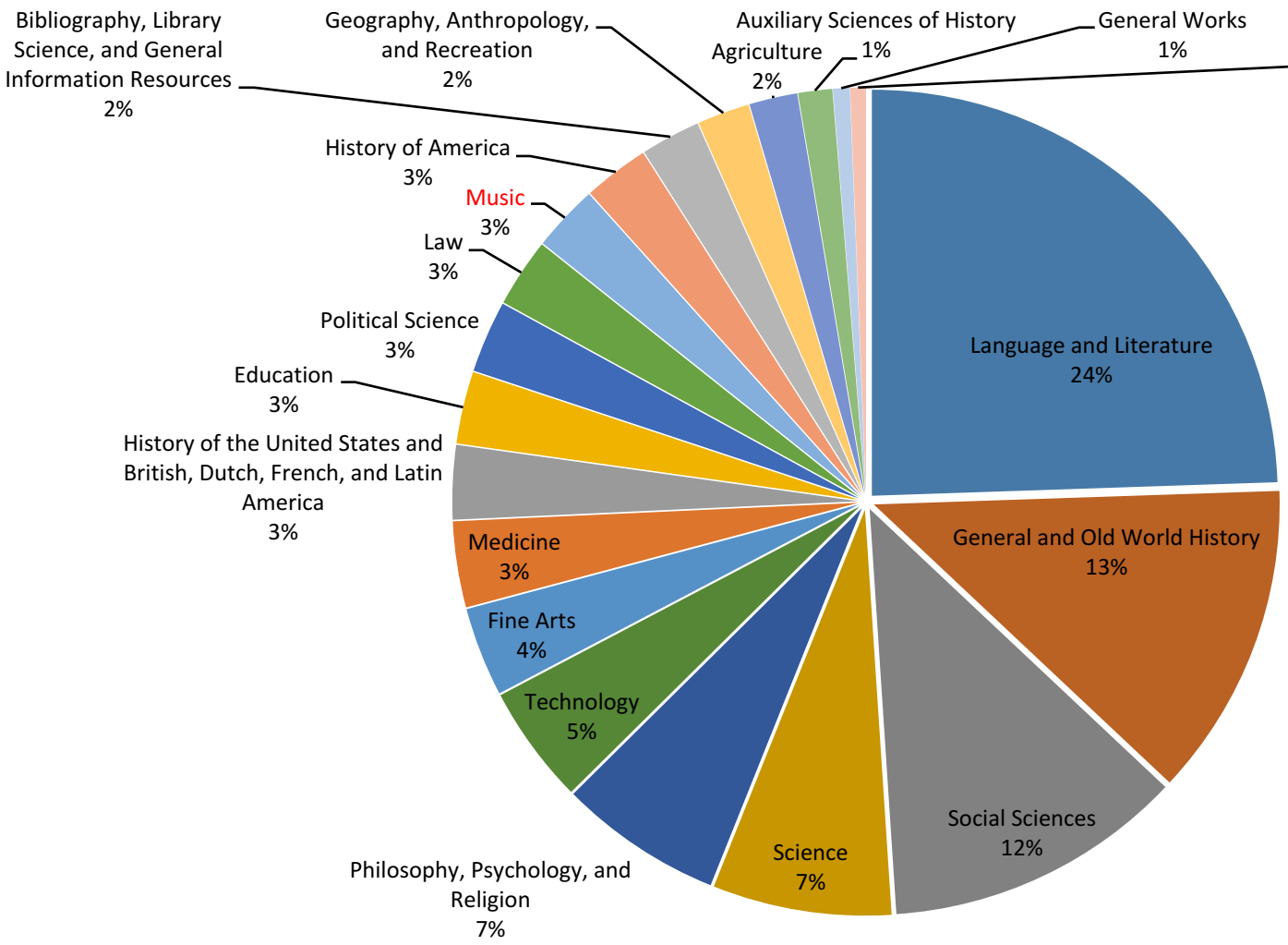


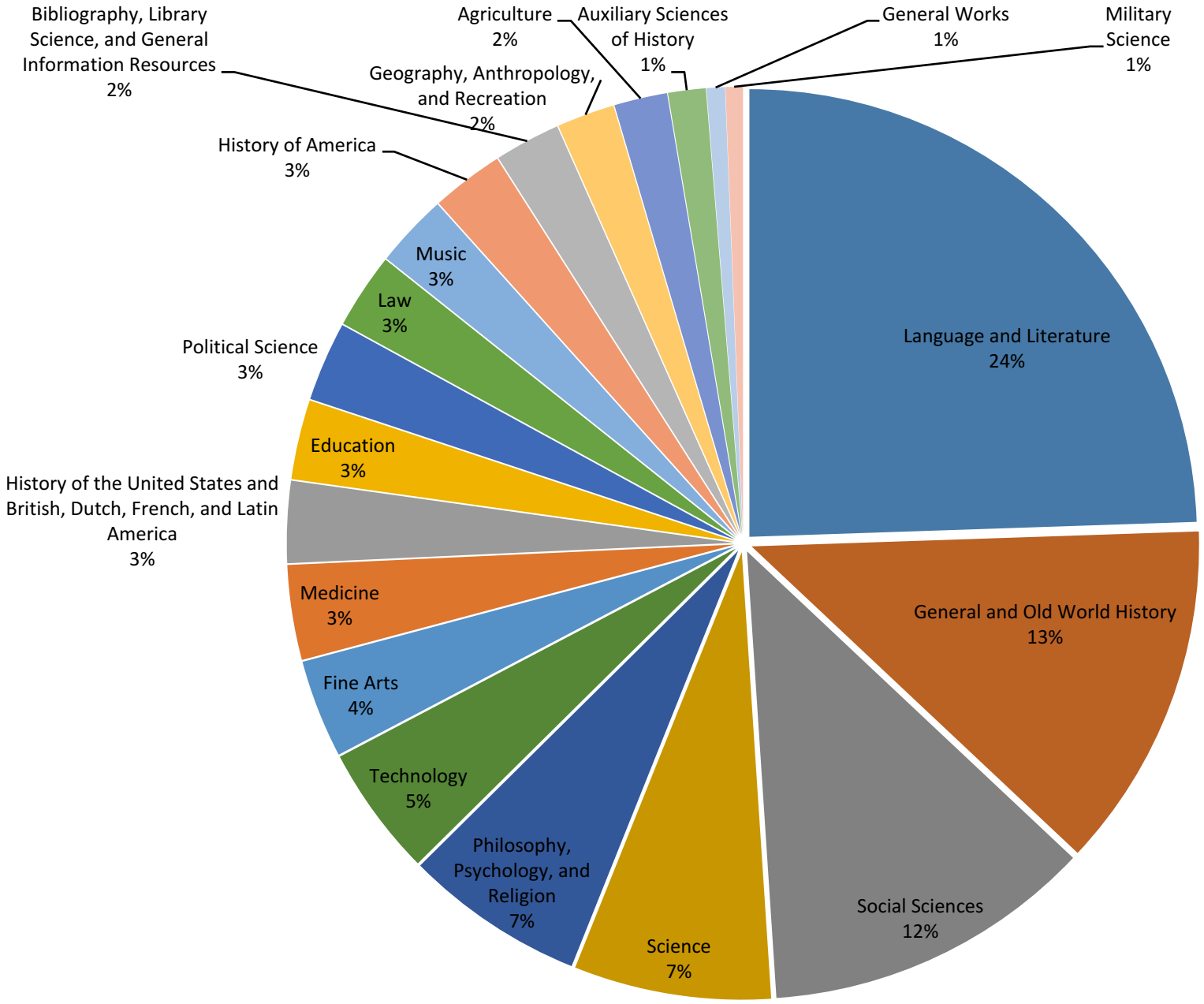
Data Overview

Language Distribution of All Works in HathiTrust, April 2015



Subject Distribution




Language and Literature 24%
General and Old World History 13%
Social Sciences 12%
Science 7%
Philosophy, Psychology, and Religion 7%
Technology 5%
Fine Arts 4%
Medicine 3%
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Law 3%
Music 3%
History of America 3%
Geography, Anthropology, and Recreation 2%
Bibliography, Library Science, and General Information Resources 2%
Agriculture 2%
Auxiliary Sciences of History 1%
General Works 1%
Military Science 1%

Four Key Data Objects

CONTENTS.

BOOK I.

Containing a general Account of thoſe People who have flouriſhed at Sea in all Ages.

CONTENTS.

BOOK I.

Containing a general Account of thoſe People who have flouriſhed at Sea in all Ages.

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CONTENTS.

BOOK I.

Containing a general Account of thofe People who have flouriilied at Sea in all Ages.

Containing a general Account of thofe People who have
flouriilied at Sea in all Ages.

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8
9  Containing a general Account of thofe People who have
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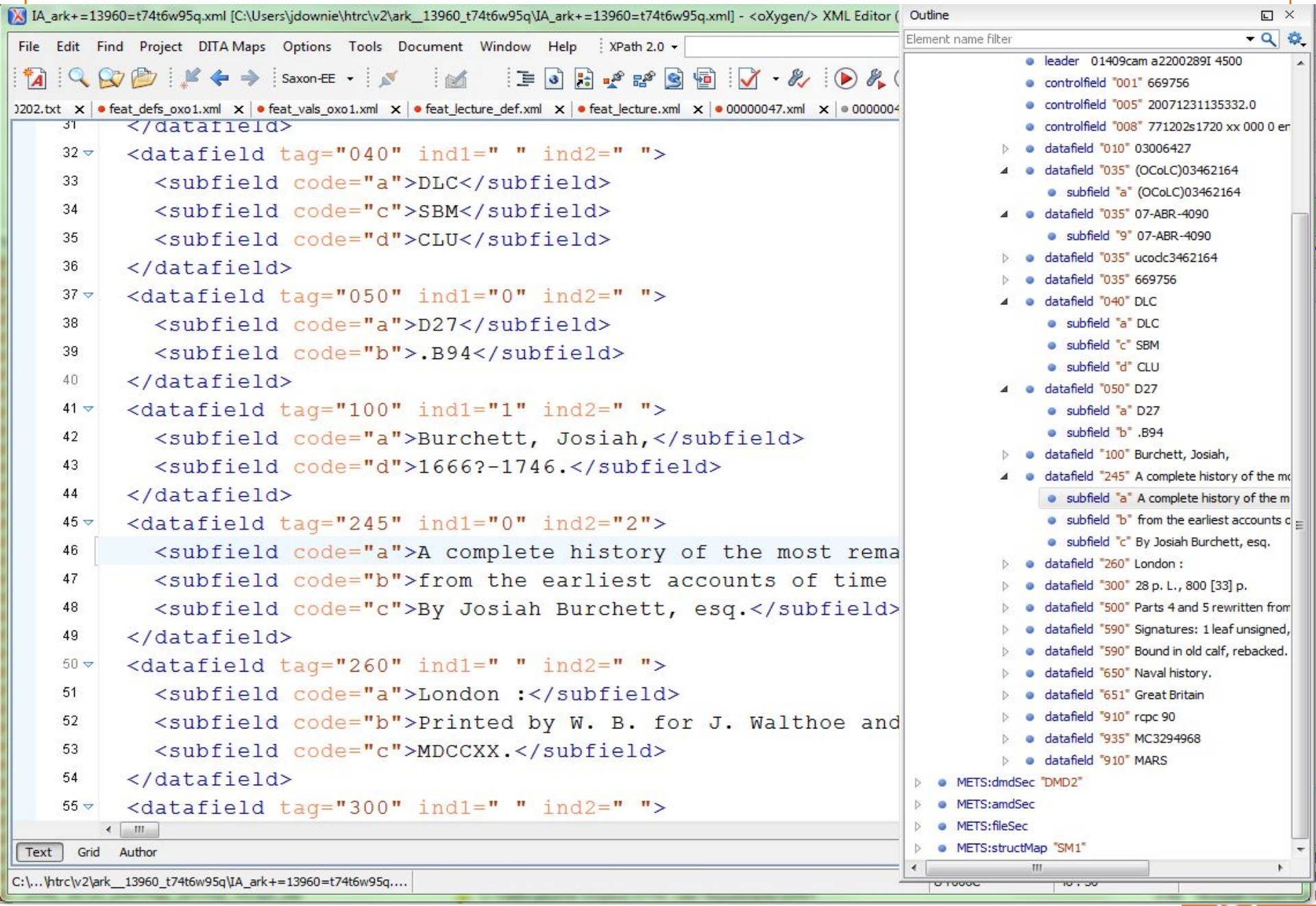
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METS:structMap "SM1"

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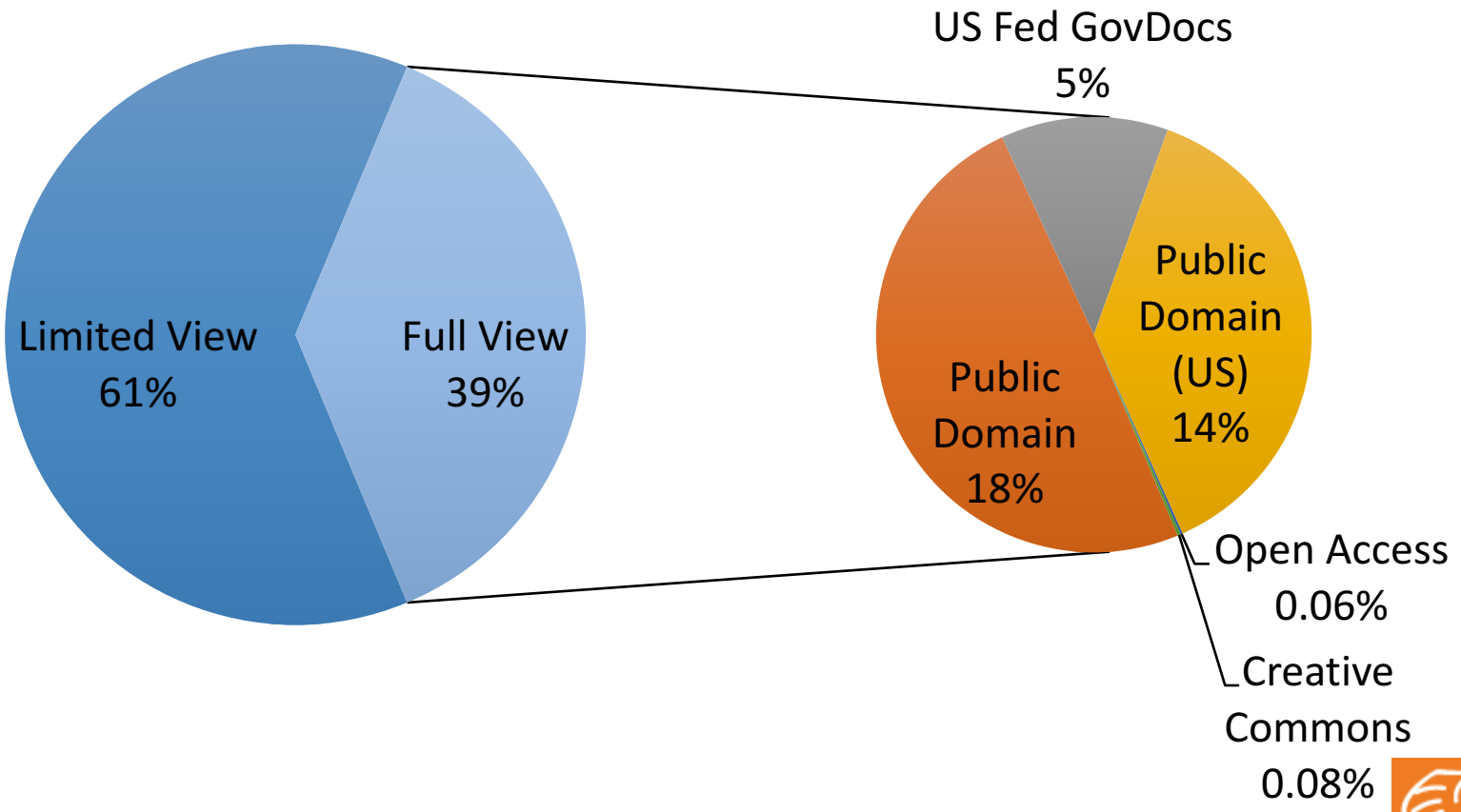


How Do We Legally Overcoming Copyright Restrictions?

LEARN FROM MIREX!

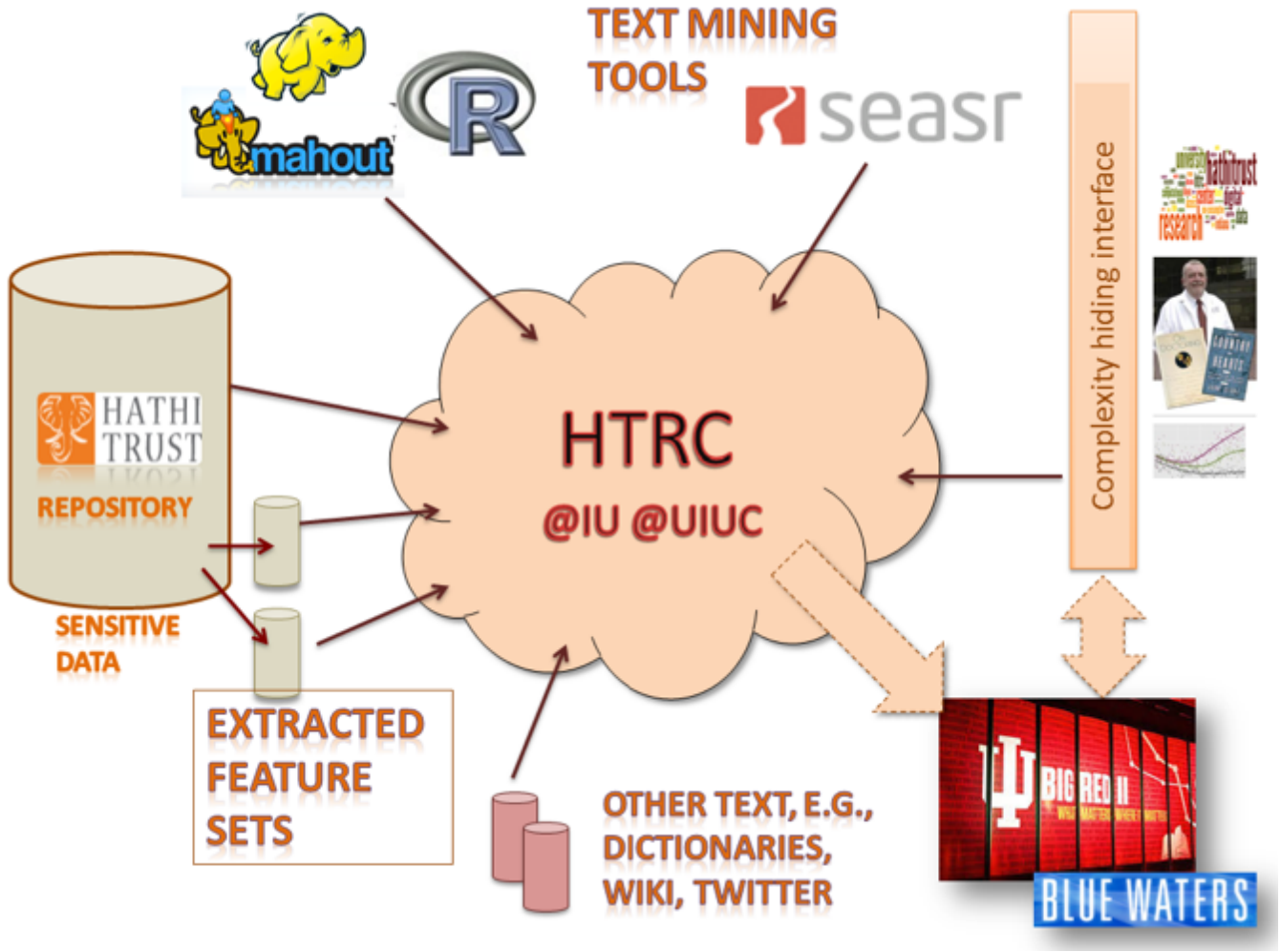
Non-Consumptive Research Paradigm

Bring the
COMPUTATION
to the
DATA!

Non-Consumptive Research Paradigm

- *No action or set of actions on part of users, either acting alone or in cooperation with other users over duration of one or multiple sessions can result in sufficient information gathered from collection of copyrighted works to reassemble pages from collection.*
- Definition disallows collusion between users, or accumulation of material over time. Differentiates human researcher from proxy which is not a user. Users are human beings.

HTRC Overview



HTRC Portal Home About Worksets Algorithms Results HTRC Data Capsule Data Help docdownie1

Meandre_Classification_NaiveBayes

Description: This analysis will perform NaiveBayes Classification. Given a workset (that was uploaded as a csv file) containing the workset volume ids as a "volume_id" attribute and labelled data as a "class" attribute. Loads each page of each volume from HTRC. Removes the first and last line of each page. Joins hypenated words that occur at the end of the line. Uses the replacement rules (learned from our usage of Google Ngrams data) to clean OCR errors, normalize to British spelling and normalize for period spelling (or you can change this to your own custom replacement rules). Performs part of speech tagging, selecting nouns, verbs, adjectives and adverbs. Lowercase all tokens. Counts the tokens remaining for each volumes eliminating tokens with count of 1. Selects the number of attributes specified by num_attributes to use in modeling. Removes attributes that exist in only one volume and removes attributes that exist in all documents. Splits the data randomly into a training (60%) and testing (40%) set. Performs uniform discretization of frequency counts of the tokens by creating 2 equally spaced bins between the minimum and maximum for each scalar column. Creates a NaiveBayes model on the training set. Calculates the accuracy of the training and testing set and outputs the confusion matrix. Outputs the predicted value of the volumes in the training and testing sets. NOTE: The volume limit is 1000.

Version: 1.2

Author: Loretta Auvil

Please enter a job name: (required)

000mixed_grill@docdo::Meandre_Clas::18:58:14

Please select a workset that has a "volume_id" and "class" attribute. (required)

Select a workset from my worksets Select a workset from all worksets

000mixed_grill@docdownie1

The labelled input workset is a workset (csv file) that you have uploaded containing the "volume_id" and "class" attributes.

Please provide a url that contains a text file of replacement rules (default: http://sandbox.htrc.illinois.edu/data/text/ngram_corrections.txt) (optional)

http://sandbox.htrc.illinois.edu/data/text/ngram_corrections.txt

The replacement rules are used for cleaning and normalizing tokens.

Please provide the number of attributes to keep for modeling. (optional)

1000

The number of attributes to keep for modeling.

Please provide the percentage to use for the training set. (optional)

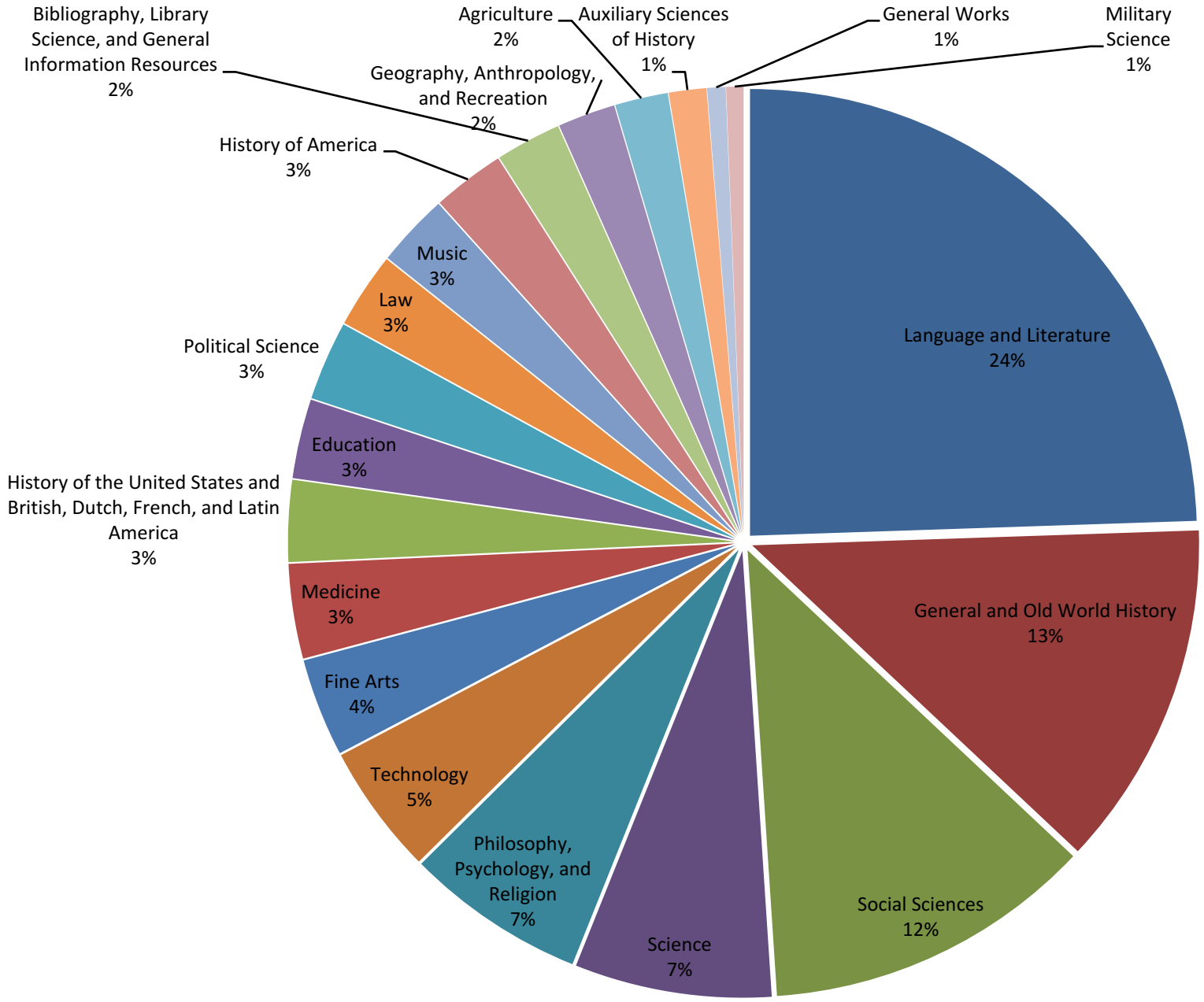
60

The percentage to use for the training sets.

Please provide the percentage to use for the testing set. (optional)

https://sharc.hathitrust.org/viewalgorithm?algorithmName=Meandre_Classification_NaiveBayes&message=+

Discovering Music Resources in HathiTrust by Library of Congress Classification and Subject Headings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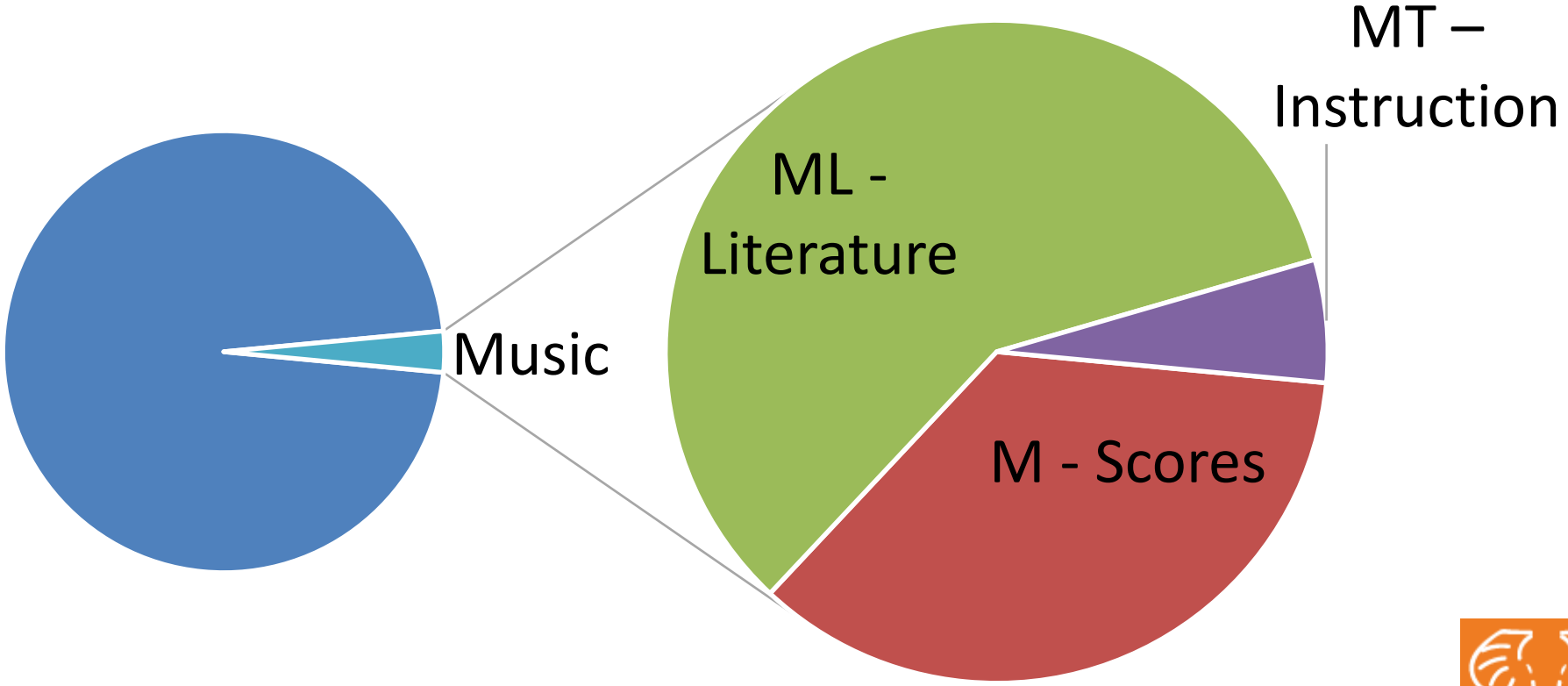
Music 3%
History of America 3%
Geography, Anthropology, and Recreation 2%
Bibliography, Library Science, and General Information Resources 2%
Agriculture 2%
Auxiliary Sciences of History 1%
General Works 1%
Military Science 1%

Music in HathiTrust by LoC Subclass

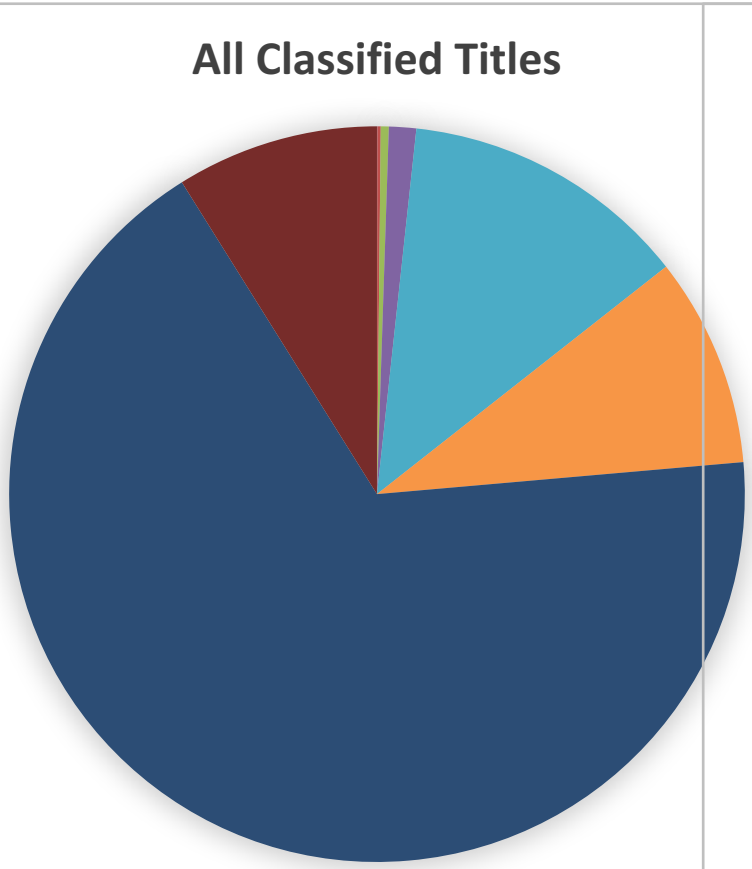


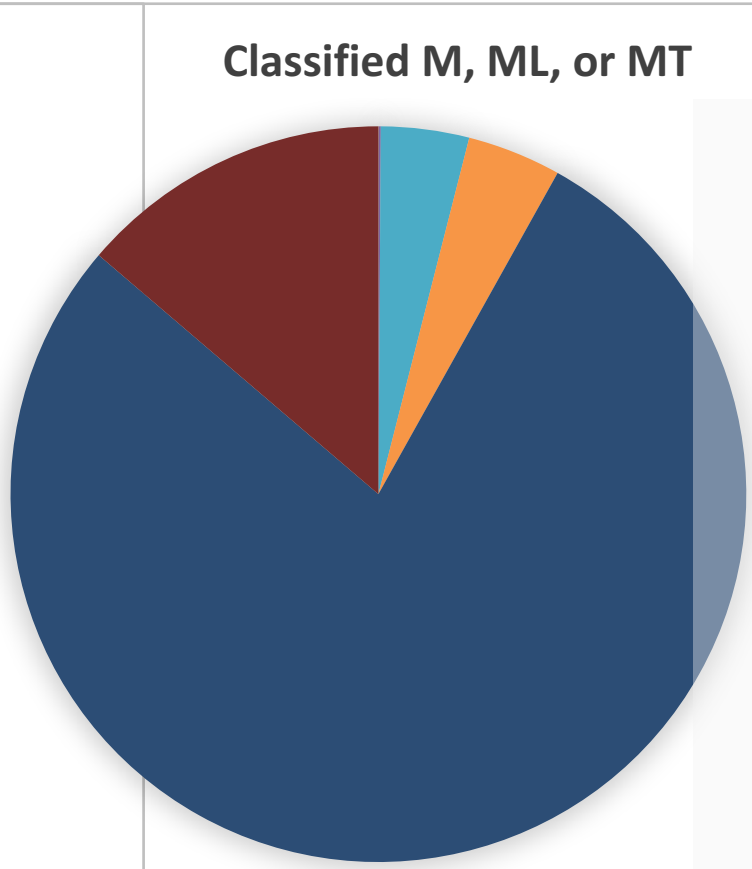
Exploring Music Resources in HathiTrust

Exploration Facets

- Publication Date
- Language
- Subject Headings
- Genre
- Full Text

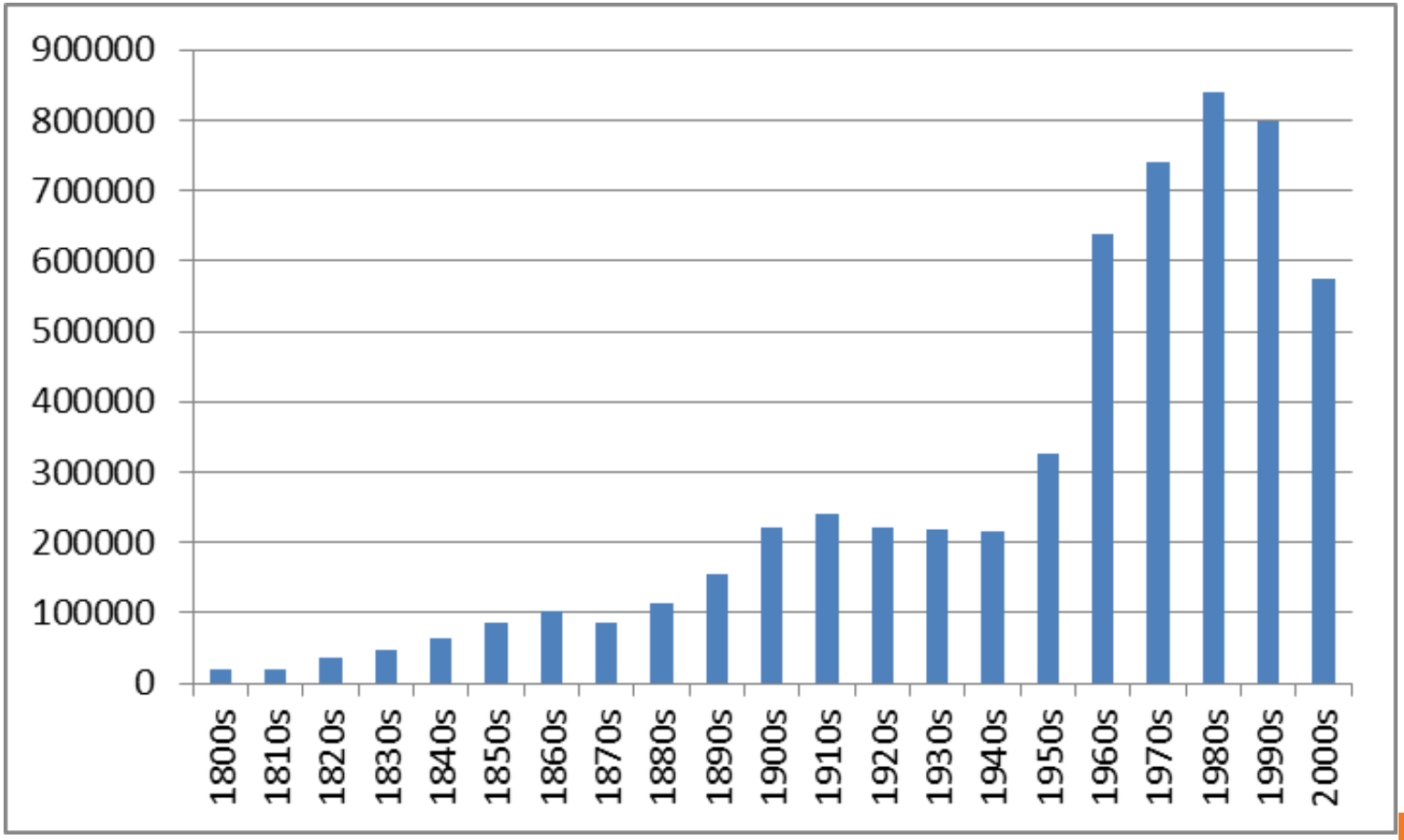
Publication Dates



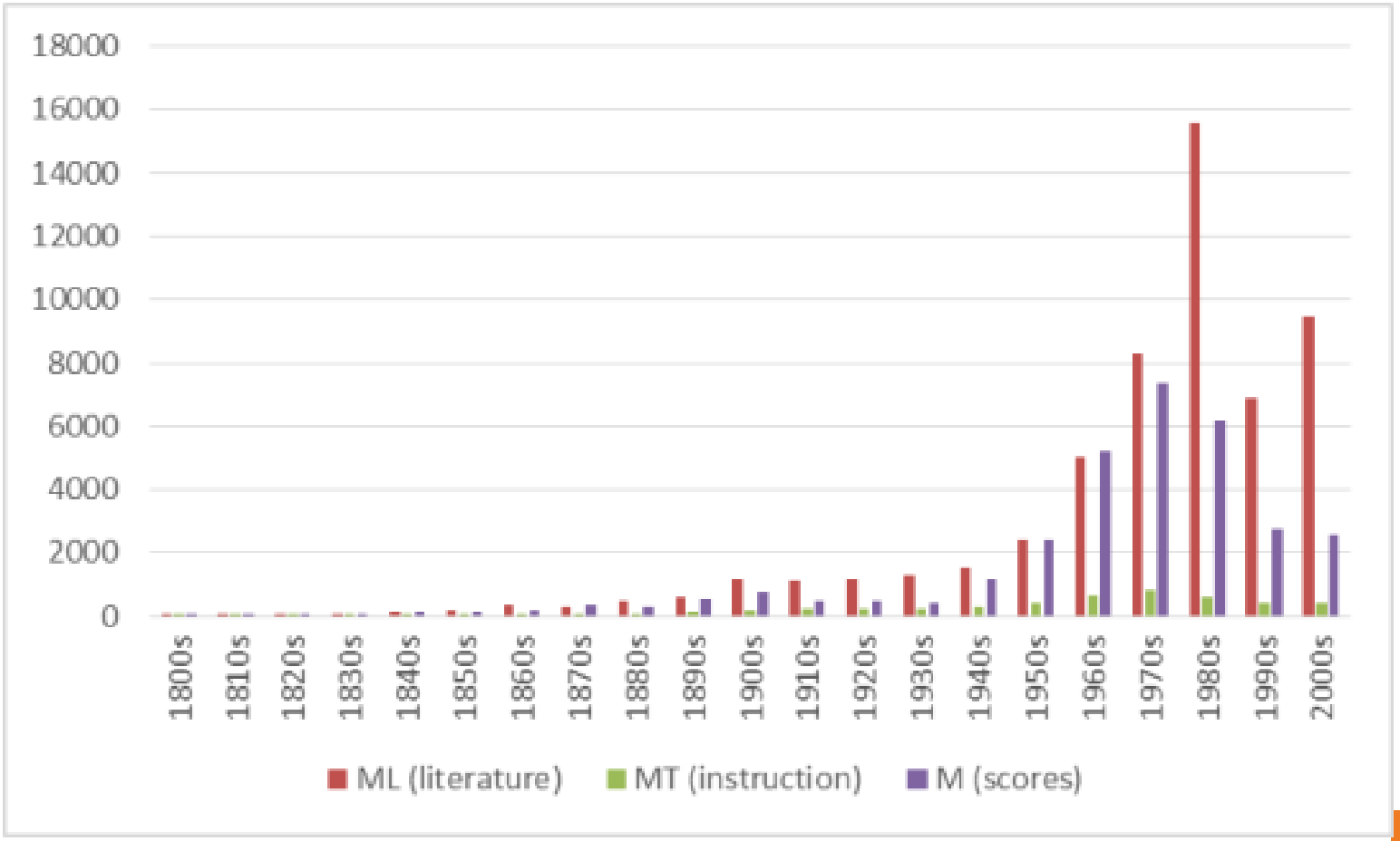


Pre 16th Century
16th Century
17th Century
18th Century
19th Century
20th Century - to 1923
20th Century - Post 1923
21st Century to 2014

Resources in HTDL by decade (between 1800 and 2010)

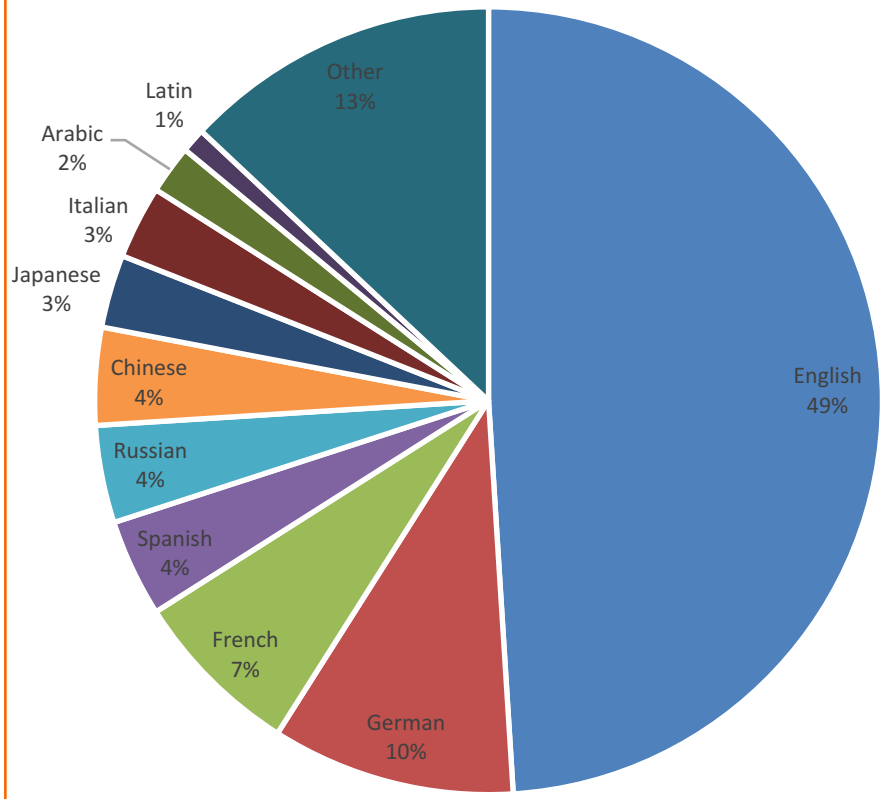


Resources in HTDL for Library of Congress subclasses M, ML and MT, by decade

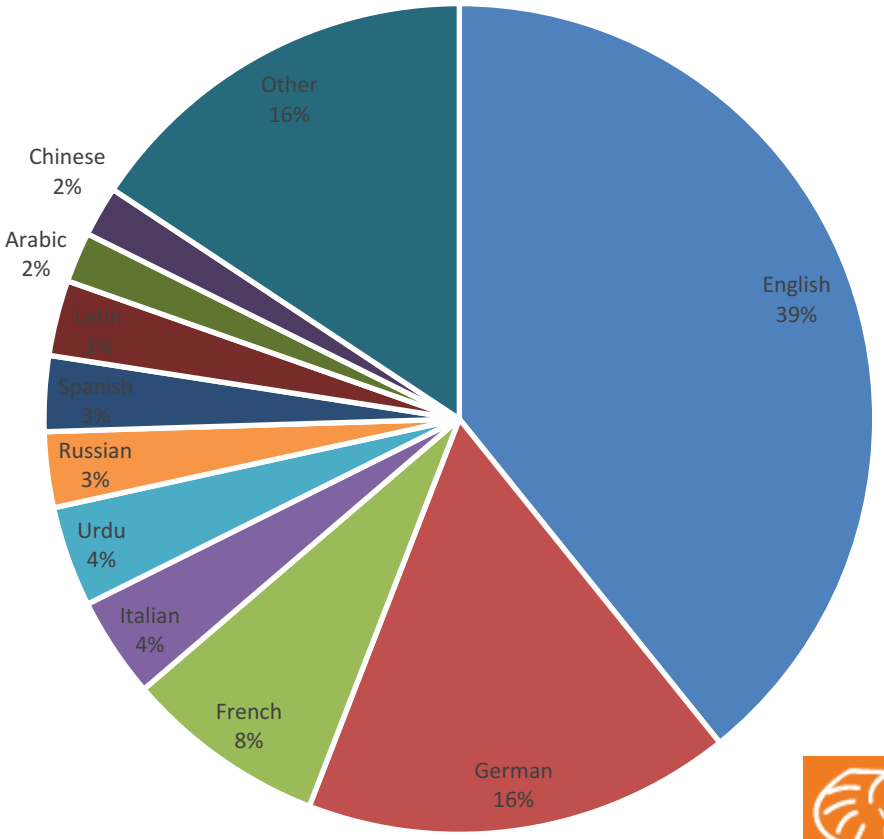


Language Coverage

Langauge in HathiTrust

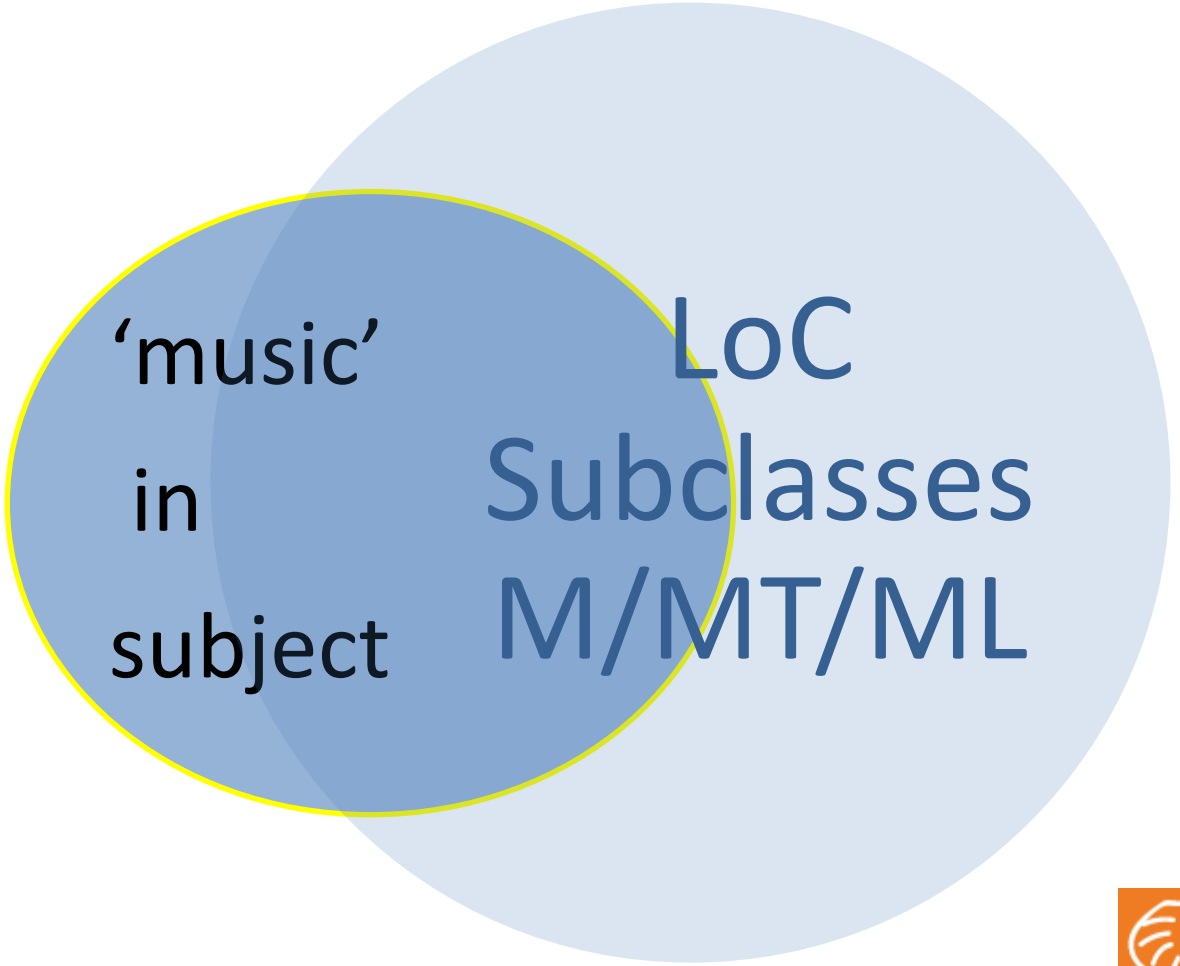


Language in HathiTrust Music Resources



HathiTrust Music Resources Mining Subject Headings

Beyond LoC Classification, additional resources can be found by searching subject headings.



Frequently represented subject fields values containing “music”

Music	24,565
Piano music	5,045
Folk music	2,026
Popular music	2,023
Organ music	1,930
Orchestral music	1,861
Church music	1,388
Songs and music	1,295
Music theory	1,217

Music Literature Subject Headings

Common subject headings
from resources in LoC Subclass ML

Music--History and criticism	432
Music--Philosophy and aesthetics	406
Music--Periodicals	315
Music--20th century History and criticism	310
Musicians--Correspondence	227

HathiTrust Music Resources - Genres

Biography	7880
Government publication	1071
Discography	310
Catalog	285
Festschrift	249
Dictionary	125
Tune-books	36
Encyclopedia	17
Handbook	8

Common genres, with character sequence “music” in at least one subject heading

HathiTrust Resources with parts (from Subject Headings)

String quartets	115
Violin and piano music	92
Violin and piano music, Arranged	87
Violin and piano music, Scores and parts	77
Violin and piano music, Arranged Scores and parts	71
String quartets, Parts	67
Sonatas (Violin and piano)	61
Sonatas (Violin and piano) Scores and parts	52

Re-Reflecting on MIREX (Reparadigming my problem space)

MIREX 2015 TASKS	
Grand Challenge 2015: Jamendo Dataset	Audio Tempo Estimation
Grand Challenge 2015: J-DISC Dataset	Audio Train/Test tasks
Audio Beat Tracking	Discovery of Repeated Themes & Sections
Audio Chord Estimation	Audio Downbeat Estimation
Audio Cover Song Identification	Query by Singing/Humming
Multiple Fundamental Frequency Estimation & Tracking	Real-time Audio to Score Alignment (aka. Score Following)
Audio Fingerprint	Singing Voice Separation
Audio Key detection	Structural Segmentation
Audio Melody Extraction	Symbolic Melodic Similarity
Audio Onset detection	Set List Identification
Music/Speech Classification and Detection	

Grand Unified Music Libraries

Can we bring the pieces together?

Hmmm…Swiss Army Knive Approach?

Songle

A Web Service for Active Music Listening
Based on Music-Understanding Technologies

AIST, Japan

Masataka Goto
Kazuyoshi Yoshii
Hiromasa Fujihara
Matthias Mauch
Tomoyasu Nakano

Songle (http://songle.jp)

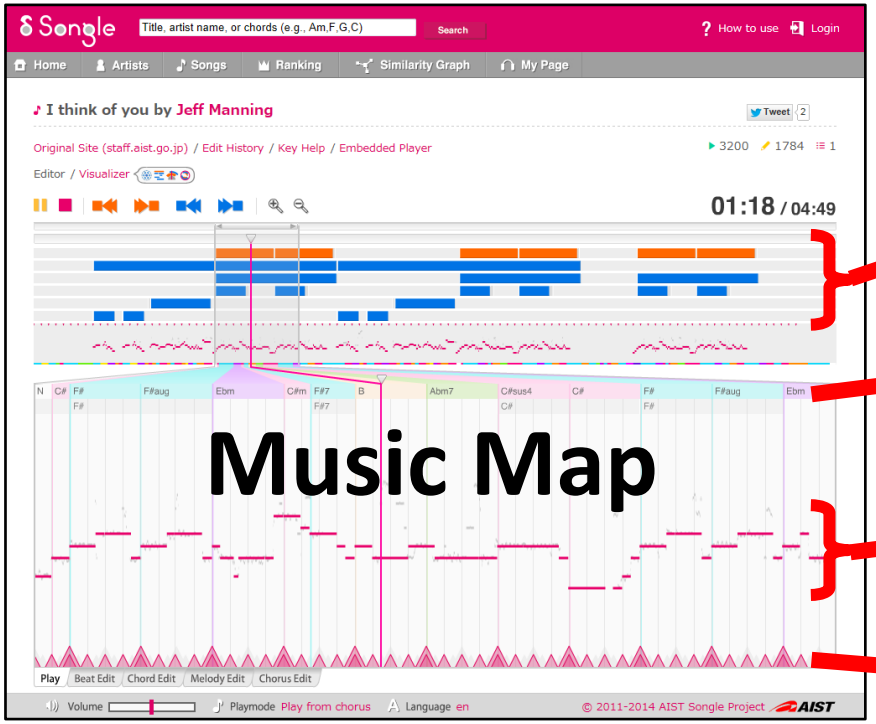
- Web service for active music listening
  - Allow end users to enjoy

    popular music (MP3, YouTube, SoundCloud, etc.) on the web

    by using music-understanding technologies

Music Map

- Use automatic music-understanding technologies



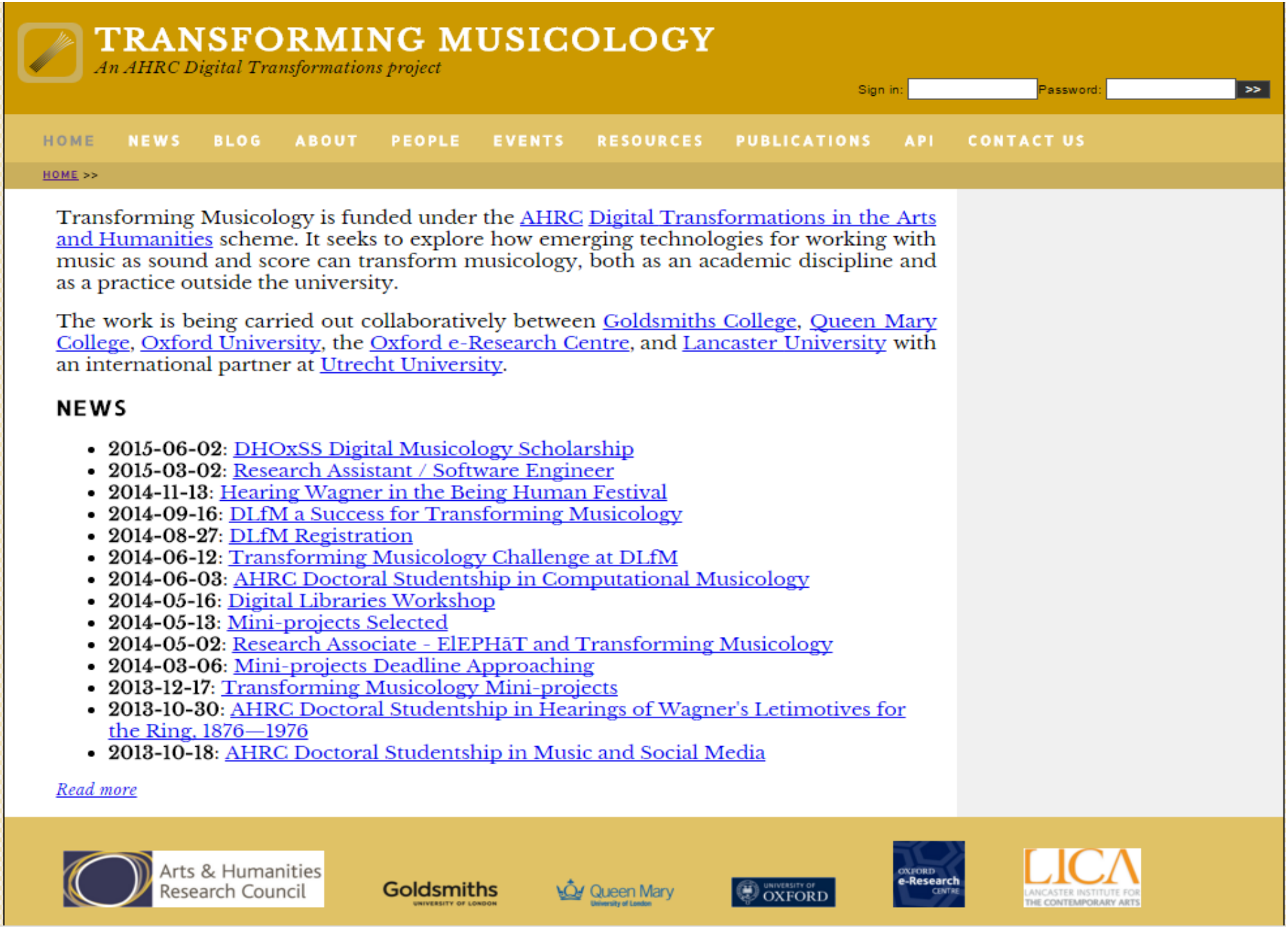
Four major types of musical elements

Music structure
(chorus / repeated sections)

Chords G/B Am
(root note and chord type)

Melody line
(F0 of the vocal melody)

Beat structure
(musical beats and bar lines)



http://www.transforming-musicology.org/

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DLfM 2017

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4th International Digital Libraries for Musicology workshop (DLfM 2017)

SATURDAY 28TH OCTOBER 2017

Shanghai Conservatory of Music, 20 Fenyang Road, Xuhui district, Shanghai 200031, China

Proceedings published in ACM ICPS

A satellite event of ISMIR 2017

NEWS

- **29 June 2017**: Following several requests, we are able to offer a short deadline extension until 3rd July 2017 (23:59 UTC-11) **for updates to papers which have already submitted their title, authors, and abstract by the 1st July 2017 (23:59 UTC-11)**. Further extensions may be available in *exceptional* circumstances, but are not guaranteed -- please contact dlfm2017@easychair.org
- **26 June 2017**: Paper submissions close at the end of *this week* on 30 June! Registration for the workshop will open in August. For those attendees looking to arrange local accommodation, the location for DLfM 2017 is confirmed as the Shanghai Conservatory of Music, 20 Fenyang Road, Xuhui district, Shanghai 200031, China.
- **19 June 2017**: We are now accepting paper submissions on easychair. Authors can submit until Friday 30th June.
- **25 May 2017**: We are pleased to announce that the DLfM 2017 proceedings will again be published in the ACM Digital Library as part of the ICPS series.

CALL FOR PAPERS

In 2017 DLfM calls for paper submissions to two tracks: a 'proceedings track' for short and full papers which will be presented at the workshop and published in the workshop proceedings; and a 'Transforming Musicology challenge' track for presented papers and posters.

Workshop location

Shanghai is one of the most populous cities in the world, a major international gateway to China and an important academic centre, housing over thirty universities and colleges. As a location for a satellite workshop of ISMIR, it is especially convenient, being on the route

ICPS Published by ACM

PREVIOUS WORKSHOPS

DLFM 2016

DLFM 2015

DLFM 2014

DLFM 2017 IS KINDLY SUPPORTED BY:

Since 1927 上海音樂學院 SHANGHAI CONSERVATORY OF MUSIC

Transforming Musicology

OXFORD e-Research CENTRE

UNIVERSITY OF OXFORD

FAST

http://www.transforming-musicology.org/dlfm2017

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Dutch Song Database

stanza search

search AND all words (songs) sort by year

Browsing the Dutch Song Database

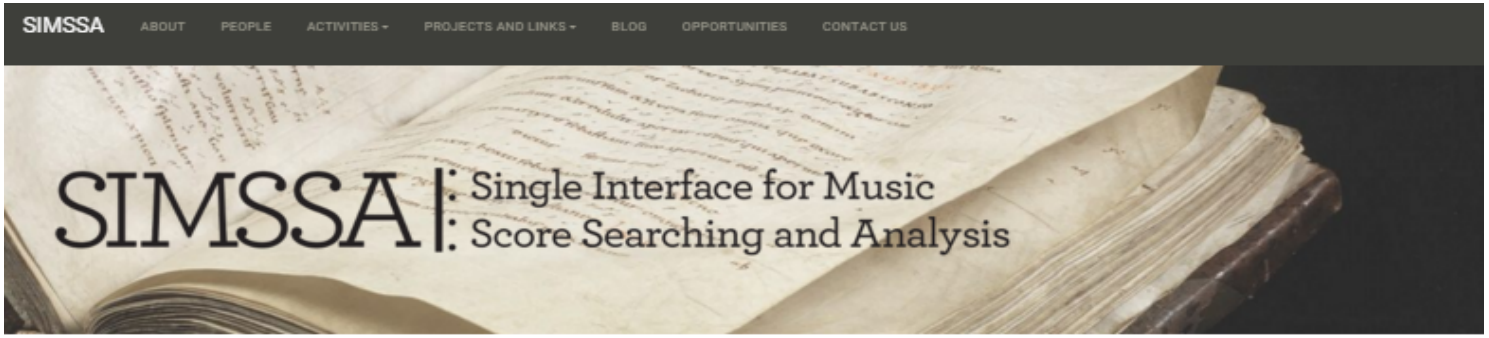
For an impression of the content of the Dutch Song Database (over 170.000 songs) we suggest some routes for browsing:
Songs with audio
Songs with audio
Songs with full texts
Songs about specific subjects
Songs with a story

Songs with audio

Souterliedekens are rhymed psalm translations in Dutch, set to popular tunes. They were made by the Utrecht nobleman Willem van Zuylen van Nyevelt, who is also responsible for choosing the more than 150 melodies. In this way he hoped to get the youth to sing psalm texts. The Souterliedekens were published in Antwerp in 1540. It is the first complete Psalter in any European vernacular. Nowadays we are most interested in the music: thanks to the melodies of the Souterliedekens, represented in mensural notation, we can sing many of the original secular texts. These texts are only known from sources without music, such as the Antwerp Songbook (1544). By combining the texts from the Antwerp Songbook with the melodies of the Souterliedekens we can reconstruct the popular music of the sixteenth century.
You can listen to the first stanza of all the Souterliedekens, sung by a choice of Dutch and Flemish singers, recorded in 2001 for the Repertorium of Dutch Songs until 1600.
all Souterliedekens

Songs from Under the Green Linden For his radio program Under the Green Linden Ate Doornbosch made some 5,000 recordings of old songs sung by people who had sung them in the beginning of the 20th century during work on the fields or at home, sitting 'under the green linden'. Because of the oral tradition every version is different. Listen to all our recordings of some ballads:
Daar ging een heer dikwijls van huis (A Man Went Often Away From Home - The False

http://www.liederenbank.nl/index.php?actie=grasduinen&lan=en



The Single Interface for Music Score Searching and Analysis project (SIMSSA) is teaching computers to recognize the musical symbols in digital images of musical scores, linking materials from the shelves of libraries and museums from around the world in a single digital forum.

Our goals include:

- Creation of a 21st-century architecture for processing music documents
- Transformation of symbolic representations into searchable data
- Search and analysis tools for large digital music collections
- Public access to musical data that can be studied, analyzed, and performed

For more information, please contact Ichiro Fujinaga

Le Projet SIMSSA (Single Interface for Music Score Searching and Analysis, que l'on pourrait traduire en français par « Interface unique pour la recherche et l'analyse de partitions musicales ») a pour objectif d'apprendre aux ordinateurs à extraire les symboles musicaux de partitions musicales ayant été numérisées. Il a également pour objectif de réunir en un seul lieu virtuel les collections de bibliothèques et de musées du monde entier.

Nos objectifs incluent :

- créer une infrastructure du XXIe siècle pour le traitement de partitions musicales;
- transformer ces partitions musicales en données recherchantes;
- développer des outils de recherche et d'analyse pour de grandes collections de partitions musicales numériques;
- donner accès à ces collections musicales afin qu'elles puissent être étudiées, analysées et interprétées.

Pour plus d'information, veuillez communiquer avec Ichiro Fujinaga

Social Sciences and Humanities Research Council of Canada
Conseil de recherches en sciences humaines du Canada
Canada

McGill
Schulich School of Music
École de musique Schulich

DDMAL
DISTRIBUTED DIGITAL MUSIC ARCHIVES & LIBRARIES LAB

CIRMMT
Centre for Interdisciplinary Research in Music Media and Technology

Fonds de recherche
Société et culture
Québec

http://www.transforming-musicology.org/dlfm2014

SIMSSA

- Prototype for "Google scores" minus Google
  - OMR (optical music recognition) is required for full-text search
  - Sophisticated music query (based on ELVIS)
- Access to digitized scores world-wide from a single website
- Find pages that contain scores in Google Books (HathiTrust)
  - HathiTrust: 6.8M book titles (4.7Billion pages): 612TB

What would SIMSSA provide?

- Web-based optical music recognition (OMR) system with score editors
  - Rodan (Remote Online Document Analysis Network)
    - Gamera + Aruspix (a combination of existing OMR software)
  - Verovio (open-source music engraver)
  - "Gradsourcing" to correct errors
  - Early music
- Web-based user interface to view, search, annotate, and analyze scores
  - MEI (Music Encoding Initiative)
  - Diva.js (web-based IIIF-compatible document delivery system)
  - Humdrum / music21 (analytical tools)

The Vision: Global Music Library

Tools

diva.js

Music Encoding Initiative

Humdrum

music21

DIAMM
Digital Image Archive of Medieval Music

IMSLP

Early Music Online

Music Treasures Consortium

Metadata & Text

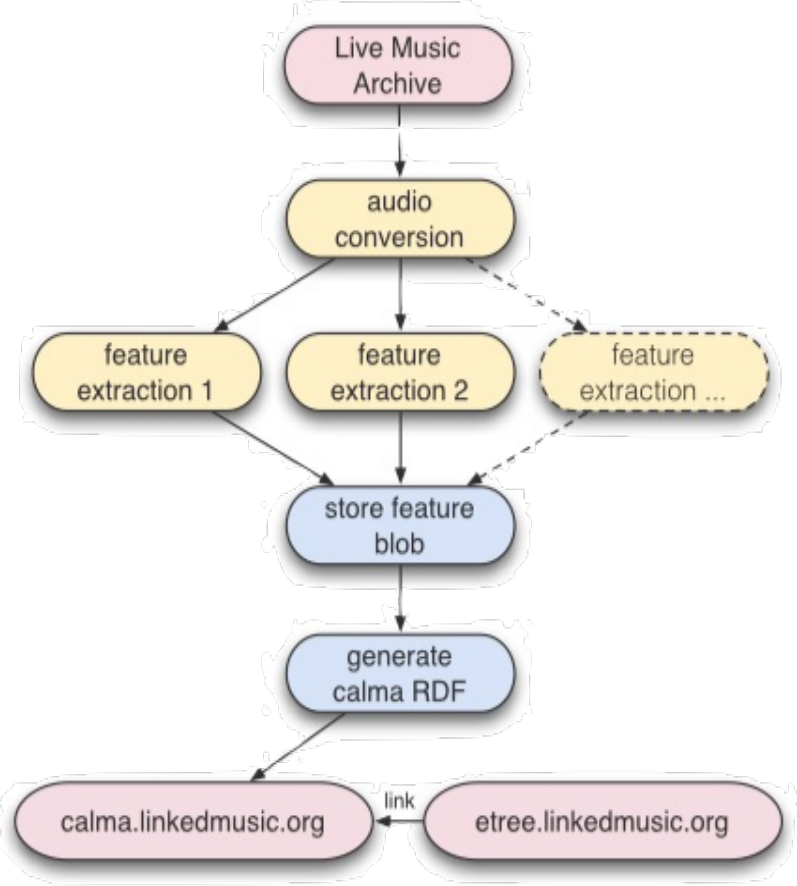
cantus

RISM

rilm

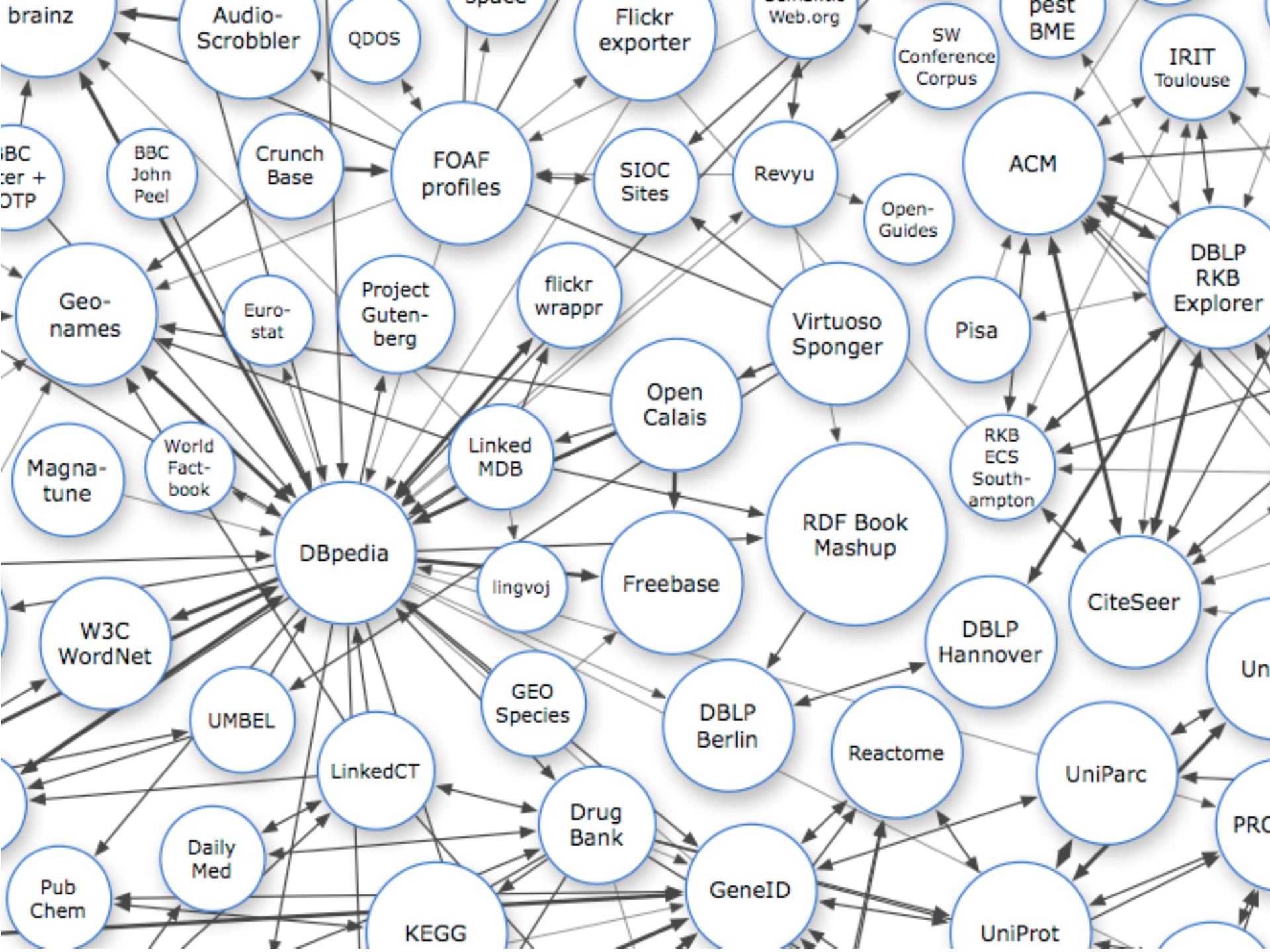
CALMA

Computational Analysis of the Live Music Archive



- Linked data service for a big music collection
- Metadata
  - user generated
  - audio feature extraction
- Provide data for research
- Basis for tools to navigate the Live Music Archive
- data linked to etree (~140,000 performances)

Mark Sandler. ISMIR 2015 Keynote.


brainz
Audio-Scrobbler
QDOS
Flickr exporter
Web.org
SW Conference Corpus
pest BME
IRIT Toulouse
BBC John Peel
Crunch Base
FOAF profiles
SIOC Sites
Revyu
ACM
Open-Guides
Geo-names
Euro-stat
Project Guten-berg
flickr wrappr
Virtuoso Sponger
Pisa
DBLP RKB Explorer
Open Calais
Magna-tune
World Fact-book
Linked MDB
RKB ECS South-ampton
DBpedia
RDF Book Mashup
lingvoj
Freebase
CiteSeer
W3C WordNet
DBLP Hannover
GEO Species
DBLP Berlin
UMBEL
Reactome
UniParc
LinkedCT
Drug Bank
Daily Med
Pub Chem
GeneID
KEGG
UniProt

Wrapping Up

Almost done.

Closing thoughts

- Are we there yet?
  - No, but the pieces to make it happen are at hand
- Can MIR help musicology?
  - Absolutely
    - Need to resolve data issues
    - Perfection is the enemy of the good
    - Need to shift questions
    - Requires some mental agility
    - Need to manage expectations

THANK YOU!

Thanks to the great ISMIR, Digital Library and Digital Humanities Communities

And thanks to everyone who let me steal their slides.