End-to-end loading of new music libraries to F-Tempo via IIIF Alastair Porter¹, Tim Crawford², David Lewis²

alastair.porter@upf.edu ¹Music Technology Group, Universitat Pompeu Fabra, ²Goldsmiths, University of London

We have a new end-to-end system to automatically load metadata and musical content into F-Tempo, our early music search tool, and process it so that it can be searched in our web interface.

Read more about F-Tempo at https://f-tempo.org Crawford, Tim; Badkobeh, Golnaz and Lewis, David. 2018. 'Searching Page-Images of Early Music Scanned with OMR: A Scalable Solution Using Minimal Absent Words'. Proceedings of the 19th International Society for Music Information Retrieval Conference, 2018.

Data ingest

● ● E × K > api.digitale-sammlungen.de	ф + С	•••		🔒 rism.online	<u></u> ث +
		RISM	16 Motets; Print; Boettick	erL 1999 1585δ, LV 830-845	
seeAlso": [0	\sim	Here Description Source contents (16)		
"@id": "https://mdz-nbn-resolving.de/details:bsb00094091",					
"label": "Details",		\oplus	Title and content description		
"format": "text/html"			Composer/Author	O Lasso, Orlando di (1532c-1594)	
}.			Source type	Print	
{`		AR	Content type	Notated music	
"@id": "https://opacplus.bsb-muenchen.de/title/BV007831059",			Standardized title	16 Motets	
"label": "OPAC",		FB(1	Title on source	[title page, parts:] CANTICA SACRA, RE- CENS NVMERIS ET MODVLIS MVSICIS ORNATA, NEC VLLIBI	
"format": "text/html"		T		ANTEA TYPIS EVVLGATA. SEX ET OCTO VOCIBVS. Authore ORLANDO LASSO, Sereniß: Boiorum Ducis	
},		**		Symphoniacorum Præfecto. [indication of part] MONACHII EXCVDEBAT ADAMVS BERG. Cum	
s, s			Searing summary	Priuilegio Cæs: Maiest: peculiari, cuius Argumentum pagina versa continet. ANNO SALVTIS M. D. LXXXV. V (6)	
"@id": " <u>https://opacplus.bsb-muenchen.de/title/BV007831059?format=marc</u> ",		童	Scoring summary	V (8)	
"label": "MARCXML",		_	Total scoring	V (X)	
		5	Language of text	Latin	
"format": "application/marcxml+xml",			Series statement fields	RISM A/I L 956: LL 956	
"profile": "http://www.loc.gov/standards/marcxml/"			RISM ID number	990036742	
			Subject headings	Motets	
<pre>"@id": "https://opacplus.bsb-muenchen.de/title/BV007831059?format=rdf",</pre>			Material description		
"label": "RDF",			Group 01		
"format": "application/rdf+xml",			Source type	Print	
"profile": "https://lod.b3kat.de/doc"			Content type	Notated music	
}			Place of publication	MONACHII [München]	
l,			Publisher, copyist	EXCVDEBAT ADAMVS BERG	
sequences": [Date	1585	
$\{$			Format, extent	6 parts	
"@id": "https://api.digitale-sammlungen.de/iiif/presentation/v2/bsb00094091/sequence/normal",			Parts held and extent	S: 20 f. A: 20 f.	
"@type": "sc:Sequence",				A: 201. T: 20 f.	
"canvases": [B: 20 f.	
				V 5: 20 f.	
"@id": "https://api.digitale-sammlungen.de/iiif/presentation/v2/bsb00094091/canvas/1",			Drinting technique	V 6: 20 f.	
"@type": "sc:Canvas",			Printing technique	Typography 4°	
"label": "(0001)",			Book format	4	
"service": {			General note	Gesamtunfang, T: f. a1r Titel; f. a1v "EXTRACTVS PRIVILEGII CÆS: MAIEST:", gezeichnet "Rhudolphus. V.	
<pre>"@context": "http://iiif.io/api/annex/services/physdim/1/context.json",</pre>				S. Vieheuser. D. ad mandatum, &c. Ærstenberger."; f. a2r Dedikation "ADMODVM ILLVSTRI DOMINO,	
				DOMINO EYTELIO FRIDERICO, COMITI IN HOHEN- ZOLLERN, ET SIGMARINGEN, &c. DOMINO MEO	
"physicalScale": 0.007468711876569789,				COLENDISSIMO SA- LVTEM.", gezeichnet "Datæ Monachij Calendis Maij, Anno salutis M. D. LXXXV.	
"physicalUnits": "cm",				Illustri Dominationi Tuæ Obsequentissimus Orlandus Lassus."; f. a2v-e3v Noten; f. e4r "INDEX	
"profile": " <u>http://iiif.io/api/annex/services/physdim</u> "			1	MOTTETARVM, QVÆ IN HOC LIBRO CONTINENTVR." und Schlussvermerk "FINIS."; f. e4v leer.	
}, HimagosHi [6	Record URI (Permalink): https://rism.online/sou	rces/990036742	Created on: November 111
"images": [i	Report an issue		Last modification: June 11t

- We automatically process items starting from the IIIF Manifest 1. Download manifest and linked images 2. Download metadata from RISM Online and the library
- 3. Using Aruspix, perform OMR on the images to obtain a symbolic representation
- 4. Post-process the resulting MEI to extract Minimal Absent Words for efficient search
- 5. Build search index in Solr with combined textual metadata and musical content

We start with IIIF manifests of source books which we want to add to F-Tempo, provided by libraries.

We worked with RISM Digital Center to link IIIF Manifests from our source libraries to items in RISM Online (GB-Lbl: 326 books, D-Mbs: 1300 books).

For items which could not be mapped, we download metadata from the source libraries.

Metadata search

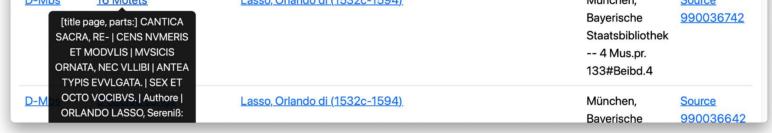
		localhost	ري وي <i>ي</i>	۵
F-Tempo	Examples Manual search Browse	corpus Help		
	Browse the F-Te	empo corpus by	library	
	• D-Mbs • <u>GB-Lbl</u>			
	Browse the F-Te	empo corpus by	person	
	 Leuttner, Georg Christoph Mareschall, Samuel (1554) Eisenhuet, Thomas (1644) Zenaro, Giulio (1590p+) Löwe von Eisenach, Johan Jacquet de la Guerre, Elisa Dietzel, Johann Sebastian Gastorius, Severus (1646) Tartaglino, Ippolito (1539c) 	<u>-1640)</u> - <u>1702)</u> In Jakob (1629-1703) Ibeth-Claude (1664c-1729) (17/18). - <u>(17/18)</u> .		
	 Du Beron (16.sc). Hagius, Johann (1530c-15) Schmid, Bernhard (1535-1) Gippenbusch, Jakob (1612) Palladius, David (1599c+). Herpol, Homer (1520c-15) 	575 <u>p)</u> 1592) 2-1664)		

F-Tem	po Examples Manual se	earch Browse corpus Help		
	se the F-Ten , Orlando di (15	npo corpus by person 532c-1594)		
Library	Title	Composer	Shelfmark	RISM
<u>D-Mbs</u>	Ein schön nutz und gebräuchlich Orgeltabulaturbuch	Lasso, Orlando di (1532c-1594), Riccio, Teodoro (1540c-1601c), Striggio, Alessandro (1536c-1592), Paix, Jakob (1556-1623p), Senfl, Ludwig (1489p-1543c), Paix, Gilis (16.sc), Josquin des Prez (1450p-1521), Bourges, Clementine de (1561+), Janequin, Clément (1485c-1558), Mertel, Elias (1561c-1626), Zirler, Stephan (1520c-1568), Paix, Aegidius (16.sc), Utendal, Alexander (1530c-1581), Crecquillon, Thomas (1505c-1557c), Aloysius, Walter, Johann (1496-1570), Rore, Cipriano de (1515c-1565), Ivo Barry (16.sc), Monte, Philippe de (1521-1603).	München, Bayerische Staatsbibliothek 2 Mus.pr. 62#Beibd.2	Source 99004823
<u>D-Mbs</u>	Patrocinium musices III	<u>Lasso, Orlando di (1532c-1594)</u>	München, Bayerische Staatsbibliothek 2 Mus.pr. 13	<u>Source</u> 99003670
D-Mbs	16 Motets	Lasso, Orlando di (1532c-1594)	München,	Source

•			localhost	5 9 0	<u></u> + ۵
F-Tempo Examp	oles Manual s	earch Browse corpus Help			
1	Motets c	ontent search for this b	<u>oook</u>		
	Composers	Jacquet de (1505c-1567c), Lasso (1535-1592), Sermisy, Claudin de	o, Orlando di (1532c-1594), Pathie, Rogier (513-1574), Godard, Robert (16.sc), Berchem, 1510c-1565p), Anonymus, Schmid, Bernhard 568), Richafort, Jean (1480c-1547p), Meiland, 5c-1557c), Rore, Cipriano de (1515c-1565)	
	Title on source	sechs/ fünff und vier Stimmen/ auß d ander Allerley schöne Teutsche/ Italie Galliardo vnd Täntze in sich begreiff außgangen/ Allen Organisten vnd ar	en Kunstreichesten vnd weitberümbtesten Musi enische/ Frantzösische/ Geistliche vnd Weltliche t. Alles inn ein richtige bequemliche vnd artliche ngehenden Instrumentisten zu nutz/ vnd der Hoc	eren das Erste außerlesne Moteten und Stuck zu cis vnd Componisten diser vnser zeit abgesetzt. Das Lieder/ mit fünff vnd vier Stimmen/ Passamezo/ e ord- nung/ deren dergleichen vormals nie im Truck chloblichen Kunst zu Ehren/ auffs Neue zusamen en zu Straßburg. Getruckt zu Straßburg/ bei Bernhart	
	Publisher	Jobin, Bernhard			
	Place of publication	Strasbourg			
	Date of publication	1577			
	Library	D-Mbs			
	Shelfmark	München, Bayerische Staatsbibli	othek 2 Mus.pr. 62		
	RISM	Source 990058133			
	Catalogue record	https://mdz-nbn-resolving.de/del	tails:bsb00083823		
	IIIF Manifest	https://api.digitale-sammlungen.o	de/iiif/presentation/v2/bsb00083823/manife	est (rism viewer)	
1	Front image				



A new feature in F-Tempo is the ability to navigate the corpus based on metadata from RISM Online. We can see an overview of the content in the corpus.



We can view all items in a library, or all items linked to a person. We can perform text search on any of the metadata that we have loaded including names, titles, shelfmarks, and other text.



We can view metadata for a specific book and switch to F-Tempo's content-based search.

Content search

••• • • < >				localhost			C	ſ
	F-Tempo Examples	Manual search Browse c	orpus Help					
Previous Book Previous Page	e Random Page Nex	t Page Next Book	Result Ranking	Jaccard Distance		~	2.0	VPERIVS.
Of 5.	XIX. CANTVS.	Orlando di Laffo.	Results to display	10		~	2 - + + + + + + + + + + + + + + + + + +	19.996 99969966
E CONTRACTOR	V-fan-na faire, fometime of loux	requefted, Su-fan-na	Collections to search D-Mbs D-Bsb cpdl	🗹 F-Pn 🗹 GB-Lbl 🗹	PL-Wn		30099999999999999	
and a state of the		FF\$ = + \$	Search 10 results — 226 wo	rds in query			36966881=06666666666666	cœur trill'et delconfortée, Fut en lon cœur trill'et del
faire	, fometime of loue reque-	fted,by two	Page ID		Match Score		té- e, Voyant l'effort fait à la chalto-	té, Elle leur dict li par defloyauté de ce corps m
3+ + + + + + =	I SIII S Sou		GB-Lbl_K3k19_(012_1	100.00		auezjouiffance, C'elt fait de moy :/: fi	jo fay reliftan- ce, Vous me ferez mourir en deshôneu
old men whome hir fweet lo	ooks al- lur'd, was in h	ir heart full fad & fore	GB-Lbl_A337b_	024_1	56.09	Q	1000' 999 b 900 - 1999 0 b	100 09900000
-+++++++++++++++++++++++++++++++++++++	0 1 0 . 11 PP 1	=======================================	D-Mbs_bsb000	91845_00060	52.67	Q	i'ayme mieux petir en innocence, Que d'offen/er par p	eché le Soigneur, Qued'offeníer : par pechél
G.III II.		0 0 V 0 0	D-Mbs_bsb000		49.82	~		
molefted, : : ful fad &	& fore mole- fted, fe	eing the force hir cha-	D-Mbs_bsb000	77375_00028	28.1	Q		
26-1-1.90-1-10	¥ • • • • • • • •	0. 9 9 - 9x0.	cpdl_Giles_Farn	aby_Susanna_fair_Soprano	25.	Q		
0		<u></u>	D-Mbs_bsb000	71987_00028	22	Q		
ftitie en- dur'd, to th	hem fhee faid, if 1 by craft proce	ir'd, doe yeld to you	D-Mbs_bsb000	84674_00096	14	Q		
269999999000	9 9 . 19	9.00.	D-Mbs_bsb000	89611_00026	14	Q		
my body to abufe it, I kill	my Conte dia Seif T	doe refufe it, you will	D-Mbs_bsb000	91205_00095	14	Q		
Gt 1 9 0 1 9 0 0		\$ 0-0 ·· 0 -						
mee judge to death reprochful	l- ly,but better it is in innoc	ence to chuse it, the						
6 9 9 9 8 8 8 9	* [* ? ? * *	90090						
by my fault t'offend my God	d on hye the by my fault, : !!:	t'offend my						

•••					localhost		C	合 + 0
	F-Tempo Exa	amples Manual sea	arch Browse corpus	Help				
Previous Book Previous Page	Random Page	Next Page	Next Book	esult Ranking	Jaccard Distance	~	A 4. SVPERIVS	
	piour ma dou ce y		Bon - jour	esults to display	10	~	1000 1000 000 000 000 000 000 000 000 0	
Allo $\mathbf{E} \mathbf{e} \mathbf{e}$ \mathbf{e}	a - jour ma dou c i - jour ma dou c i i i i i i i i i i i i i i i i i i i		Bon jour Bon jour	earch this voice	 Soprano Alto Tenor Bass 		Onjourmő cœur Bőjourma douce vi-	e, Bon jour mõ œil Bon jour ma che-
Bon jour mon cocer. Bon	s-jour ma dou e	ce vi č.	C	ollections to search D-Mbs 🕑 D-Bs cpdl	b 🗹 F-Pn 🗹 GB-Lbl 🗹	PL-Wn	39999x0.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	elle Mamignar dife, Bon iour mes de-
P P ≥ P P P mon ocil. Bon-jour na chè - mon ocil. Bon-jour na chè -	re _a mi el	He' bon-jour, ma tou- He' bon-jour, ma tou-	ie bel - le, Ma	Search 10 results — 134 w	ords in query		lices mon 2- mour, Mödoux printems, Ma douce fleur nouvelle, Mö	doux plaifir, Ma douce colombelle, Mon
Image: Second	ebè-re_a mi · · e!	He! bon-jour, ma tou-t	b 7 b te bel - le, Ma	Page ID		Match Score	paffereau, Ma gente tourterelle, Bon iour ma douce rebelle, Bon iour	na douce rebelle.
non ocil. Bon-jour ma chè	rc_a mi c!	He! bon-jour, ma tou-	e bel-le, Ma	GB-Lbl_A337b	0_021_1	100.00		
D D T T T T T T T T T T T T T T T T T T	es, mon a - mour. Mon	doux prin - temps, ma dou	- ce fleur nou-vel -	cpdl_Orlando_ Bonjour_S_VP	di_Lasso_Lassus- ERIVS_Sopran	97.04 Q		F Chanf. d'Orlan. 44. 5. 6.
mi-gnar-di - se, Bon - jour, mes dè - li - ce	s, mon amour, Mon	doux prin - temps, ma dou	- ce fleur nou-vel -	D-Mbs_bsb00	089980_00047	83.33 Q		
mi-gnar-di - se, Ron - jour, mes dè - li - ce	s, mon a - mour, Mon	doux prin - temps, ma dou	1 - ce fleur nou-vel -	D-Mbs_bsb00	077376_00003	(79.59) Q		
mi-grar-di - se, Bon - jour, mes dè - li - ce	s, mon a mour. Mon	doux prin - temps, ma dou	i - ce fleur nou-vel -	D-Mbs_bsb00	091845_00046	75.32 Q		
,e <u> </u>	· · · · · ·	6 • F 6 6	5 5 p			6012		

We have rewritten the F-Tempo frontend (React+Next.js) allowing us to more easily add new features.

19	nu guar ar - M	Jun Jun,	ines de s			nical.	Mon Lance		and the new type were		D-Mbs_bsb	00091845_00046		75.32	Q
6	-le, M	n doux plai - sir, a	a dou - c	ce co-lom-	bel - k,	≹ ↑ Mo	n pas - s	e-reau, ma gen-	c tour-te - rel		cpdl_Orland	lo_di_Lasso_Ws-la	iss-bon_Soprano	68.13	Q
6		doux plai - sir, n	a dou - c	ce co-lom-	bel - le,	ک Mor	n pas - se -	reau, ma gen	e tour-te - rel		cpdl_di_Las	so_CPDLBonjourm	noncoeur_Sopran	65.00	Q
6	le, Mon	doux plai - sir, m	a dou	ce co-lom-	hel - le,	\$ f	pas-se - reau,	→ p l b ma gen	e taur - te - rel		D-Mbs_bsb	00071988_00003		52.4	Q
9:	-le, Mon	doux plai - sir, n	a dou	₿ Ĵ ₿ . co-lom-	bel - ke.	ي Mor	n pas + se -	reau, ma gen	- e tour-te - rel -	m	D-Mbs_bsb	00092005_00011		50.0	Q
											D-Mbs_bsb	00077374_00023		42.1	Q

For example, we can now show symbolic scores in the F-tempo frontend. In this example we have loaded scores from CPDL and searched for matches in our corpus.

10th International Conference on Digital Libraries for Musicology. Milan, Italy. 10 November 2023





UNIVERSITY OF LONDON



https://dev.f-tempo.org

Use it yourself at our DLfM demo: