

Speeding-up the encoding of mensural collections from Spanish libraries



easda
Esc. de Arte y Superior
de Diseño de Alicante



Universitat d'Alacant
Universidad de Alicante

Outline

- ❖ Spanish libraries and archives
- ❖ The role of music encoding
- ❖ Digital encoding methods
- ❖ Optical Music Recognition
- ❖ MuRET tool
- ❖ Ongoing work

World Heritage Sites in Spain



Third most UNESCO World Heritage sites

World Heritage Sites in Spain



Third most UNESCO World Heritage sites

World Heritage Sites in Spain



Third most UNESCO World Heritage sites

World Heritage Sites in Spain



Third most UNESCO World Heritage sites

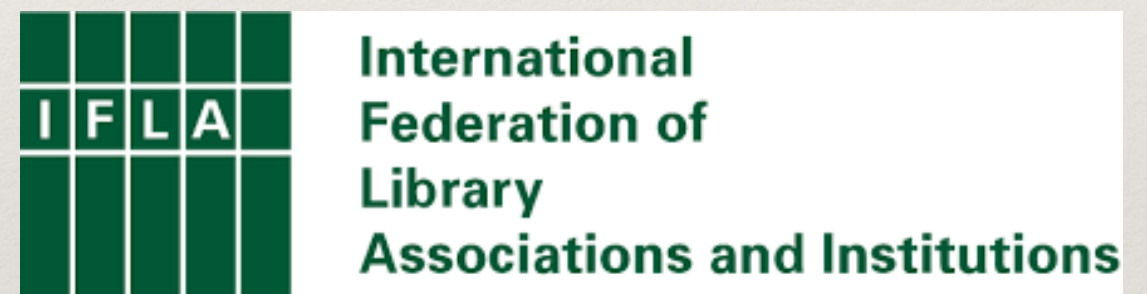
World Heritage Sites in Spain



Third most UNESCO World Heritage sites

Cooperation

- ❖ Most professionals managing collections cooperate in...



Spanish libraries and archives



The screenshot shows the header of the Eresbil website. On the left is the Eresbil logo, which consists of a blue square with white horizontal lines and the word 'Eresbil' in white text below it. To the right of the logo, the text 'musikaren euskal artxiboa' and 'archivo vasco de la música' is displayed in a black, sans-serif font. Below this header is a black navigation bar with white text for various sections: 'ACTUALIDAD', 'SERVICIOS', 'TRANSPARENCIA', '¿QUIÉNES SOMOS?', 'CATÁLOGO', 'WEBS TEMÁTICAS', and 'DIRECTORIO'. The 'CATÁLOGO' link is highlighted with a blue background. Below the navigation bar, the main content area has a light blue background. It features two columns. The left column is titled 'Catálogo general' in a large, bold, blue font. Below the title, it says 'Grabaciones sonoras, partituras impresas, libros y revistas existentes en Eresbil.' and includes a blue button with the text 'Ir al catálogo general'. The right column is titled 'Otros catálogos' in a large, bold, blue font. Below the title, there is a list of four links, each preceded by a right-pointing chevron: 'Partituras de música vasca', 'Bibliografía musical vasca', 'Catálogo Colectivo de Euskadi', and 'Liburuklik - Eresbil digital'. In the bottom right corner of the main content area, there is a small graphic showing a vinyl record, a CD, and some sheet music.

Eresbil

musikaren euskal artxiboa
archivo vasco de la música

ACTUALIDAD · SERVICIOS · TRANSPARENCIA · ¿QUIÉNES SOMOS? · **CATÁLOGO** · WEBS TEMÁTICAS · DIRECTORIO

Catálogo general

Grabaciones sonoras, partituras impresas, libros y revistas existentes en Eresbil.


Ir al catálogo general


Otros catálogos


- › Partituras de música vasca
- › Bibliografía musical vasca
- › Catálogo Colectivo de Euskadi
- › Liburuklik - Eresbil digital




Spanish libraries and archives







**Biblioteca
de Catalunya**

 El Podcast de la BC


 El Blog de la BC


 Connecta't

Català ▼

Cerca al web



 Mapa web

A A A

Inici

Coneix-nos

Visita'ns

Fons i col·leccions

Catàlegs

Serveis

Professionals

Cap a RDA

La BC en 360°

Ets a: [Inici](#) / [Fons i col·leccions](#) / Música

Adquisicions singulars

Novetats al catàleg

Cerca Fons i col·leccions

Tresors de la BC

Arxius

Manuscrits

Llibres impresos

Revistes i diaris

Materials gràfics

Fotografies

Mapes

Música


Sonors i vídeos

Arxiu Joan Maragall


Museu Marès

Música


Més de 50.000 obres manuscrites i impreses tant de literatura i tractats musicals com de partitures d'un ampli grup d'autors de diverses èpoques, estils i procedències. També té entre el seu fons els arxius personals de compositors, musicòlegs o intèrprets, com Isaac Albéniz, Conxita Badia, Xavier Benguerel, Manuel Blancafort, Robert Gerhard, Enric Granados, Lamote de Grignon, Joaquim Homs, Frederic Mompou i Enric Morera, Anna Ricci i Amadeu Vives, entre d'altres.




Partitures impreses antigues i modernes




Notació musical de totes les èpoques




Llibrets d'òpera



Tractats i mètodes musicals





Spanish libraries and archives

INICI | QUI SOM? | UNITATS ARTÍSTIQUES | PROGRAMACIÓ | NOTÍCIES | AJUDES | FESTIVALS | PUBLICACIONS | **DOCUMENTACIÓ** | AGENDA

Castellano | **Valencià**

IVC > MÚSICA > DOCUMENTACIÓ

Documentació



Manuscrit d'una sonata de Rafael Anglés (1730-1816) al fons José Iturbi

Centre de documentació musical

El centre de documentació musical de l'IVC disposa d'una biblioteca-mediateca especialitzada en continu creixement, de la qual formen part publicacions adquirides o rebudes i una sèrie de documents inèdits d'elaboració pròpia, entre els quals destaquen els enregistraments de música tradicional valenciana i les entrevistes a protagonistes de la nostra escena musical, a més de fotografies i gravacions d'alguns dels festivals i cicles organitzats per la Generalitat des de 1985 aproximadament. Compta així mateix amb una col·lecció de programes i cartells d'activitats musicals realitzades per tota la Comunitat Valenciana durant les últimes dècades. El centre coordina a més les publicacions de l'IVC en matèria de música, tant llibres com gravacions discogràfiques, i ha organitzat o col·laborat en nombroses exposicions, conferències i congressos.

D'altra banda el centre de documentació musical de l'IVC ofereix als investigadors l'accés a una sèrie d'importants llegats o dipòsits de músics i institucions, com:

- Matilde Salvador / Vicent Asencio
- José Iturbi
- Salvador Seguí
- Ofelia Rana

Sol·licitem el seu permís per a obtenir dades estadístiques de la seua navegació en esta web, en compliment del Reial Decret Llei 13/2012. Si continua navegant considerem que accepta l'ús de cookies. [OK](#) | [Més info](#)

Spanish libraries and archives



Junta de Andalucía
Consejería de Cultura y
Patrimonio Histórico

**Centro de Documentación
Musical de Andalucía**

Centro Documentación Biblioteca

Buscar...



Inicio / Centro de Documentación Musical de Andalucía



VISITAS AL CDMA

Proyecto Patrimonio Musical e Interdisciplinariedad, con el objetivo de acercar el fondo musical a la sociedad.

Efemérides



Efemérides



Spanish libraries and archives



Español

Socios en línea

Clientes en línea



[Inicio](#)

[Socios](#)

[Clientes](#)

[Actualidad](#)

[Somos SGAE](#)

[Consejos territoriales](#)

[Repertorio online](#)

[COVID-19](#)

[Read in english](#)

ALQUILER Y CONSULTA DE FONDOS

Centro de Documentación y Archivo

El Centro de Documentación y Archivo (CEDOA) de la SGAE es el archivo de música civil más importante de España a la par que una de las más completas bibliotecas teatrales del país. Nuestro origen corre paralelo al de la propia SGAE, ya que desde el mismo momento en que ésta se fundó (en 1899 bajo las siglas SAE) se creó el archivo, que no ha dejado de crecer a lo largo de estos más de cien años de vida gracias a la actividad creativa de los socios de SGAE.

Transfiriendo datos desde s3-eu-west-1.amazonaws.com...

Spanish libraries and archives

[Trámites](#) [Actualidad](#) [El Ayuntamiento](#) [Distritos](#) [Oposiciones](#) [Contacto](#) 



Biblioteca Histórica Municipal

Lo más visto 

[Biblioteca Pública Municipal Iván...](#) / [Bibliotecas Públicas. Solicitud d...](#) / [Biblioteca Pública Municipal Euge...](#)

 [Cultura, ocio y deporte](#) > [Cultura y ocio](#) > [Biblioteca Histórica Municipal](#)

  [a+](#) [a-](#) 

Teatro y Música escénica

[← Volver](#)

Portada

Información general

Emilia Pardo Bazán:
mujer de vasta
ilustración y fino ingenio

Política de donación a las
instituciones de
patrimonio bibliográfico
y documental



PRIMERA PARTE.
DE FREY LOPE DE VEGA CARPIO.
HABLAN EN ELLA LAS PERSONAS SIGUIENTES.

Ordoño, Rey de Leon, Barba.	Doña Elvira, Infanta	Fortun, Labrador
Don Ramiro	Laura, Labradora	Sancho, Villano.

Proceden en su mayor parte de los teatros madrileños de la Cruz y del Príncipe, cuyo origen se encuentra en los corrales de comedias del mismo nombre, fundados en 1579 y 1582 respectivamente. En sus archivos se conservó desde fechas tempranas toda la producción teatral. y junto a obras del Teatro de los Caños del



LINEA MADRID
CHAT ONLINE
ASISTENTE VIRTUAL

Spanish libraries and archives



+ 200 institutions and orchestras

Spanish libraries and archives



Spanish libraries and archives



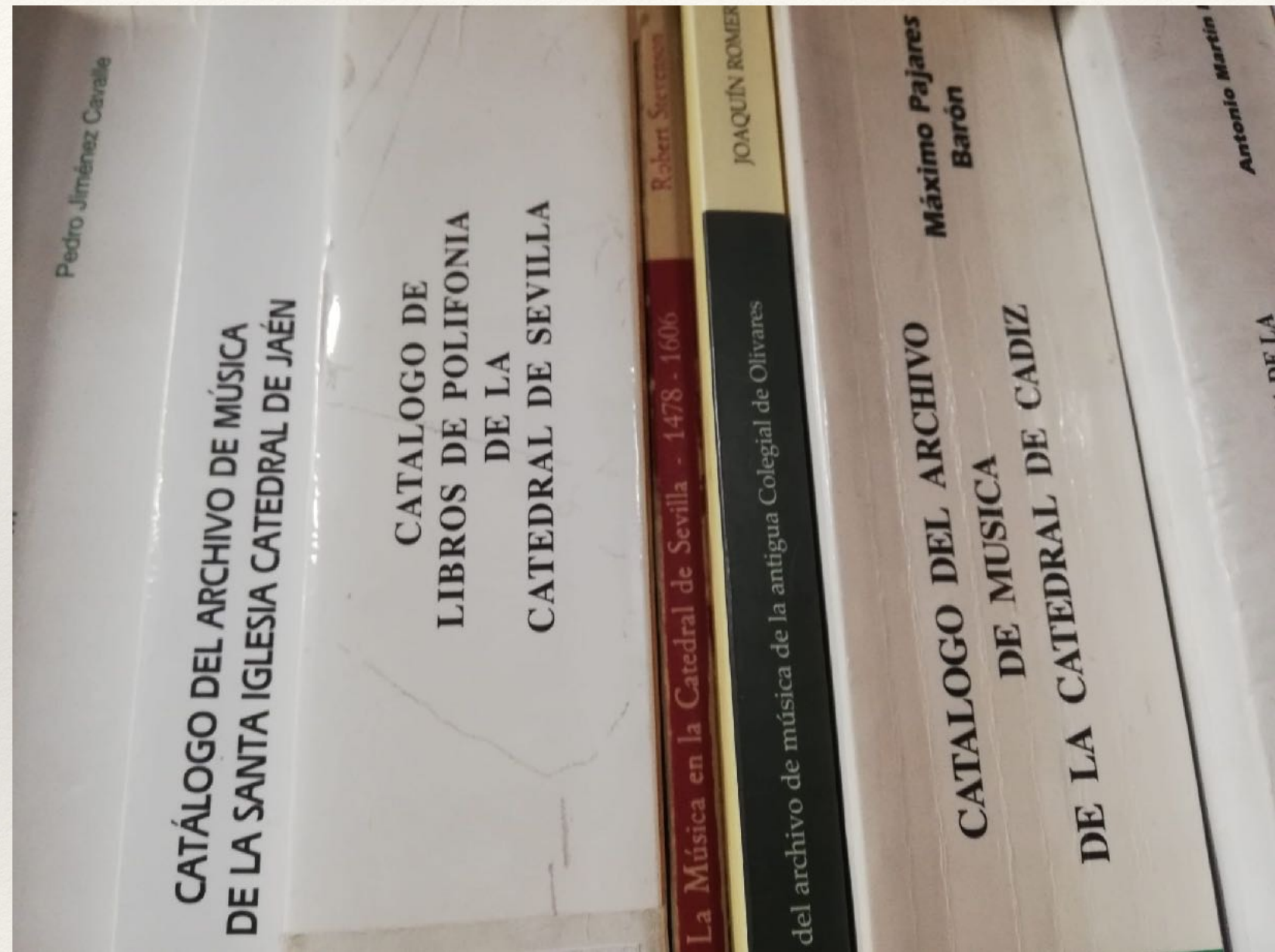
Spanish libraries and archives



Spanish libraries and archives



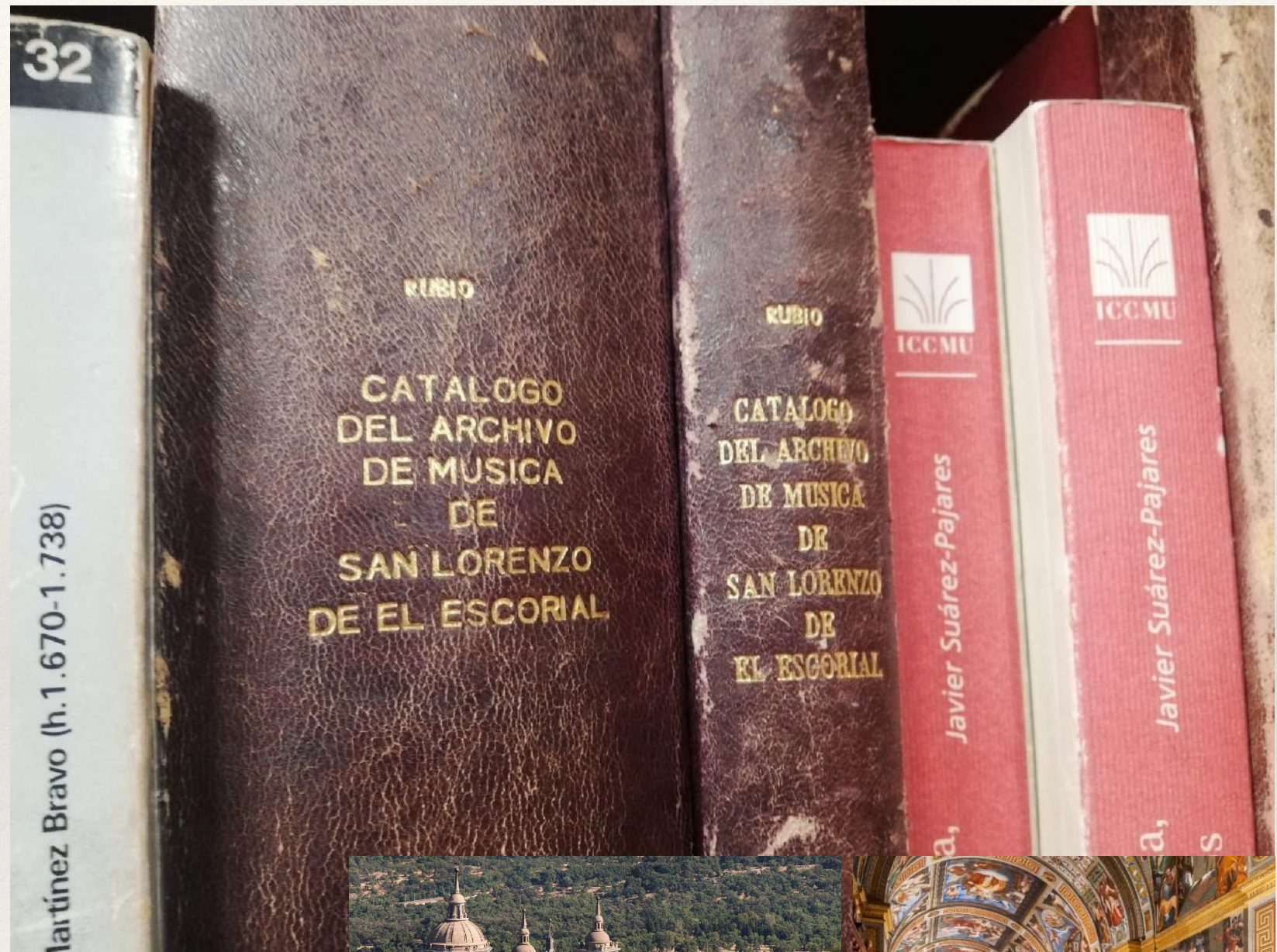
Vast musical heritage



Most of collections
are already catalogued



Vast musical heritage



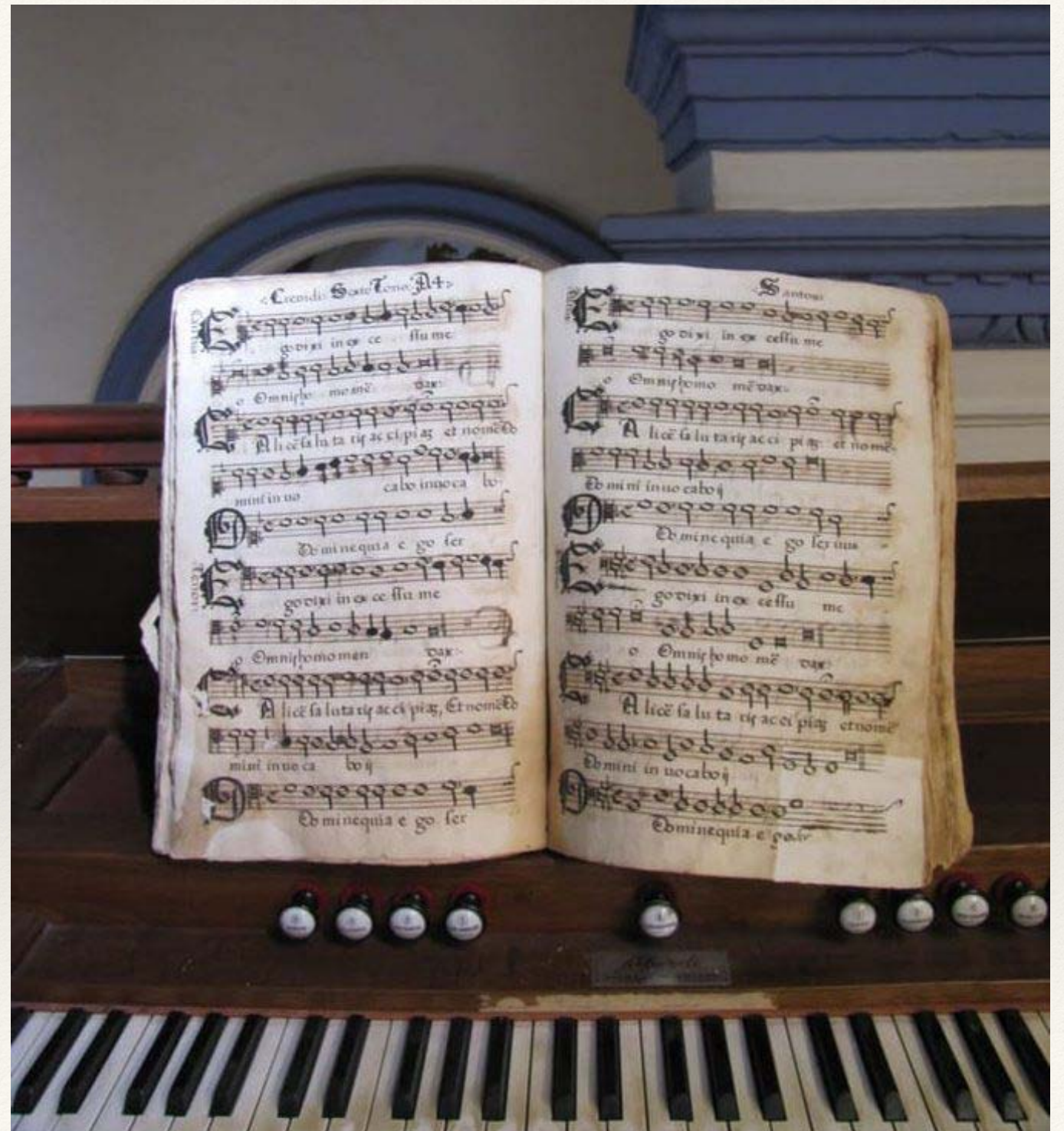
Most of collections
are already catalogued



The role of music encoding

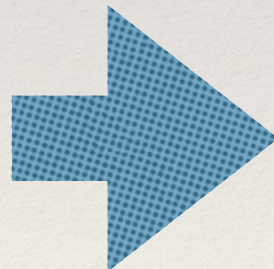


The role of music encoding



The role of music encoding

- ❖ 21st century
 - ➔ many archives and libraries have digitized their collections



Scanned files are catalogued



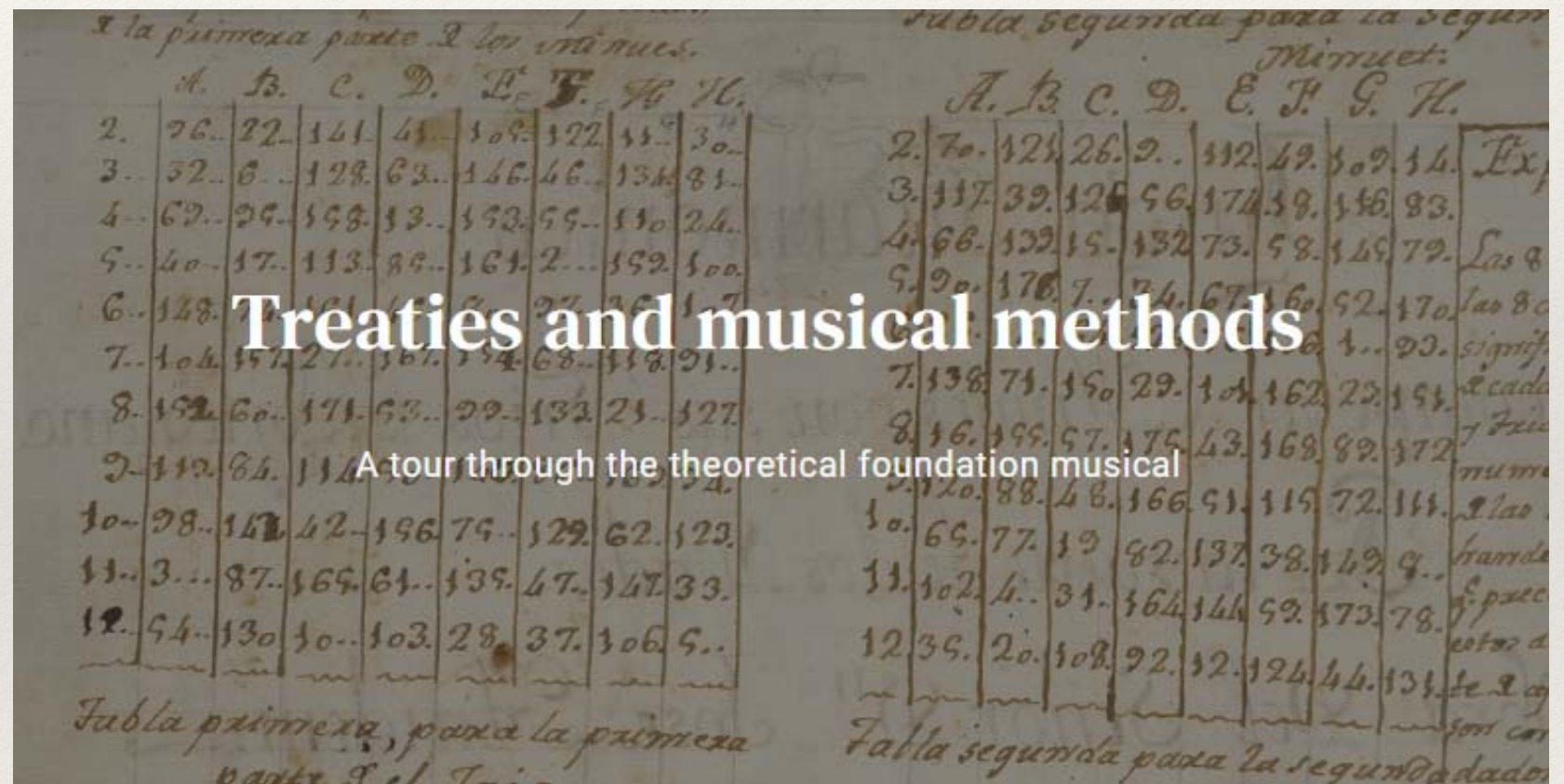
Geography and n

Formed by a large number of old maps and mod

and are accessible online

The role of music encoding

Scanned files
are catalogued



and are accesible online

The role of music encoding

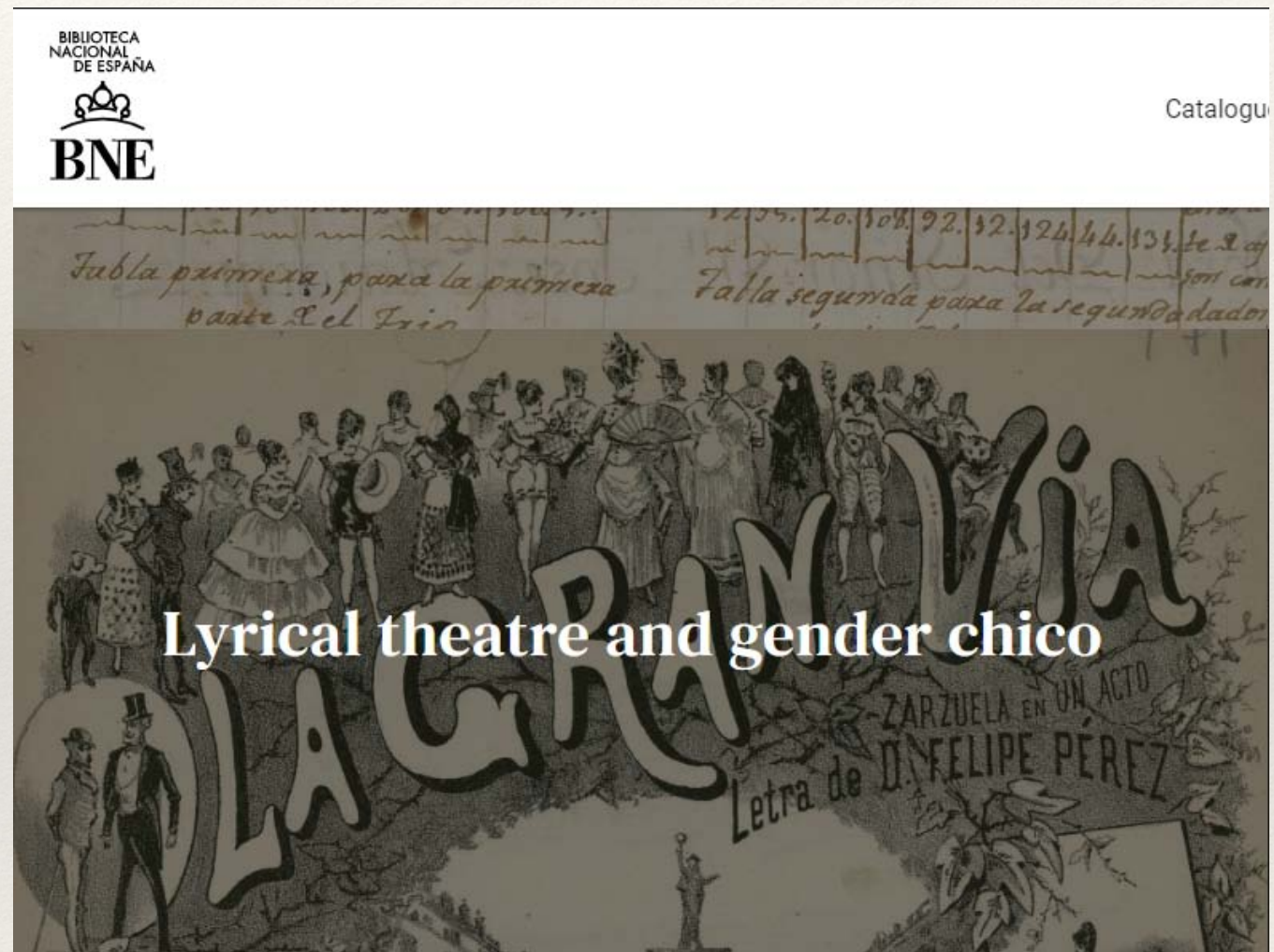
Scanned files
are catalogued



and are accesible online

The role of music encoding

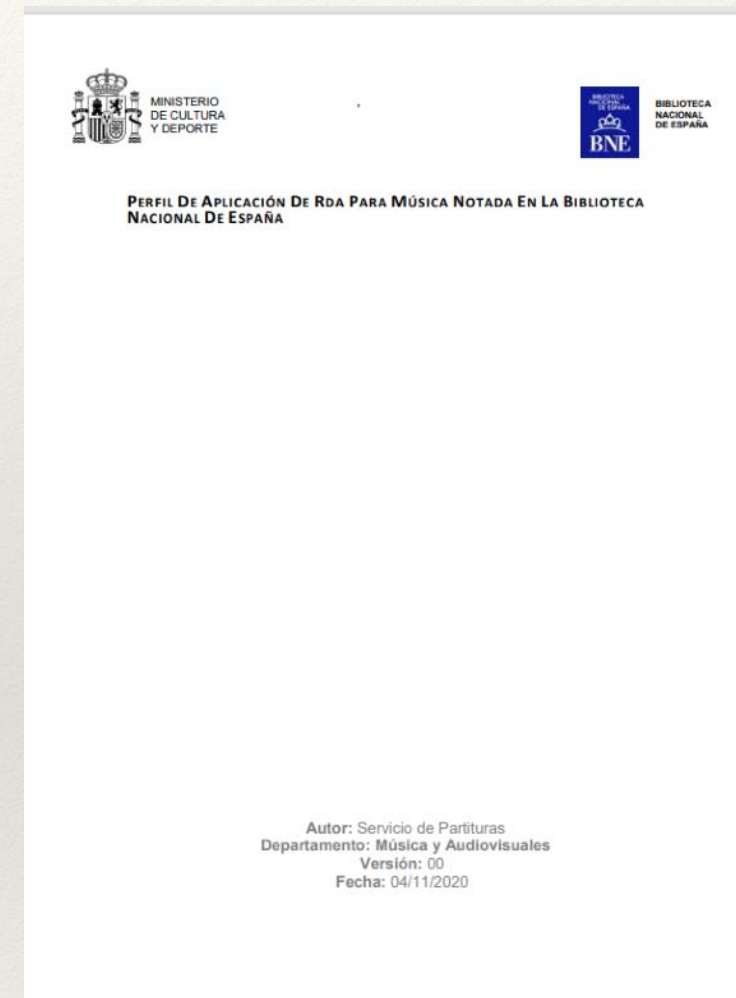
Scanned files
are catalogued



and are accesible online

The role of music encoding

Scanned files
are catalogued

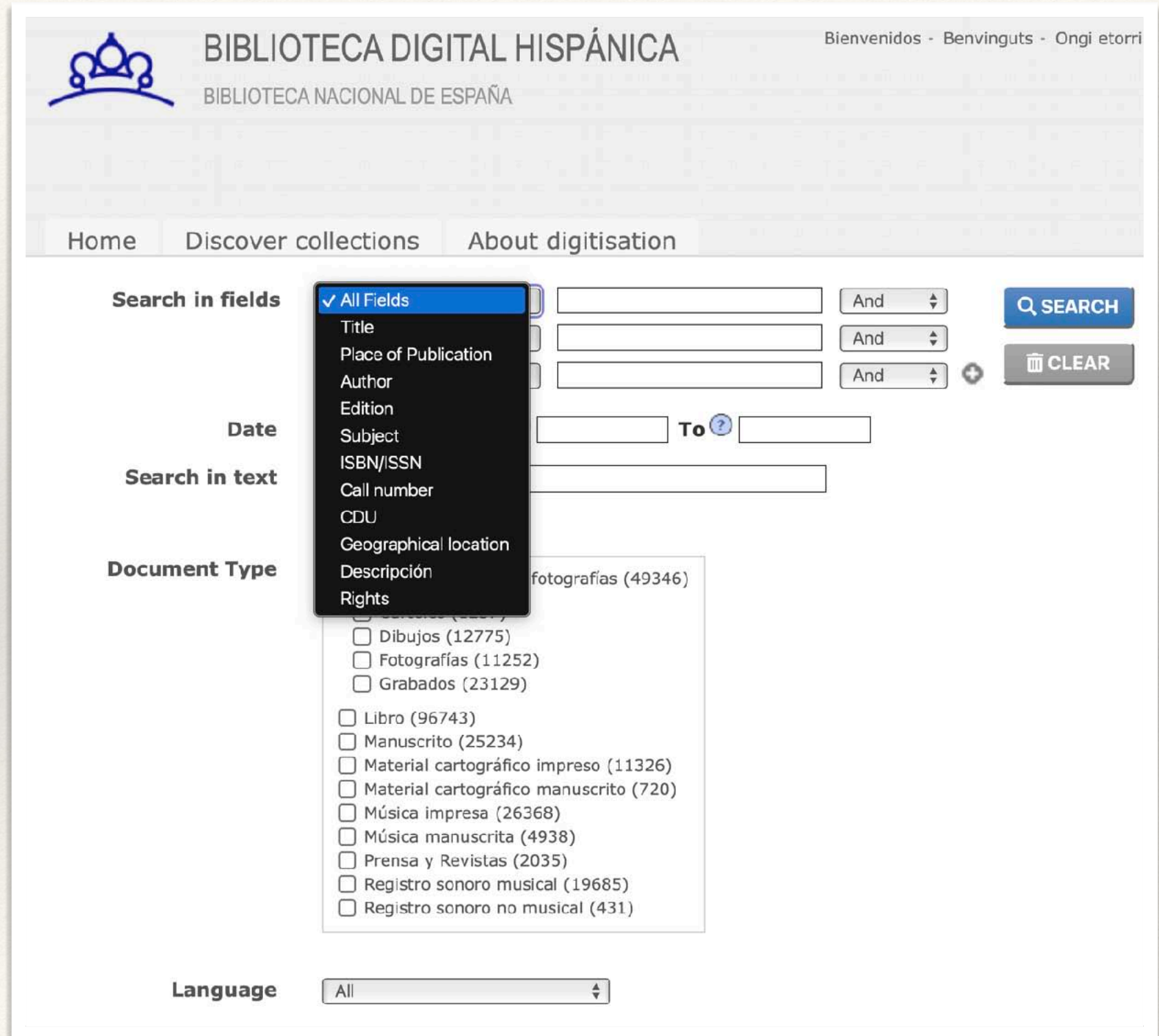


**RDA application profile for notated
music in the National Library of Spain**

The role of music encoding

User can search using metadata

- Title
- Subject
- Author
- Edition
- Description
- Etc.



The screenshot displays the search interface of the Biblioteca Digital Hispánica. At the top, the header includes the library's name in Spanish and English, along with a welcome message. Below the header is a navigation bar with links to Home, Discover collections, and About digitisation. The main search area features a 'Search in fields' section with a dropdown menu currently open, listing various metadata fields such as Title, Place of Publication, Author, Edition, Subject, ISBN/ISSN, Call number, CDU, Geographical location, Descripción, and Rights. To the right of the dropdown are three input fields for search terms, each followed by an 'And' dropdown and a search button. Below these is a 'Date' section with a 'To' dropdown and a search button. Further down is a 'Search in text' section with a single input field and a search button. At the bottom, there is a 'Document Type' section with a list of document types and their counts, including Dibujos (12775), Fotografías (11252), Grabados (23129), Libro (96743), Manuscrito (25234), Material cartográfico impreso (11326), Material cartográfico manuscrito (720), Música impresa (26368), Música manuscrita (4938), Prensa y Revistas (2035), Registro sonoro musical (19685), and Registro sonoro no musical (431). A 'Language' dropdown at the bottom is set to 'All'.

BIBLIOTECA DIGITAL HISPÁNICA
BIBLIOTECA NACIONAL DE ESPAÑA

Bienvenidos - Benvinguts - Ongi etorri

Home Discover collections About digitisation

Search in fields

- ✓ All Fields
- Title
- Place of Publication
- Author
- Edition
- Subject
- ISBN/ISSN
- Call number
- CDU
- Geographical location
- Descripción
- Rights

Date

Search in text

Document Type

- ☐ Dibujos (12775)
- ☐ Fotografías (11252)
- ☐ Grabados (23129)
- ☐ Libro (96743)
- ☐ Manuscrito (25234)
- ☐ Material cartográfico impreso (11326)
- ☐ Material cartográfico manuscrito (720)
- ☐ Música impresa (26368)
- ☐ Música manuscrita (4938)
- ☐ Prensa y Revistas (2035)
- ☐ Registro sonoro musical (19685)
- ☐ Registro sonoro no musical (431)





Language All

The role of music encoding

User can search using metadata

- Title
- Subject
- Author
- Edition
- Description
- Etc.

Seleccionar todos Ver seleccionados 1 2 ▶ ▶▶

Vista de resultados:    

Filtros Aplicados:

Tipo de material
✖ Música impresa
[Quitar todos](#)

Filtrar por Tipo de material ▲

☒ Música impresa (60)

Filtrar por Colecciones destacadas ▼

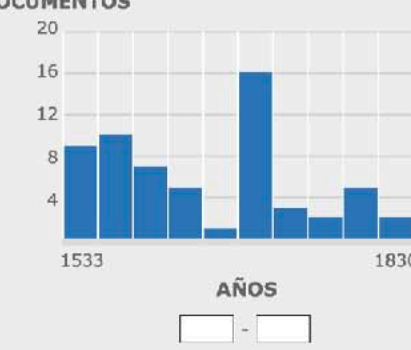
Filtrar por Autor ▼

Filtrar por Lengua ▼






Filtrar por Derechos ▼






Filtrar por Año ▼






DOCUMENTOS













AÑOS	DOCUMENTOS
1533	8
1550	10
1567	7
1584	5
1601	1
1618	16
1635	3
1652	2
1669	5
1686	2
1703	1






1. [A brief introduction to the skill of musick in three books : the first, the grounds and rules of musick, according to the gam ut and other principles thereof; the second, instructions for the baß viol, and also for the treble violin with lessons for beginners](#)
Playford, John - Música impresa - 1666
☐ Seleccionar     






2. [Alceste : tragedie mise en musique](#)
Lully, Jean-Baptiste - Música impresa - 1708
☐ Seleccionar     

3. [Les amours déguisez](#)
Bourgeois, Thomas-Louis - Música impresa - 1713
☐ Seleccionar     

4. [Armide : tragedie mise en musique](#)
Lully, Jean-Baptiste - Música impresa - 1710
☐ Seleccionar     

5. [Arte de canto llano y organo ó Promptuario músico : dividido en quatro partes ...](#)
Romero de Ávila, Jerónimo - Música impresa - 1811
☐ Seleccionar     

6. [Arte de canto llano y organo ó Prontuario musico \[Música notada\] : dividido en quatro partes ...](#)
Romero de Ávila, Jerónimo - Música impresa - 1830
☐ Seleccionar     

7. [Arte de canto llano y organo, o Promptuario musico : dividido en quatro partes ...](#)
Romero de Ávila, Jerónimo - Música impresa - 1785
☐ Seleccionar     

The role of music encoding

Records 1 of 1

[View selected items](#)



[View work](#)

Title

Author

Date

Edition

Type

Subject

Physical description

Call number

PID

Description

Canoni, et oblihi di cento, et dieci sorte sopra l'Ave maris stella [Música notada] / di Francesco Soriano Romano ...

[Soriano Romano, Francesco](#)

[Robletti, Giovanni Battista - impresor](#)

1610

In Roma : appresso Gio: Battista Robletti

Música impresa

[Cánones, fugas, etc. \(Voces\)](#)

[Ave Maris Stella \(Música\)](#)

[156] p.; Fol.

M/1337

bdh0000158335

Notación cuadrada mensural

Anglés y Subirá vol. III, n. 13.

"A tre, quattro, cinque, sei, sette, et otto voci"

Colofón con marca del impresor

Sign.: []⁴⁻¹, A -M⁶, N⁴

Portada orlada con escudo xilografico

Incluye una h. suelta de tamaño reducido con la letra y melodía del Ave maris stella

Inaccuracies

[Catalogue bibliographic record](#)

☐ Select



Vote



The role of music encoding

EN ES Canoni, et oblihi di cento, et die...

7 / 90

Hide thumbnails Show thumbnails

Canoni, et oblihi di cento, et dieci sorte sopra l'Ave maris stella [Música notada]

1

2

3

4

5

6

Attes Jucos All'vaifono. I A mezza pausa.

Etter de mantes esperando mejo

All'Vaifono II. Al Sospiro

Biblioteca Nacional de España

BIBLIOTECA DIGITAL HISPÁNICA

The role of music encoding

Is this melody
present in the
collection?

Is this a copy of
another work?

Humans at work ~~is it possible?~~ **at work** more...

I want to
catalogue some items
into RISM

Can I retrieve works
using colored notes?

The role of music encoding

YES

**By encoding the music notation
contained in the images**

The role of music encoding

Triple 1. Coro à 8. La torze

Re gi - - - na, re gi na, re gi na, re gi - - - na, salve re gi na,

matex, mater, ma ter ma ter mi se ri cor di e, ma ter mi se ri cor di e, mi-

se ri cor di e, vi - - - ra, dulce do, et spes nostra sal ve ad te ad te

clamamus exules fi li i He ve. Ad te, ad te suspi ra mus suspi ra-

mus, suspi ra mus, suspi ra mus, suspi ra mus, ge mētes, et flentes, in hac

lacryma rū valle, gemen tes, et flentes in hac lacryma rū valle, Eja ex go ad voca ta nostra, illos

tuos mi se ri co des o cu los ad nos con verte. Et Je sum benedi cū fructū ven tu sti i.

fructū ven tu sti i, no bis post hac, no bis post hac exi lium, exi lium os ten de, o cle-

mens, o pi a, o dul cis, dul cis vir go Ma ria, Ma ria, vir go Ma ria, Ma ri a.

T1/8

ter.sym="common"

/>

<slur startId="#N1" endId="#N2"/>

Encoding methods



`%C-1@2'A2A2A2A1A2A2A2A2A2A2'C4'B1A2xG1A/`

Manual encoding of modern conversion
Plaine and Easy Code

Encoding methods

Psal., 113 "In exitu Israel", Modo I (SATB). Folio 6v

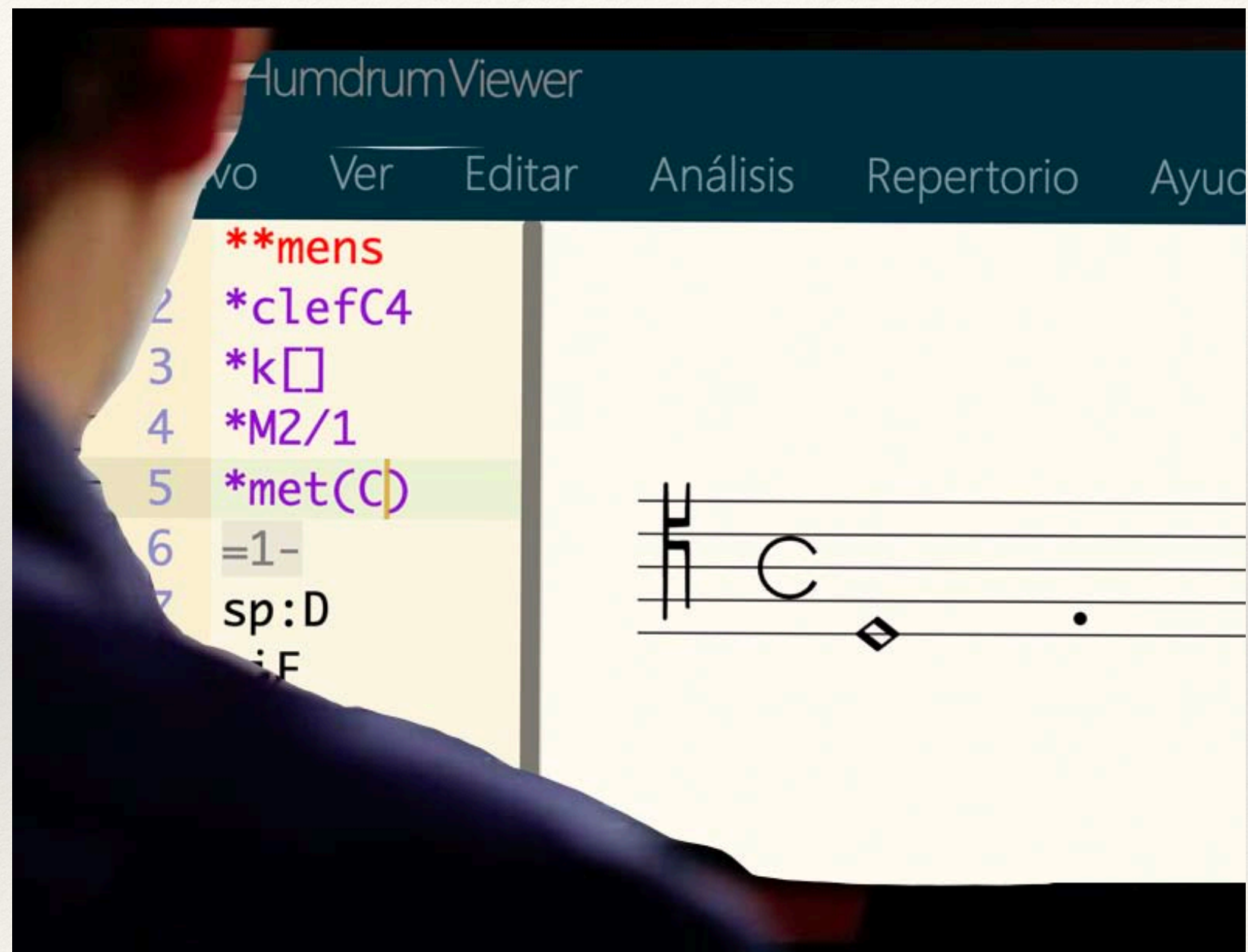


Manual encoding

MEI XML

```
</encodingDesc>
<meiHead>
  <music xml:id="music_164">
    <body xml:id="body_165">
      <mdiv xml:id="mdiv_166">
        <score xml:id="score_167">
          <scoreDef xml:id="scoreDef_168">
            <staffGrp xml:id="staffGrp_169">
              <staffDef n="1" lines="5" notationtype="mensural.white" xml:id="staffDef_170">
                <clef line="1" shape="C" xml:id="L0"/>
                <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="L1"/>
              </staffDef>
            </staffGrp>
          </scoreDef>
          <section xml:id="section_171">
            <measure n="1">
              <staff n="1" xml:id="staff_172">
                <layer n="1" xml:id="layer_173">
                  <note xml:id="L2" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L3" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L4" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L5" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L6" dur="semibrevis" pname="a" oct="4"/>
                  <note xml:id="L7" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L8" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L9" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L10" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L11" dur="minima" pname="a" oct="4"/>
                  <note xml:id="L12" dur="minima" num="2" numbase="3" pname="c" oct="5"/>
                  <dot form="aug" xml:id="dot_174"/>
                  <note xml:id="L13" dur="semiminima" pname="b" oct="4"/>
                  <note xml:id="L14" dur="semibrevis" pname="a" oct="4"/>
                </layer>
              </staff>
            </measure>
          </section>
        </score>
      </mdiv>
    </body>
  </music>
</meiHead>
```


Encoding methods



Manual encoding of mensural code

****mens**

Encoding methods



Binary file



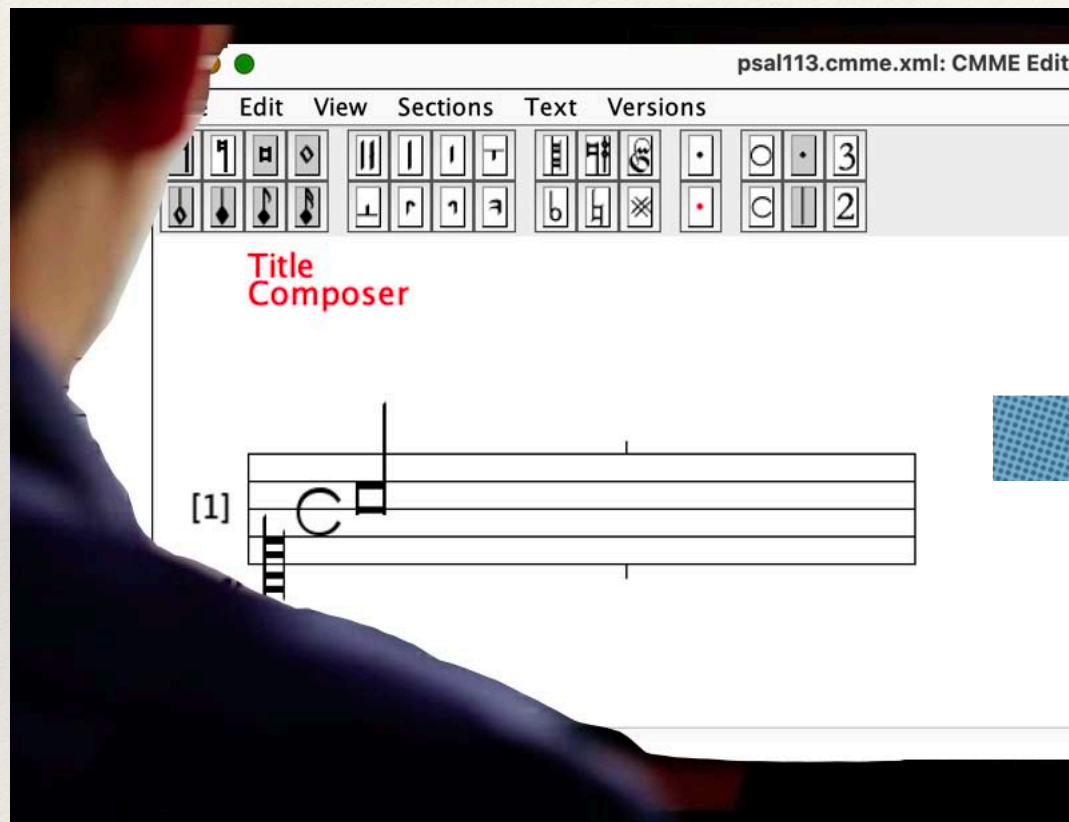
0000	FF	D8	FF	E1	1D	FE	45	78	69	66	00	00	49	49	2A	00
0010	08	00	00	00	09	00	0F	01	02	00	06	00	00	00	7A	00
0020	00	00	10	01	02	00	14	00	00	00	80	00	00	00	12	01
0030	03	00	01	00	00	00	01	00	00	00	1A	01	05	00	01	00
0040	00	00	A0	00	00	00	1B	01	05	00	01	00	00	00	A8	00
0050	00	00	28	01	03	00	01	00	00	00	02	00	00	00	32	01
0060	02	00	14	00	00	00	B0	00	00	00	13	02	03	00	01	00
0070	00	00	01	00	00	00	69	87	04	00	01	00	00	00	C4	00
0080	00	00	3A	06	00	00	43	61	6E	6F	6E	00	43	61	6E	6F
0090	6E	20	50	6F	77	65	72	53	68	6F	74	20	41	36	30	00
00A0	00	00	00	00	00	00	00	00	00	00	00	00	B4	00	00	00
00B0	01	00	00	00	B4	00	00	00	01	00	00	00	32	30	30	34
00C0	3A	30	36	3A	32	35	20	31	32	3A	33	30	3A	32	35	00
00D0	1F	00	9A	82	05	00	01	00	00	00	86	03	00	00	9D	82
00E0	05	00	01	00	00	00	8E	03	00	00	00	90	07	00	04	00

Dorico /
Finale /
Sibelius /
Musescore

psal113.mus (Finale), psal113.sib (Sibelius)
Can be exported to MusicXML or MEI

Visual input with notation software
(using modern notation)

Encoding methods



Computerized Mensural
Music Editing (CMME)

```
<?xml version="1.0" encoding="UTF-8"?>
<Piece xmlns="http://www.cmme.org" xmlns:xsi="http://www.w3.org/2001/XMLSchema"
  <GeneralData>
    <Title>Title</Title>
    <Composer>Composer</Composer>
    <Editor>Editor</Editor>
    <VariantVersion>
      <Default />
      <ID>Default</ID>
    </VariantVersion>
  </GeneralData>
  <VoiceData>
    <NumVoices>1</NumVoices>
    <Voice>
      <Name>[1]</Name>
    </Voice>
  </VoiceData>
  <MusicSection>
    <MensuralMusic>
      <NumVoices>1</NumVoices>
      <Voice>
        <VoiceNum>1</VoiceNum>
        <EventList>
          <Clef>
            <Appearance>C</Appearance>
            <StaffLoc>1</StaffLoc>
```

psal113.cmme.xml

Visual input with notation software
(using mensural notation)

Computer help?

- ❖ Optical Character Recognition (OCR) for text contents



BIBLIOTECA NACIONAL DE ESPAÑA
BNE

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<< Volver

AGENDA

Convocatoria de prensa

Presentación de MarIA, el primer sistema masivo de Inteligencia Artificial de la lengua española

Jueves, 11 de noviembre de 2021.
10:00h - 12:00h

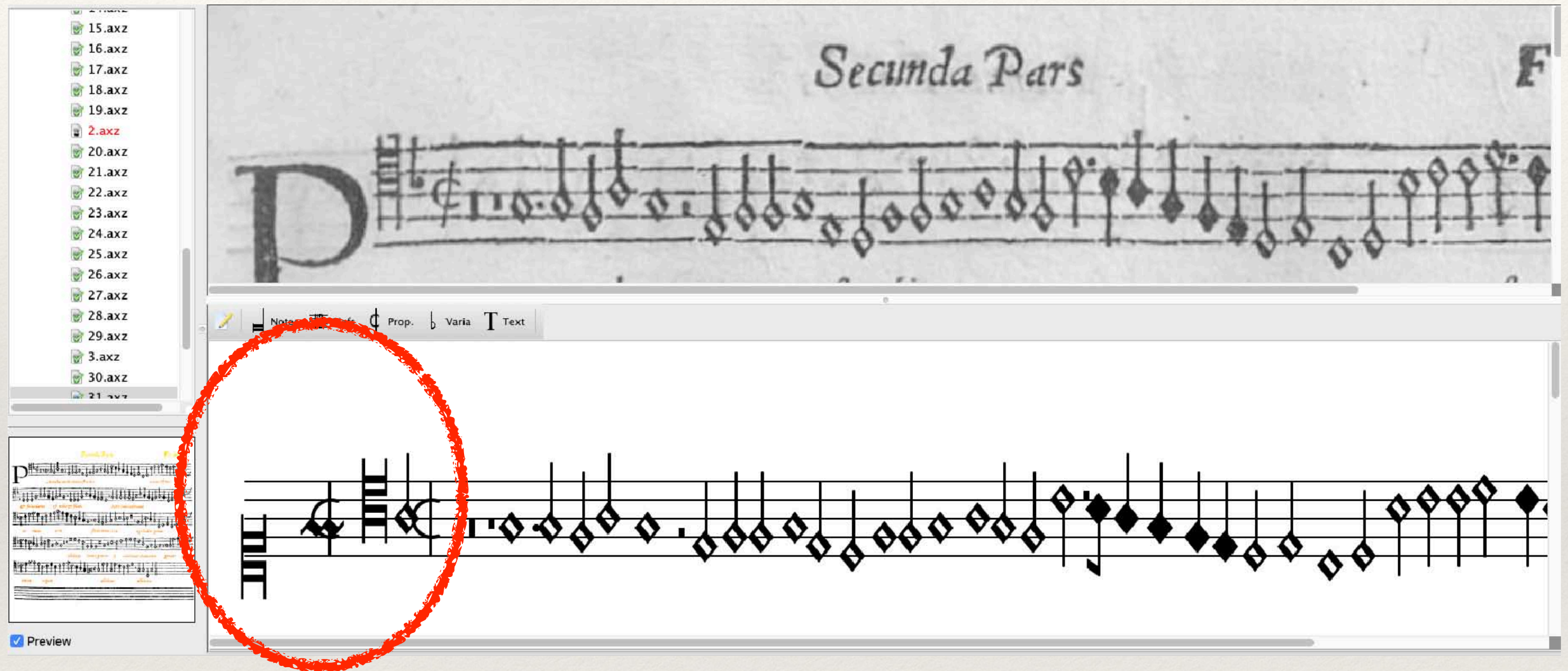
Computer help?

- ❖ Optical Character Recognition (OCR) for text contents

Optical **Music** Recognition (OMR)

**Time devoted to the important:
musicological tasks rather than encoding**

Encoding methods



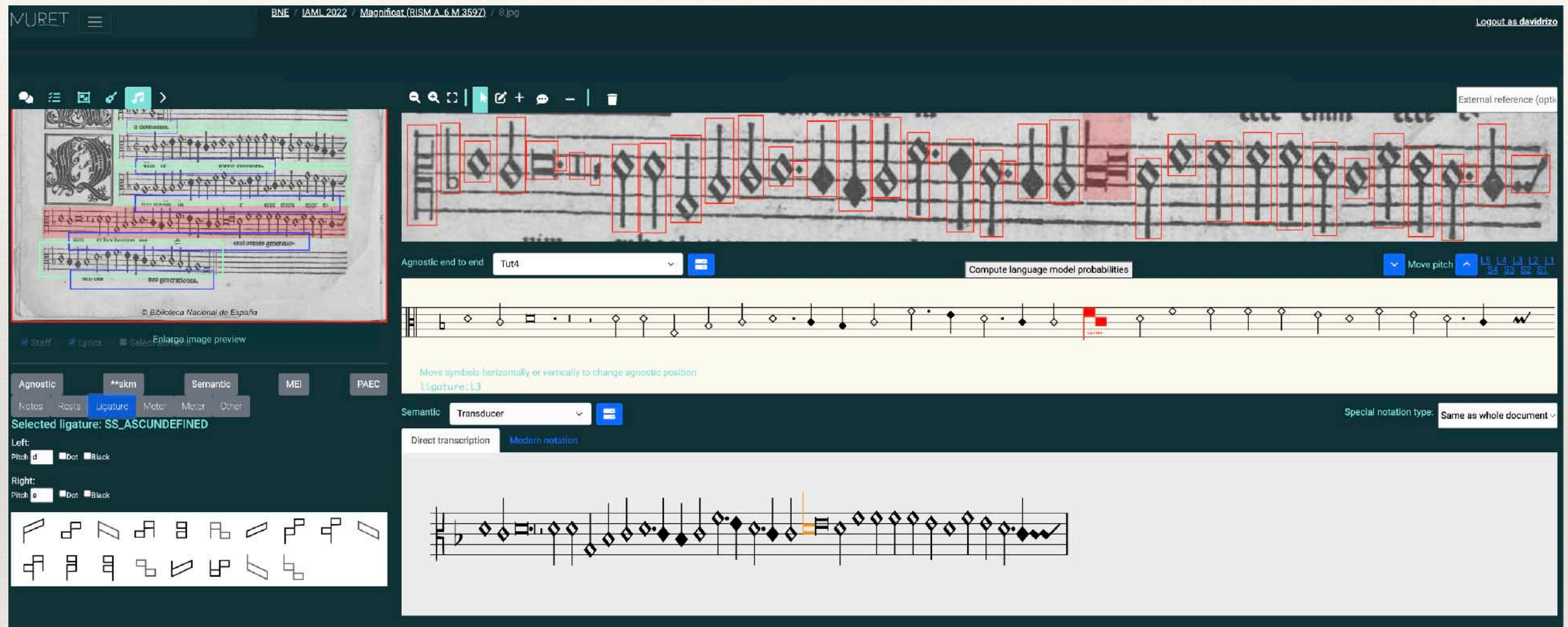
It exports to MEI

Aruspix

Optical Music Recognition (OMR)

Post-editing process of errors

Encoding methods



It exports to MEI, **kern and **mens, Plaine and Easie Code and Lilypond

MuRET

Optical Music Recognition (OMR)

Post-editing process of errors

Encoding scenarios

Encoding fidelity

OMR
without
post-edit

The collage illustrates various music encoding scenarios. It includes screenshots of HumdrumViewer, a mensural score, a modern score, and XML code for encoding.

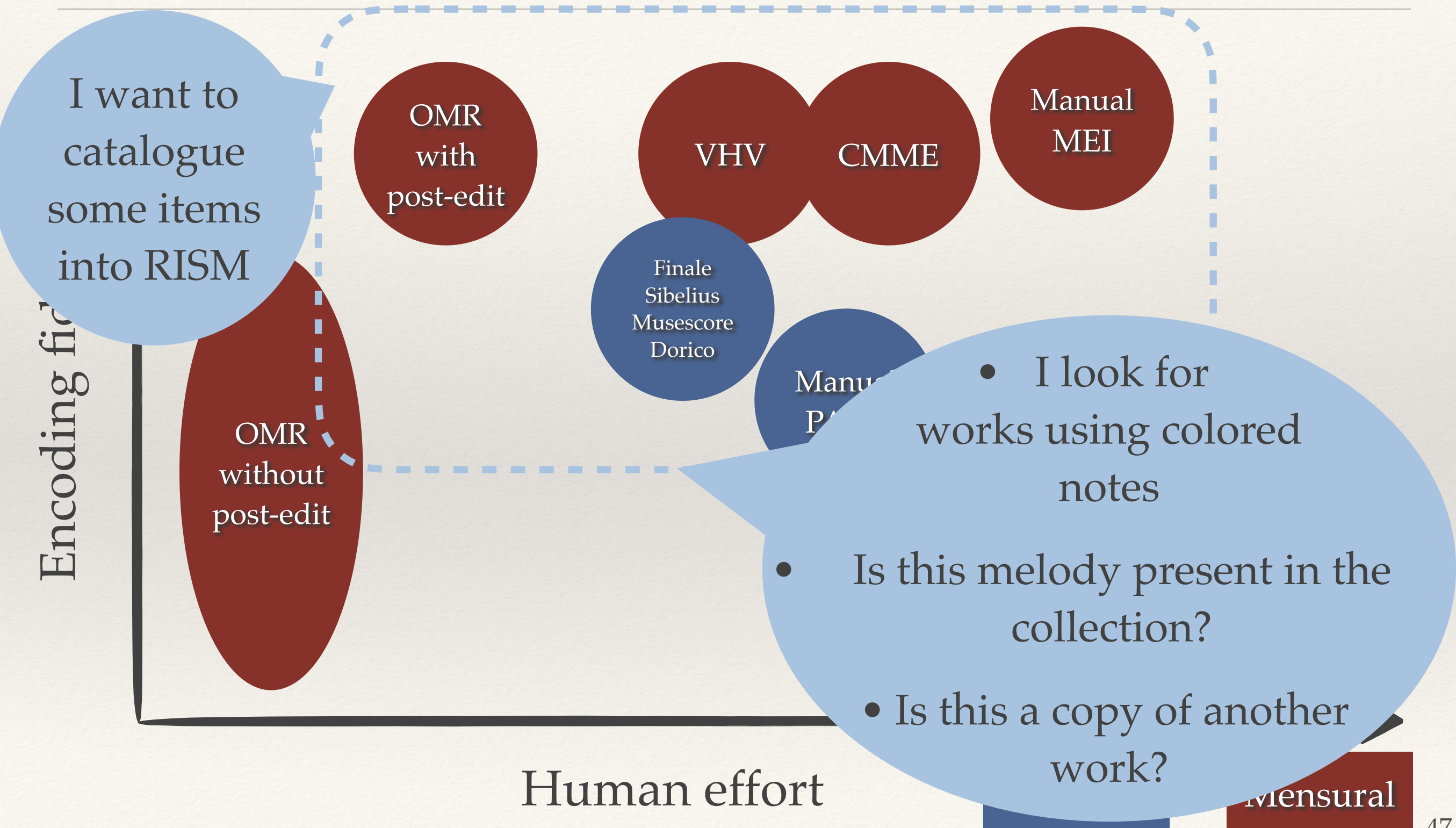
```
</encodingDesc>
</meiHead>
<music xml:id="music_164">
  <body xml:id="body_165">
    <mdiv xml:id="mdiv_166">
      <score xml:id="score_167">
        <scoreDef xml:id="scoreDef_168">
          <staffGrp xml:id="staffGrp_169">
            <staffDef n="1" lines="5" notationtype="mensural.white" xml:id="staffDef_170">
              <clef line="1" shape="C" xml:id="L0"/>
              <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="L1"/>
            </staffDef>
          </staffGrp>
        </scoreDef>
        <section xml:id="section_171">
          <measure n="1">
            <staff n="1" xml:id="staff_172">
              <layer n="1" xml:id="layer_173">
                <note xml:id="L2" dur="minima" pname="a" oct="4"/>
                <note xml:id="L3" dur="minima" pname="a" oct="4"/>
                <note xml:id="L4" dur="minima" pname="a" oct="4"/>
                <note xml:id="L5" dur="minima" pname="a" oct="4"/>
                <note xml:id="L6" dur="semibrevis" pname="a" oct="4"/>
                <note xml:id="L7" dur="minima" pname="a" oct="4"/>
                <note xml:id="L8" dur="minima" pname="a" oct="4"/>
                <note xml:id="L9" dur="minima" pname="a" oct="4"/>
                <note xml:id="L10" dur="minima" pname="a" oct="4"/>
                <note xml:id="L11" dur="minima" pname="a" oct="4"/>
                <note xml:id="L12" dur="minima" num="2" numbase="3" pname="c" oct="5"/>
                <dot form="aug" xml:id="dot_174"/>
                <note xml:id="L13" dur="semiminima" pname="b" oct="4"/>
                <note xml:id="L14" dur="semibrevis" pname="a" oct="4"/>
              </layer>
            </staff>
          </measure>
        </section>
      </score>
    </mdiv>
  </body>
</music>
```

Human effort

Modern

Mensural

Encoding scenarios



Once encoded: MIR tasks

- ❖ Search graphical symbol (colored brevis)

Music information retrieval

Search


Input the music to search using either an agnostic string or ****kern/**mens** for semantic search

Use SQL wildcards (% , _ \ for escape)

Examples

- Agnostic: sixteenth_up:L2
- SKM: *clefG3

breveBlack



Search

Agnostic

SKM

Pitches

Rhythm

Intervals (half-steps)

Query found in #5 collections

Zaragoza

BNE

Query found in #2 documents

Magnificat (RISM A_6 M 3597)

Query found in #2 images

12.jpg
Query found in #3 regions

13.jpg
Query found in #6 regions

Sacrarum varii styli cantionum. Liber primus

Lauro Seco

Guatemala

Pruebas

Update MIR sequences / indices

This operation may take several minutes in background

Once encoded: MIR tasks

- ❖ Highlighted result

13.jpg
Query found in #6 regions

Press button to show image

Altus. Morales Primi Toni. iii

Suscepit Israel puerum suum recordatus recordatus misericordie sue.

Gloria patri et filio et filii o et filii o et spiritui sancto et spiritui

Intervals (half-steps)

- ❖ Search for a pitch sequence

Use SQL wildcards (% , _ \ for escape)

- Agnostic: sixteenth_up:L2
- SKM: *c|efG3

a
g
g
g
f
d

Zaragoza

B-53.781

11584.JPG

Query found in #1 regions

 Press button to show image



Collections

GOBIERNO DE ESPAÑA

MINISTERIO DE CULTURA Y DEPORTE

inaem

INSTITUTO NACIONAL DE LAS ARTES ESCÉNICAS Y DE LA MÚSICA



Centro de Documentación de las Artes Escénicas y de la Música

Teatro y Circo

Música y Danza

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Agencia del ISMN ▼

Temáticos ▼

Patrimonio de Música y Danza ▼

NUEVA EDICIÓN DEL MAPA DEL PATRIMONIO MUSICAL EN ESPAÑA

Publicación en línea que ofrece información sobre fondos musicales de más de 600 instituciones, ahora con contenidos añadidos y nuevo diseño

Más información

Mapa del **patrimonio musical** en España

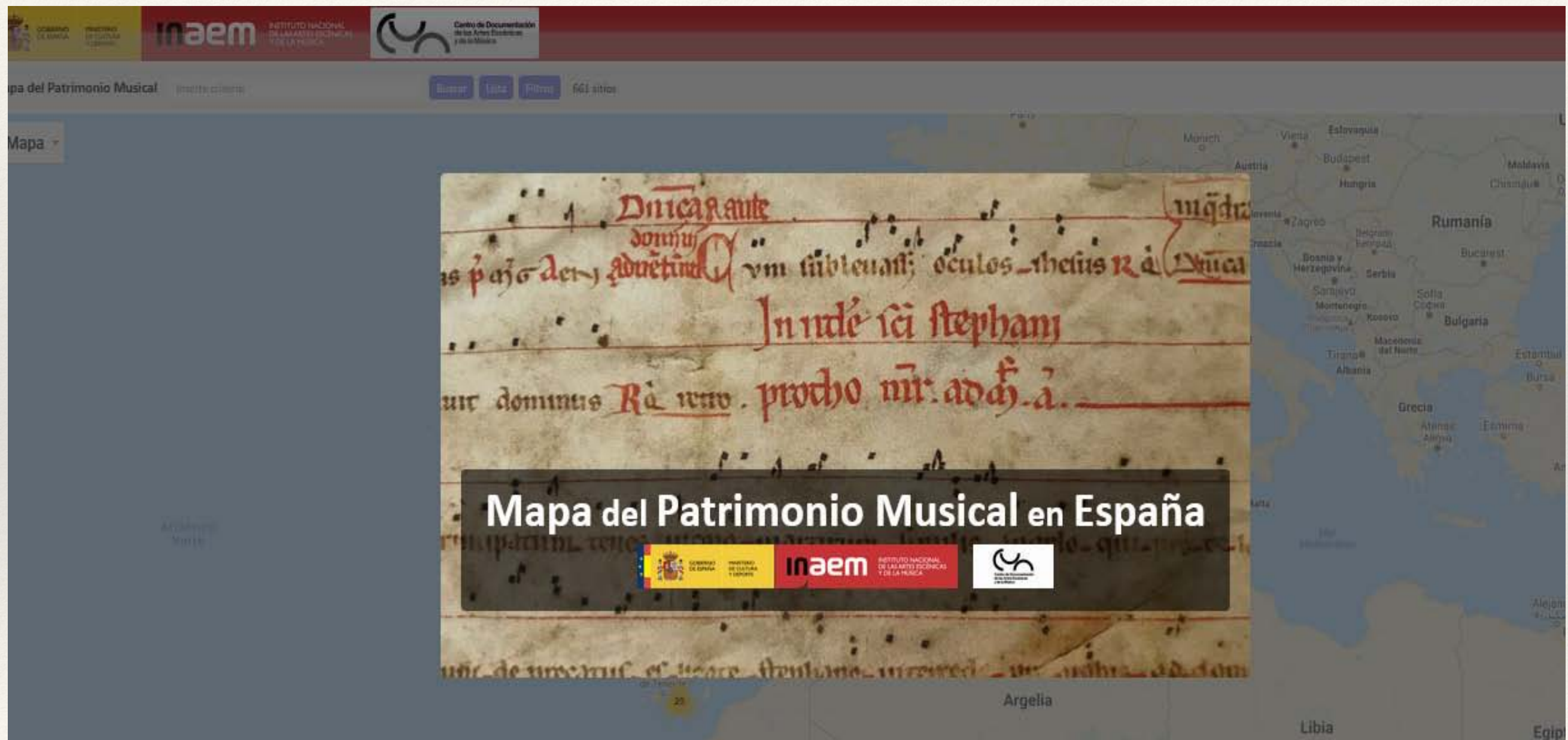
TERCERA EDICIÓN





51

Collections



Collections

FEIMA GIJON - B X GEMA MUSICA / X Página de inicio X GEMA Asociació X Biblioteca Nacio X Biblioteca Nacio X Centro de Docur X Mapa del Patrim X

https://cdmyd.mcu.es/mapapatrimoniomusical/?contenido=Institución eclesiástica 110% ☆

Mapa del Patrimonio Musical Inserte criterio **Buscar** **Lista** **Filtros** **Institución eclesiástica X** 218 sitios


Mapa

Google

Combinaciones de teclas Datos de mapas ©2021 Google, INEGI 500 km Términos de uso


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Libros de polifonía hispana
Llibres de polifonia hispana
Books of Hispanic Polyphony






Institució Milà i Fontanals, Barcelona
Musicology

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Search



[» Advanced search](#)

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- **2485** Sources
- **553** Institutions
- **1829** People
- **6027** Works
- **6342** Movements
- **104** Documents
- **1807** Bibliography items

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- [Log out](#)

Latest additions

- 12-Jul-2022
E-G (14r-17v) (Works)
Added by **Mar Miranda**

Books of Hispanic Polyphony IMF-CSIC: A Catalog of Books of Spanish and New World Polyphonic Music in Context

Welcome to the *Books of Hispanic Polyphony IMF-CSIC* (BHP) website!

We made the BHP site open access coinciding with our presentation during the Medieval and Renaissance Music Conference in Prague on 7 July 2017; we had been working on it (without open access) since 2013.

The objective of *Books of Hispanic Polyphony* (BHP) is to serve as a comprehensive research tool concerning manuscript and printed polyphonic books in Spain and books with hispanic polyphony elsewhere. BHP has no chronological limitations, and we have started to cover the period from the 15th through the 20th century. We do not provide images of the sources, unless the institutions that hold them do so through repositories or permission. In such cases, we incorporate the appropriate links; for instance, to the *Biblioteca Digital Hispánica*, for books at the Biblioteca Nacional de España in Madrid. We also incorporate links to manuscripts described in *Digital Image Archive of Medieval Music* (DIAMM), to printed books in *Printed Sacred Music Database 1500-1800*, to *Portuguese Early Music* (PEM) database, and to other appropriate websites that could offer relevant information. Our menu for "Sources", "Locations", "Institutions", "People", "Genres", "Works", "Movements", "Documents" and "Bibliography" should give you a sense of our objective, and we are still building searching tools and different ways to connect information. We would like to serve as a reference tool and as a platform to present fresh, new research and foster international collaboration.

This digital library was initiated as part of the four-year (2013-2016) R+D Project "Libros de polifonía hispana (1450-1650): catálogo sistemático y contexto histórico-cultural" (HAR2012-33604) of the Spanish Ministry of Economy and Competitiveness. Currently, BHP was part of the objectives of another R+D Project "Hispanic Polyphony and Music of Oral Tradition in the Age of Digital Humanities" (HAR2016-75371-).

Our tool: MuRET

- ❖ **MuRET: Music Recognition Encoding and Transcription**

The logo for MuRET is displayed on a dark teal rectangular background. The letters 'MURFT' are written in a white, thin, sans-serif font. A light blue wavy line is positioned beneath the letters 'R' and 'F', extending from the right side of the 'R' towards the right edge of the background.

MURFT

What is MuRET

- ❖ Machine learning OMR research tool
 - ➔ Created for experimenting machine learning algorithms
- ❖ Still being developed



Notation and manuscript type

White
Mensural

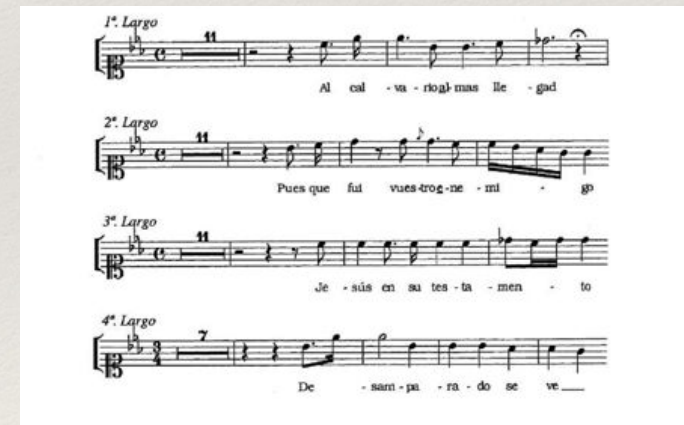
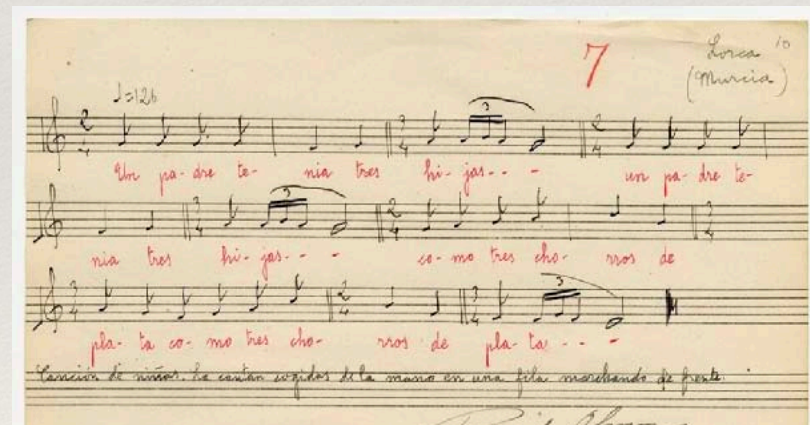


Handwritten



Printed

Modern



Monodic staves

Supported document types

563

DISCÍPULO DE IRIBARREN. *Clarines de las selvas. Villancico de Kalenda a 7 para Concepción con violines. y clarines. s.a. Ms. Part 14. Pap 17. Compl. Bien. Re M. 3. Voc-Inst. Villancico. SAT-SATB. Crín 2-Vi 2-Ac 2. Sig.: 108-A/5.*

→ *Estrib*. Allegro vivo*
Cia - ri - nes de las Sel - vas. de las Sel - vas

→ *Andante gracioso*
Ju - dit, Ju dit her - mo - sa, Ra - quel, Ra quel a - ma da

→ *Ya - sí con tri - nos*

DISCÍPULO DE IRIBARREN. *Como Dios del otro mundo. Villancico a 4 para Navidad con violines. 1766. Ms. Part 6. Pap 8. Compl. Bien. Re m. 2. Voc-Inst. Villancico. SSAT. Vi 2-Ac 2. Sig.: 108-A/6.*

→ *Entrada. Andante*
Co - mo Díos del O - tro, del O - tro mun - do

→ *All*. Todos*
Va - yan, va - yan lle - gan - do, va - yan

DISCÍPULO DE IRIBARREN. *Con mi ganado estará. Villancico a Solo para Navidad con violines. y trompas. 1766. Ms. Pap 7. Compl. Bien. Mib M. 1. Voc-Inst. Villancico. T. Tpa 2-Vi 2-Ac 2. Sig.: 108-A/7.*

→ *Voz sola. Tenor*
Con mi ga - nado es - ta - ra en es - ce - ji - do

1. Incipits

Independent
staves
CDMA

SONG
1

SONG
2

2. Compilation

Each page is a different
song - one voice
FMT - IMF/CSIC

Otra Aña de la Candelaria, â 4.

SUPERIUS

U men ad fe ue la ti o nem gen ti um.

TENOR

U men ad fe ue la ti o nem gen ti um.

Bermudes.

ALTUS

U men ad fe ue la ti o nem gen ti um.

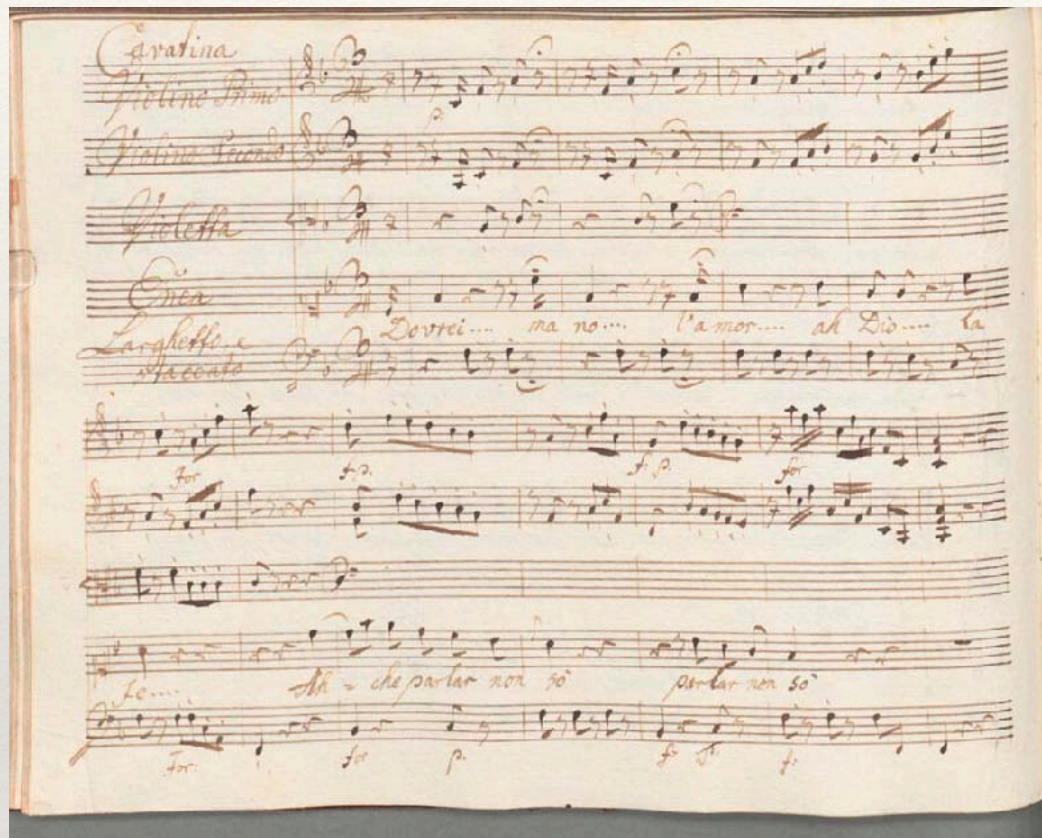
BASSUS

U men ad fe ue la ti o nem gen ti um.

3. Parts

Instruments / Parts in
several images / pages
Mensural collections

Document types: multi-staff systems partially supported



4. Orchestral scores

OMR training set
from DIDONE
project sources



5. Piano, voice, accompaniment ...

FMT - IMF/CSIC

MuRET workflow

The image displays two pages of a handwritten musical manuscript, likely a Mass, with digital annotations. Each page contains six staves of music. The annotations include:

- Page 1 (Left):**
 - Staff 1: Lyrics "Kyrie e ley son Kyrie" (highlighted in blue).
 - Staff 2: Lyrics "Kyrie e ley" (highlighted in blue).
 - Staff 3: Lyrics "son" (highlighted in blue).
 - Staff 4: Lyrics "Et in terra pax hominibus laudamus te" (highlighted in blue).
 - Staff 5: Lyrics "laudamus te adoramus te glorificamus" (highlighted in blue).
 - Staff 6: Lyrics "te" (highlighted in blue).
- Page 2 (Right):**
 - Staff 1: Lyrics "gimus ti bi propter magnam gloriam tuam" (highlighted in blue).
 - Staff 2: Lyrics "Agnus Dei Rex celsit Deus Pater omni" (highlighted in blue).
 - Staff 3: Lyrics "nipotens Deus Pater omnipotens Domine" (highlighted in blue).
 - Staff 4: Lyrics "Domine Fili unigeni te Iesu Chris" (highlighted in blue).
 - Staff 5: Lyrics "te Domine De us Agnus dei Fi" (highlighted in blue).
 - Staff 6: Lyrics "lus Pa tris" (highlighted in blue).

The annotations are color-coded: green boxes for "staff" labels and blue boxes for "lyrics" labels. The text is in a cursive script, and the music is written on five-line staves.

1. Document analysis

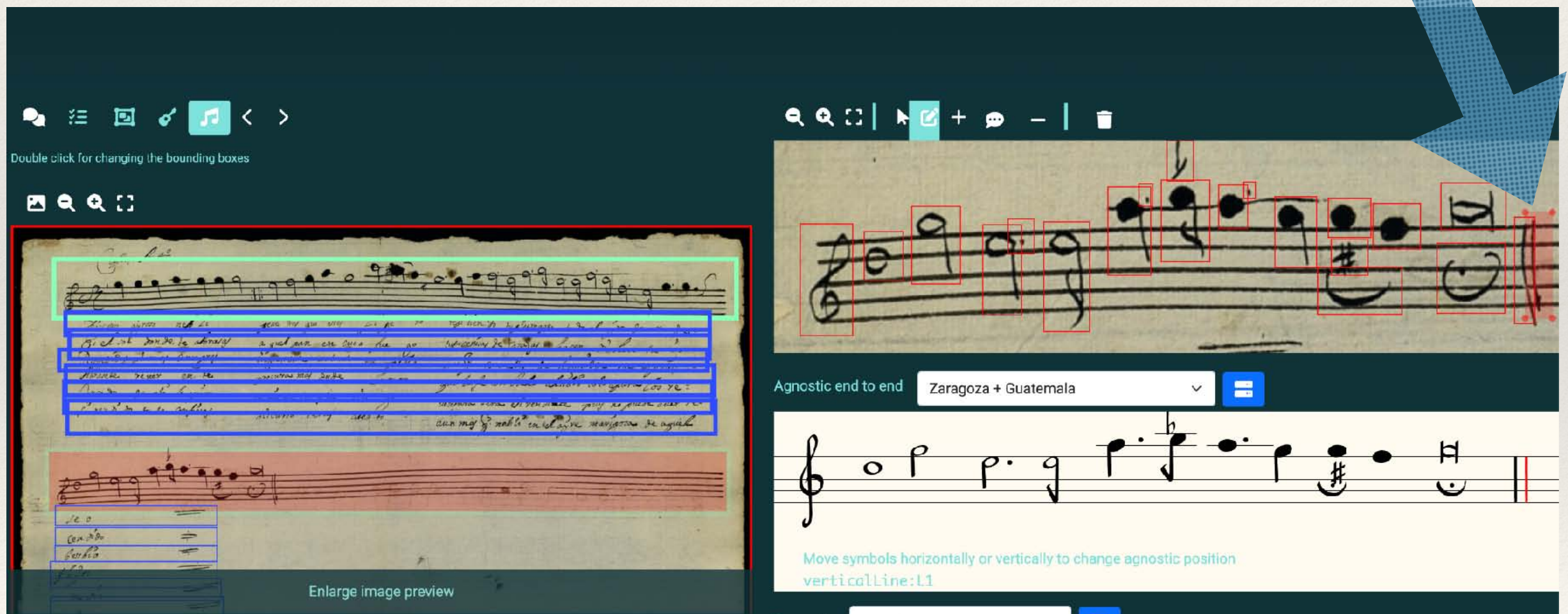
MuRET workflow

2. Tagging with parts / instruments

The diagram illustrates the MuRET workflow for tagging musical parts. It features a large blue arrow pointing from the left towards a musical score. The score is divided into four staves, each labeled 'Tenor' in green text. The staves are grouped by green rectangular boxes. Blue rectangular boxes highlight specific segments of the music, such as 'a dominum.' and 'Eia re in exit dominum'. The musical notation includes diamond-shaped notes and a clef. The background of the score is a light gray with a subtle pattern.

MuRET workflow

3. Agnostic (graphical symbols are recognized)



Double click for changing the bounding boxes

Agnostic end to end Zaragoza + Guatemala

Move symbols horizontally or vertically to change agnostic position
verticalLine:L1

Enlarge image preview

MuRET workflow

4. Semantic musical information is encoded

The screenshot displays the MuRET workflow interface, which is used for encoding semantic musical information. The interface is divided into several sections:

- Top Left:** A preview of the original manuscript image, showing musical notation and lyrics. A color calibration chart (KODAK Color Control Patches) is visible below the image.
- Top Right:** A zoomed-in view of the manuscript image, highlighting a specific section of the notation.
- Bottom Left:** A list of musical symbols and their corresponding MEI (Music Encoding Initiative) codes. The list includes:
 - **skm
 - *clefF4
 - sF
 - SE
 - sD
 - sGG
 - LAA/
 - SD
 - ==
- Bottom Center:** A section for selecting the output format. The options are:
 - Agnostic
 - **skm
 - Semantic
 - MEI
 - PAEC
- Bottom Right:** A section for selecting the output format. The options are:
 - Direct transcription
 - Modern notation

A large blue arrow points from the left side of the interface towards the right, indicating the flow of the workflow.

MuRET workflow

5. Scoring up: staves and parts are organized to create a score.

The screenshot displays the MuRET workflow interface. On the left, a 'Document overview' panel shows a list of image files: 8.jpg, 9.jpg, 16.jpg, and 17.jpg, each associated with a 'Supertus Tenor' part. The main area shows a musical score with four staves. The first staff is labeled '8.jpg, p1, s1' and the second staff is labeled '8.jpg, p1, s6'. The third staff is labeled '9.jpg, p1, s1'. The fourth staff is empty. The score is written in a musical notation style with diamond-shaped notes. At the top of the interface, there are buttons for 'Download MEI file' and 'Export parts and facsimile for MPEditor', and a prompt to 'Press ESC to exit'.

MuRET workflow

6. Exporting

```
</meiHead>
<music xml:id="music_3530">
  <body xml:id="body_3531">
    <mdiv xml:id="mdiv_3532">
      <score xml:id="score_3533">
        <scoreDef xml:id="scoreDef_3534">
          <staffGrp xml:id="staffGrp_3535">
            <staffDef n="1" lines="5" label="superius" notationtype="mensural.white" xml:id="staffDef_3536">
              <clef line="2" shape="G" xml:id="clef_3537"/>
              <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="mensur_3538"/>
            </staffDef>
            <staffDef n="2" lines="5" label="tenor" notationtype="mensural.white" xml:id="staffDef_3539">
              <clef line="3" shape="C" xml:id="clef_3540"/>
              <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="mensur_3541"/>
            </staffDef>
            <staffDef n="3" lines="5" label="altus" notationtype="mensural.white" xml:id="staffDef_3542">
              <clef line="2" shape="C" xml:id="clef_3543"/>
              <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="mensur_3544"/>
            </staffDef>
            <staffDef n="4" lines="5" label="bassus" notationtype="mensural.white" xml:id="staffDef_3545">
              <clef line="4" shape="C" xml:id="clef_3546"/>
              <mensur sign="C" modusmaior="2" modusminor="2" tempus="2" prolatio="2" xml:id="mensur_3547"/>
            </staffDef>
          </staffGrp>
        </scoreDef>
        <section xml:id="section_3548">
          <staff n="1" xml:id="staff_3549">
            <layer n="1" xml:id="layer_3550">
              <ligature xml:id="A12" form="recta">
                <note xml:id="A13" dur="semibrevis" pname="d" oct="5"/>
                <note xml:id="A14" dur="semibrevis" pname="e" oct="5"/>
              </ligature>
              <note xml:id="A15" dur="semibrevis" pname="f" oct="5">
                <verse n="1" xml:id="verse_3551">
                  <syl xml:id="syl_3552">lv.jpg, p1, s1</syl>
                </verse>
                <accid accid="s"/>
              </note>
              <note xml:id="A16" dur="semibrevis" pname="g" oct="5"/>
            </layer>
          </staff>
        </section>
      </score>
    </mdiv>
  </body>
</music>
```


Fully automated process

❖ Still experimental

Unattended transcription

15 images from Sacrarum varii styli cantionum. Liber primus

(Note up to 15 images can be loaded so far)

Document overview

Select the classifiers

Document analysis classifier Tut4

Agnostic end to end classifier BNE + Magnificat David

Stop transcription

Progress

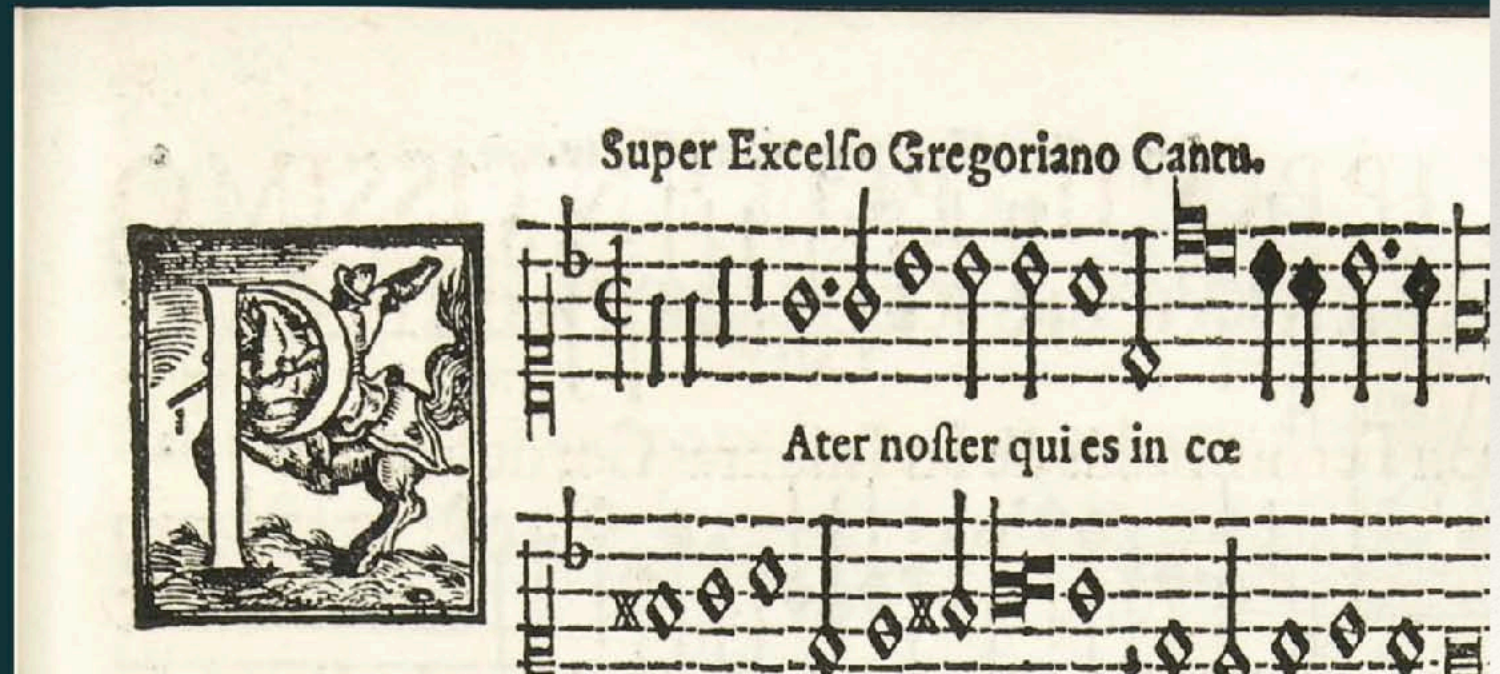
Elapsed time: 7.079 seconds

13%

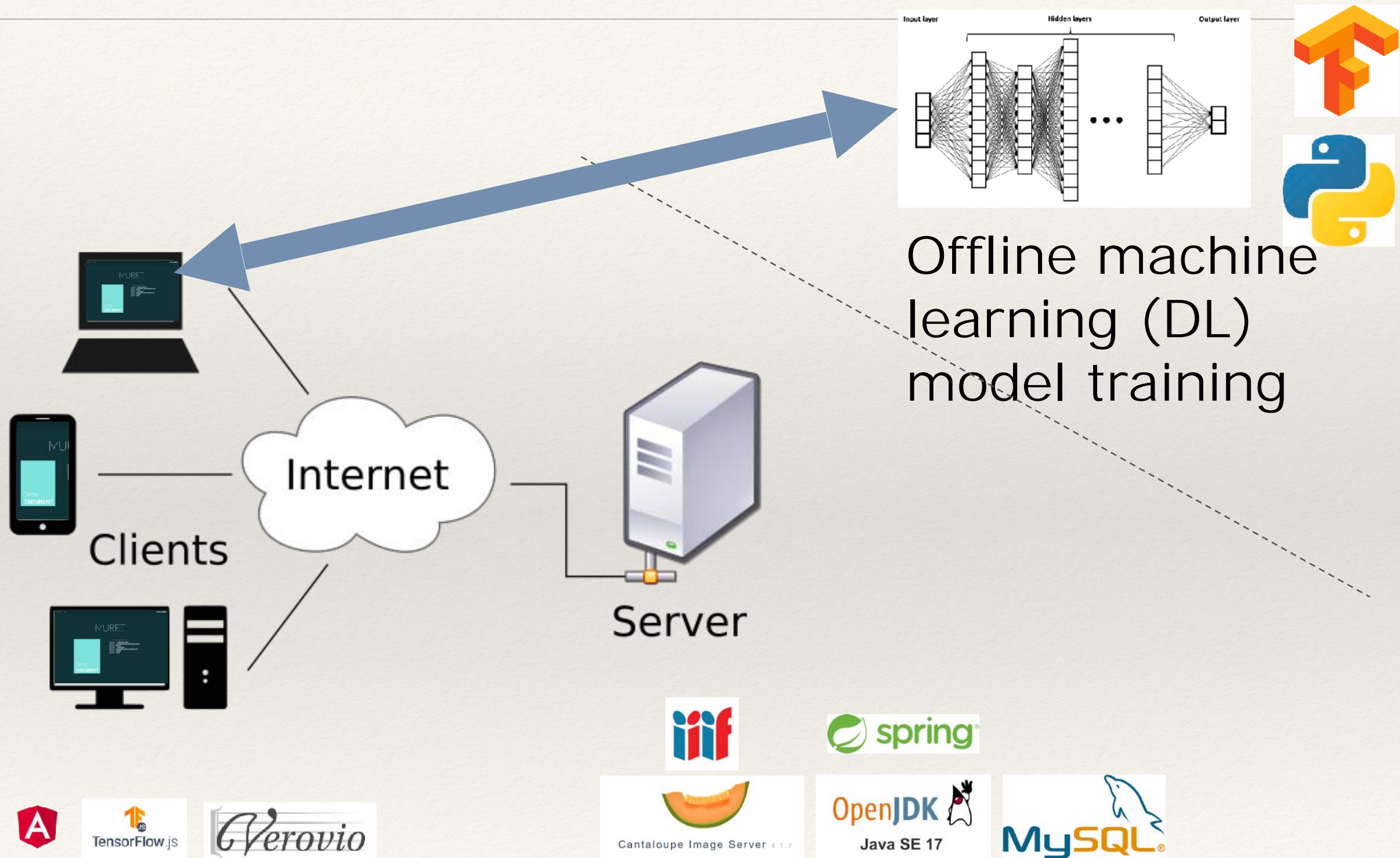
sacrarum_02.jpg: image tensor loaded
sacrarum_02.jpg: image loaded on browser
sacrarum_01.jpg: saving this image unattended analysis
sacrarum_01.jpg: all regions agnostic end2end finished
sacrarum_01.jpg: region 2/2 agnostic end2end prepared
sacrarum_01.jpg: region 1/2 agnostic end2end prepared
sacrarum_01.jpg: document analysis finished
sacrarum_01.jpg: image tensor loaded
sacrarum_01.jpg: image loaded on browser

Current image

sacrarum_02.jpg



MuRET architecture



AI: Machine learning paradigm

- ❖ Computer models are trained using examples:
 - image of staff with its agnostic encoding



```
clef.Fpetrucci4:L4 accidental.flat:L2 metersign.Ccut:L3 note.half:L1  
accidental.flat:L2 note.half:L2 dot:S2 note.quarter:S1 note.whole:L1  
accidental.sharp:S0 note.half:S0 note.whole:L1 note.half:S4  
accidental.flat:S5 note.half:S5 dot:S5 note.quarter:L5 note.whole:S4  
accidental.sharp:L4 note.half:L4 note.whole:S4 note.half:L3  
note.whole:L4 accidental.flat:S3 note.quarter:S3 note.quarter:L3  
accidental.flat:S3 note.half:S3 note.half:L3 accidental.flat:S3  
note.whole:S3 note.whole:L3 dot:S3 accidental.flat:L2 note.whole:L2  
note.half:S1 accidental.flat:L2 note.half:L2 dot:S2 note.quarter:S1
```


AI: Machine learning paradigm

- ❖ Computer models are trained using examples:
 - image of staff with its agnostic encoding



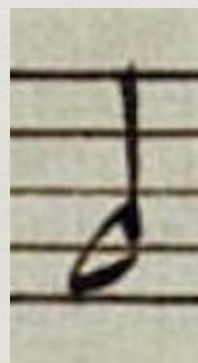
clef.C-L1 metersign.C-L3 rest.semibrevis-L3 note.minima-S3
note.semiminima-S1 note.semiminima-L2 note.minima-S2
note.semiminima-L2 note.semiminima-L3 note.semiminima-L2
note.minima-S3 note.minima-S4 note.semiminima-L5 note.semiminima-
S4 dot-S4 note.fusa-L4 note.fusa-S3 note.fusa-L3 note.semiminima-
S3 dot-S3 note.fusa-L3 note.semiminima-S2 note.semiminima-L2
custos-L2 clef.C-L1 note.semiminima-L2 note.semiminima-S3
note.semiminima-S3 note.semiminima-L3 ...

AI: Machine learning paradigm

- ❖ **Computer models are trained using examples:**
- ❖ **Model quality depends on the**
 - ➔ **Quantity and representativeness of training examples**
 - ➔ **Quality of the examples (lack of encoding errors)**

AI: Machine learning paradigm

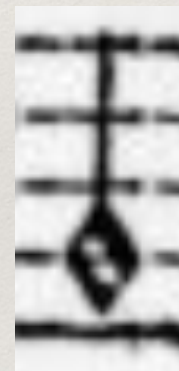
- ❖ **Models see images, not music**
 - **Computer must be trained** that all these symbols are the same by feeding it with **thousands of examples**



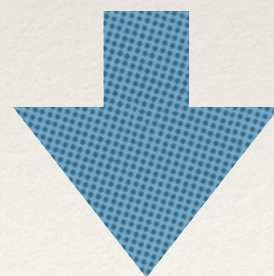
≠



≠



≠



System must learn

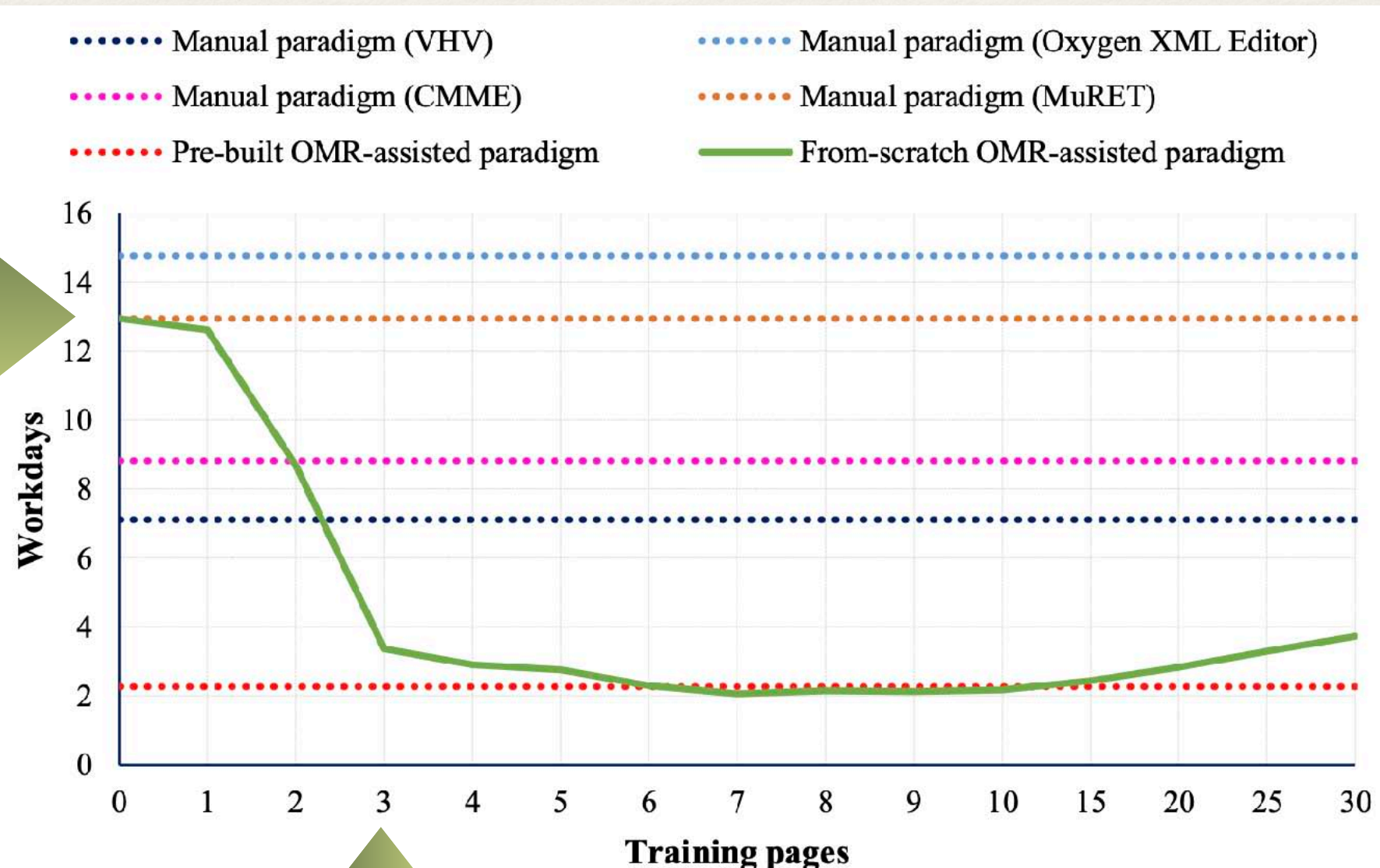
`note.minima_up:L2`

Human effort

- ❖ Existing computer **models cannot recognize all** typographies or calligraphies
- ❖ **User must tag manually** some pages of examples to train computer models

Human effort

- ❖ User must tag manually some pages of examples to train computer models



Not only OMR: usability

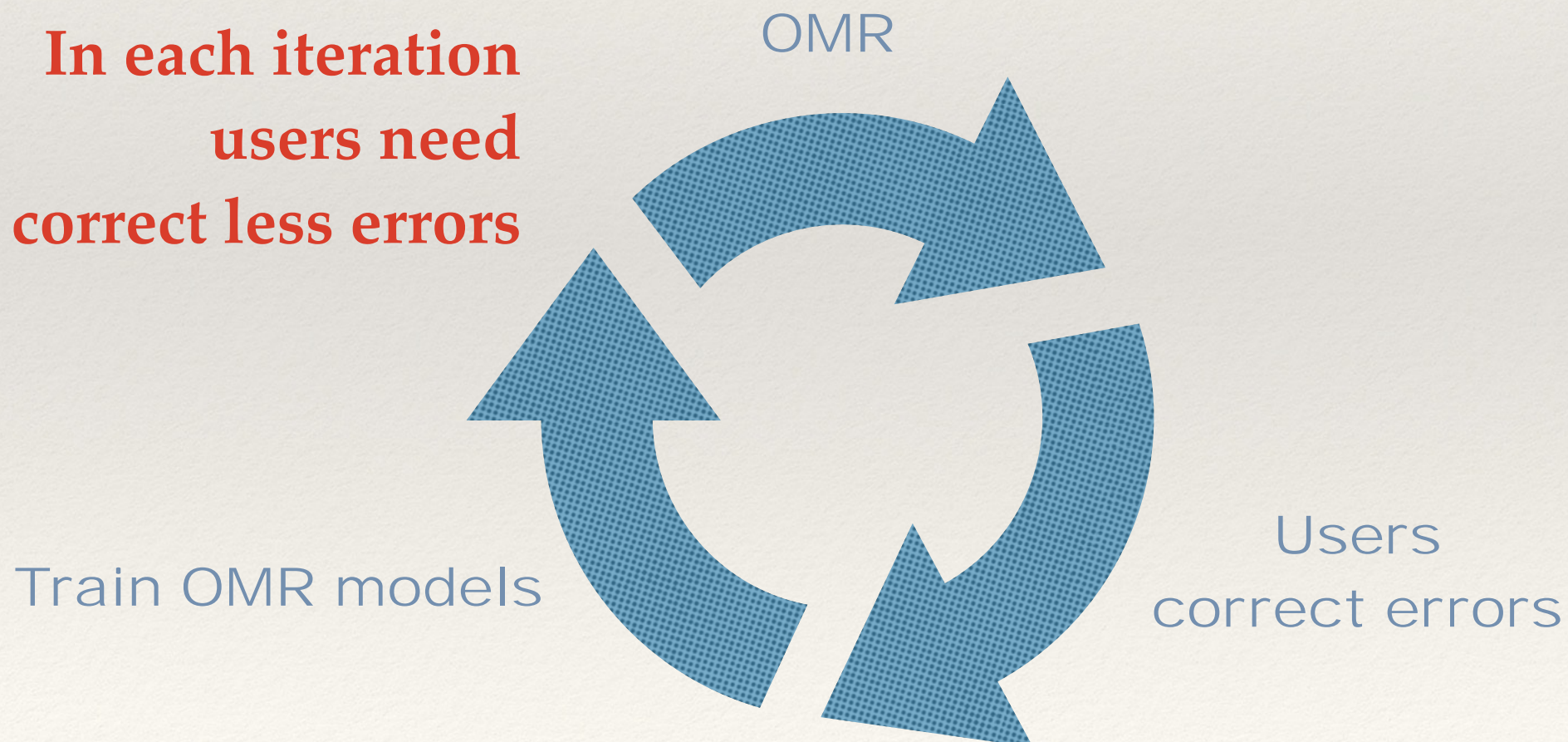
- ❖ “**Usability** is a measure of **how well** a **specific user** in a **specific context** **can use a product** / design to achieve a **defined goal effectively, efficiently and satisfactorily**”.
- ❖ OMR may be very accurate
 - ➔ If the **usability** fails, the **whole process** fails.

Ongoing work

- ❖ Currently tagging Spanish collections @BNE_biblioteca
- ❖ Iterative incremental approach



**In each iteration
users need
to correct less errors**



Next steps

- ❖ **UX/UI of MuRET is being improved**
- ❖ **We are gathering training sets to improve the models**
- ❖ **Working on language models to detect recognition errors**
- ❖ **Enhancing deep neural network models to work with small training datasets**
- ❖ **Any further collaboration with other digital libraries...**

After the encoding...

Tiple 1.º Coro à 8. *La forte*

Re gi - - na, re gi na, re gi na, re gi - - na, sal ve re gi na,

ma ter, ma ter, ma ter ma ter mi se ri cor di e, ma ter mi se ri cor di e, mi -

se ri cor di e, vi - - ra, dul ce do, et spes nostra sal ve ad te ad te

clamamus, ex ules fi li i De us, Ad te, ad te sus pi ra mus, sus pi ra -

mus, sus pi ra mus, sus pi ra mus, sus pi ra mus, ge mē tes, et flē tes, in hac

lacryma rū val le. ge mē tes, et flē tes in hac lacryma rū val le. Eja ex go ad vo ca ta nostra illos

tuos mi se ri co res o cu los ad nos con ver te. Et Je su m be ne dic ti ō fructū ven tū sti i.

fructū ven tū sti i, no bis post hoc, no bis post hoc exi lium, exi lium os ren des, o cle -

mens, o pi a, o dul cis, dul cis vir go Ma ria, Ma ria, vir go Ma ria, Ma ri a.

T1/8

Thank you!

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