OMR for Mensural Notation: Looking at a Guatemalan Music Manuscript

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Dissertation Project

- Preservation of the colonial musical heritage of Guatemala
- Collection of 6 choirbooks written in mensural notation
- Increase access to these sources through:
    1. Digitization
    2. OMR
    3. Automatic transcription (into modern values)

GuatC 1: Guatemalan Choirbook 1

- January 2019: Digitization stage
- Summer 2019: Working on the other two stages

Optical Music Recognition (OMR)

Test an End-to-End OMR Approach

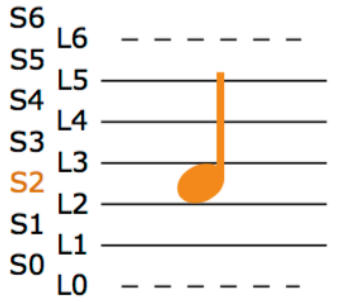
(Jorge Calvo-Zaragoza and David Rizo)

End-to-End OMR Approach

- Convolutional Recurrent Neural Network (CRNN) model
- Staff level
- Extracts two pieces of information for each symbol:
  1. Category of the symbol
  2. Category of its vertical position within the staff

Group	Symbol			
Note	Semibrevis	Minima	Col. Minima	Semiminima
Rest	Longa	Brevis	Semibrevis	Semiminima
Clef	C Clef	G Clef	F Clef (I)	F Clef (II)
Time	Major	Minor	Common	Cut
Others	Flat	Sharp	Dot	Custos

(Pacha and Calvo-Zaragoza, 2018)



(Pacha and Calvo-Zaragoza, 2018)

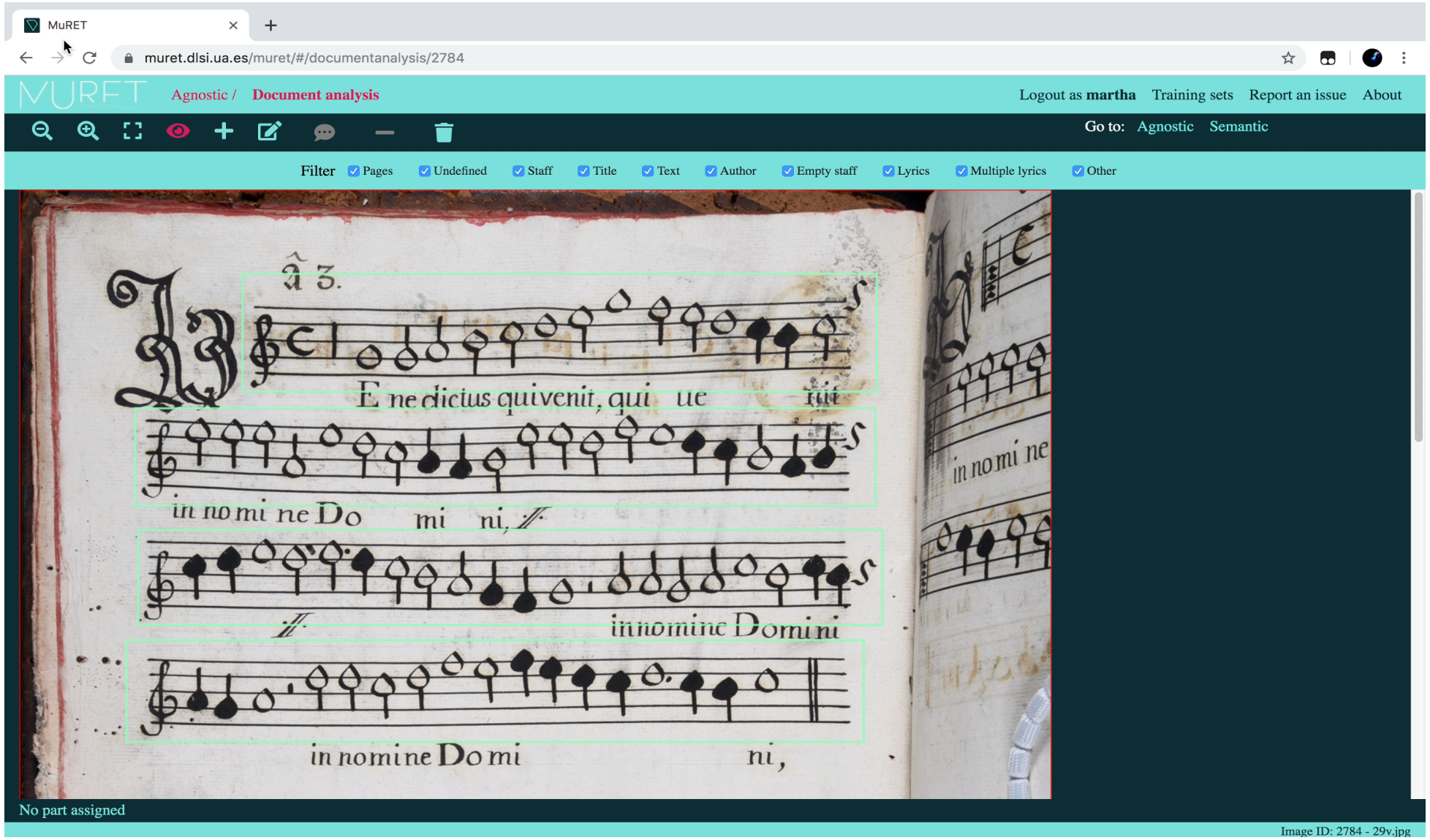
End-to-End OMR Approach

Reasons:

a) Efficiency

b) Model already trained on Spanish mensural notation
   - Seventeenth-century manuscript
   - Corresponding to a complete mass (a 12)
   - From the Cathedral of Zaragoza

MuRET (Music Recognition, Encoding, and Transcription)



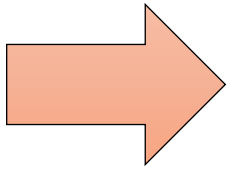
Automatic Transcription of Mensural Notation

Translation Problem:

Graphical encoding (OMR) → Musical meaning

Translator: Agnostic to Semantic

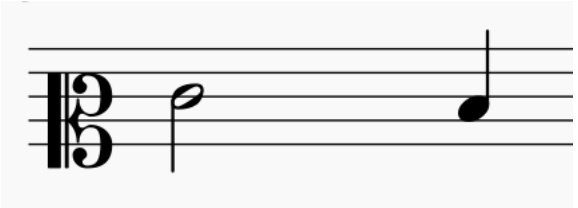
Agnostic Sequence
token = symbol + line/space



Semantic Sequence
token = symbol + pitch

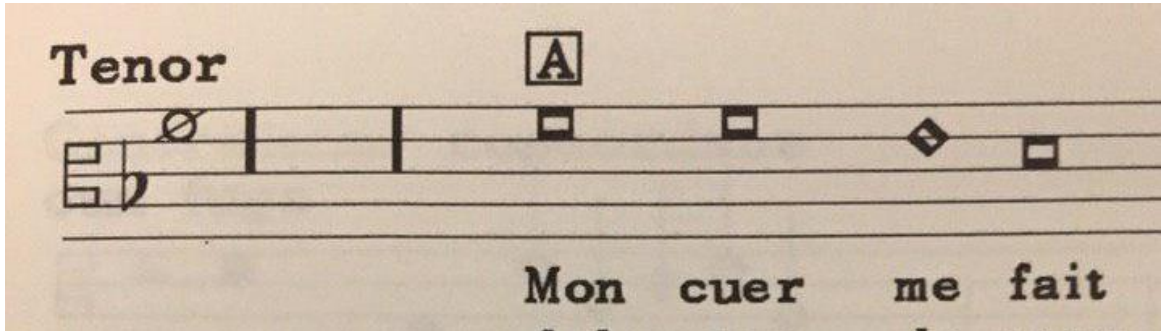
clef.C-L2 note.half-L3 note.quarter-S2

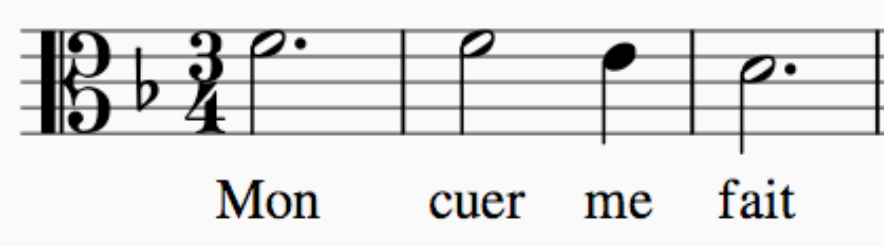
clef.C2 note-E4_half note-D4_quarter



Translator: Agnostic to Semantic

- Note shape (i.e., symbol class) is not enough to convey the duration of a note in mensural notation





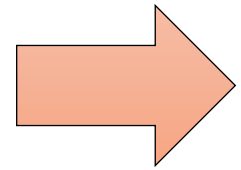
Translation: Agnostic to Semantic

- Machine learning based model (sequence-to-sequence model)
- Training set: pairs of agnostic and semantic sequences
- Not enough training data for mensural notation (yet)
- Test the implemented translator:
  - **PrIMuS** (Printed Images of Music Staves) dataset
    - Set of 87,678 real-music incipits
    - In common Western music notation

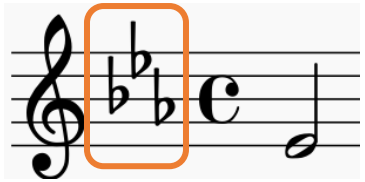
    https://grfia.dlsi.ua.es/primus/
    (Calvo-Zaragoza and Rizo 2018)

Translator: Agnostic to Semantic

Agnostic Sequence
token = symbol + line/space



Semantic Sequence
token = symbol + pitch

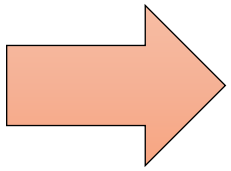


clef.G-L2 accidental.flat-L3 accidental.flat-S4 accidental.flat-S2 **metersign.C/-L3** note.half-L1

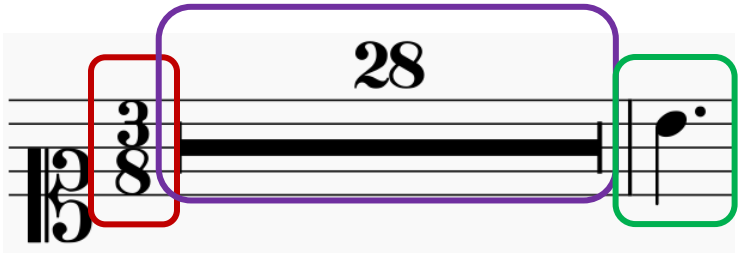
clef-G2 keySignature-EbM **timeSignature-C/** note-Eb4_half

Translator: Agnostic to Semantic

Agnostic Sequence
token = symbol + line/space



Semantic Sequence
token = symbol + pitch



clef.C-L1 digit.3-L4 digit.8-L2 **digit.2-S5 digit.8-S5 multirest-L3** barline-L1 **note.quarter-S4 dot-S4**

clef-C1 timeSignature-3/8 **multirest-28** barline **note-C5_quarter.**

Future Work

- Finish performing OMR on the whole GuatC1 manuscript
- Obtain the training data for testing the translation model on mensural notation
- Compare the machine learning based approach against a heuristic one (MA thesis)

Thank you!

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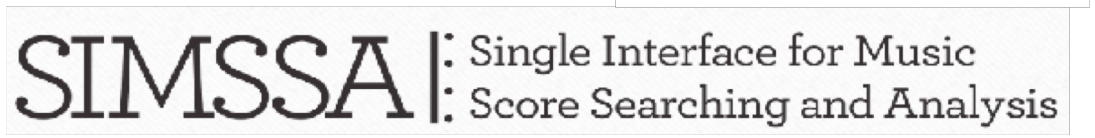
Special thanks to: José Manuel Iñesta, David Rizo, and Jorge Calvo-Zaragoza



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Sequence-to-Sequence Model with Attention