

Music & the Internet

MUMT301

Gabriel Vigliensoni
Schulich School of Music
McGill University

Plan

- Last class:
 - Web-based sound generation
 - Web-based recording and sequencing applications
 - Web-based collaborative applications
- Assignment 7 review
- Final project proposal guidelines and round
- Online music editors
- Online music scores and libraries
- Music Information Retrieval
- In-class final project proposal help

Assignment 7 review

- Tommy
- Jackson
- Ishani
- Sam
- Jacob
- Julie
- Zoe

Final project proposal

The final project proposal consists on:

1. The submission of a **project proposal report**.

- You will describe your **goal** for the project, dividing it into **sub-goals**, and arranging them into a **timeline**.
- You must also present **references**. These may be **bibliographical**, **code** examples, **music** examples, **software** applications, or any kind of **creative** or **intellectual work** that you think is relevant for the development your project.
- The report should be 2 pages long at the most, 11 pt, single-spaced.

Final project proposal presentation guidelines

2. The presentation of your project proposal.

- You will present your project in class by means of a powerpoint-style slide show or an HTML webpage.
- You will describe your **goals** and **sub-goals**, and will present the **references** you consider relevant for doing your project.
- The presentation will be **15 minutes** (10-minute presentation, 5-minute round for questions). Rehearse and time your presentation accurately, since no extra time will be given.

I will send the presentation order before this coming Thursday.

The final project submission is due on Tuesday 19 December, by midnight.

Online music editors

- Scorio
- Noteflight
- Scorecloud
- Flat
- Verovio (music notation engraving library)

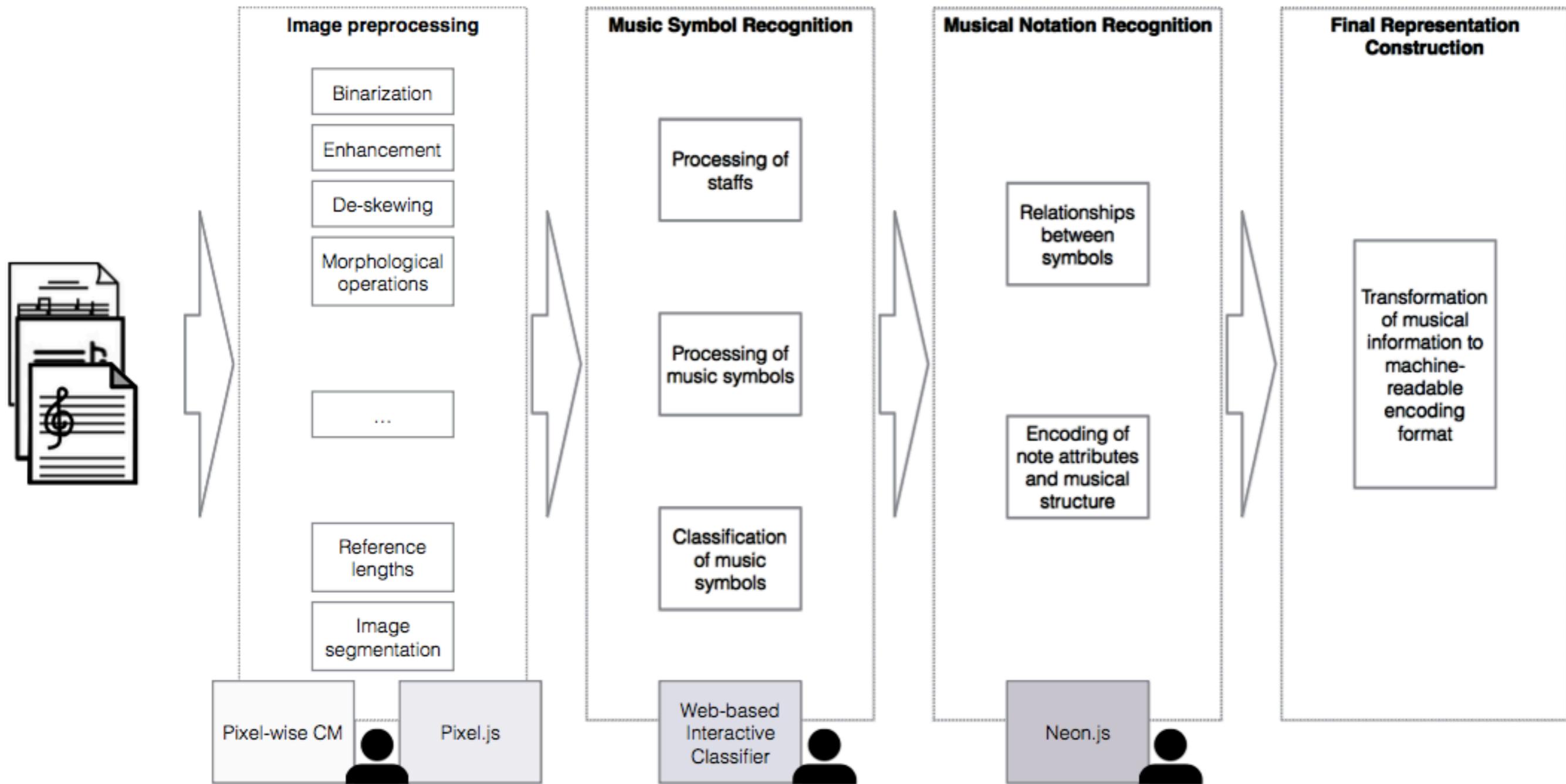
Online music scores and libraries

- IMSLP
- Online Digital Musical Document Libraries

SIMSSA: Single Interface for Music Score Searching and Analysis

- Prototype for “Google Books” for music, minus Google
- OMR (optical music recognition) is required for full-text search
- Access to digitized scores world-wide from a single website

SIMSSA technologies

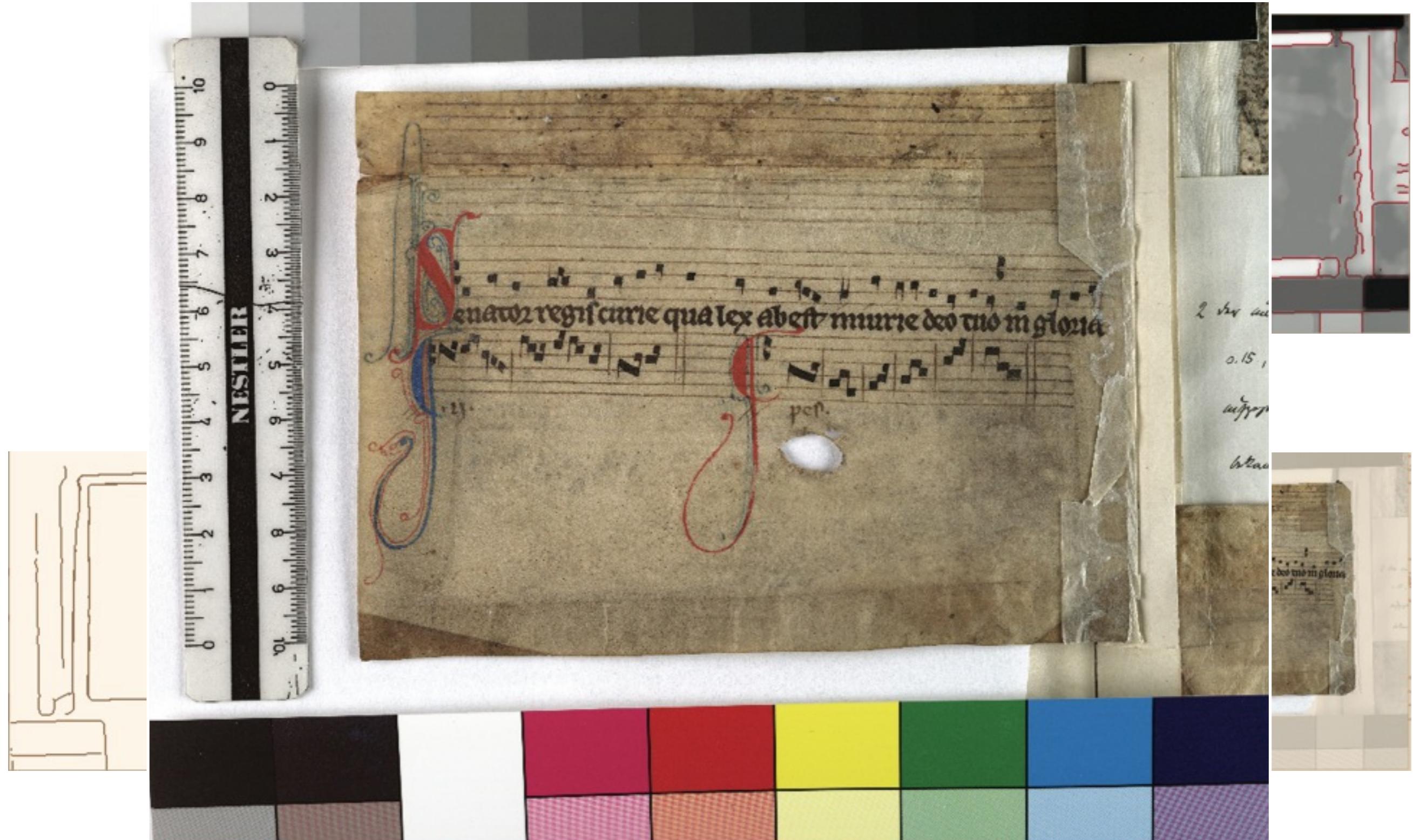


SIMSSA technologies

- Web-based optical music recognition (OMR) system with score editor
 - Rodan (Remote Online Document Analysis Network)
 - Gamera and Aruspix for image preprocessing and music symbol recognition
 - Neon.js (web-based neume editor)
 - Crowdsource for error correction
- Web-based user interface to view, search, annotate, and analyze scores
 - Diva.js
 - MEI (Music Encoding Initiative)
 - music21

Preprocessing for OMR

I Bte higant deceptibng



More intelligent cropping

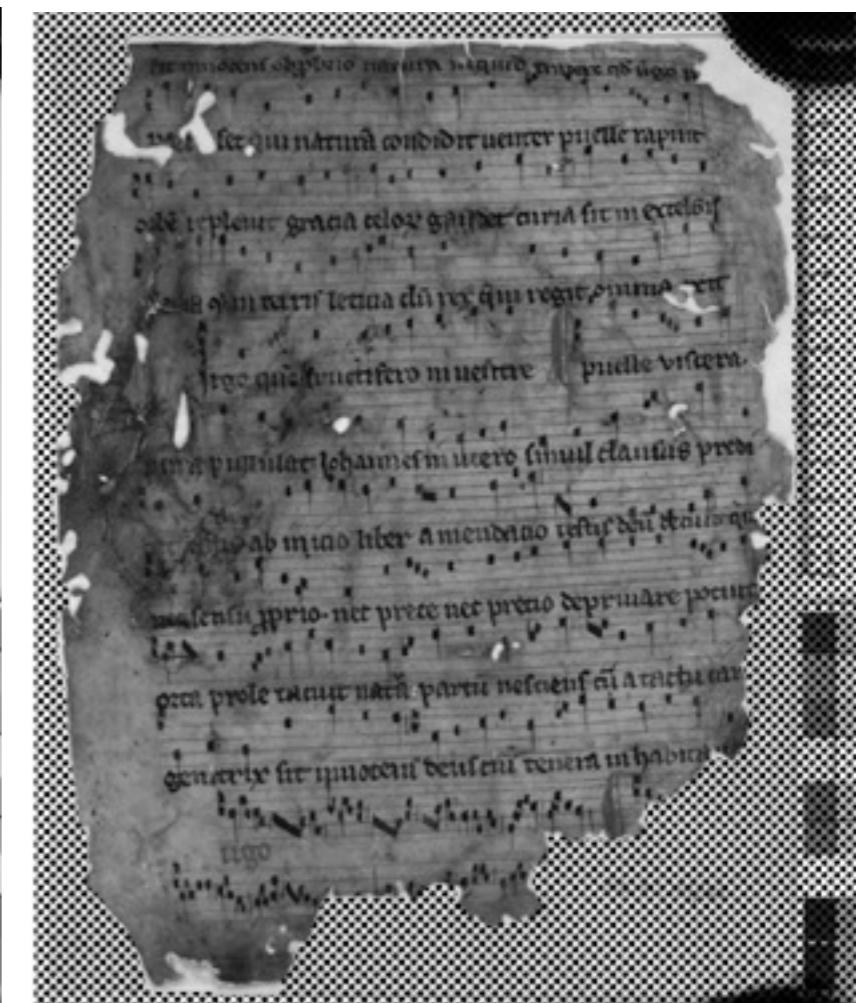
Original



Greyscale



Cropped



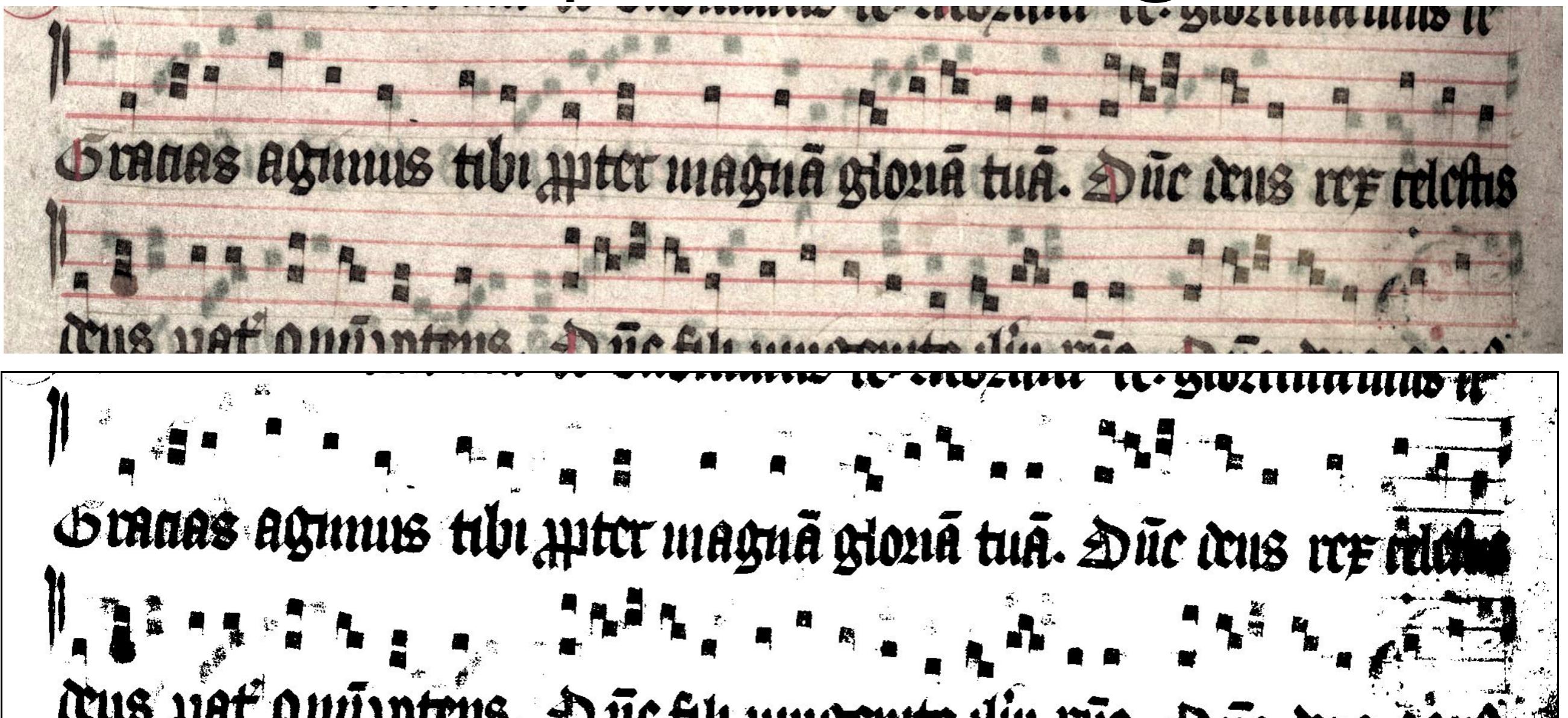
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Preprocessing



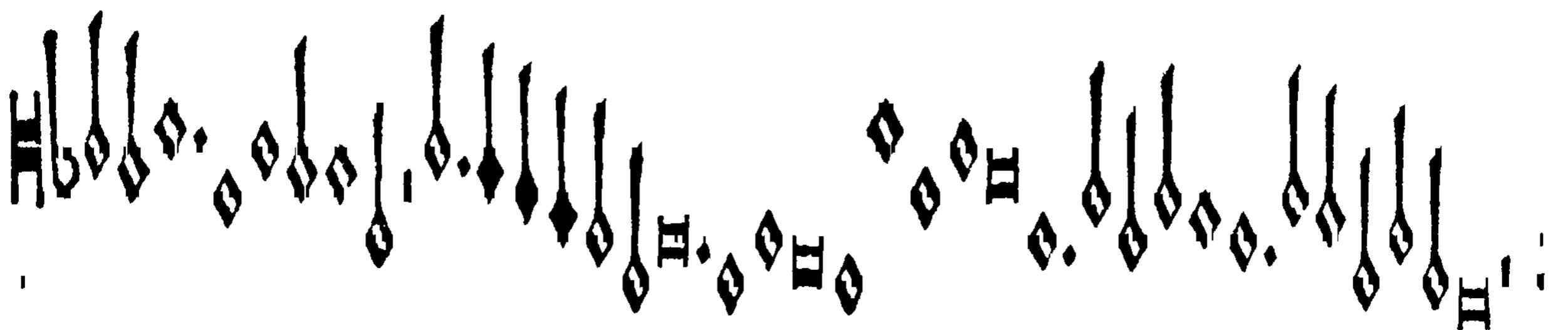
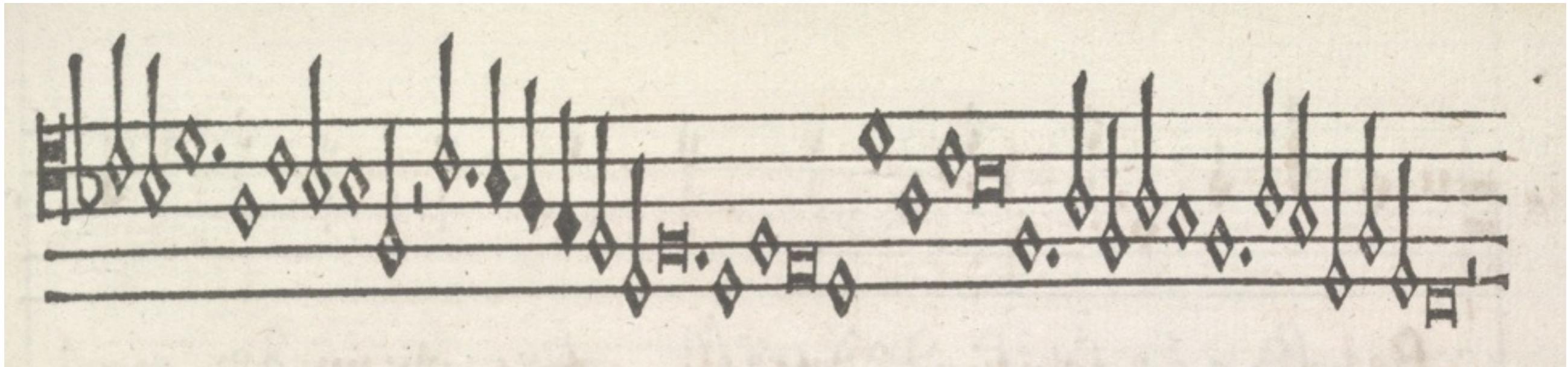
Brightness enhancement

Preprocessing

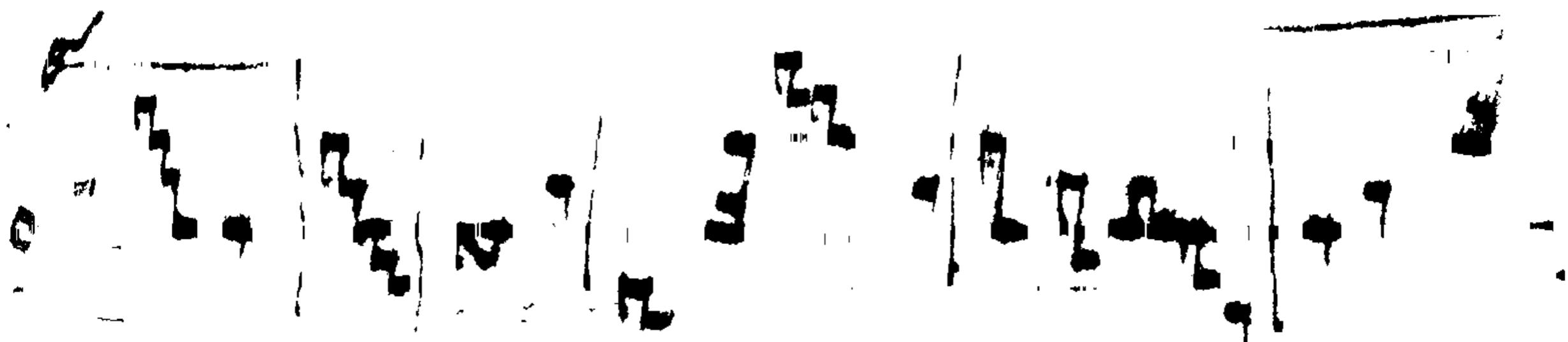


Thresholding

Staffline Removal

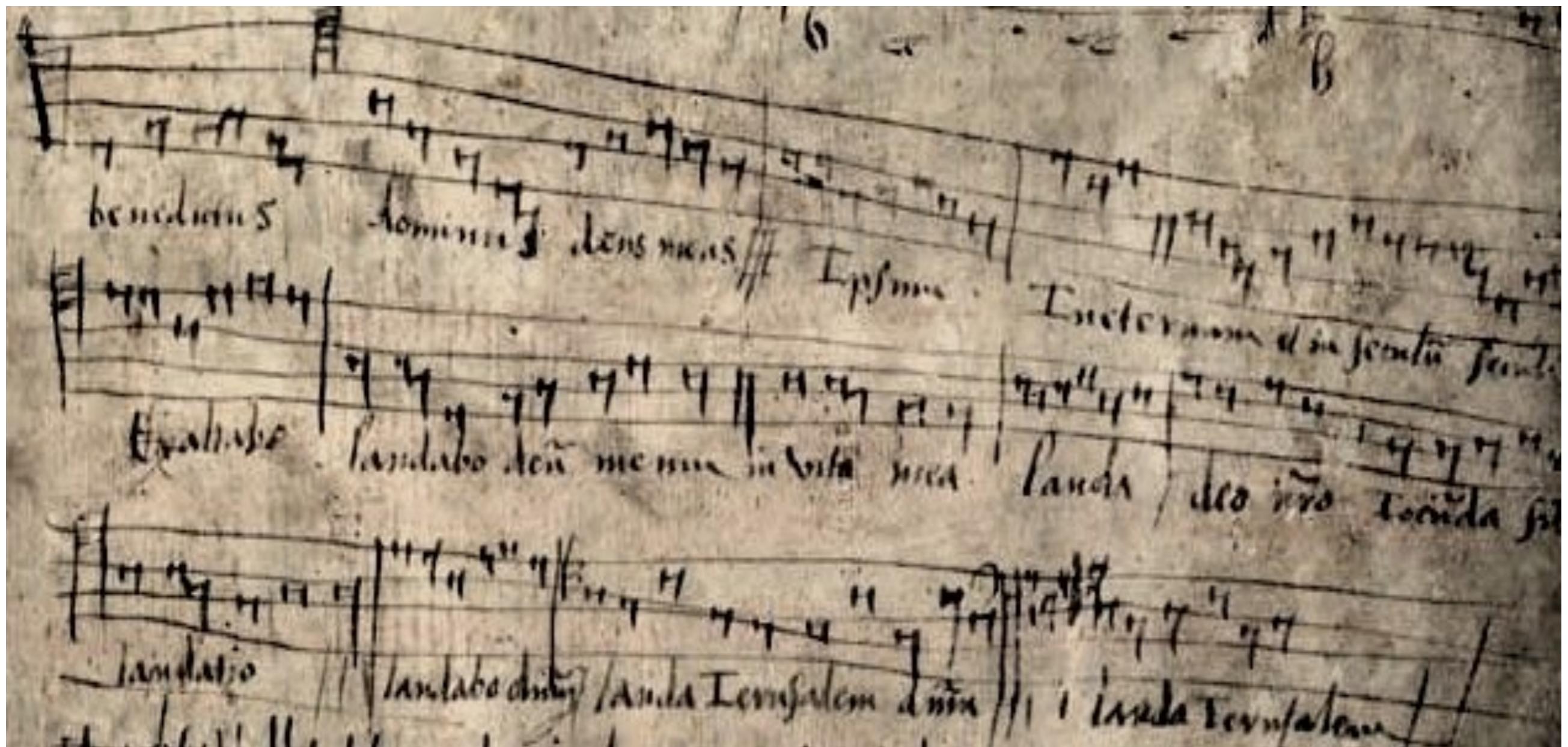


Staffline Removal



Four-line hand-drawn staff example

Staffline Removal



Difficult

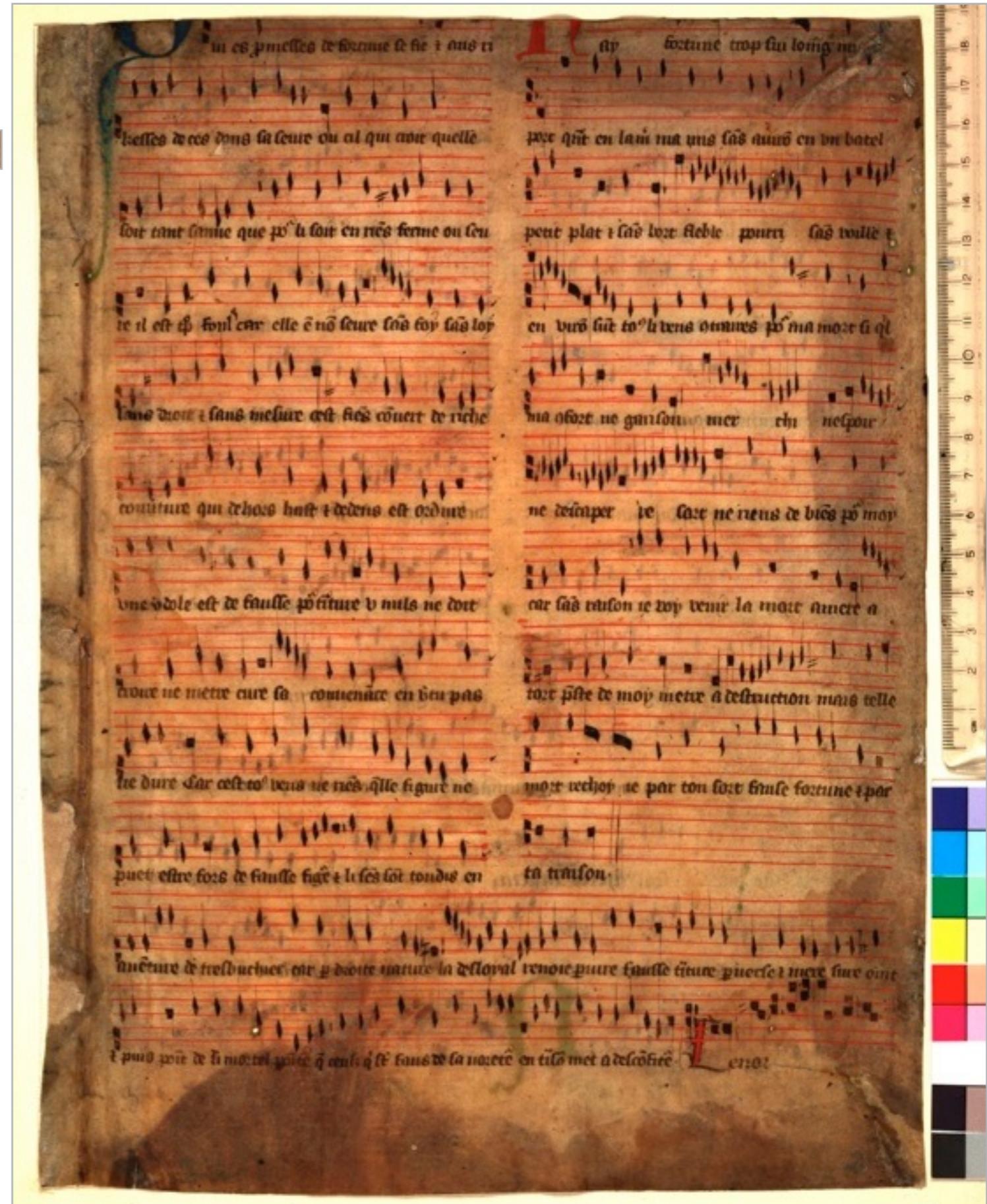
Extracting lyrics from Early music



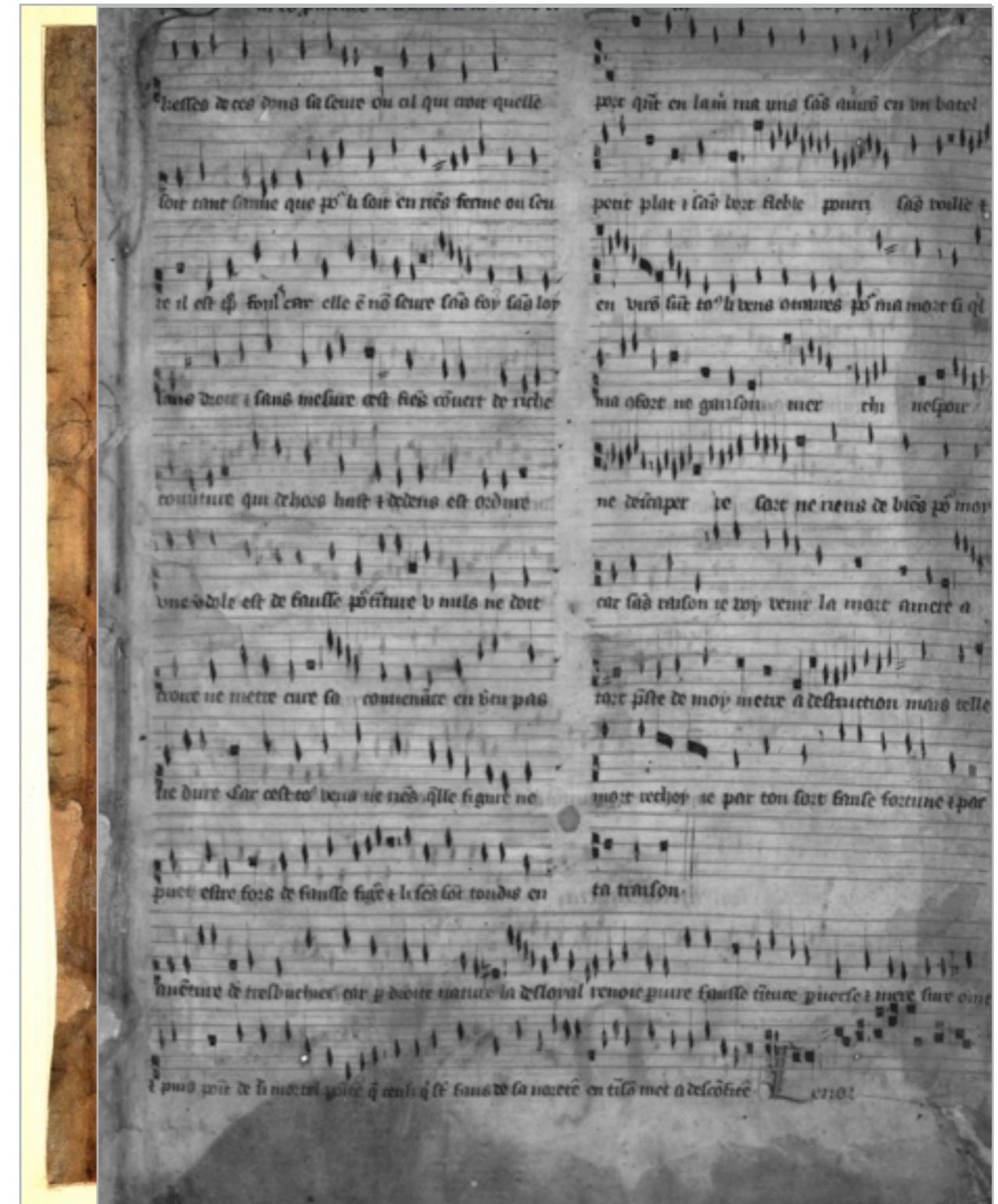
Images Courtesy of

Extracting lyrics from Early music

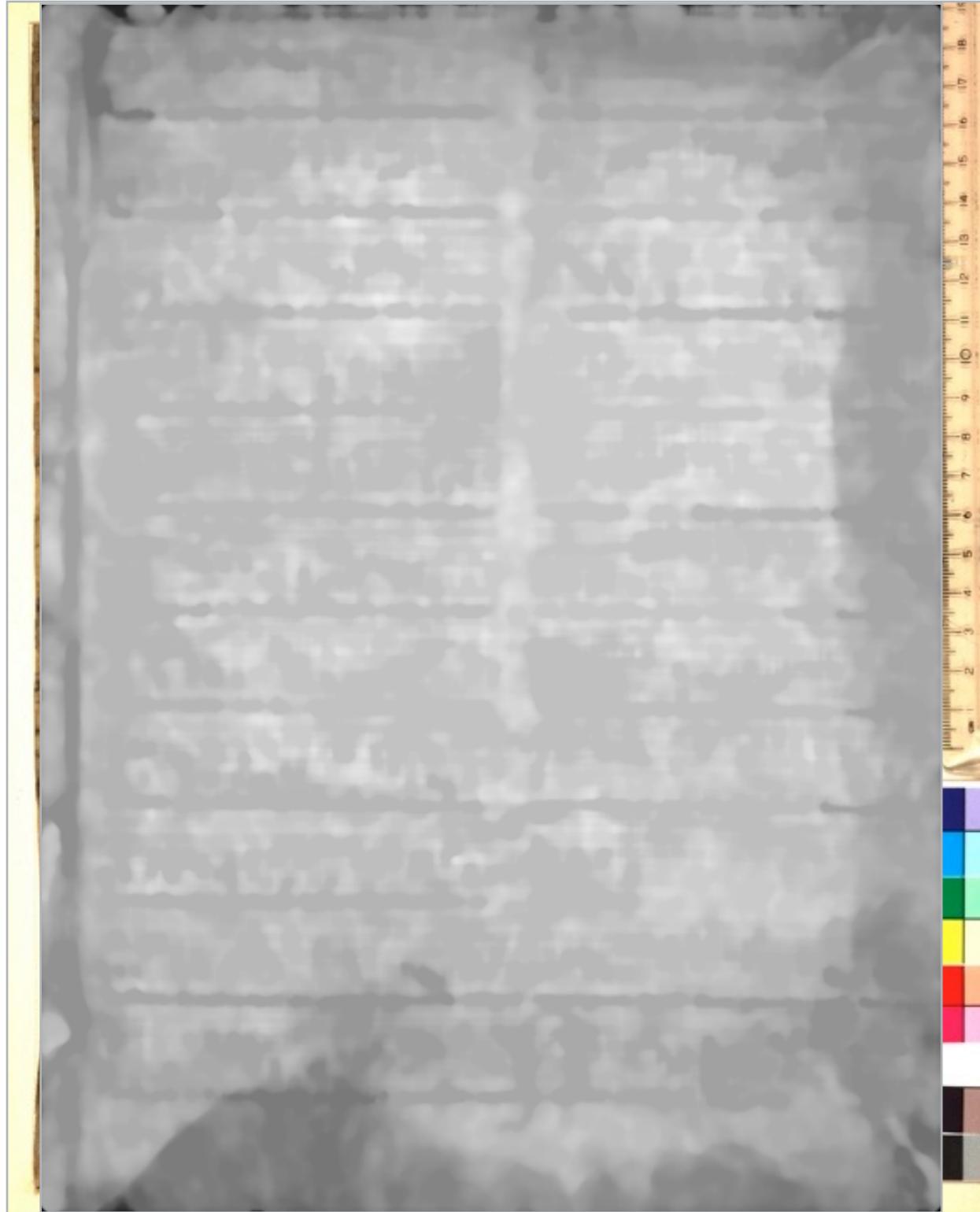
Images Courtesy of



Preprocessing: Greyscale

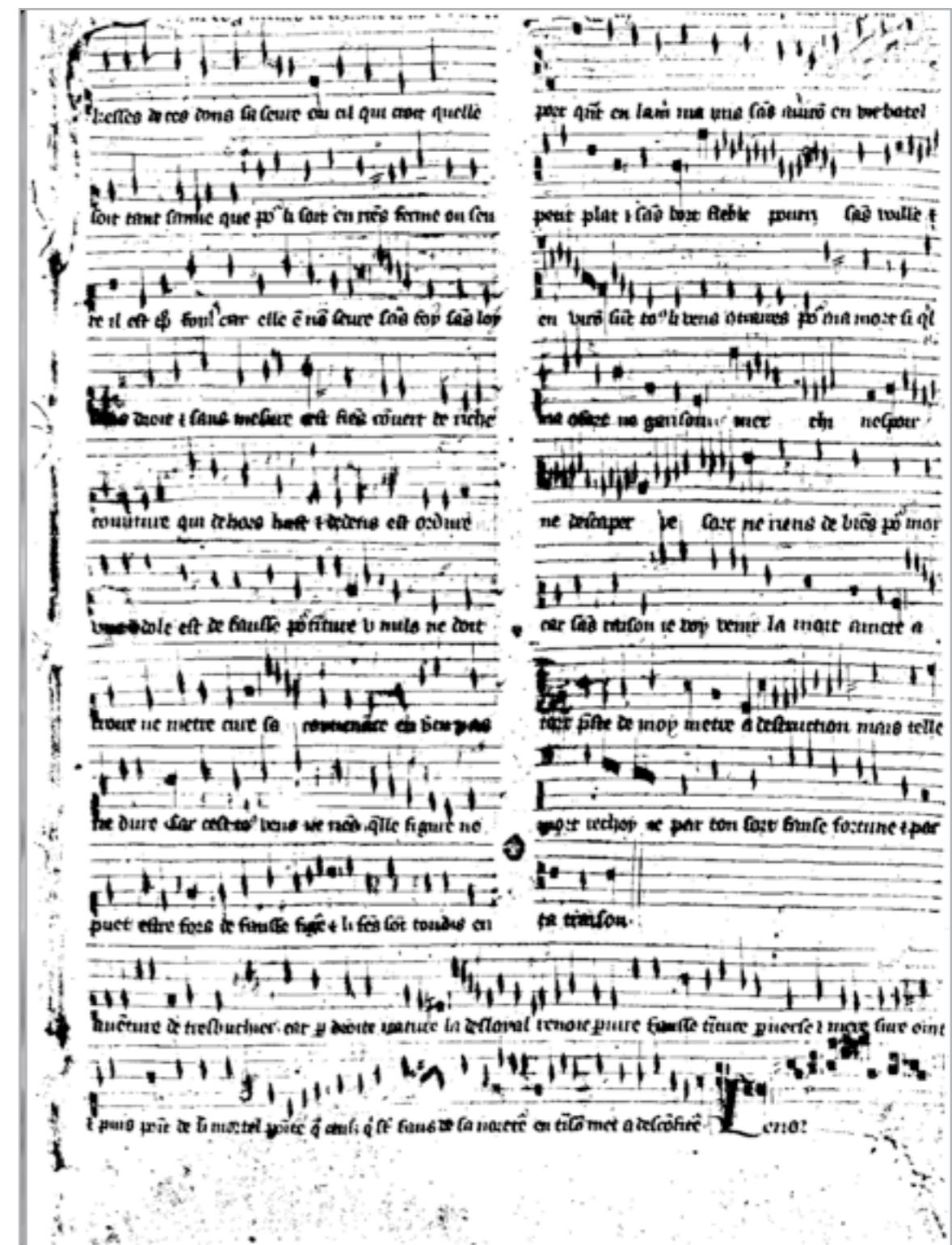


Preprocessing: BG estimation



liestes de ces dons la force ou al qui amer quelle
loit tant simme que po' le soit en n'es ferme ou leu
te il est qd son'car elle e n'e leure los moy las lor
lise droit i sans mesur est ries couert de riche
constitue qui dehors hant t delens est ordure
une vole est de faulx p'titure v mis ne doit
droit ne mette cure sa contenante en deu pas
lie dure l'ar coste deus ne n'es quelle figure ne
puet estre fors de faulx fage t le ses lot tondus en
l'autre de tressbutcher sur y droite nature la defforal renvoie pture faulx t mere sine oint
t puit puit de li n'ost tel yole qd en qd sans de la n'rete en tilo met a descoibree L enor

Preprocessing: Binarisation



Preprocessing: Staff removal

A page from a medieval musical manuscript featuring two staves of music. The music is written in black ink on white paper, with square neumes on four-line red staves. The lyrics are written in French in a Gothic script below the staves.

The lyrics are as follows:

blesses de ces dons la leue ou ai qui croit quelle
loit tenu simie que po' la foy en mes feme ou seu
re il est qd son car elle e n'e leue los soy las loy
me dore i sans meure est foy couert de riche
couiture qui debors hest i deus est ordure
quandole est de faulx porteur u nuls ne sont
trouer ne metre oute sa remonance en bres pas
ne dure sur ceste leys we ried qd elle figure no
puet estre foy de faulx figure & li foy lor toutes en
huncure de tresbueher est y deute quante la destral tenore puer faulx tenuer puer & mes foy
et puer puer de la mortel puer qd sans de la morte en tis met a deschofie L enor

Connected-component analysis



Lyric extraction

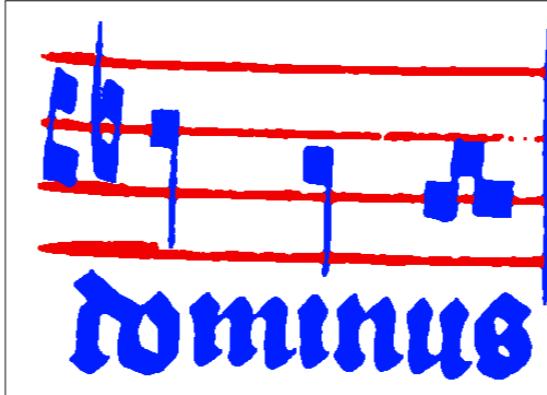
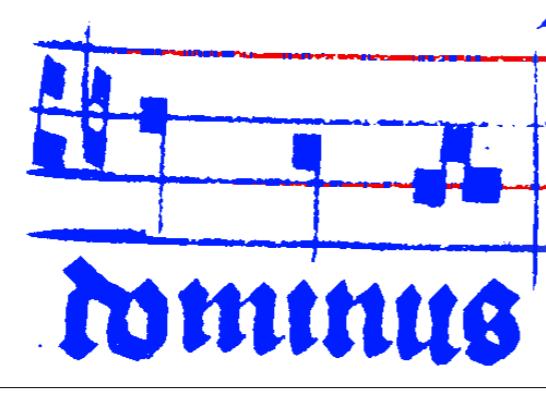
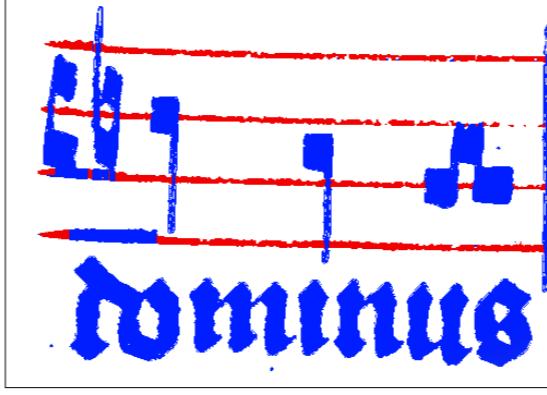
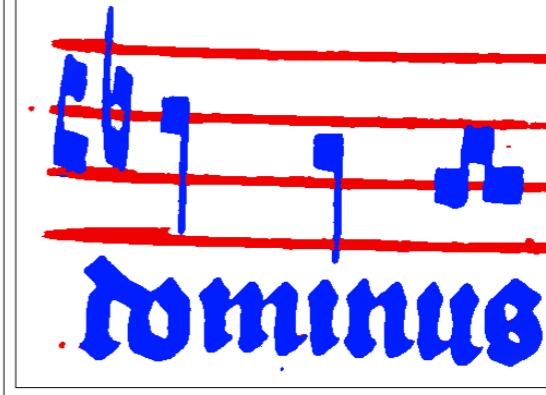
besses de ces dons la leure ou ou qui voit quelle
 soit tenu simile que po la soit en mes feme ou seu
 re il est qd foul car elle e na leure los for las loy
 ma dore i sans meurt est fies couer de riche
 couture qui debors hest tedenis est ordure
 une chose est de faulx porteur u nuls ne doit
 trouer ne mette oute sa rumeur en bres
 ne dure sur ceste leys we rach qd elle figure no
 puet estre foy de faulx figure & le fez lor toutes en
 aueture de trebuchier est y deute iparue la delaval tenore puer faulx tenuer puer le meur leure oint
 e puer puer de la mortel puer qd amf qd sans de la morte en tis met a deschoie eno?

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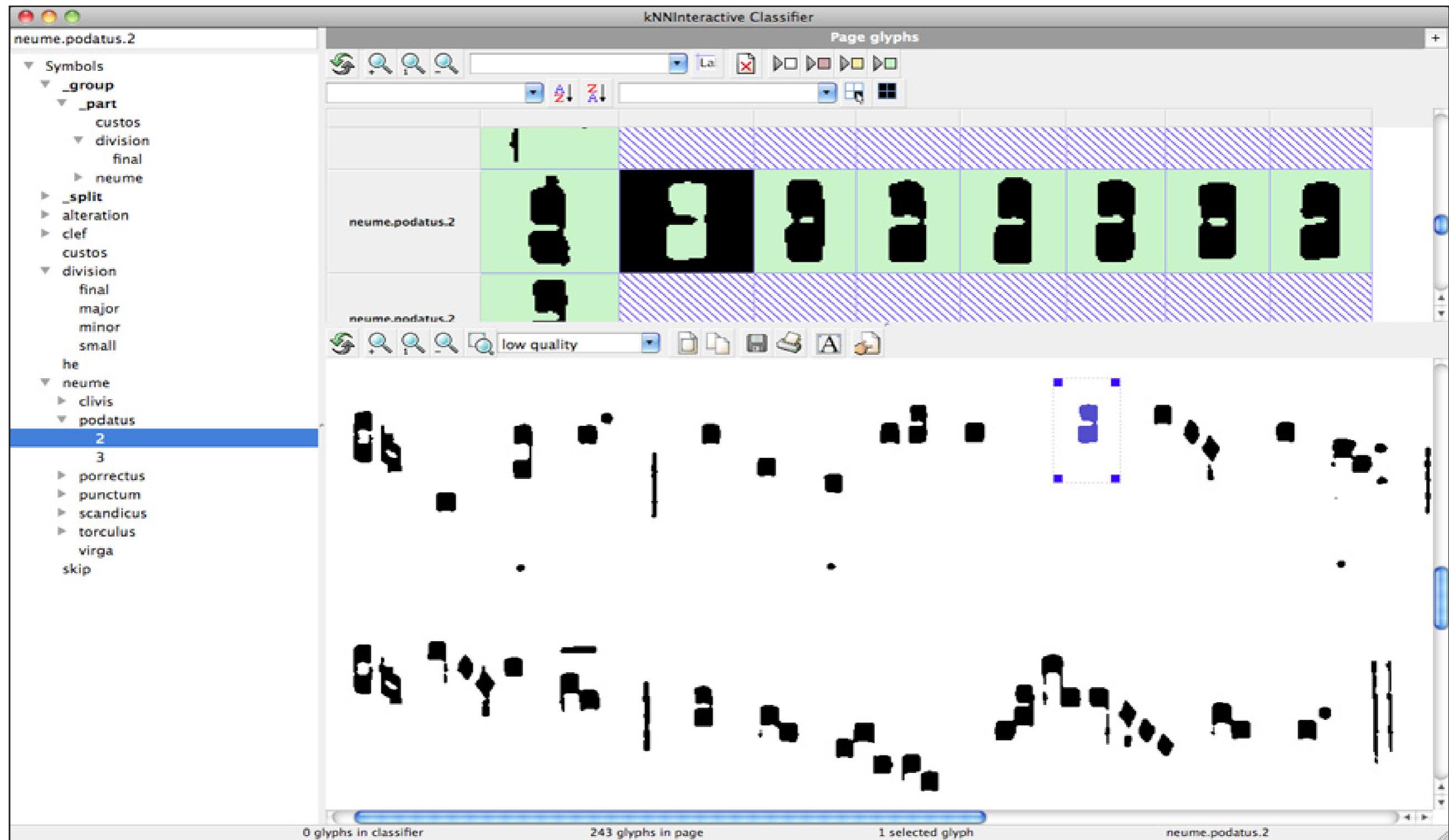
One-step detection of elements in music scores using machine learning

(Calvo-Zaragoza et al., 2017)

QUALITATIVE RESULTS

Source	Ground-truth	
		
BLIST+LRDE	BLIST+INESC	CNN
		

Symbol classifier / Gamera



Neume correction: Neon.js

Neon.js File ▾ Hotkey Glossary | Help | Developers | DDMAL

Editing CF-012

MODE + Insert Edit

INSERT ■ Neume || Division System C/F Clef

Select Head Shape

- Punctum
- Quilisma
- Custos

flece quia cito veniet salus tu a. dicitur
In laud. Antiphona. Alleluia. ps. Misericordie. R.
Ueni ad liberandum nos. Domine deus virtutum. da t ostende faciem
tuam et latum erimus. Domine. pmi.
Splendor paternae. verbi. Emitte agnum domine dominatorem terrae. De petra deserti ad montem filie syon. Ad benedictus Antiphona.

Web visualizer: Diva.js



Zoom level: 2

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Go



SIMSSA proof-of-concept projects

- Liber Usualis
- Cantus Ultimus
- Musiclibs

MIR: Music Information Retrieval

- Similarity
 - Melody, timbre, rhythm, form, style, tempo, mood, etc.
- Recognition, analysis, classification
 - Instrument, timbre, singer identification
 - Structural analysis
 - Style analysis
 - recommendation system
 - playlist generation
 - Optical music recognition
- Knowledge Representation
 - Standards (metadata, audio file formats, symbolic, song / artist unique IDs)
 - Taxonomy (categorization: genre, tags, mood, etc.)
 - Summarizations
 - Indexing and metadata

MIR: Music Information Retrieval

- Human-computer interaction and interfaces
 - Usability
 - Multi-modal user interfaces
 - Visualization tools
 - The loudness war (Ex. 1, Ex. 2)
 - Everynoise
 - <http://rama.inescporto.pt/app/>
 - Charting-the-Beatles
 - Mobile applications
- Corpora and databases
 - Digital music libraries and archives
 - Text and web mining
 - Web services and APIs

MIR: Music Information Retrieval

- Socio-cultural aspects
 - Business models
 - Music and cultural heritage value
 - Non-Western music
 - Personalization / privacy
- Intellectual property issues
 - Watermarking and digital rights management
 - Audio fingerprinting
- Evaluations of MIR systems
 - User needs and expectations
 - Building test collections (ground truth)
 - Experimental design
 - Metrics and benchmarks
 - http://www.music-ir.org/mirex/wiki/MIREX_HOME
 - Annual evaluation campaign for MIR algorithms

MIR: Music Information Retrieval

- Automatic searching, transcription, and annotation
 - Podcastle
- Active Music Listening interfaces
 - Songle API!
 - Songrium

The End!