Watermarks and Paper Features in Modern Italian Manuscripts

A Digital and Archival Approach

Alberto Campagnolo

Senior Researcher, PRIMA ERC project, CESR, University of Tours
Assistant professor, Book Heritage Lab Director, KU Leuven
Editor-in-Chief: Journal of Paper Conservation

alberto.campagnolo@univ-tours.fr
alberto.campagnolo@kuleuven.be
orcid.org/0000-0002-8672-8400

Robert G. Erdmann

Advisor, PRIMA ERC project, CESR, University of Tours
Professor, University of Amsterdam

r.g.erdmann@uva.nl

Reykjavik
2025

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

PRIMA

Manuscript Culture in the Age of Print (1575-1800)

ERC Advanced Grant

PI: Prof. Elena Pierazzo

CESR,
University of Tours

Italian collections

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

PRIMA Team

Alberto Campagnolo
Senior researcher

Serena Carlamaria Crespi
PostDoc researcher

Carlos González
Associate professor

Maria Antonia Papa
PostDoc researcher

Robert G. Erdmann
Professor

Ambra Stefanello
PhD researcher

Victoire Muller
Engineer

Alice Gydé
MA student

Nina Amambal
Project manager

Orsetta Baroncelli
Archivist

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

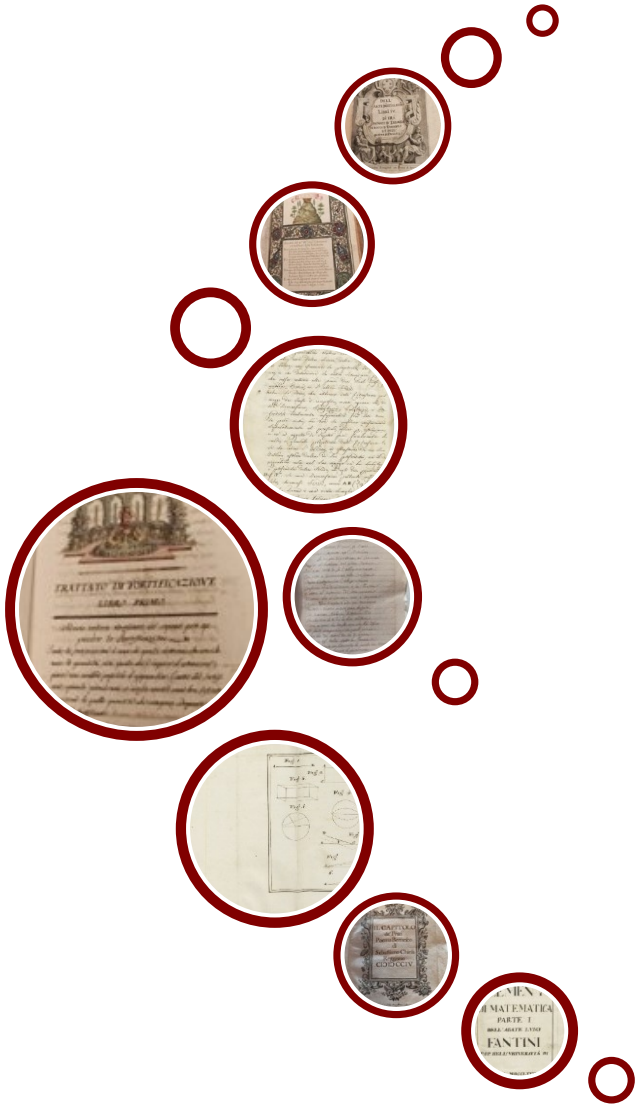
The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Common Narrative about Manuscripts and Print:

- A one-way narrative: from manuscript to print
- Print becomes the main medium for cultural dissemination in the 16th century
- Manuscripts fall into oblivion, except for private use or to evade censorship
- Palaeography ceases to be a discipline
- Same for codicology
- Book history (i.e., the history of printed books) takes over

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



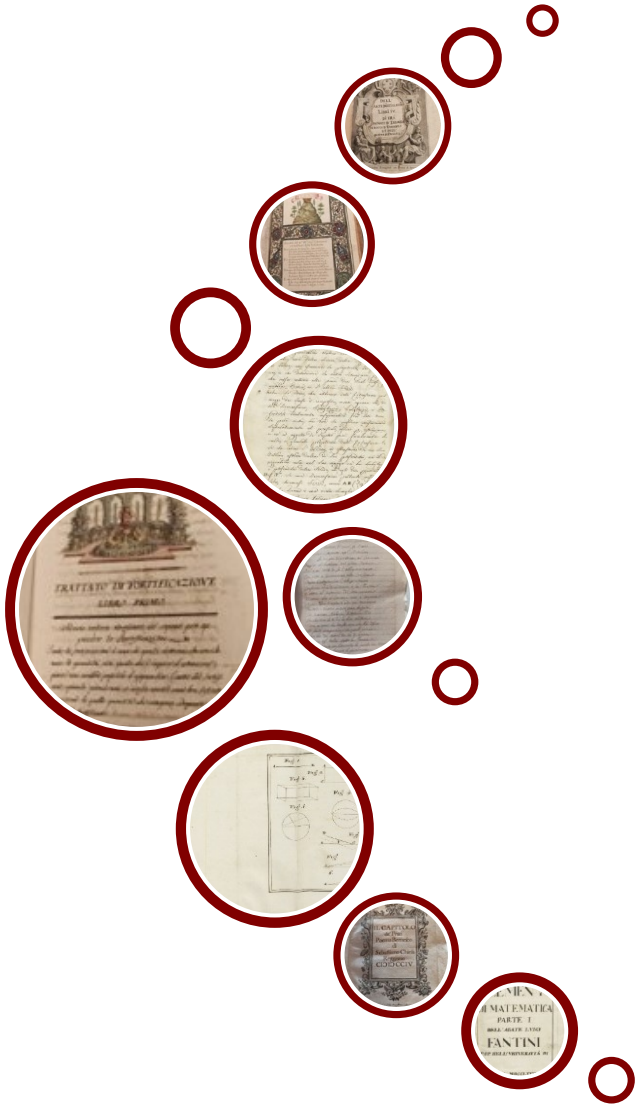
Manuscript Collections 1575-1800

- Manuscripts Produced by Professionals
- In **abundance**
- All genres: scientific, theatre, satire, song lyrics, translations, history, manuals

- Where do they come from? Why were they produced? Who were they intended for? How did they end up being used?

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



Project's objectives

- Study a large number of manuscripts to analyse manuscript culture at a time when it was supposedly no longer present
- Understand materiality through modern codicology
- Understand the evolution of handwriting through modern palaeography (or neography?)
- Understand textuality through the philology of modern manuscripts
- Understand places of production: monasteries, schools, academies...
- Understand the market in relation to literacy and cultural circles
- Understand the audience to rethink the culture of the Italian Ancien Régime

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

A layered corpus

Partner libraries

18K mss * 70% = 12.600 relevant records

156K records

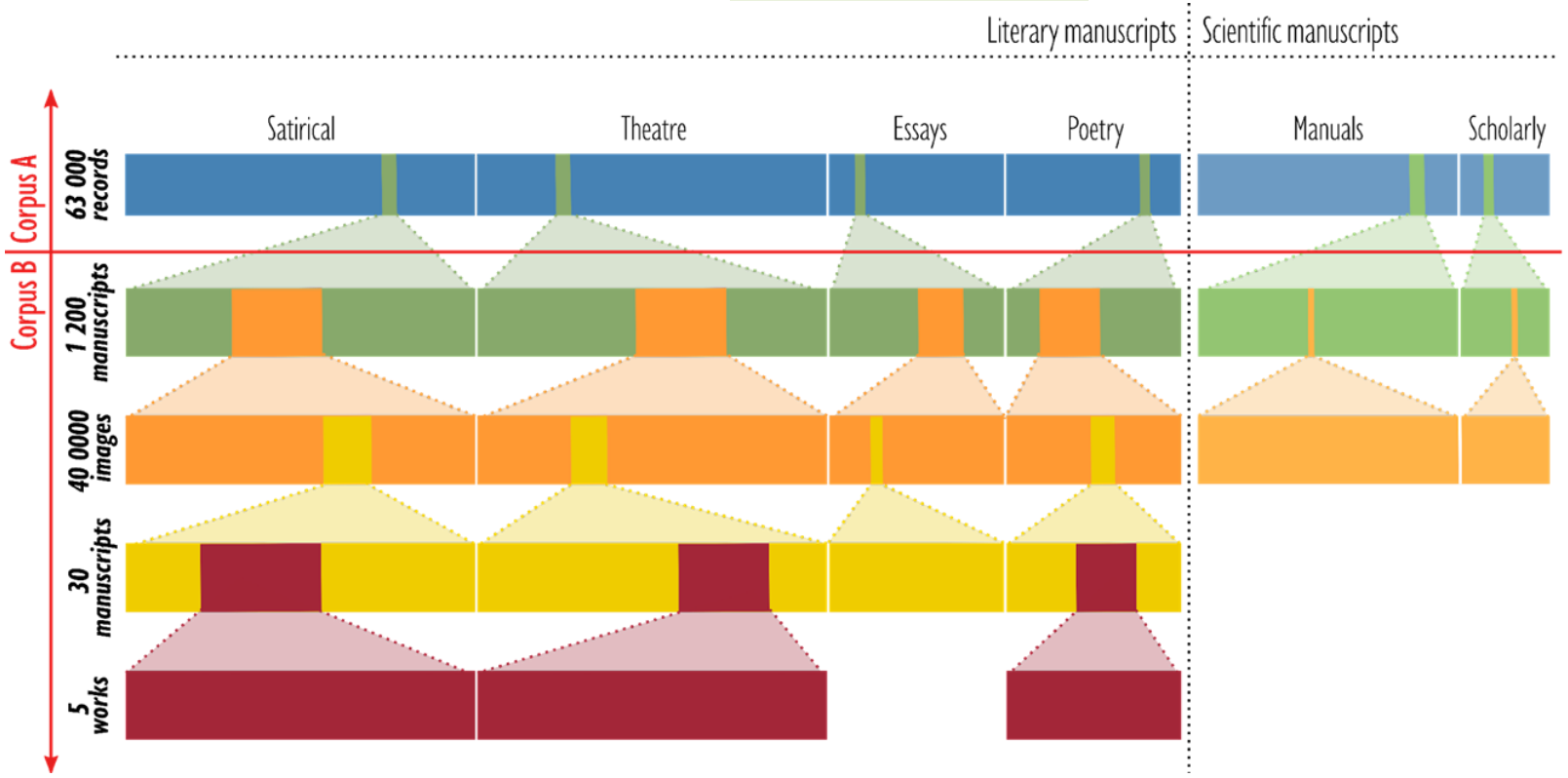
Filtering and mining

40% ≅ 57K relevant records

Existing databases

- ICCU Manus: 128K records
- Gallica: 1.200 records
- Schöenberg DB: 3K recors

6K records from Crespi's PhD



Metadata harvesting

Manual description

Digitisation

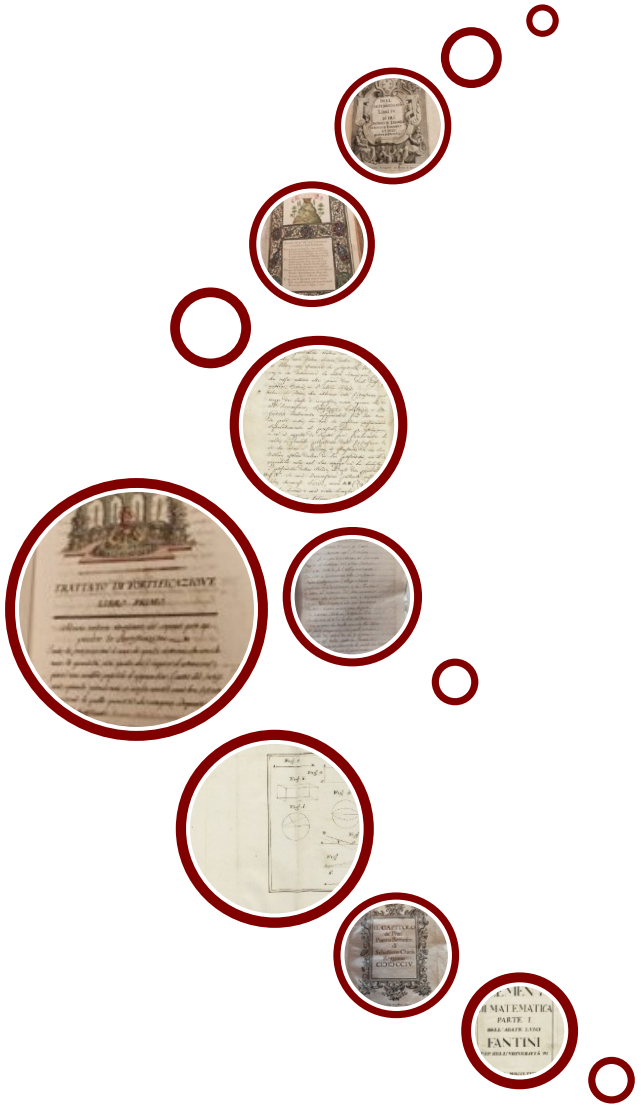
Handwritten Text Recognition

Edition

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



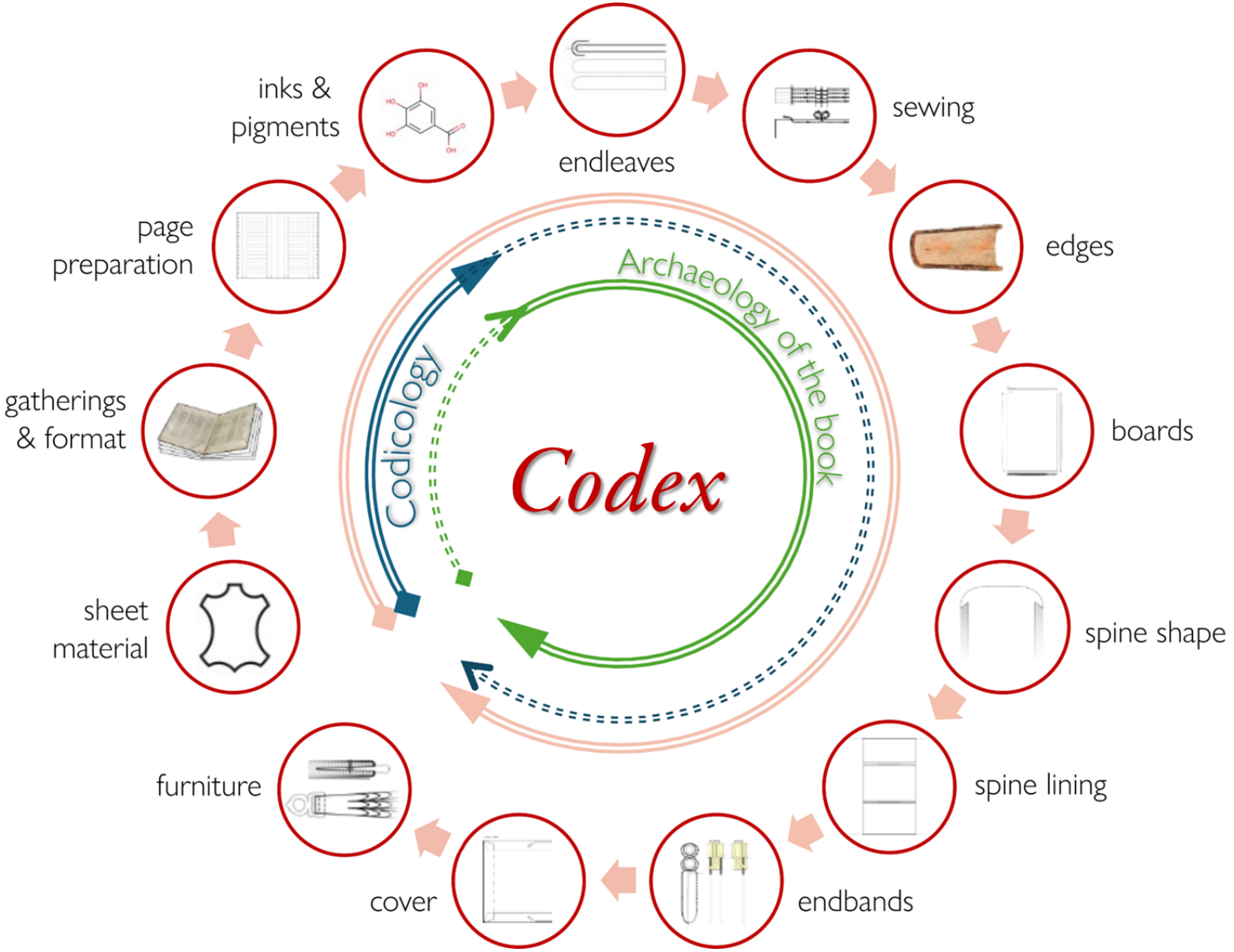
Project's objectives

- Study a large number of manuscripts to analyse manuscript culture at a time when it was supposedly no longer present
- Understand materiality through modern codicology
- Understand the evolution of handwriting through modern palaeography (or neography?)
- Understand textuality through the philology of modern manuscripts
- Understand places of production: monasteries, schools, academies...
- Understand the market in relation to literacy and cultural circles
- Understand the audience to rethink the culture of the Italian Ancien Régime

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

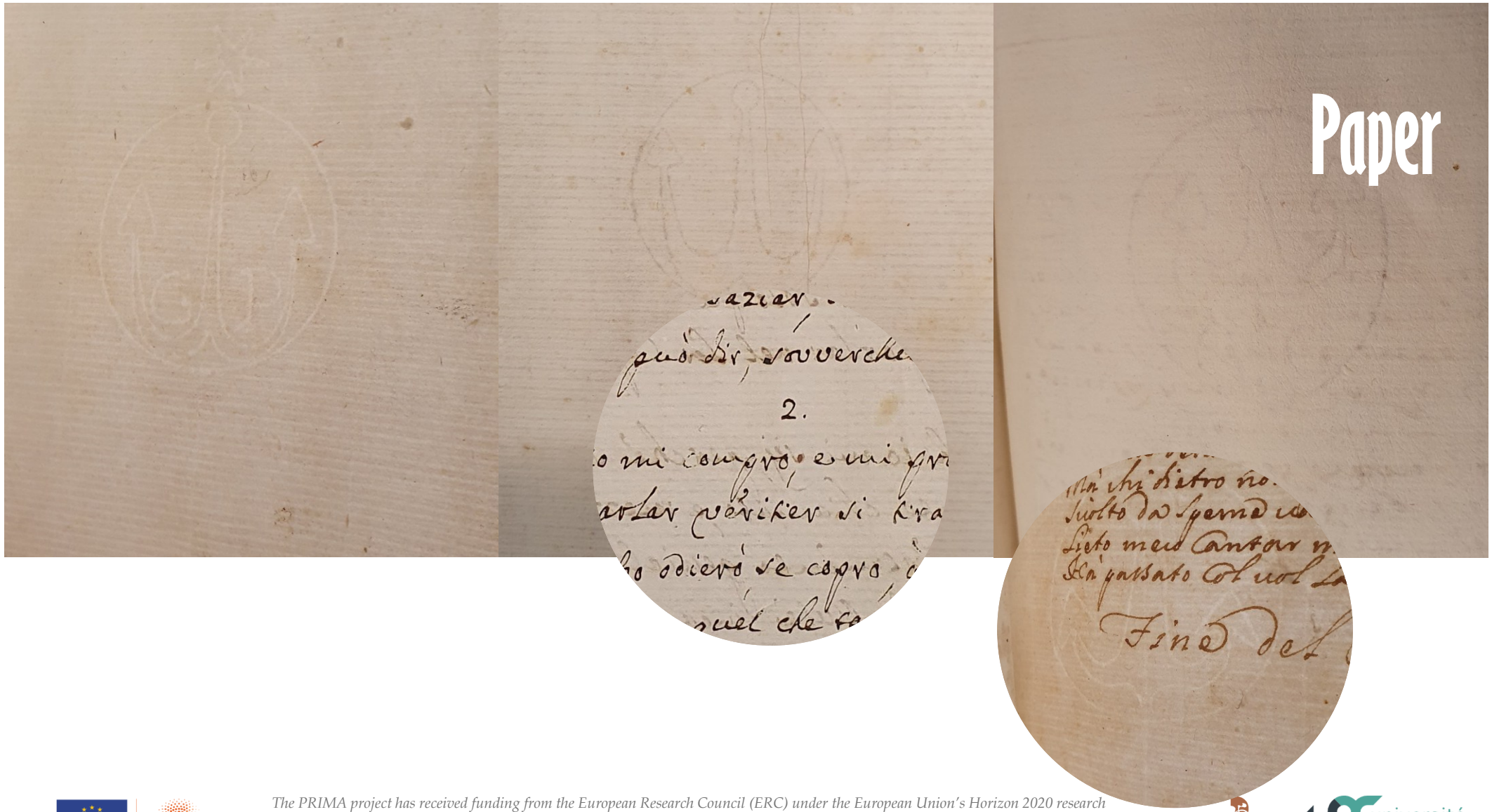
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

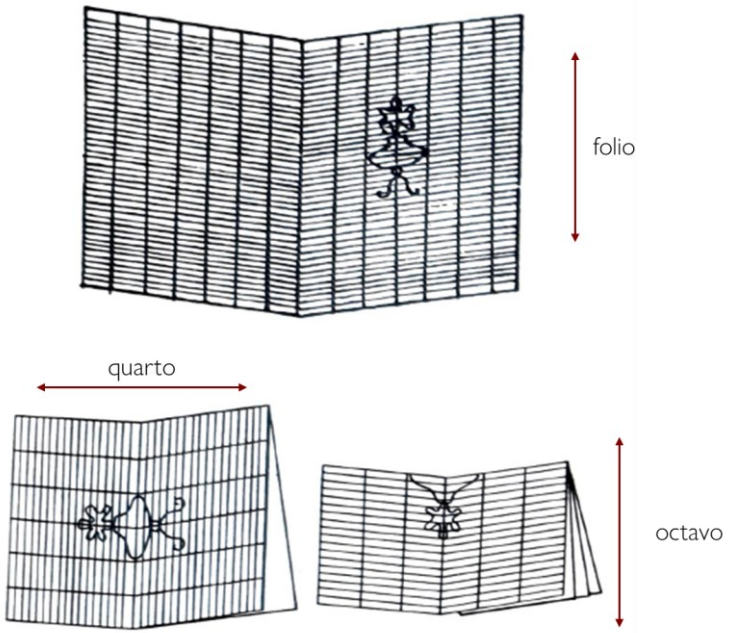


The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

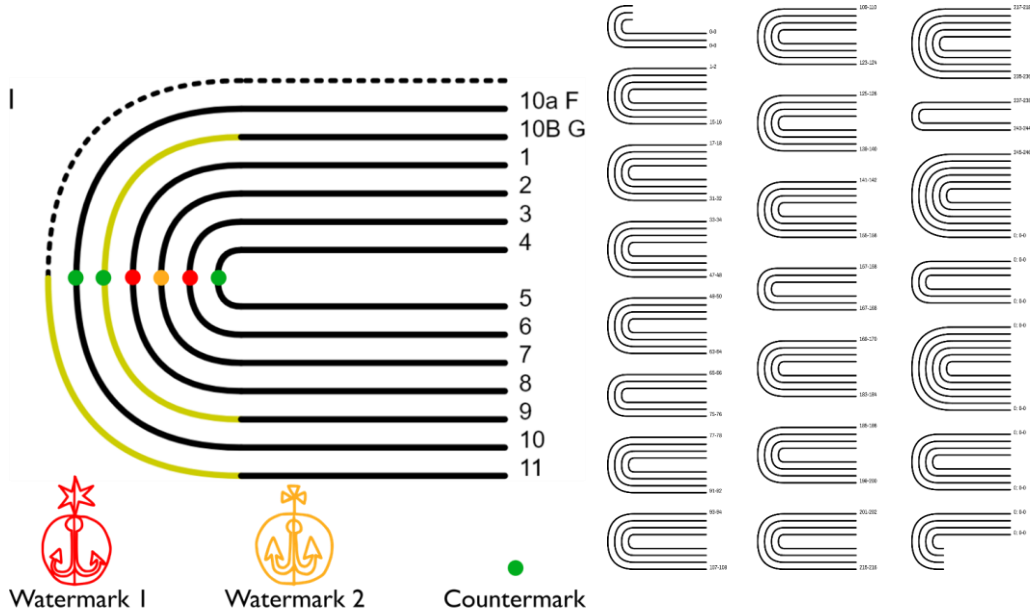
The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Paper and format



		←fold		fore-edge→
		inner	(centre)	**outer**
head→	**top**	❖	❖	❖
	(middle)	❖	❖	❖
←tail	**bottom**	❖	❖	❖

Watermark position on the page



Watermark position in the gatherings

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

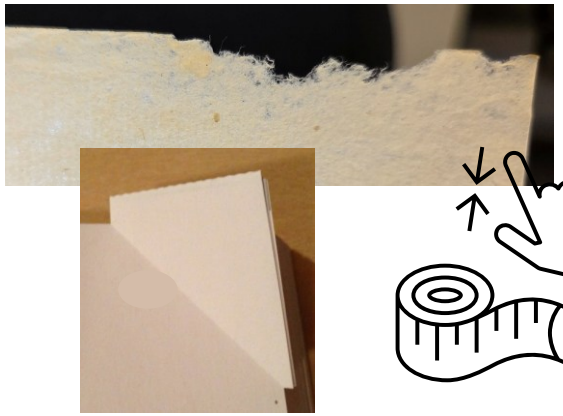
Paper sizes

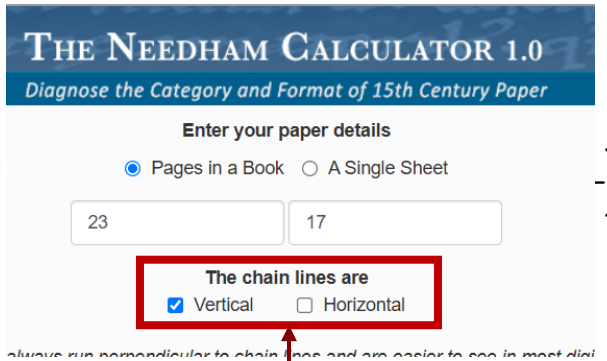
Page measurement >
Volume measurements > remove square >

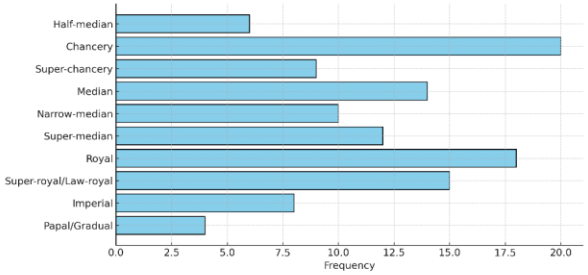
catalogues

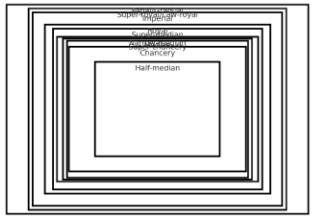
extracted
size information

Papal/Gradual
Imperial
Super-royal/Law-royal
Royal
Super-median
Narrow-median
Median
Super-chancery
Chancery
Half-median





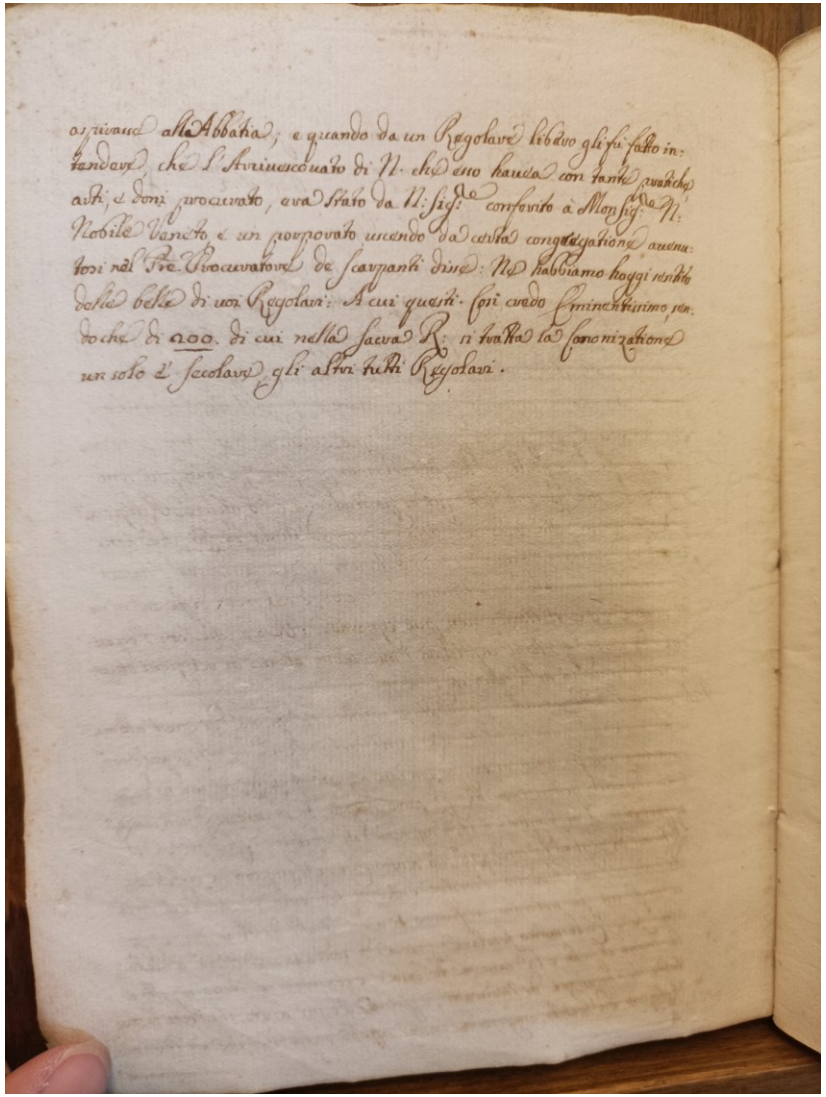


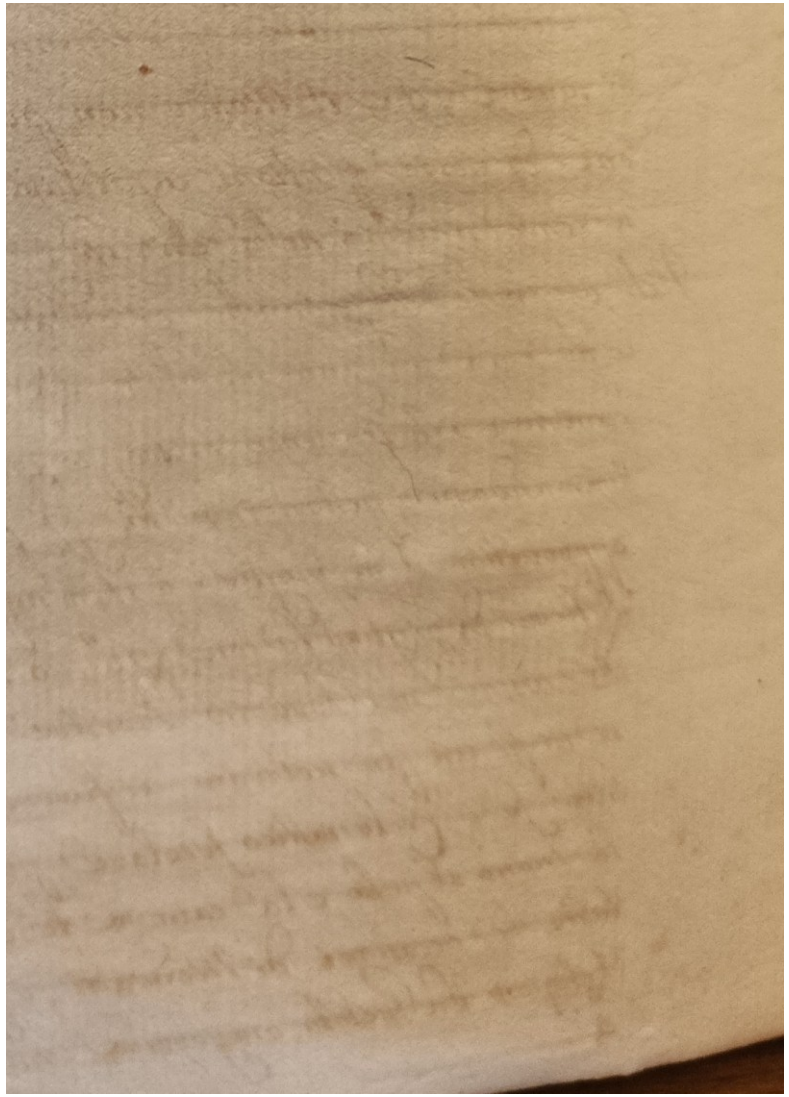


https://www.needhamcalculator.net/

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours





Ruling board

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Archive and family archive research

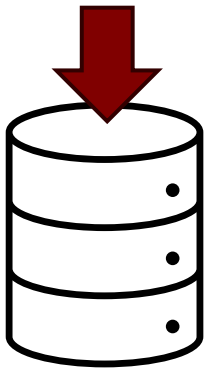
Orsetta Baroncelli

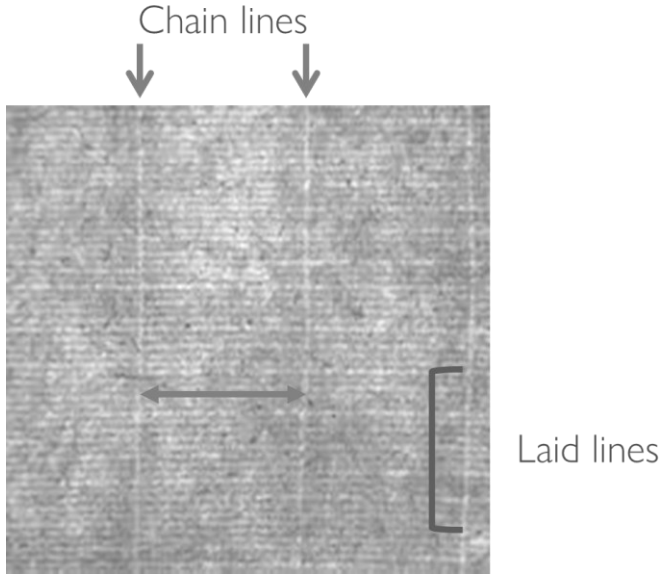
Paper and ink purchases
Frequency
Sellers
Nomenclature

Provenance
Dating
Usage

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



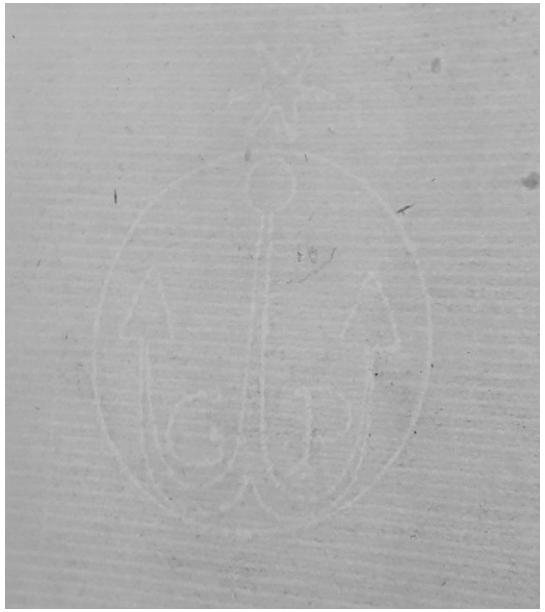


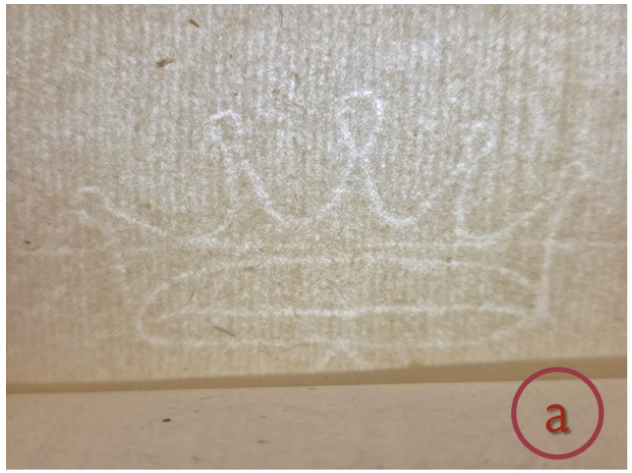
Watermark Motif description

- Primary Motif
- Secondary Elements
- Correlation Between Motifs

Watermark type

- Main watermark
- Countermark
- Third mark





twin watermarks

thickness

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

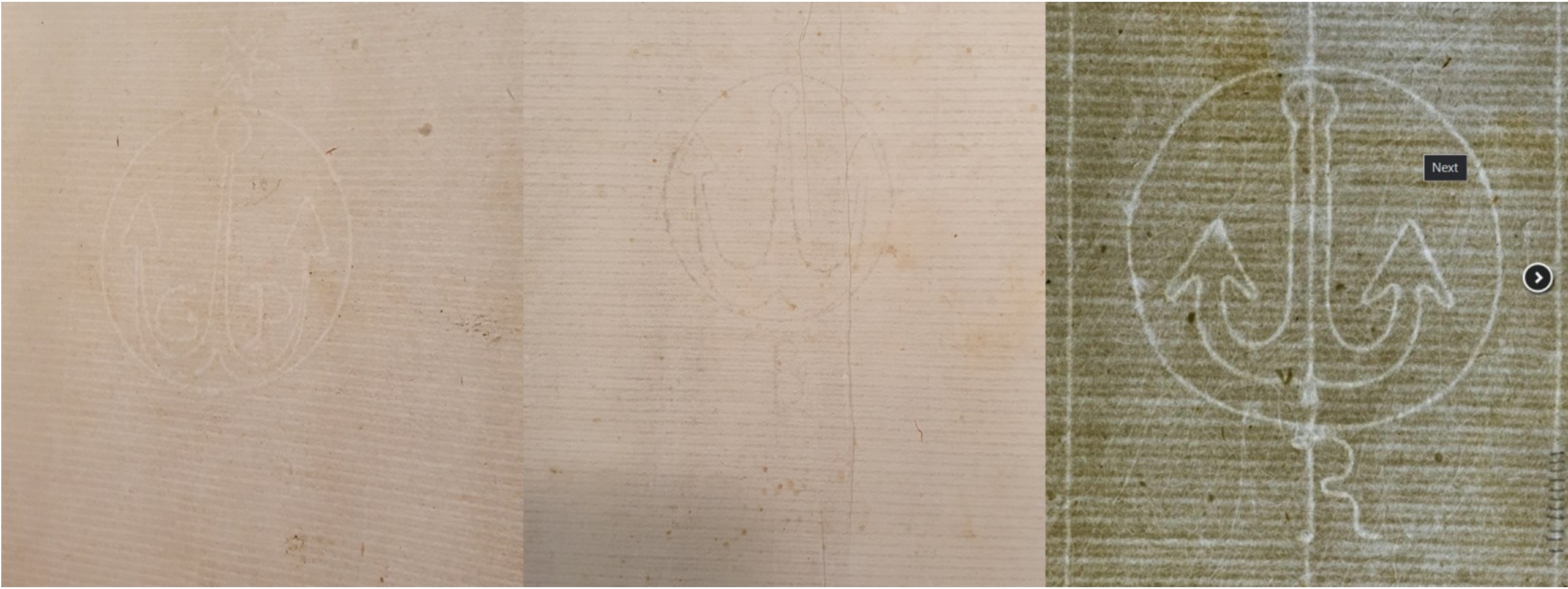
The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Paper for manuscripts v. print

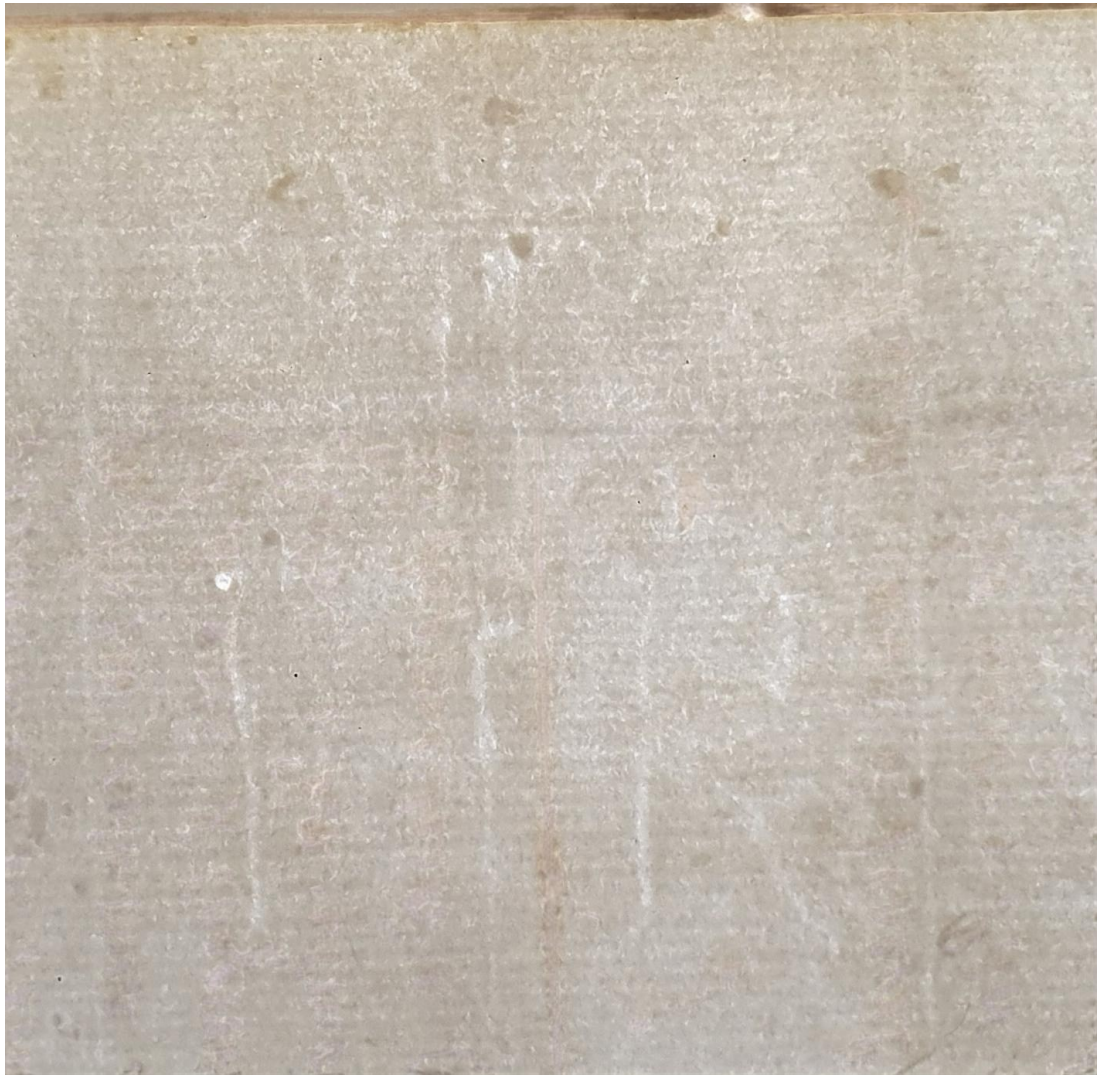


The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Poor quality



The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

GBIB PM0459

Title: Corso di riforme pei seminarj fatte da un giovane passionista. Manuscrit

Date: 1700

Extent: **duodecimo** *[?]*

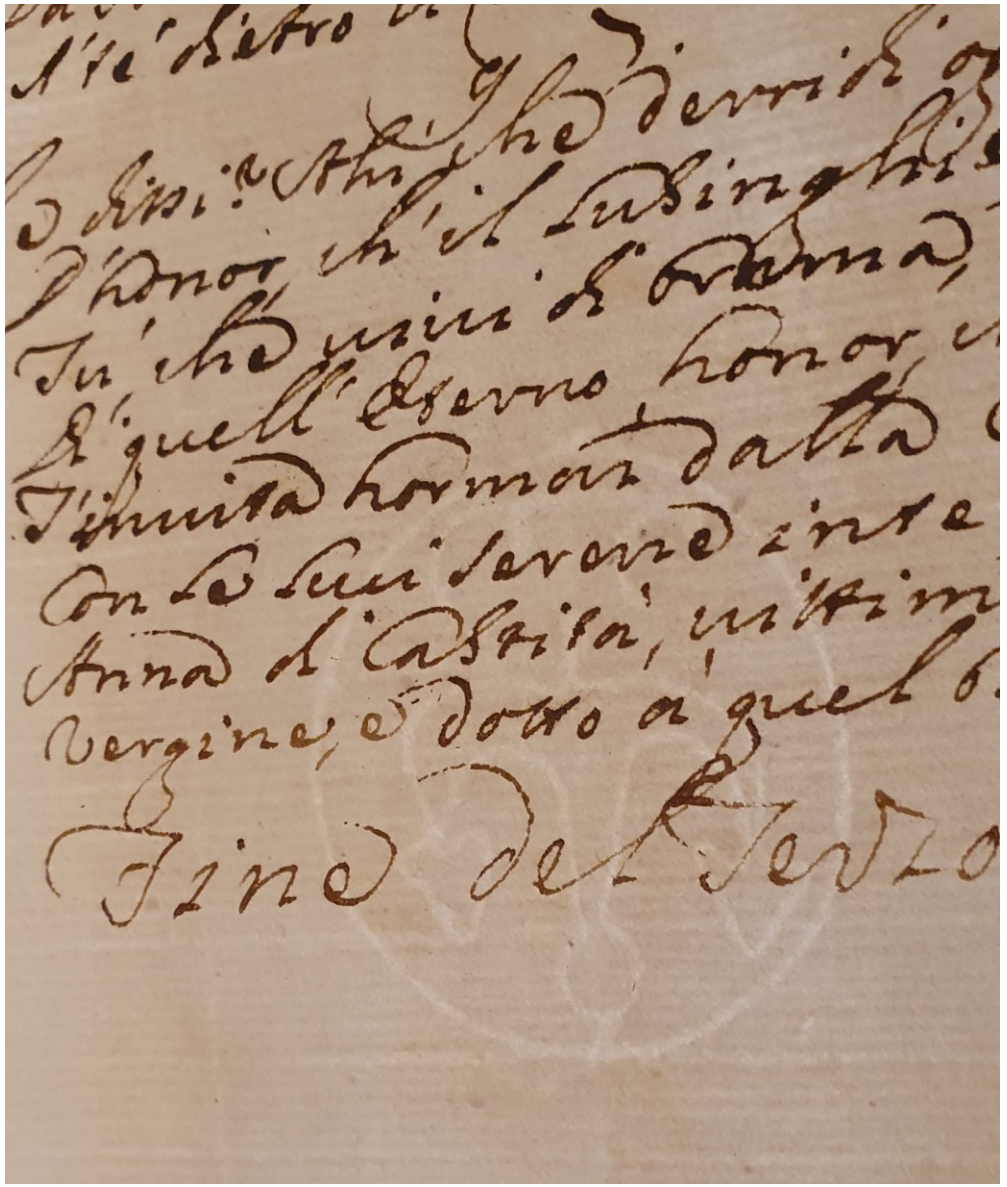
Language: Undetermined *[italian]*

Period of production: 1601-1700

?

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

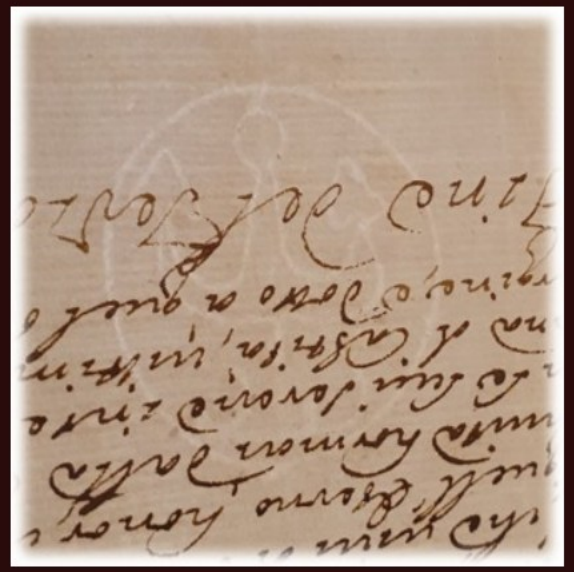


The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Drag and drop one or more images here for ink removal, or click to select.

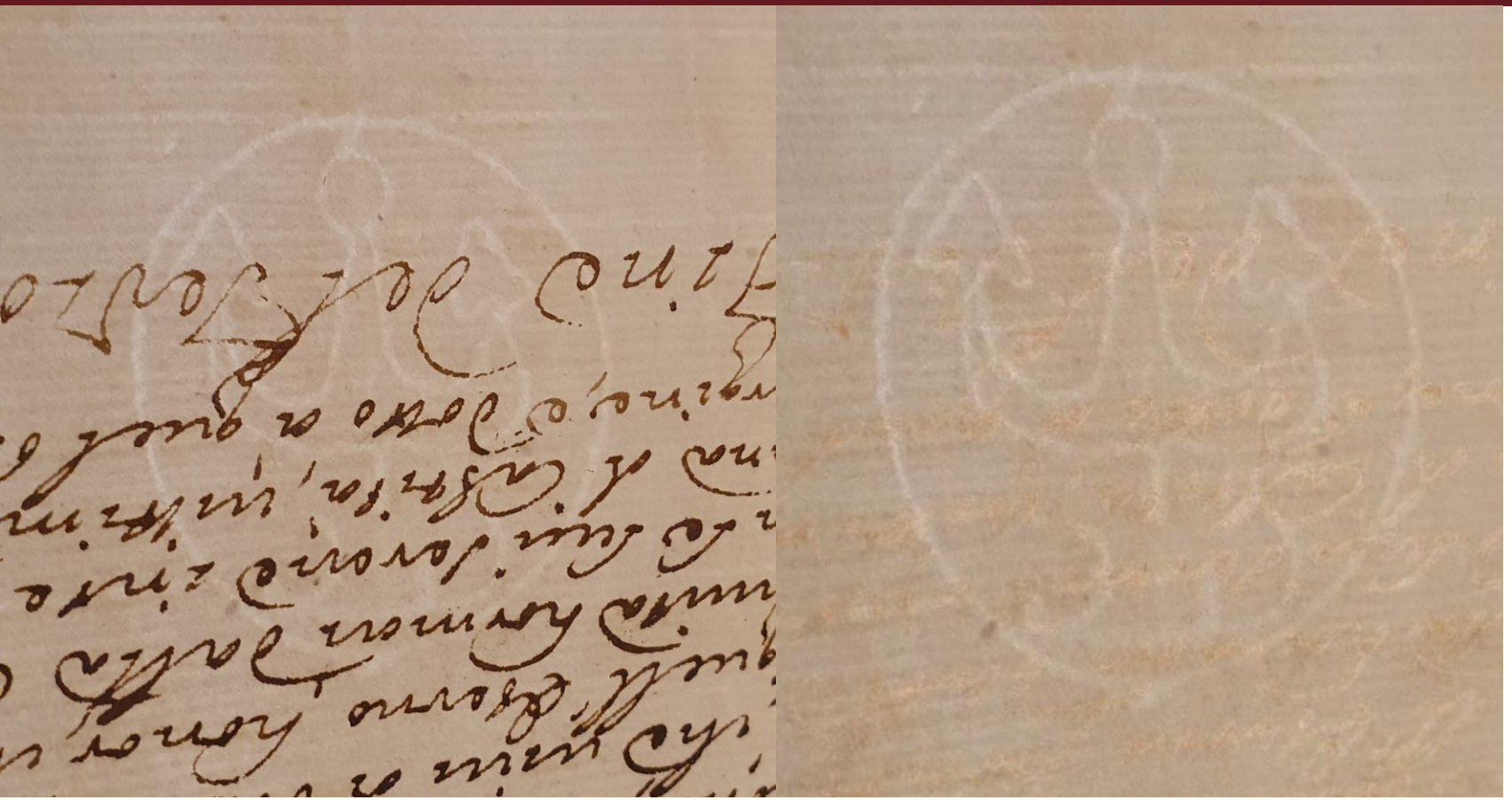


Made by Robert G. Erdmann. Please provide feedback! Images are saved on the server to improve the algorithm.

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours



https://images.erdmann.io/magic_eraser/

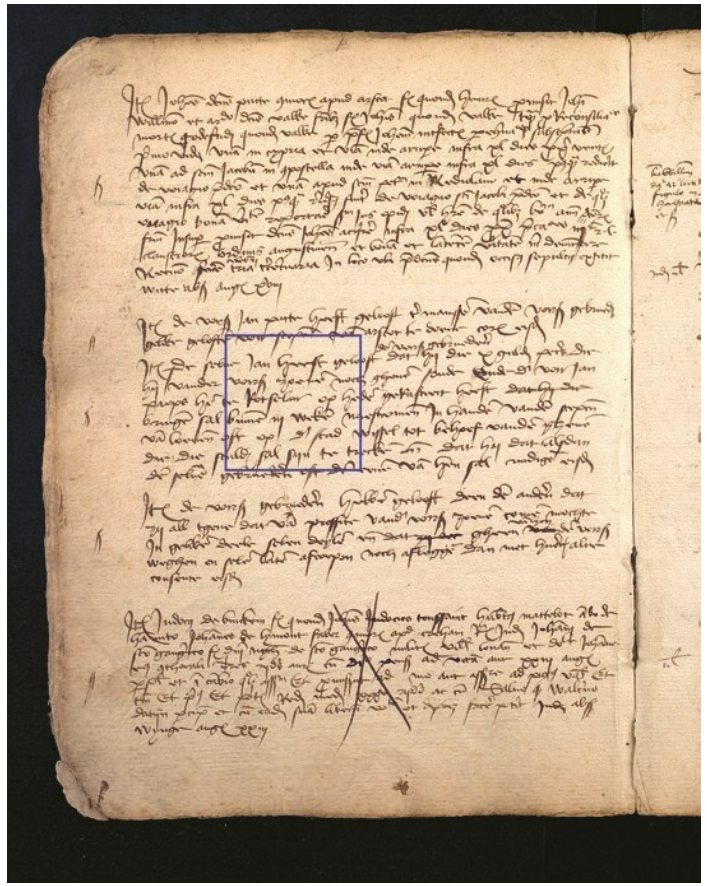
https://images.erdmann.io/send/2401.0218_AFHEPP_PAPIERS_N18_Smilauer_Erdmann.pdf

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

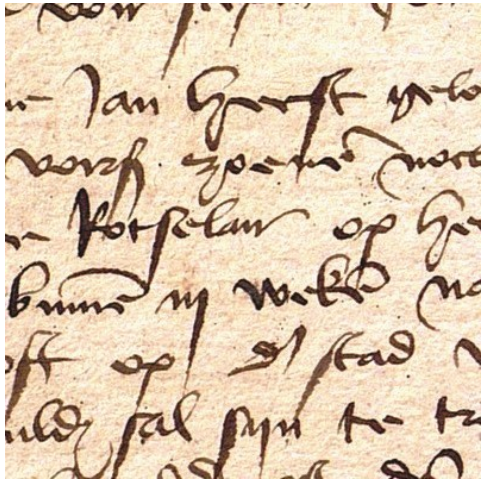
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

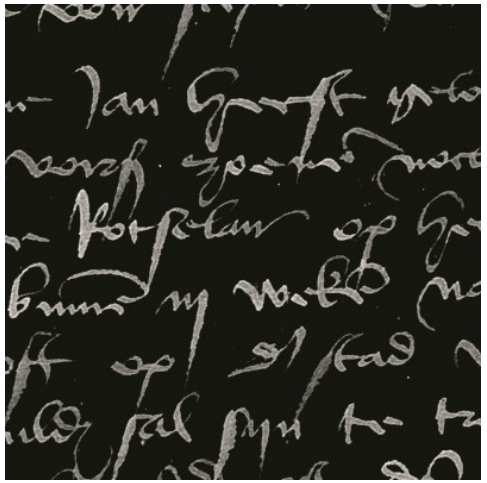
Synthesizing Training Data For A Neural Network



Random manuscript page

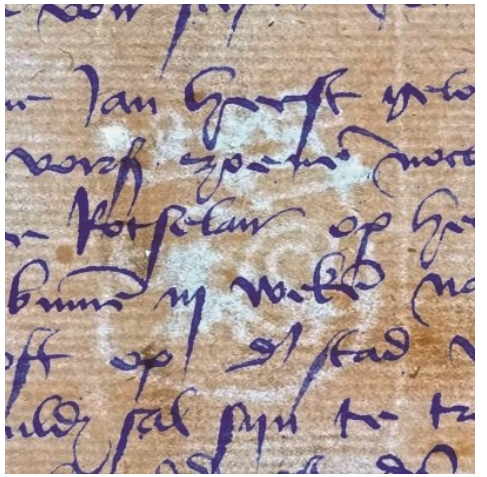


Extracted region from page



Extracted ink density (GMM)

Ink-free watermark image (FPT Project)



Synthetically inked with ink density

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Examples During Training

INPUT: Synthetically inked sample

OUTPUT: Neural Network removes ink

GROUND TRUTH: Original image

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.

Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours

Watermarks and Paper Features in Modern Italian Manuscripts

A Digital and Archival Approach

Alberto Campagnolo

Senior Researcher, PRIMA ERC project, CESR, University of Tours
Assistant professor, Book Heritage Lab Director, KU Leuven
Editor-in-Chief: Journal of Paper Conservation

alberto.campagnolo@univ-tours.fr
alberto.campagnolo@kuleuven.be
orcid.org/0000-0002-8672-8400

Robert G. Erdmann

Advisor, PRIMA ERC project, CESR, University of Tours
Professor, University of Amsterdam

r.g.erdmann@uva.nl

Reykjavik
2025

The PRIMA project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, Grant agreement No. 101142242.
Funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Council Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

The project is hosted by the Centre d'Études Supérieures de la Renaissance (CESR), Université de Tours