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CATMuS-Medieval: Consistent Approaches to Transcribing Manuscripts

Ariane Pinche, Thibault Clérice, Alix Chagué, Jean-Baptiste Camps, Malamatenia Vlachou-Efstathiou, Matthias Gille Levenson, Olivier Brisville-Fertin, Federico Boschetti, Franz Fischer, Michael Gervers, et al.

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CATMuS-Medieval

Consistent Approaches to Transcribing Manuscripts

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DH 2024: Reinvention & Responsibility, August 8, 2024



- 1 Introduction
- 2 History of the CATMuS Project
 - 2.1 First Initiatives
 - 2.2 Gathering projects: CATMuS Chronology
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- **2016**, the OCRopy tool (Breuel 2014)– designed as an open-source, easily trainable OCR engine – piqued the interest of digital humanists
- **2016–2019**, the landscape of handwritten text recognition (HTR) underwent a profound transformation
 - Model training became feasible with the advent of general public GPUs
 - Programming libraries like Tensorflow and PyTorch became standard
 - Kraken gained prominence (Kiessling 2022)
 - Transkribus emerged as a comprehensive solution, enabling manual annotation, model training, and post-correction, (Kahle, Colutto, Hackl, and Mühlberger 2017)



Automatic Text Recognition (ATR): State of the

- **2020 - ...**, ATR became more and more common in research projects in humanities
 - Expansion of the use of intuitive platforms: eScriptorium, (Stokes et al. 2021) and Transkribus
 - Need to standardize methods and data sets to enable data gathering and production of a generic model

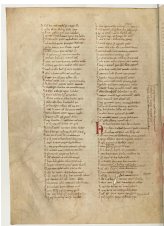


Figure: BnF, Latin, 8001, 13th century

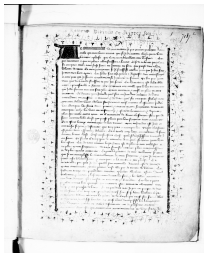


Figure: BnF, French, 777, 15th century

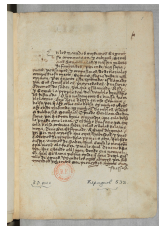


Figure: BnF, Espagnol, 533, 15th century



- **CATMuS stands for Consistent Approaches to Transcribing Manuscripts.**
- International initiative involving 17 collaborators: A. Pinche, T. Clérice, A. Chagué, J-B. Camps, M. Vlachou-Efstathiou, M. Gille Levenson, O. Brisville-Fertin, F. Boschetti, F. Fischer, M. Gervers, A. Boutreux, A. Manton, S. Gabay, P. O'Connor, W. Haverals, M. Kestemont, C. Vandyck
- From Europe and North America
- Provides guidelines, datasets, and models for HTR



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Once upon a time DH 2019...

Everything began at DH 2019, with: Jean-Baptiste Camps, Thibault Clérice, and Ariane Pinche. “Noisy medieval data, from digitized manuscript to stylometric analysis: Evaluating Paul Meyer’s hagiographic hypothesis”. In: *Digital Scholarship in the Humanities* 36.Supplement_2 (Oct. 2021), pp. ii49–ii71. ISSN: 2055-7671. URL: <https://doi.org/10.1093/llc/fqab033> (visited on 12/03/2021)





Collective initiatives on HTR, in partnership with École nationale des chartes (ENC), DIM MAP and INRIA:

- CREMMA (Consortium Reconnaissance d'Écriture Manuscrite des Matériaux Anciens) to create HTR datasets and help set up an eScriptorium instance
- CREMMALab
 - Methodological reflection on corpus transcription protocols to optimizing HTR models for medieval French Manuscripts
 - Producing a dataset to train generic model for medieval French manuscripts, (Pinche 2022)
- CREMMA Medii Aevi: dataset for medieval manuscripts in Latin, (Clérice, Chagué, and Vlachou-Efstathiou 2023)



- 1 CREMMA & CREMMALab (DIM MAP, région île de France)
- 2 Gallic(orpor)a
- 3 FoNDUE
- 4 DEEDS
- 5 HTRomance (training data production for French and Latin manuscripts, Bibliothèque nationale de France)
- 6 HTRogène (multilingual training data production, Biblissima+, ongoing)

Total expenses: €100,000 for infrastructure, postdoctorat, training data producing, not counting “hours” of team members.





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Why establishing transcription guidelines ?

“Well-prepared material is key to producing general recognition models. It is unthinkable that single scholars and small project teams could provide enough training material to train a general model independently.” (Hodel, Schoch, Schneider, and Purcell 2021)

Transcription guidelines are needed to:

- Create **consistent data**
- Build **reusable ground truth data** sets to minimize the collective cost
- Produce **generic models**

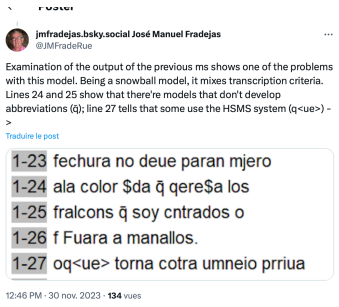


Figure: Prediction using Transkribus Coloso Español model. Capture kindly provided by J. M. Fradejas Rueda.



Birth of the CATMuS-Medieval Guidelines

- The CATMuS guidelines follow on from those of the CREMMALab project, *available here*:
<https://hal.archives-ouvertes.fr/hal-03697382>
- This first draft is the results of a reflection carried during the years 2021 and 2022 at the ENC.
- The aim was:
 - To ensure compatibility of transcription data
 - To find a medium path to ensure feasibility and consistency of the data
 - To produce data reusable by historians, linguists, paleographers philologists
 - Not to constitute a definitive transcription or a final edition



Figure: Example of a conceptual text acquisition pipeline



How to transcribe manuscripts to ensure consistency in the HTR model?

- Define transcription methods suitable for machine learning.
- Determine the desired level of detail in transcription.



Figure: <de la uirtut> or <de la uirtut>

- Ensure compatibility of data
 - Use a predefined characters set
 - Document your choices

LATIN SMALL LETTER P WITH STROKE (<i>p barré droit</i>)		p	U+A751
LATIN SMALL LETTER P WITH FLOURISH (<i>p barré courbe</i>)		p	U+A753
LATIN SMALL LETTER Q WITH DIAGONAL STROKE (<i>q barré</i>)		q	U+A759
TIRONIAN SIGN ET (<i>abréviation tironienne de « et »</i>)		ʒ	U+204A
DIVISION SIGN (<i>abréviation de « est »</i>)		+	U+00F7



CATMuS-Medieval guidelines: principles

Guidelines are based on basic principles:

- Reducing each letter form to a standardized representation
- Distinctions like <u>/<v> and <i>/<j> are reduced to <u> and <i>
- Keeping abbreviations (and thus, reducing the part of the language-specific traits the model has to learn)
- Restricting the characters used for specific purposes according to the MUFI
- Reducing the complexity of medieval punctuation: single sign = “.” and double sign = “:”.

Caroline 8 th -13 th	eurex t euticus qui inerpreat for eunax. eutex t euticus qui inerpreat fortunat ⁹	potūt hēri i bona q̄titate s; q̄ tibi videbī potūt hēri i bona q̄titate s; q̄ tibi videbī	<i>Cursiva</i> 14 th -15 th E
<i>Praegothica</i> 12 th -13 th	iora q̄b; ifor̄t ymago d̄r p̄pe sic picta. iora q̄b; ifor̄t ymago d̄r p̄pe sic picta.	domos .s. uii milia ho ^m quos 7 ip̄e domos .s. uii milia ho ^m quos 7 ip̄e	<i>Hybrida</i> 15 th -16 th
<i>Gothica Textualis</i> 13 th -16 th	ē q̄re pauonē q̄re anserē gallina refugi ē q̄re pauonē q̄re anserē gallina refugi	inandria sic aut inopia & cognatorum negligē inandria sic aut inopia & cognatorum negligē	<i>Humanistic</i> 16 th
<i>Semitextualis</i> 13 th -16 th	C omō que creō no fuessen C omō que creō no fuessen	De Sperchio fluuio.xxiii.oceāi filio De Sperchio fluuio.xxiii.oceāi filio	<i>Incunabulum</i> 15 th



- New languages and new challenges:
 - Latin involves new abbreviation to represent, such as <ꝛ> for <rum>;
 - Middle English involves new signs for new phonetic realization, like <ð> (eth) representing the voiced and voiceless dental fricative.
- The establishment of transcription rules remains an ongoing and evolving effort for ensuring data quality and homogeneity.
- The guidelines will be available at the following link:
<https://catmus-guidelines.github.io> - **Work in progress.**

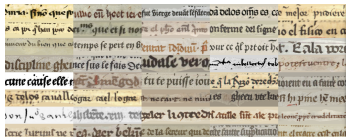
The screenshot shows the website for 'Consistent Approaches to Transcribing Manuscripts'. The page title is 'Presentation'. The main heading is 'CATMuS, common rules for the transcription of medieval roman sources'. Below this, the text reads: 'This site presents the standards commonly built by the CATMuS community (for *Consistent Approaches to Transcribing Manuscripts*). It lists a number of recommendations concerning the transcription of medieval documents and does not not concerned with earlier phases (segmentation into zones or lines¹) or later phases (text normalization, development of abbreviations²).' The left sidebar contains a navigation menu with items: 'Presentation', 'Tools and keyboards', 'Transcription principles' (with a dropdown arrow), 'General principles', 'Letters' (with a dropdown arrow), and 'Introduction'.



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CATMuS-Medieval dataset



CATMuS
Medieval



- CATMuS dataset is published and documented on hugging face: <https://huggingface.co/datasets/CATMuS/medieval>
- built upon 17 different repositories
- c. 175.000 lines and 6.2M characters
- contains 245 different documents
- 9 different languages
- Its most represented centuries are the 15th century, the 14th, and the 13th.
- Over-representation of some genre and language: French-Narratives (29.2% of the dataset), Treatises-Latin (24.2%) and Treatises-Castilian (23%), linked to the history of the data gathering

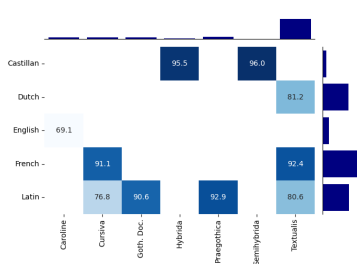


Figure: Absolute accuracy

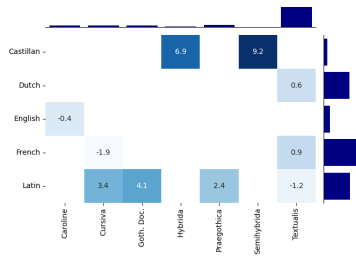


Figure: Improvement over CREMMA Generic

Figure: Test micro-accuracy per language and scripta. Bars represents the total number of characters per categorical feature.



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- A general model for gothic prints: Sonia Solfrini and Simon Gabay. “CATMuS Gothic Print”. frm. In: (Jan. 2024). Publisher: Zenodo. URL: <https://zenodo.org/records/10599911> (visited on 03/27/2024)
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- Thanks to the guidance provided by the guidelines and the support of our sponsors, we have significantly **increased the number of available, interoperable datasets** for training HTR models in recent years.
- This increase has enabled us to develop **new generic models for medieval manuscripts**.
- Consistent transcription standards, collaboration and data sharing across languages have **improved the accuracy of HTR models**
- *Future developments:*
 - Continuing the extension of the project to Old English and Middle Dutch
 - Extending the temporal scope from the Middle Ages to the contemporary era



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