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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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- 5 Conclusion



- **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

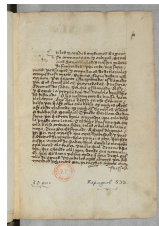


Figure: BnF, Espagnol, 533, 15th century



- **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 Clérico, 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**

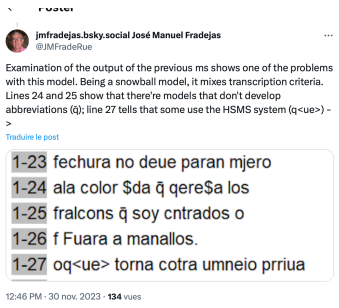


Figure: Prediction using Transkribus Coloso Español model. Capture kindly provided by J. M. Fradejas Rueda.



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.

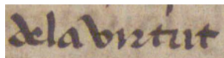


Figure: <de la uirtut> or <de la uirtut>

- 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			<i>Cursiva</i> 14 th -15 th E
<i>Praegothica</i> 12 th -13 th			<i>Hybrida</i> 15 th -16 th
<i>Gothica Textualis</i> 13 th -16 th			<i>Humanistic</i> 16 th
<i>Semitextualis</i> 13 th -16 th			<i>Incunabulum</i> 15 th
	C omō que ceo no fuessen	De Sperchio fluuio.xxiii.oceāi filio	



- 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.**

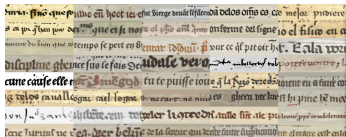
The screenshot shows the website for 'Consistent Approaches to Transcribing Manuscripts'. The left sidebar contains a navigation menu with the following items: 'Presentation', 'Tools and keyboards', 'Transcription principles' (with a dropdown arrow), 'General principles', 'Letters' (with a dropdown arrow), and 'Introduction'. The main content area is titled 'Presentation' and contains the following text: 'CATMuS, common rules for the transcription of medieval roman sources'. Below this, it states: '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).



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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

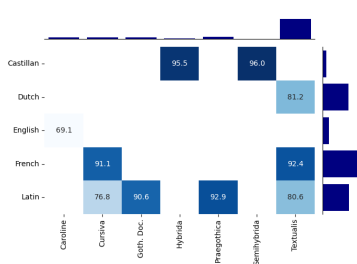


Figure: Absolute accuracy

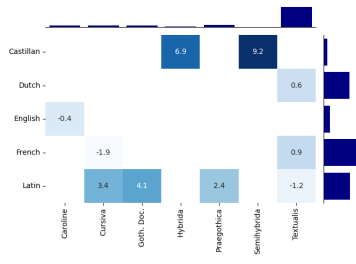


Figure: Improvement over CREMMA Generic

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



- A general model for medieval manuscripts: Ariane Pinche et al. “CATMuS Medieval”. lat. In: (Nov. 2023). Publisher: Zenodo. URL: <https://zenodo.org/records/10066219> (visited on 01/08/2024)
- 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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