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# Corpus and Models for Lemmatisation and POS-tagging of Classical French Theatre

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## Abstract

This paper describes the process of building an annotated corpus and training models for classical French literature, with a focus on theatre, and particularly comedies in verse. It was originally developed as a preliminary step to the stylometric analyses presented in Cafiero and Camps [2019]. The use of a recent lemmatiser based on neural networks and a CRF tagger allows to achieve accuracies beyond the current state-of-the art on the in-domain test, and proves to be robust during out-of-domain tests, *i.e.* up to 20th c. novels.

## Keywords

Lemmatisation; POS tagging; 17th c. French; Classical Theatre.

## I INTRODUCTION

If many lemmatisers and POS taggers have been trained, and sometimes conceived, for French (*e.g.* Tellier et al. [2012], Urieli [2013]...), they usually focus on contemporary French and tools for *Ancien Régime* French remain scarce. One important exception is the *TreeTagger* [Schmid, 1995] model developed by Diwersy et al. [2017] for the *Presto* project [Vigier and Blumenthal, 2013-2017]. They have prepared training data with c. 60,000 tokens annotated manually, using an adapted version of MULTEX [Ide and Veronis, 1994] and GRACE [Adda et al., 1998] for the parts of speech (POS), and the *Lefff* [Sagot, 2010], *Morphalou* [Romary et al., 2004] and *LGeRM* [Souvay and Pierrel, 2009] for the lemmas. Unfortunately, training data are not publicly available (yet?)<sup>1</sup>, they are made of non-normalised texts from the 16th to the 18th c. which prevents any comparison task, and no detailed evaluation of the model is offered by the designers of the model.

Recent developments have renewed the field of normalisation, lemmatisation and tagging of historic language varieties, including variation rich languages. Particularly, deep learning methods have been used to establish a new state of the art for Middle Dutch [Kestemont et al., 2016], Medieval Latin [Kestemont and De Gussem, 2017], Medieval Occitan [Camps and Couffignal, 2017], Early Irish [Dereza, 2019] or Middle High German and a variety of other languages [Schmid, 2019, Manjavacas et al., 2019]. Convolutional or (bidirectional) LSTM networks have

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<sup>1</sup>The *Presto* data have been entirely revised after the initial publication of this paper (cf. Gabay et al. [2020b]) and are available online at the following address: <https://github.com/e-ditiones/LEM17>.

been put to use, in architecture involving word or character levels representations, for instance word embeddings, and usually a sequence to sequence approach using an encoder–decoder model [Bollmann, 2019], that allow for taking into account the context of a token at either word or character level.

Such architectures are now competing with character level statistical machine translation models for the state of the art of historical text normalisations [Tang et al., 2018, Bollmann, 2019, Gabay and Barrault, 2020]. The developments of such architectures allowed to obtain results in the 89 to 96% range for lemmatisation of historical languages (and even up to 97.86% for standard languages like modern French, see Manjavacas et al. [2019]), though they have been showed to be the most dependent on the quantity and quality of training data, outperforming more traditional (essentially, rule based) approaches only when substantial training data is available [Bollmann, 2019].

POS and morphological taggers, especially in the case of morphologically rich languages, have also benefited from neural architectures, with state of the art for modern languages often being attained by recurrent neural nets [Ling et al., 2015, Heigold et al., 2016, Schmid, 2019], with accuracies in the range of 97-98% for POS and 92-94% for morphology [Heigold et al., 2016], and more specifically from 90 to 98% for POS tagging of historical languages [Schmid, 2019, Manjavacas et al., 2019].

In this paper, we present in detail our corpus, the annotation choices, the training set up and finally the results obtained by two models. On the one hand, an “extended” model for lemmatisation of normalised 17th c. French theatre, *i.e.* tested specifically for this data, but with enough additional training material to have it perform relatively well on modern (16th c. to 18th c.) and even contemporary (19th c. to 20th c.) French. On the other hand a POS-tagging model including the morphology (gender, number, tense. . .), based exclusively on 17th c. century training data.

These models were initially developed to allow the stylometric analyses presented in Cafiero and Camps [2019], especially the analyses based on lemma, lemma in rhyme position, and POS 3-grams. In this context, getting results as accurate as possible was a necessary step to ensure the reliability of stylometric results. This initial motivation is reflected in some of the choices of this paper, notably the constitution of the training corpus (which is a sample from the corpus that was to be used in the analyses)<sup>2</sup>.

## II THE THÉÂTRE CLASSIQUE CORPUS

Because of its cultural importance for French literature and thanks to a few innovative pioneers, 17th c. French theatre (also called *théâtre classique*, “classical theatre”) benefits from many digital editions freely available online. Among the various projects offering texts online, the *Théâtre classique* database [Fièvre, 2007, Schöch, 2018] proposes one of the most comprehensive collections. The texts derive from digitisations of 17th c. prints taken from *Gallica* [Bibliothèque nationale de France, 1997]. The oldest print is usually used, but it is not necessarily the case (for detailed bibliographic information on 17th c. printed theatre, cf. Riffaud [2014]). The text is normalised manually and the spelling aligned with contemporary French<sup>3</sup>

Among all the plays available, 41 comedies (cf. appendix A) have been selected to create a training corpus. They have been written by six different authors spread over two generation:

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<sup>2</sup>Stylometric results are not presented in this paper. For them, see Cafiero and Camps [2019].

<sup>3</sup>About this (strange) French tradition, cf. Gabay [2014], Duval [2015].

Antoine Le Métel d’Ouille (1589-1655), Jean de Rotrou (1609-1650), Paul Scarron (1610-1660), Pierre Corneille (1606-1684), Molière (1622-1673) and Thomas Corneille (1625-1709). All the plays have been written between the 1630’s and the 1670’s, that is to say within c. 40 years.

### III BUILDING AN ANNOTATED CORPUS

The annotation scheme has been conceived to cope with diachronically spread data, especially earlier periods such as middle and Renaissance French.

#### 3.1 Choice of authority lists

Since annotation principles are rather complex, we have decided to publish guidelines separately [Gabay et al., 2020a], and we will summarise here our most important choices.

Regarding POS tags, on top of the aforementioned MULTEX, many possibilities exist: EAGLES [Leech and Wilson, 1996], UD-POS [Petrov et al., 2011] and CATTEX [Prévost et al., 2013]. While EAGLES and UD-POS have been developed as international standards, CATTEX has been designed specifically for French medieval texts.

We have decided to choose CATTEX, because we are interested in a long diachronic perspective, and we want to maintain interoperability with several existing corpora that are already using it, such as the *Base de français médiéval* (“Medieval French Database”, cf. Guillot-Barbance et al. [2017]) or the *Geste* corpus [Camps, 2019]<sup>4</sup>.

The annotation manual of CATTEX09 (Guillot et al. [2013b]) offers a detailed list of tagging rules that we strictly observed. Three options are offered to the annotator: morphological tagging, morpho-syntactical tagging<sup>5</sup>, or both. If adding both labels is ideal (to study processes such as adjectivisation, substantivisation. . .) it remains far too costly in time, and we have therefore opted for a simple morpho-syntactical tagging, that appeared at the time as an interesting middle way.

Regarding lemmatisation, we have already mentioned *LGeRM*, the *Lefff* and *Morphalou*. The main interest of the last one, that we have chosen, is that not only the v3.1 includes the *Lefff*, but it is also used by the *Frantext* base – the data of which is partially available online to be used as additional material for our model – and the *Trésor de la Langue Française informatisé*. The *LGeRM* lexicon is irrelevant in our case, since it is an artificially archaised version of *Morphalou* to match 17th and 18th c. forms. Concerning proper names, we built a specific reference list, thanks to the characters and places index provided by Fièvre [2007], that we expanded when necessary.

Some of our choices diverge from those made by the authors of *Morphalou*. We were, for instance, more systematic in choosing the masculine singular form as a lemma for nouns (*baronne* is lemmatised as *baron*) but not only (*la* (det. def.) as *le*, *sa* or *ses* (poss.) as *son*). Concerning personal pronouns, the singular masculine subject (when relevant) case has been used as lemma: direct regimen forms (*le*, *la*, *les*, as in, *il les donne*) as well as indirect regimen forms (*lui*, *elle(s)*) have been lemmatised to the subject masculine singular (*il*) – one single pronoun can indeed be subject (*il*), reflexive (*se*), direct object (*le* or *en*), indirect object (*lui* or *y*) or disjunctive (*lui*). Still in line with our diachronic approach, we kept the difference between the old partitive *des*

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<sup>4</sup>It is to be noted that using Cattex does not prevent, in the future, conversions to other tag-sets. For instance, the SRCMF corpus [Prévost and Stein, 2013], originally tagged with Cattex tags, exists in a converted version using UD-POS [Prévost Sophie, Stein Achim, SRCMF, 2020].

<sup>5</sup>With morpho-syntactical tagging, categories are mainly determined in context: *il veut le bien* (*bien* is NOM<sub>com</sub>) vs *il est bien grand* (*bien* is ADV<sub>gen</sub>).

(contracted form of *de les*) and the new non-definite plural article *des*, and encoded the contracted form *au(x)* as *a+le*.

It has to be noted that, since lemmas are not numbered in *Morphalou*, it has not been possible to introduce a number-based disambiguation for homographs (e.g., *son1* (poss. “his”) vs. *son2* (noun “sound”)). Such a situation is however only partially problematic, since it remains possible to distinguish forms thanks to the POS, or the morphology.

### 3.2 Texts preprocessing and sampling

In order to limit model biases, each play of the corpus was sampled to create training and testing data. The text of Fièvre [2007] editions have been tokenised using *TXM* [Heiden, 2010] XML import. During the import an XSL filter was used to retain only the character’s speeches, with exclusion of all other material (stage directions, act and scene numbering...). Out of these data, a three-tier sample was constituted with the 2,000 first tokens of our 41 plays for training data (hereafter train set), the 100 median tokens for validation data (hereafter dev set), and the last 100 for testing data (hereafter test set). Case was not normalised, in order to keep information relevant to the identification of proper names.

The complete XML and annotation workflow is presented in fig. 1<sup>6</sup>.

### 3.3 Annotation and correction process

The annotation has been done in three phases. A first *Pie* [Manjavacas et al., 2019] lemmatisation model has been trained only on the *Frantext Open Access* data [ATILF-CNRS and Université de Lorraine, 1998-2018], and has been used to annotate a first sample of c. 40,000 tokens, in combination with an available *Pie* model for POS tags trained on Old French<sup>7</sup>. After being corrected, the same corpus has been used to train new models and annotate c. 40,000 other tokens that were, once again, corrected to create the final training corpus.

Lemma and POS-tags have all been corrected manually. This work was facilitated by the use of *Pyrrha* [Clérice et al., 2019], a web-based correction interface able to do batch correcting as well as to handle authority lists, allowing efficient collaborative work (fig. 2). *Pyrrha* also keeps tracks of all changes made on the corpus (fig. 3), and makes it possible to import, correct, share, and download back corpora and authority lists.

### 3.4 Expanding annotation through available resources

If POS-tags have all been systematically corrected, through both linear reading and batch corrections, it is not the case of the morphology, which has only been mostly batch-corrected, because of time concerns. Thus, we can guarantee that every POS tag has been proofread at least once (and usually multiple times), which is not the case for the morphology.

Indeed, to save time, morphological information was not added manually, but was instead projected using the lexicon of inflected forms *Morphalou* [ATILF-CNRS and Université de

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<sup>6</sup>Since the initial publication of this article, the effects of Unicode NFKD normalisation have also been tested, with an unclear effect on training accuracy Gabay et al. [2020b].

<sup>7</sup>A recent version of the model for Old French can be found as part of the web application *Deucalion* [Clérice et al., 2019]; they are also directly usable through *Pyrrha*’s interface [Clérice et al., 2019]. Finally, the most up-to-date version of both the Old French and Classical French models is provided, along with functionalities to ease tagging of new documents, as part of the simple `pie-extended` Python Package [Clérice, 2020]. The models can be procured using their linguistic code (`fro` for Old French, `fr` for Classical French) by running the commands: `pie-extended download fr` and texts can be annotated by `pie-extended tag fr MyFile.txt`. They also are available online, on the École des chartes’ *Deucalion* instance, at <https://dh.chartes.psl.eu/deucalion/>.

Lorraine, 2016]. To do so, CATTEX POS-tags were mapped to *Morphalou*'s categories (table 1)<sup>8</sup>. Then, a simple algorithm looked for matching forms inside *Morphalou*: when the form was unambiguous, the morphological information was directly retrieved, otherwise the hand-corrected POS was used to assess the correct morphological information to retrieve. If none was found, an unknown morph tag was added.

CATTEX	<i>Morphalou</i>	CATTEX	<i>Morphalou</i>	CATTEX	<i>Morphalou</i>
INJ	Interjection	DETdef	Déterminant	PROord	Nom commun
ADVgen	Adverbe	DETndf	Déterminant	PROrel	Pronom
ADVneg	Adverbe	DETdem	Déterminant	PROint	Pronom
ADVint	Adverbe	DETpos	Déterminant	PROcom	Déterminant
ADVsub	Adverbe	DETind	Déterminant	ADJqua	Adjectif qualificatif
CONcoo	Conjonction	DETrrel	Déterminant	ADJind	Adjectif qualificatif
CONsub	Conjonction	DETint	Déterminant	ADJord	Adjectif qualificatif
VERcjcj	Verbe	DETcom	Déterminant	ADJpos	Adjectif qualificatif
VERinf	Verbe	PROper	Pronom	NOMcom	Nom commun
VERppe	Verbe	PROimp	Pronom	ADJcar	Nombre
VERppa	Verbe	PROadv	Pronom	DETcar	Nombre
PRE	Préposition	PROpos	Pronom	PROcar	Nombre
		PROdem	Pronom		
		PROind	Pronom		

Table 1 – Mapping of CATTEX POS-tags to *Morphalou* categories

Finally, *Morphalou*'s information was converted back to CATTEX09 format, using the mapping presented in table 2.

<i>Morphalou</i>	CATTEX	<i>Morphalou</i>	CATTEX	<i>Morphalou</i>	CATTEX
<b>Mode</b>		<b>Temps</b>		<b>Nomb.</b>	
indicative	ind	present	pst	singular	s
imperative	imp	imperfect	ipf	plural	p
conditional	con	future	fut	<b>Genre</b>	
subjunctive	sub	simplePast	psp	masculine	m
infinitive	-	<b>Pers.</b>		feminine	f
past	-	firstPerson	1	neuter	n
participle	-	secondPerson	2	<i>Varia</i>	
		thirdPerson	3	-	-
				invariable	x
				1036442	ERROR

Table 2 – Mapping of *Morphalou* to CATTEX flexion tags.

### 3.5 Increasing corpus generality with *Frantext* data

The *Frantext* base offers an open access version [ATILF-CNRS and Université de Lorraine, 1998-2018], 32 texts of which have been used to increase the training data (see appendix B). Marginal interventions have been made to correct some systematic errors, but also to ensure its consistency with our annotation choices. For instance, for pronouns (labelled as CLO, CLS and PRO in *Frantext* data), the lemmas *je*, *me*, *m'*, *M'*, *moi*, *Moi*, were mapped to *je*; likewise, *ils*, *elle*, *elles*, *le*, *la*, *les*, *lui*, *leur*, *eux*, *Ils*, *Lui*, *Elle*, *Elles*, to *il*, etc. On the other hand, some forms of *celui* and *cela* were originally lemmatised to *il*, and we changed the lemmatisation to *celui*

<sup>8</sup>Punctuation and proper names were dealt with separately and specifically, as well as CATTEX combined label, PRE.DETdef. The correspondence between some categories reflect substantial difference in the grammatical typology used. For instance, CATTEX PROord (e.g., 'premier' in 'le premier') match *Morphalou*'s more generic common noun category. For more information on CATTEX categories, see Guillot et al. [2013a].

and *cela*. Similarly, forms of *chacun* (or *aucun*) were lemmatised to *un*, and we changed it to *chacun* (or *aucun*).

We were also more systematic in the alignment of feminine and masculine forms to a single (masculine, singular) lemma, may it be for possessives (*mienne, tienne, sienne* to *mien, tien, sien*) or just nouns (*hôtesse, amie, veuve, captive*, to *hôte, ami, veuf, captif*, etc).

A few minor corrections of obvious errors were also made (e.g., *saurer* to *savoir*), especially regarding homograph forms of some lemmas (e.g., between verbal forms of *défaire*, “undo”, and the noun *défaite*, “defeat”, or between *ver*, “worm” and *vers*, “verse”). An additional adjustment has also been made regarding the ligature *œ* (*cœur*), which has been preferred over its decomposed form (*coeur*).

## IV TRAINING SETUP

As previously mentioned, many tools are already available. *TreeTagger* [Schmid, 1995] remains one of the most widely used, even though it is outperformed by other solutions. For the French language, *TALISMAN* [Urieli, 2013] or *MElt* Sagot [2016] are commonly used by the NLP community, but many other solutions are available such as *Lemming* (only for lemmas, cf. Müller et al. [2015]), *Marmot* (only for POS, cf. Müller et al. [2013]) or *Pie* (mainly for lemmas, cf. Manjavacas et al. [2019]). We have decided to use the two latter.

### 4.1 Lemmatisation

Concerning *Pie* as a lemmatiser, we tested three different configurations (table 3):

1. **base (sent-lm)**, default configuration, based on the configuration that achieved best accuracy described in Manjavacas et al. [2019], using sentence context, RNN character embeddings, as well as forward and backward language models<sup>9</sup>;
2. **wembs** the same as the previous one, but with the adjunction of word embeddings, initialised using pretrained embeddings;
3. **bert** same as the previous one, but using *CamemBERT* embeddings [Martin et al., 2019], reduced from 768 to 150 dims;
4. **cnn+wembs** a configuration using CNN character embeddings, with word embeddings, based on *skipgram* on a larger unlemmatised corpus. This configuration is the one used for Cafiero and Camps [2019], with limited additional tuning.

	context	char embs	word embs	hidden size
base	sentence	rnn 300 dims	0	150
wembs	sent.+word	rnn 300 dims	150 dims	150
bert	sent.+word	rnn 300 dims	768 to 150 dims	150
cnn+wembs	sent.+word	cnn 150 dims	150 dims	150

Table 3 – Configurations tested with *Pie*

For each configuration, due to the stochastic nature of the process, five models were trained, using early stopping with threshold 0.001 and patience 6, and the best one was retained.

For the third configuration, word-embeddings were pretrained using *Word2Vec* Python implementation, on a large corpus of 343 theatre texts from Fièvre [2007] and those of the *Frantext Open Access* that we presented *supra*, for a total of c. 7M tokens.

<sup>9</sup>For this configuration, we used a config file provided to us by Enrique Manjavacas, main developer of *Pie*.

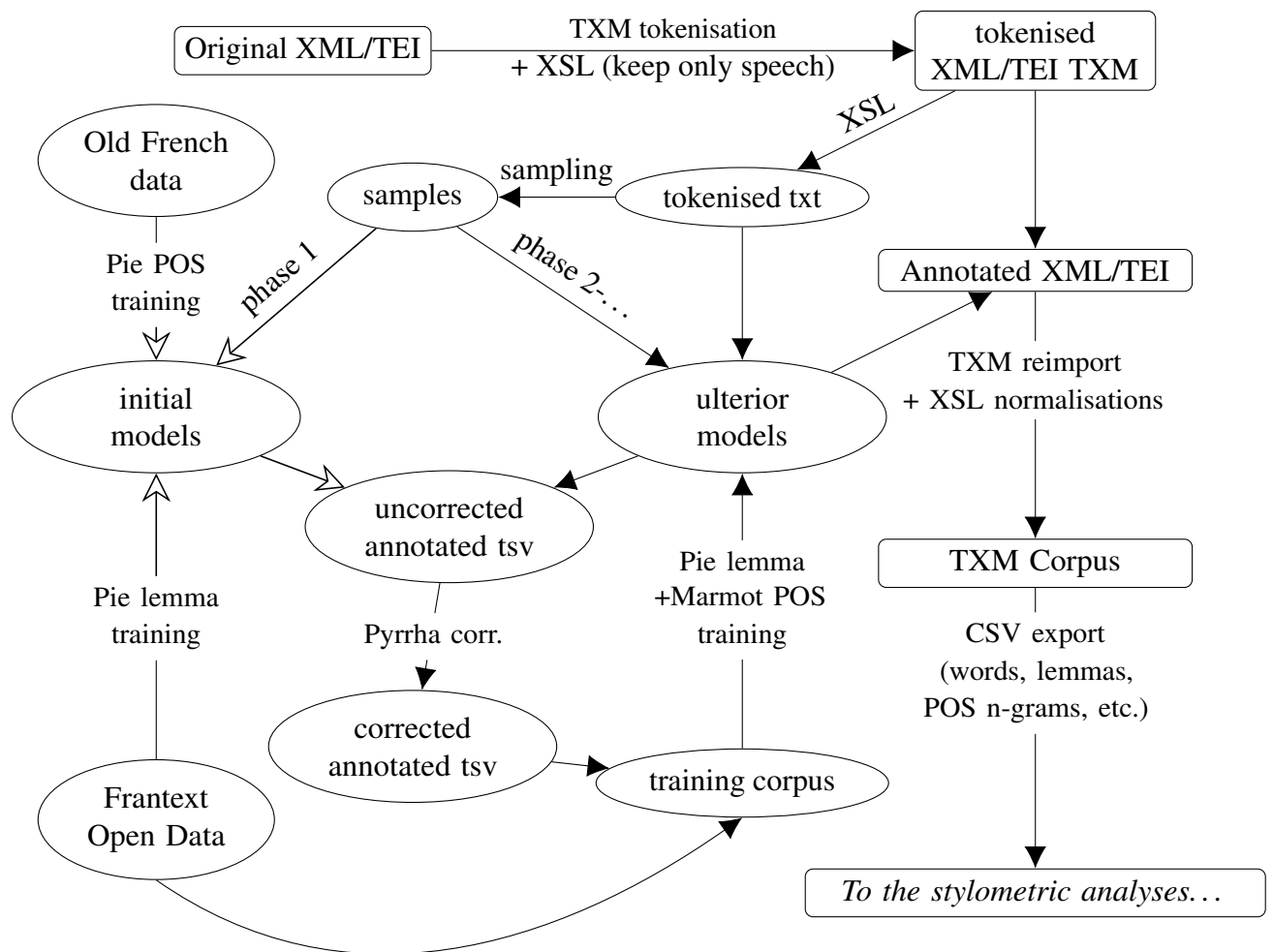


Figure 1 – Workflow for building the training corpus and models (ellipses) and the annotated XML corpus used for stylometric analysis (rectangles); void-arrowheads specify steps particular to the initial model building phase



Pyrrha

https://dh.chartes.psl.eu/pyrrha/corpus/16/tokens/correct?page=2&lin

Pyrrha Dashboard New Corpus Corpora Control Lists Bug or request? Help Your Account Log out

Classique\_Acte2\_V2

Quick links

- Statistics
- Search tokens
- Correct tokens
- Last corrected tokens
- Export tokens
- Corrections history
- Control List
- Editions history

Correct tokens with

- Unallowed lemma
- Unallowed POS
- Unallowed morph

## Corpus Classique\_Acte2\_V2 - List of tokens

1 2 3 4 5 6 ... 492 493 Go to Page

Id	Form	Lemma	POS	Morph	Context	Similar	Save	+
101	en	en	PRE	-	vante, Je me trompe moi -même en trompant Amarante, Et choisis un ami	704	Save	+
102	trompant	tromper	VERppa	-	, Je me trompe moi -même en <b>trompant</b> Amarante, Et choisis un ami qui	1	Save	+
103	Amarante	Amarante	NOMpro	-	Je me trompe moi -même en trompant <b>Amarante</b> , Et choisis un ami qui ne	4	Save	+
104	,	,	PONfbl	-	me trompe moi -même en trompant Amarante, Et choisis un ami qui ne veut	3785	Save	+
105	Et	et	CONcoo	-	trompe moi -même en trompant Amarante, <b>Et</b> choisis un ami qui ne veut que	558	Save	+
106	choisis	choisir	VERcjcj	-	moi -même en trompant Amarante, Et <b>choisis</b> un ami qui ne veut que m'	1	Save	+
107	un	un	DETndf	-	-même en trompant Amarante, Et choisis <b>un</b> ami qui ne veut que m' ôter	546	Save	+

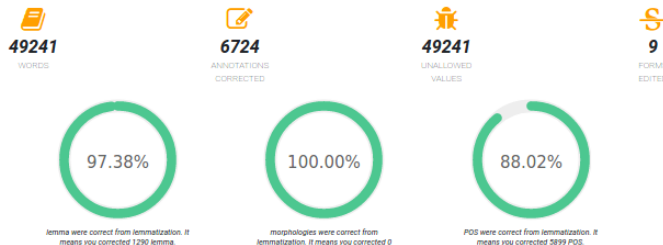
Figure 2 – Screenshot of the *Pyrrha* interface: main correction view

# Corpus Classique\_Acte2\_V2 - List of tokens

1 2 ... 313 314 315 316 317 318 319 ... 336 Go to Page

User	Edit	Context	Old Lemma	Corr Lemma	Previous POS	Actual POS	Previous Morph	Actual Morph	Similar
S.Gabay	Feb 11, 2019 4:55 PM	D' agréables langueurs et de ravissements , Jusques où d' un bel oeil peut s'	jusque	jusque	VERcjg	PRE	-	-	0 similar
S.Gabay	Feb 11, 2019 4:55 PM	saisissements , D' agréables langueurs et de ravissements , Jusques où d' un bel oeil	ravissement	ravissement	VERcjg	NOMcom	-	-	0 similar
S.Gabay	Feb 11, 2019 4:55 PM	appas , de doux saisissements , D' agréables langueurs et de ravissements , Jusques où	agréable	agréable	NOMcom	ADJqua	-	-	0 similar
S.Gabay	Feb 11, 2019 4:55 PM	de sorte d' appas , de doux saisissements , D' agréables langueurs et de ravissements	saisissement	saisissement	VERcjg	NOMcom	-	-	0 similar
S.Gabay	Feb 11, 2019 4:54 PM	amour a des tendresses Que nous n' apprenons point qu' auprès de nos maîtresses .	apprendre	apprendre	NOMcom	VERcjg	-	-	0 similar
S.Gabay	Feb 11, 2019 4:54 PM	faut point douter , l' amour a des tendresses Que nous n' apprenons point qu'	de_le	un	DETndf	DETndf	-	-	82 similar
S.Gabay	Feb 11, 2019 4:53 PM	d' un amant parfait . Il n' en faut point douter , l' amour a	en	en	PRE	PROadv	-	-	334 similar
S.Gabay	Feb 11, 2019 4:53 PM	l' avoir bien fait ; Un bon poète ne vient que d' un amant parfait	poète	poète	VERcjg	NOMcom	-	-	0 similar
S.Gabay	Feb 11, 2019 4:53 PM	discourir , il faut l' avoir bien fait ; Un bon poète ne vient que	faire	faire	VERcjg	VERppe	-	-	76 similar
S.Gabay	Feb 11, 2019 4:53 PM	Pour en bien discourir , il faut l' avoir bien fait ; Un bon poète	le	le	DETdef	PROper	-	-	435 similar

## Corpus Classique\_Acte2\_V2 Statistics



## Annotations over time



## Most common corrections

10 See more

Count	Corrected	Original
102	vous	vous
94	un	de_le
62	si	se
43	elle	vous
42	pouvez	vous
22	Dieu	dieu
20	ceste	ce
16	sort	sorte

## Morphology

Count	Corrected	Original
-------	-----------	----------

## POS

Count	Corrected	Original
749	NOMcom	VERcjg
477	PROper	DETdef
370	PROadv	PRE
364	PROrel	CONsub
288	VERcjg	NOMcom
264	VERppe	VERcjg

## POS

Count	Corrected	Original
749	NOMcom	VERcjg
477	PROper	DETdef
370	PROadv	PRE
364	PROrel	CONsub
288	VERcjg	NOMcom
264	VERppe	VERcjg
247	ADJqua	VERcjg
183	PROimp	PROper

Figure 3 – Screenshot of the *Pyrrha* interface: correction history and corpus statistics

## 4.2 POS tagging

For POS-tagging, we trained both *Marmot* and *Pie* on the training data we produced, without further augmentation. The configurations were the following:

1. **Marmot**: base configuration provided with *Marmot*, using the dev set during training, and the test set for final evaluation;
2. **Pie**: same configurations that for lemmatisation (**base (sent-lm)**, **wembs** and **bert**, see above and table 3) but with a CRF output layer to predict part-of-speech tags;
3. **+aux**: for each of the POS-tagging configuration, we tried to see if we could obtain a gain in accuracy by using auxiliary tasks (the tasks used can be seen in table 2 in bold, with the addition of **Case**, mainly used for personal pronouns). In a multi-task setting, we trained linear classifiers for each morphological feature, but sharing weights with the main task (POS prediction).

## V RESULTS

### 5.1 Calibration and in-domain tests

Results of the *Pie* lemmatisation training are presented in table 4. The best *Pie* model (configurations 2, **wembs**) achieved 99.09% accuracy on the test set. The results obtained with *Marmot* and *Pie* for POS on the test set are presented in table 5, and the best results are achieved by the **wembs+aux** configuration. Yet, in both cases, the variation between the accuracies are relatively low, and not substantially higher than random variations between different iterations of the same configuration.

	base	wembs	bert	cnn-wembs	support
<i>all</i>	98.80	<b>99.09</b>	98.95	98.80	4181
<i>unknown tokens</i>	70.31	71.88	<b>76.56</b>	65.62	64
<i>ambiguous tokens</i>	97.32	<b>98.02</b>	97.43	97.43	857
<i>unknown targets</i>	50.00	57.14	<b>85.71</b>	57.14	14

Table 4 – *Pie* lemmatisation accuracies on the test set for the best model for each configuration. “Unknown tokens” are tokens never seen during training, while “ambiguous tokens” are forms that can correspond to different lemmas. “Unknown targets” are lemmas never seen in training, but that the neural network can still sometimes accurately predict, thanks to its character level modelling.

	<i>Marmot</i>	<i>Pie</i>						
	base	base	+aux	wembs	+aux	bert	+aux	support
All	96.87	96.72	96.51	96.84	<b>97.01</b>	96.65	96.15	4181
Ambiguous tokens	NA	91.86	91.43	<b>92.40</b>	92.29	91.76	90.36	934
Unknown tokens	82.57	<b>86.24</b>	<b>86.24</b>	78.44	81.65	76.61	73.39	218

Table 5 – Results obtained for POS by the *Marmot* and *Pie* models on the test set. For the *Pie* models, we confronted trainings with or without morphology as auxiliary tasks.

### 5.2 Out-of-domain tests

To evaluate the ability of the best models to generalise for data from other periods, we conceived two out-of-domain corpora. Since we want to evaluate generality with regard to diachronic, diaphasic and diagenic (i.e. gender based) variation, we have selected samples from 16th to the 20th century texts, either from theatre plays or from a variety of genres outside theatre, literary or practical (administrative texts, correspondence, etc.), from male and female authors, in order to have:

- 20 samples of roughly 100 tokens for each century, 10 of theatre plays, 10 of a variety of other genres;
- roughly as much tokens written by men or women for each century;
- a comparable distribution of tokens by genres for each century.

In addition, for the samples concerning 17th century theatre, we excluded verse comedies in general, and the authors from which were drawn our training corpus. A complete list is given in appendix C.

We evaluate the best models (**wembs** and **wembs+aux**) for lemma and for POS on the out-of-domain data (table 6 and 7).

LEMMA						
<i>Corpus</i>	<b>16th</b>	<b>17th</b>	<b>18th</b>	<b>19th</b>	<b>20th</b>	<i>All cent.</i>
<b>Theatre</b>	97.60	98.10	98.88	98.34	98.00	98.19
<b>Not theatre</b>	97.78	98.02	98.06	96.97	97.39	97.65
<b>Both</b>	97.69	98.06	98.46	97.66	97.70	97.92

Table 6 – Lemmatisation accuracies of the best models on out-of-domain data

POS						
<i>Corpus</i>	<b>16th</b>	<b>17th</b>	<b>18th</b>	<b>19th</b>	<b>20th</b>	<i>All cent.</i>
<b>Theatre</b>	95.05	96.59	95.98	94.81	93.57	95.18
<b>Not theatre</b>	92.89	94.27	96.53	91.87	91.35	93.42
<b>Both</b>	93.93	95.44	96.27	93.36	92.48	94.30

Table 7 – POS accuracies of the best models on out-of-domain data

The lemmatisation model proves to be relatively robust: globally, the loss of accuracy is of roughly 1 percentage point, while it is closer to 3 percentage points for the POS model. This difference can be explained by the difference between the training corpora: the use of significant additional data to improve the efficiency of the lemmatisation model seems to reflect in its greater capacity to generalise. The same reason could also explain why the lemmatisation models transpose better to non-dramatic texts than the POS model.

In both cases, though, the better accuracies are reached for the 17th and 18th centuries – and, surprisingly, more specifically for 18th century data in most cases. It progressively decreases going backward or forward in time.

### 5.3 Improvement over previous corpus

In order to evaluate the importance of the addition of the newly annotated data (*Theatre*), we set-up a second training experiment where we reuse the best configuration found in 4.1 (*wembs*) over 5 iterations using the same training, dev and test set, except for the files from the *Theatre* sample in train and dev. Using the best model, we are able to measure the effect of the introduction of *Theatre* data on top of the *Frantext* data. On lemmatization, the results are clear: the overall accuracy with the same configuration goes from 97.30% to 99.09%, an increase of 1.79 points. We cannot compare unknown and ambiguous tokens as well as unknown tokens as the support from these categories moved: -88 unknown tokens, +34 ambiguous tokens, -23 unknown targets. The same impact can be seen on out-of-domain data (Table 8) with a more visible impact on the Theatre corpus of the 18th century (+0.96 points). Strangely enough, neither the 17th century or the Theatre genre benefits the most from the inclusion of 17th century Theatre data, as the *Not Theatre* corpus and the 18th century are the most improved ones.

<i>Corpus</i>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<i>All cent.</i>
<b>Theatre</b>	+0.16	+0.30	+0.96	+0.00	+0.22	+0.32
<b>Not theatre</b>	+0.74	+0.46	+0.63	+0.30	+0.67	+0.56
<b>Both</b>	+0.46	+0.38	+0.79	+0.07	+0.44	+0.45

Table 8 – Score improvements between *Frantext* corpus and *Frantext+Theatre*. Reads as follow: on 17th century theatre, a model trained with *Frantext+Theatre* has +0.30 points of accuracy, going from 97.80 to 98.10%.

#### 5.4 Most frequent confusions

The most frequent confusions of the best models on the out-of-domain data are presented in table 9.

Expected	Tot. Err.	Pred.	Pred. times	Expected	Tot. Err.	Pred.	Pred. times
LEMMA				POS			
monsieur	9	M.	9	NOMcom	182	ADJqua	45
le	9	il	9			NOMpro	33
cœur	6	cuur	4			VERinf	32
		crur	2			VERcjc	18
franc	6	Franc	6			VERppe	11
Électre	5	éLECTRE	4	ADJqua	104	NOMcom	45
		électre	1			VERppe	17
noble	4	Nobles	4			VERcjc	12
maître	4	maîtresse	4	NOMpro	81	NOMcom	43
de_le	4	un	4	VERcjc	61	NOMcom	18
un	4	de_le	4			ADJqua	12
dame	3	Dame	2			VERppe	12
		damer	1	ADVgen	58	NOMcom	16
Phanor	3	phanor	3			VERcjc	14
voir	3	vivre	3	PROrel	31	CONsub	26
Vosges	3	vosge	3				
Médée	3	médé	3				

Table 9 – Sample from the confusion matrix for the best *Pie* models on the out-of-domain data.

Regarding lemmatisation, some errors related to homographs such as the token *le* (regimen pronoun (*il*) or determiner (*le*); or the token *des* (plural of the determiner *un* or partitive *de\_le*). Some other errors are due to abbreviations not present in the training data (*M.* for *monsieur*). More interestingly, for the research of potential improvements, many errors are related to rare characters classes in the training data, such as capital letters or ligatures (*æ*).

For POS, the most frequent confusions are in nominal rather than verbal tags. In particular, confusions between common nouns (NOMcom), proper nouns (NOMpro), adjectives (ADJqua) and nominal forms of the verbs (participle, VERppe, and infinitive, VERinf). Some errors are due to the morpho-syntactic nature of our annotation, which, for instance, labels substantive adjective as common nouns (*le beau* is NOMcom).

## VI DISCUSSION

The scores of up to 99% for in-domain lemmatisation and 97% for POS tagging put our best models above the expected state of the art, or in its upper range (see I). Yet, these results were deserving of further investigation, through out-of-domain tests and more qualitative inspection.

Out-of-domain tests show that, even though they were trained for 17th century classical theatre, the model reach their best accuracies for 18th century texts. Such a fact seems counter-intuitive, but a plausible explanation might be as follow: the median date of the texts of the *Frantext* corpus is 1872, and mean date is 1859. By adding roughly 80k tokens of 17th century texts to the 2,3M of Frantext (with mean text date 1859), we may have somehow slightly pulled the corpus closer to the 18th century.

In any case, through the careful construction of a labelled corpus and the use of a neural lemmatiser and tagger, we were able to develop models very suitable to the annotation necessary for the stylometric analyses showed in Cafiero and Camps [2019]. But we think that the model are useful for the annotation of 17th century theatre, and even beyond that, of Early Modern French texts in normalised spelling, with encouraging results regarding generalisation beyond the original scope of the experiments.

## VII FURTHER RESEARCH

Looking at our results, the main lead for improvements should be a more efficient way to deal with rare character classes, such as capital letters, diacritics or ligatures. Several methods could be used to reduce the number of classes (*e.g.*, Unicode decomposed normalisation) or, alternatively, the training set could be sufficiently extended to provide enough cases.

More generally, three possible directions could be followed in the coming years. The first is to expand the training corpus to other dramatic genres (tragedy, tragi-comedy. . .), and other genres in general (poetry, novels, short stories. . .). The second would be to replace normalised tokens by non-normalised ones, and therefore offer a new model that takes full advantage of the ability of tools like *Pie* to deal with spelling variation in historical languages, and, doing so, strengthen the ability of model to deal with older varieties of French. The third is to expand dramatically the training with data taken from 18th or 16th c. texts. Results going in these directions and continuing the experiments described in this paper will be presented at DTUC'20 [Gabay et al., 2020b].

## AUTHOR CONTRIBUTIONS

P.F. encoded the corpus and all its metadata. F.C., J.-B. C. and S.G. designed the research project. The preprocessing of the texts, the initial setup of the *Pyrrha* corpus and of the authority lists were performed by J.-B. C. Correction of the training data and expansion of the authority lists was shared equally between F.C., J.-B. C. and S.G. Post-processing of the trained corpus, injection of morphological data, and correction of the *Frantext* data was done by J.-B. C., as well as the training, testing of the models and their further use to annotate unseen data. T.C. programmed modifications to *Pie* code to include *Bert* and participated in the training and benchmarking of models, as well as additional debugging of the annotation tools. All authors contributed to the writing of this paper.

The authors have no competing interests to declare.

## MATERIALS AND DATA AVAILABILITY

The most up-to-date version of the models can be easily obtained and used thanks to the *pie-extended* Python package, available on Pypi (<https://pypi.org/project/pie-extended/>), with the command `pie-extended download fr`, and can be queried at <https://tal.chartes.psl.eu/deucalion/>.

The initial version created for Cafiero and Camps [2019] is available from the *Science Advances* website since the publication of the paper, on 27th Nov. 2019 at this address: [https://advances.sciencemag.org/highwire/filestream/221312/field\\_highwire\\_adjunct\\_files/0/aax5489\\_Data\\_file\\_S1.zip](https://advances.sciencemag.org/highwire/filestream/221312/field_highwire_adjunct_files/0/aax5489_Data_file_S1.zip). The initial version of the models is available on Zenodo ([10.5281/zenodo.3353421](https://doi.org/10.5281/zenodo.3353421)).

The version of the best models described in this paper, as well as training, validation and test data can be found on Zenodo as well, as version 3 of the same repository (doi: [10.5281/zenodo.3828644](https://doi.org/10.5281/zenodo.3828644)).

Licensing is specified separately for each repository.

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## A PLAYS SAMPLED TO CREATE THE INITIAL TRAINING CORPUS

The following plays selected from Fièvre [2007] were sampled.

id	auteur	titre	date	genre	inspiration	structure	type	periode
CP_DONSANCHE	CORNEILLE, Pierre	DON SANCHE D'ARAGON, COMÉDIE HÉROÏQUE	1649	Comédie héroïque	moeurs espagnoles	5 act.	vers	1641-1650
CP_GALERIEDUPALAIS	CORNEILLE, Pierre	LA GALERIE DU PALAIS ou L'AMIE RIVALE	1637	Comédie	moeurs françaises	5 act.	vers	1631-1640
CP_ILLUSIONCOMIQUE	CORNEILLE, Pierre	L'ILLUSION COMIQUE, COMÉDIE	1639	Comédie	moeurs françaises	5 act.	vers	1631-1640
CP_MELITE33	CORNEILLE, Pierre	MÉLITE OU LES FAUSSES LETTRES, COMÉDIE	1633	Comédie	moeurs françaises	5 act.	vers	1621-1630
CP_MENTEUR	CORNEILLE, Pierre	LE MENTEUR, COMÉDIE	1644	Comédie	moeurs françaises	5 act.	vers	1641-1650

CP_PULCHERIE	CORNEILLE, Pierre	PULCHÉRIE, COMÉDIE	1673	Comédie	histoire chrétienne	5 act.	vers	1671-1680
CP_SUITEMENTEUR	CORNEILLE, Pierre	HÉROÏQUE LA SUITE DU MENTEUR, COMÉDIE	1645	Comédie	moeurs françaises	5 act.	vers	1641-1650
CP_SUIVANTE	CORNEILLE, Pierre	LA SUIVANTE, COMÉDIE	1637	Comédie	moeurs françaises	5 act.	vers	1631-1640
CP_TITE	CORNEILLE, Pierre	TITE ET BÉRÉNICE, COMÉDIE	1671	Comédie	histoire romaine	5 act.	vers	1661-1670
CP_VEUVE34	CORNEILLE, Pierre	HÉROÏQUE LA VEUVE OU LE TRÁÍTRE TRAHÍ, COMÉDIE	1634	Comédie	moeurs françaises	5 act.	vers	1631-1640
CT_AMOURALAMODE	CORNEILLE, Thomas	L'AMOUR Á LA MODE, COMÉDIE.	1651	Comédie	moeurs espagnoles	5 act.	vers	1651-1660
CT_CHARMEDELAVOIX	CORNEILLE, Thomas	LE CHARME DE LA VOIX, COMÉDIE	1658	Comédie	moeurs italiennes	5 act.	vers	1651-1660
CT_COMTESSEORGUEIL	CORNEILLE, Thomas	LA COMTESSE D'ORGUEIL, COMÉDIE	1690†	Comédie	moeurs françaises	5 act.	vers	1651-1660
CT_DOMBERTRANDECIGARRAL	CORNEILLE, Thomas	DON BERTRAN DE CIGARRAL, COMÉDIE	1709*	Comédie	moeurs espagnoles	5 act.	vers	1651-1660
CT_DOMCESARDAVALOS	CORNEILLE, Thomas	DON CÉSAR D'AVALOS, COMÉDIE.	1661	Comédie	moeurs espagnoles	5 act.	vers	1671-1680
CT_FEINTASTROLOGUE	CORNEILLE, Thomas	LE FEINT ASTROLOGUE, COMÉDIE	1651	Comédie	moeurs françaises	5 act.	vers	1651-1660
CT_FESTINPIERRE	CORNEILLE, Thomas	LE FESTIN DE PIERRE, COMÉDIE	1677	Comédie	moeurs espagnoles	5 act.	vers	1671-1680
CT_GALANTDOUBLE	CORNEILLE, Thomas	LE GALANT DOUBLÉ, COMÉDIE.	1659	Comédie	moeurs espagnoles	5 act.	vers	1651-1660
CT_GEOLIERDESOIEMEME	CORNEILLE, Thomas	LE GEÓLIER DE SOI-MÉME, COMÉDIE.	1655	Comédie	moeurs italiennes	5 act.	vers	1651-1660
CT_ILLUSTRESENNEMIS	CORNEILLE, Thomas	LES ILLUSTRES ENNEMIS, COMÉDIE	1657	Comédie	moeurs espagnoles	5 act.	vers	1651-1660
CT_INCONNU	CORNEILLE, Thomas	L'INCONNU, COMÉDIE.	1675	Comédie	moeurs françaises	5 act.	vers	1671-1680
M_AMPHITRYON	MOLIÈRE	AMPHITRYON, COMÉDIE	1668	Comédie	mythe grec	3 act., prol.	vers	1661-1670
M_DEPITAMOUREUX	MOLIÈRE	LE DÉPIT AMOUREUX	1656	Comédie	moeurs françaises	5 act.	vers	1651-1660
M_DOMGARCIEDENAVARRE	MOLIÈRE	DON GARCIE DE NAVARRE, COMÉDIE	1682‡	Comédie	moeurs espagnoles	5 act.	vers	1661-1670
M_ECOLEDESFEMMES	MOLIÈRE	L'ÉCOLE DES FEMMES, COMÉDIE.	1663	Comédie	moeurs françaises	5 act.	vers	1661-1670
M_ETOURDI	MOLIÈRE	L'ÉTOURDI ou LES CONTRE-TEMPS, COMÉDIE	1663	Comédie	moeurs françaises	5 act.	vers	1661-1670
M_FEMMESSAVANTES	MOLIÈRE	LES FEMMES SAVANTES, COMÉDIE	1672	Comédie	moeurs françaises	5 act.	vers	1671-1680
M_MISANTHROPE	MOLIÈRE	LE MISANTHROPE ou L'ATRABILAIRE AMOUREUX, COMÉDIE	1667	Comédie	moeurs françaises	5 act.	vers	1661-1670
M_TARTUFFE	MOLIÈRE	LE TARTUFFE ou L'IMPOSTEUR, COMÉDIE	1669	Comédie	moeurs françaises	5 act.	vers	1661-1670
O_ABSENTCHEZSOI	OUVILLE, Antoine le Mérel	L'ABSSENT CHEZ SOI	1643	Comédie	moeurs françaises	5 act.	vers	1641-1650
O_FAUSSESVERITES	OUVILLE, Antoine le Mérel	LES FAUSSES VÉRITÉS, COMÉDIE	1643	Comédie	moeurs françaises	5 act.	vers	1641-1650
O_SOUPCONS	OUVILLE, Antoine le Mérel	LES SOUPÇONS SUR LES APPARENCES, COMÉDIE	1650	héroïco-comédie	moeurs françaises	5 act.	vers	1641-1650
R_BELLEALPHREDE	ROTRON, Jean	LA BELLE ALPHRÈDE, COMÉDIE	1639	Comédie	moeurs arabes	5 act.	vers	1631-1640
R_CAPTIFS	ROTRON, Jean	LES CAPTIFS OU LES ESClaves, COMÉDIE	1640	Comédie	moeurs françaises	5 act.	vers	1631-1640
R_SOSIES	ROTRON, Jean	LES SOSIES, COMÉDIE	1638	Comédie	mythe grec	5 act.	vers	1631-1640
S_DOMJAPHETDARMENIE	SCARRON, Paul	DON JAPHET D'ARMÉNIE, COMÉDIE.	1653	Comédie	moeurs françaises	5 act.	vers	1651-1660
S_GARDIENDESOMEME	SCARRON, Paul	LE GARDIEN DE SOI-MÉME	1654	Comédie	moeurs italiennes	5 act.	vers	1651-1660
S_HERITIERRIDICULE	SCARRON, Paul	L'HÉRITIER RIDICULE OU LA DAME INTÉRESSÉE..	1650	Comédie	moeurs espagnoles	5 act.	vers	1641-1650
S_JODELET	SCARRON, Paul	LE JODELET OU LE MAÍTRE VALET, COMÉDIE.	1648	Comédie	moeurs françaises	5 act.	vers	1641-1650
S_JODELETDUELISTE	SCARRON, Paul	LE JODELET DUELLISTE, COMÉDIE.	1646	Comédie	moeurs françaises	5 act.	vers	1641-1650
S_MARQUISRIDICULE	SCARRON, Paul	LE MARQUIS RIDICULE, OU LA COMTESSE faite à la hâte, COMÉDIE.	1656	Comédie	moeurs espagnoles	5 act.	vers	1651-1660

† The edition used as base is from 1690, but the play dates back to 1670.

The edition used as base is from 1709, but the play dates back to 1652.

‡ Created in 1661, but published 1680.

## B ANNOTATED TEXTS FROM THE *FRANTEXT* BASE

The following texts, from ATILF-CNRS and Université de Lorraine [1998-2018], were used as complementary data for lemmatisation training.

id	auteur	titre	date	place	publisher	N.tok
K639:1890:52916	LOTI, Pierre	Le Roman d'un enfant	1891	Paris	Calmann-Levy	61,417
K934:1898:35797	ROSTAND Edmond	Cyrano de Bergerac	1898	Paris	Fasquelle	47,213
K999:1899:45606	GOURMONT Remy de	Esthétique de la langue française...	1899	NA	Soc. Mercure de Fr.	53,640
L233:1895:13272	JARRY Alfred	Ubu Roi, <i>Œuvres complètes</i> , t. 4.	s.d.	Monte-Carlo	éd. Du Livre	17,672
L266:1905:59455	POINCARÉ Henri	La Valeur de la science	1905	Paris	Flammarion	66,125
L433:1882:31745	BECQUE Henry	Les Corbeaux, <i>Théâtre complet</i> , t. 2	1922	s.p.	Fasquelle	38,813
L486:1884:68155	HUYSMANS Joris-Karl	À rebours	1907	Paris	Fasquelle	79,058
L499:1901:63336	Jaurès Jean	Études socialistes	1902	Paris	Ollendorf	71,159
L784:1908:100993	LEROUX Gaston	Le Parfum de la dame en noir	1908	Paris	L'Illustration	N.tok
L846:1857:68636	ABOUT Edmond	Le Roi des montagnes	1857	s.p.	Hachette	79,720
L884:1867:20871	MEILHAC Henri et Ludovic HALÉVY	La Vie parisienne	1867	Paris	M. Levy	27,381
M223:1873:70999	VERNE Jules	Le Tour du monde en quatre-vingts jours	s.d.	Paris	Hetzl	84,925
M289:1874:69484	FROMENTIN Eugène	Un été dans le Sahara	1877	Paris	Plon	80,612
M362:1825:111416	BRILLAT-SAVARIN Jean-Anthelme	Physiologie du goût...	1847	Paris	Charpentier	127,968
M374:1830:28471	FOURIER Charles	Le Nouveau monde industriel...	1830	Paris	Bossange	32,566
M425:1794:4621	CHÉNIER André	L'Invention, <i>Œuvres complètes</i> , t. 2.	1910	Paris	Delagrave	5,473
M433:1807:57291	STAËL Germaine de	Corinne ou l'Italie : t. 1	1807	s.p.	Peltier	65,012
M464:1801:72408	DESTUTT DE TRACY	Éléments d'idéologie, 1	1804	Paris	Courcier	80,433
M468:1803:62746	KRÜDENER Barbara Juliane von	Valérie	1840	Paris	Charpentier	73,463
M473:1809:82847	LAMARCK Jean-Baptiste	Philosophie zoologique : t. 1	1809	s.p.	Dentu	95,111
M492:1805:123259	CUVIER Georges	Leçons d'anatomie comparée : t. 1	1805	Paris	Baudouin	138,674
M528:1798:12861	GUILBERT DE PIXERÉCOURT	Victor ou l'Enfant de la forêt	1798	Paris	Barba	16,878
M548:1832:199497	SAY Jean-Baptiste	Traité d'économie politique	1841	Paris	Guillaumin	223,038
M622:1789:24158	SIEYÈS Emmanuel	Qu'est-ce que le Tiers état ?	1888	Paris	Soc. Hist. Rév. Fr.	27,002
M629:1792:31251	FLORIAN Jean-Pierre	Fables	1792	Paris	Didot	37,172
M893:1869:61374	GONCOURT Edmond et Jules de	Madame Gervaisais	1876	s.p.	Charpentier	71,174
M939:1852:84555	COMTE Auguste	Catéchisme positiviste...	1909	Paris	Garnier	95,589
N245:1838:32486	HUGO Victor	Ruy Blas, <i>Œuvres complètes. Théâtre</i> , 3	1905	Paris	Ollendorf	41,487
N268:1802:63535	BONALD Louis de	Législation primitive... t. 1	1802	Paris	Le Clère	72,539
N429:1778:64388	BUFFON Georges-Louis de	Des époques de la nature, <i>Hist. Natur.</i> , t. 5.	1778	Paris	Impr. Royale	70,866
P556:1872:177870	VIOLLET-LE-DUC Eugène	Entretiens sur l'architecture : t. 2	1872	Paris	A. Morel	199,695
Q454:1784:53428	RÉTIF DE LA BRETONNE Nicolas	La Paysanne perversité... t. 1	1784	s.p.	Vve Duchesne	64,424

## C OUT-OF-DOMAIN TEXTS

Here follows the list of the texts that were sampled for building the out-of-domain test set. Spelling was modernised when necessary.

Theatre texts were sampled from Fièvre [2007], with the exception of:

**AUBIGNAC\_PUCELLE** sample transcribed and modernised from the edition Paris, 1642, available on *Gallica*.

**GRINGORE\_SAINTE-LOUIS** sample transcribed and modernised from the *Œuvres complètes*, éd. Ch. d'Héricault et A. Montaignon, Paris, 1858-1877, available on *Gallica*.

**ANOUILH\_MEDEE** sample transcribed from the *Nouvelles pièces noires*, Paris, La Table Ronde, 1976.

**GIRAUDOUX\_ELECTRE** sample transcribed from the *Théâtre complet*, éd. J. Body, Paris, Gallimard, 1982.

**CESAIRE\_CHRISTOPHE** sample transcribed from *Poésie, Théâtre, Essais et Discours*, éd. Albert James Arnold, Paris, CNRS Editions, 2013.

For the non-dramatic texts, the main sources, as shown in the table, are:

**ELEC** *Éditions en ligne de l'École des chartes*, <http://elec.enc.sorbonne.fr/>.

**GALL** *Gallica*, Bibliothèque nationale de France, <https://gallica.bnf.fr>.

**WS** *Wikisource: la bibliothèque libre*, <https://fr.wikisource.org/>.

Other online editions were occasionally used:

*Correspondance d'Isabelle de Charrière*, éd. Suzan van Dijk and Madeleine van Strien-Chardonneau, <https://charriere.huysens.knaw.nl/>.

*Les Nouvelles Nouvelles (1663) par Jean Donneau de Visé*, éd. Claude Bourqui et Christophe Schuway, <http://www.unifr.ch/nouvellesnouvelles/>.

*Œuvres de Frédéric le Grand - Werke Friedrichs des Großen Digitale Ausgabe der Universitätsbibliothek Trier*, dir. Hans-Ulrich Seifert, Trier, <http://friedrich.uni-trier.de/>.

*Testaments de Poilus (1914-1918): transcription collaborative*, dir. Florence Clavaud, 2018-..., <https://testaments-de-poilus.huma-num.fr>.

The sample from MONTEGUT\_ISMENE was transcribed and modernised from the edition Paris, 1768, available on *Google Books*.

### 3.1 Theatre

id	author	title	date	genre	inspiration	structure	type	period
ANONYME_PARDONNEUR	anonyme	FARCE NOUVELLE TRÈS BONNE ET FORT JOYEUSE À TROIS PERSONNAGES, FARCE	1500 c.	Farce	Sermon joyeux	1 act.	vers	1501-1600
ANONYME_PONTAUXANES	anonyme	FARCE NOUVELLE FORT JOYEUSE DU PONT AUX ÂNES	1500 c.	Farce	Sermon joyeux	1 act.	vers	1501-1600
ANONYME_RESURRECTION-JENINLANDORE	anonyme	FARCE NOUVELLE TRÈS BONNE ET FORT JOYEUSE DE LA RESURRECTION DE JENIN LANDORE, FARCE	1500 c.	Farce	Sermon joyeux	1 act.	vers	1501-1600
ANONYME_SERMONJOYEUX	anonyme	SERMON JOYEUX DE BIEN BOIRE, FARCE	1500 c.	Farce	Sermon joyeux	1 act.	vers	1501-1600
BEZE_ABRAHAM	BEZE, Théodore	ABRAHAM SACRIFIANT, TRAGÉDIE.	1550	Tragédie	bible	1 act.	vers	1541-1550
GRINGORE_SAINTE-LOUIS	GRINGORE, Pierre	Mystère de Saint Louis	1514	mystère	histoire médiévale	8 livres	vers	1511-1520
JODELLE_CLEOPATRE	JODELLE, Étienne	CLÉOPÂTRE CAPTIVE, TRAGÉDIE.	1574	Tragédie	histoire romaine	5 act.	vers	1571-1580
JODELLE_DIDON	JODELLE, Étienne	DIDON SE SACRIFIANT, TRAGÉDIE.	1574	Tragédie	mythe grec	5 act.	vers	1571-1580
JODELLE_EUGENE	JODELLE, Étienne	L'EUGÈNE, COMÉDIE.	1574	Comédie	moeurs françaises	5 act.	vers	1571-1580
TURNÈBE_CONTENTS	TURNÈBE, Odet de	LES CONTENTS, COMÉDIE NOUVELLE EN PROSE FRANÇAISE	1584	Comédie	moeurs françaises	5 act.	prose	1581-1590
AUBIGNAC_PUCELLE	AUBIGNAC, François Hédelin	La Pucelle d'Orléans	1642	Tragédie	histoire médiévale		prose	1641-1650
CHAMPREPUS_ULYSSE	CHAMPREPUS, Jacques de	ULYSSE, TRAGÉDIE.	1603	Tragédie	mythe grec	5 act.	vers	1601-1610
CHAPPUZEAU_ARMETZAR	Samuel Chappuzeau (1625-1701)	ARMETZAR OU LES AMIS EN-NEMIS, TRAGICOMÉDIE.	1656	Tragi-comédie	histoire turque	5 act.	vers	1651-1660
DESHOULIERES_GENSERIC	DESHOULIÈRES, Antoinette du Ligier de la Garde	GENSERIC, TRAGÉDIE	1680	Tragédie	histoire romaine	5 act.	vers	1671-1680
DESJARDINS_FAVORI	DESJARDINS, Marie-Catherine-Hortense dite de Villedieu	LE FAVORI, TRAGICOMÉDIE.	1665	Tragi-comédie	moeurs espagnoles	5 act.	vers	1661-1670
DURANT_OISIVETE	DURANT, Catherine	OISIVITÉ EST MÈRE DE TOUS LES VICÉS, PROVERBE.	1699	Proverbe	moeurs françaises	1 act.	prose	1691-1700
MATHIEU_MAGICIENNE-ETRANGERE	MATTHIEU, Pierre	LA MAGICIENNE ÉTRANGÈRE, TRAGÉDIE.	1617	Tragédie	histoire française	4 act.	vers	1611-1620
SCUDERY_LIGDAMON-ELIDIAS	SCUDERY, Georges de	LIGDAMON ET LIDIAS, TRAGICOMÉDIE	1631	Tragi-comédie	histoire médiévale	5 act.	vers	1631-1640
URFE_SYLVANIRE	URFÉ, Honoré d'	SYLVANIRE ou la MORTE VIVE, FABLE BOCAGÈRE	1627	Pastorale héroïque	pastorale	5 act., un prologue	vers	1621-1630
VONDREBECK-ALARD_FORCESDELAMOUR	VONDREBECK, Maurice et ALARD, Charles	LES FORCES DE L'AMOUR ET DE LA MAGIE, DIVERTISSEMENT	1678	Divertissement	moeurs françaises	3 act.	prose	1671-1680
BERGASSE_JOURNEE-DESDUPES_1790	BENSERADE, Isaac de	LA JOURNÉE DES DUPES, TRAGICOMÉDIE	1790	Tragi-comédie	histoire française	4 act.	prose	1781-1790
BIEVRE_VERCINGENTORIXE	BIÈVRE, François-Georges Mareschal de	VERCINGENTORIXE, TRAGÉDIE.	1770	Tragédie	histoire française	1 act.	vers	1761-1770
BOISSY_VIEESTUNSONGE	BOISSY, Louis de	LA VIE EST UN SONGE, COMÉDIE-HÉROÏQUE.	1732	Comédie héroïque	moeurs polonaises	5 act.	vers	1731-1740
DANCOURT_SANCHO	DANCOURT, Florent CARTON dit	SANCHO PANÇA, GOUVERNEUR, COMÉDIE	1712	Comédie	moeurs françaises	5 act.	vers	1711-1720
DIDEROT_FILSNATUREL	DIDEROT, Denis	LE FILS NATUREL ou Les ÉPREUVES DE LA VERTU.	1757	Tragi-comédie	moeurs françaises	5 act.	prose	1751-1760
DUFRESNY_MARIAGEFAIT-ETROMPU	DUFRESNY, Charles	LE MARIAGE FAIT ET ROMPU, COMÉDIE	1721	Comédie	moeurs françaises	3 act.	vers	1721-1730
GUDIN_LOTHAIRE	GUDIN de la BRENELLERIE, Paul-Philippe	LOTHAIRE, ROI DE LORRAINE, TRAGÉDIE	1759	Tragédie	histoire française	5 act.	vers	1751-1760
MARIVAUX_PEREPRUDENT	MARIVAUX, Pierre de	LE PÈRE PRUDENT ET ÉQUITABLE, COMÉDIE	1712	Comédie	moeurs françaises	1 act.	vers	1711-1720
REGNARD_MENECHMES	REGNARD, Jean-François	LES MÉNECHMES, ou LES JUMEAUX, COMÉDIE	1705	Comédie	moeurs françaises	5 act.	vers	1701-1710
VOLTAIRE_MORTDECESAR	VOLTAIRE	LA MORT DE CÉSAR, TRAGÉDIE EN TROIS ACTES	1736	Tragédie	histoire romaine	3 act.	vers	1731-1740
ALLAIS_BONBOUGRE	ALLAIS, Alphonse	LE PAUVRE BOUGRE ET LE BON GÉNIE, FÉERIE EN UN ACTE.	1889	Féerie	moeurs françaises	1 act.	prose	1881-1890
AUDE_ECOLETRAGIQUE	AUDE, Joseph	L'ÉCOLE TRAGIQUE, OU CADET ROUSSEL MAÎTRE DE DÉCLAMATION COMÉDIE	1802	Comédie	moeurs françaises	1 act.	mixte	1801-1810
BANVILLE_ANTIENPIERROT	BANVILLE, Théodore de	ANCIEN PIERROT, MONOLOGUE.	1877	Monologue	moeurs françaises	1 act.	prose	1871-1880
BONNETAIN_APRESLE-DIVORCE	BONNETAIN, Paul	APRÈS LE DIVORCE, PIÈCE	1890	Comédie	moeurs françaises	1 act.	prose	1881-1890
CONSTANT_WALLSTEIN	CONSTANT, Benjamin	WALLSTEIN, TRAGÉDIE	1809	Tragédie	histoire allemande	5 act.	vers	1801-1810
DUMAS_DONJUAN	DUMAS, Alexandre	DON JUAN DE MARANA, MYSTÈRE	1836	Drame	moeurs espagnoles	5 act.	mixte	1831-1840
GENLIS_BELLEETLABETE	GENLIS, Stéphanie-Félicité Du Crest de	LA BELLE ET LA BÊTE, COMÉDIE	1829	Comédie	moeurs françaises	2 act.	prose	1821-1830
HUGO_HERNANI	HUGO, Victor	HERNANI, OU L'HONNEUR CASTILLAN	1830	Drame	histoire espagnole	5 act.	vers	1821-1830
JARRY_UBUROI	JARRY, Alfred	UBU ROI, DRAME	1896	Drame	Fantaisie historique	5 act.	mixte	1881-1890
SAND_MOLIERE	SAND, George	MOLIÈRE, DRAME.	1851	Comédie	histoire littéraire	2 act.	prose	1851-1860
ANOUILH_MEDEE	ANOUILH, Jean	Médée	1946	tragédie	mythe grec	NA	prose	1941-1950

BERNARDT_PARTIEDE-BRIDGE	BERNARD, Tristan	LA PARTIE DE BRIDGE, COMÉDIE	1930	Comédie	moeurs françaises	1 act.	prose	1921-1930
BERTON_HOMMEQUIA-TUELAMORT	BERTON, René	L'HOMME QUI A TUÉ LA MORT, DRAME	1928	Pièce dramatique	moeurs françaises	2 act.	prose	1921-1930
CESAIRE_CHRISTOPHE	CÉSAIRE, Aimé	La Tragédie du roi Christophe	1963	tragédie	histoire haïtienne	3 act.	prose	1961-1970
COURTELINE_MONSIEUR-BADIN	COURTELINE, Georges	MONSIEUR BADIN, COMÉDIE.	1904	Saynète	moeurs françaises	1 act.	prose	1891-1900
GIRAUDOUX_ELECTRE	GIRAUDOUX, Jean	Électre	1937	tragédie bourgeoise	mythe grec	2 act.	prose	1931-1940
HUGUES_CENDRILLON	HUGUES, Clovis	CENDRILLON, COMÉDIE.	1906	Comédie	conte de fées	1 act.	vers	1901-1910
HUGUES_TYL	HUGUES, Clovis	TYL L'ESPIEGLE, COMÉDIE.	1906	Comédie	moeurs flamande	1 act.	vers	1901-1910
LESENNE_REVEIL-CORNEILLE	LE SENNE, Camille	LE RÉVEIL DE CORNEILLE, POÈME DRAMATIQUE.	1916	Dialogue des morts	histoire littéraire	1 act.	vers	1911-1920
RENARD_MAITRESSE	RENARD, Jules	LA MAÎTRESSE, COMÉDIE.	1927	Comédie	moeurs françaises	2 act.	prose	1921-1930

### 3.2 Varia

ID	auteur	titre	genre	forme	date	source	ed.
ANONYME_PAIX-BERGERAC	Chancellerie royale	Paix de Bergerac. Édit de Poitiers. Poitiers, septembre 1577.	légal	prose	1577	ELEC	éd. Bernard Barbiche, École nationale des chartes.
ANONYME_REITRES	anonyme	Le vray discours sur la route et admirable desconfiture des Reistres...	discours	prose	1587	WS	éd. Éd. Fournier, Var. hist. et litt., t. 9
ARBEAU_BELLE	Thoinot Arbeau	Belle qui tiens ma vie	chanson	vers	1588	WS	manq.
FRANCOISPREMIER-CORRESP	François Ier	La correspondance du chancelier Antoine Du Bourg (1535-1538)	correspondance	prose	1537	ELEC	éd. Olivier Poncet
LENONCOURT-MARTIN_HYPNEROTO-MACHIE	Robert de Lenoncourt, Jean Martin (trads)	Hypnérotomachie, ou Discours du songe de Poliphile...	discours	prose	1546	WS	Jacques Kerver, 1546
LIEBAUT_MISERES	Liébaud, Nicole Estienne	Les Misères de la Femme mariée...	poésie morale	vers	1587	WS	éd. Éd. Fournier, Var. hist. et litt., 3, 1855.
LOUISELABE_ELEGIE	Louise Labé	Élégie I	poésie lyrique	vers	1555	WS	éd. Charles Boy, 1887.
MARGUERITENAVARRE_MIROIR	Marguerite de Navarre	Miroir de l'âme pécheresse	miroir	vers	1529	WS	éd. Félix Frank, 1873
RABELAIS_PANTAGRUEL	Rabelais	Pantagruel	roman	prose	1532	WS	éd. Marty-Laveaux, 1868
RONCARD_SONNETS	Ronsard, Pierre de	Je plante en ta faveur cet arbre de Cybèle	poésie	vers	1578	WS	éd. Roger Sorg, 1921
ANNEROHAN_PORTRAIT	Anne de Rohan-Soubise	Portrait de feue la duchesse de Nevers...	poésie	vers	1629	GALL	éd. Éd. de Barthélemy, Paris, 1862
ANONYME_AIRABOIRE	anonyme	Air à boire	chanson	vers	16...	WS	La Chanson française du XVe au XXe siècle, éd. Jean Gillequin, 1910.
ANONYME_ARREST	anonyme	Arrest notable donné au profit des femmes contre l'impuissance des maris	légal	prose	1626	WS	éd. Éd. Fournier, Var. hist. et litt., 6, 1856
BOILEAU_SATIRE	Nicolas Boileau	satires (satire I)	satire	vers	1660	WS	Paris, 1872
DONNEAU_NOUVELLES	Jean Donneau de Visé	Nouvelles nouvelles	actualité	prose	1663	other	éd. Bourqui & Schuwey
ELISABETHBOHEME-CORRESPONDANCE	Élisabeth de Bohême	Correspondance avec René Descartes	correspondance	prose	1643	WS	manq.
PERRAULT_PETIT-CHAPERON	Charles Perrault	Le petit Chaperon rouge	conte	prose	1697	WS	Paris, 1902
POULLAIN_EGALITE	François Poullain de La Barre	De l'Égalité des deux sexes, Discours physique et moral	discours	prose	1679	GALL	Paris, 1679
SCUDERY_ARTAMENE	Madeleine de Scudéry	Artamène ou le Grand Cyrus	roman	prose	1654	WS	Auguste Courbé, 1654.
VERVILLE_UN-JOUR	Béroalde de Verville	« Un jour reconnaissant que je suis incapable »	poésie	vers	av. 1626	WS	manq.
ANONYME_DECLARATION	anonyme	Déclaration des Droits de l'Homme et du Citoyen de 1793	légal	prose	1793	WS	manq.
CHARRIERE_LETTRE	Isabelle de Charrière	lettre	correspondance	prose	1755	other	éd. S. van Dijk et M. van Strien-Chardonneau
CHATELET_DISCOURS	Émilie du Châtelet	Discours sur le bonheur	discours	prose	1744	WS	éd. Bourlet de Vauxcelles, 1796
CHENIER_ODE	André Chénier	Ode IX (à Charlotte Corday)	poésie	vers	1793	WS	éd. H. de Latouche, 1819
FREDERICDEUX_DIVINE-EMILIE	Frédéric II de Prusse	À la Divine Émilie	poésie	vers	1737	FG	Œuvres de Frédéric le Grand, Berlin, 1850
MERICOURT_DISCOURS	Méricourt, Théroigne de	Discours devant la Société fraternelle des Minimes, 25 mars 1792	discours	prose	1792	GALL	Paris, 1792
MONTÉGUT_ISMENE	Jeanne de Montégut-Ségla	Ismene, élégie	poésie	vers	1739	other	Paris, 1768
ROUGET_MARSEILLAISE	Rouget de Lisle	La Marseillaise	chanson	vers	1792	WS	manq.
TENCIN_SIEGE	Madame de Tencin	Le Siège de Calais	roman	prose	1739	WS	éd. L.-S. Auger, Paris, 1820.
VOLTAIRE_ZADIG	Voltaire	Zadig	nouvelle	prose	1747	WS	Paris, 1877.
CMH_PV	Commission des monuments historiques	PV 29 février 1884	administratif	prose	1884	ELEC	éd. J.-D. Pariset.
DELESCLUZE_LETTRE	Henri Delescluze	Lettre à Charles Delescluze (Carnets de prison)	correspondance	prose	1851	ELEC	éd. Chr. Nougaret et Fl. Clavaud
DEROULEDE_CHANTS	Paul Déroulède	Nouveaux chants du soldat	chanson	vers	1883	GALL	Paris, 1883
DESBORDESVALMORE_IN-SOMNIE	Marceline Desbordes-Valmore	L'Insomnie	poésie	vers	1860	WS	Paris, 1860.
HEREDIA_EPEE	Hérédia, José Maria de	L'Épée	poésie	vers	1893	WS	Paris, 1893.
MERIMEE_ACADEMIE	Prosper Mérimée	Discours de réception à l'Académie française	discours	prose	1845	other	Site de l'Académie française
POTTIER_INTERNATIONALE	Eugène Pottier	L'Internationale	chanson	vers	1871	WS	Paris, 1908.
SAND_MARIANNE	George Sand	Marianne	roman	prose	1877	WS	Paris, 1877
SEGUR_BOSSU	Comtesse de Ségur	François le Bossu	roman	prose	1864	WS	Paris, 1901
STAEL_ALLEMAGNE	Mme de Staël	De l'Allemagne	essai	prose	1810	WS	Paris, 1814
ANONYME_CONSCRITS	anonyme	Les Conscrits insoumis	chanson	vers	1902	WS	manq.
BLUM_FRONTPOP	Léon Blum	« Nous sommes un gouvernement de front populaire »	discours	prose	1936	GALL	J. O. de la Rép. fr. 7 juin 1936
BRASILLACH_JEANNE	Robert Brasillach	Le Procès de Jeanne d'Arc	étude historique	prose	1941	GALL	Paris, 1941
BRIMONT_MIRAGES	Renée de Brimont	Mirages	poésie	vers	1919	WS	Paris, 1919
COLETTE_MAISON	Colette	La Maison de Claudine	nouvelle	prose	1922	WS	manq.
LAHIRE_ROUE	Jean de La Hire	La Roue fulgurante	feuilleton SF	prose	1908	GALL	Le Matin, 11 avril 1908

LASTEYRIE_TESTAMENT	Gaspard Louis Guy de Lasteyrie marquis du Saillant	Testament	légal	prose	1915	other	Testaments de Poilus
LONDRES_BAGNE	Albert Londres	Au bagné	reportage	prose	1924	WS	Paris, 1924
NOAILLES_COEUR	Anna de Noailles	Le Cœur innombrable	poésie	vers	1901	WS	Paris, 1901
RACHILDE_GRENOUILLES	Rachilde	Le Tueur de Grenouilles	nouvelle	prose	1900	WS	Mercure de France