



# Emotional Interpretation of *Opera Seria*: Impact of Specifics of Drama Structure (Position Paper)

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Abstract: The application of artificial intelligence techniques to help musicologists analyse and classify operatic arias in terms of the sentiment they might be expressing constitutes a novel task that may benefit from the application of sentiment analysis techniques. However, because the analysis of text in this instance aims to provide information to support the analysis of the associated music, the conventions of how narrative is structured in traditional opera need to be taken into account to ensure that the relevant spans of text are considered. The present position paper argues for a treatment of operatic libretti as semi-structured data, to take advantage of annotations on speaker identity and recitative vs. aria distinctions so that the most relevant sentiment for the music of the arias can be mined from the texts. This would constitute a new task that applies artificial intelligence specifically to the needs of musicology.


## 1 INTRODUCTION


There is growing interest in exploring the application of artificial intelligence techniques to help musicologists analyse and classify operatic arias in terms of the sentiment they might be expressing. This has followed recent advances in the quality of sentiment analysis solutions. For a musicologist, being able to tell whether an aria might be expressing a particular sentiment opens the gate to identifying which of the musical features of the piece might be serving the purpose of expressing that sentiment (Torrente and Domínguez, 2022). However, in the particular context of opera, particularly *opera seria*, direct application of the procedures developed to attribute sentiment to news headlines or Twitter messages may not be the optimal approach, given the specific relations that hold between the sentiment expressed in an aria, the text of the aria, and the text of the recitative that lead to the aria.

*Opera seria* is an Italian term used to describe the operatic genre that prevailed among the courts of Europe during most of the 18th century. It is characterised by the alternation of *recitative* – where the

performers engage in dialogue that carries the action, sung in a style very close to normal speech and accompanied only by a limited subset of instruments – and *arias* – where solo singers elaborate on the feelings of a particular character and sing complex melodies accompanied by the whole orchestra (Fabri, 2003). This convention was very strictly followed at the time.<sup>1</sup> The texts were always written in Italian, no matter the nationality of the composer or the country where they were performed.

The present position paper argues that this singular structure of *opera seria* needs to be considered when attempting automated treatment of the libretti to annotate the emotional content being expressed in the arias. The conventions of *opera seria* allow very complex dramatic situations to be set up during the longer recitatives, so that they can be given musical expression in the arias. But the arias themselves usually have very short texts, that very often express abstract or metaphoric references to the situation in question, rather than descriptions of them, because they rely for that on the material just presented in the preceding recitative. This presents a challenge to the artificial intelligence researcher attempting to run his sentiment

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<sup>1</sup>A brief review of evidence in support of this statement is provided in section 2.1 below.

analysis code on the text of the aria to obtain a meaningful representation of the feelings being expressed by the music of the aria. In the sections that follow we present a more elaborate argument in support of this point of view, and a simple computational experiment to show the significant differences in relative size between the volume of text of the arias and the volume of text of the recitatives that precede them.

## 2 PREVIOUS WORK

The following topics are reviewed: basic conventions of opera seria and existing work on identifying emotion in Italian opera.

### 2.1 Basics of Operatic Convention on Narrative

The chief structural principle of opera seria is the alternation of recitatives, where the plot action is expressed with simple music and accompaniment, and arias, where the characters express their feelings in elaborate musical settings with orchestra. This division, that may look artificial to a modern audience, appears to be a direct reflection of René Descartes' theory of human emotions as described in *Les passions de l'âme* (Descartes, 1649) doubtless the most influential essay on this matter for more than a century. Descartes uses the term passion to imply that human emotions are the reaction of the mind and the body to a certain action. As a consequence of this conception, the mechanics of opera seria consist of a sequence of actions during the recitatives that successively arouse specific passions in one or more characters that are in turn being expressed in their arias (Torrente and Llorens, 2020). For more than a century, arias followed the same structural pattern because 'form must be comprehensible if a work is to achieve its goal of moving the audience's passions' (Bonds, 1991, p. 81). The key to this separation is that the emotional conflicts expressed musically on-stage in the form of arias are the "true" musical drama (Dahlhaus, 2003, p. 73). Usually, as the characters might be experiencing a set of complex emotions, a particular aria would attempt to represent a specific aspect of those feelings (Hill, 2005, p. 390). Operas were in fact a formal representation of an emotional universe (Bianconi, 2008, p. 85).

### 2.2 Mining Emotions in Opera

The recent work of Shibingfeng (Shibingfeng, 2021; Fernicola et al., 2020) addresses the automatic iden-

tification of emotion in Italian opera. This approach is based on the assumption that an aria may transmit more than one emotion, and to address this problem, the task is defined in terms of identifying the emotions transmitted by each specific stanza of the aria poem: in opera seria most poems consist of just two stanzas. To achieve this, a corpus of 2,500 aria stanzas was annotated by two human annotators with the emotions they attribute to it. A number of state-of-the-art text representations and classification approaches are tested over the corpus. Best performance was obtained by using a character trigram based TF-IDF representation and a neural network with 2 hidden layers as classifier. This yielded an accuracy of 0.47 on the test set. An extension of the work to assign emotions at the aria level, using a convolutional neural network combined with character trigram based embeddings developed based on a corpus of Italian arias achieved an accuracy of 0.68.

The annotated corpus of arias, the AriEmozione1.0 corpus, has been made public (Garcea et al., 2020).

## 3 Relative Differences in Emotional Interpretation Contexts for Arias

The general idea is that, given that the libretto is an alternating sequence of spans of recitative followed by an aria, it would be useful to consider that the aria is intended to express the emotions felt by a particular character (the singer) as a result of the accumulated actions described in the preceding (span of) recitative.

This approach is made possible by the fact that libretti for opera seria are not single stretches of sequential text, but rather a sequence of small spans of text organised in a fixed structure of acts, scenes and contributions of individual singers at given points in time (Muñoz-Lago et al., 2020). The text of each of these small spans is itself broken down into lines of verse, though this feature does not influence the argument being put forward. The contributions by the singers are also annotated to show whether they are instances of recitative or of arias.

### 3.1 A Corpus of Machine-Readable Operas

For the purpose of this paper, we are working with XML representations of all the libretti written by Pietro Metastasio, the principal li-



let someone else decide over her heart and fate), but the preceding recitative outlines the actions that have triggered this response (her sister Selene has just told her that Enea leaves because he fears the hurt of seeing her accept the marriage proposal she has just received).

Table 3 shows a more complex and more convincing example of the case in question, taken from Metastasio’s *Artaserse*. The scene involves the trial of Arbace, who is being falsely accused of murdering the Persian King Serse. The assigned judge is Artabano, Arbace’s father, who is the one who actually killed Serse. Arbace knows that the real murderer is his father, but during the trial filial piety stops him not only from accusing his father, but also from defending himself, to the surprise of all. Artabano sentences his son to death for a murder that he himself has committed. At the end of the trial, Arbace pardons his father, kisses his hand, and sings the aria “Per quel paterno amplesso”. The text of this aria speaks about his father’s embrace and his own loyalty to the crown. The positive and even cheerful character of the poem does not reflect Arbace’s inner feelings, having accepted his own sacrifice for a crime committed by his father. This cannot be grasped without taking into account the preceding recitative.

### 3.3 Reading Libretti onto Meaningful Data Structures

Fortunately the XML encoding allows very easily to recover the recitatives that precede a given aria. The main proposal of this position paper is that any emotional analysis of the content of an aria from the point of view of the text of the libretto – given that a major point of interest of such an analysis for musicology would be to identify which emotions might be represented in the corresponding musical fragment – should consider not just the text of the aria itself but also the text of the recitative that separates that aria from the preceding one.

The code for parsing the XML file of a libretto builds a representation in Java. The resulting Java classes are designed to capture the structure of nested conceptual elements that constitutes the libretto. The class diagram for this structure is shown in Figure 1 and explained below:

- **Libretto** class to represent a libretto for a full opera, made up of instances of **Acto** (this represents the complete opera)
- **Act** class to represent an act, made up of instances of **Scena3** (these classes represent each of the acts in the opera)

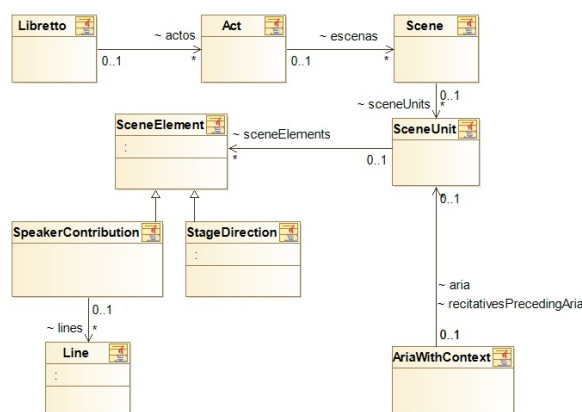


Figure 1: Class Diagram Representing the Nested Structure of Text Element in a Libretto.

- **Scene** class to represent a scene, made up of instances of **SceneUnit** (each act is broken down into scenes, which are spans of the opera which usually involve the same subset of the cast)
- **SceneUnit** class to represent a fragment of a scene, that corresponds to either a recitative or an aria; made up of instances of **SceneElement** (with a scene, parts of it may be recitative and parts of it may be arias)
- **SceneElement** mother class for elements in a scene: speaker contributions or stage directions
- **StageDirection** extends **SceneElement** class to represent a stage direction (the libretto includes stage directions that are not spoken or sung but which are placed within the corresponding scene)
- **SpeakerContribution** extends **SceneElement** class to represent a contribution to a scene by a given speaker, made up of separate lines represented as instances of **Line** (recitatives in particular, but sometimes also ensemble arias – duets, trios –, are usually a sequence of alternating contributions by different speakers; this class represents a set of lines contributed to the scene by a given speaker without interruptions from other speakers)
- **Line** class to represent a line of verse (represented as a **String**) which may have an associated stage direction (also represented as a **String**)
- **AriaWithContext** class to represent the association between a **SceneUnit** class that represents the aria is associated with a **List<SceneUnit>** that represents the recitatives that precede it in the sequence of the opera

A given libretto can now be parsed into a sequence of instances of **AriaWithContext** class data struc-

SCENA: SCENA XI  
[RECITATIVE]  
(STAGE-DIRECTION): ARBACE, con catene fra alcune guardie, e detti

ARBACE:  
980 Tanto in odio alla Persia  
981 dunque son io che di mia rea fortuna  
982 l'ingiustizie a mirar tutta s'aduna!  
983 Mio re.

ARTASERSE:  
983 Chiamami amico. Infin ch'io possa  
984 dubitar del tuo fallo, esser lo voglio.  
985 E perché si bel nome  
986 in un giudice è colpa, ad Artabano  
987 il giudizio è commesso.

ARBACE:  
987 Al padre!

ARTASERSE:  
987 A lui.

ARBACE:  
988 (Gelo d'error).

ARTABANO:  
988 Che pensi? Ammiri forse  
989 la mia costanza?

ARBACE:  
989 Inorridisco, o padre,  
990 nel mirarti in quel luogo. E ripensando  
991 quale io son, qual tu sei, come potesti  
992 farti giudice mio? Come conservi  
993 così intrepido il volto? E non ti senti  
994 l'anima lacerar?

ARTABANO:  
994 Quei moti interni,  
995 ch'io provo in me, tu ricercar non devi  
996 né quale intelligenza  
997 abbia col volto il cor. Qualunque io sia  
998 lo son per colpa tua. Se a' miei consigli  
999 tu davi orecchio e seguitar sapevi  
1000 l'orme d'un padre amante, in faccia a questi  
1001 giudice non sarei, reo non saresti.

ARTASERSE:  
1002 Misero genitor!

(...)

ARBACE:  
1005 (Quanto rigor!)

ARTABANO:  
1005 Dunque alle mie richieste  
1006 risponda il reo. Tu comparisci, Arbace,  
1007 di Serse l'uccisor. Ne sei convinto;  
1008 ecco le prove. Un temerario amore,  
1009 uno sdegno ribelle...

ARBACE:  
1009 Il ferro, il sangue,  
1010 il tempo, il luogo, il mio timor, la fuga  
1011 so che la colpa mia fanno evidente.  
1012 E pur vera non è, sono innocente.

ARTABANO:  
1013 Dimostralo se puoi; placa lo sdegno  
1014 dell'offesa Mandane.

ARBACE:  
1014 Ah se mi vuoi  
1015 costante nel soffrir, non assalirmi  
1016 in sì tenera parte. Al nome amato  
1017 barbaro genitor...

ARTABANO:  
1017 Taci, e non vedi  
1018 nella tua cieca intolleranza e stolta  
1019 dove sei, con chi parli e chi t'ascolta?

ARBACE:  
1020 Ma padre...

ARTABANO:  
1020 (Affetti, ah tollerate il freno!)

(...)

ARTABANO:  
1034 Principessa, è il tuo sdegno  
1035 sprone alla mia virtù. Resti alla Persia  
1036 nel rigor d'Artabano un grand'esempio  
1037 di giustizia e di fé non visto ancora.  
1038 Io condanno il mio figlio. Arbace mora.  
(INDIVIDUAL-STAGE-DIRECTION):  
(Sottoscrive il foglio)

(...)

ARTASERSE:  
1039 Sospendi amico  
1040 il decreto fatal.

ARTABANO:  
1040 Segnato è il foglio,  
1041 ho compito il dover.  
(INDIVIDUAL-STAGE-DIRECTION):  
(S'alza e dà il foglio ad Artaserse)

ARTASERSE:  
1041 Barbaro vanto!  
(INDIVIDUAL-STAGE-DIRECTION):  
(Scende dal trono e i grandi si levano da sedere)

SEMIRA:  
1042 Padre inumano!

(...)

ARTABANO:  
1046 Di giudice severo  
1047 adempite ho le parti. Ah si permetta  
1048 agli affetti di padre  
1049 uno sfogo o signor. Figlio perdona  
1050 alla barbara legge  
1051 d'un tiranno dover. Soffri, che poco  
1052 ti rimane a soffrir. Non ti spaventi  
1053 l'aspetto della pena; il mal peggiore  
1054 è de' mali il timor.

ARBACE:  
1054 Vacilla o padre  
1055 la sofferenza mia. Trovarmi esposto  
1056 in faccia al mondo intero  
1057 in sembianza di reo, veder recise  
1058 sul verdeggiar le mie speranze, estinti  
1059 su l'aurora i miei dì, vedermi in odio  
1060 alla Persia, all'amico, a lei che adoro,  
1061 saper che il padre mio...  
1062 Barbaro padre... (Ah, ch'io mi perdo!) Addio.  
(INDIVIDUAL-STAGE-DIRECTION):  
(In atto di partire, poi si ferma)

ARTABANO:  
1063 (Io gelo).

(...)

ARBACE:  
1063 O temerario Arbace,  
1064 dove trascorri? Ah genitor, perdono.  
1065 Eccomi a' piedi tuoi. Scusa i trasporti  
1066 d'un insano dolor. Tutto il mio sangue  
1067 si versi pur, non me ne lagno; e invece  
1068 di chiamarla tiranna,  
1069 io bacio quella man che mi condanna.

ARTABANO:  
1070 Basta, sorgi, purtropo  
1071 hai ragion di lagnarti;  
1072 ma sappi... (Oh dei!) Prendi un abbraccio e parti.

ARBACE:  
[ARIA]  
ARBACE:  
1073 Per quel paterno amplesso,  
1074 per questo estremo addio,  
1075 conservami te stesso,  
1076 placami l'idol mio,  
1077 difendimi il mio re.  
1078 Vado a morir beato,  
1079 se della Persia il fato  
1080 tutto si sfoga in me.  
(INDIVIDUAL-STAGE-DIRECTION):  
(Parte fra le guardie seguito da Megabise e partono i grandi)

Table 3: Example of an aria preceded by a recitative (*Artaserse*, Act II, Scene XI). The original XML has been rendered as structured text for readability. Some lines of the recitative not relevant to the point being made have been omitted to match space constraints.

Title	% Arias	% Recitative
<i>Didone abbandonata</i>	16.15	83.85
<i>Siroe</i>	16.38	83.62
<i>Catone in Utica</i>	15.74	84.26
<i>Ezio</i>	12.78	87.22
<i>Semiramide</i>	18.49	81.51
<i>Alessandro nell'Indie</i>	16.64	83.36
<i>Artaserse</i>	16.48	83.52
<i>Demetrio</i>	16.54	83.46
<i>Issipile</i>	16.68	83.32
<i>Adriano in Siria</i>	16.69	83.31
<i>Olimpiade</i>	16.39	83.61
<i>Demofonte</i>	15.21	84.79
<i>La clemenza di Tito</i>	15.98	84.02
<i>Achille in Sciro</i>	21.11	78.89
<i>Ciro riconosciuto</i>	13.99	86.01
<i>Temistocle</i>	14.97	85.03
<i>Zenobia</i>	13.75	86.25
<i>Ipermestra</i>	17.35	82.65
<i>Antigono</i>	18.34	81.66
<i>Attilio Regolo</i>	16.02	83.98
<i>Il re pastore</i>	16.49	83.51
<i>L'eroe cinese</i>	15.56	84.44
<i>Nitteti</i>	16.73	83.27
<i>Il trionfo di Clelia</i>	14.57	85.43
<i>Romolo ed Ersilia</i>	19.10	80.90
<i>Ruggiero</i>	12.47	87.53

Table 4: Proportion of arias to recitatives in Metastasio's libretti.

tures, which allows easy retrieval of specific instances of an aria together with the recitatives that precede it.

Over such data structures, the text of the associated recitatives can now be easily processed to identify any emotional connotations that might be relevant for the emotional labelling of the aria.

### 3.4 Quantitative Data from the Corpus

Metastasio has 26 librettos with a total of 681 arias, including alternative arias that he wrote for some librettos and also the choirs; all that the Italians call *forme chiuse*, different from the *sciolti* verses of the recitative. The proportion of verses is 16% arias and 84% recitatives, although the range of arias oscillates between 12.5% and 21.1% for arias. The relative percentages of aria and recitatives with respect to the full length of the text is shown for the various libretti by Metastasio in Table 4.

To illustrate the point from a quantitative point of view, Table 5 shows the difference in volume of text – measured in terms of number of lines – between each of the arias and the recitative that precedes it for Metastasio's *Artaserse*. This table shows the significant differences between arias in the same text, with

Recitative	Aria	Recitative	Aria
178	5		
33	8	103	7
96	6	36	8
31	7	66	6
29	8	38	8
7	6	56	8
71	8	11	12
25	8	196	7
33	7	13	8
3	6	3	6
134	8	49	12
66	12	12	10
18	10	52	10
16	9	83	12
44	10	84	8
37	8	48	8
3	8	50	9
95	8	8	9
29	8	222	8
9	7	30	8
51	6	24	12
33	9	18	6
5	8	6	9
169	8	0	4
8	9	61	10
55	7	5	7
6	8	67	8
101	6	6	8
22	8	37	10
6	8	6	6
0	3	198	16
115	8	163	6
73	8		
48	4	56.5	8.6
48.5	7.6		

Table 5: Relative differences between the average sizes of each aria and the preceding span of recitative – expressed in number of lines – for Metastasio's *Didone abbandonata* – left hand column – and *Artaserse* – right hand column.

some cases where there is a very significant amount of recitative to be analysed to inform the emotions expressed in the aria that follows.

## 4 DISCUSSION

The emotion that the aria is expressing is not the result of its text exclusively, but rather of the narrative developments in the preceding recitative. The text of the aria is possibly intended as linguistic elaboration on the emotions in question, but the music is surely intended to represent the emotion felt by the character at that point in the drama, which is not necessarily

clearly captured by the text of the aria. If it were, the whole point of opera as a genre would be put in question, as the dramatic recitatives leading to the aria, including all the dialogues between the characters and the development of the plot, would be dispensable.

The nature of opera libretti as documents subject to conventions on the need to indicate the overall structure of the drama – as a sequence of acts built of scenes – the specifics of verse sung by each performer – lines corresponding to a particular speaker – and even the type of contribution – either recitative or aria – allows this to be achieved with relative ease. The libretto of a particular opera can then be seen as semi-structured data, with these overarching annotations providing a complex structure that delivers spans of text at particular points, while providing with very specific details on their role in the context of the opera.

## 5 CONCLUSIONS

There is a fundamental difference between sentiment analysis of text as applied in other disciplines – such as news headlines or Twitter messages – and its potential application in musicology. Whereas for the analysis of news or items in a Twitter feed the text itself is the main and the only source of information, for the study of opera the text comes accompanied by an elaborate musical work which contributes at least as much as the text – and very possibly much more – to the emotions being expressed. When musicologists consider the emotions expressed in the text elements of an opera, it is not so much to obtain a single value that is the only source of information, but rather in search of additional information that may support their analyses of the emotion that the corresponding music is expressing.

The present paper argues that, in this endeavour, the text of the recitatives preceding an aria should be taken into consideration with special importance when trying to identify the emotions that (the music for) an aria should be considered to be trying to express.

This argument in no way intends to question the merit of application of sentiment analysis to the text of the arias themselves. Rather it proposes a slightly different task, possibly resorting to the same tools and techniques, but considering a slightly wider scope of text in their application to ensure that the best sources for emotional information are employed.

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