

# TV-AfD: An Imperative-Annotated Corpus from *The Big Bang Theory* and Wikipedia’s Articles for Deletion Discussions

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## Abstract

In this study, we created an imperative corpus with speech conversations from dialogues in *The Big Bang Theory* and with the written comments in Wikipedia’s Articles for Deletion discussions. For the TV show data, 59 episodes containing 25,076 statements are used. We manually annotated imperatives based on the annotation guideline adapted from Condoravdi and Lauer’s study (2012) and used the retrieved data to assess the performance of syntax-based classification rules. For the Wikipedia AfD comments data, we first developed and leveraged a syntax-based classifier to extract 10,624 statements that may be imperative, and we manually examined the statements and then identified true positives. With this corpus, we also examined the performance of the rule-based imperative detection tool. Our result shows different outcomes for speech (dialogue) and written data. The rule-based classification performs better in the written data in precision (0.80) compared to the speech data (0.44). Also, the rule-based classification has a low-performance overall for speech data with the precision of 0.44, recall of 0.41, and f-1 measure of 0.42. This finding implies the syntax-based model may need to be adjusted for a speech dataset because imperatives in oral communication have greater syntactic varieties and are highly context-dependent.

**Keywords:** Imperative, Corpus, Speech Resources, Text Classification

## 1. Introduction

Imperative sentences or clauses are those expressed to the addressee a speaker’s directive to follow, wishes or invitations of the future, or suggestions of action. Detecting imperatives in both oral and written communication helps to identify these speakers’ intentions and the extracted information can be then used to automatically display instructional information or generate answers to an inquiry. Personal digital assistant is one example that utilizes oral imperative. What a personal digital assistant mostly does is to provide information, send messages, make calls, schedule an appointment, open or close the applications, and activate specific functions in the device upon users’ verbal “request”. Nowadays, despite the fact that people rely on personal digital assistant more and more, they still have trouble detecting or processing imperatives when the users don’t use the expected forms, including cases where there is no verb at the beginning of the sentence or when the imperatives contains non-affixal negative markers like *not*, *n’t*, *never*, *neither*, *nobody*, *no*, *none*, *nor*, *nothing*, and *nowhere*. Personal digital assistants are still unable to detect imperatives like “No one wakes me up tomorrow morning.” or “I would prefer you not to play music.” when the users want to turn off the alarm clocks set for tomorrow or when the users want to pause the music playlist. Hence, in order to help machines recognize orders and requests from users better, we need to improve the current imperatives detection system. However, there are not many imperatives from speech conversations in current studies for machine-learning classifiers or rule-based classification to be trained to detect imperatives from

speeches. Therefore, one of the purposes of this study is to use a comprehensive annotation guideline adapted from Cleo Condoravdi and Sven Lauer’s study (2012), which particularly considers affixal negative markers, to build an imperatives corpus from conversations in the TV show, *The Big Bang Theory*.

On the other hand, as necessary as those in speeches, imperatives from written texts are crucial in the online environment. Sometimes, people interact with chatbots online to make inquiries and requests or try to find instructional information from online discussions and resources. However, noises in the user-generated texts in these applications also make it hard to detect imperatives. Therefore, we also provide an imperatives corpus from a Wikipedia discussion forum that can serve as a resource to study written imperatives and help improve its detection. Imperatives in this part of the corpus are extracted using a predefined syntax rule first and then manually annotated based on the aforementioned guideline. We did not further categorize the speaker’s intentions of imperatives and whether it contains affixal negative markers like we did for the speech data. This manual annotation step, together with a process that applies the syntax rule to the annotated data from the TV show, serve to test the performance of the rule classification. Our final imperative corpus, namely, TV-AfD, includes annotated data from both the TV show and Wikipedia Article for Deletion discussions and is available for download online<sup>1</sup>.

The remaining sections of the paper are organized as follows. In section 2, we review works on imperatives including the definition and functions of an imperative, the existing corpora that have imperatives annotated, and the

<sup>1</sup> [https://github.com/yiminxisu/TV-AfD\\_Imperative\\_Corpus](https://github.com/yiminxisu/TV-AfD_Imperative_Corpus)

approaches to computationally detect imperatives. Section 3 introduces the two data sources used in this paper, the annotation guideline and the rule classification methods we utilized to find annotated imperatives, and the data annotation process. An analysis of our rule classification performance and annotated data is given in section 4 as a use case of the corpus. The paper concludes with discussion and conclusion in sections 5 and 6 respectively.

## 2. Literature Review

### 2.1 Imperatives and functions

Illocutionary act is one of the basic units of human linguistic communication, which could be classified into five categories: representatives, directives, commissives, expressive, and declarations (Searle, 1976). Imperatives are said to be a subcategory of directives by Ervin-Tripp (1976) under a classification made on formal diversity and language variances.

According to Condoravdi and Lauer (2012), an imperative utterance can function more than merely as directives. They found that an imperative sentence can have the illocutionary force of making wishes, permissions, invitations and disinterested advice apart from issuing directives. It serves three functions: to express content related to the hearer's future actions, to convey the speaker's wish for the content to happen, and to incentivize the hearer to take action for the content.

### 2.2 Imperatives classification

There have been some studies that are interested in developing computational techniques to automatically detect imperatives. Kwong and Yorke-Smith (2009) explored how to detect imperative questions and interrogative questions from the Enron email corpus<sup>2</sup> and Cspace corpus (Minkov et al., 2005). In their approach, the authors used the S&M approach proposed by Shrestha and McKeown (2004) and algorithms deploying regular expressions to detect questions including imperative questions.

Mao et al. (2014) developed a rule-based method to extract imperatives from Wikipedia's discussions. The researchers applied two rules. The first rule is that in the dependency structure, when the verb is in its base form and at the root and it has no subject child, the sentence is imperative. The second rule is that the sentence has a modal verb with the subject being a personal pronoun or noun. The evaluation of this method based on the human-annotated Wikipedia discussion data obtained precision of 0.84, recall of 0.73 and F-measure of 0.79.

Gupta et al. (2018) extracted imperative speech trying to help identify procedures in technical documents. They used a pre-trained rule-based parser Slot-grammar with domain-specific words added to the features to detect imperatives. The result was validated with a publicly released human-annotated dataset. Both precision and recall were 0.82.

### 2.3 Existing imperative corpus from the written discussion

There are not many publicly available corpora created specifically for imperative sentences on a large scale. However, we are able to find some corpus that is intended

to extract sentences of similar functions or that have imperative sentences as a small subset.

Parakeet Lab's Email Data Set<sup>3</sup> which was originally built from Enron Email Corpus<sup>2</sup> has data labeled for intention. The dataset has in total 5,204 labeled sentences and 1,908 of them are positive cases. The targeted *intention* in the sentence includes the *request* intention and the *propose* intention (Cohen, Carvalho and Mitchell, 2004), which is similar to some of the functions of imperative sentences. The text data was collected from email communications and contains both formal (in emails sent from service provider to customers) and informal (between colleagues) language instances.

The English Web Treebank (Ann Bies et al. 2012) contains data from English blogs, news, emails, reviews, and question-answer pairs, covering both formal and informal texts. All sentences in this treebank are POS tagged. Imperative sentences are labeled using a "Mood-Imp" tag on the verb in sentences. There are in total of 944 imperative sentences out of 12,543 sentences from the dataset.

## 3. The Development of TV-AfD

Our TV-AfD corpus has data extracted from two sources. One is from the TV show, *The Big Bang Theory* (the original dialogue data mainly from the online source<sup>4</sup>), and the other is from Wikipedia Articles for Deletion (AfD). We propose two methods of extracting imperatives. The first method resorts to manual annotation based on annotation guidelines built upon the pragmatic perspectives. The other method uses a predefined syntax rule implemented in Python to conduct automatic detection of imperatives. For data extracted from the TV show, we use solely human annotation in method 1, while for Wikipedia AfD data, we used the second method first for a preliminary classification and then performed human annotation on the positive results to leave out false-positive sentences and test rule performance. The following sections give a detailed analysis of our data sources, the two classification methods and their implementation.

### 3.1 The Annotation Guidelines

Our annotation guideline is adapted from the Condoravdi and Lauer's (2012) conceptualization of the imperative use. As shown below, there are four types of imperatives considered in the annotation, each with two sub-groups (affixal negative markers included or affixal negative markers-free, for which we used the name of negation-included and negation-free respectively).

#### Group 1: Directives

One of the speaker's intentions of imperatives, namely directives, is to get the addressee to do something or stop them from doing something. These directives could be orders, warnings, requests, advice, and pleas.

Here are the examples:

#### Negation-free

(No non-affixal negative markers are included):

- (a) Warriors, unsheathe your weapons! (command)
- (b) You'd better be quiet. (warning)
- (c) Give me the book, please. (request)

<sup>2</sup> <https://www.cs.cmu.edu/~enron/>

<sup>3</sup> <https://github.com/ParakweetLabs/EmailIntentDataSet/wiki>

<sup>4</sup> <http://www.tvsubtitles.net/tvshow-154-2.html>

(d) Please, I need the money! (plea)

*Negation-included*

(Non-affixal negative markers are included):

(a) Don't do that. (command)

(b) Don't try to talk to him behind my back. (warning)

(c) Don't panic when we need you. (request)

(d) Please, don't say anything bad about me to her. (plea)

#### Group 2: Wish-type uses

The speaker's intention for this type is to express his or her own wishes. These wishes could be well-wishes, ill-wishes/curses and even addressee-less (the addressee is absent) or non-addressee (there is no addressee) wish.

Here are some examples:

*Negation-free*

(a) Get well soon! (wish)

(b) Go to hell! (curse)

(c) Please, be sunny! (addressee-less wish)

(d) [on the way to a blind date] Be Asian! (non-addressee wish)

*Negation-included*

(a) Don't end up like me being in prison! (well-wish)

(b) I wish you have no money! (curse)

(c) Please, don't snow! (addressee-less wish)

(d) [on the way to a blind date] Don't be a fat guy! (non-addressee wish)

#### Group 3: Permissions/Invitations/Suggestion

The speaker's intention of this type is to express something that the speaker does not mind happening but could be the addressee's potential desire or something that could be beneficial to the addressee. These could be permissions, concessions, offers, and invitations.

Here are some examples:

*Negation-free*

(a) Okay, go out and play. (permission/concession)

(b) Have a cookie if you like. (offer)

(c) Come to dinner tonight if you like. (invitation)

(d) You should exercise more. (suggestion)

*Negation-included*

(a) Okay, let's all not be Spiderman. (in a pre-costume party meeting) (permission/concession)

(b) Why don't you two have some cookies? (offer)

(c) Why don't you two have dinner at my place tonight? (invitation)

(d) Why don't you buy a better printer? (suggestion)

#### Group 4: Disinterested advice

The speaker's intention of this type is to fulfill the expectations he or she is given in the previous messages they received. It could be an answer to certain questions that may require some information. For instance, a person asked, "How to get to the train station?", and the speaker gave disinterested advice: "Turn right". In this case, the speaker does not care if the addressee would really do as told; and if the addressee chooses to turn right, it would be because that is the addressee's prior goal (to get to where he or she wants to go).

Here are some examples:

*Negation-free*

[Strangers in the streets]

A: Excuse me, how do I get to Syracuse University?

B: Take the bus that leaves in 10 minutes. [points to bus stop] [Disinterested advice]

*Negation-included*

A: How to be attractive?

B: Don't be so nerdy. [Disinterested advice]

### **3.2 Imperative-Annotated TV Show Data**

Quaglio (2009) states, "scripted language has been studied as a representation of the face-to-face conversation" (p. 11). In his book, *Television Dialogue: The Sitcom Friends Vs. Natural Conversation*, he mentions Rey (2001) used the show *Star Trek* (American TV show) for a diachronic and synchronic study of language and gender because he thinks scripted language can be an effective indicator of how natural conversation is perceived. Quaglio (2009) also points out the following:

There seems to be an agreement among scholars that, despite the natural restrictions imposed by the televised medium, television dialogue should sound natural; otherwise, viewer identification with the show characters can be negatively impacted, thus, potentially, affecting the success of the show (p. 13).

Therefore, we decided to use dialogues in the TV show to build a speech imperatives corpus.

The TV show we chose for the speech imperatives corpus is *The Big Bang Theory*. It is an American television sitcom created by Chuck Lorre and Bill Prady. According to its Wikipedia page, seven seasons of the show have ranked within the top ten of the final television season ratings; it ultimately became no. 1 in its eleventh season. According to Nielsen Ratings, there are 18.63 million viewers for the show throughout season 11. *The Big Bang Theory* is undoubtedly popular, and it is also one of the most iconic TV sitcoms in the United States. In this study, we used the dialogues in 59 seasons including the entire season 2 (23 episodes), season 3 (23 episodes) and episode 1 to 13 in season 4. In total, 25,076 statements are used for our corpus. One of the co-first authors and the third author developed an annotation guideline for identifying imperatives in the conversational data. The co-first author then recruited and trained three people. The four of them annotated the imperatives in the TV show data. Among the four annotators, one is a Master's student in Computational Linguistics, one is a native English speaker, and two have taken linguistics courses and majored in English.

During the training process, the co-first author first explained to the other three coders the annotation guideline and assigned each a small training dataset (one episode of dialogues with around 400 statements). Each of them then annotated this dataset independently. The three coders' annotation results were compared with that of the co-first author. The Cohen's Kappa values between any pair (i.e., between the co-first author and a coder) are shown in the table 1. These values were considered to be in excellent agreement (Viera & Garrett, 2005). The four coders then annotated the rest TV show data, each analyzing a subset of the data. In the end, we identified 2,203 imperative statements out of the 25,076 statements.



3.1. Secondly, we examine and compare the applicability of our rule-based classifier (detailed in section 3.3) in identifying imperatives from the two contexts (both the TV show data and the Wikipedia AfD). As we have already obtained a manually annotated TV show dataset, we applied the rule classifier to the dataset and compared the classification result against manual annotation to test the rule’s performance. For AfD data, this analysis draws from a comparison between rule classification result and a follow-up manual annotation, both in the process of annotating the data and detailed in section 3.3.

#### 4.1 Types of Imperatives in the TV Show Data

The annotated results of the TV show data are shown below in the table 2. In all the statements, imperatives take up about 8.8% (2,203 statements). In the imperative cases, “nf” cases are about 82% (1,804 statements) and “ni” cases are about 18% (399 statements). Also, imperatives belonging to group 1 to 4 take about 86% (1,889 statements), 3% (73 statements), 8.8% (194 statements), and 2% (47 statements) of total imperatives respectively.

Types of Statements	Amount
Imperative	2,203
Non-imperative	22,873
“nf” imperatives	1,804
“ni” imperatives	399
Group 1: Directives	1,889
Group 2: Wish-type uses	73
Group 3: Permission/Invitation/ Suggestion	194
Group 4: Disinterested Advice	47

Table 2: Summary statistics of imperative annotation from the TV show data

#### 4.2 Rule-based Classification of Imperatives in TV-AfD

We applied the rule-based classifier which was used in the AfD imperative annotation process to the TV show data. With our manual annotation as the “gold standard”, the classifier obtained 0.90 of accuracy, 0.45 of precision (1,120 false positive statements), 0.41 of recall (1,300 false negative statements) and 0.43 of the f-1 score.

Because we do not have the “gold standard” for the whole AfD discussion dataset, we were not able to measure the performance of the classifier with this dataset. However, out of the 10,624 positively classified sentences from the rule application, our manual annotation obtained 2,122 false positives, which means that the precision of the classifier was 0.80.

The comparison of these results from the two datasets suggest that people use different strategies to offer imperatives in the two communication contexts. More specifically, if a sentence that follows the rule structure (e.g., start a sentence with a verb in base form) is used in the text-based communication, they are likely to be imperatives (hence, the relatively high precision in AfD discussion data). However, this is not the case in face-to-face communications (i.e., the low precision). In addition, while we do not have the full picture of the imperative use

situation in online discussions, people use strategies that do not follow the specified language rules when offering imperatives (i.e., the low recall) in speech context. To further compare the imperative use in the two contexts, we conducted an error analysis as follows.

##### 4.2.1 TV Show

**False-positive** Out of the 1,120 false-positive statements from the TV show data, around 60% percent is caused by the casual speech in oral conversation. The speaker would drop first-person singular pronoun or only use verbs to conveniently convey their ideas. Examples include “thank you”, “see you”, and “guess what”. Consequently, these simplified statements then match the rule criteria and wrongly classified as imperatives. About 30% are statements where the sentence matches the syntactic structure of imperative sentences but do not serve functions of imperative sentences from a pragmatic perspective. For example, sentences “look, let me just say my story all the way through” and “bite me” are used to get the addressee’s attention and express feelings respectively. As a result, even though they are classified as imperatives, they do not serve imperative functions. Around 5% of false-positive errors are questions starting with “Do you/we” or “Have you/we” structure that ask the hearer for opinion or information, rather than issuing a command, giving an invitation, suggestion, advice or wish as an imperative would do. Example sentences include “Howard, have you seen my girdle” asking for information and “Sheldon, do you want to sleep here tonight” asking for an opinion. The “Do” at the beginning of the sentence makes the rule to falsely believe that this is part of an imperative structure.

**False-negative** Out of the 1,300 false-negative statements from the TV show data, around 80% are caused by some limitations of the rule. The rule is not able to extract context information and also not flexible enough to find sentences that do not match the syntactic structure but still serve pragmatic functions of imperative. Example statements are “Okay have fun”, “Now, Sheldon”, “Chocolate” and “Leonard, I said not now”. While all of these sentences do not seem to match a general grammatical structure of imperative sentences, they serve the pragmatic functions of inviting and making a wish or command under the context. The POS tagger and dependency parser used to implement the rule cause the remaining 20% errors. Examples are “Don’t answer” and “Wait, I only initiated it” where the rule is not able to rightly parse the negation “n’t” and the one-word clause “wait”. Thus, those statements are wrongly classified as non-imperatives.

##### 4.2.2 Wikipedia AfD

**False-positive** Out of the 2,122 false-positive sentences from Wikipedia AfD data, more than 70% percent are sentences where the writer dropped the first-person singular pronoun or subject at the beginning of the sentence, thus resulting in sentences that match the rule. Some example sentences are “(I) Thank you” and “(I think this should be) delete(d)” with words in parenthesis dropped. Such sentences can appear with many verbs to indicate an action made or wished to make by the speaker, and the usage is often context dependent. Around 20% of the sentences are caused by incorrect POS tagging and parsing. This issue is related to the performance of the parser used in the rule and preprocessing of the data before the rule is

applied. One example sentence is “*Not even close*” where the adjective “*close*” is parsed as a verb. Around 5% of the false positive sentences are questions starting with “*Do you/we*” or “*Have you/we*” structures as analyzed in false-positive sentences from the TV show data. Only around 2% of the sentences are caused by pragmatic reasons where a sentence matches the syntactic structure of imperatives but pragmatically does not serve an imperative function. One example sentence is “*Let alone its own article*”.

## 5 Discussion

Since our annotation guideline is pragmatic-oriented, the annotated imperatives data from *The Big Bang Theory* shows more varieties of imperatives. In comparison, our predefined rule for classification is relatively limited. The rule’s overall performance for the speech data is low in precision, recall and f-1 score. Also, although the rule-classification performs better in text data from the Wikipedia AfD discussion forum in precision, there are still some errors worth discussing. We see that data from both sources have similar causes of false-positive errors with rule classification, 60% of the false-positive from the TV show data and 70% of the false-positive from the Wikipedia discussion are both resulted by the dropping of first-person singular pronoun or other possible pronouns and subjects at the beginning of the sentence (e.g. “*See you*”). This indicates that the rule might be too general in some cases when it simply tries to catch sentences with a base form of a verb at the beginning of the sentence. However, we also notice that these phrases from the speech data including “*See you*”, “*Guess what*”, and “*Thank you*” are commonly used phrases. It is possible for these errors to be largely avoided if the rule excludes these phrases from getting classified as positive. Besides, in both data sources, 5% of false-positive errors are caused by questions starting with “*Do you/we*” or “*Have you/we*”, which shows that this type of error might need specific processing steps. Intriguingly, while only 2% of false-positives in the text data is caused by the pragmatic reason, 30% of false-positive errors in the speech data are caused by the same reason. This may indicate that there are much more statements in the speech data that fit in the general syntactic forms of imperatives but not serve the functions of imperatives. Also, we found that POS tagging and parsing have their limitations, in that in some cases they fail to parse “*n’t*” or incorrectly tag *verbs* as *adverbs*. It leads to 20% of false positives in the text data and 20% of false negatives in the speech data. Other than that, we found the rules in the rule-classification we design are not flexible enough for speech data. There are 80% of false negatives resulted from the rules being too limited and not representing how people construct imperatives in face-to-face communication beyond adhering to the general syntactic structures. That said, imperative detection in speech data require more flexible rules and to account for commonly used sentence patterns (e.g. “*Would you like to join me for Chinese food*” or “*Could you get that*”).

## 6 Conclusion

In this paper, we used data from the TV show, *The Big Bang Theory* for speech data and Wikipedia Articles for

Deletion comments for written text data to build an imperative corpus. We used an annotation guideline based on Condoravdi and Lauer’s study (2012) and a predefined classification rule based on the general syntactic forms of imperatives to classify retrieved data.

We then used the corpus to assess the performance of the predefined rule. The assessment shows different performances for speech and text data. The low performance of the rule on speech data may also imply the flaws, limitations and inflexibility associated the context-free feature of the rule-based model. The differences shown in the error analysis of the rule-based classification for both datasets also reveal some linguistic differences between written and face-to-face communication. Additionally, this use case showcases the value of the corpus in our study, which provides a labeled imperatives dataset to develop, test, and improve not just rule-based classification models, but also supervised machine learning models in future studies. Another factor worth future analysis is that our classification methods may work differently with auto transcribed text, as there can be transcription errors of text and sentence segmentation and other factors that can complicate the classification process.

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