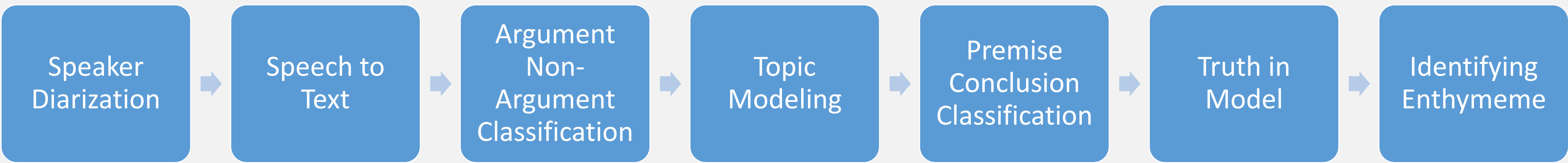


Detect and Ease Quarrel Like Situations

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Speaker Diarization

- Input to this application will be conversations in voice format.
- These conversations will be in the form of continuous speeches without any clue to the computer which sentence is spoken by which speaker.
- To disambiguate this conversation according to the speakers, that is to identify when each speaker is speaking, a tool called speaker diarization is used.
- This tool will analyze the speech and using K-means clustering, it will divide the speech into different parts indicating the time when each speaker is starting the conversation and when each speaker is ending the conversation.
- I have used PyAudioAnalysis tool by tyiannak for speaker diarization.

Speech to Text

- To analyze the information in voice format, it needs to be converted to text format.
- IBM, Google provide services that can convert this voice format to text format.
- Output to next step will be in the form of a list of dialogs and a list of corresponding speakers.
- Dialogs will be separated at each full stops.

Argument Non-Argument Classification

- Classification of dialogs into arguments or non-arguments is required since only those dialogs are required which contribute to argumentation
- Maximum Entropy Classifier is used for this classification task since it also takes into account previously classified dialogs.
- Features used are shown below.

Feature	Description
Unigrams	Each word in sentence.
Bigrams	Every consecutive words in sentence.
Trigrams	Every three consecutive words in sentence.
Adverbs	Detected with Part Of Speech (POS) Tagger.
Verbs	Detected with a POS tagger. Only the main verbs (excluding “to be”, “to do” and “to have”) are considered.
Modal Auxiliary	Existence of a modal auxiliary detected using a POS tagger.
Text Statistics	Sentence length, average word length and number of punctuation marks.
Punctuation	The sequence of punctuation marks present in the sentence (e.g. “:.”). When a punctuation mark occurs more than once in a row, it is considered the same pattern (e.g. two or more successive commas both result in “,+”).
Word Couples	All possible combinations of two words in the sentence are considered.

Topic Modeling

- Topic Modeling is used to find out the topics used in the current sentence or group of sentences.
- Topic modeling provides output in the form of proportions in which current sentence is divided into topics.
- A vocabulary is assigned to each topic when the model is fitted with large document corpus.
- Latent Dirichlet Allocation is used to perform topic modeling.
- Cosine similarity is then calculated between output of topic models of sentences to find their similarity score.

Premise Conclusion Classification

- To further find meaning of ongoing conversation, dialogs are classified into premises and conclusion.
- This classification will help us in knowing purpose of each sentence and will help in detecting quarrel like situations and in solving them.

Feature	Description
Absolute Location	Position of sentence in conversation; 7 segments.
Sentence Length	A binary feature indicating whether sentence is longer than 12 words or not.
Type of Main Verb	Tense of verb of main clause of sentence.
Rhetorical Patterns	Type of rhetorical pattern occurring on current sentence (support, against, or none).
Information 1st classifier	Whether this sentence is classified as argument or not using classifier discussed above.
History	Type of rhetorical patterns on previous and next sentence.

Truth in Model

- This method is used to identify whether conversation is quarrel like or not.
- All the dialogs are converted in form of First Order Logic through an intermediate representation called DRS(Discourse Representation Structure).
- Using NLTK implementation of model building, model comprising of all these sentences is prepared.
- If we are not successful in building model, quarrel like situation exists.

Identifying Enthymeme

- To find out hidden premises (enthymeme), NLTK implementation of theorem proving is used.
- Using classified premises and conclusion, their first order logic formats are prepared and conclusions are proved using premises. If unsuccessful, some information is missing which is identified.
- Same task is done with interpersonal dialogs after identifying which speaker is supporting or opposing which speaker using truth in model.