Mini Project Final Presentation
on
"TransSummarize: Leveraging NLP for Transcription and Summarization"

Hari Om (Reg. No. 202000004)
Sushma Oinam (Reg. No. 202000048)
Aryan Raj Pradhan(Reg. No. 202000012)

Under the guidance of:

Dr. Saumya Das
Department Of Information Technology, Assistant Professor

**DEPARTMENT OF INFORMATION TECHNOLOGY
SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY
(A constituent college of Sikkim Manipal University)
MAJITAR, RANGPO, EAST SIKKIM – 737136**

CONTENTS

ABSTRACT

- Speech recognition and Text summarization are popular areas in Natural Language Processing.

- The project "TransSummarize" aims to combine speech recognition and text summarization in one whole.

- In a small scenario like a seminar where only one person will speak, this feature will be helpful to provide summary of conversation into a document without losing vital information.

INTRODUCTION

- Natural Language Processing (NLP) is a field of study under Artificial Intelligence and Linguistics, devoted to make computers comprehend and interpret human language.

- Speech recognition refers to the capacity of a computer system to recognize and transcribe spoken language into written text, while text summarization will condense lengthy texts into summaries without losing vital information.

- This project aims to reduce the time and effort of manual documentation. Sometimes, the main points from a communication in the same language can be overlooked due to a person's accent.

LITERATURE SURVEY

Sl. No.	Author(s)	Paper and Publication Details	Findings	Relevance to the project
1	Shaikh Naziya S, R.R.Deshmukh	Speech Recognition System - A Review IOSR Journal of Computer Engineering(IOSR-JCE), Volume 18 (July- Aug, 2016) [1]	• Techniques in Speech Recognition Systems(SRS) • Various SRS modeling techniques are listed. • The different models have their pros and cons. .	• Vocabulary of HMM is very high - can be used for large amounts of data for speech recognition. • Machine learning techniques for speech recognition.
2	Nenkova A., & McKeown, K.	A survey of text summarization techniques Mining text data, 43-76.(2012) [2]	• Topic Representation extracts topics discussed in the input document. • Indicator representation scores the importance of each sentence which will come in the summary.	• Provides ideas about how text summarization works.

3.	Kågebäck, M., Mogren, O., Tahmasebi, N., & Dubhashi, D. .	Extractive summarization using continuous vector space models Proceedings of the 2nd Workshop on Continuous Vector Space Models and their Compositionality (CVSC) (pp. 31-39). (2014, April)	• evaluate different compositions for sentence representation on a standard dataset using the ROUGE evaluation measures.	• the effects of using phrase embeddings for summarization, and showed that these can significantly improve the performance of the state-of-the-art summarization method
4.	Gupta, S., & Gupta, S. K.	Abstractive summarization: An overview of the state of the art. Expert Systems with Applications, 121, 49-65. (2019).	• Its approaches are broadly divided into structure based and semantic based. • sentence compression, concept fusion, calculation of path scores and summary generation are few common parts of an abstractive summarization system	• abstractive summarization systems consist of 3 steps namely pre-processing, inferencing and Natural Language Generation.

PROBLEM DEFINITION

Currently, there are many speech-to-text tools available, but most of them simply transcribe the speech into text without providing any summary or analysis. This can be time-consuming and inefficient, as the user has to manually read through the entire text to understand the main points.
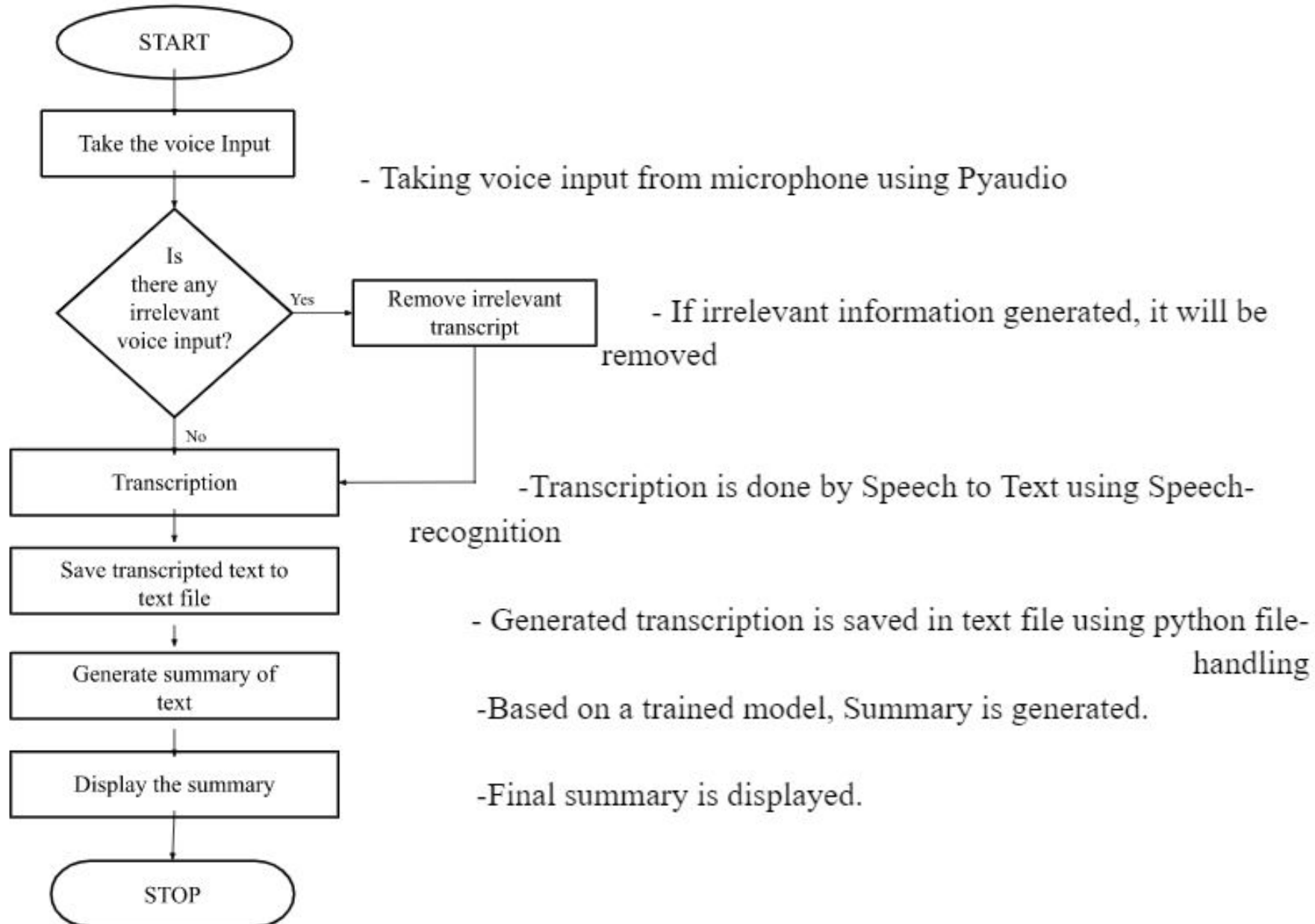
SOLUTION STRATEGY

Figure 1: Flowchart

START

Take the voice Input

- Taking voice input from microphone using Pyaudio

Is there any irrelevant voice input? — Yes → Remove irrelevant transcript

- If irrelevant information generated, it will be removed

No

Transcription

-Transcription is done by Speech to Text using Speech-recognition

Save transcripted text to text file

- Generated transcription is saved in text file using python file-handling

Generate summary of text

-Based on a trained model, Summary is generated.

Display the summary

-Final summary is displayed.
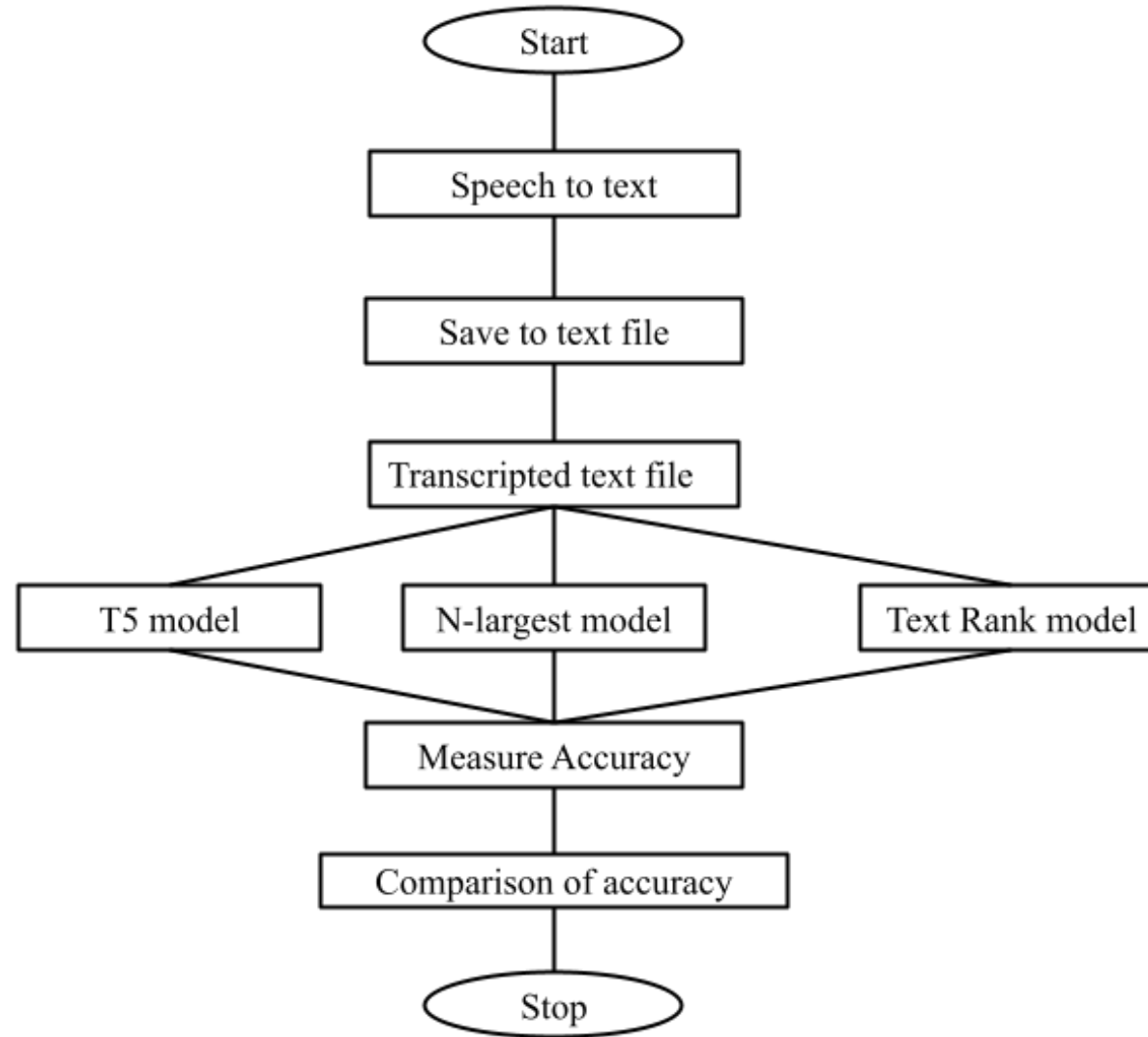
STOP

WORKFLOW DIAGRAM

Figure 2:Workflow Diagram

ALGORITHMS

- **Extractive Text Summarization**

- Extracts original sentences from the corpus directly if they are deemed important or ranked so. i.e subset of the corpus.
  - Text Rank
  - It prefers pages with a higher number of pages hitting it.
  - Originally "TextRank" algorithm used the percentage of words appearing among two sentences as the weights of an edge between them.
  - The algorithm then creates a graph with sentences as the nodes and overlapped words as the links.
  - Nlargest
  - nlargest is a function that finds n number of elements that is the largest or have the largest valve for a given key.
  - it can be used to find the rank of sentences in the corpus for extractive text summarization.

- **Abstractive text summary**

T5-Model (Text-To-Text Transfer Transformer)

- The Text-To-Text Transfer Transformer (T5) is a natural language processing model that utilizes the Transformer architecture. This pre-trained language model is capable of being fine-tuned for various NLP tasks like text classification, question answering, and summarization.

- T5 works by encoding the input text into a vector representation of a fixed length and then decoding that representation into the desired output text. To attend to relevant parts of the input and output sequences, the model uses attention mechanisms within a sequence-to-sequence architecture.

Evaluation metrics

- ROUGE(Recall-Oriented Understudy for Gisting Evaluation) :
  - Based on the idea that a good summary should include the important content of the original text.
  - Rouge-N -> N-gram
  - Rouge-L -> Longest common subsequent (LCS): the longest sequence of words that not necessarily consecutive, but still in order.

- BLEU(Bilingual Evaluation Understudy):
  - Calculates the similarity between the machine-translated text and the reference translations using a modified form of n-gram precision, where n-grams are sequences of n contiguous words.
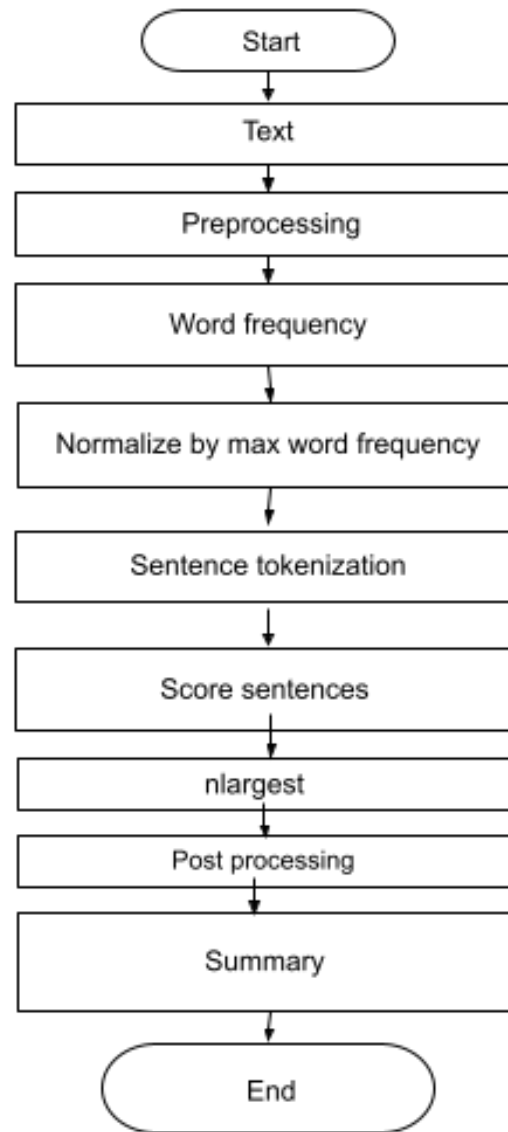 - Brevity Penalty (BP)
  - BLEU-N -> n-grams
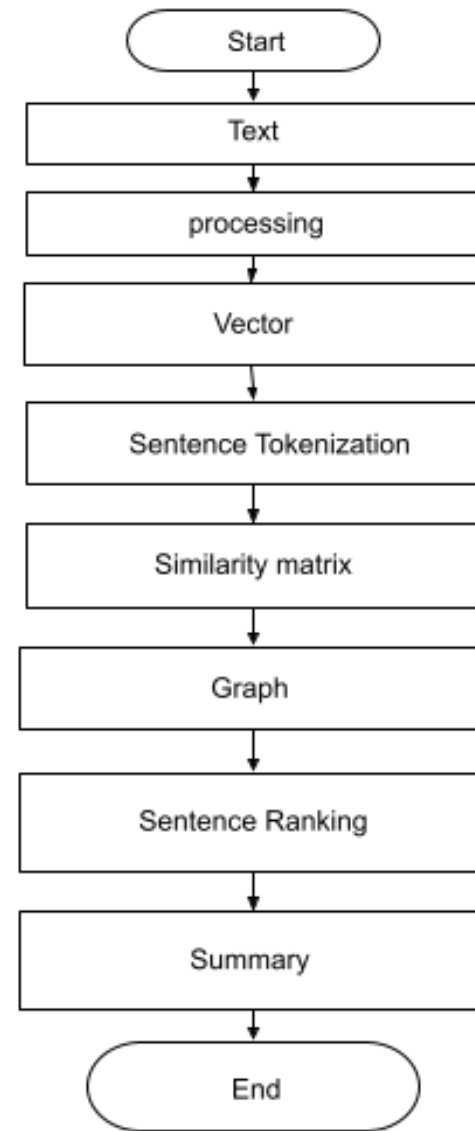 - BLEU = BP * BLEU

Fig 3: Flowchart for nlargest model

Fig 4: Flowchart for TextRank model
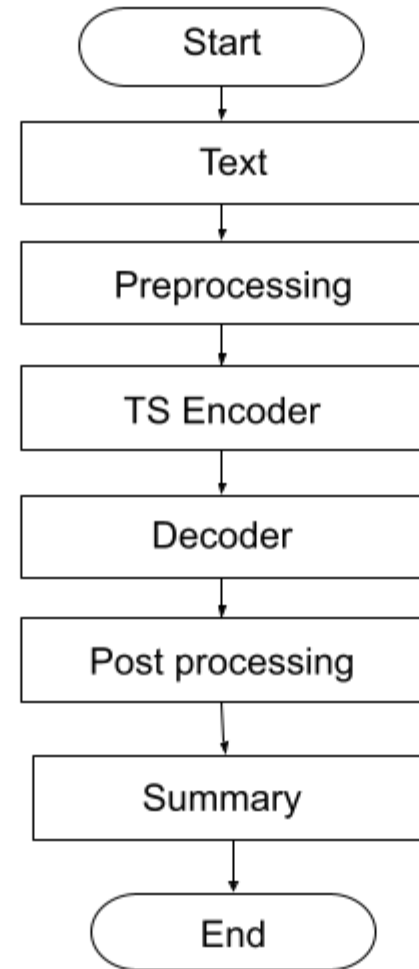
Fig 5: Flowchart for T5 model

(CNN) -- The National Football League has indefinitely suspended Atlanta Falcons quarterback Michael Vick without pay, officials with the league said Friday. NFL star Michael Vick is set to appear in court Monday. A judge will have the final say on a plea deal. Earlier, Vick admitted to participating in a dogfighting ring as part of a plea agreement with federal prosecutors in Virginia. "Your admitted conduct was not only illegal, but also cruel and reprehensible. Your team, the NFL, and NFL fans have all been hurt by your actions," NFL Commissioner Roger Goodell said in a letter to Vick. Goodell said he would review the status of the suspension after the legal proceedings are over. In papers filed Friday with a federal court in Virginia, Vick also admitted that he and two co-conspirators killed dogs that did not fight well. Falcons owner Arthur Blank said Vick's admissions describe actions that are "incomprehensible and unacceptable." The suspension makes "a strong statement that conduct which tarnishes the good reputation of the NFL will not be tolerated," he said in a statement. Watch what led to Vick's suspension » . Goodell said the Falcons could "assert any claims or remedies" to recover $22 million of Vick's signing bonus from the 10-year, $130 million contract he signed in 2004, according to The Associated Press. Vick said he would plead guilty to one count of "Conspiracy to Travel in Interstate Commerce in Aid of Unlawful Activities and to Sponsor a Dog in an Animal Fighting Venture" in a plea agreement filed at U.S. District Court in Richmond, Virginia. The charge is punishable by up to five years in prison, a $250,000 fine, "full restitution, a special assessment and 3 years of supervised release," the plea deal said. Federal prosecutors agreed to ask for the low end of the sentencing guidelines. "The defendant will plead guilty because the defendant is in fact guilty of the charged offense," the plea agreement said. In an additional summary of facts, signed by Vick and filed with the agreement, Vick admitted buying pit bulls and the property used for training and fighting the dogs, but the statement said he did not bet on the fights or receive any of the money won. "Most of the 'Bad Newz Kennels' operations and gambling monies were provided by Vick," the official summary of facts said. Gambling wins were generally split among co-conspirators Tony Taylor, Quanis Phillips and sometimes Purnell Peace, it continued. "Vick did not gamble by placing side bets on any of the fights. Vick did not receive any of the proceeds from the purses that were won by 'Bad Newz Kennels.' " Vick also agreed that "collective efforts" by him and two others caused the deaths of at least six dogs. Around April, Vick, Peace and Phillips tested some dogs in fighting sessions at Vick's property in Virginia, the statement said. "Peace, Phillips and Vick agreed to the killing of approximately 6-8 dogs that did not perform well in 'testing' sessions at 1915 Moonlight Road and all of those dogs were killed by various methods, including hanging and drowning. "Vick agrees and stipulates that these dogs all died as a result of the collective efforts of Peace, Phillips and Vick," the summary said. Peace, 35, of Virginia Beach, Virginia; Phillips, 28, of Atlanta, Georgia; and Taylor, 34, of Hampton, Virginia, already have accepted agreements to plead guilty in exchange for reduced sentences. Vick, 27, is scheduled to appear Monday in court, where he is expected to plead guilty before a judge. See a timeline of the case against Vick » . The judge in the case will have the final say over the plea agreement. The federal case against Vick focused on the interstate conspiracy, but Vick's admission that he was involved in the killing of dogs could lead to local charges, according to CNN legal analyst Jeffrey Toobin. "It sometimes happens -- not often -- that the state will follow a federal prosecution by charging its own crimes for exactly the same behavior," Toobin said Friday. "The risk for Vick is, if he makes admissions in his federal guilty plea, the state of Virginia could say, 'Hey, look, you admitted violating Virginia state law as well. We're going to introduce that against you and charge you in our court.' " In the plea deal, Vick agreed to cooperate with investigators and provide all information he may have on any criminal activity and to testify if necessary. Vick also agreed to turn over any documents he has and to submit to polygraph tests. Vick agreed to "make restitution for the full amount of the costs associated" with the dogs that are being held by the government. "Such costs may include, but are not limited to, all costs associated with the care of the dogs involved in that case, including if necessary, the long-term care and/or the humane euthanasia of some or all of those animals." Prosecutors, with the support of animal rights activists, have asked for permission to euthanize the dogs. But the dogs could serve as important evidence in the cases against Vick and his admitted co-conspirators. Judge Henry E. Hudson issued an order Thursday telling the U.S. Marshals Service to "arrest and seize the defendant property, and use discretion and whatever means appropriate to protect and maintain said defendant property." Both the judge's order and Vick's filing refer to "approximately" 53 pit bull dogs. After Vick's indictment last month, Goodell ordered the quarterback not to report to the Falcons training camp, and the league is reviewing the case. Blank told the NFL Network on Monday he could not speculate on Vick's future as a Falcon, at least not until he had seen "a statement of facts" in the case. E-mail to a friend . CNN's Mike Phelan contributed to this report.

Figure 3: Sample input text for generating summary

The suspension makes "a strong statement that conduct which tarnishes the good reputation of the NFL will not be tolerated," he said in a statement.Goodell said the Falcons could "assert any claims or remedies" to recover $22 million of Vick's signing bonus from the 10-year, $130 million contract he signed in 2004, according to The Associated Press.Vick said he would plead guilty to one count of "Conspiracy to Travel in Interstate Commerce in Aid of Unlawful Activities and to Sponsor a Dog in an Animal Fighting Venture" in a plea agreement filed at U.S. District Court in Richmond, Virginia.The charge is punishable by up to five years in prison, a $250,000 fine, "full restitution, a special assessment and 3 years of supervised release," the plea deal said."The defendant will plead guilty because the defendant is in fact guilty of the charged offense," the plea agreement said.In an additional summary of facts, signed by Vick and filed with the agreement, Vick admitted buying pit bulls and the property used for training and fighting the dogs, but the statement said he did not bet on the fights or receive any of the money won."Peace, Phillips and Vick agreed to the killing of approximately 6-8 dogs that did not perform well in 'testing' sessions at 1915 Moonlight Road and all of those dogs were killed by various methods, including hanging and drowning."Vick agrees and stipulates that these dogs all died as a result of the collective efforts of Peace, Phillips and Vick," the summary said.The judge in the case will have the final say over the plea agreement.The federal case against Vick focused on the interstate conspiracy, but Vick's admission that he was involved in the killing of dogs could lead to local charges, according to CNN legal analyst Jeffrey Toobin.Vick agreed to "make restitution for the full amount of the costs associated" with the dogs that are being held by the government."Such costs may include, but are not limited to, all costs associated with the care of the dogs involved in that case, including if necessary, the long-term care and/or the humane euthanasia of some or all of those animals."After Vick's indictment last month, Goodell ordered the quarterback not to report to the Falcons training camp, and the league is reviewing the case.Blank told the NFL Network on Monday he could not speculate on Vick's future as a Falcon, at least not until he had seen "a statement of facts" in the case.

Fig 4:Extractive summary 1

"NEW: NFL chief, Atlanta Falcons owner critical of Michael Vick's conduct .
NFL suspends Falcons quarterback indefinitely without pay .
Vick admits funding dogfighting operation but says he did not gamble .
Vick due in federal court Monday; future in NFL remains uncertain ."

Fig 5: Abstractive summary 1

" Vick also agreed that "collective efforts" by him and two others caused the deaths of at least six dogs."Such costs may include, but are not limited to, all costs associated with the care of the dogs involved in that case, including if necessary, the long-term care and/or the humane euthanasia of some or all of those animals."Both the judge's order and Vick's filing refer to "approximately" 53 pit bull dogs"The defendant will plead guilty because the defendant is in fact guilty of the charged offense," the plea agreement said.Vick said he would plead guilty to one count of "Conspiracy to Travel in Interstate Commerce in Aid of Unlawful Activities and to Sponsor a Dog in an Animal Fighting Venture" in a plea agreement filed at U.S. District Court in Richmond, Virginia.Blank told the NFL Network on Monday he could not speculate on Vick's future as a Falcon, at least not until he had seen "a statement of facts" in the case. Goodell said the Falcons could "assert any claims or remedies" to recover $22 million of Vick's signing bonus from the 10-year, $130 million contract he signed in 2004, according to The Associated Press."Peace, Phillips and Vick agreed to the killing of approximately 6-8 dogs that did not perform well in 'testing' sessions at 1915 Moonlight Road and all of those dogs were killed by various methods, including hanging and drowning.Judge Henry E. Hudson issued an order Thursday telling the U.S. Marshals Service to "arrest and seize the defendant property, and use discretion and whatever means appropriate to protect and maintain said defendant property."Vick agreed to "make restitution for the full amount of the costs associated" with the dogs that are being held by the government.The charge is punishable by up to five years in prison, a $250,000 fine, "full restitution, a special assessment and 3 years of supervised release," the plea deal said."Most of the 'Bad Newz Kennels' operations and gambling monies were provided by Vick," the official summary of facts said.The suspension makes "a strong statement that conduct which tarnishes the good reputation of the NFL will not be tolerated," he said in a statement. "Vick agrees and stipulates that these dogs all died as a result of the collective efforts of Peace, Phillins and Vick." the summary said.

Fig 6: Output generated from Nlargest model

In an additional summary of facts, signed by Vick and filed with the agreement, Vick admitted buying pit bulls and the property used for training and fighting the dogs, but the statement said he did not bet on the fights or receive any of the money won. The federal case against Vick focused on the interstate conspiracy, but Vick's admission that he was involved in the killing of dogs could lead to local charges, according to CNN legal analyst Jeffrey Toobin. Vick agreed to "make restitution for the full amount of the costs associated" with the dogs that are being held by the government. Blank told the NFL Network on Monday he could not speculate on Vick's future as a Falcon, at least not until he had seen "a statement of facts" in the case. "It sometimes happens -- not often -- that the state will follow a federal prosecution by charging its own crimes for exactly the same behavior," Toobin said Friday. Vick said he would plead guilty to one count of "Conspiracy to Travel in Interstate Commerce in Aid of Unlawful Activities and to Sponsor a Dog in an Animal Fighting Venture" in a plea agreement filed at U.S. District Court in Richmond, Virginia. But the dogs could serve as important evidence in the cases against Vick and his admitted co-conspirators. Your team, the NFL, and NFL fans have all been hurt by your actions," NFL Commissioner Roger Goodell said in a letter to Vick. After Vick's indictment last month, Goodell ordered the quarterback not to report to the Falcons training camp, and the league is reviewing the case. " In the plea deal, Vick agreed to cooperate with investigators and provide all information he may have on any criminal activity and to testify if necessary. "Vick agrees and stipulates that these dogs all died as a result of the collective efforts of Peace, Phillips and Vick," the summary said. The judge in the case will have the final say over the plea agreement. The suspension makes "a strong statement that conduct which tarnishes the good reputation of the NFL will not be tolerated," he said in a statement. In papers filed Friday with a federal court in Virginia, Vick also admitted that he and two co-conspirators killed dogs that did not fight well.

Fig 7: Output generated from TextRank model

new: "your team, the NFL, and NFL fans have all been hurt by your actions," nfl says. "conduct which tarnishes the good reputation of the football will not be tolerated," owner says. ap: 'vick did not gamble by placing side bets on any fights.' he will plead guilty to conspiracy to travel in interstate commerce in aid of unlawful activities.

Figure 8: Output generated from T5 model

Real Summary
NEW: NFL chief, Atlanta Falcons owner critical of Michael Vick's conduct . NFL suspends Falcons quarterback indefinitely without pay . Vick admits funding dogfighting operation but says he did not gamble . Vick due in federal court Monday; future in NFL remains uncertain .

Predicted Summary
new: "your team, the NFL, and NFL fans have all been hurt by your actions," nfl says. "conduct which tarnishes the good reputation of the football will not be tolerated," owner says. ap: 'vick did not gamble by placing side bets on any fights.' he will plead guilty to conspiracy to travel in interstate commerce in aid of unlawful activities.

Figure 9: T5 vs original Summary

Real Summary
The suspension makes "a strong statement that conduct which tarnishes the good reputation of the NFL will not be tolerated," he said in a statement.Goodell said the Falcons could "assert any claims or remedies" to recover $22 million of Vick's signing bonus from the 10-year, $130 million contract he signed in 2004, according to The Associated Press.Vick said he would plead guilty to one count of "Conspiracy to Travel in Interstate Commerce in Aid of Unlawful Activities and to Sponsor a Dog in an Animal Fighting Venture" in a plea agreement filed at U.S. District Court in Richmond, Virginia.The charge is punishable by up to five years in prison, a $250,000 fine, "full restitution, a special assessment and 3 years of supervised release," the plea deal said."The defendant will plead guilty because the defendant is in fact guilty of the charged offense," the plea agreement said.In an additional summary of facts, signed by Vick and filed with the agreement, Vick admitted buying pit bulls and the property used for training and fighting the dogs, but the statement said he did not bet on the fights or receive any of the money won."Peace, Phillips and Vick agreed to the killing of approximately 6-8 dogs that did not perform well in 'testing' sessions at 1915 Moonlight Road and all of those dogs were killed by various methods, including hanging and drowning."Vick agrees and stipulates that these dogs all died as a result of the collective efforts of Peace, Phillips and Vick," the summary said.The judge in the case will have the final say over the plea agreement.The federal case against Vick focused on the interstate conspiracy, but Vick's admission that he was involved in the killing of dogs could lead to local charges, according to CNN legal analyst Jeffrey Toobin.Vick agreed to "make restitution for the full amount of the costs associated" with the dogs that are being held by the government."Such costs may include, but are not limited to, all costs associated with the care of the dogs involved in that case, including if necessary, the long-term care and/or the humane euthanasia of some or all of those animals."After Vick's indictment last month, Goodell ordered the quarterback not to report to the Falcons training camp, and the league is reviewing the case.Blank told the NFL Network on Monday he could not speculate on Vick's future as a Falcon, at least not until he had seen "a statement of facts" in the case.

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Figure 10: T5 vs extractive Summary

Real Summary

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Figure 11: Nlargestvs original Summary

Real Summary

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Figure 12: TextRank vs original Summary

EVALUATION SCORES:
Average Rouge Scores

ID	set	nLargest(Avg)	TextRank(Avg)	T5(Avg)
1	e	0.8833333333	0.6533333333	0.3
4	e	0.89	0.7233333333	0.2933333333
4	d	0.7733333333	0.7066666667	0.1533333333

Nlargest BLEU

ID	set	BLEU-4	BLEU-1	BLEU-2	BLEU-3	2-gram Ind	3-gram Ind	4-gram Ind	2-gram	3-gram	4-gram
1	e	0.84	0.77	0.81	0.83	0.84	0.88	0.88	0.65	0.57	0.50
4	e	0.82	0.82	0.83	0.82	0.83	0.81	0.80	0.68	0.55	0.44
4	d	0.84	0.92	0.90	0.87	0.87	0.81	0.77	0.85	0.73	0.60

TextRank BLEU

ID	set	BLEU-4	BLEU-1	BLEU-2	BLEU-3	2-gram Ind	3-gram Ind	4-gram Ind	2-gram	3-gram	4-gram
1	e	0.74	0.89	0.84	0.79	0.79	0.69	0.63	0.70	0.49	0.31
4	e	0.90	0.93	0.92	0.91	0.91	0.89	0.87	0.90	0.85	0.79
4	d	0.78	0.89	0.85	0.81	0.82	0.73	0.67	0.81	0.66	0.50

T5 BLEU

ID	set	BLEU-4	BLEU-1	BLEU-2	BLEU-3	2-gram Ind	3-gram Ind	4-gram Ind	2-gram	3-gram	4-gram
1	e	0.78	0.99	0.94	0.85	0.89	0.71	0.58	0.88	0.62	0.36
4	e	0.59	0.84	0.76	0.67	0.69	0.52	0.40	0.66	0.39	0.18
4	d	0.83	1.00	0.97	0.91	0.95	0.78	0.63	0.95	0.74	0.47

ROUGE(1,2,L)

ID	set	nLargest r1	nLargest r2	nLargest rL	TextRank r1	TextRank r2	TextRank rL	T5r1	T5r2	T5rL
1	e	0.90	0..85	0.90	0.68	0.60	0.68	0.44	0.15	0.31
4	d	0.79	0.74	0.79	0.73	0.66	0.73	0.21	0.04	0.21
4	e	0.90	0.87	0,90	0.74	0.69	0.74	0.34	0.22	0.32

CONCLUSION

- Goggle API has been found to be successful for using to convert the voice input into text in a short time for the project which completes the Speech Recognition part.

- TextRank and Nlargest models are used for extractive summaries.

- To allow greater flexibility in the summaries we could obtain, T5 model for abstractive method has also been used.

- ROUGE and BLEU evaluation metrics are used to assess the performance of these summarization models.
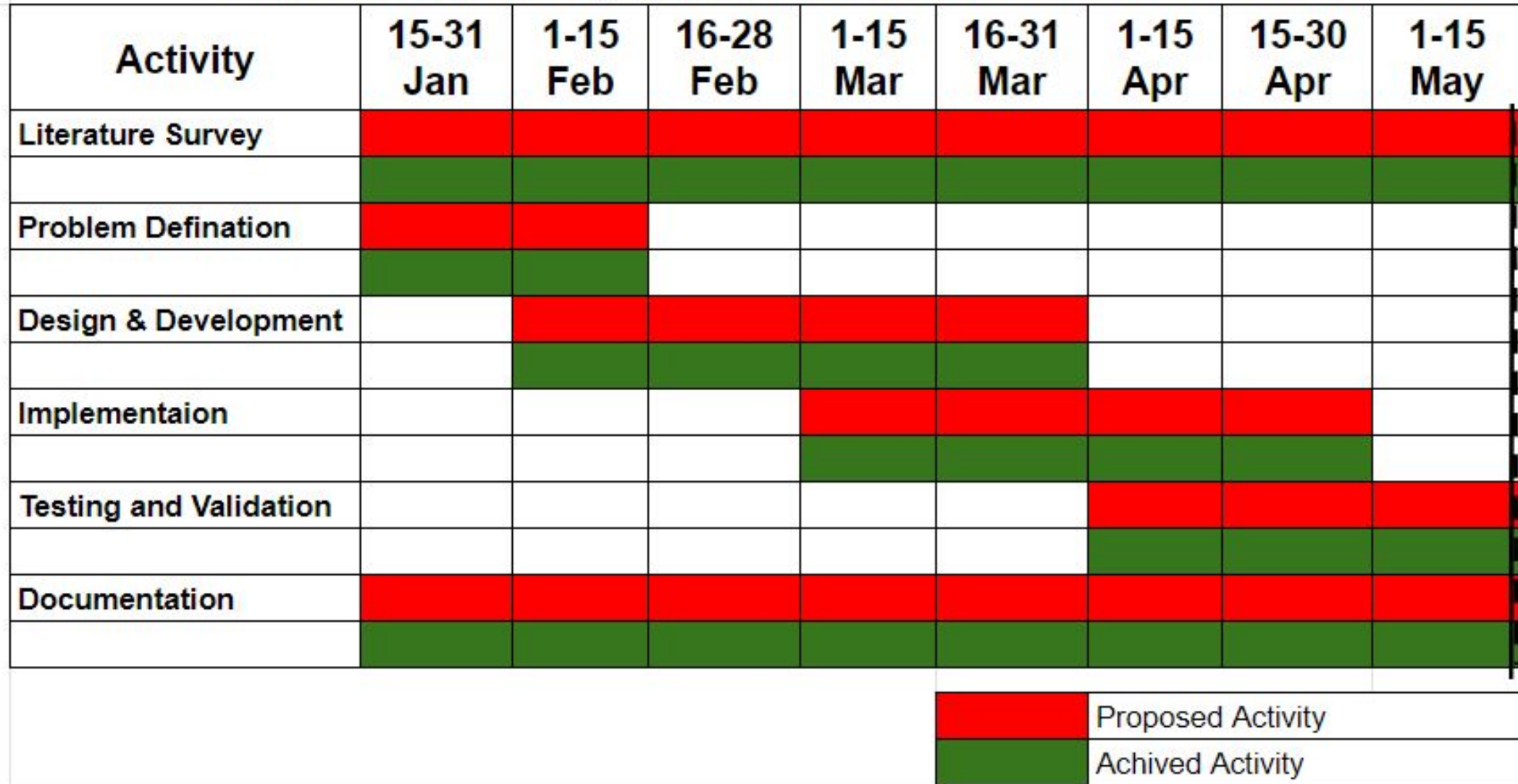
LIMITATION

- Speech Recognition system struggle to transcribe from noisy environment and poor sound quality.

- The text summarization model's performance sometimes depends on the length of the input text. While we evaluated our model on texts of varying lengths, we found that longer texts may result in less concise summaries.

- In case of T5 model it is build for input sequence less then 512 using texts with greater length may lead to errors.

- Due to the inability to have apply technology in hand we could not perform models like Seq2Seq.

GANTT CHART

TransSummarize: Leveraging NLP for Transcription and Summarisation

Activity	15-31 Jan	1-15 Feb	16-28 Feb	1-15 Mar	16-31 Mar	1-15 Apr	15-30 Apr	1-15 May
Literature Survey	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■
Problem Defination	■	■						
	■	■						
Design & Development		■	■	■	■			
		■	■	■	■			
Implementaion				■	■	■	■	
				■	■	■	■	
Testing and Validation						■	■	■
						■	■	■
Documentation	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■

■	Proposed Activity
■	Achived Activity

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PLAGIARISM REPORT

Turnitin check nlp

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9% SIMILARITY INDEX

6% INTERNET SOURCES

8% PUBLICATIONS

% STUDENT PAPERS

THANK YOU