



Team 9

AI MAVERICKS

Technology Enhanced Smart Cities

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MEET THE TEAM!

Linh Pham



Amazing
Mentor: Kevin
Walsh

Chen Feng
Tsai

Khanh Ha
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01

THE SAFETY PROBLEM

■
49% increase

in the number of **gun-murders**
from 2015 to 2020 in the US

■
4.5 millions

violent incidents targeted **U.S. residents**
age 12 or older in 2020

■
21.9%

of U.S. high school students were in
a **physical fight at school** in 2019

→ **More challenges for safety officers**
due to the increasing number of
violent and aggressive behaviors

Signs of potential aggressive behaviors



Verbal cues of impending aggression
(e.g. threatening language, derogatory comment, or excessive profanity)



Underlying negative emotions
(e.g. anger, disappointment, fear)



Safety officers can better handle the situations if given **timely and concise information**

↳ **Primary goal:** solve the safety problem by providing **safety officers (end users)** with **real-time and concise information** about these signs

02. OUR SOLUTION!

EmoSpeech

A Speech Recognition API

01

EMOTION ANALYSIS

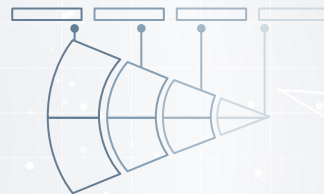
Language-based emotion detection model



02

CONTENT SUMMARIZATION

Extractive summarization:
filter out unimportant ideas



Address primary goal: help solve the safety problem by sending safety officers **timely and concise** report on **emotions and key points of speech**

BUSINESS PERSPECTIVE



Shorten response time when there is a need for human intervention



Instantaneous, 24/7 service

Multiple applications besides safety:



- ❑ **Customer service:** relay important points from voice message and customers' emotions during interactions
- ❑ **Education:** accurately transcribe course materials and filter out unimportant information

Emotion Analysis

BERT Model

- Bidirectional Encoder Representations from Transformers
- Open source machine learning framework for natural language processing (NLP)

Why we chose BERT?

- Huge pre-trained model
- Effective in sequential features modeling
- Open source and accessible



GoEmotions Dataset

- For language-based emotion classification
- 58k Reddit comments extracted from subreddits
- 27 emotion categories (12 **+**, 11 **-**, 5 others)

Positive		Negative		Ambiguous
admiration 🙌	joy 😄	anger 😡	grief 😞	confusion 😕
amusement 😂	love ❤️	annoyance 😡	nervousness 😬	curiosity 🤔
approval 👍	optimism 🙌	disappointment 😞	remorse 😞	realization 💡
caring 🤗	pride 😊	disapproval 🗨️	sadness 😞	surprise 😲
desire 🤩	relief 😌	disgust 🤢		
excitement 😄		embarrassment 😳		
gratitude 🙏		fear 😨		

GoEmotions taxonomy: Includes 28 emotion categories, including "neutral".



CONTENT SUMMARIZATION

Mechanism:

1. Cosine Similarity
2. Filter out low score sentences
(irrelevant information)
3. Extract aggregated result



DEMO

1

Speech Recognition with Emotion and Summarization

An emotion detection tool.
Start by recording your voice,
and we will pass the speech on to our emotion analysis model.

Record your voice:

Record

Or

See a demo:

Example

Click on **"Record"**
Start recording

Click on **"Example"**
Show Default Result

2

Record your voice:

Record

Or

See a demo:

Example

You said :

I really appreciate the movie because it teach me a lot and I really like to go to the movie again

Emotion : love

Output

3

Record your voice:

Record

Or

See a demo:

Example

Example text :

What an excellent sequel - I, in fact, like it more than its predecessor 'Top Gun: Maverick' is fantastic, simply put. I was expecting it to be good, but it's actually much more enjoyable than I had anticipated. The callbacks to the original are expertly done, the new characters are strong/well cast, it has plenty of meaning, music is fab and the action is outstanding - the aerial stuff is sensational. The story is superb, with each high stake coming across as intended - parts even gave me slight goosebumps, which is a surprise given I'm not someone who has a connection to the 1986 film. It's all super neatly put together, I honestly came close to giving it a higher rating. Tom Cruise is brilliant as he reprises the role of Maverick, while Miles Teller comes in and gives a top performance. Jennifer Connelly is another positive, though her role does kinda feel a tiny bit forced in order to have a love interest: given Kelly McGillis' (unexplained) absence, Monica Barbaro stands out most from the fresh faces, though I actually did enjoy watching them all - which is something I thought the film may struggle with, adding new people, but it's done nicely; sure Jon Hamm and Glen Powell are a little cliché, though overall I approve. A great watch - I'd highly recommend it, though naturally would suggest watching the previous film first if you haven't already.

Emotion : admiration

Summarized text :

Monica Barbaro stands out most from the fresh faces, though I actually did enjoy watching them all - which is something I thought the film may struggle with, adding new people, but it's done nicely; sure Jon Hamm and Glen Powell are a little cliché, though overall I approve. A great watch - I'd highly recommend it, though naturally would suggest watching the previous film first if you haven't already. What an excellent sequel - I, in fact, like it more than its predecessor 'Top Gun: Maverick' is fantastic, simply put. The story is superb, with each high stake coming across as intended - parts even gave me slight goosebumps, which is a surprise given I'm not someone who has a connection to the 1986 film. Jennifer Connelly is another positive, though her role does kinda feel a tiny bit forced in order to have a love interest; given Kelly McGillis' (unexplained) absence

Output

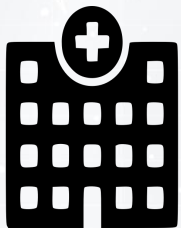
04

Market Research AND Competitors



03.

Speech Recognition: Big Business!



2B
19.8%

Healthcare:
Speech recognition in
Clinical documentation

3.6B
27.4%

Finance/ Banking:
Speech recognition in
Financial, Banking services



2.5B
21.3%

Retail:
Speech recognition in
customer service,
Inventory management

2.6B
29.2%

Automotive:
Speech recognition in
Safety features,
Driver assistance



COMPETITORS' FEATURES

Siri	Limited capability to detect emotions through voice recordings
	Only available to Apple users
Cortana	Need Microsoft account/ subscription
	Not always summarize the most important points

VS

OUR FEATURES

Detect 27 emotions and can do more	EmoSpeech
Available to every user	
No need subscription to access all features	
Retain the most relevant ideas/ words → more concise	



05. Ethics, Actionable Recommendations

04. Ethical Matrix

Respect for:	Fairness	Wellbeing	Accountability
Users: Safety Officer	Law enforcement without bias	Safety Efficiency	Clear Principle for law enforcement
Affected citizen: Individuals, students	Summarization without bias	Safety Prevent bias	Personal behavior
Technology providers: EmoSpeech Company	Easy install Cost effective	Innovation Self-realization	Data, Model Application
Environment	Fair to everyone	Safer environment	Clear division of responsibility



Reduce Effect of Background Noise

- Seed the model with parallel clean and noisy speech database
- Noise filtering methods (e.g. Wave U Net)
- Send notification to indicate loudness of environment



Tone & Pitch in Emotion Analysis

- Integrate audio signals - librosa
- Provide more audio embeddings for model



Add Adjustable Features

- Implement different language options for recognition
- Select different recording time frame
- Select how concise the summarization text is

06. FUTURE PLANNING



05.

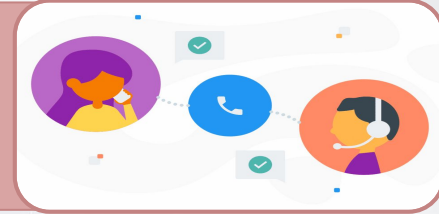
Present

Future

Identify and decrease bias in journalism



Improve customer service by analyzing customers' emotions during interactions



Save endangered languages and learn from minority groups



Reduce human error, increase productivity and shorten transcription time



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THANK YOU

Any Questions?