Team 9
AI MAVERICKS
Technology Enhanced Smart Cities

Presenters:
Khanh Ha Nguyen, Chen Feng Tsai, Linh Pham

MEET THE TEAM!

Linh Pham

Chen Feng Tsai

Amazing Mentor: Kevin Walsh

Khanh Ha Nguyen

TABLE OF CONTENTS

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

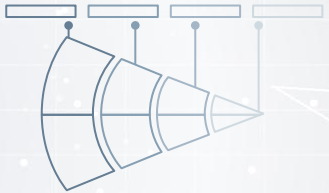
EMOTION ANALYSIS

Language-based emotion detection model

02

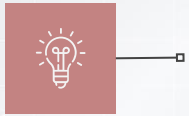
CONTENT SUMMARIZATION

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".

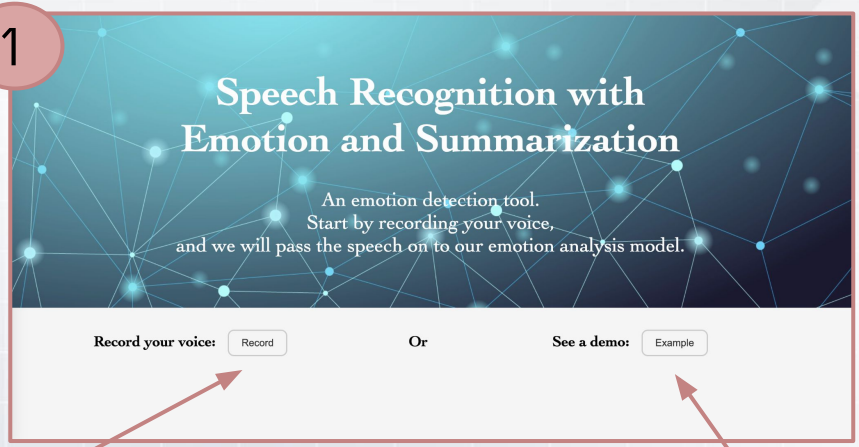
CONTENT SUMMARIZATION

Mechanism:

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

DEMO

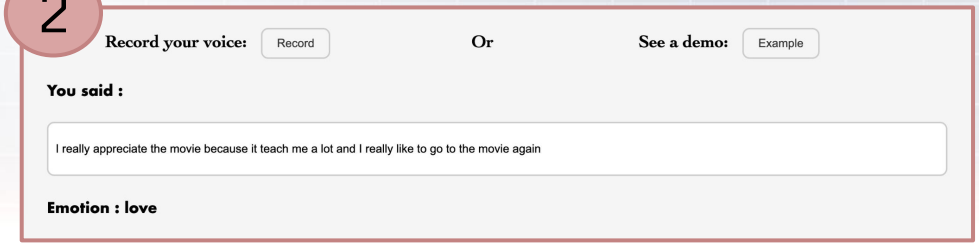
1



Click on **"Record"**
Start recording

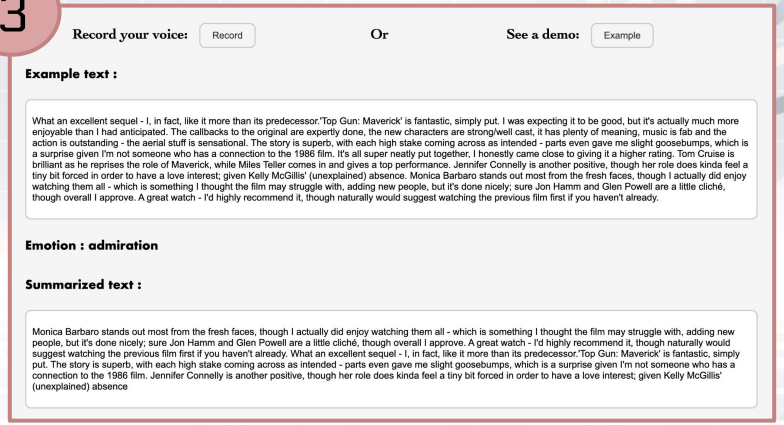
Click on **"Example"**
Show Default Result

2



Output

3

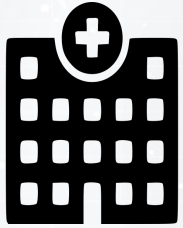


Output

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

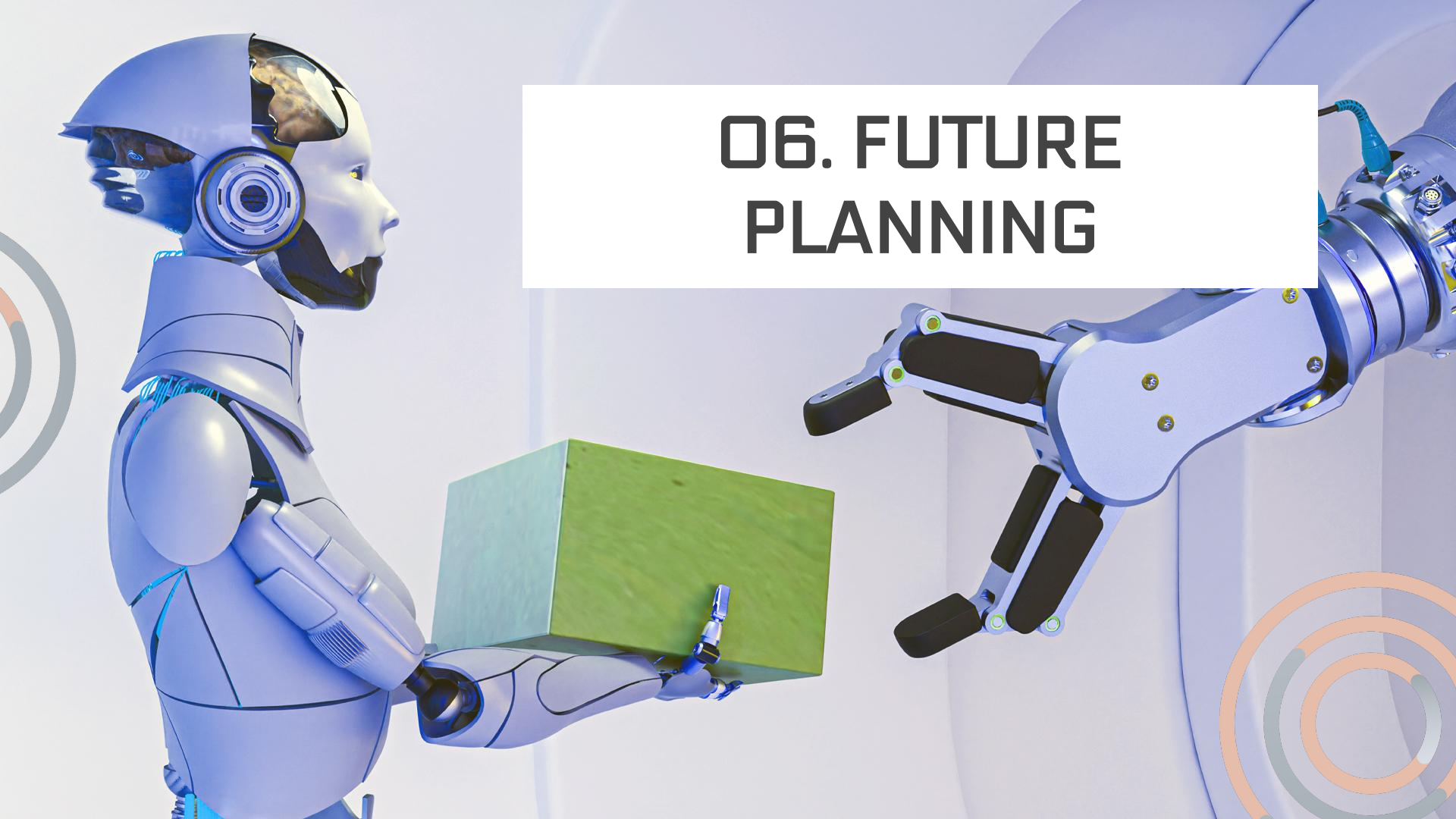
- ➔ Seed the model with parallel clean and noisy speech database
- ➔ Noise filtering methods (e.g. Wave U Net)
- ➔ Send notification to indicate loudness of environment

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

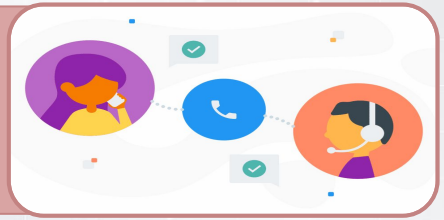
05.

Present

Future

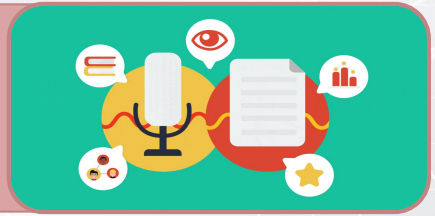
Identify and decrease bias in journalism

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



THANK YOU

Any Questions?