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香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

VoiceCoach: Interactive Evidence-based Training for Voice Modulation Skills in Public Speaking


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Introduction

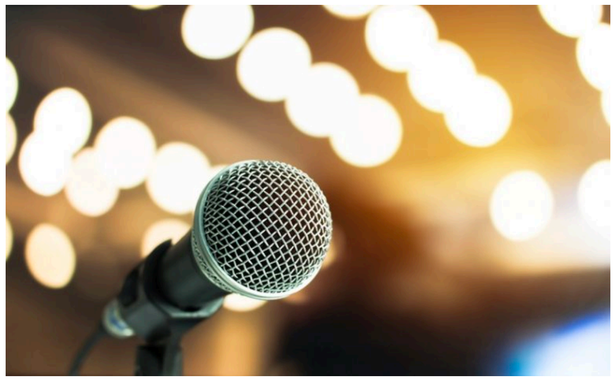
Voice Modulation

Pitch

Volume

Speed

Pause



Public Speaking

audience engagement

convey key ideas

Introduction

Voice Modulation

Pitch

Volume

Speed

Pause

- **Higher** *volume/pitch* → vocal emphasis

audience engagement

- **Increasing** speed → excitement

convey key ideas

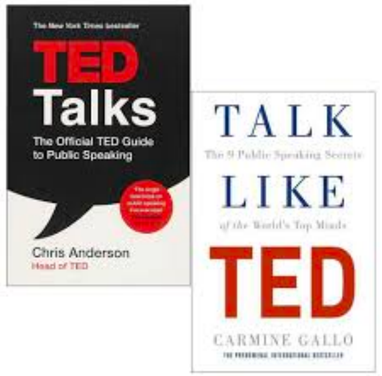
- **Slowing** down and **pauses** → content reflection → personal connections

Introduction

Voice Modulation

It is challenging for novice speakers to master various voice modulation skills

Soln1: Follow the guidelines from the books



Problem: No timely feedback

Introduction

Voice Modulation

It is challenging for novice speakers to master various voice modulation skills

SoIn2: Join the public speaking training programs

Problems: (feedback)

1. No quantitative evaluation
2. Subjected to personal preferences

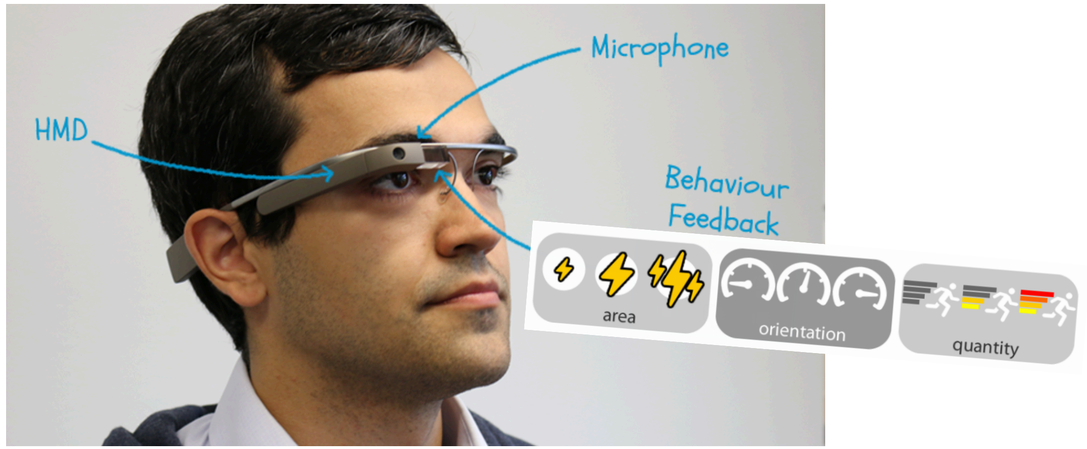
Introduction

Training Systems for Voice Modulation

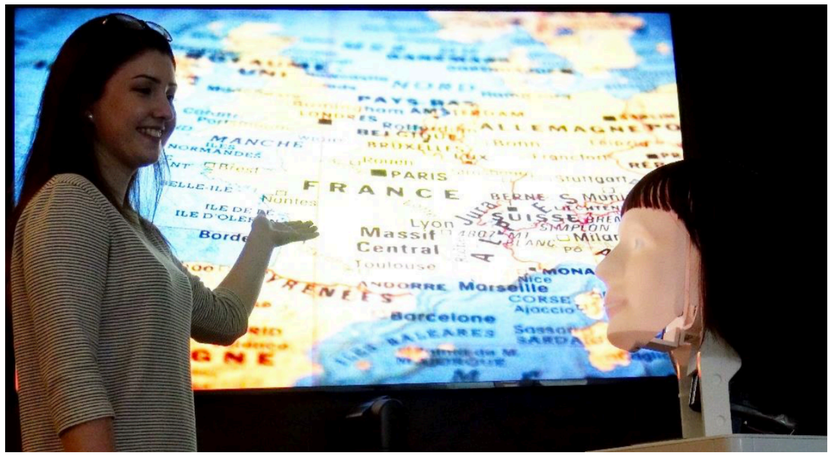
To facilitate the training process:

- **Automatic feedback**
- **Effective feedback**

on speech quality
(pitch, speech rate, loudness)



Logue (Damian et al., 2015)



RoboCOP (Trinh et al., 2017)

→ Pre-defined thresholds regardless of sentences and contexts

Introduction

Training Systems for Voice Modulation

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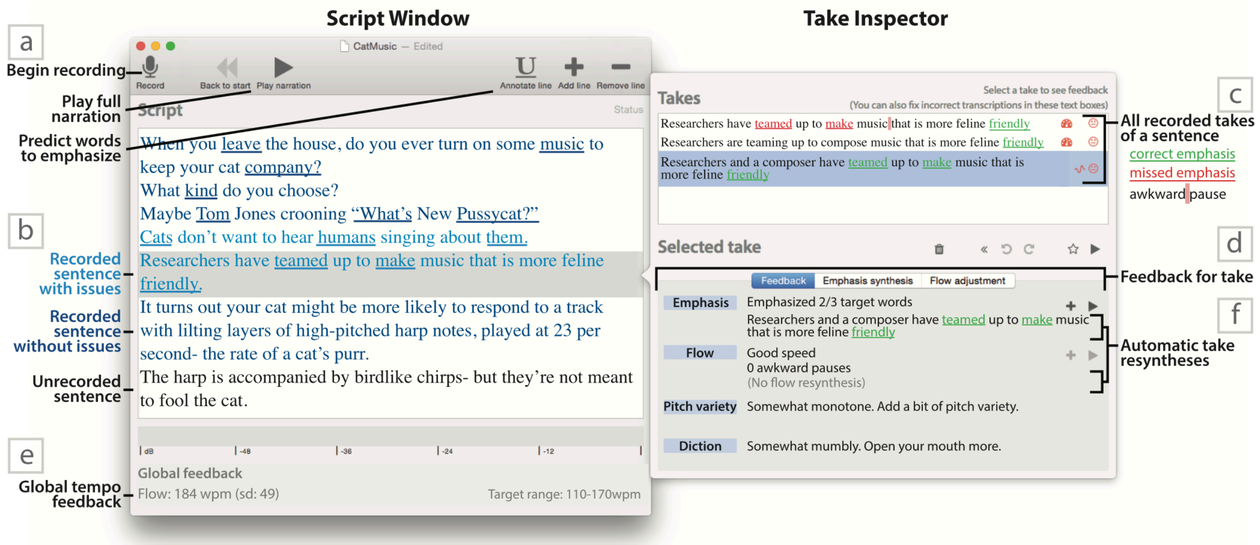
(pitch, speech rate, loudness)



NarrationCoach (Rubin et al., 2015)

Check whether speakers satisfy specific requirements for words in sentences

→ Difficult for novice speakers to specify requirements

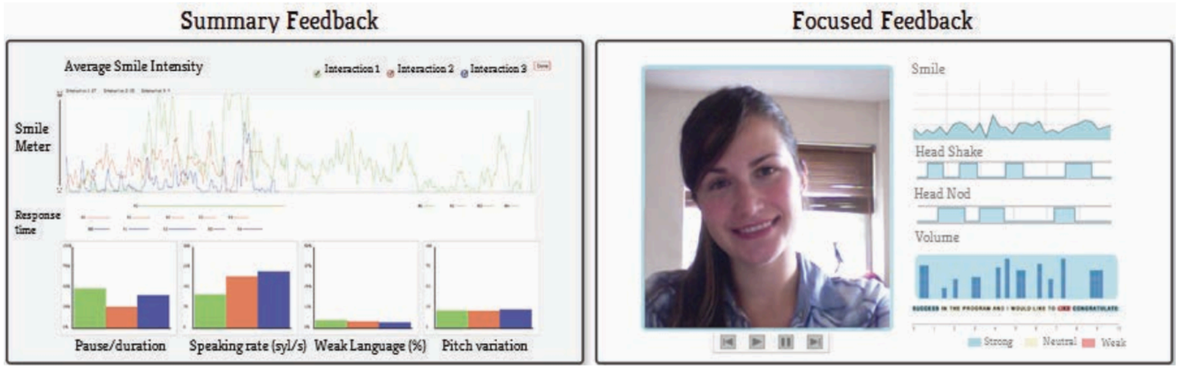
Introduction

Training Systems for Voice Modulation

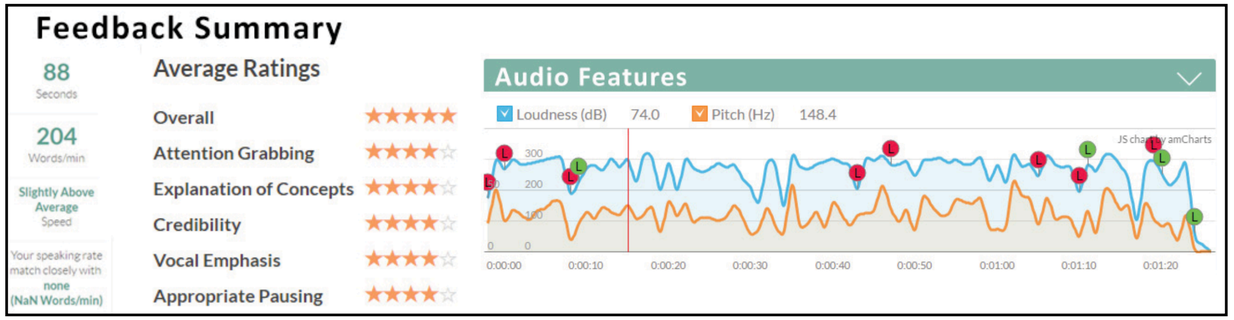
To facilitate the training process:

- Automatic feedback
- Effective feedback

for self-reflection & practice



MACH (Hoque et al., 2013)



ROC Speak (Fung et al., 2015)

Simple charts with limited interaction support

→ insufficient to **compare** their performance and **practice deliberately**

Design Process

To help novice speakers improve voice modulation

- Iterative development (8 months)
- Worked with **4 professional communication coaches**
  - Well-experienced (>= 6 years) in training of public speaking

    → gain deeper understanding of voice modulation skills
  - “Proxies” to novice speakers

    → better aware of difficulties that they may encounter

    → deep insights into limitations of traditional methods

System Requirements

- R1: **Inform** speakers of their voice modulation
- R2: Provide **hints and evidence** to guide potential improvements
- R3: Illustrate the evidence with **concrete examples**
- R4: Enable **on-the-fly** feedback on speakers' vocal performance
- R5: Promote **deliberate** and **iterative** practice

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Our Approaches

- For personalized guidelines *(R2, R3)*
  - Data-driven approach to retrieve **GOOD** learning examples

    (sentences that have similar **structures** and **meaning**)
  - **TED Talks** as benchmark

- For self-awareness (feedback) & self-adjustment (practice) *(R1, R4, R5)*
  - **Interactive Visualization**

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Our Approaches

User Input

Sentences & words

Voice modulation

Recommender

Speech content

Sentence structure

TED Talk Videos

Sentences & words

Voice modulation

User Interface

Visualization

Exploration & comparison

On-the-fly feedback

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Our Approaches

User Input

Sentences & words

Voice modulation

Audio

Transcribe

Text

Voice Modulation

volume, pitch,
pause, speed

1) … **?**

2) **If your actions, …** **.**

slower

louder

… … …

n) **… …** **!**

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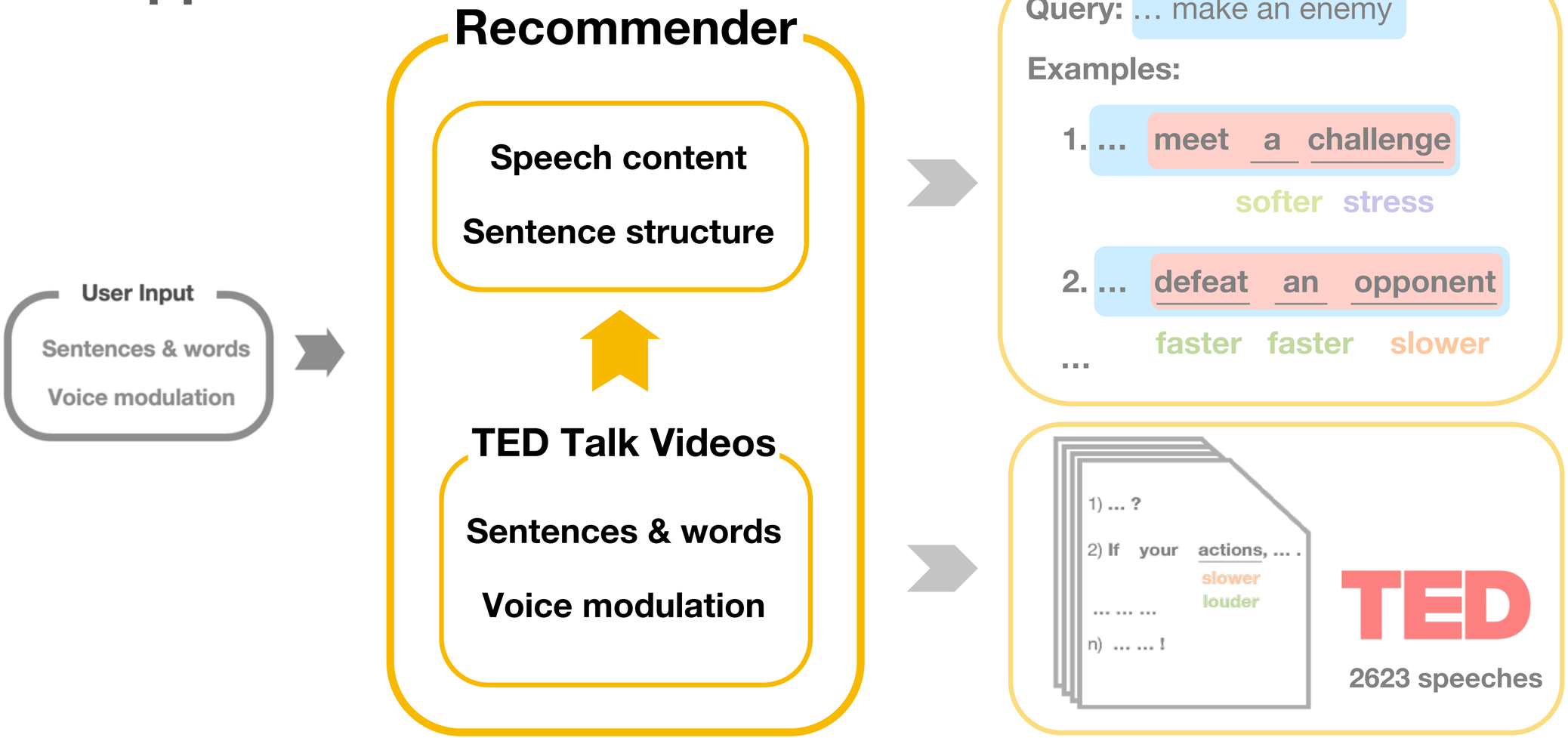
Our Approaches



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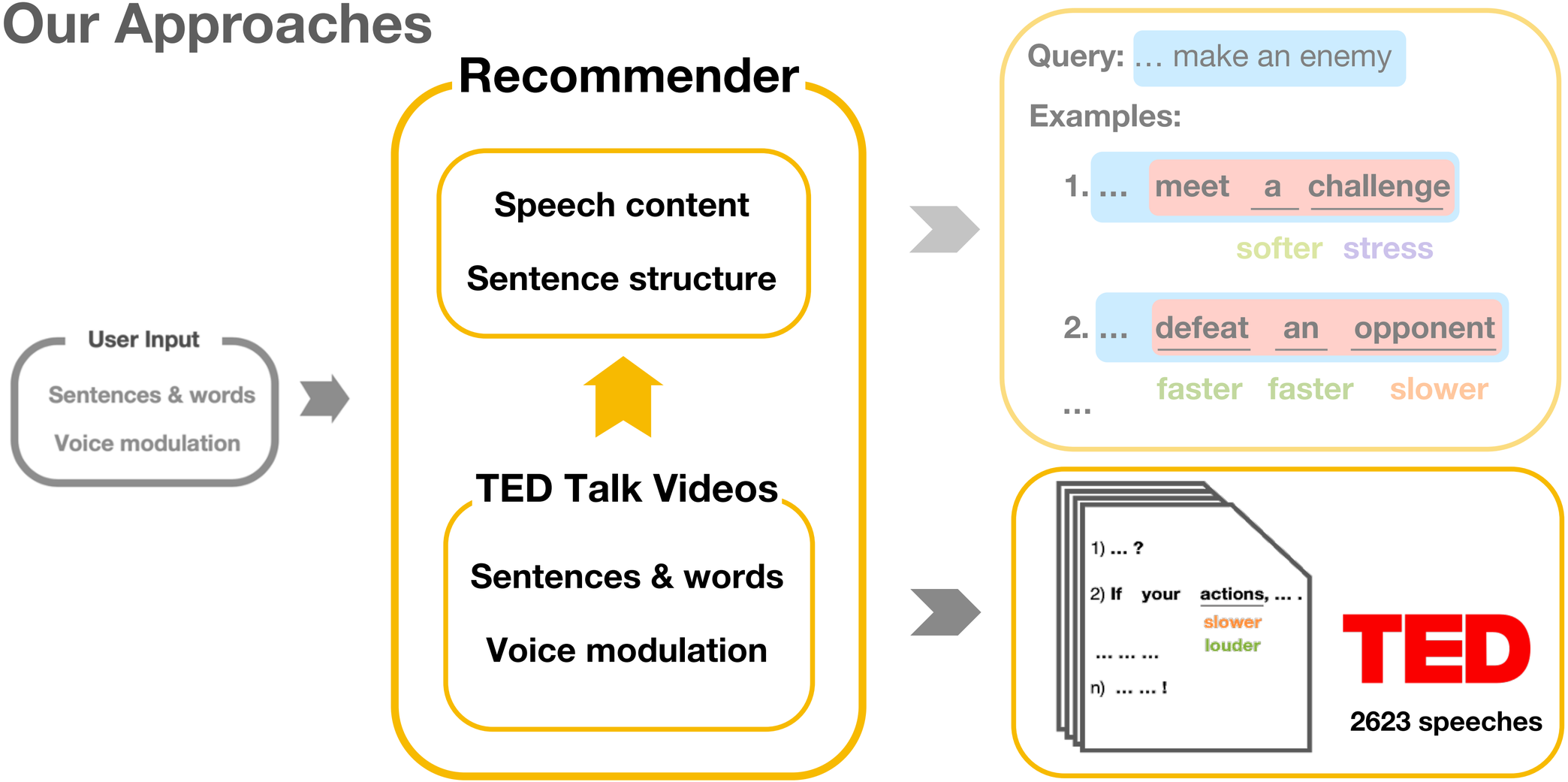
Our Approaches



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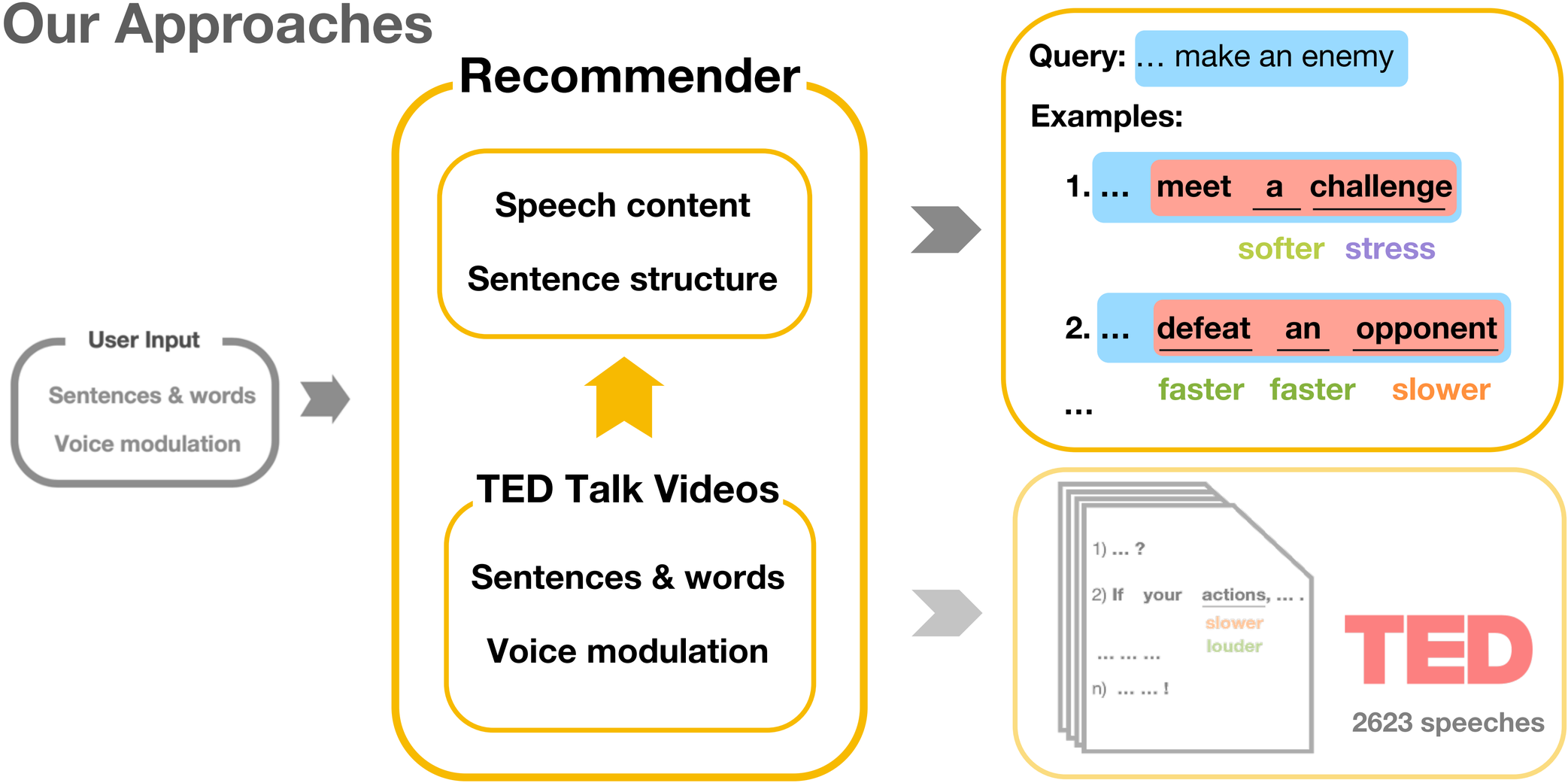
Our Approaches



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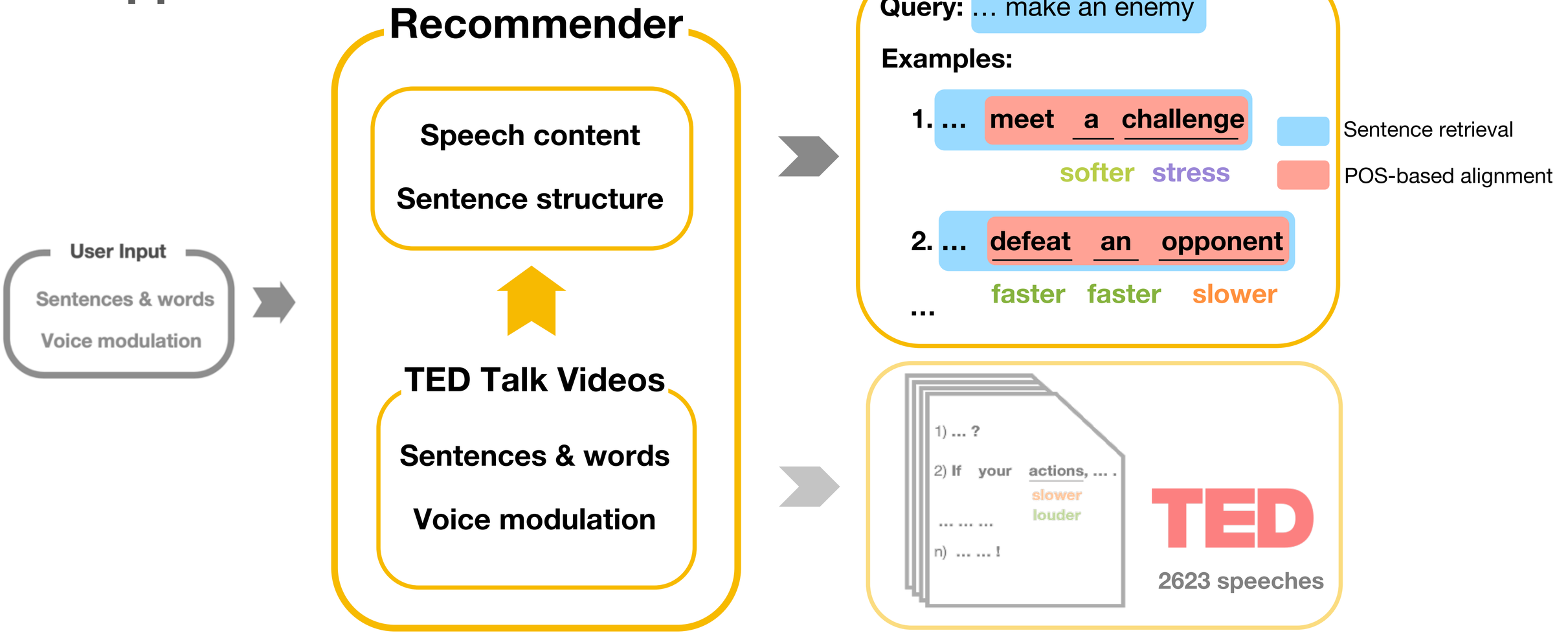
Our Approaches



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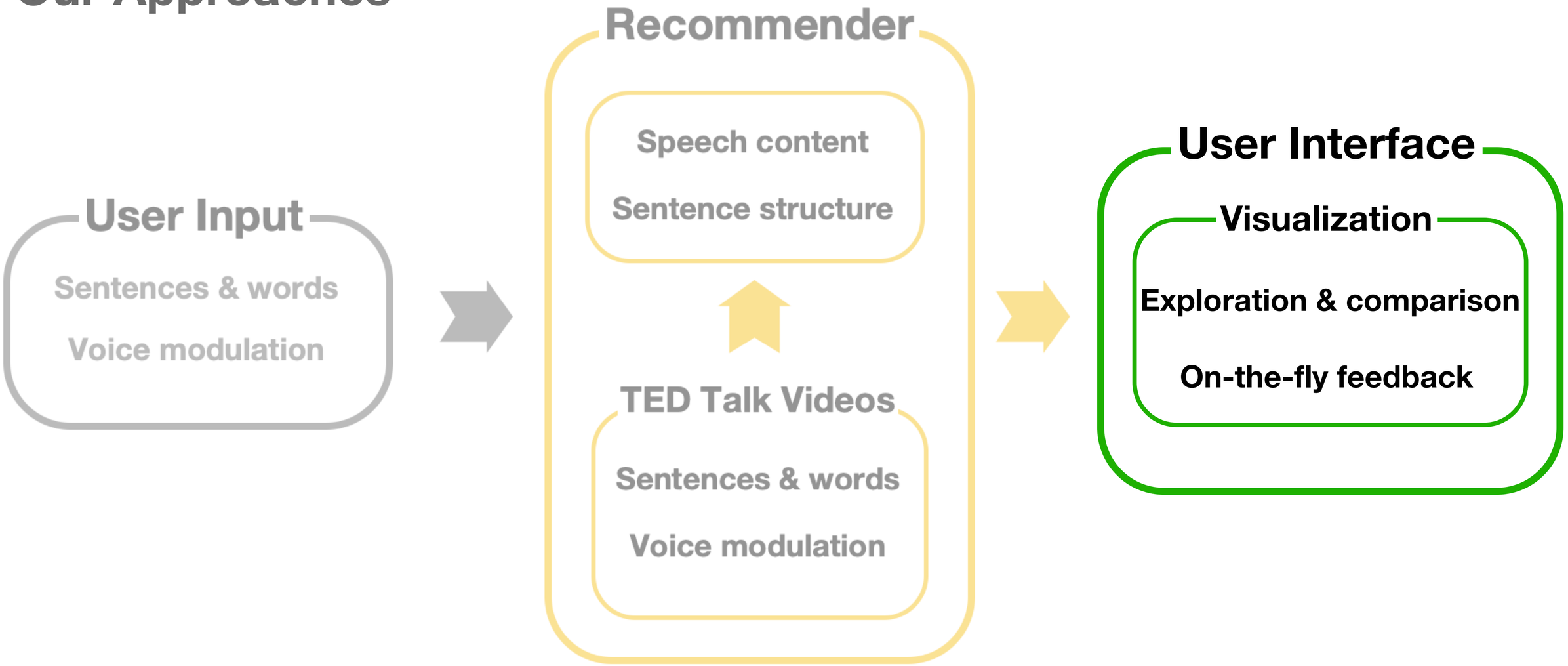
Our Approaches



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User Interface

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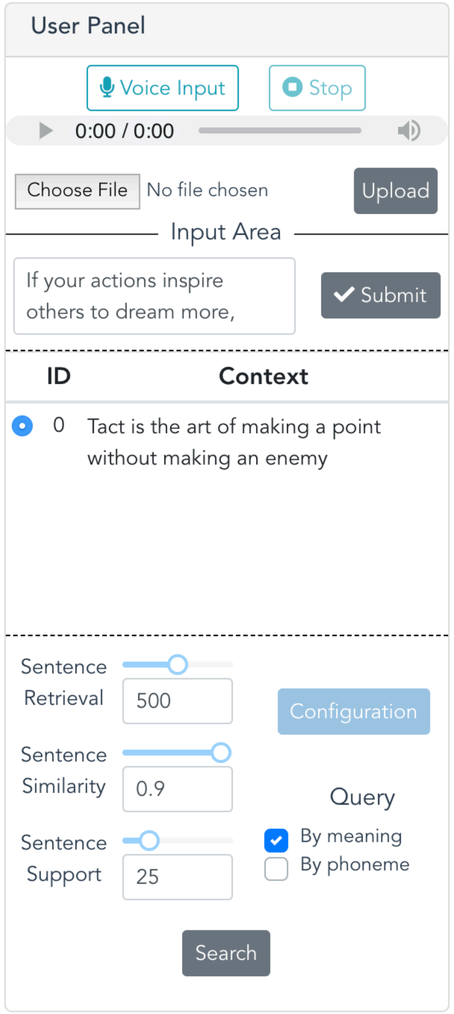
User Interface - User Panel



A: Audio streaming

B: Speech file uploading

C: Text input

speech input

Parsing the speech input into sentences

Configuration of example retrieval

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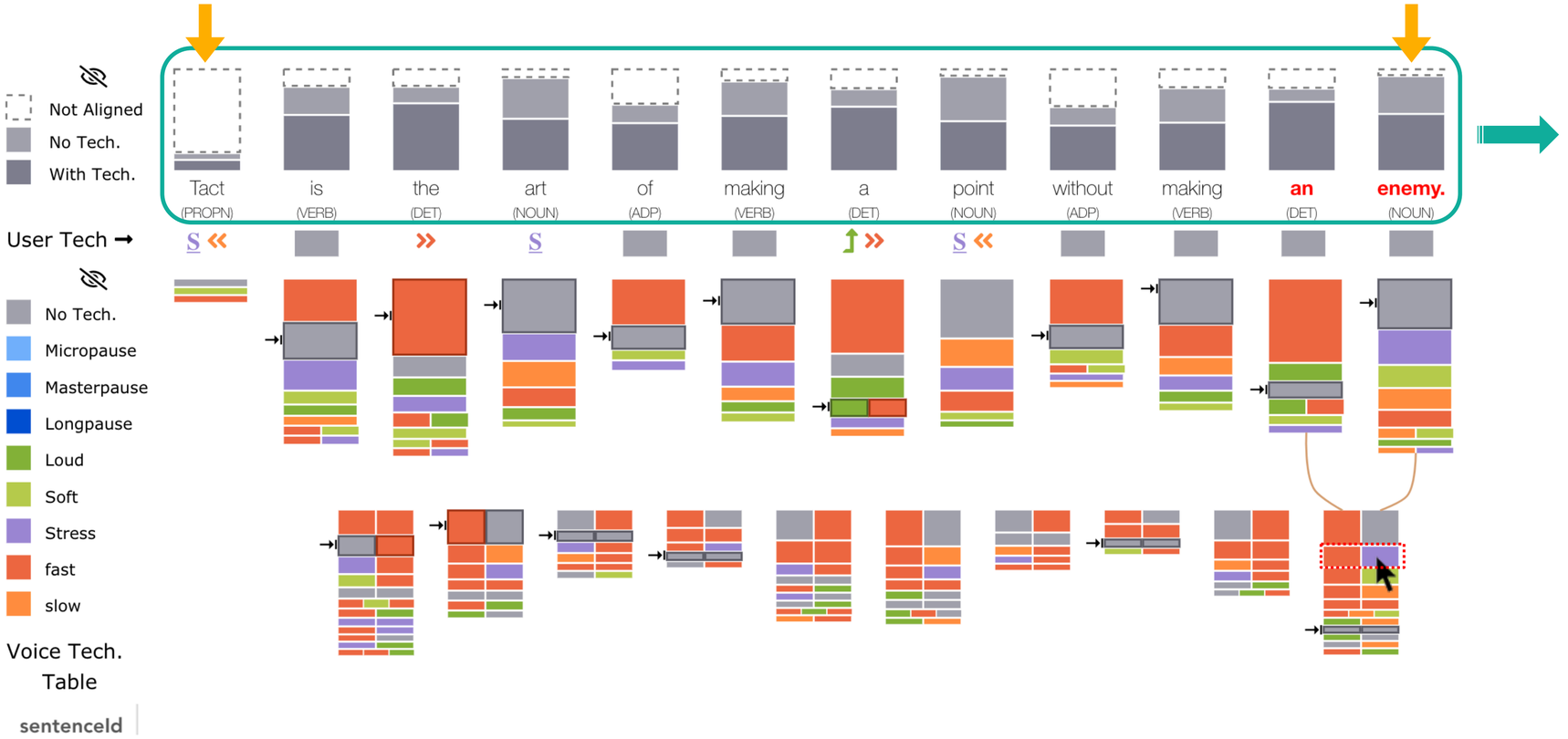
User Interface - Recommendation View



General summary of retrieval results

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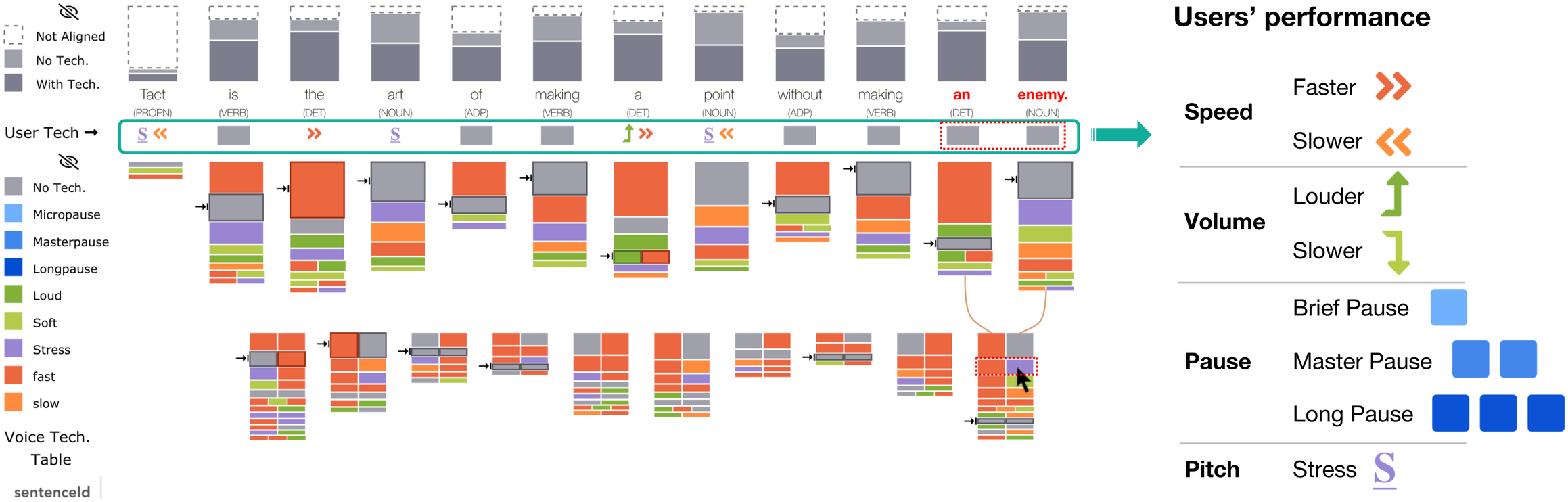
User Interface - Recommendation View



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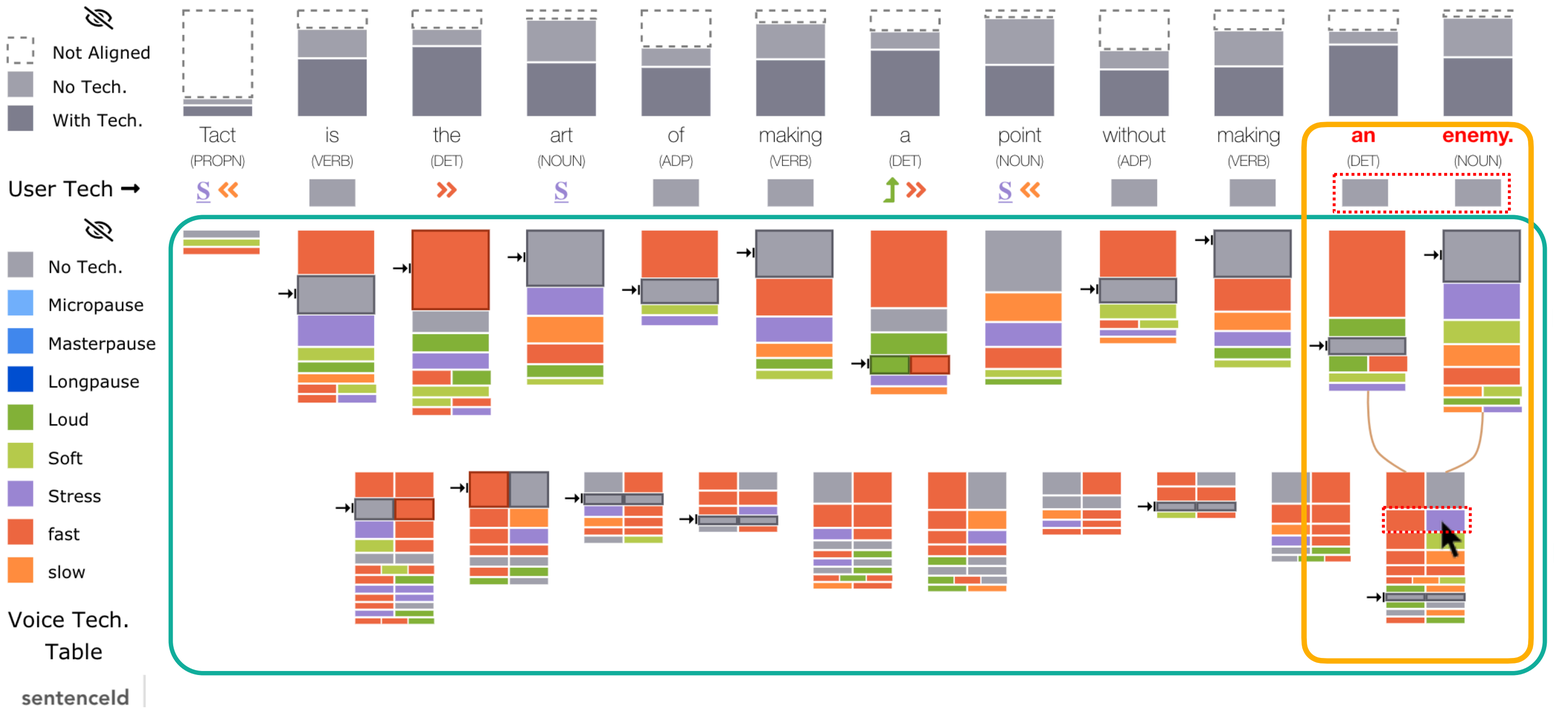
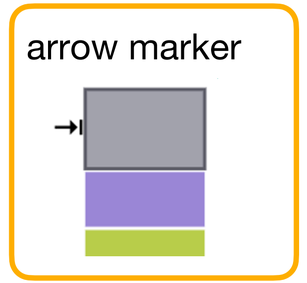
User Interface - Recommendation View



Word Combinations

1-gram summary

2-gram summary



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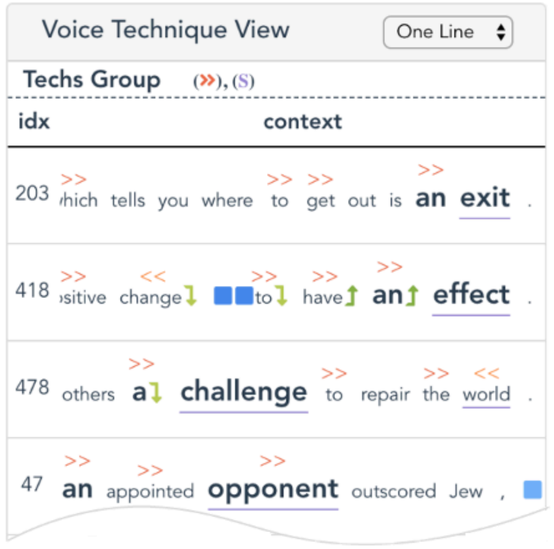
User Interface - Voice Technique View

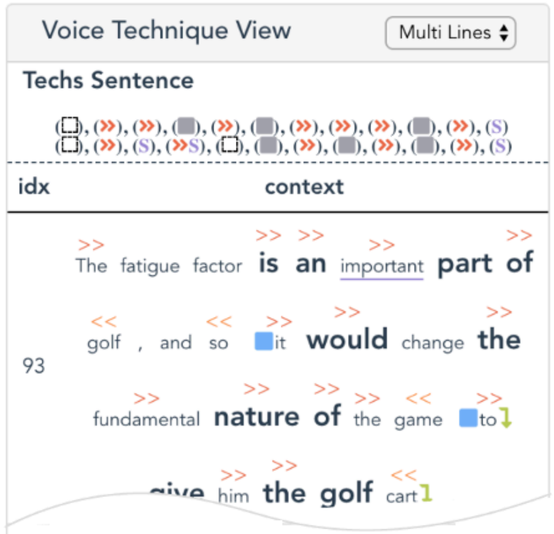


Query: Tact is … making **an enemy**

One-line mode

Phrase candidates for modulation of interest

- Combinations of modulation: (Faster », Stress S)
- Contexts of focused modulations



Multi-line mode

Corresponding sentence for modulation of interest

- Summary of modulation
- Contexts of focused sentences

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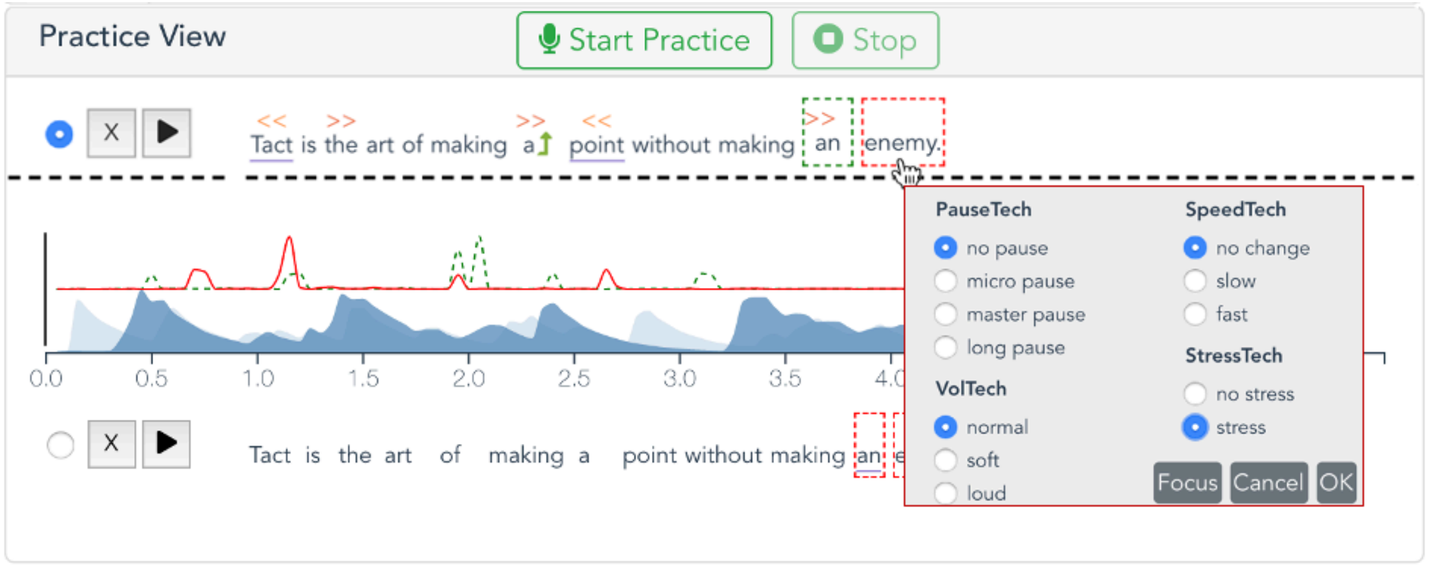
User Interface - Practice View



Original sentence and modulation

Configuration: an enemy (Faster », Stress S)

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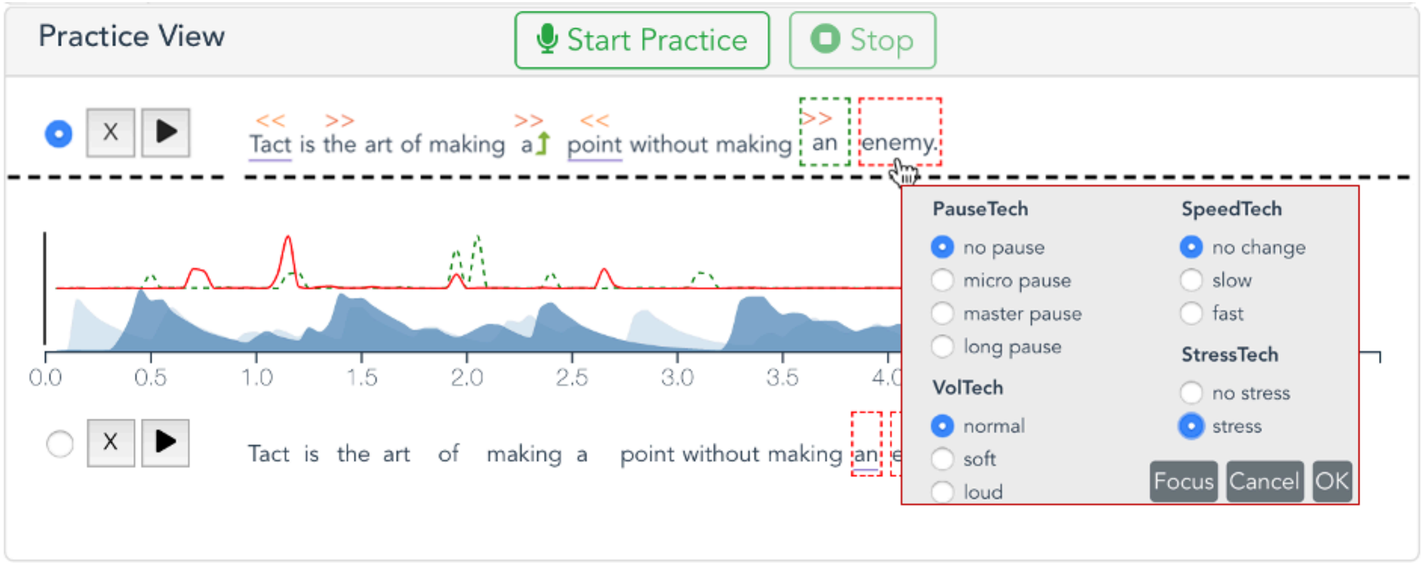
User Interface - Practice View



Realtime quantitative feedback curve & iterative practice

Last performance | Current performance

Line chart **(Pitch)**

Area chart **(Volume)**

Highlighting of differences

Pitch: line

Volume: area

Pause: segments that have volume = 0

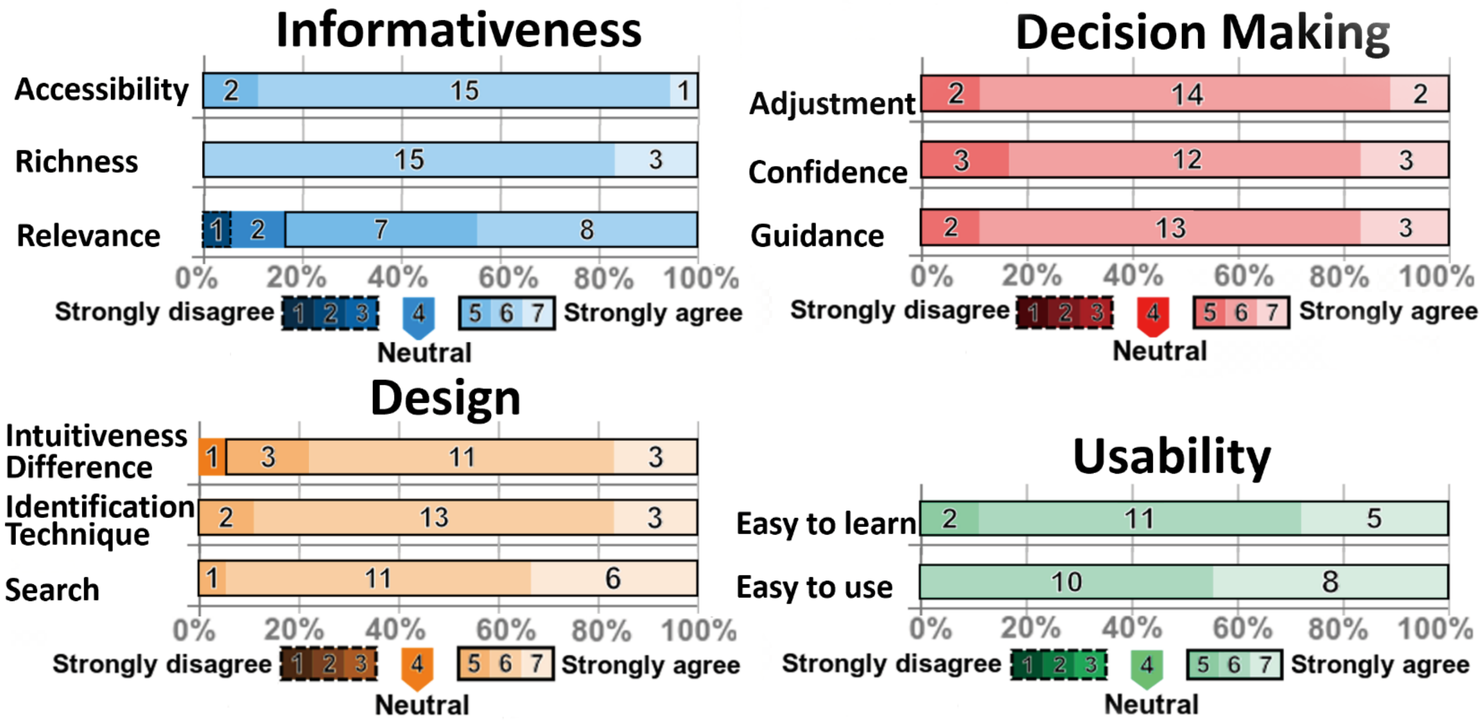
Speed: speed of curve

Evaluation

- **Expert Interviews**
- **User Study**
  - Recommendation helpfulness (recommendation view, voice technique view)
  - Effectiveness of immediate feedback (practice view)
  - Overall usability & effectiveness

User Study

Evaluation on recommendation (Recommendation View, Voice Technique View)



Questionnaire results of recommendation in 4 aspects

Recommended examples

(Voice Technique View)

- 4.21 (SD = 1.21) of top 5 satisfied the participants' needs.
- The relevance rate was 89%.

Overall feedback

- Positive, e.s.p. decision making & usability

User Study

Evaluation on Practice View

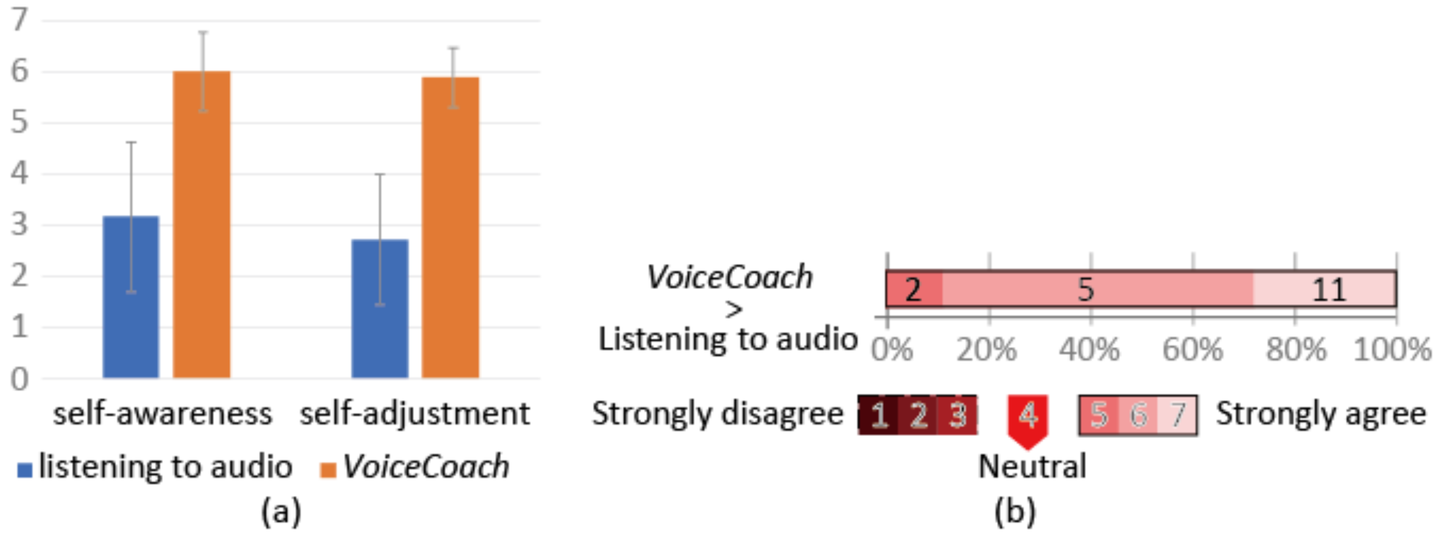


Fig. Results of questionnaire about user experience of practice:

VoiceCoach V.S. Listening to audio

Wilcoxon signed-rank test

- Self-awareness ($P<0.001$, $Z=-3.75$)
- Self-adjustment ($P<0.001$, $Z=-3.70$)

Overall feedback

- All participants prefer VoiceCoach

User Study

Overall Evaluation

1. Participants' feedback on VoiceCoach

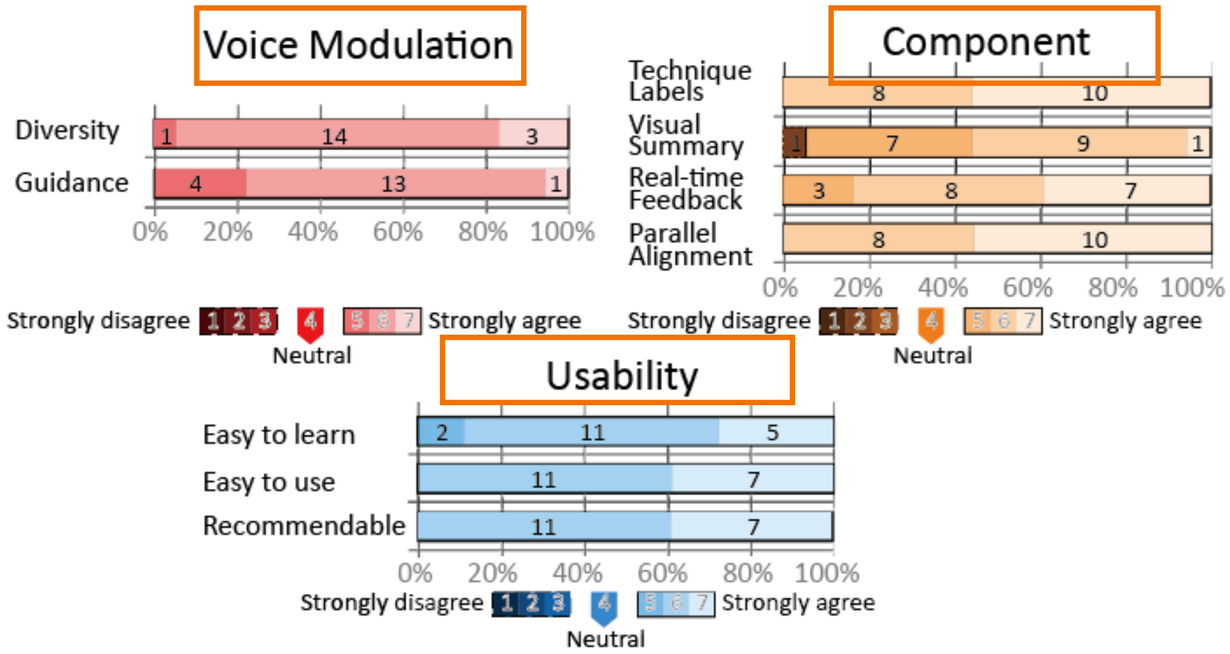


Fig. Results of questionnaire about system.

2. Scoring by coaches on participants' performance

Wilcoxon signed-rank test (**with/without** VoiceCoach)

- Performance (P=0.03, Z=-2.15)
  - VoiceCoach (5.08 +/- 1.08)
  - Without VoiceCoach (4.17 +/- 1.03)

Future Work

- **Extend** current dataset (e.g., academic talks)
- Learning from “**BAD**” examples of voice modulation
- **Improve** recommendation
  - Users’ preferences (e.g., examples with more pauses)

END

VoiceCoach

Thank you!

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