



Projects

CSC3160/MDS6002 teaching team

Project Topics

▶ **Three Recommended projects (Baseline provided)**

- Singing voice conversion (POC: Xueyao Zhang)
- Detecting generated abstract (POC: Feng Jiang)
- Voice Spoofing detection (POC: Li Wang)

▶ **Other projects including: (POC: Xi Chen)**

- Conversation summarization
- Accent conversion
- Audio quality prediction
- Commonsense QA
- Fake news detection
-

If you do NOT choose one of the three recommended projects, please contact Xi Chen (xichen7@link.cuhk.edu.cn) before Feb 24

Singing Voice Conversion Project

▶ POC: Xueyao Zhang (xueyaozhang@link.cuhk.edu.cn)

▶ Background

- Singing Voice Conversion (SVC) is to convert singing voice to our desired targets. It has been paid more and more attention due to its potential applications in imitation and entertainment, singing voice beautification, vocal education, and creative art.
- You can read this tutorial to know more about it (including the related papers and datasets): <https://www.zhangxueyao.com/data/SVC/tutorial.html>

▶ Task

- You need to conduct an “**any-to-one**” conversion task. Specifically, given any singing voice source, you are required to convert it to *Opencpop* singer’s singing voice.

▶ Baseline

- WORLD-based SVC: <https://github.com/SLPcourse/Singing-Voice-Conversion>

Singing Voice Conversion Project

- ▶ Potential ideas to work on
 - Reproduce 1-3 published papers
 - Inject singing voice **domain knowledge** (eg: pitch, duration, score, timbre features) in to the model
 - Explore the impact of different **vocoders**
 - Design better **evaluation metrics**. For example, more robust objective evaluation, or more efficient and friendly subjective evaluation
 - Improve the **explainability** of SVC. For example, **visualize** the different module of the deep learning framework.
 - Bring your own idea

XU

provide some ideas for singing voice conversion research



Here are a few ideas for singing voice conversion research:



1. Developing new machine learning models for singing voice conversion that can handle a wider range of singing styles and languages.
2. Improving the quality of the converted singing voice, by researching ways to better preserve the expressive elements of the singing, such as vibrato and phrasing.
3. Investigating the use of unsupervised or semi-supervised learning techniques for singing voice conversion, which would require less labeled data.
4. Developing a singing voice conversion system that can work in real-time, so that it can be used in live performance settings.
5. Exploring the use of transfer learning techniques to improve the performance of singing voice conversion models on low-resource languages and genres.
6. Investigating the use of singing voice conversion for creating more expressive synthetic singing voices for digital music composition, or to enhance the singing of people with speech and singing disorders.
7. Investigating the use of singing voice conversion for creating expressive synthetic singing voices for virtual assistants and voice assistants.
8. Investigating the use of singing voice conversion to enhance the singing in games, movies, and other interactive media.
9. Investigating the use of singing voice conversion to enhance the singing in karaoke and singing games.

These are just a few examples, and there are many other possibilities for singing voice conversion research.

Suggestions from ChatGPT

Detecting Generated Abstract Project

- ▶ POC: Feng Jiang (jeffreyjiang@cuhk.edu.cn)

Detecting Generated Abstract Project

► POC: Feng Jiang (jeffreyjiang@cuhk.edu.cn)

◆ What is ChatGPT?

Let's take a quick poll

1. How many of you have tried using ChatGPT?



Detecting Generated Abstract Project

◆ What is ChatGPT?

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1. How many of you have tried using ChatGPT?
2. How many of you feel that ChatGPT is powerful?



Detecting Generated Abstract Project

◆ What is ChatGPT?

Let's take a quick poll

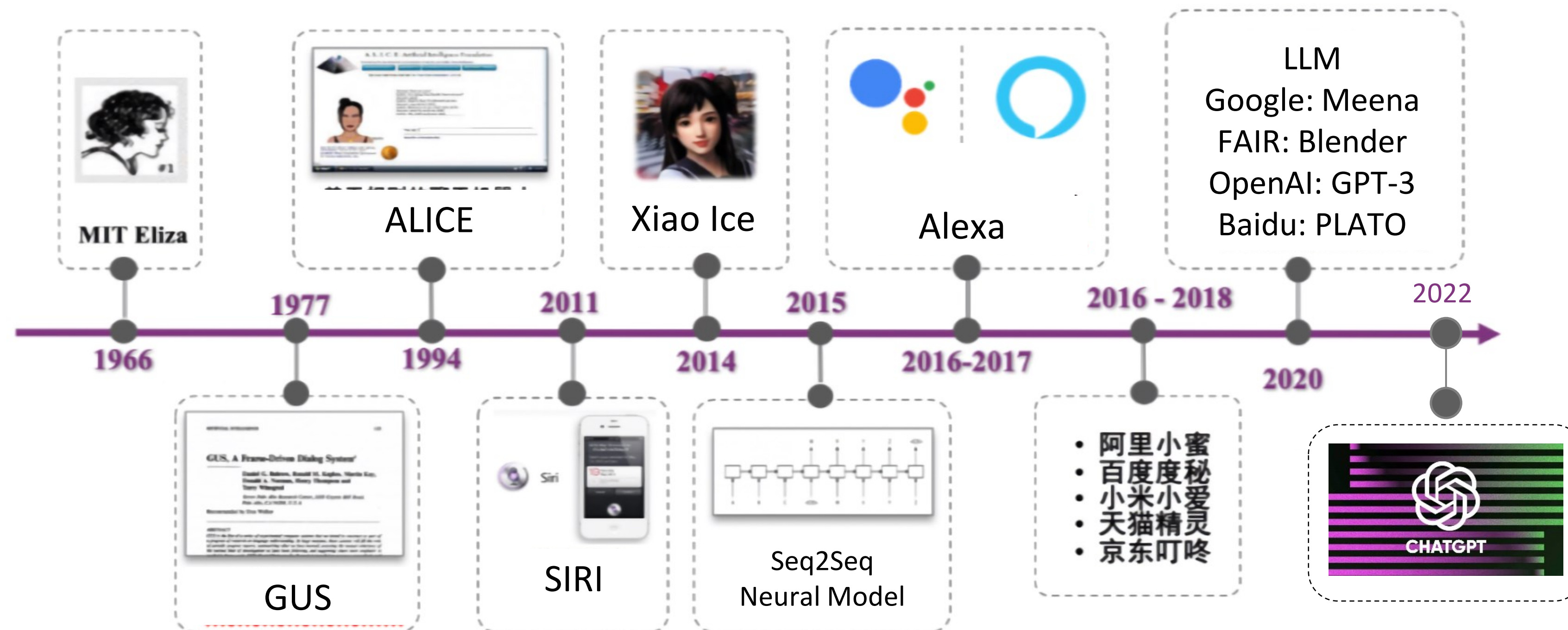
1. How many of you have tried using ChatGPT?
2. How many of you feel that ChatGPT is powerful?
3. How many of you want a tool to detect the ChatGPT-generated text?



Detecting Generated Abstract Project

◆ What is ChatGPT?

ChatGPT is the **latest conversation system** of GPT series based on **large-scale pre-training language model**



Detecting Generated Abstract Project

◆ **Simple Turing Test:** Can ChatGPT cheat you?

Which answer is generated by ChatGPT? Can you give your reasons?

Question: What is an array in programming?

Answer1: In computer science, array programming languages (also known as vector or multidimensional languages) generalize operations on scalars to apply transparently to vectors, matrices, and higher dimensional arrays. Array programming primitives concisely express broad ideas about data manipulation.

Answer2: In programming, an array is a data structure that is used to store a collection of items. The items can be of the same type, or they can be of different types. An array is often used to store a large number of values that are of the same type, such as a list of numbers or a list of strings.

Detecting Generated Abstract Project

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Detecting Generated Abstract Project

◆ The impact of ChatGPT in Education

Many students use it to finish their assignments.



Come from Nata Metlukh

Chat GPT Use in Fall Quarter 2022 Finals

If you used ChatGPT to assist with your final fall quarter assignments and/or exams, to what extent did you use it?

Brainstorming, outlining, and forming ideas

59.2%

Answered multiple-choice questions with the help of ChatGPT

29.1%

Submitted written material from ChatGPT with edits

7.3%

Submitted written material from ChatGPT without edits

5.5%

Come from The Stanford Daily

Public schools in New York are prohibited from using ChatGPT.

Although this tool may provide quick answers to questions, it cannot cultivate critical thinking and problem-solving ability, which will affect students' academic and lifelong achievements.

Detecting Generated Abstract Project

◆ The impact of ChatGPT in Science

- [1] <https://www.nature.com/articles/d41586-023-00056-7>
- [2] <https://www.nature.com/articles/d41586-023-00340-6>
- [3] <https://www.nature.com/articles/d41586-023-00288-7>

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NEWS | 12 January 2023

Abstracts written by ChatGPT fool scientists

Researchers cannot always differentiate between AI-generated and original abstracts.

[Holly Else](#)

nature

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COMMENT | 03 February 2023

ChatGPT: five priorities for research

Conversational AI is a game-changer for science. Here's how to respond.

[Eva A. M. van Dis](#), [Johan Bollen](#), [Willem Zuidema](#), [Robert van Rooij](#) & [Claudi L. Bockting](#) 

Three articles contain ChatGPT in the title published by Nature within two months, which can be seen as its impact on the scientific field.

nature

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[nature](#) > [news feature](#) > article

NEWS FEATURE | 06 February 2023 | Correction [08 February 2023](#)

What ChatGPT and generative AI mean for science

Researchers are excited but apprehensive about the latest advances in artificial intelligence.

[Chris Stokel-Walker](#) & [Richard Van Noorden](#)

Detecting Generated Abstract Project

◆ The Detector of ChatGPT

Therefore, some people think we need to build the detector to prevent ChatGPT.

Importance of Detectors for ChatGPT

- **Transparency:** Help readers understand the source of information and judge its credibility
- **Misinformation:** Minimize the spread of false information
- **Fraud prevention:** Prevent AI-generated text from being used for malicious purposes

Limitations of Detectors for ChatGPT

- Can be circumvented by determined individuals
- Not 100% effective

Despite Limitations, Detectors Serve an Important Purpose

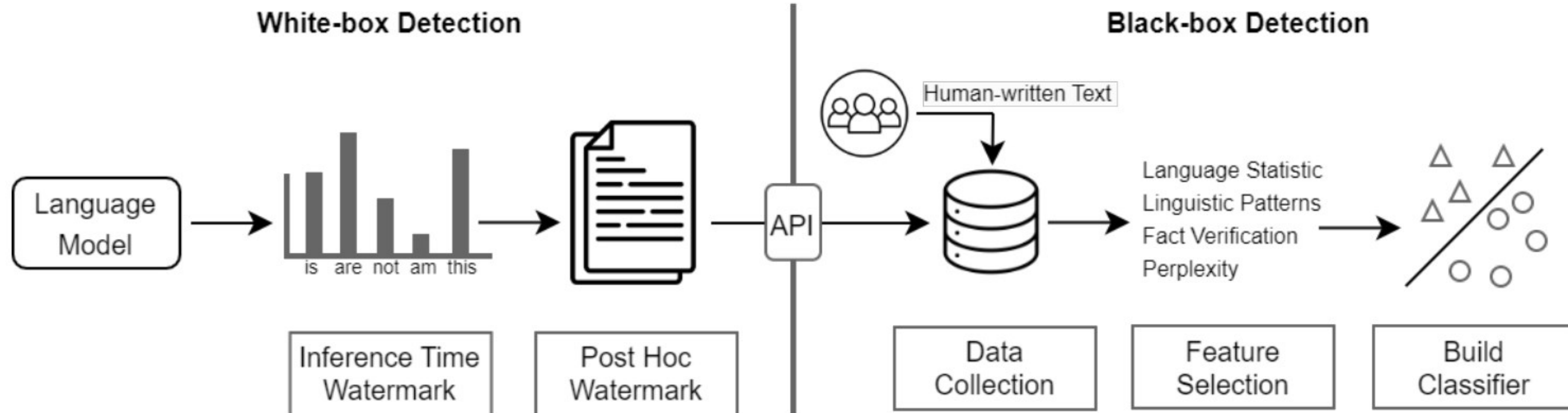
- Serve as a deterrent for malicious individuals and organizations
- Provide a baseline for evaluating text authenticity
- Drive progress in AI research and development toward more advanced detectors in the future

Detecting Generated Abstract Project

[The Science of LLM-generated Text Detection](#)

◆ The Detector of ChatGPT

- ◆ White-box Detection: Add the watermark to label it when the model generates text.
- ◆ Black-box Detection: Build a classifier to detect it by language statistic or linguistic pattern.



The overview of the LLM-generated text detection.

Detecting Generated Abstract Project

GPT-2 output: <https://openai-openai-detector.hf.space/>
AI Text Classifier: <https://platform.openai.com/ai-text-classifier>
GPT-ZERO: <https://gptzero.me/>
DetectGPT: <https://detectgpt.ericmitchell.ai/>
ChatGPT detector: <https://huggingface.co/spaces/Hello-SimpleAI/chatgpt-detector-single>

◆ The Detector of ChatGPT

Black-box Detectors



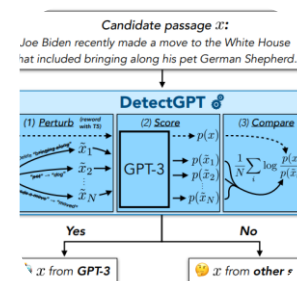
GPT-2 output detector



AI Text Classifier



GPT-ZERO



DetectGPT



ChatGPT detector

English 中文版

Note: Providing more text to the 'Text' box can make the prediction more accurate.

Text

In programming, an array is a data structure that is used to store a collection of items, such as a list of numbers or a list of strings.

Predicted Label 🎃

ChatGPT

Prob

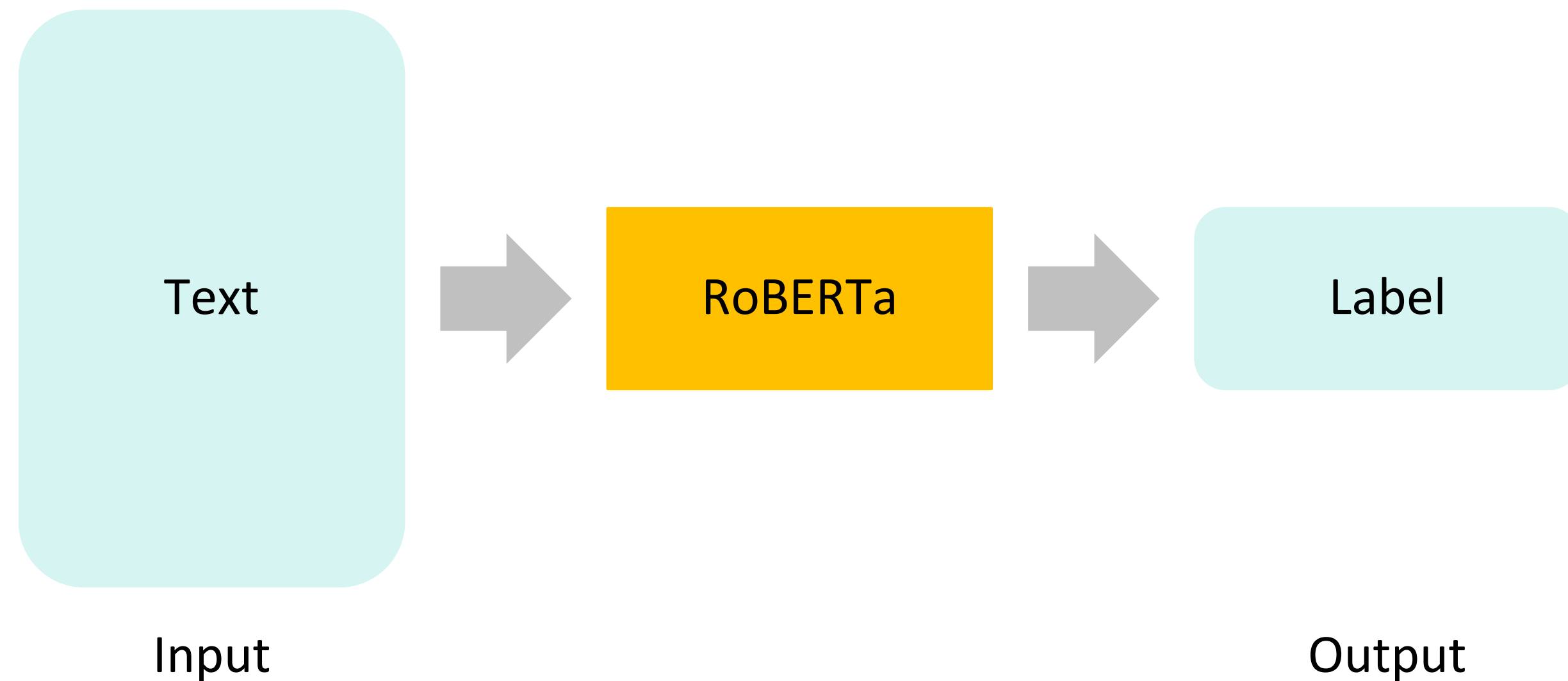
0.9998898506164551

Detecting Generated Abstract Project

[How Close is ChatGPT to Human Experts?
Comparison Corpus, Evaluation, and Detection](#)

◆ Model (RoBERTa)

View the task as a text classification: Detect whether a piece of text is ChatGPT generated, using PLM-based classifiers (RoBERTa)



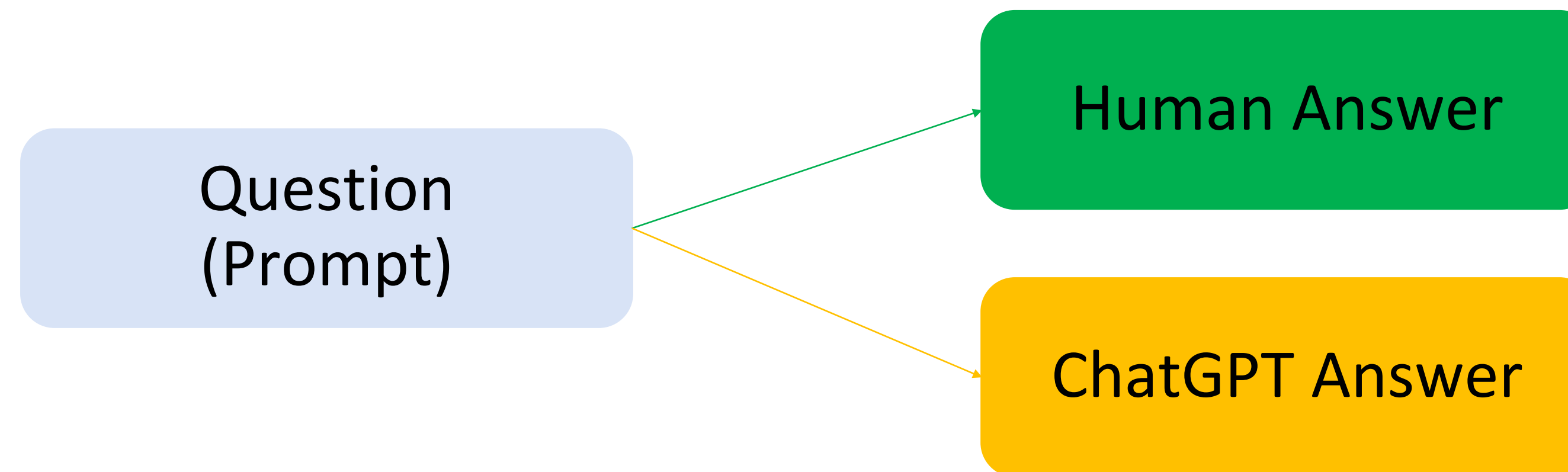
[RoBERTa: A Robustly Optimized BERT Pretraining Approach](#)

Detecting Generated Abstract Project

[How Close is ChatGPT to Human Experts?
Comparison Corpus, Evaluation, and Detection](#)

◆ Data Collection

The dataset comes from HC3-English corpus, which contains the human answer and ChatGPT answer for the same Question



HC3-English

	# Questions	# Human Answers	# ChatGPT Answers	Source
All	24322	58546	26903	
<i>reddit_eli5</i>	17112	51336	16660	ELI5 dataset [10]
<i>open_qa</i>	1187	1187	3561	WikiQA dataset [39]
<i>wiki_csai</i>	842	842	842	Crawled Wikipedia (A.1)
<i>medicine</i>	1248	1248	1337	Medical Dialog dataset [6]
<i>finance</i>	3933	3933	4503	FiQA dataset [23]

Detecting Generated Abstract Project

◆ Assignment

Objective: Create a detector for identifying text generated by ChatGPT

1. Reproduce the independent text version of ChatGPT detector (Baseline)
2. Build an improved detector considering model selection and better training methods
3. Optionally, participate in a more challenging task: Detecting the AI-polished abstract

For more details, see github repo, coming soon.

Detecting Generated Abstract Project

◆ Detecting the AI-polished abstract

State-level policies greatly impact aspects of our daily life, like healthcare and education access. Nonetheless, little is known about the legislative process behind these policies. To address this, we use a data-driven approach to decode how legislation impacts stakeholders, like teachers, to gain insights into the decision-making and voting process of legislators. We compile a new dataset for several US states by linking various sources of information, including bills, stakeholders, legislators, and donors. Using a textual graph-based model, we analyze state bills and predict their winners/losers. We then utilize this information to better understand the legislative body's vote breakdown by demographic/ideological criteria, such as gender.

Decisions on state-level policies have a deep effect on many aspects of our everyday life, such as health-care and education access. However, there is little understanding of how these policies and decisions are being formed in the legislative process. We take a data-driven approach by decoding the impact of legislation on relevant stakeholders (e.g., teachers in education bills) to understand legislators' decision-making process and votes. We build a new dataset for multiple US states that interconnects multiple sources of data including bills, stakeholders, legislators, and money donors. Next, we develop a textual graph-based model to embed and analyze state bills. Our model predicts winners/losers of bills and then utilizes them to better determine the legislative body's vote breakdown according to demographic/ideological criteria, e.g., gender.

Voice Spoofing Detection Project

- ▶ **POC: Li Wang (wangli@cuhk.edu.cn)**
- ▶ **Background**
 - Intelligent voice systems, such as speaker recognition and automatic speech recognition, are vulnerable to spoofing attacks, limiting their further development. Therefore, voice spoofing detection techniques are needed to ensure the safety the system.



Voice Spoofing Detection Project

▸ Task

- The voice spoofing detection task is essentially a binary classification task. Specifically, given an audio, label it as either bonafide or spoof.

▸ Baseline

- High Frequency Cross-Subband: <https://github.com/SLPcourse/Voice-Spoofing-Detection>

Voice Spoofing Detection Project

► Potential ideas to work on

- Reproduce 1-3 published papers
- Try generative methods: In the ASVSpooof2021 competition, the one class classification method was used, which is a generative method that shows the highest spoof detection accuracy, outperforming the baseline system.
- Data augmentation: text-to-speech, voice conversion, adversarial generation, and audio clipping are the ways to generate attack samples, and the dataset can be augmented using the above methods.
- Exploring network structures: Different network structures, such as convolutional neural networks and attention mechanisms, are good at identifying different types of spoofed samples due to their different modeling properties.
- Bring your own idea.