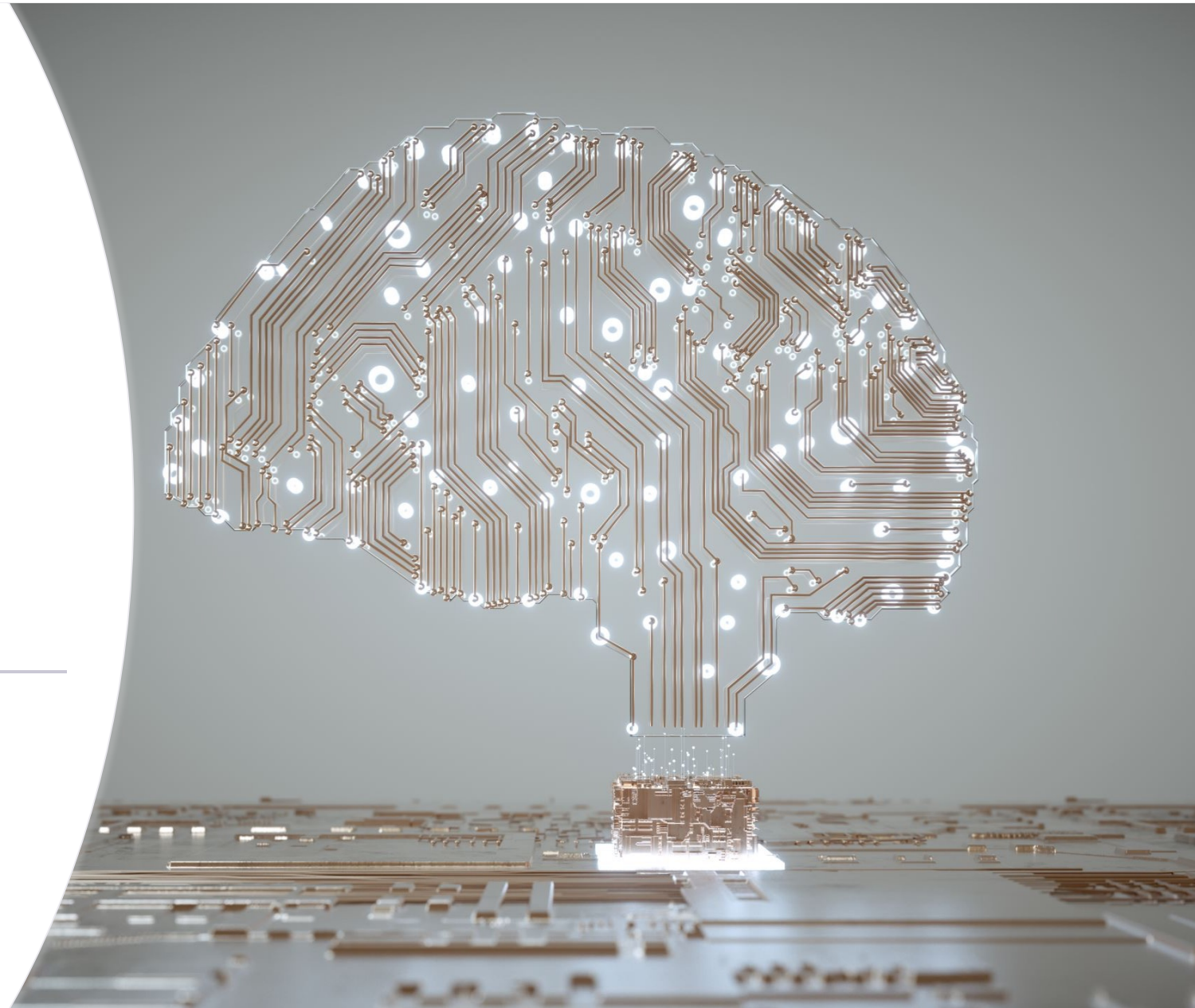# Artificial Intelligence for Professional Translators

SIU Sai Cheong

Outline

An Overview of Artificial Intelligence

Technology for Translators: Examples and Useful Tips

New Trend: Technology for Multimodal Translation

1. An Overview of Artificial Intelligence
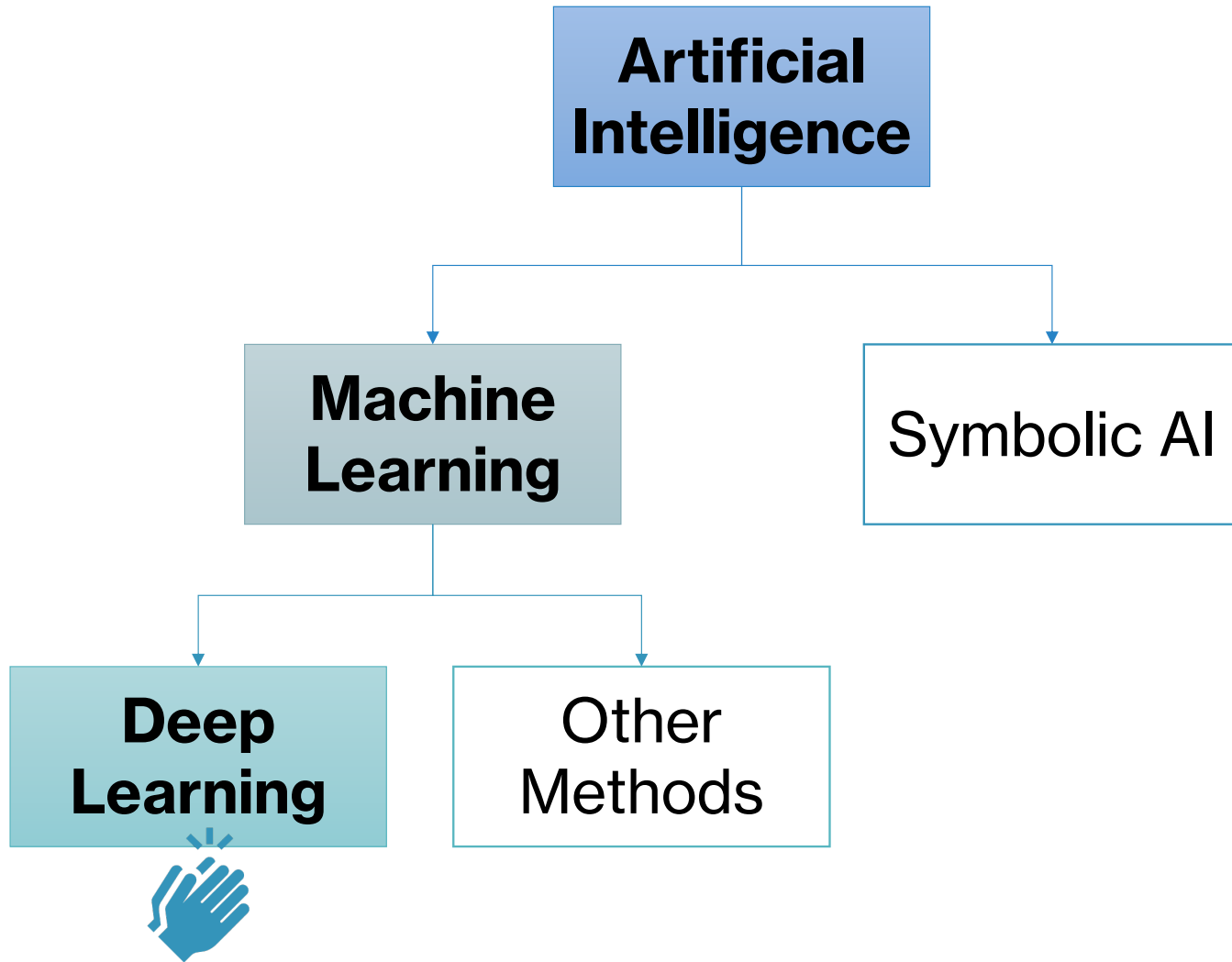
Language and Translation

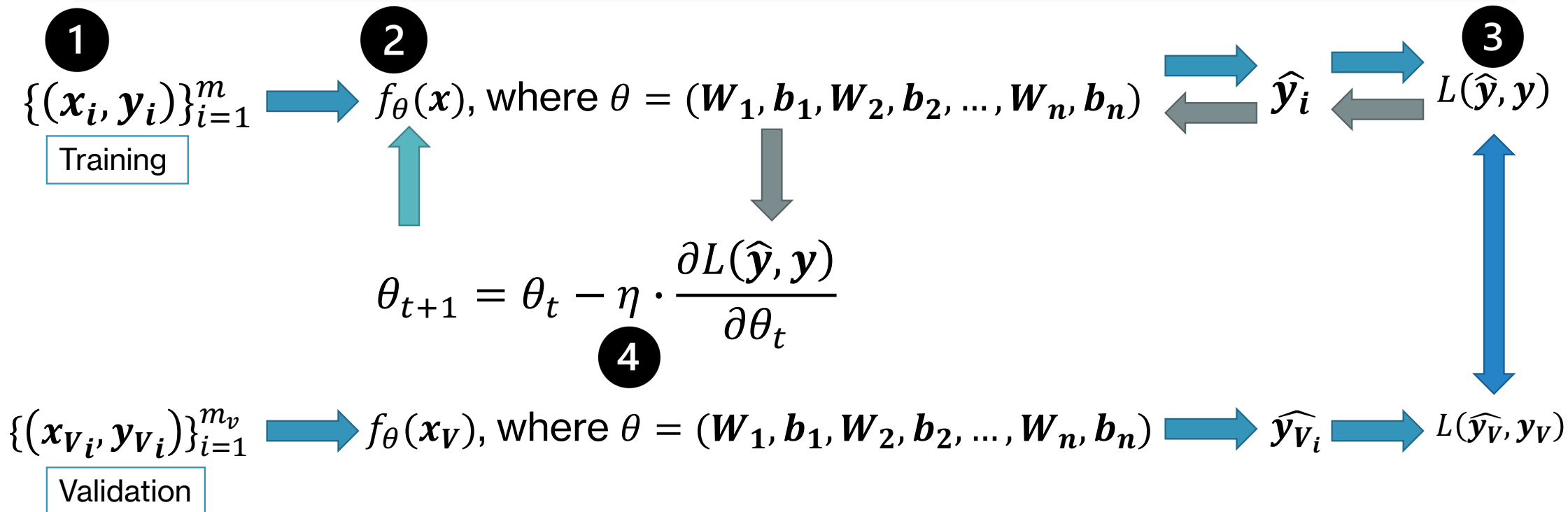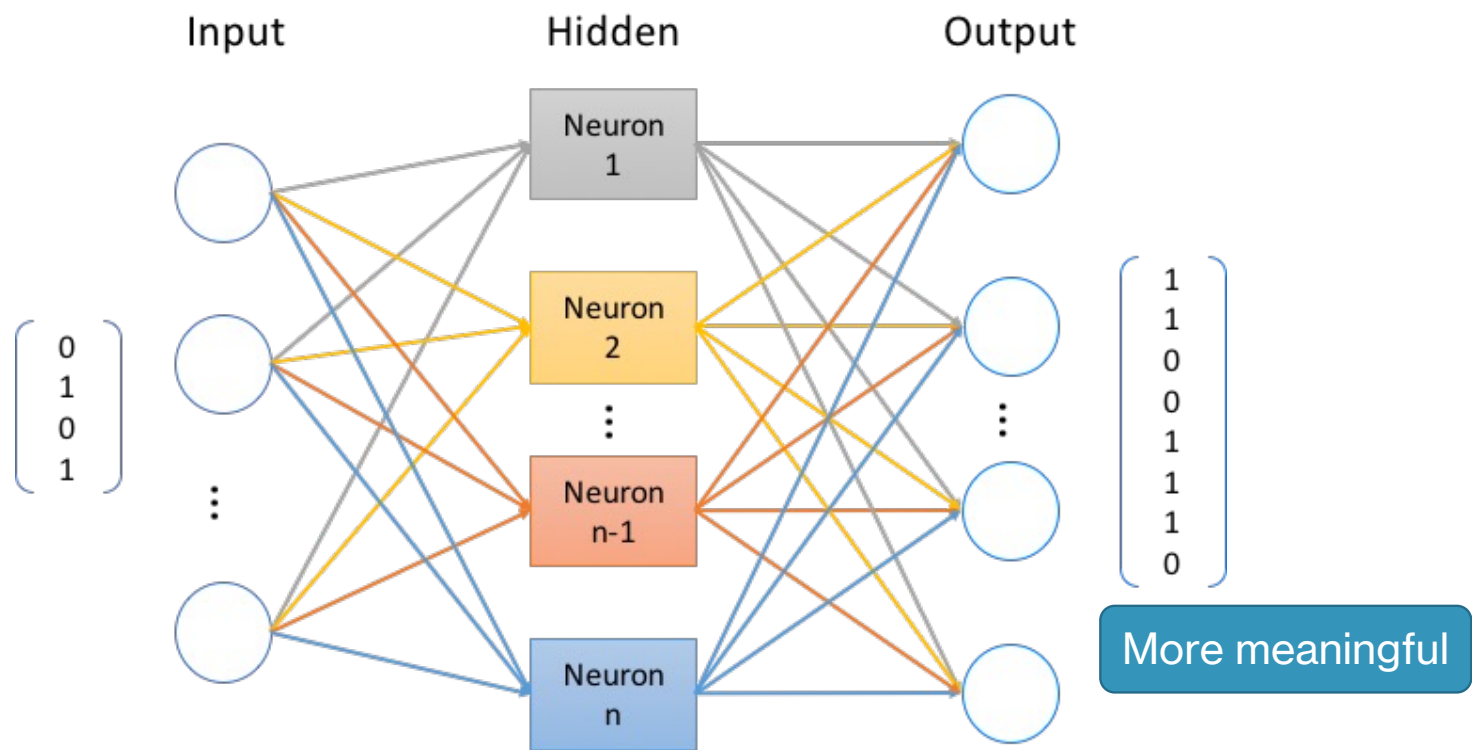# Three Concepts
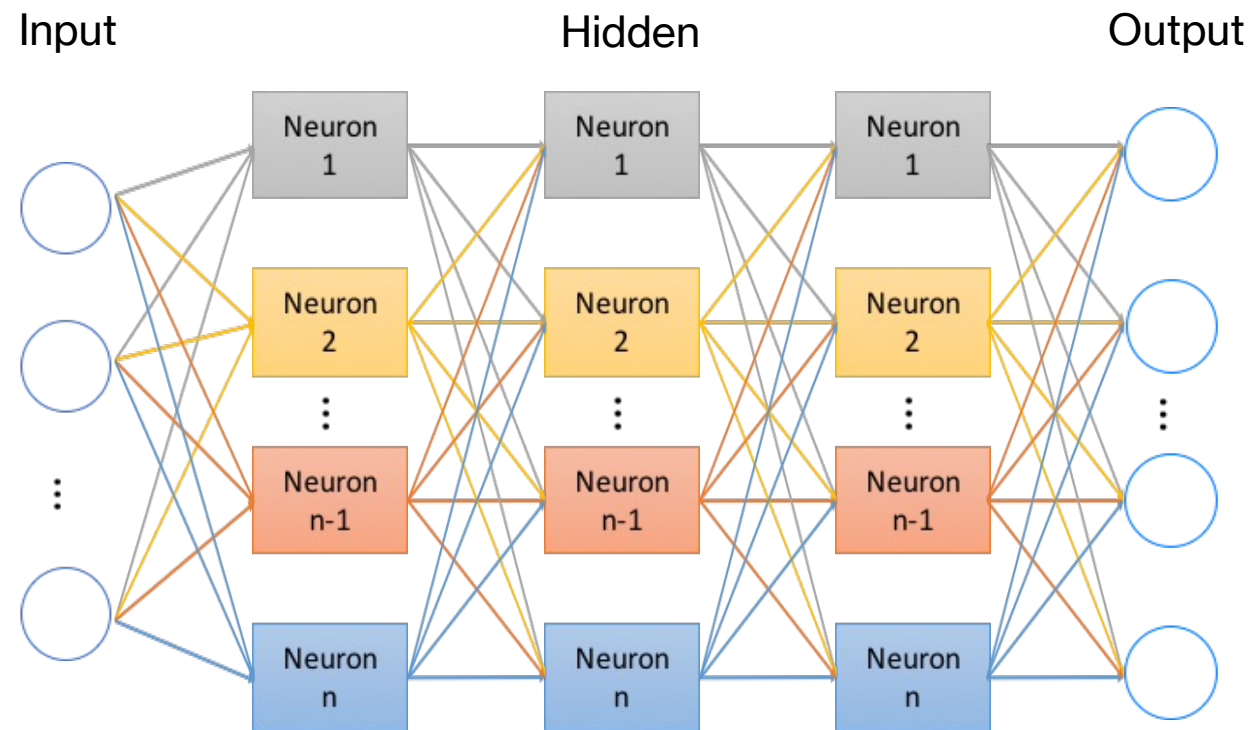
Artificial Intelligence

Machine Learning

Deep Learning

Deep Learning: A "Simple" Example 😵‍💫

① $\{(\boldsymbol{x_i}, \boldsymbol{y_i})\}_{i=1}^{m}$ ⟶ **②** $f_\theta(\boldsymbol{x})$, where $\theta = (\boldsymbol{W_1}, \boldsymbol{b_1}, \boldsymbol{W_2}, \boldsymbol{b_2}, \ldots, \boldsymbol{W_n}, \boldsymbol{b_n})$ ⟶ $\widehat{\boldsymbol{y_i}}$ ⟶ **③** $L(\widehat{\boldsymbol{y}}, \boldsymbol{y})$

Training

$$\theta_{t+1} = \theta_t - \eta \cdot \frac{\partial L(\widehat{\boldsymbol{y}}, \boldsymbol{y})}{\partial \theta_t}$$

④ $\{(\boldsymbol{x_{V_i}}, \boldsymbol{y_{V_i}})\}_{i=1}^{m_v}$ ⟶ $f_\theta(\boldsymbol{x_V})$, where $\theta = (\boldsymbol{W_1}, \boldsymbol{b_1}, \boldsymbol{W_2}, \boldsymbol{b_2}, \ldots, \boldsymbol{W_n}, \boldsymbol{b_n})$ ⟶ $\widehat{\boldsymbol{y_{V_i}}}$ ⟶ $L(\widehat{\boldsymbol{y_V}}, \boldsymbol{y_V})$

Validation

Artificial Neural Network

Input **Hidden** **Output**

Neuron 1	Neuron 1	Neuron 1
Neuron 2	Neuron 2	Neuron 2
Neuron n-1	Neuron n-1	Neuron n-1
Neuron n	Neuron n	Neuron n

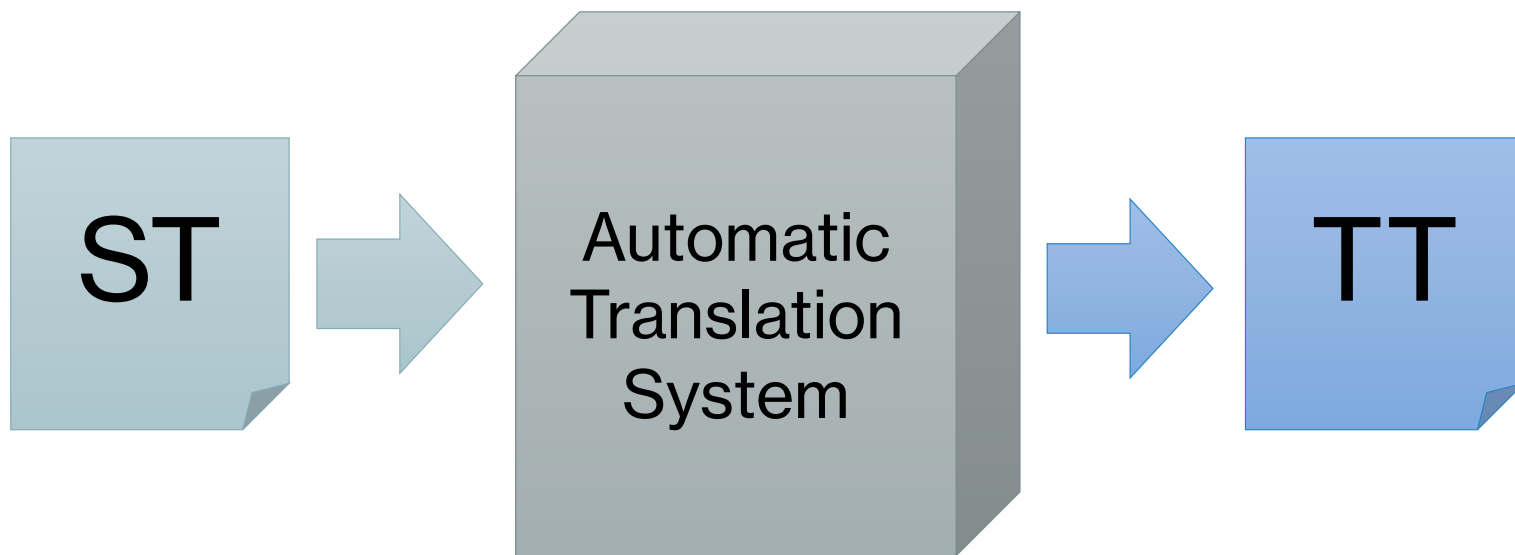**Deep Neural Network**

2. Technology for Translators

Translator-technology interaction

Machine Translation (MT)

ST → Automatic Translation System → TT

Four Ways to Build Machine Translation Systems

- I go to school by train.
- I go to school by <u>taxi</u>. 我乘<u>計程車</u>去學校。
- 我乘火車去學校。

- Deep Learning
- Artificial neural networks

Rule-based Machine Translation

Example-based Machine Translation

Statistical Machine Translation

Neural Machine Translation

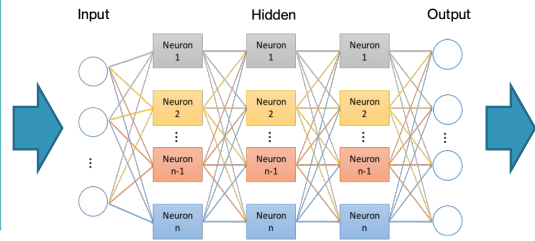- I go to school by train.
- 我 / 去 / 學校 / 乘 / 火車 / 。
- 我乘火車去學校。

- Translation Model
  $P(\text{"I"}|\text{"我"}) \times P(\text{"go"}|\text{"去"}) \times \ldots$
- Language Model:
  $P(\text{"我乘火車去學校"})$

ST → Input | Hidden | Output → 3 0 6 2 4 7 0 0 3 0 6 2 4 7 7 0 → Input | Hidden | Output → TT
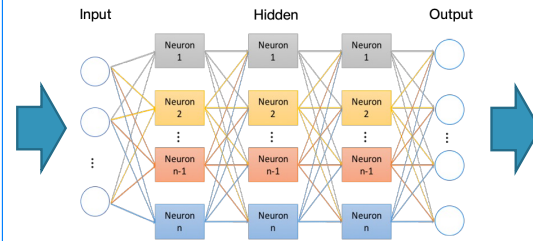
Encoding

Decoding

Neural Machine Translation

Automatic Translation as a Prediction Problem: Given X, what is the next word?

Given the following:

ST: I / go / to / school / by / bus / . /

TT: 我 / 乘

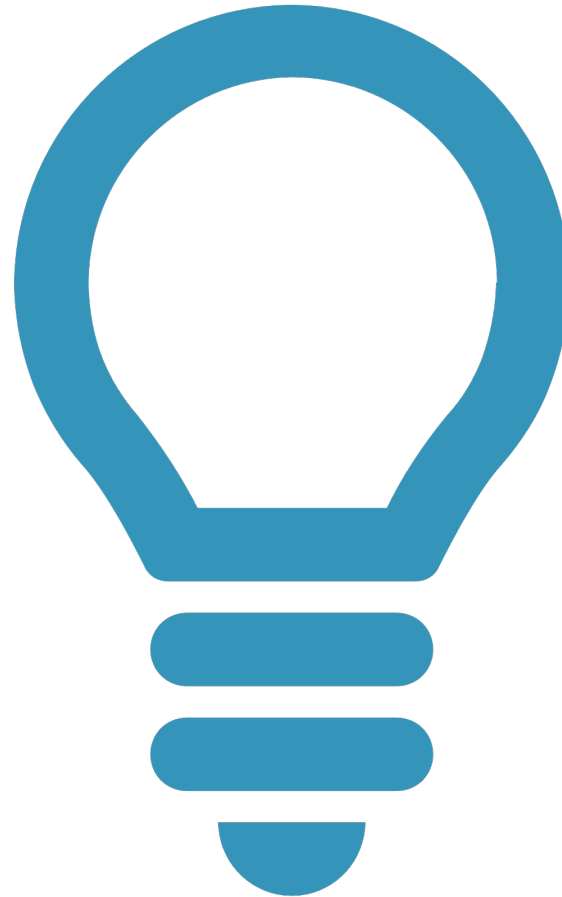Which of the following is most likely to be the next word?

公車

火車

學校

咖啡

電腦

翻譯

A Few Examples

- Google Translate: https://translate.google.com/

- Bing Translator: https://www.bing.com/translator

- Yandex Translate: https://translate.yandex.com/

- DeepL: https://www.deepl.com/translator

Tips

Tip 1

- Use multiple machine translation engines

Example
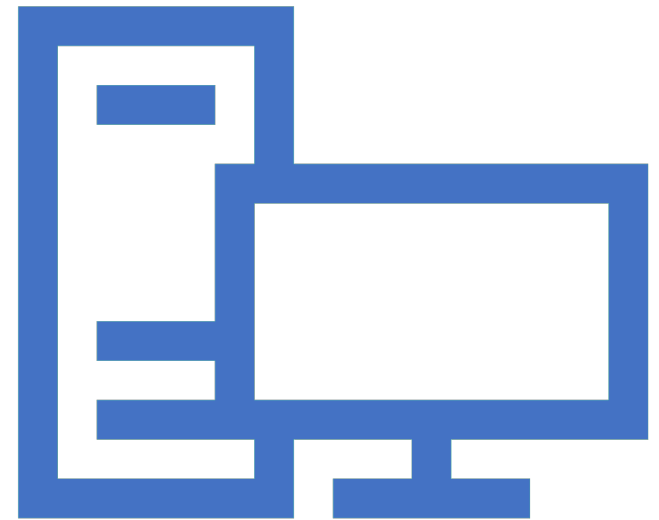
- QTranslate (https://quest-app.appspot.com/home)

Tip 2

- Use specialised translation engines

Examples

- Baidu: https://fanyi.baidu.com/

- Sogou: https://fanyi.sogou.com/text

- WIPO Translate: https://www.wipo.int/wipo-translate/en/

Our Project 1*

Read more: Siu (2019)

• **"Machine Translation of IPO Documents"**

IPO Documents

- IPO documents are usually prepared by lawyers and accountants in English and need to be translated to Chinese as required by HKEX.

- The translation task, usually handled by printing companies, is costly and labor-intensive.

IPOTranslate

Technology for Translation of IPO Prospectuses

What's IPOTranslate?

IPOTranslate is a web-based platform for computer (-aided) translation of prospectuses for Initial Public Offerings (IPOs) from English into Chinese. The system is the product of a machine translation project supported by the Innovation Technology Fund (Project title: Machine Translation of IPO Documents (ITF/238/17)), which was completed in May 2019 and aimed to explore the possibilities of supporting the translation of IPO documents by applying deep learning technology.

IPO Translate (English-Chinese Translation)

Source Text

Hong Kong Exchanges and Clearing Limited, The Stock Exchange of Hong Kong Limited and Hong Kong Securities Clearing Company Limited take no responsibility for the contents of this Prospectus, make no representation as to its accuracy or completeness, and expressly disclaim any liability whatsoever for any loss howsoever arising from or in reliance upon the whole or any part of the contents of this Prospectus.

A copy of this Prospectus, having attached thereto the documents specified in "Appendix V — Documents Delivered to the Registrar of Companies and Available for Inspection" to this Prospectus, has been registered by the Registrar of Companies in Hong Kong as required by section 342C of the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Chapter 32 of the Laws of Hong Kong). The Securities and Futures Commission and the Registrar of Companies in Hong Kong take no responsibility for the contents of this Prospectus or any other document referred to above.

[Load Sample] [Translate]

Hong Kong Exchanges and Clearing Limited, The Stock Exchange of Hong Kong Limited and Hong Kong Securities Clearing Company Limited take no responsibility for the contents of this Prospectus, make no representation as to its accuracy or completeness, and expressly disclaim any liability whatsoever for any loss howsoever arising from or in reliance upon the whole or any part of the contents of this Prospectus.

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Translation 1	Translation 2
香港交易及結算有限公司、香港聯合交易所有限公司及香港證券結算有限公司就本招股章程的內容概不承擔任何責任,概不就其準確性或完整性表示任何聲明,並明確概不就本招股章程所載的全部或任何部分產生的任何虧損而產生的任何損失承擔責任。	香港交易及結算所有限公司、香港聯合交易所有限公司及香港中央結算有限公司對本招股章程的內容概不負責,對其準確性或完整性概不發表任何聲明,並明確表示概不就因本招股章程全部或任何部分內容而產生或因依賴該等內容而產生的任何損失承擔任何責任。

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Translation 1	Translation 2
本招股章程的副本連同本招股章程「附錄五－送呈公司註冊處處長及備查文件」所載文件所附的文件,已根據公司(清盤及雜項條文)條例第342C 條(香港法例第32章)的規定於香港公司登記。	本招股章程副本連同本招股章程「附錄五－送呈公司註冊處處長及備查文件」所述文件,已根據公司(清盤及雜項條文)條例(香港法例第32章)第342C 條的規定由香港公司註冊處處長登記。

The Securities and Futures Commission and the Registrar of Companies in Hong Kong take no responsibility for the contents of this Prospectus or any other document referred to above.

Translation 1	Translation 2
證券及期貨事務監察委員會及香港公司註冊處處長概不就本招股章程或上文所述任何其他文件的內容負責。	證券及期貨事務監察委員會及香港公司註冊處處長對本招股章程或上述任何其他文件的內容概不負責。

Our Project 2*

Read more: Siu (2022)

- **"A Hybrid Approach to the Translation of Government Press Releases: Integration of Translation Memories and Neural Machine Translation"**
- Computer-aided Translation of HKSAR Government Press Releases
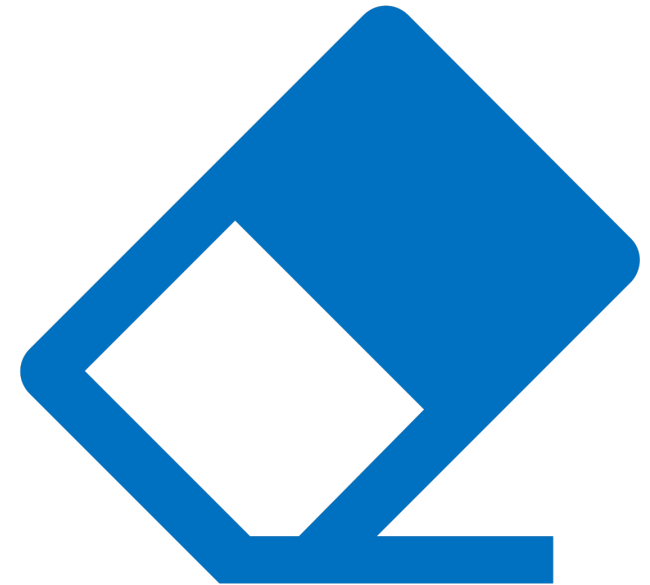
HKSAR Government Press Releases

- An important communication channel between the government and the public

- Information provided by different bureaus and departments

HKSAR Government Press Releases

- Available online: https://www.info.gov.hk/gia/general/today.htm
- Three versions: English, Traditional Chinese, and Simplified Chinese

Tip 3
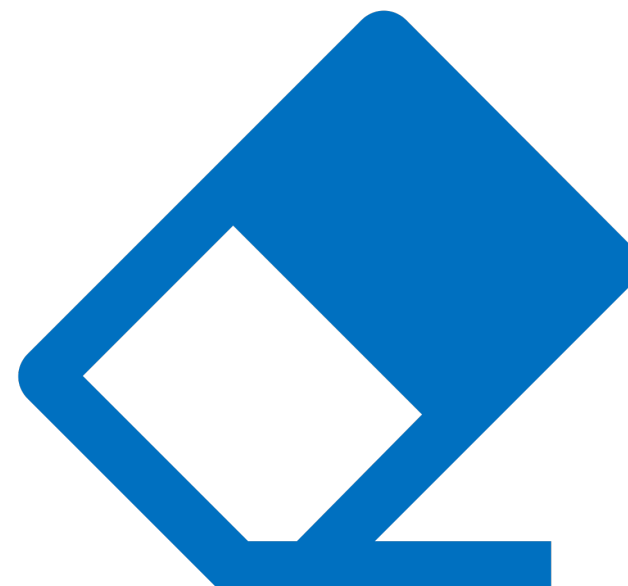
- ???

Consider the following:

- 為了更好地發揮香港聚財集氣的優勢和國際金融中心的影響力，我已邀請金管局籌備舉辦高層次的投資峯會，邀請國際和內地金融機構的負責人來港出席，親身了解香港的獨特優勢及投資環境，共同探討未來的環球金融機遇和香港可以發揮的作用。

Consider the following:

- **Source Text:** 為了更好地發揮香港聚財集氣的優勢和國際金融中心的影響力，我已邀請金管局籌備舉辦高層次的投資峯會，邀請國際和內地金融機構的負責人來港出席，親身了解香港的獨特優勢及投資環境，共同探討未來的環球金融機遇和香港可以發揮的作用。

- **TT1:** In order to better leverage Hong Kong's advantages of gathering wealth and gas and its influence as an international financial center, I have invited the HKMA to prepare for a high-level investment summit, and invited the heads of international and mainland financial institutions to attend and learn about Hong Kong first-hand. to explore the future global financial opportunities and the role that Hong Kong can play.

- **TT2:** In order to make better use of Hong Kong's advantages of pooling capital and talents and its influence as an international financial center, I have invited the HKMA to organize a high-level investment summit, and invited the heads of international and mainland financial institutions to attend Hong Kong, so as to understand Hong Kong first-hand the unique advantages and investment environment, and jointly explore the future global financial opportunities and the role that Hong Kong can play.
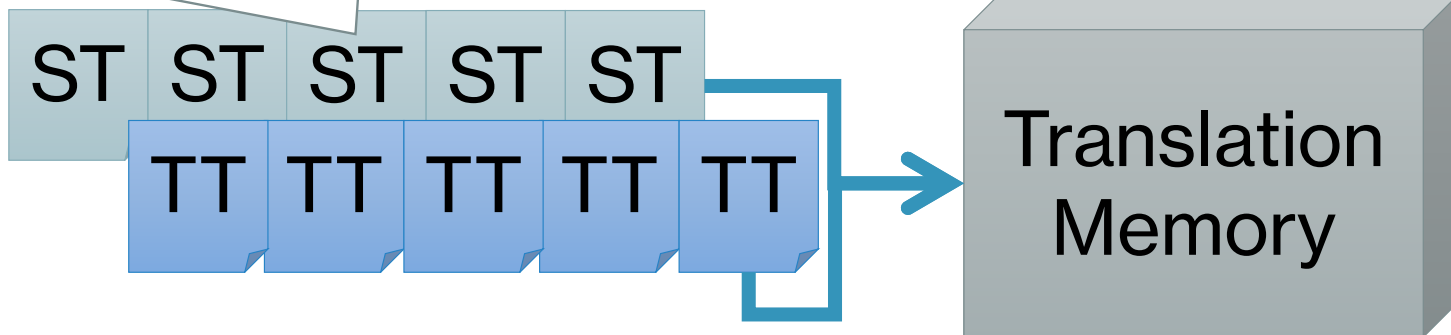
Tip 3

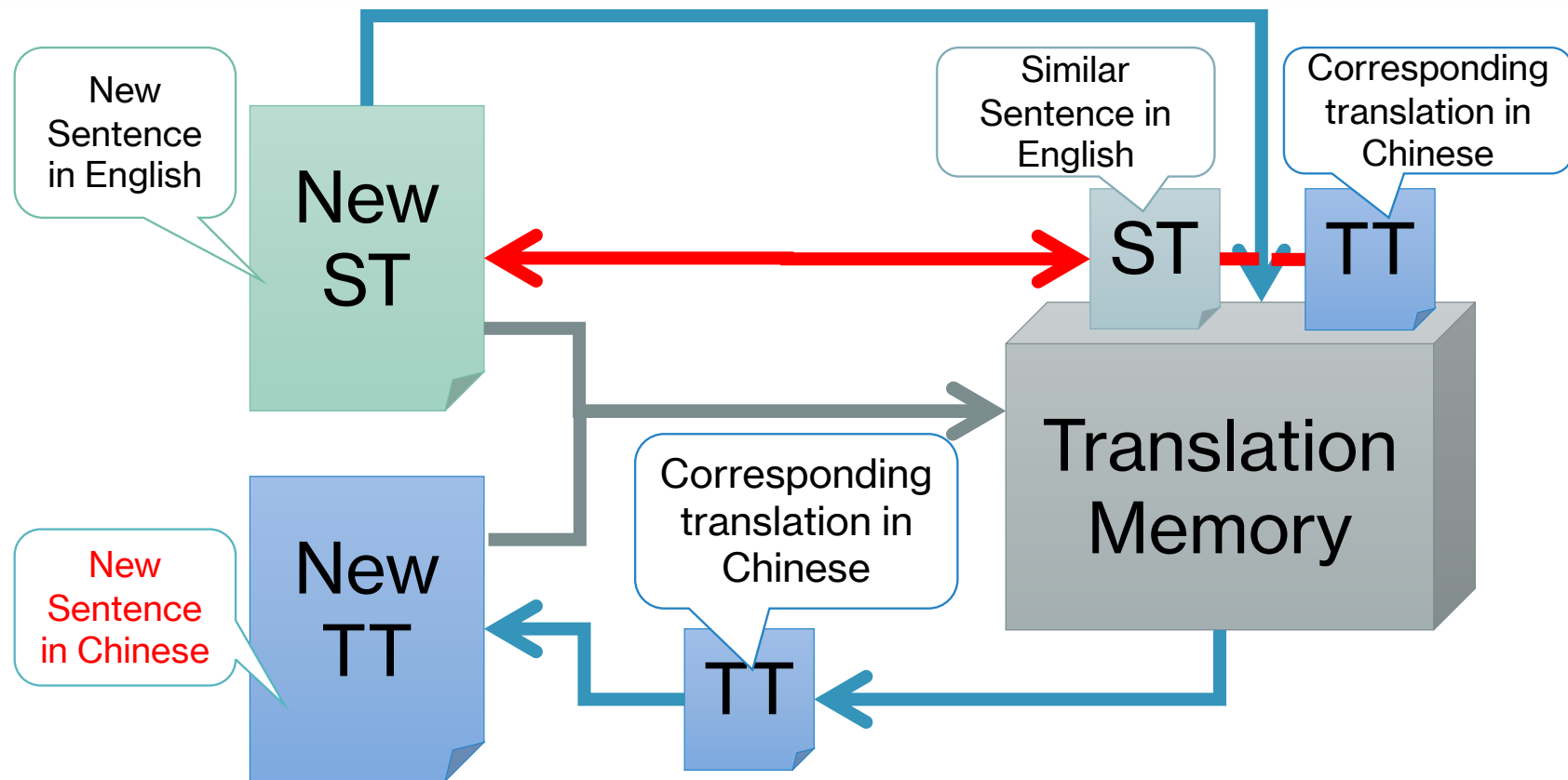- Edit your automatic translation results and the source text.

Translation Memory

Translation Memory

Examples

- MemoQ: https://www.memoq.com/solutions/translators

- Memsource: https://www.memsource.com/

- SmartCAT: https://www.smartcat.com/

- Termsoup: https://termsoup.com/

- Trados Studio: https://www.rws.com/translation/software/trados-studio/

3. Technology for Multimodal Translation
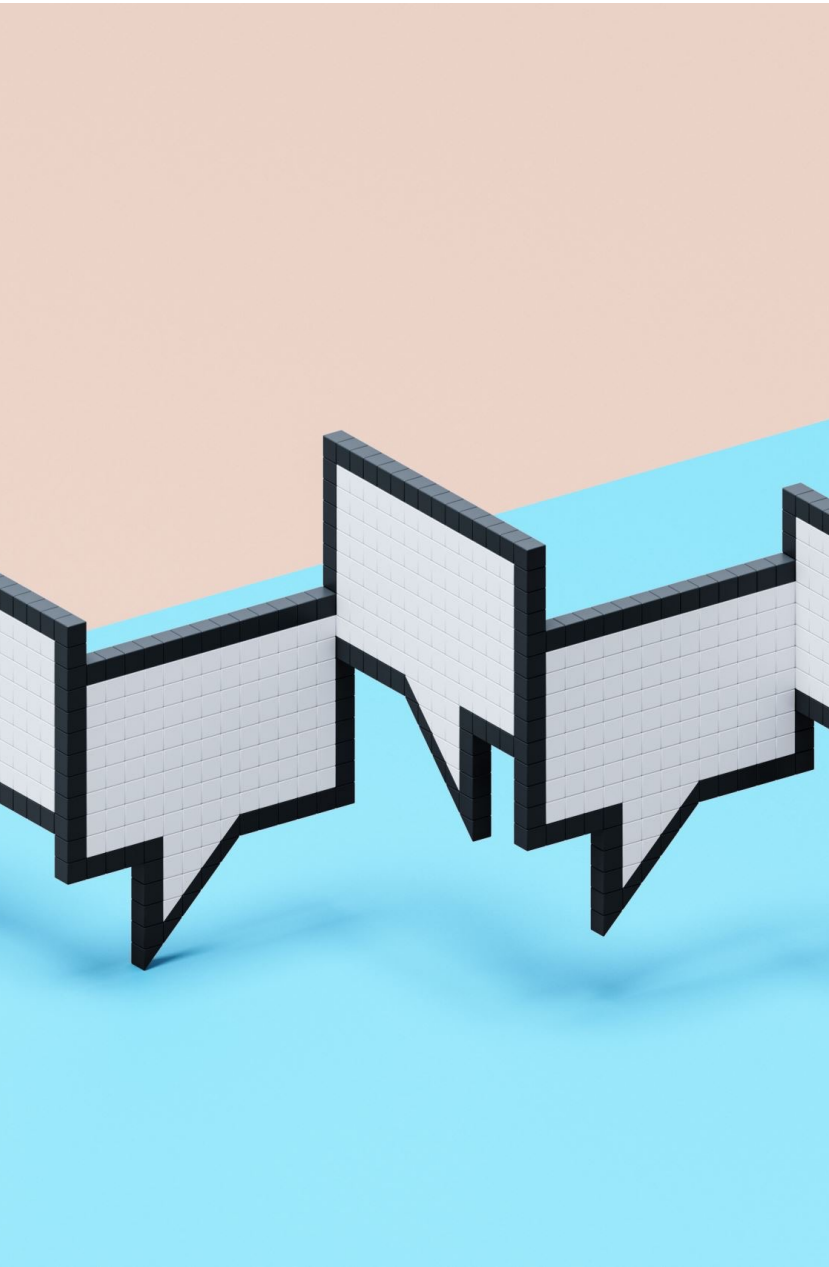
Go Beyond Text Translation

- Speech
- Image
- Video
- Music

Thank you!

- scsiu@hsu.edu.hk