Information Technologies for Industrial Engineers

เทคโนโลยีสารสนเทศสำหรับวิศวกรอุตสาหการ

"Question and Answering" Application

Natural Language Processing (NLP)

What is NLP?

- A field of AI that makes human language intelligible to machines.

- NLP combines the power of linguistics and computer science to study the rules and structure of language.

- NLP creates intelligent systems capable of understanding, analyzing, and extracting meaning from text and speech.
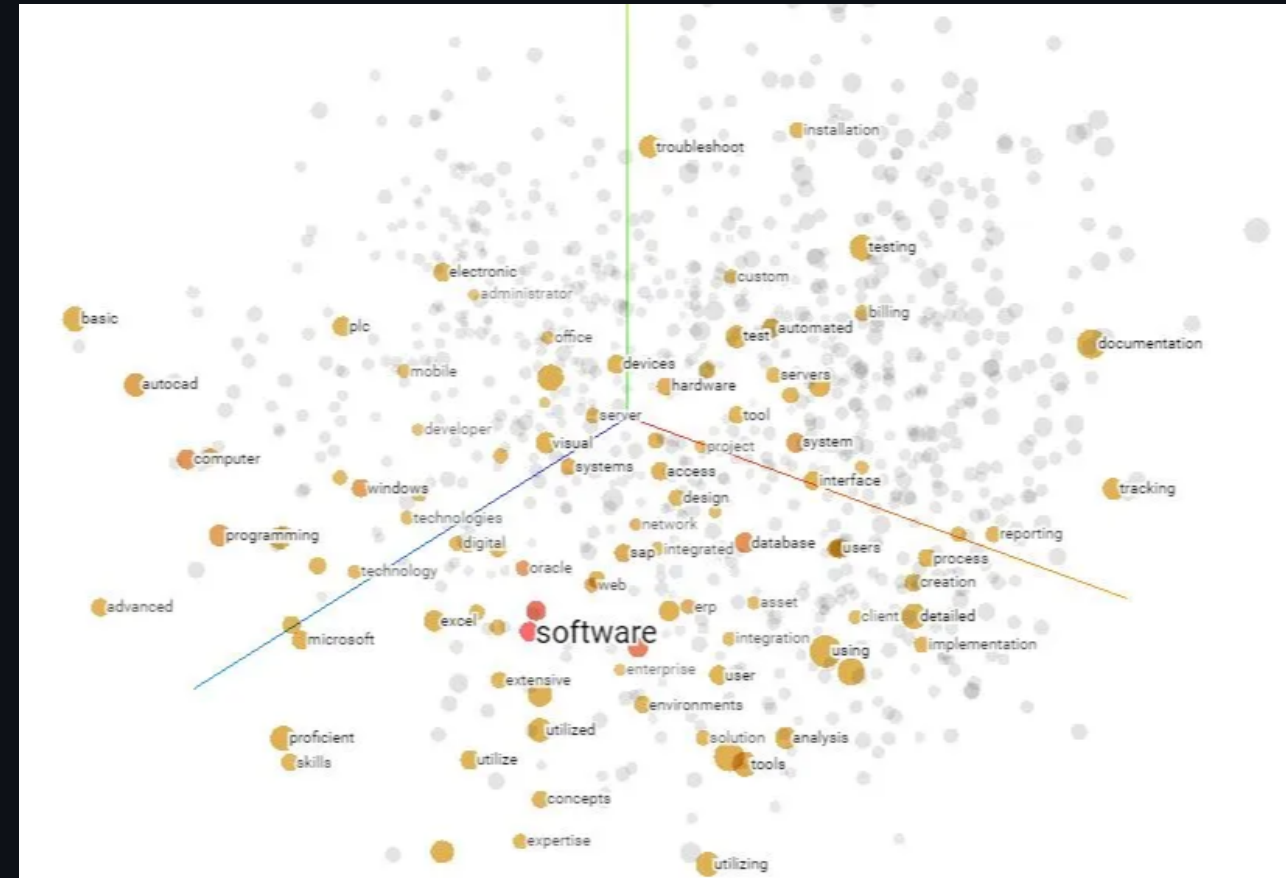
Aspect of language

- Syntax - ไวยากรณ์

- Semantics - ความหมาย

- Pragmatics - ความหมายในบริบท

- Morphology - การประกอบคำ

How does it work?

- Text vectorization
  - Unsupervised learning
- NLP tasks
  - Supervised learning

Text vectorization

- Known as "text embedding"
- Turn text/sentences into vectors.
- Need tons of data!
- Unsupervised learning

NLP tasks (language analysis)

- Syntactic analysis

- Tokenization

- Part-of-speech tagging

- Dependency parsing

- Constituency parsing

- Lemmatization & stemming

- Word sense disambiguation

- Stopword removal

NLP tasks (applications)

- Semantic Analysis
  - Classify text by polarity of opinion (positive, negative, neutral). Named Entity Recognition
- Named Entity Recognition (NER)
  - Extract entities from within a text (names, places, organizations, email addresses, etc).
- Text Classification
  - Classify text into predefined categories (tags).
- Answering questions

"Question and Answer" model

- Pretrained BERT model

  - *Bidirectional Encoder Representations from Transformers*
  - Method of pre-training language representations which obtains state-of-the-art results on a wide array of Natural Language Processing tasks.

- Fine-tuned on SQuAD 2.0 dataset.

  - Stanford Question Answering Dataset
  - Dataset consisting of articles from Wikipedia and a set of question-answer pairs for each article.

Let's build an app.

Setting up

- `npm install @tensorflow/tfjs @tensorflow-models/qna react-highlight-words`

- `npm install -D @types/react-highlight-words`
  - Type definition

`./src/model.ts`

```typescript
import * as qna from "@tensorflow-models/qna";
import "@tensorflow/tfjs-backend-webgl";

export type Model = qna.QuestionAndAnswer;

export async function load_model() {
  // Load the model.
  try {
    const model = await qna.load();
    return model;
  } catch (err) {
    console.log(err);
    return null;
  }
}
```

Initial information

- `./src/utils.ts`
  - https://gist.github.com/nnnpooh/344403f912b08c70925c4e405eef5e9f#file-model-ts
  - You can provide your own info.

Main code

- `./src/App.tsx`
  - https://gist.github.com/nnnpooh/344403f912b08c70925c4e405eef5e9f#file-model-ts

Testing

- Where is CMU?

- Where is CMU main campus?

- When did CMU open?

- What subject did CMU teach?

- What type of university CMU is?

- *What is the first higher education in northern Thailand?*

Full version

- `./src/model.ts`

  - https://gist.github.com/nnnpooh/4ceaf25e25e382e2104ab66f486538d9#file-model-ts

- `./src/utils.ts`

  - https://gist.github.com/nnnpooh/4ceaf25e25e382e2104ab66f486538d9#file-utils-ts

- `./src/App.tsx`

  - https://gist.github.com/nnnpooh/4ceaf25e25e382e2104ab66f486538d9#file-app-tsx