

“AI + Law”

An Intelligent Legal Aid System

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Why do we need the system? -**Motivation**

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What is the technic in it? -**NLP, Deep Learning**

Motivation



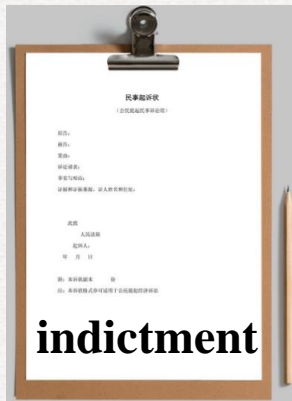
step1



step2



step3

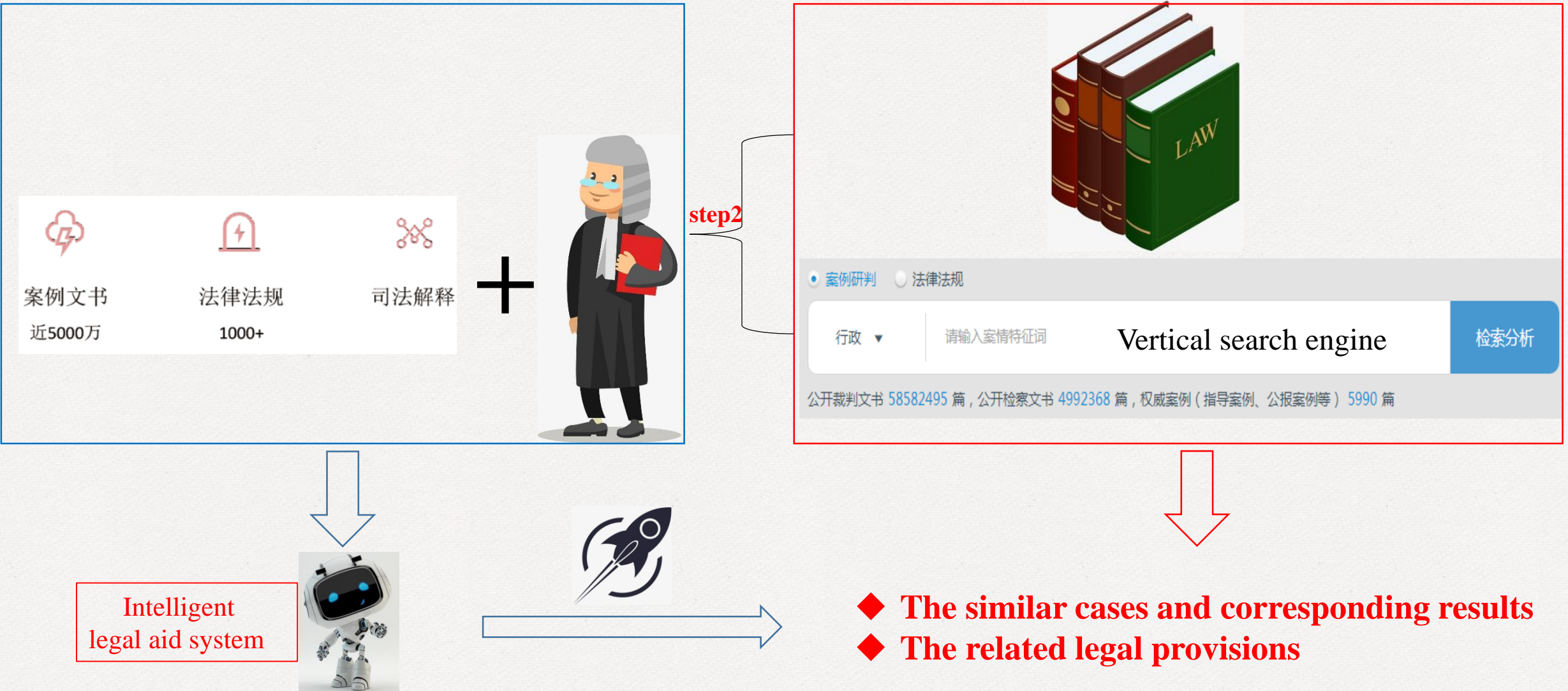


step4



Inefficient!

Motivation



Data driven + Human knowledge

An Example

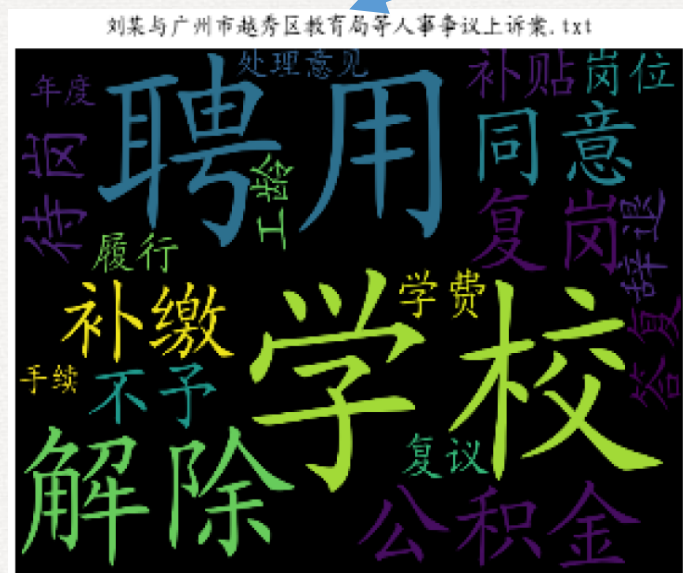
“刘某与广州市越秀区教育局的人事争议”

Personnel disputes between Liu and the Education Bureau of Yuexiu District, Guangzhou



Intelligent
legal aid system

Word segmentation and
keywords extraction

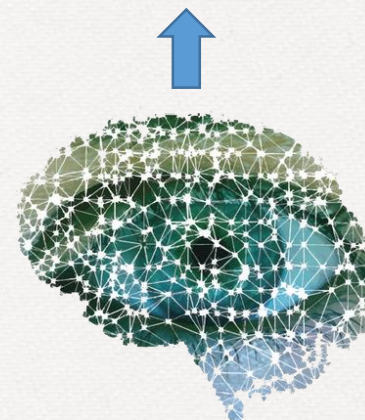


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3.516986	-1.4420295	3.5566697	0.1640175	5.619183
0.04541214	-4.1607533	-2.1845772	11.726991	-3.0029936
-0.3130498	5.9651704	-1.0586551	0.9081588	-1.0437454
-1.1796094	1.7108203	10.524109	0.97891027	-1.708284
-3.6433237	-1.1190311	-4.1413937	1.863986	0.30365318
-8.473044	6.9378815	-7.641036	3.2573366	3.630906
9.061473	-2.9476633	-2.0653622	-9.13409	10.931139
8.383988	0.896191	8.154213	-5.619686	1.4512124
-11.620233	-1.8333874	-2.264474	-5.82567	-3.3037508
-5.0316324	2.699493	5.497882	0.62359124	-2.163273
-1.5877146	2.2845285	4.9675703	-0.8401757	10.220414
5.1498365	1.2585422	-2.799362	11.040748	

“学校” 一词的向量表示

Vector representation of the Chinese word "school"

- The related legal provisions
- The similar cases



System brain:
Deep learning
Knowledge base

Case matrix:
64*64

An Example

“刘某与广州市越秀区教育局的人事争议”

Personnel disputes between Liu and the Education Bureau of Yuexiu District, Guangzhou

The decision issued by the Supreme Court:

《劳动合同法》第十条,
The 10th articles of the labor contract law

《劳动合同法》第十四条,
The 14th articles of the labor contract law

《劳动合同法》第四十八条,
The 48th articles of the labor contract law

《中华人民共和国民事诉讼法》第十三条,
The 13th articles of the PRC Civil Procedure Law

《中华人民共和国民事诉讼法》第一百七十条
The 170th articles of the PRC Civil Procedure Law

The output of our intelligent legal aid system:

《劳动合同法》第十条,
The 10th articles of the labor contract law

《劳动合同法》第十四条,
The 14th articles of the labor contract law

《劳动合同法》第四十八条,
The 48th articles of the labor contract law

《中华人民共和国民事诉讼法》第十三条,
The 13th articles of the PRC Civil Procedure Law

《中华人民共和国民事诉讼法》第一百八十条
The 180th articles of the PRC Civil Procedure Law

Performance evaluation

Precision: $4/5 = 0.8$,

Recall: $4/5 = 0.8$,

F1: $2 * \text{Precision} * \text{Recall} / (\text{Precision} + \text{Recall}) = 0.8$

The main technic

Training data

Massive legal judgment documents

(each document = fact description + corresponding judgment result)

Chinese laws and regulations documents

Supreme People's Court of China

↓ Natural language processing (NLP), such as TF-IDF, NER, etc.

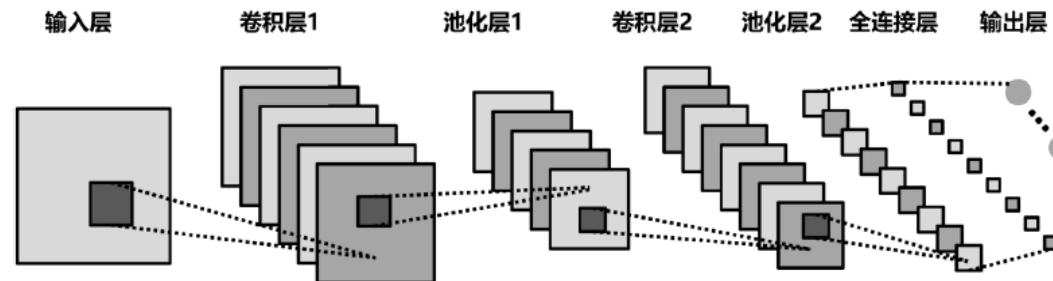
Model learning

Extract the top64 key words and the corresponding legal provisions from each document

↓ word2vec

Transfer each key word to a 64-dimension vector;
→ each document: 64*64 matrix

Input: Keywords matrix of a legal case ;
Output: legal provisions



Multilabel classification problem

“AI + Law” project:
Intelligent legal aid system

Future works



01

Use some advanced algorithms (e.g., Deep residual networks, Bayesian network) to improve the performance of the “Intelligent legal aid system”.

02

Apply random neural network algorithms including my earlier published algorithms to improve the efficiency of the system.

03

Add more functions to the system, such as automatically generate a indictment for users.



Thank you!

Questions?