Based on fastAPI, a python web asynchronous framework, the connection between the back end and the front end is built more efficiently and quickly. Using http protocol, the front end can fetch arbitrary data quickly and efficiently.

Technical Architecture.

Sensing layer: rtk real-time differential positioning device.

Transport layer: 4G network.

Control layer: Huawei cloud data center.

Software and software development environment: MySQL database, Ubuntu18.04, windows10 (64-bit).

Cloud Application: snowboarding digital twin system.

Snowboard slalom chase and other snow events with high speed and complex trajectories. In the future, it can also be applied to water conservancy industry, such as water area planning, water conservancy monitoring and water conservancy management. The use of UAV +RTK system in the field of water conservancy can improve the accuracy of information collection and timeliness of transmission of rain, water, drought and disaster information, make timely and accurate prediction and forecast of its development trend, and formulate flood control and drought control scheme. Digital twin technology can also be applied to smart cities to achieve green transportation, urban planning, urban illegal construction supervision, engineering environmental management, smart logistics, smart transportation, etc.

УДК 005

信息工程——面向自然语言的轨迹可视化系统

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Summary. *This project proposes a natural language oriented trajectory mining system, which seeks to design a location mining model for the problem of location sparsity and dynamic transformation of multiple geographic locations in natural language, and make the trajectory more intuitive by presenting the specific route on the map.*

Project Requirements. This project targets the investigation trajectory of infectious disease patients. Taking the COVID-19 epidemic as an example, In the epidemiological survey for confirmed patients, their travel trajectories are presented in natural language and cannot be visualized, making it difficult for the general public to intuitively determine whether they have intersected with confirmed patients or close contacts.

Features and innovations of the project. Location mining method based on deep learning. The project adopts a semantic trajectory extraction oriented to natural language, which can help people quickly extract the relevant information they need and make the information more intuitive. The proposed BiLSTM-CRF model is constructed by using bi-directional LSTM technology and equipped with the latest CRF model to extract semantic trajectories for natural language and to mine relevant location information using data mining techniques. The project keeps up with current events and is closely integrated with current technology needs.

Trajectory visualization method. Nowadays, we are in the era of information explosion, and the huge amount of information brings many problems to people, the main one is that it is difficult to extract effective information, such as the traditional epidemic trajectory is described in natural language and without visualization, when facing a large number of epidemic infected people's travel information, the trajectory overlapping routes cannot be extracted as soon as possible. If effective information on the spread of the epidemic can be extracted quickly, the relevant departments can study the spread trajectory of the epidemic more quickly and clearly, and plan for prevention and control.

Technical route.

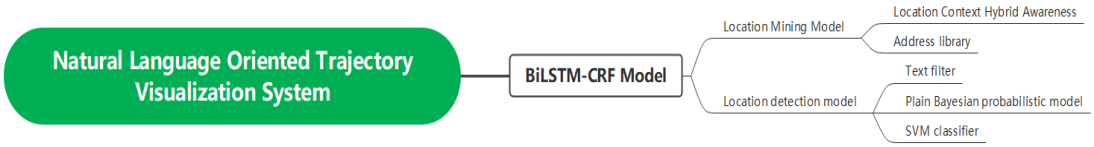

Figure 1 – Technology Roadmap

Project results: We implemented a total of three modules. In Module 1 (fig. 2), we try to use several different models (including HMM, CRF, Bi-LSTM, Bi-LSTM+CRF) to solve the Chinese named entity recognition problem, train and evaluate the model after installing the dependencies.

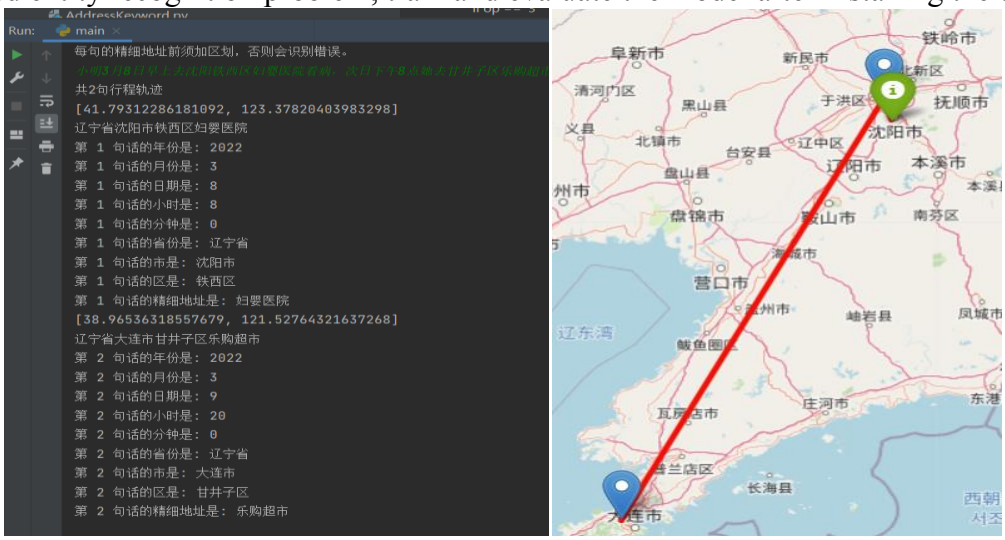

Figure 2 – Module 1

In Module 2 (as in fig. 3), we use generalized least squares for the prediction of epidemic spread. In Module 3 (as in fig. 4), we found that the virus normally spreads from a central point to the surrounding area through the study of epidemic transmission, so the single-source shortest path would be the optimal solution for epidemic transmission time prediction. We can easily derive the shortest distance between a point and the central point of the epidemic by preprocessing the traffic line, and thus divide the shortest distance by the spread speed of the virus, thus easily deriving the shortest spread time of the epidemic, which is conducive to the relevant authorities to control the epidemic more scientifically and rationally, and effectively take measures at a reasonable time to avoid further spread and spread of the virus.

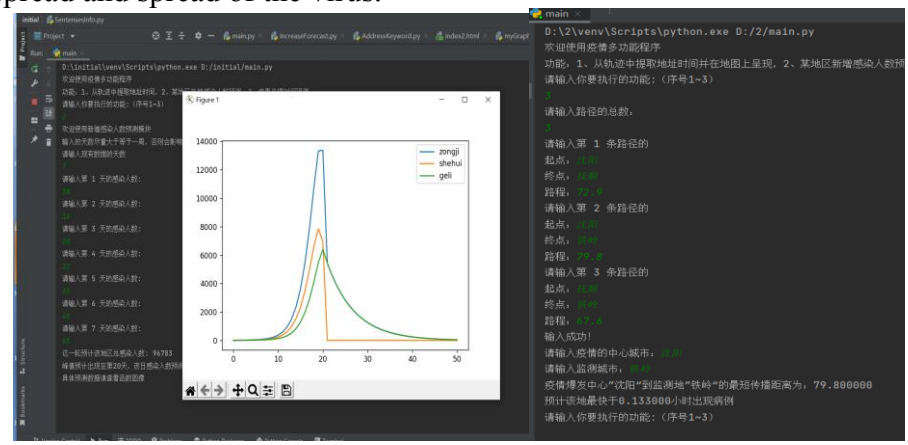

Figure 3 – Module 2

Figure 4 – Module 3

Reference

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将视频多模态情感分析运用在临床抑郁检测中

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Summary. *The current clinical diagnosis of depression in the medical community relies on self-rating scales and physician interviews, but this approach is limited by the expertise of clinicians and the uneven distribution of medical resources. This paper proposes the use of video multimodal techniques in clinical diagnosis, aiming to improve the efficiency and accuracy of depression detection in clinical settings.*

根据世界卫生组织的数据，全球有 2.8 亿人患有抑郁症。仅近三年，全球新增抑郁症患者超过 7000 万人。抑郁症，被称为“21 世纪最大的杀手”。抑郁症是一种严重的心理疾病，不仅会对个人的心理以及身体产生极大的危害，而且也会给家庭、社会带来不利的影响。″早发现、早治疗 ″被认为是这种疾病的最佳治疗方案，这表明需要对抑郁症进行早期筛查。传统的抑郁症诊断依赖于自我评估量表和医生访谈，但这种方法受限于临床医生的专业知识和医疗资源的不均衡分布。人工智能的快速发展为抑郁症的识别提供了一个新的解决方案，有望弥补上述不足。

抑郁症患者语言上常表现为消极、厌世, 表情常表现为皱眉和更少的微笑, 声音常表现为语速较慢、停顿较多，利用人工智能可以很好的捕捉到这些特征。所以，通过情感分析辅助识别抑郁症是一种趋势，已经有一些研究通过分析社交文本、语音信号或面部图像来检测抑郁症，然而，由于抑郁症的表现形式多样，基于单一特征的抑郁症识别并不能获得足够的信息，导致识别不准确，故论文提出在临床诊断中使用视频多模态情感分析技术来提升抑郁症识别的准确率以及效率。

视频多模态情感分析（Video multimodal sentiment analysis）是指首先将视频中包含的视觉、听觉、文本等多模态信息提取出来，在采取特征融合后进行情感分析，并且综合分析结果，从而得出更有效的结论。在临床抑郁症的诊断中，可以在经过被诊断者允许的情况下，收集其日常生活的视频，因为在视频中可以很好的呈现出被诊断者在日常交流时体现出的表情变化，语气转变以及用词的倾向。将视频分为三种类型的数据集，分别为：视频中提取出的文本信息、视频中的语音信息、包含表情变化的关键帧，这些数据集可在各自对应的模型中进行处理，最后通过 Attention 机制进行模态融合。

Attention 机制，简单来说，人类在观察外界事物时，通常不会把它作为一个整体来看待，而是倾向于根据自己的需要有选择地获取被观察事物的一些重要部分。同样，在深度学习中，Attention 机制可以帮助模型对输入的每一部分给予不同的权重，提取更多的关键和重要的信息，从而使模型能够做出更准确的判断，而不会给模型的计算和存储带来更多的开销。Attention 机制有效实现了多模态信息的互补性和多模态贡献度计算, 保证了多模态信息融合的合理性和准确度。