通。我们每个人一生当中肯定会去很多不同的医院就诊，就目前而言，如果在患者就诊过程中医生需要查看其病历数据，患者只能去复印纸质材料以及手写病历本，这些材料不仅不易携带而且相对容易发生磨损和丢失，这样已然对医生和患者造成了很多不便。对此，设计一个各医院病历数据共享的电子病历系统就能解决这一类问题，医生可以随时从中获取患者在所有医院就诊的病历数据。在该系统的设计过程中，患者病历数据的安全性是最重要的，系统要保证每个患者的信息不被泄露，且能够在各个机构中数据互通，那么利用区块链技术在云端存储病历数据将是一个较好的选择。（区块链技术的特点是通过加密技术与共识机制对区块中的数据进行集体维护）

结合前两个子系统的设计，加上当今互联网的高速发展，打造“无纸化”医院是有可能的，也是有实际意义的。“无纸化”包括“门诊无纸化”、“住院无纸化”、“办公无纸化”，消除在医院服务中产生的病历本、挂号票、缴费单、诊断单、处方单等等纸质材料，能够有效降低耗材成本、提高管理效率、减少疾病传染。

以上子系统的软件技术层面包括 App 开发（Hybrid）、Web(Vue.js、JavaScript、Java)以及云端服务器的搭建，App 用于大众群体进行“一站式”就诊服务、Web 用于医院中的工作人员进行各类医疗服务操作。由于该系统的子功能、子模块很多，建议采用“微服务”架构风格进行开发，将一个复杂的单体架构应用系统按业务划分为可以多个独立运行的子系统，每个服务都是一个独立的项目，可以独立部署，不依赖于其他服务，使得整个系统耦合度更低。

信息技术的发展离不开创新，而创新的意义在于使得人们的生活更便捷更美好，随着信息技术和人工智能的高速发展，未来的医院信息管理系统将会使得人们就诊越来越方便安全，为“生病”产生的烦恼也会越来越少。

УДК 004.42

药研云医生——基于深度学习的药物疗效预测系统

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Summary. *The drug efficacy prediction system can link the pharmacological big data with the disease target protein through in-depth learning and other methods, and then build an artificial intelligence model of drugs and diseases, explore the originally seemingly “irrelevant” diseases and syndromes and the potential efficacy of drugs, and greatly reduce the drug development cost and time limit through drug reuse.*

Sources of problem. Fund background of pharmaceutical research:

Drug development takes time and effort. In the process of drug research and development, it is not only necessary to invest a lot of manpower and material resources, but also need to conduct repeated experiments on drug effectiveness for a long time to discover and verify its efficacy and side effects.

Background of drug reuse:

Drug reutilization, refers to the development of new uses beyond the original use of drugs or the originally approved indications. In recent years, drug reuse has attracted more and more attention because pharmaceutical companies seek potential low-cost alternatives to reduce the high cost of drug development and improve the screening success rate of target drugs [1].

Pain point to be solved in this work:

Long cycle: From determining the pathogenic factor to finally testing drug efficacy against this factor. A large number of in vivo and clinical experiments are needed.

High investment:Huge financial support is needed behind drug research and development. It's impossible to develop a new drug without support of huge funds.

High risk: It usually takes at least 10 years for a successful new drug to be developed, mass produced, and finally formed into a medical commodity, with an investment of about 2 billion yuan.

Technical proposal. Drug data collection:

Due to the large number of existing drugs, and different drugs have different characteristics, such as molecular structure, protein composition, etc. These drug data can be collected from websites such as STITCH and DrugBank.

Drug feature extraction:

The drug feature extraction method we use extracts one-to-one corresponding feature parameters for SMILES, so that different drugs have unique feature values. Standardize and characterize drug data,different drugs have unique characteristic values.

Introduction to Davis and Kiba:

We have downloaded these two data sets from Internet. These two data sets contain test sets, training sets, and affinity matrices of drugs for target proteins. By processing these data, we can get the data format that is convenient for inputting graph neural network.

Construction of graph neural network:

This project uses multiple graph neural networks for in-depth learning training, such as GAT (Graph Attention Network) and GCN (Graph Convolutional Network).A new neural network will be built to make the prediction efficiency reach 95 % or higher.

Conducting in vivo experiment of drugs:

Therefore, this topic will cooperate with the School of Life of our school to conduct relevant animal experiments in vivo, and finally obtain the accuracy of the drug efficacy prediction method proposed in this topic in biological experiments.

Project realization. Build a drug efficacy prediction platform:

This platform envisages visualizing the drug and disease related data obtained from drug efficacy prediction research. The presentation effect includes two directions: scientific research and benefiting the people.

Project innovation points:

High accuracy: the accuracy of the new model in predicting drug efficacy has been greatly improved, which can not only save a lot of financial and material resources required for developing new drugs, but also achieve “one drug for multiple purposes”.

High efficiency: the drug efficacy prediction method proposed in this topic can help medical institutions to quickly and accurately find the best drug with new models when diagnosing patients.

High scalability: the improved drug efficacy prediction model has better scalability and can input more drug characteristics and makes it more widely used.

Low cost: the drug efficacy prediction system can make full use of existing drugs, and eliminate the time and economic costs of developing new drugs when encountering new diseases or when there is a shortage of drugs to treat certain diseases.

Project outlook:

1. Complete the establishment of drug efficacy prediction system.

2. The graph neural network model was used to predict drug efficacy. Realize the effect prediction of drugs on diabetes, and achieve prediction accuracy rate greater than 95 %.

3. Build a database of predicted results for other medical laboratory personnel to use.

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城市之光—基于 AIoT 技术的城市节能智慧路灯系统

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Summary. *The work designed by me is proposed to address the huge energy consumption problem in the field of urban traffic lighting in China. It is a street light control system integrating adaptive light regulation and environmental energy capture, which is capable of automatic switching and dimming control of intelligent street lights under the influence of multi-variable factors.*

Since the reform and opening up, China's rapid economic development and huge consumption of electric power resources have made electric energy very tight. In China's overall electricity consumption, urban lighting accounts for a large proportion of electricity consumption, and urban street lighting is an important part of urban modernization, which creates a good production and living environment for people.

However, with the rapid development of China's economy, the number of street lighting is increasing year by year, and the proportion of its electricity consumption in the total urban consumption is also increasing. To reduce the annual consumption of urban electric energy, it is significant for the existing street lighting equipment and control methods to be transformed.

By fully considering energy consumption, multi-source parameters, device size, protocol transmission, scalability, and reliability of use, this paper uses big data, Internet of Things, artificial intelligence, and other technologies to create an integrated smart streetlight comprehensive solution that integrates lighting adaptive control, environmental energy capture, intelligent monitoring of traffic flow, and cloud-based monitoring.

The overall architecture of this system from the lower to the upper layer is the sensing layer, control layer, transmission layer, network layer and application layer in order.

The sensing layer contains current and voltage detection sensors, light intensity sensors, weather environment monitoring sensors, high-definition camera modules and LED street light modules, which are used to collect data of street light current and voltage, light intensity, weather environment and video monitoring, and are the basis for intelligent control of the intelligent street light control system.

The centralized controller of the control layer adopts Arduino and Raspberry Pi, which on the one hand processes the data collected by the sensing layer and transmits the information to the monitoring center, and on the other hand receives the lighting control commands from the monitoring center to realize the control of street light switching and brightness.

The transmission layer consists of NB-IoT and ZigBee wireless communication technology to form the whole communication system; the data layer mainly collects the street light working status information, light intensity data and weather environment information from the centralized controller of the control layer and stores them in the database server.

The data layer mainly collects the street light working status information, light intensity data and weather environment information from the centralized controller in the control layer and stores them in the database server, which will analyze the collected information more specifically through cloud computing technology and transmit the analysis results to the application layer.

The application layer will process the received data and information and present them in the form of maps and charts in the cloud platform of the monitoring center.