Jiaju KANG

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EDUCATION

Bachelor's Degree in Data Science and Big Data Technology | Shandong Jianzhu University *09/2020-06/2024*
Core Modules: *Introduction to Data Science, Data Structures Course Design, Database Principles and Applications, Operating Systems, and Applied Statistics.*
GPA: *80/100*

PUBLICATION

Research on Mathematical Modelling Competition and Ideological and Political Education Based on Analysis and Prediction Algorithm

- Joint first author | 4th International Conference on Computer Science and Intelligent Communication (CSIC 2022) | accepted and to be published
- This paper conducted research by mathematical modelling competition and correlation analysis of ideological and political education based on analysis and prediction algorithm, including corresponding analysis algorithm, time series prediction algorithm, bp neural network prediction algorithm, and grey association analysis algorithm. First, the indicators of the past three years were obtained when the corresponding analysis method was used, based on the extraction of many ideological and political documents. The four indicators of "teacher system, reform and innovation, cultural integration, and student classroom" were clustered to accept the four indicators' status quo and development trend. For predicting the future ideological and political education, the time-series algorithm and the BP neural network algorithm were used to derive the number of published articles and the development trends in the ideological and political fields in the next two years.
- Using grey correlation analysis, with "mathematical modelling, politics" as the theme to all relevant literature retrieval, extracted 100 representative articles to all the factors involved in the article clustering, red elements, traditional culture, classroom atmosphere, personal value, national situation five related factors, analysed the influence of grey correlation, got the results from high to low order: red elements 0.611,0.596, traditional culture, classroom atmosphere 0.594, personal value of 0.593, national situation 0.581, are strong influence factors, to prove the rationality of the model.

Composition Analysis and Identification of ancient glass Products

- Joint first author | 5th International Conference on Chemical Engineering and Advanced Materials (CEAM 2022) | accepted and to be published
- This paper studies the chemical composition of two major types of glass products in ancient China and the constituent structure of residual substances in a long-term weathering environment. It proposes a classification method based on composition analysis. When researchers provide unknown categories of ancient glass samples, these results can be used to make type judgments based on their chemical composition and assist generation and other work.
- Based on the quantitative analysis of the chemical composition of different sampling sites, the glass sample classification model is tested using the bp neural network, the decision tree classification model, and the ID3 mechanism. When analysing the problem, it was found that some of the data in the attachment did not meet the requirements of the problem setting and even had missing values. Therefore, we cleaned the data, completed the null value and eliminated the erroneous data with 0, embodied in lines 15 and 17 of Table 2. Using Kappa consistency matrix analysis, it was an apparent connection between the surface weathering of glass cultural relics and their types, decoration, colour and other characteristics. The discrete dot plot for pooling analysis was drawn using data characteristics of surface chemical composition changes before and after weathering. The prediction formula was established using vector iteration to predict the chemical composition after weathering. Later, the vector iteration method was used to develop the weighted average ratio prediction formula to predict the chemical composition of the glass samples after weathering.

Review of UAV obstacle avoidance planning based on artificial potential field

- First author | International Conference on Mechatronics and Smart Systems (CONF-MSS 2023) | accepted and to be published

- UAV obstacle avoidance technology is an integral part of intelligent UAV systems. Using sensors to collect data, solve the drone's onboard computing power, and build its environment in simulation space is now a standard method used by researchers. Through the perception and processing of the environment, the drone can use a series of algorithms to avoid obstacles in the environment to maximise the safety of the mission route. Researchers have been working on UAV obstacle avoidance algorithms based on the potential field method in recent years. This paper summarises and organises their application. It contains and summarises the application and some innovative modifications of potential field methods in the field of UAV by different researchers and puts forward the prospect of the future development direction of possible field methods.

Research on unmanned distribution mode of 'land-air combination' multi-agent medical supplies based on improved CBS algorithm (under review)

- In the development of major medical problems, there needs to be more supply and demand for dynamically changing medical resources and emergency supplies. At the end of medical resource allocation, such as university campuses or small residential areas, unmanned systems for logistics distribution can reduce the risk of cross-infection, distribution costs, and efficiency. Based on the characteristics of the small-scale allocation of health resources, this study uses the field road network of Shandong Jianzhu University as the modelling background to construct an urban model with dynamic changes in material demand similar to the actual situation. It evaluates the completion of the unmanned system considering safety parameters, total power consumption and other parameters. In the constrained time, an unmanned distribution system with CBS algorithms with the core of task completion is constructed, including payload UAVs and multi-type unmanned transport vehicles. The results show that the system's efficiency is increased by 6% compared with the traditional distribution method in the urgent increase in material demand.

Research on Key Technology of Ground Object Classification Based on Trans-Luojia Remote Sensing Image Data (under review)

- Traditional neural network methods cannot balance efficiency and accuracy when processing remote sensing images with many details and large formats, and researchers have chosen to improve the technique to visual transformers. Deep learning methods combined with visual transformers have developed rapidly in remote sensing image processing, and Wuhan University recently released the world's first remote sensing dedicated deep learning framework LuojiaNet. Combined with the remote sensing properties of LuojiaNet and the excellent feature processing ability of transformer technology in extensive image data, the semantic segmentation function is realised on the remote sensing image dataset, and the basic principles and application scenarios of the Trans-Luojia network are introduced. In addition, the performance of SegNet, U-Net, U-Net++, FCN, Mask R-CNN and other methods under the same data set was also analysed, and the accuracy of the model reached 83%, which showed a significant improvement compared with the old model and verified the feasibility of the model.

KGCN4Camp: The short text processing mechanism of Chinese complaints (under review)

- How to efficiently classify a large number of short complaint texts from the public? This is the key to government departments applying intelligent algorithms for digitized governance and efficient implementation of public opinion. Unlike general short text classification tasks, accurately representing complaint text data with sparse features, complex context, poor semantic abilities, diverse topics, and high data noise remains a challenging point in previous studies.To address this challenge, the constructed KGCN4Camp consists of a knowledge graph with a four-layer ontological schema to represent the entire Chinese complaint scene, and an adaptive graph convolutional neural network for feature engineering and classification. Ten feature calculation methods and classifier combinations were compared on a collected Chinese dataset, based on subgraphs generated from input text and complaint short texts. In previous research in the field of Chinese text processing, few researchers have utilized knowledge graph construction and graph neural network approaches for multi-label classification of complaint texts. KGCN4Camp demonstrates significant superiority in the task of complaint short text classification, achieving a 4.1% increase in classification accuracy compared to the Bert model.

SOFTWARE COPYRIGHT

New GCE Voluntary Application Support Decision System V1.0

- Summarised and sorted out the student performance data after the new college entrance examination reform in Shandong Province and the admission scores of various universities and majors nationwide.
- Used intelligent algorithm and probability model to calculate the success rate of users' scores to apply for a

particular major in a specific college and university, intelligently recommended colleges and majors, and developed corresponding platforms to assist users in data analysis.

PATENT

A method of traffic travel mode projection based on mobile phone signalling data

- This study proposes a set of traffic travel mode projection frameworks based on mobile phone signalling data, aiming to improve the projection accuracy. Firstly, the start and end points of traffic trips are determined based on the spatial and temporal information of the mobile phone signalling data. Then, criteria such as average speed, speed variance, 85th percentile speed, stopping time per kilometre and stopping point interval distance are proposed. Finally, a clustering algorithm is used to cluster similar trips, label the trip categories and determine the threshold values of the criteria. This study uses the Ada base station road test tool to collect mobile phone signalling data for multi-modal trips for testing and shows that the model has an accuracy of 95.45%. This study can provide technical support for multi-modal traffic planning and control and has strong guiding significance for optimising multi-modal traffic facilities and passenger flow control.

ACADEMIC RESEARCH PROJECT

Research on the construction of "Data Science and Big Data Technology" for smart cities based on the Big Data Double Innovation Studio

- Responsible for the day-to-day management and operation, interfacing with the company and professors at the college, internal training of the studio and project approval as the student leader of the studio.

Mobile Robot under the guidance of Amanda Prorok from the University of Cambridge

- Took responsibility for the explanation of the A* algorithm and CBS algorithm in the presentation.
- Assisted the team leader in completing the design of the algorithm system and the realisation of algorithm writing in the project completion process.
- Provided accurate original data and urban model parameters and participated in the discussion of determining the environment construction in environmental modelling.
- Used a computer vision algorithm to provide a more efficient solution for the operation of a grid map.

PROFESSIONAL EXPERIENCES

Research Intern | LuojiaNet Team, State Key Laboratory of Surveying, Mapping, and Remote Sensing Information Engineering, Wuhan University *07/2023-Present*

- Building a visual build of a draggable neural network component.
- Redeveloping using TensorFlow's front-end components to meet LuojiaNet's usage requirements.

AWARDS AND HONOURS

Awards

- Third Prize in the 20th Shandong College Student Software Design Competition - Industry Scene Application based on Artificial Intelligence
  10/2022
- Third prize in the 20th Shandong College Student Software Design Competition-Cyberspace Security Technology Application Design
  10/2022
- Second Prize of the 5th China Youth Cup National College Students Mathematical Modelling Competition
  07/2022
- Second Prize in the Chinese-English Group of the 6th General Translation Award National College Student Translation Competition
  06/2022
- First Prize in the Campus Selection of the 17th National University and Provincial Transportation Science and Technology Competition
  04/2022

Honours

- "Young and Promising" title in Huawei National Youth Artificial Intelligence Social Practice
  12/2021
- Excellent Volunteer of the 13th Shandong College Students Science and Technology Festival-The 19th Shandong College Students Software Design Competition
  11/2021
- Excellent Communication Ambassador of the 5th China Youth Cup National College Student Mathematical Modelling Competition
  07/2022
- Outstanding Organizer of the 5th China Youth Cup National College Student Mathematical Modelling Competition
  07/2022

SKILLS

- Languages: Mandarin (Native), English (Fluent);
- Software: MS Office (Word, Excel, PowerPoint);
- Familiarity with CV and NLP-related techniques;
- Involved in algorithms related to UAV swarm path planning and multimodal data processing;
- Skilled in classical SLAM algorithms;
- Proficient in the TensorFlow framework and programming languages such as Python and Java.

HOBBIES

- Programming, swimming, music, debating