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Editorial

Advances in Information Entropy

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Entropy comes from thermodynamics in physics. It is one of the state parameters of matter to describe the degradation of energy. It generally refers to a measure of the state of some material systems. With the development of statistical physics and information theory, the essence of entropy is gradually explained, that is, the degree of internal chaos of a system. It has important applications in many fields, such as cybernetics, probability theory, life science, and astrophysics. In information theory, entropy gives a measure of the amount of information in an event drawn from a distribution. In the information world, the higher the entropy is, the more information can be transmitted. The lower the entropy is, the less information can be transmitted. Information entropy is always a useful tool to deal with the information quantity contained in the information and random variables. Information entropy also measures the complexity of a system. Information entropy is widely used in signal processing, system analysis, and other related fields.

This special issue includes 11 high-quality peer-reviewed papers that deal with different aspects of information entropy problems. These papers contain some new, novel, and innovative techniques and ideas. The aim of this special issue is to bring together original research and review articles highlighting the recent advances in this field. We hope that this special issue provides a platform to outline the continuing efforts to understand this field.

In the paper entitled "Anti-Interference Heartbeat Measurement Based on a Miniaturized Doppler Radar Sensor," the authors propose a novel algorithm to solve the sudden and unexpected interference. Firstly, the one-dimensional signal detected by the sensor is divided into segments to form a two-dimensional data matrix. In both the intrasegment and intersegment domains of the data matrix, a robust algorithm is employed to suppress unwanted interference, which significantly improves the robustness of demodulation. Experiments show the effectiveness of the proposed algorithm, based on which weak heartbeat signal hidden in the interference can be well extracted.

In the paper entitled "Use Python Data Analysis to Gain Insights from Airbnb Hosts," the author uses Python and its external data processing package to conduct an in-depth analysis machine study of Airbnb review data. The first part is for all hosts (super and nonsuper hosts). The second part suggestions are for nonsuper hosts to improve and super hosts to maintain. In the future, the author will build on this to further optimize the design.

In the paper entitled "Study on Announcement Effect of Stock Repurchase from the Perspective of Configuration Analysis," the authors take the stock repurchase cases in 2018-2019 after the promulgation of the New Company Law as the research object and use qualitative comparative analysis methods and the PSO-ICA-GARCH model to analyze 240 stock repurchase cases in the Chinese securities market from 2018 to 2019, and through the study of five types of 7 paths of high and nonhigh CAR stock repurchase announcement effects. The next step is to further optimize the model to make the analysis more accurate and effective.

In the paper entitled "The Statistical Analysis of Multidimensional Psychological Characteristics and User Feedback

Willingness," the authors study the influence of multidimensional psychological characteristics on users' feedback intention by using several statistical analysis methods based on information theory. The results show that both personality traits and cognitive styles can have a significant impact on feedback motivation factors and also show that self-efficacy may be the only evident feedback motivation to encourage useful feedback information. The results show that the willing users with extraversion trait are more likely be motivated by self-efficacy and thus have evident feedback willingness.

In the paper entitled "Asymptotic Behavior of Solution for Functional Evolution Equations with Stepanov Forcing Terms," through the use of the measure theory, evolution family, "Acquistapace–Terreni" condition, and Hölder inequality, the core objective of this work is to seek to analyze whether there is unique μ-pseudo almost periodic solution to a functional evolution equation with Stepanov forcing terms in a Banach space. Certain adequate conditions are derived guaranteeing there is unique μ-pseudo almost periodic solution to the equation by Lipschitz condition and contraction mapping principle.

In the paper entitled "ECG Signal Detection and Classification of Heart Rhythm Diseases Based on ResNet and LSTM," based on the ResNet34 network, three-layer stacked long-term and short-term memory networks are added, and the Mish function is used as the activation function. The final improved model can obtain the context dependence of the feature and retain the negative information in the ECG signal. Comparing the results of the ResNet34 model and ResNet-18 model on the same test dataset, the improved model in this paper has a better classification and recognition effect on ECG signals as a whole, which can identify atrial fibrillation diseases more effectively.

In the paper entitled "Research on Spectrum Feature Identification of Indoor Multimodal Communication Signal," the authors solve the problem of large signal acquisition error caused by radio wave multipath effect in indoor environment. Firstly, the signal source carried on the motion platform is collected for spectrum signal, and the signal processed by wavelet threshold denoising algorithms extracted and stored for spectrum feature extraction. Then, after data training and identification, the signal source is input into the system in random mode for identification. The experimental results show that the improved fuzzy clustering algorithm (FCA) is 12.7% higher than the spectrum envelope extraction method (SEEM) in the recognition rate of spectrum characteristics of different modes of signal source.

In the paper entitled "Multiperson Target Dynamic Tracking Method for Athlete Training Based on Wireless Body Area Network," aiming at the problems of large tracking error and long tracking time in traditional multiperson target dynamic tracking methods, a new method based on wireless body area network for athlete training multiperson target dynamic tracking is proposed. Experimental results show that this method can accurately measure the similarity of target features, with small tracking error and short tracking time. The minimum tracking error is only 0.11 frame.

In the paper entitled "Characterizations and Entropy Measures of the Exponentiated Generalized Frechet Geometric Distribution," some characterizations and entropy measures of the exponentiated generalized Fréchet geometric (EGFG) distribution are studied. Firstly, characterizations of the EGFG distribution based on five different approaches are discussed. The submodels for the EGFG distribution with their characterization expressions formed on the ratio of two truncated moments are also presented. Secondly, four different entropy measures are considered and expressed analytically via the incomplete gamma function. The behavior of all these entropy measures is discussed by performing a numerical study.

In the paper entitled "A Cloud Computing-Based Intelligent Forecasting Method for Cross-Border E-Commerce Logistics Costs," aiming at the problems of poor forecasting effect and low accuracy and low efficiency in current cross-border e-commerce logistics cost prediction methods, a cloud computing-based intelligent method for cross-border e-commerce logistics cost prediction is proposed. The experimental results show that the cross-border e-commerce logistics cost prediction effect of the proposed method is good, and it can effectively improve the accuracy and efficiency of cross-border e-commerce logistics cost prediction.

In the paper entitled "HRM-An Intelligent Helmet Recognition Model in Complex Scenes," the authors present an intelligent helmet recognition model in complex scenes based on YOLOv5s. The experimental results show that in the project, the average accuracy of helmet detection reaches 92.82%. Compared with SSD, YOLOv3, and YOLOv5s, the average accuracy of this algorithm is improved by 6.89%, 8.28%, and 2.44% and has a strong generalization ability in dense scenes and small target scenes, which meets the accuracy requirements of helmet wearing detection in engineering applications.

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this Special Issue.

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