



The digital economy—technologies, trends, and influences

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Published online: 25 August 2023

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The digital economy is undergoing rapid advancements and transformative changes, especially in emerging markets. The existing organizational structures are being gradually replaced by the platform economy, which thrives on algorithmic systems, big data analytics, and immense computing power. For example, the advanced analytics techniques, combined with availability of vast amounts of data, empower businesses to gain deep insights into customer behavior, market trends, and operational efficiencies, which enables organizations to make informed decisions, personalize experiences, and optimize their operations to meet the evolving demands of the digital economy. Also, as computing power continues to advance, it opens up new possibilities for businesses to leverage emerging technologies such as artificial intelligence, machine learning, and Internet of Things (IoT), further propelling the growth and transformation of the digital economy. The ever-increasing processing capabilities and storage capacities enable businesses to handle massive amounts of data, deploy complex algorithms, and deliver real-time services. The shift involves leveraging various enabling technologies such as the Internet of Things (IoT), artificial intelligence (AI), cloud computing, augmented and

virtual reality (AR/VR), and smart manufacturing. It disrupts long-established norms and presenting both opportunities and challenges for businesses. Meanwhile, the platform economy, with its reliance on cutting-edge technologies, is reshaping the way organizations operate, collaborate, and create value.

The primary objective of this special issue, titled “The Digital Economy - Technologies, Trends, and Influences,” is to foster collaboration and knowledge exchange across diverse disciplines. By bringing together research contributions from various fields, it aims to provide insights into the emerging business, technology, and social issues within the digital economy and explore their interconnectedness.

Hang Lin and Zhengjun Zhang explore the effects of digital finance development on household income, consumption, and financial asset holding in their paper titled “The impacts of digital finance development on household income, consumption, and financial asset holding: an extreme value analysis of China’s microdata.” The previous studies rarely study the tail effects of digital finance on household financial activities, the effect of fairness, and the externalities of digital finance to household economic activities, especially its spatial spillover effect. The authors find that digital finance has a significant impact on poverty reduction, increased consumption, and the promotion of financial asset holding. Additionally, it fosters incentives and efficiency in household income and financial asset management. Their analysis centers around three types of extreme pairs (min to min, max to max, and max to min) that correspond to the fairness, efficiency, and trade-off aspects of digital finance’s influence on economic welfare. To investigate these impacts, the authors utilize panel data from the Peking University Digital Financial Inclusion Index of China and the China Family Panel Studies. They employ generalized extreme value distribution to model the block maxima and minima of variables. Nonlinear dependence between digital finance and household economic variables is detected through binary expansion testing, while the tail quotient correlation coefficient quantifies tail dependencies. The study reveals a

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positive spatial externality of digital finance across all household economic variables, with wider-scoped pairs related to household income and consumption demonstrating a greater spatial spillover effect. In summary, Hang Lin and Zhengjun Zhang's research contributes to understanding the impact of digital finance development on household economic activities. It explores tail effects, fairness considerations, and externalities while highlighting the spatial spillover effect. Their findings have implications for reducing poverty, enhancing consumption, and encouraging financial asset holding, as well as promoting incentives and efficiency in household income and financial management.

In their paper titled "Federated Learning Intellectual Capital Platform," Chengying He, Bin Xiao, Xi Chen, Qingzhen Xu, and Jianwu Lin introduce the Federated Learning Intellectual Capital Platform (FedLICP). This platform utilizes a blockchain-based federated learning algorithm with smart contracts based on Shapley Values to reward data providers. It addresses the limitations imposed by commercial confidentiality that have previously hindered the direct sharing of data, leading to inadequate model predictions and an incomplete understanding of customer behavior. FedLICP overcomes this challenge by uncovering hidden value and improving the performance of commercial banks. It employs the FATE framework for training and encrypting data models, uploading them to the federation chain blocks to prevent malicious nodes from modifying the trained models. Furthermore, FedLICP incorporates an incentive mechanism based on Shapley Values. This mechanism compensates the cost of maintaining the blockchain, increases members' willingness to participate, and motivates them to contribute high-quality data. In all, FedLICP encourages high-quality model uploads, participation in federated learning, providing commercial banks with multi-dimensional customer portraits and risk control support.

Kaicheng Zhang, Li Pan, and Shijun Liu, in "A rating prediction model with cross projection and evolving GCN for Bitcoin trading network," propose a novel deep learning framework for evaluating trading in the Bitcoin marketplace. The framework encompasses a dynamic rating construction network layer, extracting node features layer, and edge learner layer, which collectively overcome the limitations of traditional static graph models. The model combines graph convolutional networks (GCN) and gated recurrent units (GRU) to aggregate node information during node embedding, with the GRU parameters evolving the GCN parameters. Experimental results demonstrate the model's effectiveness in predicting edge weights, surpassing state-of-the-art approaches and providing more accurate trading evaluations. This prediction capability enhances fraud risk reduction and facilitates finding optimal trading partners. Additionally, the model offers advantages such as reduced

training time, fewer parameters to learn, and applicability to dynamic graphs like social networks and recommendation systems.

Xin Jin, Min Zhang, and Xiao Hou explored the relationship between participation motivation, knowledge sharing quality, creative realization, and satisfaction of CIS through empirical research in "Research on performance optimization of crowd innovation space from the perspective of participation motivation." Crowd innovation space (CIS) plays a pivotal role in fostering entrepreneurship and innovation within the digital economy, emphasizing marketization, specialization, integration, and networking. Despite its prominence in the field of innovation and entrepreneurship, there is no consensus on its definition and characteristics. Therefore, they reveal that goal-oriented motivation, self-belonging, and inspirational motivation have a positive impact on the quality of knowledge sharing within CIS. Moreover, the quality of knowledge sharing positively influences creativity realization, albeit not significantly, and significantly enhances overall satisfaction. These findings encourage potential entrepreneurs to actively engage in CIS, thereby improving the efficiency and effectiveness of crowd innovation spaces.

In the paper "Can digital transformation of the enterprise break the monopoly?," Xingfang Guo, Xiaoxiao Song, Bin Dou, Aiping Wang, and Haifeng Hu demonstrate the positive effects of corporate digital transformation on firm performance and its potential to disrupt industry and regional monopolies. The emergence of digital transformation has brought significant changes to market competition, attracting considerable scholarly attention due to its economic impact on companies, industries, and regions. However, there is no consensus among scholars regarding whether digital transformation strengthens or weakens market monopolies. To investigate this, the authors analyze data from Chinese listed companies from 2009 to 2019 and employ a text analysis approach to build new indicators of corporate digital transformation to examine the long-term temporal trends of corporate digital transformation and the long-term impact on corporate performance. The results show that the application of digital technologies influences innovation, R&D models, processes, and competitive advantage that would consequently alter the competitive landscape of the market.

In "An efficient and secure recommendation system based on federated matrix factorization in digital economy," Hongyu Chen, Chunlei Fu, and Chunqiang Hu propose an efficient and secure recommendation system based on federated matrix factorization. The recommendation system analyzes user's characteristics to generate the list of products for users to choose. However, since it requires users to upload their personal data, it is easy to have the privacy leakage problems; so, many users are not willing to provide their information without protection regulation, which is a

big challenge for improving the recommendation system. To address this challenge, the authors develop an efficient and secure recommendation system based on federated matrix factorization. This approach ensures user privacy while achieving effective recommendations. During the training process, users have the option to drop out without affecting subsequent epochs, and participants' behaviors are recorded to calculate rewards or punishments. Additionally, offline behavior is also recorded and subject to appropriate penalties. It offers a solution that legally utilizes data and addresses the privacy concerns associated with traditional recommendation systems.

Mehdi Kargar designs an intuitive search system to enhance knowledge accessibility in the article “Enhancing knowledge accessibility in digital economy with search over enterprise data.” Currently, people are searching the enterprise data through the searching engine, but the data on the webs are usually loosely structured paragraphs, which makes users hard to find relevant information. Unlike the current approach of searching for data on the web, which is based on loosely structured paragraphs, this new system provides users with a more efficient and effective way to explore enterprise data. For example, traditional methods of analysis such as SQL require a preference for a certain language, and pre-defined search forms are expensive and need to be updated frequently. However, Kargar's search engine requires no previous knowledge and improves the user's experience with exploring enterprise data.

In the article “Analysis of investment effect in Xinjiang from the perspective of nontraditional security,” Ming Chen, Yuqi Zhang, Saiji Fu, and Yingjie Tian utilize data mining methods and econometric models to examine the relationship between terrorism and economic activities in Xinjiang. To conduct their analysis, the authors gather data on terrorism incidents from 2007 to 2017. They also obtain information on defense spending and public security expenditures from the website of the Statistics Bureau of the People's Republic of China. The analysis uses both time and space characteristics data of Xinjiang, and it identifies that the areas primarily affected by terrorism in Xinjiang are Kashgar, Aksu, and Hotan, which are located in southern Xinjiang. With the Gradient Boosting Regression Tree (GBRT) model, they compare the importance of 16 different indicators. Their empirical study reveals that the impact of investment in fixed assets (INV) on GDP is ranked the highest among the indicators considered. The authors also find that the number of casualties resulting from terrorist attacks (TER) significantly hinders the GDP in Xinjiang. Conversely, Foreign direct investment (FDI) and, particularly, investment in fixed assets (INV) have a positive effect on the region's GDP.

Bin Teng, Sicong Wang, Qinghua Ren, Qi Hao, and Yufeng Shi conduct a study titled “The cross-interval price

impact model and its empirical analysis on cryptocurrency order book” in which they proposed a new model called cross-interval price impact model (CIPIM) to analyze price changes in the bitcoin market. While previous research has primarily focused on understanding how price fluctuations influence trading volumes and exploring financial market activities from a microstructure perspective, this article introduces a novel approach. The authors developed a feature extractor for order book events utilizing a long short-term memory (LSTM) layer. Additionally, they construct a price response model using a multi-layer perceptron (MLP) neural network. Through their empirical analysis, the authors demonstrate the effectiveness of the CIPIM model in predicting the direction of Bitcoin price movements. They show that the model had a significantly higher concurrent R^2 range, indicating its superior performance in capturing and forecasting price changes compared to existing models. The CIPIM model is a valuable tool for analyzing price impact in the Bitcoin market. The combination of the LSTM-based feature extractor and MLP-based price response model proves to be effective in predicting the direction of Bitcoin price movements.

In “Innovative chest X-ray image recognition technique and its economic value,” Junqi Guo, Yueli Li, Hao Wu, and Jun Wang build a multi-weight-based limited learning instance model for chest X-ray image recognition. X-ray image recognition based on deep learning techniques can relieve the doctor's work pressure through improving the diagnosis efficiency, but it currently has many limitations such as lack of theoretical guidance and learning cases. To address these limitations, the authors propose several key components in their model. Firstly, they incorporate optimized saliency detection to identify and remove irrelevant learning cases. Additionally, they employ multi-scale sparse representation to calculate the weights of learning instances, accurately measuring the significance of different cases. This allows the model to assign appropriate importance to each instance. Furthermore, a multi-weight-based cost function is introduced, considering the variations between cases to ensure comprehensive evaluation. To validate the effectiveness of their model, the authors compare the average precision (AP) and area under the curve (AUC) values with other existing models. The results demonstrate the accuracy and efficacy of their approach. Moreover, the versatility of the model enables its applicability in various situations, indicating its high economic value beyond the scope of the research.

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