Editorial

Special Issue on AI and FinTech: The Challenge Ahead

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It is our pleasure to share with you this special issue on AI and Fintech, which includes 17 articles published in the March/April (eight articles) and May/June (nine articles) issues of *IEEE Intelligent Systems (IS)*.

After our announcement in early September 2019 for this special issue on AI and Fintech for *IS*, we received a larger volume of manuscripts than anticipated by the January 2020 deadline. These worldwide submissions included both academic researchers and practitioners in IT and financial industries. After a long round of revision from independent, anonymous referees that ultimately led to the current, official versions of the articles published in both issues, we would like to first and foremost thank all the contributors and the anonymous referees for their hard work on this project. Second, we give our sincere gratitude to the supportive effort of the *IS* team led by Professor Venkatramanan Subrahmanian (VS) to ensure the timely publication of both issues.

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We know that Finance has been one of the most active domains with increasingly bigger data, faster innovations, and more prosperous applications of artificial intelligence (AI) and data science, including algorithmic trading, cryptocurrency, blockchains, P2P lending, digital and mobile payments, digital assets, crowdfunding, roboadvising, regtech transformation, etc. AI and data science are driving new-generation financial technology (FinTech), which profoundly disrupts existing theories of money, investment, credit, market, and regulation, and furthermore empowers new-generation financial innovations, products, services, operations, processes, and ecosystems. We hope that this special issue on AI and FinTech will collect the latest advancements in FinTech driven by the advanced AI and data science that model complex interactions, relations, and their dynamics; their impact on big financial data analytics and complex financial behaviors across financial markets, products, systems, and networks; and their driving force behind smart financial innovations, services, markets, operations, processes, products, regulation, and risk management.

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While most new concepts and related technology with applications for AI and Fintech are still in their infancy or integration stage, in the past few months, several specialized AI or Fintech topic issues have seen publication (e.g., see Goldstein *et al.*[1] and Germán *et al.*).[2] In dialog with these articles, we hope that our journal brings something new and different to readers by featuring articles that discuss and address at least one true (or simulated) problem from the practice of Fintech with applications.

We have eight articles that focus on AI for this March/April issue, and nine articles that concentrate on Fintech for the May/June issue. In the following, we give a brief introduction to each of the March/April articles that focus on AI.

The first article entitled "Data Cleaning for Personal Credit Scoring by Utilizing Social Media Data: An Empirical Study" by Yu *et al.*[4] establishes general rules for "Rules 1, 2, and 3" as the benchmark to conduct data cleaning for the job under the framework of bigdata environment to perform the so-called "Real but False Data" for the personal credit evaluation. As an application with true situations, they show that the approach established is very important to use the social media data when we plan to build a credible personal credit evaluation system to reduce the credit risk of the current Internet financial industry.

The second article entitled "Asymptotic Meta Learning for Cross Validation of Models for Financial Data" by Xiang *et al.*[5] proposes two Asymptotic Meta learning algorithms (AML-lin and AML-xiang), which are ordinal optimization algorithms for meta learning based on cross validation. The numerical experiments and real-world cases are conducted to illustrate its efficiency in cross validation of models in different scenarios, especially for the financial data. The new method proposed in this article to dealing with financial data is a significant improvement compared to the OCBA and IAML algorithms.

The third article entitled "An Asymptotic Statistical Learning Algorithm for Prediction of Key Trading Events" by Ying *et al.*[6] proposes an event mapping model to formally define the randomness and express it in a low-dimensional and normalized space $\mathcal{Q}$ through mapping functions. Interestingly, when mapping functions are monotonic, the probability of a key event can be approximated by those of nested random events in $\mathcal{Q}$. Based on this finding, the article designed a long short-term memory (LSTM) based neural network to learn the mapping functions and derived an asymptotic statistical learning (ASL) algorithm. ASL automatically analyzes the convergence of random events in space $\mathcal{Q}$ and makes point estimates on key events in trading. Finally, the article conducts the comparison study with 12 existing algorithms on six real datasets from NYSE, S&P 500, NASDAQ, cryptocurrency markets, etc., which shows that the algorithm ASL reliably predicts sparse key events from many random events, which provides a method to deal with the imbalance classification problem in predicting key events in trading. ASL significantly outperforms other algorithms under different market situations in both bull and bear markets. The results are very interesting and should be very useful for the practice.

For the fourth article entitled "Monitoring High-Frequency Data Streams in FinTech: FADO versus K-Means" by Pelckmans[7] reports that results of two algorithms are able to perform well in the demanding setting: The first algorithm is a basic version of *K*-means and the second algorithm is the recently introduced FADO, working in a passive–active way with only a single cluster. The article also provides experimental evidence and conceptual discussion for use of either. In order to steer clear from hardware-related and commercial considerations, the reported comparison is measured using the modest computational hardware. Those algorithms are to be complemented with more dedicated (computational expensive) techniques to follow up on individual transactions.

For the fifth article entitled "A Deep Coupled LSTM Approach for USD/CNY Exchange Rate Forecasting" by Cao *et al.*,[8] the goal is to develop a new deep-coupled long short-term memory (LSTM) approach, namely DCLSTM, to capture the complex couplings for USD/CNY exchange rate forecasting. The article establishes a deep structure consisting of stacked LSTMs to model the complex couplings. As applications, their experimental results with 10 years data indicate that the proposed approach significantly outperforms seven

other benchmarks. This demonstrates the importance of understanding the complex couplings in exchange rate forecasting, and how the DC-LSTM is a useful tool to capture the complex couplings.

For the sixth article entitled "Stock Selection Model Based on Machine Learning with Wisdom of Experts and Crowds" by Wu *et al.*,[9] the purpose of their goal is to examine and compare different effects of the analyst attitude and crowd sentiment on stock prices with data from CSMAR (from a data company). By estimating a multivariate linear regression model, they find that although the wisdom of both experts and crowds has impact on stock prices, the latter's impact on stock prices prevail. They also adopt LightGBM, a novel machine learning model, to predict stock trend based on empirical results. Portfolio returns of different models also suggest that the crowd wisdom is more valuable for creating investment strategy than the expert wisdom. As a conclusion, it necessary to take the wisdom of both experts and crowds into consideration when making investment decision.

For the seventh article entitled "Fractional-Order Memristive Predictor: Arbitrary-Order String Scaling Fracmemristor Based Prediction Model of Trading Price of Future" by Pu *et al.*,[10] inspired by the state-of-the-art research progress of the fractional-order memristor, a fractional-order memristive prediction model of the trading price of future is attempted to be proposed, which can feasibly predict the variation trend of the following unknown trading price data only depending on a small sampling of the given ones in a previous short time. At first, the analogy analysis of the relationship between an actual system of future trading and a physical memristive system of charge transfer is achieved. Second, the achievement of a corresponding capacitive string scaling fracmemristor (LCSF) is mathematically derived and analyzed in detail. Third, five years of data from 2015 to 2019 of 300 traded open-end index securities investment funds from the Shanghai Stock exchange is selected to the multiscale predictive ability of WHAT (noun) using WHAT (noun). The theoretical contribution of this article is the first application of the fractional-order memristive electronic system to feasibly achieve an intelligent prediction model of Fintech with the practice.

For the last article of this issue with the title "The Study for Public Management Policy Utility Evaluation and Optimization System under the Framework of Social Computing Perspective" by Chen *et al.*,[11] the goal is to discuss the utility evaluation system of public management policy from the perspective of social computing. Based on the data obtained through questionnaire survey, a new belief–desire–intention model and associated simulation platform is constructed, which is used to establish a new quantitative analysis method for the policy optimization by using modified logistic functions as a tool. As an application, they conduct the case study for the "Targeted Poverty Alleviation Policy in Yulin Region" (Guangxi, China), in which the key indicators for the poverty were established. The case study completed by this article has Chinese characteristics, which might be applied to the poverty alleviation work globally. By following this way, it is reasonably expected that under the help of social computing perspective, more deeper projects could be done, which would link to the work achieved by Economists Dr. Abhijit Banerjee, Dr. Esther Duflo, and Dr. Michael Kremer who won the 2019 Nobel Economics Prize for their work in fighting global poverty (see The Prize in Economic Sciences 2019[3] for more information).

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