

Editorial for Special Issue: “Feature Papers of Forecasting”

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Nowadays, forecasting applications are receiving unprecedented attention thanks to their capability to improve the decision-making processes by providing useful indications. A large number of forecasting approaches related to different forecasting horizons and to the specific problem that have to be predicted have been proposed in recent scientific literature, from physical models to data-driven statistic and machine learning approaches. Hybrid approaches combining two or more of the previously-mentioned methods, have been also investigated. In general, two methods based on AI-Based Techniques.

In this Special Issue, the most recent and high-quality researches about forecasting are collected. A total of nine papers have been selected to represent a wide range of applications, from weather and environmental predictions to economic and management forecasts. Finally some application related to forecasting the different phase of COVID in Spain and the photovoltaic power production have been presented.

Pedrião et al. [1] compare the Direct Normal Irradiance (DNI) predictions over one year (from 1 August 2018 to 31 July 2019) from Integrated Forecasting System of European Centre for Medium-Range Weather Forecasts (IFS/ECMWF) against the corresponding observed values in south of Portugal, in Évora station, for different time steps (hourly and daily basis) and for different forecast horizons (up to four days ahead). The comparison highlights similar magnitude and trend between forecast and observed data, with an over-estimation of the predicted DNI by IFS/ECMWF and a general error increase with forecast lead time. In addition, a methodology based on DNI attenuation index (DAI) is proposed to estimate the transparency of the atmosphere and a post-processing methodology is adopted to reduce the bias in IFS/ECMWF model. The first methodology revealed the tendency of IFS/ECMWF approach to underestimate the effects of clouds on DNI, while the bias correction post-processing allowed a large improvement in the DNI forecast, with a 30% decrease for all error metrics.

Maroccu et al. [2] propose a nowcasting method for precipitation intensity predictions. The method is based on a generative neural network, which is trained with a specific loss function and presents a PredNet architecture, successfully applied in other fields such as computer vision and natural language processing. Its forecast performance is compared against those of state-of-art optical flow procedures in a real case study, a public domain dataset of radar images from Japan covering a time span of five years. The results demonstrate the neural network to be by far the most effective forecast model between all those proposed.

Gunter et al. [3] investigate the accuracy of individual and combined statistical methods in forecasting the tourism demand for the European Union. This research, contracted by the European Commission, required the analysis of models with low degree of complexity, easily rebuildable for a practical application. The accuracy assessment was performed for eight different periods spanning two years each, in order to grant stable results inside a changing macroeconomic context. The results demonstrate that the combination between Autoregressive Integrated Moving Average (ARIMA) models, REGARIMA models and Error Trend Seasonal (ETS) models performs better than single models, and that the combination based on Bates–Granger weights (Variance-Covariance methods, VACO) is better performing than the one based on uniform weights.

Ghimire et al. [4] analyze the accuracy of low-complexity data-driven persistence-based approaches for streamflow forecasting in Nepal, in the Himalayan region, proposed



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as benchmark for the real-time streamflow forecasting system. In detail, a simple persistence approach, a streamflow climatology approach and an anomaly persistence approach are discussed. In general, the forecast skill of persistence-based methods presents a strong spatio-temporal dependence: it is higher in rivers with constant baseflow respect to intermittent ones, with moderate flows respect to extreme ones and with larger river basins respect to smaller ones. Finally, the study demonstrates that the proposed persistence-based forecast approaches are difficult to outperform even with complex mechanistic hydrologic models.

Rezazadeh [5] proposes a Machine-Learning (ML) workflow implemented on the cloud-based computing platform Microsoft Azure Machine-Learning Service (Azure ML) with the aim of predicting the possibilities of winning sales opportunities in Business to Business (B2B) sales, a task nowadays mostly relying on human evaluations. In order to investigate the effectiveness of the discussed approach, it was applied to a multi-business consulting firm: the ML workflow performance was compared with user-entered predictions made by salespersons. The results demonstrate the decision-making based on the ML predictions to be more accurate than the subjective human predictions.

Comi et al. [6] investigate the variability of bus travel time by means of a time-series-based approach applied on data from Automated Vehicle Monitoring (AVM) of bus lines sharing the road lanes with traffic (private vehicles) in Rome (Italy) and Lviv (Ukraine). The analysis of the results point out the efficiency of the proposed forecast approach, highlighting also the significant effects of time of the day and the day of the week on travel time variability. Moreover, also the key structural differences between Rome and Lviv are considered, showing the need to account them when developing a forecast model.

Hogan et al. [7] describe a diminishing learning rate model, namely Boone's learning curve, with the aim to improve the end-items cost evaluation and to propose an alternative to popular but outdated learning curve models adopted by U.S. Department of Defense (DoD) in costs estimation. The research demonstrates that Boone's learning curve significantly reduces error in modeling observed learning curves using production data from 169 DoD end-items.

Mora et al. [8] develop and calibrate a semi-empirical model based on logistic maps with the aim to forecast the different phases of the COVID-19 epidemic in Spain. In detail, the model predicts the number of infected, hospitalized, patients needing an Intensive Care Unit (ICU) and deaths in four different epidemic phases, namely: non-controlled evolution, total lock-down, partial easing of the lock-down and phased lock-down easing. A reliable forecast of COVID-19 development for both countries or smaller regions allows an optimization of sanitary resources and permits the reduction of the economic and social impact of Non Pharmaceutical Interventions (NPIs), such as lock-downs. The proposed model was capable to provide reasonably accurate results for the different phases of the epidemic.

Pan et al. [9] propose a data-driven Photovoltaic (PV) output power estimation approach using only net load data, temperature data and solar irradiation data and involving a decomposition method of the Behind-The-Meter (BTM) PV output power curve. In order to illustrate the effectiveness of the described approach, the PV output decomposition was simulated and tested on a total of 300 real customers' datasets from Ausgrid.

Conflicts of Interest: The authors declare no conflict of interest.

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