

A Multi-Dimensional Analysis of Infrastructure Considerations in Industrial Facility Placement Using Machine Learning

Dilanka M.R.^{1*}, Wasalthilaka W.V.S.K.¹

¹Department of Software Engineering, Faculty of Computing,
Sabaragamuwa University of Sri Lanka, Sri Lanka

*mrdilanka@std.appsc.sab.ac.lk

Increasingly complex global economies are making the process of choosing factory locations much more difficult for policymakers and investors. In their traditional form, assessments of factory site locations no longer represent current factors affecting factory placements such as new and improved transportation infrastructure and the growth of Industry 5.0, and as a result do not give a long-term perspective on future industrial site placements. Therefore, the study presents a data-driven approach, combining industrial location theory and modern predictive analytics, to identify potential future factory locations. The approach recommended in this study will require that these factors be analyzed on a national level using predictive analysis techniques to determine the likelihood of future location suitability. Site selection factors will include analyzing six primary determinants (electric service reliability, transport/logistics performance, gross domestic product, inflation, trade openness, and political stability) influencing industrial location decisions in 151 countries from 2000-2024. Various forecasting techniques, such as vector auto-regression, random forest, XGBoost, linear regression, LSTM, and a VAR-XGBoost hybrid, determined each factor's projected 2024 value. MSE and R2 metrics indicated the model's accuracy. The random forest combination achieved the highest accuracy. The unique combination random forest achieved the highest level of accuracy. By also aggregating predicted values into a weighted Composite Factory Suitability Index allows for the establishment of a predictor of industrial location potential as well future location of factories. This research offers an adaptive, predictive approach to evaluating factory site suitability, enabling strategic decision-making for policymakers, investors, and industries globally in a rapidly changing business environment.

Keywords: *Hybrid Time-Series Modelling; Factory Suitability Index Forecasting; Vector Autoregression (VAR); XGBoost Correction Model*