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**PREDICTIVE MODELLING OF GROSS OPERATING PROFIT AS A
DETERMINANT OF OPERATIONAL EFFICIENCY ASSESSMENT IN SELECTED
HOTELS
APPLICATION OF LINEAR AND NONLINEAR REGRESSION ALGORITHMS**

Summary of the Doctoral Dissertation

The contemporary hotel industry operates in a highly dynamic, volatile, and competitive environment where operational efficiency plays a critical role in business performance. High seasonality, changing consumer preferences, and numerous external factors such as economic conditions or unexpected events (e.g. health or political crises) significantly affect hotels' financial results. In this context, Gross Operating Profit (GOP) becomes one of the most important indicators for assessing operational performance, and its accurate analysis and prediction acquire strategic importance.

The aim of this doctoral dissertation was to examine the impact of selected financial indicators on GOP in the Polish hotel sector and to develop a predictive model using modern analytical methods, including artificial intelligence algorithms. The research focused on identifying correlations between financial indicators from the USALI system (Uniform System of Accounts for the Lodging Industry) and GOP, as well as exploring the possibility of using these indicators to effectively forecast GOP values. Four research hypotheses were formulated, addressing the existence of relationships between financial indicators and GOP, the effectiveness of selected features in predicting GOP, the presence of seasonal and cyclical patterns in the data, and the performance of modern AI methods compared to traditional econometric techniques.

Empirical research was conducted using financial data collected from seven hotels operating in Poland. A wide range of USALI financial indicators were analyzed using various statistical and analytical methods, including time series analysis, empirical distribution analysis, seasonality and frequency analysis, correlation and wavelet coherence analysis, and feature importance evaluation (using MRMR and Fisher's F-statistic). Based on the results, the most significant predictors were selected and used to develop predictive models. Both classical econometric models and machine learning algorithms were applied, including nonlinear models

and neural networks. Ultimately, the most effective predictive algorithm was identified, demonstrating high accuracy and forecast stability. A key innovative aspect of this dissertation lies in its integration of advanced data analysis methods with practical hotel management. The work provides practical tools to support data-driven decision-making in hotel enterprises, contributing to improved profitability, better resource management, enhanced competitiveness, and more effective strategic planning.

The research methodology combines literature analysis, advanced data analysis techniques (in both time and frequency domains), multicollinearity and predictor variability assessments, as well as the construction and validation of predictive models. Each chapter of the dissertation guides the reader through a logically structured research process—from theoretical analysis and literature review, through empirical investigation, to the development of a functional predictive model.

In conclusion, this dissertation makes a significant contribution to the development of knowledge in the field of economics and finance by introducing a new approach to analyzing operational efficiency in the hotel industry. The results and the proposed model have practical applicability and may serve as a foundation for further research into the use of artificial intelligence in financial analysis within the service sector.