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# Exploring the Relationship Between Rent and Flat Prices Through Random Forest and Grid Search

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This paper explores the critical relationship between flat rents and prices, an important metric reflecting the state of the housing market and its underlying economic factors. The study introduces predictive models based on Random Forest algorithms, refined through Grid Search optimisation, to provide accurate market forecasts. Such predictive capabilities are crucial for policymakers, investors, and developers, who require reliable data for strategic decision-making and policy formulation. The research methodology employs Random Forest for its robust handling of complex datasets, with Grid Search utilised to calibrate the model parameters for enhanced precision. The resulting models are rigorously evaluated, achieving a training accuracy of 0.948 and testing accuracies of 0.745 for price prediction and 0.885 for rent prediction, indicating predictive solid performance. Low Log Loss metrics further validate the models' reliability. The study identifies the model's strengths and areas for refinement through detailed visualisations—accuracy comparisons, correlation heatmaps, and residual distribution plots. The residual plots, in particular, indicate a better generalisation capability in rent forecasting compared to flat price predictions, which exhibit minor overfitting. The findings provide actionable insights, demonstrating the efficacy of Random Forest and Grid Search in capturing the complex dynamics of flat rents and prices. The success of these models indicates their potential for broader application across different regions and market conditions, suggesting a valuable asset for stakeholders in achieving a balanced and fair housing market. This paper aims to contribute to the literature by offering a novel, data-driven perspective on market analysis and economic forecasting within the real estate sector

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## I. Introduction

The relationship between rent and flat prices is a critical economic indicator that reflects the overall health and dynamics of the housing market [1]. Understanding this relationship is crucial for stakeholders, including policymakers, investors, developers, and financial institutions, as it directly influences their decisions and strategies [2]. Economically, the interplay between rent and flat prices mirrors broader conditions such as inflation, employment rates, and consumer spending. For instance, an increase in flat prices, driven by high demand and limited supply, typically results in a corresponding rise in rental costs [3]. This pattern affects various population segments differently, underscoring the need for targeted housing policies and interventions to ensure affordability and market stability [4]. In response to these challenges, this study employs an advanced analytical approach utilising Random Forest and Grid Search to develop robust predictive models for the real estate market [5]. Random Forest is an ensemble learning technique that uses multiple decision trees to make more accurate predictions than could be achieved by a single decision tree [6]. This method is particularly effective for handling the complex, non-linear relationships often present in housing market data. It offers the advantage of managing large datasets and multiple variable types effectively, providing valuable insights into critical factors that drive market trends [7]. Grid Search optimises model performance by complementing the Random Forest model

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