Airbnb price prediction using RNN based LSTM

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**Introduction**

The rise of Airbnb as a leading platform for short-term rentals has revolutionized the hospitality industry. However, pricing rental properties remains a complex task for hosts, often leading to suboptimal outcomes for both hosts and guests. This proposal seeks to address this challenge by developing a price prediction model using advanced machine learning techniques. By understanding the dynamics of Airbnb listings and analyzing historical data, the model aims to provide actionable insights for hosts to maximize revenue and occupancy rates while offering competitive pricing to guests. This proposal outlines the development of a price prediction model for Airbnb listings using Bi-LSTM (Bidirectional Long Short-Term Memory) neural networks. Airbnb, a prominent internet marketplace for vacation rentals, faces challenges in pricing properties optimally, impacting both hosts and guests. The proposed model aims to assist property owners and customers by accurately predicting rental prices based on limited property information. By leveraging machine learning and natural language processing techniques, the model will analyze rental characteristics, host attributes, and customer feedback to provide reliable price estimates. The project will involve data cleaning, preprocessing, exploratory analysis, and model training to develop an effective predictive tool for the Airbnb ecosystem.

**Related Works**

Airbnb is a commercial rental service that has exploded in popularity over the last couple of years. It has outperformed its rival inns in terms of providing temporary amenities to tourists, which highlights the importance of matching visitor demands in order to entice them to return [1]. With the growth of Airbnb, understanding how this will influence tourists is critical to the future of creative enterprises. To assess future growth and development, it is critical to understand the factors that contributed to change in society, since a significant number of platforms that supply accommodations were influenced [2]. It is critical to determine if the influence is locational or structural in nature [3]. The rapid advancements have resulted in a significant increase in conflict between Airbnb and a variety of other firms. There is a need to improve and reduce expenditures in order to maintain the flow of visitors attracted to themselves. To match the steps to Airbnb's business, it's critical to have a firm grasp of the company's business model and different sectors.

Business models should be modified on a regular basis to ensure continued growth and development [3]. Additionally, the Airbnb host should be aware of the expectations for the house in comparison to hotels [2]. Numerous listing factors have an effect on Airbnb's rates, which is why it's critical to examine the relationship between numerous attributes and how they differ while reflecting the price. Thus, the host may choose the features that contribute to the community's growth while still keeping an eye on the price [4].

**Execution Plan**

1. Data Collection: Gather historical Airbnb listing data from multiple cities in the United States.
2. Data Preprocessing: Clean and preprocess the data, including handling missing values, outlier detection, and feature engineering.
3. Exploratory Analysis: Conduct descriptive and prescriptive analyses to understand listing characteristics, pricing trends, and neighborhood dynamics.
4. Model Development: Train Bi-LSTM neural networks to predict rental prices based on input features such as property attributes, host information, and customer feedback.
5. Model Evaluation: Assess the performance of the developed models using metrics such as root mean square error (RMSE) and mean absolute error (MAE).

**Expected Contributions/Learning**

* Development of a novel price prediction model for Airbnb listings using Bi-LSTM neural networks.
* Insights into the factors influencing Airbnb pricing decisions and their impact on host revenue and guest satisfaction.
* Understanding the applicability of advanced machine learning techniques in the hospitality industry and their potential for improving pricing strategies.

**Evaluation**

The performance of the developed price prediction model will be evaluated using rigorous validation techniques, including cross-validation and holdout testing. The accuracy of the model in predicting rental prices will be assessed using quantitative metrics such as RMSE and MAE, comparing the predicted prices against actual listing prices. Additionally, qualitative feedback from hosts and customers will be collected to gauge the usefulness and effectiveness of the model in real-world scenarios.

**Reference**

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