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Machine Learning System Design

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Rental Search Ranking System Design

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Booking Model

Learn about the booking model for the Airbnb Rental Search.

We'll cover the following

3. Model#

Feature engineering#

- Geolocation of listing (latitude/longitude): Taking raw latitude and raw longitude features is very tough to model as feature distribution is not smooth. One way around this is to take a log of distance from the center of the map for latitude and longitude separately.

- Favourite place: store user's favorite neighborhood place in 2 dimensions grid. For example, users add Pier 39 as their favorite place, we encode this place into a specific cell, then use embedding before training/serving.

Features	Feature engineering	Description
Listing ID	Listing ID embedding	See Embedding in Machine Learning Primer: Feature Selection and Feature engineering.
Listing feature	Number of bedrooms, list of amenities, listing city	
Location	Measure lat/long from the center of the user map, then normalize	
Historical search query	Text embedding	
User associated features: age, gender	Normalization or Standardization	
Number of previous bookings	Normalization or Standardization	
Previous length of stays	Normalization or Standardization	
Time related features	Month, weekofyear, holiday, dayofweek,	

	hourofday	

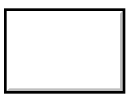
Training data#

- User search history, view history, and bookings. We can start by selecting a period of data: last month, last 6 months, etc., to find the balance between training time and model accuracy.

> In practice, we decide the length of training data by running multiple experiments. Each experiment will pick a certain time period to train data. We then compare model accuracy and training time across different experimentations.

Model architecture#

- Input: User data, search query, and Listing data.
- Output: This is a binary classification model, i.e., user books a rental or not.
- We can start with the deep learning with fully connected layers as a baseline. Model outputs a number within [0, 1] and presents the likelihood of booking.
- To further improve the model, we can also use other more modern network architecture, i.e., Variational AutoEncoder or Denoising AutoEncoder. Read more about Variational Autoencoder.



Problem Statement and Metrics

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