Rubric: Temporal Airbnb Seasonality and Modeling Extra Credit

EAS 510 Basics of AI

Overview

This rubric accompanies the "Extra Credit: Temporal Airbnb Seasonality and Modeling Assignment". It is intended primarily for instructors and graders. The assignment is scored out of a total of 130 points, divided across five parts:

- Part 1: Dataset Construction (25 points)
- Part 2: Seasonality Analysis (30 points)
- Part 3: Temporal Train/Validation/Test Split (15 points)
- Part 4: Modeling & TensorBoard (40 points)
- Part 5: Final Write-Up & GitHub Submission (20 points)

Part 1: Dataset Construction (25 points)

This section evaluates whether students correctly build the night-level panel dataset for each city and snapshot date. Students are *not required* to save the full city-level panel datasets to disk; sampled or truncated saves, or a clearly documented in-memory workflow, are acceptable.

Criterion	Points
Correctly load all required `listings.csv` and `calendar.csv` files; evidence shown (shapes, head, dtypes)	5
Successful left merge on `listing_id`; resulting dataset reflects one row per listing/date; shape is reasonable and documented	5
Key variables cleaned and transformed: `price` numeric, `is_booked` constructed from `available`, `date` parsed as datetime	7
Time-based features created: `month`, `day_of_week`, `week_of_year`, `is_weekend`, `day_of_year`, with brief verification	6
Prepared panel dataset can be conveniently reused (e.g. via a sampled or truncated saved file, or a clearly reproducible preprocessing cell); any saved filenames are clear and reproducible	2
Total Part 1	**25**

Part 2: Seasonality Analysis (30 points)

This section evaluates exploratory analysis of temporal patterns in price and occupancy.

Criterion	Points
Average price by month plot: correct aggregation, clear line plot, labeled axes, sensible scale	7
Average occupancy (booking probability) by month plot using `is_booked`; clear seasonal pattern, labeled axes	7
Weekend vs weekday comparison: correct identification of weekends; bar or grouped bar charts for price and booking probability	6
Seasonal pattern by listing type: uses an appropriate categorical variable (e.g. `room_type`); plot shows price by month by category	6
Short written interpretation (3–5 sentences) highlights key seasonal insights (peaks, dips, differences by type or weekend)	4
Total Part 2	**30**

Part 3: Temporal Train/Validation/Test Split (15 points)

This section evaluates whether students use an appropriate temporal split and prepare modeling matrices correctly.

Criterion	Points
Temporal split implemented correctly (Train: Jan–Sept, Validation: Oct–Nov, Test: Dec–Feb, or equivalent based on snapshot range); no random shuffling	6
Feature set is appropriate: uses listing and time features; avoids IDs, raw dates, and free-text fields; *both* target variables are correctly defined (price *and* `is_booked`)	5
Construction of `X_train/y_train`, `X_valid/y_valid`, `X_test/y_test` is clear; shapes and dtypes are sensible and briefly documented	4
Total Part 3	**15**

Part 4: Modeling and TensorBoard (40 points)

This section evaluates the training, evaluation, and TensorBoard logging for XGBoost and Neural Network models.

Criterion	Points
XGBoost models (*both* regressor for price and classifier for bookings) train successfully; reasonable hyperparameters; validation and test metrics are computed and reported for both	8
Neural Network models (*both* regression and classification architectures) are appropriate; both models train successfully; validation and test metrics are reported for both	10
TensorBoard is used for *both* Neural Networks: separate log directories used, scalar curves (training/validation loss and relevant metrics) are visible for both price and booking models	10
Screenshots of TensorBoard scalar plots are inserted into the notebook for *both* models and clearly associated with the corresponding experiments	5
Temporal evaluation is respected: final metrics are computed strictly on the held-out test period; no temporal leakage	4
Interpretation compares *both* models: references metrics and TensorBoard curves; comments on stability, overfitting/underfitting, and which target (price vs bookings) shows more predictable patterns	3
Total Part 4	**40**

Part 5: Final Write-Up and GitHub Submission (20 points)

This section evaluates the clarity and professionalism of the final notebook write-up and repository structure.

Criterion	Points
Notebook contains a coherent Markdown write-up as the final section, addressing data summary, seasonality insights for *both targets*, comparative model behavior, TensorBoard analysis, and business insights about which prediction target is more valuable	10
Discussion explicitly interprets TensorBoard screenshots for *both models* (e.g. evidence of overfitting/underfitting, training stability, which target shows better learning curves)	4
Public GitHub repository is provided; includes the final notebook, a README with basic instructions, and a `requirements.txt` file; structure is clear and minimal	4
Overall presentation: code and narrative are reasonably clean, with extraneous cells removed and filenames clearly labeled	2
Total Part 5	**20**

Grand Total

The assignment is graded out of 130 points:

Part	Points
Part 1: Dataset Construction	25
Part 2: Seasonality Analysis	30
Part 3: Temporal Split	15
Part 4: Modeling & TensorBoard	40
Part 5: Write-Up & GitHub	20
Total	**130**