Rex Partner Report

Dear Rex,

It has been our pleasure collaborating with you on this project. This email is to give an overview summary of our current stage of work, the challenges we are navigating and where we are heading next. Additionally, we have also attached our updated technical report which gives a more detailed breakdown.

Our ultimate aim remains to predict supply and demand for homes in the Denver area. However, in the short term we are now focusing on predicting demand after realizing that we may require a slightly different approach/ predictors when making predictions on the number of homes listed in the Denver area. The attached technical document outlines our approach to predicting demand and the next steps we are taking to overcome our challenges.

Current Stage:
In the past few weeks, we have extended our baseline models to include a neural network, as well as a new set of baseline models that use submarket classification. For submarket baseline models, we use k-means to cluster the housing market and then use simple regression techniques on each submarket to predict its demand. However, the introduction of submarket classification has not shown any prediction gain compared to non-submarket models.

Another significant update is our successful implementation of the developed model - a Bayesian hierarchical approach to predicting demand. We implemented the model via 2 approaches, using simulated sampling with PyMC3 and optimization with Expectation-Maximization (EM). The current results from both approaches have shown not to perform better than the baseline models. This may be due to suboptimal implementations or initializations, although we describe key fundamental challenges that inhibit our current approach.

Future Plan:

Each of our models currently generates similar performance, due in large part to the class imbalance between homes that are sold and not sold. We attempted to address this issue using SMOTE and found minimal success. We suggest several other methods that we will explore ahead of the next milestone. Additionally, we plan to augment the features of each

home with macroeconomic data, which has been shown to be a good predictor of both supply and demand.

Please let us know if you have any suggestions or concerns regarding our project, and we look forward to our next chat on Zoom!

Sincerely,