Finding Your Dream Home: REX House Recommendations
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GOAL
The process of finding the perfect house is often long and complicated. REX wants to improve users’ experiences by recommending suitable homes, and one important step is to provide users an easy way to find their idea home. Therefore, we aim to develop a model that serves open-minded house-hunters with personalized recommendations for discovering their perfect home.

MODELS
Baseline Models
- Content-based filtering: recommend other listings similar to what the user likes (cosine-similarity)
- Collaborative filtering: recommend using similarities between users and listings simultaneously (matrix methods: SVD, NMF)

Image Feature Extraction
To extract some additional image features from listing images for recommendation models

Location Classification
- Classify listing images as indoor or outdoor using Places365 model
- Classify room types of indoor listing images using room classification model from REX API

Style Clustering
- Use clustered labels as features for recommendation models.

DATA
Listing Data
- REX Listing Images
- REX MLS Metadata
- User Activity

Web Interaction Data
- Used web-log data from REX's website to gain an understanding of specific users' house interests
- Ranked interactions to generate scores of intent a user has for each listing they engaged with, and implemented the data in our collaborative filtering model

RESULTS
To get a better understanding of how users browse listings and explore the site currently, we defined windows of co-occurrence to understand which listings were being viewed sequentially by any users. Used in RF + Siamese NN models

WEB INTERACTION DATA
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PROJECT WORKFLOW

USER STUDY
We designed a simple user study to see how model produced recommendations that real users would be interested in
1. Pick 3 houses of interest
2. Select an additional listing of interest
Which model produced their preferred listing?

CONCLUSIONS
- We found that it is most effective to model the flexibility of user behavior using click journey/co-occurrence as supervision as opposed to simply recommending the most similar listings
- Including information from image style clustering improved our models
- Random forest was the best-performing model on our test set. Siamese Network also performs relatively well and outperforms baseline recommendation system models
- The results of our user study also showed that random forest produced the most interesting recommendations
- Moving forward, an A/B test would be useful to test how our model impacts user retention or the efficiency of finding homes on REX’s site

REFERENCES
- Home Embeddings for Similar Home Recommendations
- Siamese Network Keras for Image and Text Similarity
- Places365-CN
- Harvard John A. Paulson School of Engineering and Applied Sciences