Evaluation of Rent Prediction Models using Floor Plan Images

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In the real estate rental property, there are almost no properties with the same attributes.
For example, properties such as location, floor plan types such as 1K and 1LDK, and the shape of the floor plan differ among rental properties. Property attributes have a strong impact on prices, so a high level of expertise is needed to determine prices. Hedonic approach is used to support rent determination.

The hedonic approach is a technology that regards the price of a product as a set of property values of the product and constructs a prediction model of the product price by linear regression. However, this method using only property attributes such as location, floor plan types such as 1K and 1LDK and this method does not consider the floor plan images (FPIs). In addition, even if the layout type is the same, there are also different types of floor layouts, and in Japan there is a custom to look at FPI when searching for a desired rental property in many cases. Therefore, it is expected that FPI affects the rent, so it is important to clarify how the FPI affects the rent in the rent of the rental property.

This study constructs rent prediction models with/without floor plan images in order to validate whether such images contribute the prediction accuracy, in order to clarify the influence that a floor plan has on rents. In addition, applications of PCA (principal component analysis) and convolutional neural network are considered as a feature extractor from FPIs. The prediction accuracy is measured using properties of 90,000 rental housings in Tokyo.

In the experimental results, the root mean squared error values of the prediction model with FPIs and PCA tend to be higher than without floor plan images. Moreover, prediction rent model with PCA improve accuracy by extracting the feature quantities of FPI with 1024 and 2048 dimensions. On the other hand, prediction rent model with convolutional neural network has a low average value of the prediction error in all price ranges.

These suggests that the use of FPI contributes to accuracy of rent prediction.