

House renting based on client preferences: Optimization Model

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**Abstract.** This project provides an optimization model designed to solve a rental property selection problem, taking into consideration the clients' preferences and limitations. The problem is formulated as a Multiple-Constrained Knapsack Problem (MCKP), where there is a cost (monthly rent) and it is evaluated against the client requirements (budget, number of bedrooms, location, etc.). The objective is to maximize the number of suitable properties while satisfying all constraints at the same time. The model is implemented as a binary integer program, complemented by a sensitivity analysis, conducted in order to evaluate its adaptability and robustness when facing different preferences and needs by the customers. It is tested on a rental listing dataset and multiple hypothetical customer profiles to demonstrate its adaptability and scalability.

**Problem Statement.**

The process of selecting a rental property that meets your necessities, is often inefficient and full of options that in most cases are far from your expectations. This project addresses this problem that clients face every time they go into this process, it is treated from the decision-making perspective and aims into increasing client satisfaction through the model approach.

This project proposal is based on an adaptable optimization model, that can recommend rental properties based on customizable customers preferences. The accepted inputs are:

* Monthly budget
* Property size
* Preferred Area Type
* Preferred City
* Furnishing status
* Number of bathrooms
* Number of floors
* Number of bedrooms

Each one of the client preferences serves as a parameter of the same optimization model, helping to set up the constraints of this binary integer program problem, where each property is either selected or not based on feasibility. The goal is to maximize the number of properties that meet the client needs and preferences, taking the constraints into consideration. A sensitivity analysis is applied to observe how the variations in the customer inputs affect the model outputs, demonstrating its adaptability to different scenarios.