**Model Card for House Price Prediction Model**

**Model Overview**

* **Model Name**: House Price Prediction Model
* **Model Type**: Random Forest Regressor
* **Version**: 1.0

**Model Description**

This model is designed to predict house prices based on various features, such as area, number of bedrooms, bathrooms, and other factors. The primary purpose of the model is to assist in estimating the price of a house given its attributes.

The model is trained using a **Random Forest Regressor**. Additionally, **RandomizedSearchCV** is used to optimize the hyperparameters of the model, improving its accuracy and performance.

**Input Data**

* **Features**: The model uses the following features to predict house prices:
  + area: Total area of the house in square feet.
  + bedrooms: Number of bedrooms in the house.
  + bathrooms: Number of bathrooms.
  + stories: Number of floors/stories in the house.
  + mainroad: Whether the house is near the main road (yes/no).
  + guestroom: Presence of a guest room (yes/no).
  + basement: Presence of a basement (yes/no).
  + hotwaterheating: Presence of hot water heating (yes/no).
  + airconditioning: Presence of air conditioning (yes/no).
  + parking: Number of parking spaces available.
  + prefarea: Whether the house is in a preferred area (yes/no).
  + furnishingstatus: Furnishing status of the house (furnished/semi-furnished/unfurnished).

**Output**

* **Predicted Price**: The model outputs a predicted price for a house, given its features.

**Training Details**

* **Algorithm**: Random Forest Regressor
* **Data Split**: 80% training, 20% testing
* **Evaluation Metrics**:
  + **Mean Squared Error (MSE)**: Measures the average squared difference between the predicted and actual prices.
  + **R² Score**: Indicates how well the model explains the variance in the target variable (house price).

**Hyperparameter Tuning**

* **Method Used**: RandomizedSearchCV
* **Parameters Tuned**:
  + n\_estimators: Number of trees in the forest.
  + max\_depth: Maximum depth of the tree.
  + min\_samples\_split: Minimum number of samples required to split an internal node.
  + min\_samples\_leaf: Minimum number of samples required to be at a leaf node.

**Model Performance**

* **Baseline Model**: Random Forest Regressor with default parameters.
* **Optimized Model**: Random Forest Regressor after tuning with RandomizedSearchCV.
* **Performance Metrics**