

Model Development Phase Template

Date	07 July 2024
Team ID	740709
Project Title	House Rent Price Prediction Using Machine Learning
Maximum Marks	4 Marks

Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include classification reports, accuracy, and confusion matrices for multiple models, presented through respective screenshots.

Initial Model Training Code:

Linear Regression Model

```
Linear Regression model

linReg = LinearRegression()
linReg.fit(x_train,y_train)

[ ] y_pred = linReg.predict(x_test)

[ ] accuracy = linReg.score(x_test,y_test)
print(accuracy)

0.8139527448447011
```

Random Forest Model

```
Random Forest Model

[ ] rf = RandomForestRegressor(n_estimators = 100 , random_state = 0)
rf.fit(x,y)

[ ] y_pred = rf.predict(x_test)

[ ] accuracy = rf.score(x_test,y_test)
print(accuracy)

0.9863832466567757
```

XGBoost Regression Model

```

XGBoost Regression

import xgboost
from xgboost import XGBRegressor
xgb_model = XGBRegressor()
xgb_model.fit(x_train, y_train)
pred_xgb = xgb_model.predict(x_test)
mae_xgb = mean_absolute_error(y_test, pred_xgb)
mse_xgb = mean_squared_error(y_test, pred_xgb)
rmse_xgb = np.sqrt(mse_xgb)
rsq_xgb = r2_score(y_test, pred_xgb)
print('MAE: %.3f' % mae_xgb)
print('MSE: %.3f' % mse_xgb)
print('RMSE: %.3f' % rmse_xgb)
print('R-Square: %.3f' % rsq_xgb)
print(accuracy)

MAE: 3266.968
MSE: 25973983.707
RMSE: 5096.468
R-Square: 0.917
0.9863832466567757

```

Decision Tree Model

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Decision Tree Model:

from sklearn.tree import DecisionTreeRegressor
dt = DecisionTreeRegressor(random_state = 0)
dt.fit(x,y)

DecisionTreeRegressor
DecisionTreeRegressor(random_state=0)

[ ] y_pred = dt.predict(x_test)

[ ] accuracy = dt.score(x_test,y_test)
print(accuracy)

0.9968193356037073

```

Model Validation and Evaluation Report:

Model	Regression Report	Accuracy	Regression Matrix
Linear Regression	<pre> # Importing the libraries import numpy as np from sklearn.linear_model import LinearRegression # Splitting the dataset into the training set and the test set X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0) # Fitting the Linear Regression model to the training set regressor = LinearRegression() regressor.fit(X_train, y_train) # Predicting the test set results y_pred = regressor.predict(X_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) </pre>	81.3%	<pre> def model_compare(x_train, x_test, y_train, y_test): # Importing the libraries from sklearn.linear_model import LinearRegression # Fitting the Linear Regression model to the training set regressor = LinearRegression() regressor.fit(x_train, y_train) # Predicting the test set results y_pred = regressor.predict(x_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) # Similarly for other models (if, xgb_model), use their predict methods # ... # model_compare(x_train, x_test, y_train, y_test) # Prediction Evaluation using Linear Regression Mean Absolute Error: 3266.968468 Mean Squared Error: 25973983.707 R-squared: 0.9167246847011 0.986 </pre>
Random Forest Regressor	<pre> # Importing the libraries import numpy as np from sklearn.ensemble import RandomForestRegressor # Splitting the dataset into the training set and the test set X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0) # Fitting the Random Forest Regressor model to the training set regressor = RandomForestRegressor() regressor.fit(X_train, y_train) # Predicting the test set results y_pred = regressor.predict(X_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) </pre>	98.6%	<pre> def model_compare(x_train, x_test, y_train, y_test): # Importing the libraries from sklearn.ensemble import RandomForestRegressor # Fitting the Random Forest Regressor model to the training set regressor = RandomForestRegressor() regressor.fit(x_train, y_train) # Predicting the test set results y_pred = regressor.predict(x_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) # Similarly for other models (if, xgb_model), use their predict methods # ... # model_compare(x_train, x_test, y_train, y_test) # Prediction Evaluation using Random Forest Regressor Mean Absolute Error: 124.36138328803 Mean Squared Error: 4247661.861751512 Root Mean Squared Error: 2060.8484211805 R-squared: 0.9863832466567757 0.986 </pre>
XGBoost Regression	<pre> # Importing the libraries import numpy as np from sklearn.xgboost import XGBRegressor # Splitting the dataset into the training set and the test set X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0) # Fitting the XGBoost Regressor model to the training set regressor = XGBRegressor() regressor.fit(X_train, y_train) # Predicting the test set results y_pred = regressor.predict(X_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) </pre>	91.6%	<pre> def model_compare(x_train, x_test, y_train, y_test): # Importing the libraries from sklearn.xgboost import XGBRegressor # Fitting the XGBoost Regressor model to the training set regressor = XGBRegressor() regressor.fit(x_train, y_train) # Predicting the test set results y_pred = regressor.predict(x_test) # Evaluating the model performance print('Mean Absolute Error: ', mean_absolute_error(y_test, y_pred)) print('Mean Squared Error: ', mean_squared_error(y_test, y_pred)) print('Root Mean Squared Error: ', np.sqrt(mean_squared_error(y_test, y_pred))) print('R-squared: ', r2_score(y_test, y_pred)) # Similarly for other models (if, xgb_model), use their predict methods # ... # model_compare(x_train, x_test, y_train, y_test) # Prediction Evaluation using Gradient Boosting Regressor Mean Absolute Error: 200.26042001076 Mean Squared Error: 158730.707115117 Root Mean Squared Error: 398.40720709114 R-squared: 0.9167246847011 0.986 </pre>

Decision Tree	<pre> 1 # Importing the libraries to be used in the programme and to a series list of a body array. 2 # and to predict the test y_train on the series x_test array. 3 # Prediction Evaluation using Decision Tree Regressor 4 print("Mean Absolute Error: ", mean_absolute_error(y_test, y_pred)) 5 print("Mean Squared Error: ", mean_squared_error(y_test, y_pred)) 6 print("Root Mean Squared Error: ", np.sqrt(mean_squared_error(y_test, y_pred))) 7 print("R-squared: ", r2_score(y_test, y_pred)) 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 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656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 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1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 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