|  |  |
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| Date | 14 November 2022 |
| Team ID | PNT2022TMID45948 |
| Project Name | Predicting the energy output of wind turbine based on weather condition |
| Maximum Marks | 4 Marks |

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| 1363 lines (1363 sloc) 57.3 KB | |
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| 886 | " | <td>2018</td>\n", |
| 887 | " | <td>12</td>\n", |
| 888 | " | <td>31</td>\n", |
| 889 | " | <td>23</td>\n", |
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| 896 | " | <td>7.332648</td>\n", |
| 897 | " | <td>1173.055771</td>\n", |
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| 899 | " | <td>2018</td>\n", |
| 900 | " | <td>12</td>\n", |
| 901 | " | <td>31</td>\n", |
| 902 | " | <td>23</td>\n", |
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| 910 | " | <td>1788.284755</td>\n", |
| 911 | " | <td>84.742500</td>\n", |

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| 912 | " | <td>2018</td>\n", |
| 913 | " | <td>12</td>\n", |
| 914 | " | <td>31</td>\n", |
| 915 | " | <td>23</td>\n", |
| 916 | " | <td>30</td>\n", |
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| 921 | " | <td>2515.694092</td>\n", |
| 922 | " | <td>9.421366</td>\n", |
| 923 | " | <td>2418.382503</td>\n", |
| 924 | " | <td>84.297913</td>\n", |
| 925 | " | <td>2018</td>\n", |
| 926 | " | <td>12</td>\n", |
| 927 | " | <td>31</td>\n", |
| 928 | " | <td>23</td>\n", |
| 929 | " | <td>40</td>\n", |
| 930 | " | </tr>\n", |
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| 934 | " | <td>2820.466064</td>\n", |
| 935 | " | <td>9.979332</td>\n", |
| 936 | " | <td>2779.184096</td>\n", |
| 937 | " | <td>82.274620</td>\n", |
| 938 | " | <td>2018</td>\n", |
| 939 | " | <td>12</td>\n", |
| 940 | " | <td>31</td>\n", |
| 941 | " | <td>23</td>\n", |
| 942 | " | <td>50</td>\n", |
| 943 | " | </tr>\n", |
| 944 | " | </tbody>\n", |
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| 947 | "</div>\n", | |
| 948 | " <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-e0fd136 | |
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| 950 | " style=\"display:none;\">\n", | |
| 951 | " \n", | |
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| 953 | " width=\"24px\">\n", | |
| 954 | " <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\n", | |
| 955 | " <path d=\"M18.56 5.44l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94 2.06-2.06 | |
| 956 | " </svg>\n", | |
| 957 | " </button>\n", | |
| 958 | " \n", | |
| 959 | " <style>\n", | |
| 960 | " .colab-df-container {\n", | |

|  |  |
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| 961 | " display:flex;\n", |
| 962 | " flex-wrap:wrap;\n", |
| 963 | " gap: 12px;\n", |
| 964 | " }\n", |
| 965 | "\n", |
| 966 | " .colab-df-convert {\n", |
| 967 | " background-color: #E8F0FE;\n", |
| 968 | " border: none;\n", |
| 969 | " border-radius: 50%;\n", |
| 970 | " cursor: pointer;\n", |
| 971 | " display: none;\n", |
| 972 | " fill: #1967D2;\n", |
| 973 | " height: 32px;\n", |
| 974 | " padding: 0 0 0 0;\n", |
| 975 | " width: 32px;\n", |
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| 977 | "\n", |
| 978 | " .colab-df-convert:hover {\n", |
| 979 | " background-color: #E2EBFA;\n", |
| 980 | " box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 6 |
| 981 | " fill: #174EA6;\n", |
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| 991 | " box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n", |
| 992 | " filter: drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n", |
| 993 | " fill: #FFFFFF;\n", |
| 994 | " }\n", |
| 995 | " </style>\n", |
| 996 | "\n", |
| 997 | " <script>\n", |
| 998 | " const buttonEl =\n", |
| 999 | " document.querySelector('#df-e0fd136c-f40b-400b-8a2b-edbdd62bd85a button.c |
| 1000 | " buttonEl.style.display =\n", |
| 1001 | " google.colab.kernel.accessAllowed ? 'block' : 'none';\n", |
| 1002 | "\n", |
| 1003 | " async function convertToInteractive(key) {\n", |
| 1004 | " const element = document.querySelector('#df-e0fd136c-f40b-400b-8a2b-edbdd |
| 1005 | " const dataTable =\n", |
| 1006 | " await google.colab.kernel.invokeFunction('convertToInteractive',\n", |
| 1007 | " [key], {});\n", |
| 1008 | " if (!dataTable) return;\n", |
| 1009 | "\n", |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1039 | " | TheoreticalPowerCurve(KWh) | WindDirection | year | month | day | Hour | \\\n", |
| 1040 | "0 | 416.328908 | 259.994904 | 2018 | 1 | 1 | 0 | \n", |
| 1041 | "1 | 519.917511 | 268.641113 | 2018 | 1 | 1 | 0 | \n", |
| 1042 | "2 | 390.900016 | 272.564789 | 2018 | 1 | 1 | 0 | \n", |
| 1043 | "3 | 516.127569 | 271.258087 | 2018 | 1 | 1 | 0 | \n", |
| 1044 | "4 | 491.702972 | 265.674286 | 2018 | 1 | 1 | 0 | \n", |
| 1045 | "... | ... | ... | ... | ... | ... | ... | \n", |
| 1046 | "50525 | 3397.190793 | 80.502724 | 2018 | 12 | 31 | 23 | \n", |
| 1047 | "50526 | 1173.055771 | 84.062599 | 2018 | 12 | 31 | 23 | \n", |
| 1048 | "50527 | 1788.284755 | 84.742500 | 2018 | 12 | 31 | 23 | \n", |
| 1049 | "50528 | 2418.382503 | 84.297913 | 2018 | 12 | 31 | 23 | \n", |
| 1050 | "50529 | 2779.184096 | 82.274620 | 2018 | 12 | 31 | 23 | \n", |
| 1051 | "\n", |  |  | | | | | |
| 1052 | " | minute \n", |
| 1053 | "0 | 0 \n", |
| 1054 | "1 | 10 \n", |
| 1055 | "2 | 20 \n", |
| 1056 | "3 | 30 \n", |
| 1057 | "4 | 40 \n", |
| 1058 | "... | ... \n", |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1010 | " | const docLinkHtml = 'Like what you see? Visit the ' +\n", | | | | |
| 1011 | " | '<a target=\"\_blank\" href=https://colab.research.google.com/notebooks/ | | | | |
| 1012 | " | + ' to learn more about interactive tables.';\n", | | | | |
| 1013 | " | element.innerHTML = '';\n", | | | | |
| 1014 | " | dataTable['output\_type'] = 'display\_data';\n", | | | | |
| 1015 | " | await google.colab.output.renderOutput(dataTable, element);\n", | | | | |
| 1016 | " | const docLink = document.createElement('div');\n", | | | | |
| 1017 | " | docLink.innerHTML = docLinkHtml;\n", | | | | |
| 1018 | " | element.appendChild(docLink);\n", | | | | |
| 1019 | " | }\n", | | | | |
| 1020 | " | </script>\n", | | | | |
| 1021 | " | </div>\n", | | | | |
| 1022 | " | </div>\n", | | | | |
| 1023 | " | " | | | | |
| 1024 | ], |  | | | | |
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| 1026 | " | | Date/Time | ActivePower(kW) | WindSpeed(m/s) | \\\n", |
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| 1028 | "1 2018-01-01 | | 00:10:00 | 453.769196 | 5.672167 | \n", |
| 1029 | "2 2018-01-01 | | 00:20:00 | 306.376587 | 5.216037 | \n", |
| 1030 | "3 2018-01-01 | | 00:30:00 | 419.645905 | 5.659674 | \n", |
| 1031 | "4 2018-01-01 | | 00:40:00 | 380.650696 | 5.577941 | \n", |
| 1032 | "... | | ... | ... | ... | \n", |
| 1033 | "50525 2018-12-31 | | 23:10:00 | 2963.980957 | 11.404030 | \n", |
| 1034 | "50526 2018-12-31 | | 23:20:00 | 1684.353027 | 7.332648 | \n", |
| 1035 | "50527 2018-12-31 | | 23:30:00 | 2201.106934 | 8.435358 | \n", |
| 1036 | "50528 2018-12-31 | | 23:40:00 | 2515.694092 | 9.421366 | \n", |
| 1037 | "50529 2018-12-31 | | 23:50:00 | 2820.466064 | 9.979332 | \n", |
| 1038 | "\n", | |  |  |  |  |

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| --- | --- | --- | --- | --- | --- |
| 1059 |  | | "50525 | 10 | \n", |
| 1060 |  | | "50526 | 20 | \n", |
| 1061 |  | | "50527 | 30 | \n", |
| 1062 |  | | "50528 | 40 | \n", |
| 1063 |  | | "50529 | 50 | \n", |
| 1064 |  | | "\n", |  |  |
| 1065 |  | | "[50530 | rows x | 10 columns]" |
| 1066 | ] | |  |  |  |
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| 1070 |  | "output\_type": "execute\_result" | | | |
| 1071 | } |  | | | |
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| 1076 | ] | | | | |
| 1077 | }, | | | | |
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| 1081 | "id": "D7CDRWX3yaSE" | | | | |
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| 1089 | "execution\_count": null, | | | | |
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| 1093 | "height": 206 | | | | |
| 1094 | }, | | | | |
| 1095 | "id": "sohJiJzMvdV\_", | | | | |
| 1096 | "outputId": "2a7f4ccb-d8a6-4b5c-bfcb-d210bdf23056" | | | | |
| 1097 | }, | | | | |
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| 1099 | { | | | | |
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| 1101 | "text/html": [ | | | | |
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| 1105 | " <div>\n", | | | | |
| 1106 | "<style scoped>\n", | | | | |
| 1107 | " .dataframe tbody tr th:only-of-type {\n", | | | | |

|  |  |  |
| --- | --- | --- |
| 1108 | " | vertical-align: middle;\n", |
| 1109 | " | }\n", |
| 1110 | "\n", |  |
| 1111 | " | .dataframe tbody tr th {\n", |
| 1112 | " | vertical-align: top;\n", |
| 1113 | " | }\n", |
| 1114 | "\n", |  |
| 1115 | " | .dataframe thead th {\n", |
| 1116 | " | text-align: right;\n", |
| 1117 | " | }\n", |
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| 1124 | " <th>WindDirection</th>\n", | |
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| 1126 | " </thead>\n", | |
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| 1136 | " <td>268.641113</td>\n", | |
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| 1141 | " <td>272.564789</td>\n", | |
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| 1146 | " <td>271.258087</td>\n", | |
| 1147 | " </tr>\n", | |
| 1148 | " <tr>\n", | |
| 1149 | " <th>4</th>\n", | |
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| 1151 | " <td>265.674286</td>\n", | |
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| 1153 | " </tbody>\n", | |
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| 1155 | "</div>\n", | |
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|  |  |  |  |
| --- | --- | --- | --- |
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| 1158 | " |  | style=\"display:none;\">\n", |
| 1159 | " | \n", |  |
| 1160 | " <svg xmlns=\"[http://www.w3.org/2000/svg\"](http://www.w3.org/2000/svg\) height=\"24px\"viewBox=\"0 0 24 24\"\n" | | |
| 1161 | " width=\"24px\">\n", | | |
| 1162 | " <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\n", | | |
| 1163 | " <path d=\"M18.56 5.44l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94 2.06-2.06 | | |
| 1164 | " </svg>\n", | | |
| 1165 | " </button>\n", | | |
| 1166 | " \n", | | |
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| 1170 | " flex-wrap:wrap;\n", | | |
| 1171 | " gap: 12px;\n", | | |
| 1172 | " }\n", | | |
| 1173 | "\n", | | |
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| 1176 | " border: none;\n", | | |
| 1177 | " border-radius: 50%;\n", | | |
| 1178 | " cursor: pointer;\n", | | |
| 1179 | " display: none;\n", | | |
| 1180 | " fill: #1967D2;\n", | | |
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| 1182 | " padding: 0 0 0 0;\n", | | |
| 1183 | " width: 32px;\n", | | |
| 1184 | " }\n", | | |
| 1185 | "\n", | | |
| 1186 | " .colab-df-convert:hover {\n", | | |
| 1187 | " background-color: #E2EBFA;\n", | | |
| 1188 | " box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 6 | | |
| 1189 | " fill: #174EA6;\n", | | |
| 1190 | " }\n", | | |
| 1191 | "\n", | | |
| 1192 | " [theme=dark] .colab-df-convert {\n", | | |
| 1193 | " background-color: #3B4455;\n", | | |
| 1194 | " fill: #D2E3FC;\n", | | |
| 1195 | " }\n", | | |
| 1196 | "\n", | | |
| 1197 | " [theme=dark] .colab-df-convert:hover {\n", | | |
| 1198 | " background-color: #434B5C;\n", | | |
| 1199 | " box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n", | | |
| 1200 | " filter: drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n", | | |
| 1201 | " fill: #FFFFFF;\n", | | |
| 1202 | " }\n", | | |
| 1203 | " </style>\n", | | |
| 1204 | "\n", | | |
| 1205 | " <script>\n", | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1206 | " const buttonEl =\n", | | | | |
| 1207 | " document.querySelector('#df-2d663ef3-cbb3-4bf4-b1f2-d20e4dfcdd4c button.c | | | | |
| 1208 | " buttonEl.style.display =\n", | | | | |
| 1209 | " google.colab.kernel.accessAllowed ? 'block' : 'none';\n", | | | | |
| 1210 | "\n", | | | | |
| 1211 | " async function convertToInteractive(key) {\n", | | | | |
| 1212 | " const element = document.querySelector('#df-2d663ef3-cbb3-4bf4-b1f2-d20e4 | | | | |
| 1213 | " const dataTable =\n", | | | | |
| 1214 | " await google.colab.kernel.invokeFunction('convertToInteractive',\n", | | | | |
| 1215 | " [key], {});\n", | | | | |
| 1216 | " if (!dataTable) return;\n", | | | | |
| 1217 | "\n", | | | | |
| 1218 | " const docLinkHtml = 'Like what you see? Visit the ' +\n", | | | | |
| 1219 | " '<a target=\"\_blank\" href=https://colab.research.google.com/notebooks/ | | | | |
| 1220 | " + ' to learn more about interactive tables.';\n", | | | | |
| 1221 | " element.innerHTML = '';\n", | | | | |
| 1222 | " dataTable['output\_type'] = 'display\_data';\n", | | | | |
| 1223 | " await google.colab.output.renderOutput(dataTable, element);\n", | | | | |
| 1224 | " const docLink = document.createElement('div');\n", | | | | |
| 1225 | " docLink.innerHTML = docLinkHtml;\n", | | | | |
| 1226 | " element.appendChild(docLink);\n", | | | | |
| 1227 | " }\n", | | | | |
| 1228 | " </script>\n", | | | | |
| 1229 | " </div>\n", | | | | |
| 1230 | " </div>\n", | | | | |
| 1231 | " " | | | | |
| 1232 | ], | | | | |
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| 1234 |  | | " | WindSpeed(m/s) | WindDirection\n", |
| 1235 |  | | "0 | 5.311336 | 259.994904\n", |
| 1236 |  | | "1 | 5.672167 | 268.641113\n", |
| 1237 |  | | "2 | 5.216037 | 272.564789\n", |
| 1238 |  | | "3 | 5.659674 | 271.258087\n", |
| 1239 |  | | "4 | 5.577941 | 265.674286" |
| 1240 | ] | |  |  |  |
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| 1248 | "X=data[['WindSpeed(m/s)','WindDirection']]\n", | | | | |
| 1249 | "X.head()" | | | | |
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| 1252 | { | | | | |
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| 1258 | }, |
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| 1267 | "1 453.769196\n", |
| 1268 | "2 306.376587\n", |
| 1269 | "3 419.645905\n", |
| 1270 | "4 380.650696\n", |
| 1271 | "Name: ActivePower(kW), dtype: float64" |
| 1272 | ] |
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| 1276 | "output\_type": "execute\_result" |
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| 1281 | "y.head()" |
| 1282 | ] |
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| 1292 | "X\_train, X\_test,y\_train, y\_test = train\_test\_split(X,y ,\n", |
| 1293 | " random\_state=6, \n", |
| 1294 | " test\_size=0.25)" |
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| 1304 | "source": [ |
| 1305 | "from sklearn.tree import DecisionTreeRegressor\n", |
| 1306 | "from sklearn.svm import SVR\n", |
| 1307 | "from sklearn.linear\_model import LinearRegression\n", |
| 1308 | "from sklearn.ensemble import RandomForestRegressor\n", |
| 1309 | "from xgboost import XGBRegressor\n", |
| 1310 | "from sklearn.metrics import accuracy\_score,r2\_score,mean\_squared\_error\n", |
| 1311 | "xgr=XGBRegressor()\n", |
| 1312 | "rf=RandomForestRegressor()\n", |
| 1313 | "lr=LinearRegression()\n", |
| 1314 | "dt=DecisionTreeRegressor()\n", |
| 1315 | "sm=SVR()" |
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| 1326 | "## Ensemble Learning\n", |
| 1327 | "from sklearn.linear\_model import LinearRegression\n", |
| 1328 | "from sklearn.ensemble import VotingRegressor\n", |
| 1329 | "from sklearn.svm import SVR\n", |
| 1330 | "from sklearn.ensemble import RandomForestRegressor\n", |
| 1331 | "import xgboost as xgb\n", |
| 1332 | "from xgboost import XGBRegressor\n", |
| 1333 | "from sklearn.metrics import accuracy\_score,r2\_score,mean\_squared\_error\n", |
| 1334 | "xgr=XGBRegressor(base\_score=0.5, booster='gbtree', colsample\_bylevel=0.7,\n", |
| 1335 | " colsample\_bynode=1, colsample\_bytree=0.3, gamma=0.2,\n", |
| 1336 | " importance\_type='gain', learning\_rate=0.03, max\_delta\_step=0,\n", |
| 1337 | " max\_depth=8, min\_child\_weight=25, missing=None, n\_estimators=800,\n", |
| 1338 | " n\_jobs=1, nthread=None, objective='reg:linear', random\_state=0,\n", |
| 1339 | " reg\_alpha=0.2, reg\_lambda=0.8, scale\_pos\_weight=1, seed=None,\n", |
| 1340 | " silent=None, subsample=0.1, verbosity=1)\n", |
| 1341 | "sm=SVR(gamma='auto',C=50,epsilon=0.3)\n", |
| 1342 | "rf=RandomForestRegressor(n\_estimators=500,max\_depth=4)\n", |
| 1343 | "lr=LinearRegression()\n", |
| 1344 | "model=VotingRegressor([('lr',lr), ('rf',rf),('sm', sm),('xgr',xgr)],weights=[1,1,2,3])" |
| 1345 | ] |
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