**To find following the Machine Learning Regression method using in R² value**

**1.MULTIPLE LINEAR REGRESSION:**

**Best Value from MLR:**

**R²value =** 0.78913454847886

**2. SUPPORT VECTOR MACHINE:**

**i. Standardisation with C\_Penalty:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.NO** | **HYPER PARAMETER (C\_VALUE)** | **LINEAR (R\_VALUE)** | **RBF (NON-LINEAR) (R\_VALUE)** | **POLY**  **(R\_VALUE)** | **SIGMOID**  **(R\_VALUE)** |
| **01.** | **0.01** | **-0.088851825** | **-0.089666333** | **-0.089589028** | **-0.089585755** |
| **02.** | **0.1** | **-0.080977866** | **-0.089095494** | **-0.088322830** | **-0.088290328** |
| **03.** | **1.0** | **-0.010195463** | **-0.083405160** | **-0.075717337** | **-0.075446385** |
| **04.** | **10** | **0.4624263375** | **-0.032380600** | **0.0386251874** | **0.0394401214** |
| **05.** | **100** | **0.6289632029** | **0.3196645450** | **0.6164698351** | **0.5268415404** |
| **06.** | **1000** | **0.7648394817** | **0.8107195705** | **0.8546515591** | **0.2120454187** |
| **07.** | **10000** | **0.7413290358** | **0.8780047074** | **0.8572189614** | **-28.34165163** |

**Best Value from SVM:**

**The SVM Regressor R²value (Nonlinear (kernel =** **"rbf") and Hyper Tuning**

**Parameter (C = 10000)) = 0.8780047074440409**

**3.DECISION TREE:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SL.NO** | **CRITERION** | **SPLITTER** | **MAX\_FEATURES** | **R\_VALUE** |
| **01.** | **Squared error** | **Best** | **sqrt** | **0.7707800713119641** |
| **02.** | **Squared error** | **Best** | **log2** | **0.7614300534063496** |
| **03.** | **Friedman\_mse** | **Best** | **sqrt** | **0.7445140572039232** |
| **04.** | **Friedman\_mse** | **Best** | **log2** | **0.6550595115312327** |
| **05.** | **Absolute error** | **Best** | **sqrt** | **0.6796749073935946** |
| **06.** | **Absolute error** | **Best** | **log2** | **0.7114261542959275** |
| **07.** | **Poisson** | **Best** | **sqrt** | **0.6472164304876127** |
| **08.** | **Poisson** | **Best** | **log2** | **0.6886508984873159** |
| **09.** | **Squared error** | **Random** | **sqrt** | **0.71627952103802** |
| **10.** | **Squared error** | **Random** | **log2** | **0.6799131775438025** |
| **11.** | **Friedman\_mse** | **Random** | **sqrt** | **0.624486713670842** |
| **12.** | **Friedman\_mse** | **Random** | **log2** | **0.6782144931247716** |
| **13.** | **Absolute error** | **Random** | **sqrt** | **0.59835828495019** |
| **14.** | **Absolute error** | **Random** | **log2** | **0.6342130151276348** |
| **15.** | **Poisson** | **Random** | **sqrt** | **0.6958752685032943** |
| **16.** | **Poisson** | **Random** | **log2** | **0.6003749187441639** |

**Best Value from Decision Tree:**

**The Decision Tree Regressor R²value (criterion='squared\_error', splitter='random') =** 0.7707800713119641

**4.RANDOM FOREST:**

**Method-1**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Estimators** | **R\_Value** |
| **01.** | **10** | **0.8254024480527736** |
| **02.** | **20** | **0.8366366754276282** |
| **03.** | **30** | **0.8464896719139645** |
| **04.** | **40** | **0.8513626150908182** |
| **05.** | **50** | **0.8519160896863027** |
| **06.** | **60** | **0.8504610239826466** |
| **07.** | **70** | **0.8513009178708844** |
| **08.** | **80** | **0.8514864766488272** |
| **09.** | **90** | **0.8519445579703155** |
| **10.** | **100** | **0.8524645431942335** |

**Method-2**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Estimators** | **CRITERION** | **R\_Value** |
| **01.** | **10** | **Squared error** | **0.8254024480527736** |
| **02.** | **50** | **Squared error** | **0.8519160896863027** |
| **03.** | **100** | **Squared error** | **0.8524645431942335** |
| **04.** | **10** | **Absolute error** | **0.841182394066486** |
| **05.** | **50** | **Absolute error** | **0.8576522515477305** |
| **06.** | **100** | **Absolute error** | **0.8565701539573851** |
| **07.** | **10** | **Friedman\_mse** | **0.8254024480527736** |
| **08.** | **50** | **Friedman\_mse** | **0.8519160896863027** |
| **09.** | **100** | **Friedman\_mse** | **0.8524645431942335** |
| **10.** | **10** | **Poisson** | **0.8280224559126734** |
| **11.** | **50** | **Poisson** | **0.8495669971089854** |
| **12.** | **100** | **Poisson** | **0.8505020311598165** |

**Method-3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SL.NO** | **ESTIMATORS** | **CRITERION** | **MAX\_FEATURES** | **R\_VALUE** |
| **01.** | **10** | **Squared error** | **sqrt** | **0.841371714130463** |
| **02.** | **50** | **Squared error** | **sqrt** | **0.860384255362958** |
| **03.** | **100** | **Squared error** | **sqrt** | **0.866171806423152** |
| **04.** | **10** | **Squared error** | **log2** | **0.841371714130463** |
| **05.** | **50** | **Squared error** | **log2** | **0.860384255362958** |
| **06.** | **100** | **Squared error** | **log2** | **0.866171806423152** |
| **07.** | **10** | **Absolute error** | **sqrt** | **0.844185275693034** |
| **08.** | **50** | **Absolute error** | **sqrt** | **0.862123099996750** |
| **09.** | **100** | **Absolute error** | **sqrt** | **0.866661872028384** |
| **10.** | **10** | **Absolute error** | **log2** | **0.844185275693034** |
| **11.** | **50** | **Absolute error** | **log2** | **0.862123099996750** |
| **12.** | **100** | **Absolute error** | **log2** | **0.866661872028384** |
| **13.** | **10** | **Friedman\_mse** | **sqrt** | **0.841371714130463** |
| **14.** | **50** | **Friedman\_mse** | **sqrt** | **0.860384255362958** |
| **15.** | **100** | **Friedman\_mse** | **sqrt** | **0.866171806423152** |
| **16.** | **10** | **Friedman\_mse** | **log2** | **0.841371714130463** |
| **17.** | **50** | **Friedman\_mse** | **log2** | **0.860384255362958** |
| **18.** | **100** | **Friedman\_mse** | **log2** | **0.866171806423152** |
| **19.** | **10** | **Poisson** | **sqrt** | **0.836605439397253** |
| **20.** | **50** | **Poisson** | **sqrt** | **0.854826201808691** |
| **21.** | **100** | **Poisson** | **sqrt** | **0.859143407373711** |
| **22.** | **10** | **Poisson** | **log2** | **0.836605439397253** |
| **23.** | **50** | **Poisson** | **log2** | **0.854826201808691** |
| **24.** | **100** | **Poisson** | **log2** | **0.859143407373711** |

**Best Value from Random Forest:**

**Random Forest Regressor R²value (Estimators = 100, criterion='absolute\_error', max\_features='sqrt' and 'log2') =** 0.866661872028384

**The final Machine Learning Best Algorithm:**

**Support Vector Machine output is Best in this Dataset:**

**Support Vector Machine: (Hyper Tuning Parameter)**

**The SVM Regressor R²value (Nonlinear (kernel =** **"rbf") and Hyper Tuning**

**Parameter (C = 10000)) = 0.8780047074440409**

**(OR)**

**Random Forest Regressor R²value (Estimators = 100, criterion='absolute\_error', max\_features='sqrt' and 'log2') =** 0.866661872028384

1. **Problem Statement or Requirement is Insurance Charge Prediction.**
2. **Total No. of Rows-6, columns-1338**