**Regression Assignment:**

**Problem Statement**: Predict a best model using AI predictions to find the insurance charges based on a person’s age, BMI, children, Sex and smoker/nonsmoker.

**Problem Identification**: Machine Learning, Supervised Learning and Regression

1.Multiple regression Model:

r\_score=0.7277

**2.Support Vector Machine Model:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | C Value | Kernel:linear | Kernel:rbf | Kernel:poly | Kernel:sigmoid |
| 1 | 10 | 0.0668 | -0.3447 | -0.0480 | -0.1193 |
| 2 | 100 | 0.5524 | -0.1254 | -0.5198 | -0.1504 |
| 3 | 500 | 0.6122 | -0.1279 | -0.0291 | -0.5383 |
| 4 | 1000 | 0.6549 | -0.1224 | -0.0006 | -1.915 |
| 5 | 2000 | 0.7300 | -0.1108 | 0.0555 | -6.6213 |
| 6 | 3000 | 0.7103 | -0.0966 | 0.1102 | -14.620 |

**2.Decision Tree Algorithm: r\_score with hyper tuning parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No | Criterion | splitter | max\_features | R\_score |
| 1 | Squared\_error | random | sqrt | 0.5591 |
| 2 | Squared\_error | random | log2 | 0.5907 |
| 3 | Squared\_error | best | sqrt | 0.5267 |
| 4 | Squared\_error | best | log2 | 0.5789 |
| 5 | Friedman\_mse | random | sqrt | 0.4935 |
| 6 | Friedman\_mse | random | log2 | 0.6248 |
| 7 | Friedman\_mse | best | sqrt | 0.5913 |
| 8 | Friedman\_mse | best | log2 | 0.5668 |
| 9 | Absolute\_error | random | sqrt | 0.6033 |
| 10 | Absolute\_error | random | log2 | 0.6359 |
| 11 | Absolute\_error | best | sqrt | 0.2863 |
| 12 | Absolute\_error | best | log2 | 0.6044 |
| 13 | poisson | random | sqrt | 0.6412 |
| 14 | poisson | random | log2 | 0.5713 |
| 15 | poisson | best | sqrt | 0.6240 |
| 16 | poisson | best | log2 | 0.6244 |

**3.Random Forest Model:r\_score with random\_state=0 and other hyper tuning parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No | n-estimator | criterion | max\_features | r\_score |
| 1 | 50 | squared\_error | sqrt | 0.8482 |
| 2 | 100 | squared\_error | sqrt | 0.8501 |
| 3 | 200 | squared\_error | sqrt | 0.8499 |
| 4 | 50 | squared\_error | log2 | 0.8451 |
| 5 | 100 | squared\_error | log2 | 0.8469 |
| 6 | 200 | squared\_error | log2 | 0.8488 |
| 7 | 50 | friedman\_mse | sqrt | 0.8497 |
| 8 | 100 | friedman\_mse | sqrt | 0.8499 |
| 9 | 200 | friedman\_mse | sqrt | 0.8518 |
| 10 | 50 | friedman\_mse | log2 | 0.8520 |
| 11 | 100 | friedman\_mse | log2 | 0.8533 |
| 12 | 200 | friedman\_mse | log2 | 0.8527 |
| 13 | 50 | absolute\_error | sqrt | 0.8473 |
| 14 | 100 | absolute\_error | sqrt | 0.8537 |
| 15 | 200 | absolute\_error | sqrt | 0.8516 |
| 16 | 50 | absolute\_error | log2 | 0.8521 |
| 17 | 100 | absolute\_error | log2 | 0.8477 |
| 18 | 200 | absolute\_error | log2 | 0.8506 |
| 19 | 50 | poisson | sqrt | 0.8496 |
| 20 | 100 | poisson | sqrt | 0.8511 |
| 21 | 200 | poisson | sqrt | 0.8504 |
| 22 | 50 | poisson | log2 | 0.8505 |
| 23 | 100 | poisson | log2 | 0.8520 |
| 24 | 200 | poisson | log2 | 0.8510 |

Output:

**Best Model: Random Forest Model with r\_score= 0.8537**