**Regression Assignment**

**1.** As a data scientist I need to predict the insurance charges based on given dataset

2. **Input Columns:** Age, Sex, BMI, Children and Smoker**. Output Column:** Charges.

3. In the dataset two columns are nominal so we need to convert that to integer.

4. a. **SVM**

|  |  |  |
| --- | --- | --- |
| **Kernal** | **C** | **R\_score** |
| linear | 10 | 0.432379 |
| linear | 100 | 0.616245 |
| poly | 10 | 0.027282 |
| poly | 100 | 0.602574 |
| rbf | 10 | -0.04827 |
| rbf | 100 | 0.291168 |
| sigmoid | 10 | 0.01919 |
| sigmoid | 100 | 0.504146 |

b. **Decision tree**

|  |  |  |
| --- | --- | --- |
| **Criterion** | **Splitter** | **r\_score** |
| friedman\_mse | best | 0.692501 |
| friedman\_mse | random | 0.708438 |
| absolute\_error | best | 0.721243 |
| absolute\_error | random | 0.722628 |
| squared\_error | best | 0.692887 |
| squared\_error | random | 0.701134 |
| poisson | best | 0.700085 |
| poisson | random | 0.71567 |

**c. Random Forest**

|  |  |  |
| --- | --- | --- |
| **Criterion** | **n\_estimators** | r\_score |
| friedman\_mse | 100 | 0.85834 |
| friedman\_mse | 150 | 0.857992 |
| absolute\_error | 250 | 0.860003 |
| absolute\_error | 200 | 0.859995 |
| squared\_error | 100 | 0.85834 |
| squared\_error | 150 | 0.857992 |
| poisson | 100 | 0.857366 |
| poisson | 150 | 0.8574 |

**d. ADABOOSTING**

|  |  |
| --- | --- |
| **n\_estimators** | **r\_score** |
| 20 | 0.870236 |
| 50 | 0.852717 |
| 100 | 0.862823 |
| 150 | 0.870466 |
| 250 | 0.85722 |

**e.XGBOOSTING**

|  |  |  |
| --- | --- | --- |
| **n\_estimators** | **max\_depth** | **r\_score** |
| 50 | 2 | 0.892175 |
| 100 | 2 | 0.888571 |
| 50 | 3 | 0.880957 |
| 100 | 3 | 0.869807 |

**f. LGBOOSTING**

|  |  |  |
| --- | --- | --- |
| **n\_estimators** | **max\_depth** | **r\_score** |
| 50 | 3 | 0.893318 |
| 100 | 3 | 0.891901 |
| 50 | 2 | 0.891833 |
| 100 | 2 | 0.891198 |

5. Based on the results, **LGBMRegressor** performs well, achieving an **R² score of 0.893318** with **n\_estimators=50 and max\_depth=3.**