Following tabulation shows that r2\_score with combination of respective fine turn hyper parameters

Algorithm – Support vector machine – Support vector regression

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Si.no | Penalty value (c) | Linear r2\_score | RBF  (nonlinear) | Poly r2\_score | Sigmoid r2\_score |
| 1 | C=1.0 | 0.895 | -0.057 | -0.050 | -0.057 |
| 2 | C=100 | -357.079 | -0.030 | 0.465 | -0.050 |
| 3 | C=1000 | -36014 | 0.160 | 0.640 | -0.70 |
| 4 | C=2000 | - | 0.288 | 0.671 | -0.084 |
| 5 | C=3000 | - | 0.395 | 0.69 | -0.098 |

Note: penalty value too high leads to overfitting

Best r2\_score is – 0.895

Algorithm – Decision tree – Decision tree regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Si.no | Criterion | Splitter | Max\_  features | Min\_impurity  (Float=0-1) | Ccp-alpha  (Float=0-infiniti) | R2\_score |
| 1. | Mse | Best | None | 0.0 | 0.0 | 0.9248 |
| 2. | Mse | Random | 3 | 0.0 | 0.01 | 0.6113 |
| 3. | Mse | Best | Sqrt | 0.1 | 0.0 | 0.722 |
| 4. | Mse | Best | 3 | 0.01 | 0.05 | 0.683 |
| 5. | Mse | Random | None | 0.1 | 0.05 | 0.6514 |
| 6. | Mse | Random | None | 0.05 | 0.1 | 0.9096 |
| 7. | Mse | Best | Log2 | 0.05 | 0.1 | 0.7972 |
| 8. | Friedman\_mse | Random | Sqrt | 0.01 | 0.01 | 0.668 |
| 9. | Friedman\_mse | Best | None | 0.0 | 0.0 | 0.8987 |
| 10. | Friedman\_mse | Random | Log2 | 0.05 | 0.05 | 0.343 |
| 11. | Friedman\_mse | Random | None | 0.0 | 0.01 | 0.827 |
| 12. | Friedman\_mse | Best | 4 | 0.1 | 0.0 | 0.7525 |
| 13. | Mae | Best | Log2 | 0.05 | 0.1 | -1.127 |
| 14. | Mae | Random | 5 | 0.01 | 0.1 | 0.9539 |
| 15. | Mae | Random | Sqrt | 0.01 | 0.0 | 0.8090 |
| 16. | Mae | Best | None | 0.0 | 0.1 | 0.9379 |
| 17. | Mae | Best | 2 | 0.1 | 0.05 | 0.6134 |
| 18. | Mae | Best | 3 | 0.1 | 0.0 | 0.516 |

Note: Mse- mean squered error

Mae- mean absolute error

Best r2\_score is – 0.9539

Algorithm – Random \_Forest – regression

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Si.no | N\_Estimators | Criterion | Max\_  features | Random\_state | R2\_score |
| 1. | 50 | Mse | None | 0.0 | 0.9446 |
| 2. | 100 | Mse | None | 0.0 | 0.9297 |
| 3. | 100 | Mse | Sqrt | 0.0 | 0.7591 |
| 4. | 50 | Mse | Sqrt | 42 | 0.7875 |
| 5. | 100 | Mse | Log2 | 0.0 | 0.7591 |
| 6. | 50 | Mse | None | 42 | 0.9290 |
| 7. | 100 | Mse | Log2 | 42 | 0.8207 |
| 8. | 50 | Friedman\_mse | None | 0.0 | 0.9388 |
| 9. | 50 | Friedman\_mse | Sqrt | 0.0 | 0.6880 |
| 10. | 50 | Friedman\_mse | None | 42 | 0.9305 |
| 11. | 50 | Friedman\_mse | Log2 | 42 | 0.7880 |
| 12 | 50 | Mae | None | 0.0 | 0.9409 |
| 13 | 50 | Mae | Log2 | 0.0 | 0.940 |
| 14 | 50 | Mae | Sqrt | 0.0 | 0.7220 |
| 15 | 50 | Mae | None | 42 | 0.9300 |
| 16 | 50 | Poisson | None | 0.0 | 0.9460 |
| 17 | 50 | Poisson | Sqrt | 0.0 | 0.7280 |
| 18 | 50 | Poisson | Log2 | 42 | 0.671 |

Note: Mse- mean squared error

Mae- mean absolute error

Best r2\_score is – 0.9460

**Conclusion**

**After working with all Machine learning algorithms now we can compare and identify good model with fine tune hyper parameters**

**The good model and r2\_value of this dataset is -** Algorithm – Decision tree – Decision tree regression and Best r2\_score is – 0.9539