***Machine Learning Regression – r2\_score Value***

*To create and select best model for the following dataset using regression method by finding r2\_score value.*

***Dataset****: 50\_Startups.csv*

***1. Multiple Linear Regression***

*r2\_score Value :* ***0.9358680970046241***

***2. Support Vector Machine***

***Reference :******https://scikit-learn.org/1.5/modules/generated/sklearn.svm.SVR.html***

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| ***S.No*** | ***Hyper Parameter*** | | ***r2\_score Value*** |
| ***Kernel*** | ***C*** |
| *1* | *rbf (default)* | *C = 1.0* | *-0.0574248382107958* |
| *2* | *rbf (default)* | *C = 10.0* | *-0.056814037652687555* |
| *3* | *rbf (default)* | *C = 100.0* | *-0.050732472370936144* |
| *4* | *rbf (default)* | *C = 1000.0* | *0.006761918750925133* |
| *5* | *linear* | *C = 1.0* | *-0.055698007950230055* |
| *6* | *linear* | *C = 10.0* | *-0.03965132425427487* |
| *7* | *linear* | *C = 100.0* | *0.10645826726866126* |
| *8* | *linear* | *C = 1000.0* | *0.7802903594534853* |
| *9* | *poly* | *C = 1.0* | *-0.057110316726588284* |
| *10* | *poly* | *C = 10.0* | *-0.05367362281738153* |
| *11* | *poly* | *C = 100.0* | *-0.01980832469438143* |
| *12* | *poly* | *C = 1000.0* | *0.266159225657447* |
| *13* | *sigmoid* | *C = 1.0* | *-0.05721580193952902* |
| *14* | *sigmoid* | *C = 10.0* | *-0.054726019242509416* |
| *15* | *sigmoid* | *C = 100.0* | *-0.03046526461527077* |

***3. Decision Tree***

***Reference :*** [***https://scikit-learn.org/dev/modules/generated/sklearn.tree.DecisionTreeRegressor.html***](https://scikit-learn.org/dev/modules/generated/sklearn.tree.DecisionTreeRegressor.html)

***Default :*** 0.9123901986110556

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| ***S.No*** | ***criterion*** | ***splitter*** | ***max\_features*** | ***r2\_score Value*** |
| *1* | *squared\_error* | *best* | *None* | 0.9361116092373495 |
| *2* | *squared\_error* | *best* | *sqrt* | 0.7019249512451413 |
| *3* | *squared\_error* | *best* | *log2* | 0.49117758583002125 |
| *4* | *squared\_error* | *random* | *None* | 0.7636282124310112 |
| *5* | *squared\_error* | *random* | *sqrt* | 0.4346941227683503 |
| *6* | *squared\_error* | *random* | *log2* | 0.595060342456937 |
| *7* | *friedman\_mse* | *best* | *None* | 0.9428194060323266 |
| *8* | *friedman\_mse* | *best* | *sqrt* | 0.8198462698216181 |
| *9* | *friedman\_mse* | *best* | *log2* | 0.44559098126663754 |
| *10* | *friedman\_mse* | *random* | *None* | 0.8282903184846097 |
| *11* | *friedman\_mse* | *random* | *sqrt* | 0.7673680307151568 |
| *12* | *friedman\_mse* | *random* | *log2* | 0.6332203623570374 |
| *13* | *absolute\_error* | *best* | *None* | 0.9625452327466352 |
| *14* | *absolute\_error* | *best* | *sqrt* | -0.9235418748278017 |
| *15* | *absolute\_error* | *best* | *log2* | 0.9202334727354651 |
| *16* | *absolute\_error* | *random* | *None* | 0.864436187225292 |
| *17* | *absolute\_error* | *random* | *sqrt* | 0.6689918436588316 |
| *18* | *absolute\_error* | *random* | *log2* | -1.562835439846646 |
| *19* | *poisson* | *best* | *None* | 0.9310339388823627 |
| *20* | *poisson* | *best* | *sqrt* | 0.8813146123918402 |
| *21* | *poisson* | *best* | *log2* | 0.8891629755888263 |
| *22* | *poisson* | *random* | *None* | 0.9500994286791825 |
| *23* | *poisson* | *random* | *sqrt* | 0.7649128596131746 |
| *24* | *poisson* | *random* | *log2* | 0.5012669596361505 |

***4.Random Forest***

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| *n\_estimators* | *random\_state* | ***r2\_score Value*** |
| *100* | *0* | 0.9408605013022294 |
| *50* | *0* | 0.9378126255983763 |
| *10* | *0* | 0.9101820011709203 |

* ***n\_estimators****=100 and* ***random\_state****=0 gives best r2\_score value. Furthermore, we kept changing the hyper tuning parameters to get best results.*

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| ***S.No*** | *n\_estimators* | ***criterion*** | ***max\_features*** | ***r2\_score Value*** |
| *1* | *100* | *squared\_error* | *None* | 0.9408605013022294 |
| *2* | *100* | *squared\_error* | *1* | 0.9408605013022294 |
| *3* | *100* | *squared\_error* | *sqrt* | 0.5622710345243522 |
| *4* | *100* | *squared\_error* | *log2* | 0.5622710345243522 |
| *5* | *100* | *friedman\_mse* | *None* | 0.9408605013022294 |
| *6* | *100* | *friedman\_mse* | *1* | 0.9408605013022294 |
| *7* | *100* | *friedman\_mse* | *sqrt* | 0.5622710345243522 |
| *8* | *100* | *friedman\_mse* | *log2* | 0.5622710345243522 |
| *9* | *100* | *absolute\_error* | *None* | 0.9414563975947582 |
| *10* | *100* | *absolute\_error* | *1* | 0.9414563975947582 |
| *11* | *100* | *absolute\_error* | *sqrt* | 0.6408710250162564 |
| *12* | *100* | *absolute\_error* | *log2* | 0.6408710250162564 |
| *13* | *100* | *poisson* | *None* | 0.9378377125326994 |
| *14* | *100* | *poisson* | *1* | 0.9378377125326994 |
| *15* | *100* | *poisson* | *sqrt* | 0.5799524925998589 |
| *16* | *100* | *poisson* | *log2* | 0.5799524925998589 |