**CO1-Repeated-10-fold-validation-3-repitition**

Best MCC Score: 0.37623204286493483

Best Hyperparameters: {'C': 1e-05, 'penalty': 'none', 'solver': 'newton-cg'}

**CO1-10-fold**

Best Score: 0.40064599784290833

Best Hyperparameters: {'selector\_\_k': 230}

**Log-reg-CO2 started-Repeated-10-fold-validation-3-repitition**

Best Score: 0.4135278898051852

Best Hyperparameters: {'C': 0.1, 'penalty': 'l1', 'solver': 'liblinear'}

**CO2-10-fold**

Best Score: 0.423013337854748

Best Hyperparameters: {'selector\_\_k': 2930}

**Log-reg-CO3 started-Repeated-3-fold-validation-1-repitition**

Best Score: 0.24918829279218516

Best Hyperparameters: {'C': 1e-05, 'penalty': 'none', 'solver': 'newton-cg'}

**CO3-3-fold**

Best Score: 0.36156544341728125

Best Hyperparameters: {'selector\_\_k': 3318}

**Log-reg-CO4 started-Repeated-3-fold-validation-1-repitition**

Best Score: 0.23176964348071327

Best Hyperparameters: {'C': 1, 'penalty': 'l2', 'solver': 'lbfgs'}

**CO4-3-fold**

Best Score: 0.2014062683404629

Best Hyperparameters: {'selector\_\_k': 557}

**Log-reg-CO5 started-Repeated-3-fold-validation-1-repitition**

Best Score: 0.8076883093156914

Best Hyperparameters: {'C': 0.01, 'penalty': 'l1', 'solver': 'liblinear'}

**CO5-3-fold**

Best Score: 0.8620382577945289

Best Hyperparameters: {'selector\_\_k': 557}

**Log-reg-CO6 started-Repeated-3-fold-validation-1-repitition**

Best Score: 0.1468908272854698

Best Hyperparameters: {'C': 1e-05, 'penalty': 'l2', 'solver': 'lbfgs'}

**CO6-3-fold**

Best Score: 0.06770135442384122

Best Hyperparameters: {'selector\_\_k': 9945}

With the above hyper-parameters and with all features and repeated-10-fold validation with 1 repetitions

**CO1**

MCC Score- Mean: 0.395 SD: (0.292)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 1.15753462 | 0.01544394 | 0.39515324 | 0.76153846 | 0.675 | 0.45833333 | 0.51650794 |
| SD | 0.13933216 | 0.0026397 | 0.29234278 | 0.13952582 | 0.31280541 | 0.1547848 | 0.185663 |

**With balanced class weights**

MCC Score- Mean: 0.391 SD: (0.311)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 0.84065056 | 0.01442528 | 0.39140962 | 0.75384615 | 0.64166667 | 0.49166667 | 0.52984127 |
| SD | 0.11830696 | 0.00035806 | 0.31119466 | 0.14513817 | 0.32069802 | 0.16007811 | 0.20018736 |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.647 SD: (0.235)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 0.49248765 | 0.01043365 | 0.64657627 | 0.85384615 | 0.78833333 | 0.70833333 | 0.72571429 |
| SD | 0.04948426 | 0.00076014 | 0.23498995 | 0.10575175 | 0.23594373 | 0.16351181 | 0.16608333 |

**With optimal # of features**

MCC Score- Mean: 0.576 SD: (0.278)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [0.02924538 0.00575116 0.57614573 0.83846154 0.72166667 0.65

0.66507937]

SD [0.0027031 0.00197277 0.27787167 0.10575175 0.26247222 0.21666667

0.20746099]

**CO2**

MCC Score- Mean: 0.434 SD: (0.241)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 0.59119906 | 0.01091614 | 0.50172928 | 0.76153846 | 0.69880952 | 0.69 | 0.68341991 |
| SD | 0.09781966 | 0.00095169 | 0.223979 | 0.1 | 0.14107319 | 0.20442331 | 0.17352667 |

**With balanced class weight**

MCC Score- Mean: 0.497 SD: (0.220)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 0.60582638 | 0.01061578 | 0.49745765 | 0.74615385 | 0.68 | 0.75 | 0.7018648 |
| SD | 0.09011179 | 0.00084787 | 0.21989652 | 0.11435437 | 0.15434449 | 0.15293426 | 0.13744891 |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.464 SD: (0.244)

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean | 0.428983 | 0.00997488 | 0.46449823 | 0.73076923 | 0.6447619 | 0.74666667 | 0.68544678 |
| SD | 0.05781772 | 0.0016006 | 0.2439539 | 0.12040366 | 0.14536216 | 0.17587875 | 0.14940535 |

**With optimal # of features**

MCC Score- Mean: 0.504 SD: (0.243)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [0.08197222 0.00788391 0.50402494 0.75384615 0.67619048 0.74666667

0.70313908]

SD [0.0090923 0.00109411 0.24302099 0.11817147 0.15420045 0.17587875

0.15345217]

**Co3**

MCC Score- Mean: 0.253 SD: (0.204)

Score metrics:['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [9.96682909 0.06228209 0.25276162 0.76764706 0.57119048 0.23055556

0.31648213]

SD [0.75024408 0.00366145 0.20418772 0.05800907 0.33685293 0.12656429

0.1720325 ]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With balanced class weight**

MCC Score- Mean: 0.268 SD: (0.207)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [8.52914572 0.06224575 0.26761263 0.77058824 0.57285714 0.25416667

0.3357129 ]

SD [0.90620359 0.00632517 0.20654378 0.05703153 0.33280264 0.14725498

0.18331918]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.499 SD: (0.121)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [3.61556394 0.03738952 0.49894236 0.82647059 0.80785714 0.44583333

0.55157947]

SD [0.2642496 0.00387939 0.1211367 0.04450808 0.18940188 0.12522357

0.10562042]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With optimal features**

MCC Score- Mean: 0.589 SD: (0.087)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [0.48042784 0.01553962 0.58866524 0.85294118 0.7847619 0.59027778

0.66375313]

SD [0.03072587 0.00026363 0.08748906 0.03480047 0.13602387 0.07862878

0.05876605]

**CO4**

Mean: MCC Score- Mean: 0.108 SD: (0.214)

Score metrics:['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [8.91791282 0.08425498 0.10827033 0.85294118 0.25 0.07666667

0.11428571]

SD [0.72641305 0.02430366 0.21429134 0.02278225 0.40311289 0.13

0.18952142]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With balanced class weight**

MCC Score- Mean: 0.089 SD: (0.217)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [8.61782458 0.07469747 0.08933769 0.84411765 0.23333333 0.07666667

0.11071429]

SD [0.59970705 0.0118108 0.21727807 0.02955846 0.3958114 0.13

0.18657083]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.437 SD: (0.256)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [4.31458001 0.05980589 0.43727997 0.88235294 0.8 0.31666667

0.42063492]

SD [0.24069339 0.01745634 0.25647773 0.04742505 0.35 0.22472205

0.24137947]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**CO5**

MCC Score- Mean: 0.813 SD: (0.096)

Score metrics:['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [4.74115124 0.03919129 0.81897687 0.90882353 0.93159341 0.85714286

0.88932179]

SD [0.71152556 0.00168539 0.08720931 0.04252009 0.07068749 0.08125992

0.05268501]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

With balanced class-weight

MCC Score- Mean: 0.864 SD: (0.047)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [5.39215646 0.03895316 0.86425091 0.93235294 0.92142857 0.92428571

0.9214017 ]

SD [0.54216262 0.00299934 0.04656758 0.02297132 0.05269387 0.03734074

0.02725025]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.864 SD: (0.047)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [2.71921926 0.02373676 0.86425091 0.93235294 0.92142857 0.92428571

0.9214017 ]

SD [0.34421381 0.00166594 0.04656758 0.02297132 0.05269387 0.03734074

0.02725025]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**CO6**

MCC Score- Mean: 0.023 SD: (0.107)

Score metrics:['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [4.50167391 0.08232489 0.02330037 0.58823529 0.59226849 0.965

0.7337538 ]

SD [0.48826573 0.01787513 0.10702749 0.01860163 0.01128805 0.03201562

0.01218288]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |

**With half best feature-selection(anova-f-measure)**

MCC Score- Mean: 0.235 SD: (0.112)

['fit\_time', 'score\_time', 'test\_mccScorer', 'test\_accuracy', 'test\_precision', 'test\_recall', 'test\_f1']

Means [1.84392695 0.04888222 0.23524391 0.61470588 0.7002711 0.6

0.64238328]

SD [0.09458553 0.01613137 0.11208165 0.06232241 0.04914328 0.10954451

0.07644452]

| 10-fold-1-rep | Fit\_time | Score\_time | MCC | Accuracy | Precision | Recall | F1-score |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mean |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |