EXPERIMENT REPORT FOR LEARNING-BASED DESIGN TRADEOFF SELECTION

Experiment 1 – Original Distribution

Total OM: 14

Train OM : 14
Test OM 1 : 1 (Ecommerce)
Dataset orientation: Training set contained space between words and symbols.
Type: Test set is seen by the model.

Training Set:

Total Dataset Instances: 30970
Pareto Optimal (P) instances: 399
Pareto Optimal (NP) instances: 30571

Testing Set:

Total Dataset Instances: 105
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-1
Dataset URL: Dataset-1
Testset URL: Testset-1

	Precision	Recall	F1	Support
0 (NP)	0.88	0.90	0.89	80
1 (P)	0.65	0.60	0.63	25
Accuracy			0.83	105
Macro avg	0.77	0.75	0.76	105
Weighted avg	0.82	0.83	0.83	105

Experiment 2 – Original Distribution

Total OM: 14

Train OM : 13
Test OM 1 : 1 (University)
Dataset orientation: Training set contained space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 389 P
Pareto Optimal (NP) instances: 30551 NP

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-2
Dataset URL: Dataset-2
Testset URL: Testset-2

	Precision	Recall	F1	Support
0 (NP)	0.68	1.00	0.81	21
1 (P)	0.00	0.00	0.00	10
Accuracy			0.68	31
Macro avg	0.34	0.50	0.40	31
Weighted avg	0.46	0.68	0.55	31

Experiment 3 – Original Distribution

Total OM: 14

Train OM : 12
Test OM 1 : 2 - University (Unseen) + Decider (Unseen)
Dataset orientation: Training set contained space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 377
Pareto Optimal (NP) instances: 30452

Testing Set:

Total instances - 111
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-3
Dataset URL: Dataset-3
Test set URL: Testset-3

	Precision	Recall	F1	Support
0 (NP)	0.80	1.00	0.89	89
1 (P)	0.00	0.00	0.00	22
Accuracy			0.80	111
Macro avg	0.40	0.50	0.45	111
Weighted avg	0.64	0.80	0.71	111

Experiment 4 – Original Distribution

Total OM: 14

Train OM : 10
Test OM : 4 - University (Unseen) + Decider (Unseen) + CO (Unseen) + OS (Unseen)
Dataset orientation: Training set contained space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 367
Pareto Optimal (NP) instances: 30334

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-4
Dataset URL: Dataset-4
Testset URL: Testset-4

	Precision	Recall	F1	Support
0 (NP)	0.75	1.00	0.86	95
1 (P)	0.00	0.00	0.00	32
Accuracy			0.75	127
Macro avg	0.37	0.50	0.43	127
Weighted avg	0.56	0.75	0.64	127

Experiment 5 – Sampling Distribution

P (30%) – NP (70%)

Total OM: 14

Train OM : 13
Test OM : 1 (University OM)
Dataset orientation: Training set contained space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 9282
Pareto Optimal (NP) instances: 21658

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-5
Dataset URL: Dataset-5
Testset URL: Testset-5

	Precision	Recall	F1	Support
0 (NP)	1.00	0.24	0.38	21
1 (P)	0.38	1.00	0.56	10
Accuracy			0.48	31
Macro avg	0.69	0.62	0.47	31
Weighted avg	0.80	0.48	0.44	31

Experiment 6 – Sampling Distribution

P (30%) – NP (70%)

Total OM: 14

Train OM : 12
Test OM : 2 (University OM + Decider)
Dataset orientation: No space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 9249
Pareto Optimal (NP) instances: 21580

Testing Set:

Total instances - 111
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-6
Dataset URL: Dataset-6
Testset URL: Testset-6

	Precision	Recall	F1	Support
0 (NP)	0.64	0.07	0.13	95
1 (P)	0.24	0.88	0.38	32
Accuracy			0.28	127
Macro avg	0.44	0.47	0.26	127
Weighted avg	0.54	0.28	0.19	127

Experiment 7 – Sampling Distribution

P (30%) – NP (70%)

Total OM: 14

Train OM : 10
Test OM : 4 (University OM + Decider + CO + OS)
Dataset orientation: No space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 9210
Pareto Optimal (NP) instances: 21491

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-7
Dataset URL: Dataset-7
Testset URL: Testset-7

	Precision	Recall	F1	Support
0 (NP)	0.77	0.98	0.86	95
1 (P)	0.67	0.12	0.21	32
Accuracy			0.76	127
Macro avg	0.72	0.55	0.54	127
Weighted avg	0.74	0.76	0.70	127

Experiment 8 – Sampling Distribution

P (50%) – NP (50%)

Total OM: 14

Train OM : 13
Test OM : 1 (University OM)
Dataset orientation: No space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 15470
Pareto Optimal (NP) instances: 15470

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-8
Dataset URL: Dataset-8
Testset URL: Testset-8

	Precision	Recall	F1	Support
0 (NP)	0.82	0.67	0.74	21
1 (P)	0.50	0.70	0.58	10
Accuracy			0.68	31
Macro avg	0.66	0.68	0.66	31
Weighted avg	0.72	0.68	0.69	31

Experiment 9 – Sampling Distribution

P (50%) – NP (50%)

Total OM: 14

Train OM : 12
Test OM : 2 (University OM + Decider)
Dataset orientation: No space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 15414
Pareto Optimal (NP) instances: 15414

Testing Set:

Total instances - 111
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-9
Dataset URL: Dataset-9
Testset URL: Testset-9

	Precision	Recall	F1	Support
0 (NP)	0.81	0.87	0.84	89
1 (P)	0.25	0.18	0.21	22
Accuracy			0.73	111
Macro avg	0.53	0.52	0.52	111
Weighted avg	0.70	0.73	0.71	111

Experiment 10 – Sampling Distribution

P (50%) – NP (50%)

Total OM: 14

Train OM : 10
Test OM : 4 (University OM + Decider + CO + OS)
Dataset orientation: No space between words and symbols.

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 15350
Pareto Optimal (NP) instances: 15350

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-10
Dataset URL: Dataset-10
Testset URL: Testset-10

	Precision	Recall	F1	Support
0 (NP)	0.84	0.89	0.87	95
1 (P)	0.62	0.50	0.55	32
Accuracy			0.80	127
Macro avg	0.73	0.70	0.71	127
Weighted avg	0.78	0.80	0.79	127

Experiment 11 – Sampling Distribution

P (60%) – NP (40%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (University OM)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 18564 P
Pareto Optimal (NP) instances: 12376 NP

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-11
Dataset URL: Dataset-11
Testset URL: Testset-11

	Precision	Recall	F1	Support
0 (NP)	1.00	0.10	0.17	10
1 (P)	0.34	1.00	0.51	21
Accuracy			0.39	31
Macro avg	0.67	0.55	0.34	31
Weighted avg	0.79	0.39	0.28	31

Experiment 12 – Sampling Distribution

P (60%) – NP (40%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 12

Test OM : 2 (University OM + Decider)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 18497 P
Pareto Optimal (NP) instances: 12332 NP

Testing Set:

Total instances - 111
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-12
Dataset URL: Dataset-12
Testset URL: Testset-12

	Precision	Recall	F1	Support
0 (NP)	0.75	0.03	0.06	89
1 (P)	0.20	0.95	0.33	22
Accuracy			0.22	111
Macro avg	0.47	0.49	0.20	111
Weighted avg	0.64	0.22	0.12	111

Experiment 13 – Sampling Distribution

P (60%) – NP (40%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 10

Test OM : 4 (University OM + Decider + CO + OS)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 18420
Pareto Optimal (NP) instances: 12281

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-13
Dataset URL: Dataset-13
Testset URL: Testset-13

	Precision	Recall	F1	Support
0 (NP)	0.84	0.83	0.84	95
1 (P)	0.52	0.53	0.52	32
Accuracy			0.76	127
Macro avg	0.68	0.68	0.68	127
Weighted avg	0.76	0.76	0.76	127

Experiment 14 – Sampling Distribution

P (70%) – NP (30%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (University OM)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 21658P
Pareto Optimal (NP) instances: 9282 NP

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-14
Dataset URL: Dataset-14
Test set URL: Testset-14

	Precision	Recall	F1	Support
0 (NP)	1.00	0.05	0.09	21
1 (P)	0.33	1.00	0.50	10
Accuracy			0.35	31
Macro avg	0.67	0.52	0.30	31
Weighted avg	0.78	0.35	0.22	31

Experiment 15 – Sampling Distribution

P (70%) – NP (30%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 12

Test OM : 2 (University OM + Decider)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 21580
Pareto Optimal (NP) instances: 9248

Testing Set:

Total instances - 105
Pareto Optimal (P) instances: 25
Pareto Optimal (NP) instances: 80

Notebook URL: Notebook-15
Dataset URL: Dataset-15
Testset URL: Testset-15

	Precision	Recall	F1	Support
0 (NP)	0.82	0.10	0.18	89
1 (P)	0.20	0.91	0.33	22
Accuracy			0.26	111
Macro avg	0.51	0.51	0.25	111
Weighted avg	0.70	0.26	0.21	111

Experiment 16 – Sampling Distribution

P (70%) – NP (30%)

Dataset orientation: Training set contained space between words and symbols.
Total OM: 14

Train OM : 10

Test OM : 4 (University OM + Decider + CO + OS)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 21491 P
Pareto Optimal (NP) instances: 9210 NP

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-16
Dataset URL: Dataset-16
Testset URL: Testset-16

	Precision	Recall	F1	Support
0 (NP)	0.82	0.09	0.17	95
1 (P)	0.26	0.94	0.41	32
Accuracy			0.31	127
Macro avg	0.54	0.52	0.29	127
Weighted avg	0.68	0.31	0.23	127

Experiment 17 – Sampling Distribution

P (80%) – NP (20%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (University OM)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 24752
Pareto Optimal (NP) instances: 6188

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-17
Dataset URL: Dataset-17
Test set URL: Testset-18

	Precision	Recall	F1	Support
0 (NP)	0.68	0.71	0.70	21
1 (P)	0.33	0.30	0.32	10
Accuracy			0.58	31
Macro avg	0.51	0.51	0.51	31
Weighted avg	0.57	0.58	0.57	31

Experiment 18 – Sampling Distribution

P (80%) – NP (20%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (University OM)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30940
Pareto Optimal (P) instances: 24752
Pareto Optimal (NP) instances: 6188

Testing Set:

Total Dataset Instances: 31
Pareto Optimal (P) instances: 10
Pareto Optimal (NP) instances: 21

Notebook URL: Notebook-18
Dataset URL: Dataset-18
Test set URL: Testset-18

	Precision	Recall	F1	Support
0 (NP)	0.00	0.00	0.00	21
1 (P)	0.32	1.00	0.49	10
Accuracy			0.32	31
Macro avg	0.16	0.50	0.24	31
Weighted avg	0.10	0.32	0.16	31

Experiment 19 – Sampling Distribution

P (80%) – NP (20%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 12

Test OM : 2 (University OM + Decider)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30829
Pareto Optimal (P) instances: 24663
Pareto Optimal (NP) instances: 6165

Testing Set:

Total instances : 111
Pareto Optimal (P) instances: 22
Pareto Optimal (NP) instances: 89

Notebook URL: Notebook-19
Dataset URL: Dataset-19
Test set URL: Testset-19

	Precision	Recall	F1	Support
0 (NP)	0.00	0.00	0.00	89
1 (P)	0.20	1.00	0.33	22
Accuracy			0.20	111
Macro avg	0.10	0.50	0.17	111
Weighted avg	0.04	0.20	0.07	111

Experiment 20 – Sampling Distribution

P (80%) – NP (20%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 10

Test OM : 4 (University OM + Decider + CO + OS)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 30701
Pareto Optimal (P) instances: 24560
Pareto Optimal (NP) instances: 6140

Testing Set:

Total Dataset Instances: 127
Pareto Optimal (P) instances: 32
Pareto Optimal (NP) instances: 95

Notebook URL: Notebook-20
Dataset URL: Dataset-20
Test set URL: Testset-20

	Precision	Recall	F1	Support
0 (NP)	0.67	0.00	0.00	95
1 (P)	0.25	1.00	0.40	32
Accuracy			0.26	127
Macro avg	0.13	0.50	0.20	127
Weighted avg	0.06	0.25	0.10	127

Experiments with separate Test set on 13 OM based sampling distributions.

Experiment 21 – Sampling Distribution

P (50%) – NP (50%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (Traffic Controller)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 27379
Pareto Optimal (P) instances: 13689
Pareto Optimal (NP) instances: 13690

Testing Set:

Total Dataset Instances: 2739
Pareto Optimal (P) instances: 51
Pareto Optimal (NP) instances: 2688

Notebook URL: Experiment-21
Dataset URL: Dataset-21
Test set URL: Testset-21

	Precision	Recall	F1	Support
0 (NP)	0.98	0.84	0.91	2688
1 (P)	0.04	0.31	0.06	51
Accuracy			0.83	2739
Macro avg	0.51	0.58	0.48	2739
Weighted avg	0.97	0.83	0.89	2739

Experiment 22 – Sampling Distribution

P (60%) – NP (40%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (Traffic Controller)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 27379
Pareto Optimal (P) instances: 16427
Pareto Optimal (NP) instances: 10952

Testing Set:

Total Dataset Instances: 2739
Pareto Optimal (P) instances: 51
Pareto Optimal (NP) instances: 2688

Notebook URL: Notebook-22
Dataset URL: Dataset-22
Test set URL: Testset-22

	Precision	Recall	F1	Support
0 (NP)	0.96	0.29	0.45	2688
1 (P)	0.01	0.31	0.02	51
Accuracy			0.29	2739
Macro avg	0.48	0.30	0.23	2739
Weighted avg	0.94	0.29	0.44	2739

Experiment 23 – Sampling Distribution

P (70%) – NP (30%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (Traffic Controller)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 27379
Pareto Optimal (P) instances: 19165
Pareto Optimal (NP) instances: 8214

Testing Set:

Total Dataset Instances: 2739
Pareto Optimal (P) instances: 51
Pareto Optimal (NP) instances: 2688

Notebook URL: Notebook-23
Dataset URL: Dataset-23
Test set URL: Testset-23

	Precision	Recall	F1	Support
0 (NP)	1.00	0.05	0.09	2688
1 (P)	0.02	1.00	0.04	51
Accuracy			0.07	2739
Macro avg	0.51	0.52	0.06	2739
Weighted avg	0.98	0.07	0.09	2739

Experiment 24 – Sampling Distribution

P (80%) – NP (20%)

Dataset orientation: Training set contained space between words and symbols.

Total OM: 14

Train OM : 13

Test OM : 1 (Traffic Controller)

Type: Test set is unseen by the model.

Training Set:

Total Dataset Instances: 27379
Pareto Optimal (P) instances: 21903
Pareto Optimal (NP) instances: 5476

Testing Set:

Total Dataset Instances: 2739
Pareto Optimal (P) instances: 51
Pareto Optimal (NP) instances: 2688

Notebook URL: Notebook-24
Dataset URL: Dataset-24
Test set URL: Testset-24

	Precision	Recall	F1	Support
0 (NP)	0.00	0.00	0.00	2688
1 (P)	0.02	1.00	0.04	51
Accuracy			0.02	2739
Macro avg	0.02	0.50	0.02	2739
Weighted avg	0.00	0.02	0.00	2739

All Object Models.

Location:

1. Bank
2. Camping
3. Canteen
4. Customer_Order
5. Ecommerce
6. Hospital Management
7. Library Management
8. Onlinestore
9. Student Course
10. Traffic_Controller
11. University
12. Decider
13. School_mgmt
14. Store_mgmt