Appendix C. Comparison of data preprocessing techniques in multiclass models of specific Group 2 attacks from the perspective of evaluation metrics for the Nemenyi test.

In general, no technique showed a significant statistical difference, with all techniques within the limiting margin of the critical distance. The most considerable distance within the critical limit is considered low, presented by the GD_SS (Data Cleaning, Get Dummies, and Standard Scaler) techniques, with 59% of the critical distance value from the perspective of the Recall metric. The GD_SS techniques also obtained the highest from the perspective of the Precision metric, with a value of 38% of the critical distance value. The LE_SS (Data Cleaning, Label Encoder, and Standard Scaler) techniques had the most significant distance in the F1-Score and FAR metrics, with 38% and 50% of the critical distance value, respectively. As all the distance differences between the techniques are close and within the critical distance limit, it is impossible to state which techniques would be considered the best in terms of performance. Below, the results are presented from the perspective of each analyzed metric.

Precision (Table C.1): all techniques, when compared, presented a percentage value within the margin of the critical distance limit. The GD_MM (Data Cleaning, Get Dummies, and MinMax Scaler) techniques showed the most significant distance compared to the LE (Data Cleaning and Label Encoder) techniques, with the first greater distance within the limit of the critical distance, with 38% of the distance value criticism. The second largest distance was obtained with the LE_SS (Data Cleaning, Label Encoder, and Standard Scaler) techniques compared to the LE (Data Cleaning and Label Encoder) techniques, with a 34% of critical distance value. In the third largest distance were the GD_SS techniques (Data Cleaning, Get Dummies, and Standard Scaler) compared to the LE techniques, with 27% of the value of the critical distance. When compared, all the other techniques presented percentages ranging from 4% to 23% of the critical distance value.

Critical Distance: 2.17						
Group 1	**Ranking**	**Group 2**	**Ranking**	**Distance**	**(%)**	**Hypotheses**
GD_MM	3.17	LE_SS	3.25	0.08	4%	Equal
GD_MM	3.17	GD_SS	3.42	0.25	11%	Equal
GD_MM	3.17	GD	3.50	0.33	15%	Equal
GD_MM	3.17	LE_MM	3.67	0.50	23%	Equal
GD_MM	3.17	LE	4.00	0.83	38%	Equal
LE_SS	3.25	GD_SS	3.42	0.17	8%	Equal
LE_SS	3.25	GD	3.50	0.25	11%	Equal
LE_SS	3.25	LE_MM	3.67	0.42	19%	Equal
LE_SS	3.25	LE	4.00	0.75	34%	Equal
GD_SS	3.42	GD	3.50	0.08	4%	Equal
GD_SS	3.42	LE_MM	3.67	0.25	11%	Equal
GD_SS	3.42	LE	4.00	0.58	27%	Equal
GD	3.50	LE_MM	3.67	0.17	8%	Equal
GD	3.50	LE	4.00	0.50	23%	Equal
LE_MM	3.67	LE	4.00	0.33	15%	Equal

Table C.1: Comparison of data preprocessing techniques in the multiclass models of specific attacks in Group 2, from the perspective of the **Precision metric** for the Nemenyi test.

Recall (Table C.2): all techniques, when compared, showed a percentage value within the margin of the critical distance limit. The GD_MM (Data Cleaning, Get Dummies, and MinMax Scaler) techniques showed the most significant distance compared to the LE (Data Cleaning and Label Encoder) techniques, with the first greater distance within the critical distance limit, with 59% of the distance value criticism. The second most significant distance was obtained with the GD (Data

Cleaning and Get Dummies) techniques compared to the LE (Data Cleaning and Label Encoder) techniques, with 57% of the critical distance value. In the third largest distance were the GD_SS techniques (Data Cleaning, Get Dummies, and Standard Scaler) compared to the LE techniques, with 51% of the value of the critical distance. When compared, all the other techniques presented percentages ranging from 2% to 40% of the critical distance value.

Critical Distance: 2.17						
Group 1	**Ranking**	**Group 2**	**Ranking**	**Distance**	**(%)**	**Hypotheses**
GD_MM	3.04	GD	3.08	0.04	2%	Equal
GD_MM	3.04	GD_SS	3.21	0.17	8%	Equal
GD_MM	3.04	LE_SS	3.46	0.42	19%	Equal
GD_MM	3.04	LE_MM	3.88	0.84	39%	Equal
GD_MM	3.04	LE	4.33	1.29	59%	Equal
GD	3.08	GD_SS	3.21	0.13	6%	Equal
GD	3.08	LE_SS	3.46	0.38	17%	Equal
GD	3.08	LE_MM	3.88	0.80	37%	Equal
GD	3.08	LE	4.33	1.25	57%	Equal
GD_SS	3.21	LE_SS	3.46	0.25	11%	Equal
GD_SS	3.21	LE_MM	3.88	0.67	31%	Equal
GD_SS	3.21	LE	4.33	1.12	51%	Equal
LE_SS	3.46	LE_MM	3.88	0.42	19%	Equal
LE_SS	3.46	LE	4.33	0.87	40%	Equal
LE_MM	3.88	LE	4.33	0.45	21%	Equal

Table C.2: Comparison of data preprocessing techniques in the multiclass models of specific attacks in Group 2, from the perspective of the **Recall metric** for the Nemenyi test.

F1-Score (Table C.3): all techniques, when compared, presented a percentage value within the margin of the critical distance limit. The LE_SS (Data Cleaning, Label Encoder, and Standard Scaler) techniques showed the most significant distance compared to the LE (Data Cleaning and Label Encoder) techniques, with the first greater distance within the limit of the critical distance, with 38% of the distance value criticism. In the second largest distance, the GD_SS (Data Cleaning, Get Dummies, and Standard Scaler) and GD MM (Data Cleaning, Get Dummies, and MinMax Scaler) techniques were aligned when compared to the LE techniques, both with 27% of the critical distance value. In the third largest distance, the GD (Data Cleaning and Get Dummies) and LE MM (Data Cleaning, Label Encoder, and MinMax Scaler) techniques were aligned when compared to the LE techniques, both with 23% of the critical distance value. When compared, all the other techniques presented percentages ranging from 0% to 15% of the critical distance value.

Critical Distance: 2.17						
Group 1	**Ranking**	**Group 2**	**Ranking**	**Distance**	**(%)**	**Hypotheses**
LE_SS	3.17	GD_SS	3.42	0.25	11%	Equal
LE_SS	3.17	GD_MM	3.42	0.25	11%	Equal
LE_SS	3.17	GD	3.50	0.33	15%	Equal
LE_SS	3.17	LE_MM	3.50	0.33	15%	Equal
LE_SS	3.17	LE	4.00	0.83	38%	Equal
GD_SS	3.42	GD_MM	3.42	0.00	0%	Equal
GD_SS	3.42	GD	3.50	0.08	4%	Equal
GD_SS	3.42	LE_MM	3.50	0.08	4%	Equal
GD_SS	3.42	LE	4.00	0.58	27%	Equal
GD_MM	3.42	GD	3.50	0.08	4%	Equal
GD_MM	3.42	LE_MM	3.50	0.08	4%	Equal

GD_MM	3.42	LE	4.00	0.58	27%	Equal
GD	3.50	LE_MM	3.50	0.00	0%	Equal
GD	3.50	LE	4.00	0.50	23%	Equal
LE_MM	3.50	LE	4.00	0.50	23%	Equal

Table C.3: Comparison of data preprocessing techniques in the multiclass models of specific attacks in Group 2, from the perspective of the **F1-Score metric** for the Nemenyi test.

FAR (Table C.4): all techniques, when compared, showed a percentage value within the margin of the critical distance limit. The LE_SS (Data Cleaning, Label Encoder, and Standard Scaler) techniques showed the most significant distance compared to the GD (Data Cleaning and Get Dummies) techniques, with the first greater distance within the critical distance limit, with 50% of the distance value criticism. The second largest distance is also from the LE_SS techniques compared to the GD_SS techniques (Data Cleaning, Get Dummies, and Standard Scaler), with 42% of the critical distance value. In the third largest distance were the LE (Data Cleaning and Label Encoder) techniques compared to the GD techniques, with 34% of the value of the critical distance. When compared, all the other techniques presented percentages ranging from 0% to 27% of the critical distance value.

Critical Distance: 2.17						
Group 1	**Ranking**	**Group 2**	**Ranking**	**Distance**	**(%)**	**Hypotheses**
LE_SS	2.92	LE	3.25	0.33	15%	Equal
LE_SS	2.92	LE_MM	3.50	0.58	27%	Equal
LE_SS	2.92	GD_MM	3.50	0.58	27%	Equal
LE_SS	2.92	GD_SS	3.83	0.91	42%	Equal
LE_SS	2.92	GD	4.00	1.08	50%	Equal
LE	3.25	LE_MM	3.50	0.25	11%	Equal
LE	3.25	GD_MM	3.50	0.25	11%	Equal
LE	3.25	GD_SS	3.83	0.58	27%	Equal
LE	3.25	GD	4.00	0.75	34%	Equal
LE_MM	3.50	GD_MM	3.50	0.00	0%	Equal
LE_MM	3.50	GD_SS	3.83	0.33	15%	Equal
LE_MM	3.50	GD	4.00	0.50	23%	Equal
GD_MM	3.50	GD_SS	3.83	0.33	15%	Equal
GD_MM	3.50	GD	4.00	0.50	23%	Equal
GD_SS	3.83	GD	4.00	0.17	8%	Equal

Table C.4: Comparison of data preprocessing techniques in the multiclass models of specific attacks in Group 2, from the perspective of the **FAR metric** for the Nemenyi test.