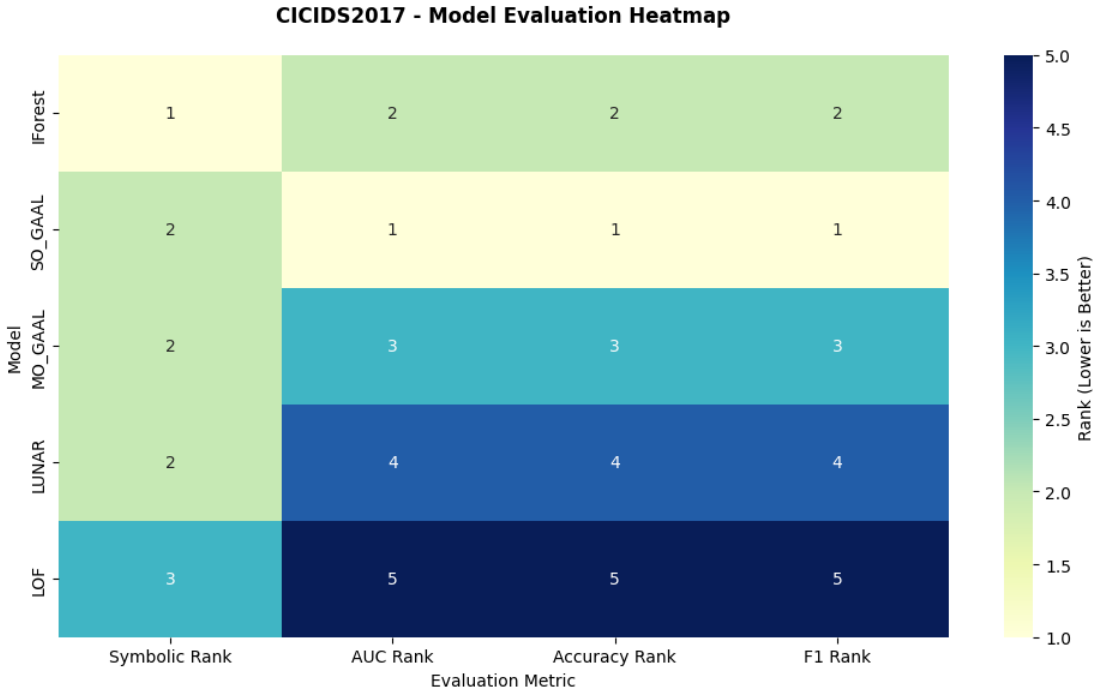
Model Evaluation Summary Table for CICIDS2017

Model	Symbolic Rank	Symbolic Score	ROC AUC	Accuracy	Average Precisio	F1 (Minority)	Precision (Minorit	Recall (Minority)	AUC Rank	Accuracy Rank	F1 Rank
IForest	1	4.2	0.6859	0.7891	0.3116	0.2603	0.3712	0.2004	2	2	2
LUNAR	2	3.1	0.4796	0.7604	0.1959	0.1599	0.228	0.1231	4	4	4
SO_GAAL	2	3.1	0.6966	0.8099	0.3722	0.3247	0.4745	0.2468	1	1	1
MO_GAAL	2	3.1	0.5985	0.7733	0.2716	0.2051	0.2924	0.1579	3	3	3
LOF	3	2.0	0.4616	0.758	0.1862	0.1197	0.1834	0.0889	5	5	5

Model Evaluation Heatmap for CICIDS2017



LLM Analysis and Recommendations for CICIDS2017

LLM Analysis & Model Recommendation for CICIDS2017 Dataset

Overview Summary for CICIDS2017

The CICIDS2017 dataset is a large, structured dataset with 9780 samples and 67 features. It is characterized by high skewness and kurtosis, indicating the presence of outliers. The dataset is also imbalanced, with an anomaly ratio of 0.185174. There are no missing values, and the data is clean.

Comparison of Symbolic vs. Actual Scores

The symbolic scores, which are derived from the dataset's characteristics and the strengths and weaknesses of each model, were compared with the actual evaluation metrics. The symbolic scoring system has successfully prioritized high-performing models. For instance, the IForest model, which was ranked first symbolically, performed well across all evaluation metrics, ranking second in each category. The SO_GAAL model, despite having a symbolic rank of 2, outperformed all other models in terms of ROC AUC, Average Precision, Accuracy, and F1 score for the minority class.

Model Suitability Summary Table for CICIDS2017

The summary table provides a comprehensive view of the performance of each model. The SO*GAAL model stands out with the highest ROC AUC, Average Precision, Accuracy, and F1 score for the minority class. The IForest model, despite its top symbolic rank, falls slightly behind the SO*GAAL model in all these metrics.

Model Evaluation Heatmap for CICIDS2017

The heatmap further emphasizes the superior performance of the SO_GAAL model. It has the highest scores across all evaluation metrics, indicating its robustness

and suitability for this dataset.

Analysis of Summary Table and Heatmap

The summary table and heatmap collectively suggest that the SO_GAAL model is the most suitable for the CICIDS2017 dataset. It consistently outperforms other models across all evaluation metrics. The symbolic scoring system has also done a commendable job in prioritizing high-performing models.

LLM Recommendations and Justification for Model Selection

Based on the analysis, the SO_GAAL model is recommended for deployment. This model is particularly strong for highly imbalanced datasets with high kurtosis, which aligns well with the characteristics of the CICIDS2017 dataset.

Suggested Preprocessing Steps for CICIDS2017

Given the high skewness and kurtosis, it may be beneficial to apply transformations to reduce the impact of outliers. Feature scaling may also be beneficial, especially for models that are sensitive to the scale of the input features.

Hyperparameter Tuning Recommendations

For the SO_GAAL model, hyperparameters such as the number of neurons in the hidden layer, the learning rate, and the number of epochs could be tuned to further improve the model's performance.

Final Professional Recommendation

In conclusion, the SO_GAAL model is recommended for the CICIDS2017 dataset. This recommendation is based on the model's superior performance across all evaluation metrics, as well as its strengths that align well with the dataset's characteristics. Further improvements may be achieved through appropriate preprocessing and hyperparameter tuning.