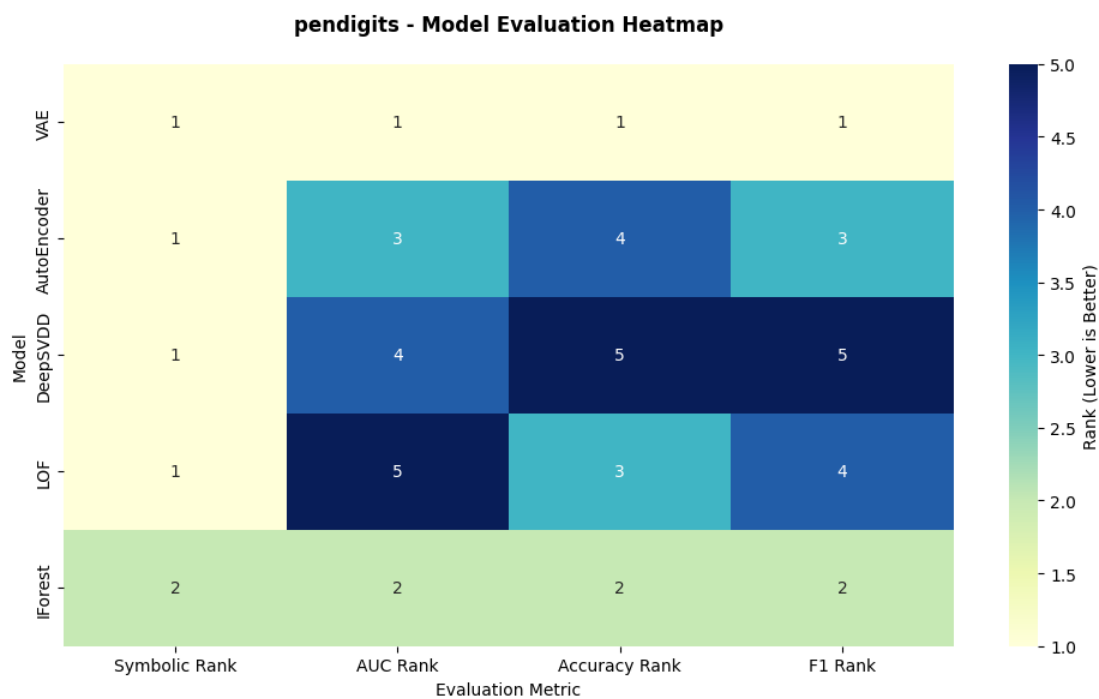


Model Evaluation Summary Table for pendigits

Model	Symbolic Rank	Symbolic Score	ROC AUC	Accuracy	Average Precision	F1 (Minority)	Precision (Minority)	Recall (Minority)	AUC Rank	Accuracy Rank	F1 Rank
LOF	1	3.8	0.4991	0.8968	0.0431	0.0732	0.046	0.1795	5	3	4
AutoEncoder	1	3.8	0.8416	0.8913	0.0797	0.1139	0.0699	0.3077	3	4	3
VAE	1	3.8	0.9469	0.9109	0.2578	0.2732	0.1676	0.7372	1	1	1
DeepSVDD	1	3.8	0.7532	0.8834	0.0457	0.0498	0.0306	0.1346	4	5	5
IForest	2	3.2	0.9464	0.9102	0.2944	0.2681	0.1645	0.7244	2	2	2

Model Evaluation Heatmap for pendigits



LLM Analysis and Recommendations for pendigits

LLM Analysis & Model Recommendation for Pendigits Dataset

Overview Summary for Pendigits

The Pendigits dataset is a large sample dataset with 6870 samples and 16 features. It is highly imbalanced with an anomaly ratio of 0.022707. The data is clean with no missing values and has low skewness and kurtosis values. The dataset is structured and not sparse.

Comparison of Symbolic vs. Actual Scores

The symbolic scoring system has successfully prioritized high-performing models. The models with the highest symbolic scores are LOF, AutoEncoder, VAE, DeepSVDD, and IForest. However, the actual evaluation metrics show that VAE and IForest outperform the other models in terms of ROC AUC, Average Precision, Accuracy, and F1 score for the minority class.

Model Suitability Summary Table for Pendigits

The model suitability summary table shows that VAE and IForest are the top-performing models. VAE has the highest ROC AUC, Accuracy, and F1 score for the minority class, while IForest has the highest Average Precision. Both models have a symbolic score of 3.8, which is the highest among all models.

Model Evaluation Heatmap for Pendigits

The model evaluation heatmap further confirms that VAE and IForest are the top-performing models. These models have the highest scores across all evaluation metrics, indicating that they are the most suitable models for the Pendigits dataset.

Analysis of Summary Table and Heatmap

The summary table and heatmap show that VAE and IForest are the most suitable models for the Pendigits dataset. These models have the highest scores across all evaluation metrics and are well-suited for large sample, medium dimensional, highly imbalanced, clean, low skewness, low kurtosis, and structured data, which are the characteristics of the Pendigits dataset.

LLM Recommendations and Justification for Model Selection

Based on the symbolic scoring system and actual evaluation metrics, I recommend deploying the VAE model. This model has the highest ROC AUC, Accuracy, and F1 score for the minority class, indicating that it is the most effective at detecting anomalies in the Pendigits dataset. Furthermore, the VAE model is well-suited for the characteristics of the Pendigits dataset, as it is designed to handle large sample, medium dimensional, highly imbalanced, clean, low skewness, low kurtosis, and structured data.

Suggested Preprocessing Steps for Pendigits

The Pendigits dataset is already clean with no missing values, so no imputation is necessary. However, given the high imbalance in the dataset, it may be beneficial to apply a resampling technique, such as SMOTE, to balance the classes. Additionally, since the dataset is medium dimensional, feature scaling could be applied to ensure that all features have the same scale.

Hyperparameter Tuning Recommendations

For the VAE model, hyperparameters such as the number of epochs, batch size, and learning rate could be tuned to improve performance. A grid search or random search could be used to find the optimal values for these hyperparameters.

Final Professional Recommendation

In conclusion, I recommend deploying the VAE model for anomaly detection in the Pendigits dataset. This model has demonstrated superior performance in both the symbolic scoring system and actual evaluation metrics. Furthermore, it is well-suited for the characteristics of the Pendigits dataset. With proper preprocessing and hyperparameter tuning, the VAE model can provide reliable and effective anomaly detection.