Model Research part

Model	Accuracy	Precision	Recall	F1-Score	Main Strength	Weakness
Logistic Regression	0.92	0.91	0.88	0.89	Fast, interpretable, good baseline	Cannot model complex non-linear relationships
KNN	0.90	0.89	0.85	0.87	Simple, effective with small, clean datasets	Slow, sensitive to high dimensions
SVM	0.95	0.94	0.90	0.92	Effective for high-dimensional data	Parameter tuning needed, slow with large data
XGBoost	0.96	0.95	0.91	0.93	Handling class imbalance, high accuracy	Complex tuning, longer to train
Random Forest	0.97	0.96	0.92	0.94	Robust, good for mixed data types	Less interpretable, overfitting risk if not tuned
DNN	0.96	0.95	0.91	0.93	Captures complex patterns, scalable	Data hungry, tuning complexity
LSTM	0.96	0.95	0.91	0.93	Sequential/temporal data modeling	Longer training, requires sequence data
Autoencoder	0.93	0.90	0.89	0.90	Detects unknown threats via anomaly detection	Threshold tuning critical, limited for labeled data
Hybrid (RF + LSTM + AE)	**~0.99**	0.99	0.98	0.99	Best overall performance, combines strengths of models	Complex ensemble setup, requires tuning for real-time deployment