

A Hybrid Approach To Sales Forecasting

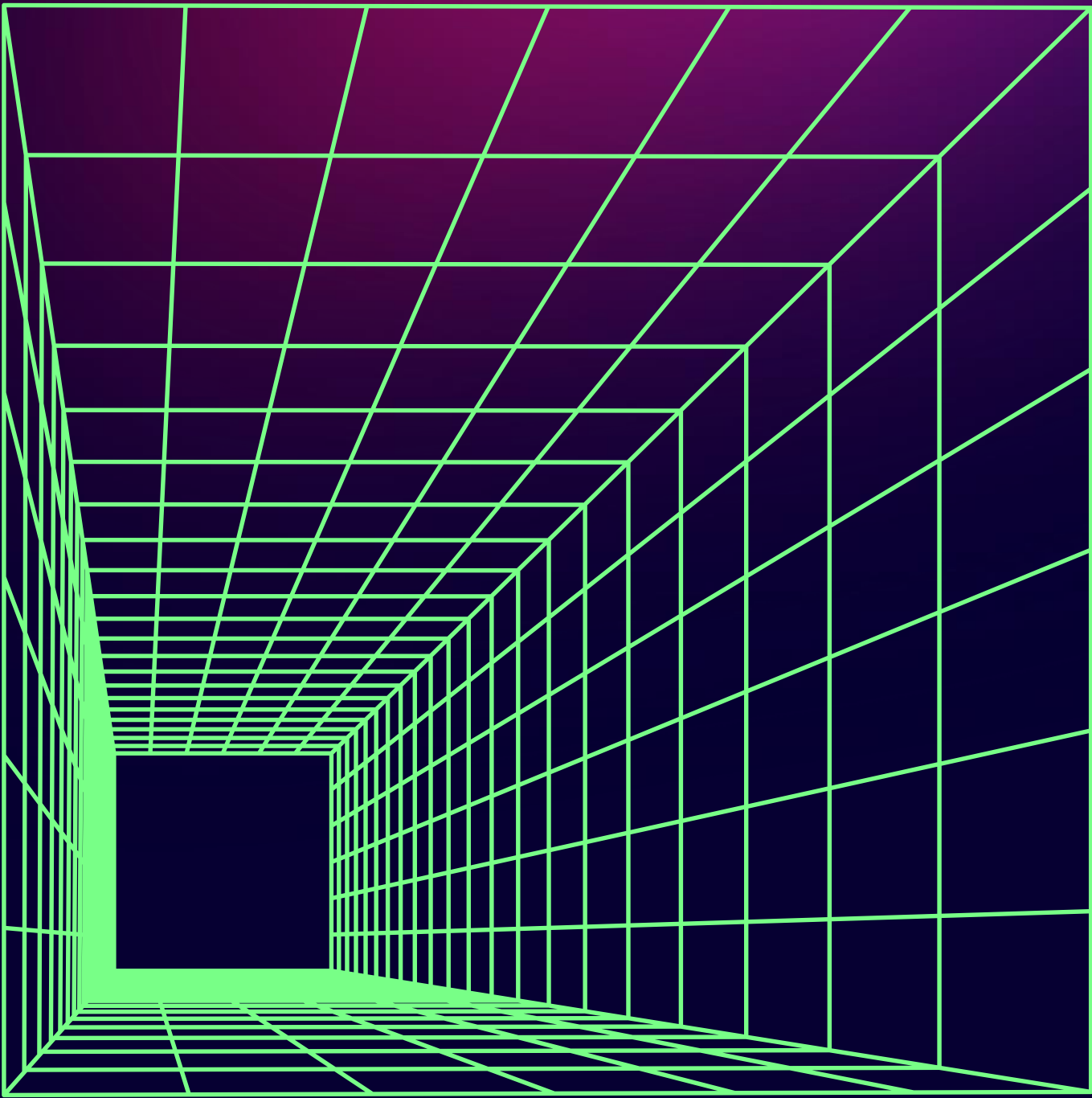
Othman Omar Othman Alamoudi
Midocean University

Prof. Dr. Yasser
Abdelhamid

Introduction

Traditional Sales forecasting

Keywords: Deep Learning, Machine Learning, Hybrid Machine and Deep Learning, Sales Forecasting.



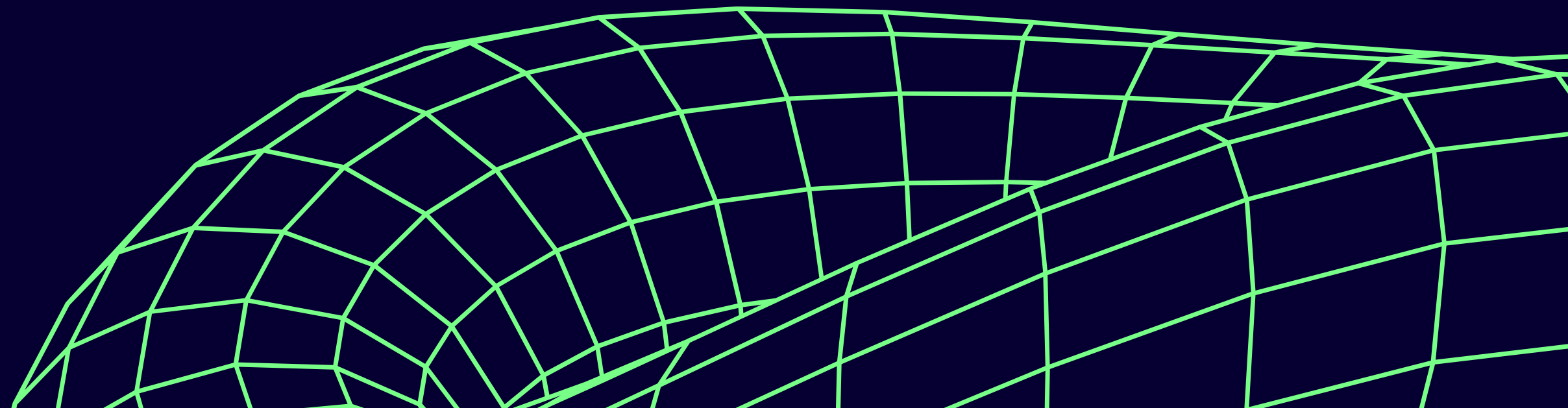
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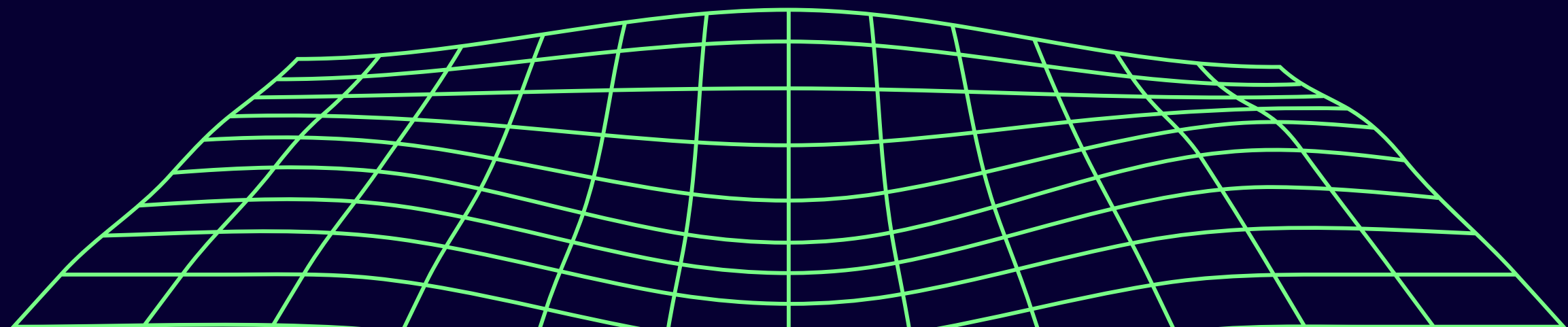


Problem Definition

Accuracy

Data Quality

Dynamic Market Conditions



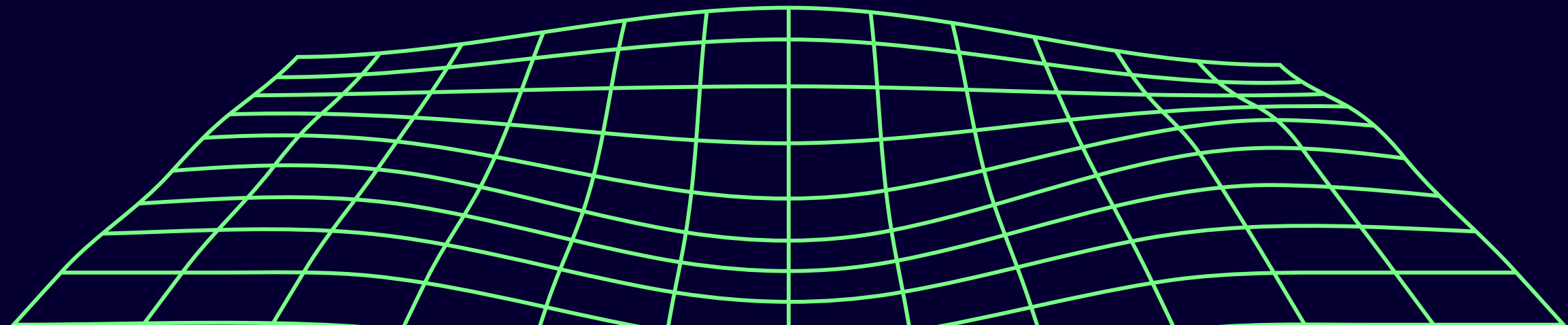
Research Questions

Q1. What are the DL and ML models used for sales forecasting?

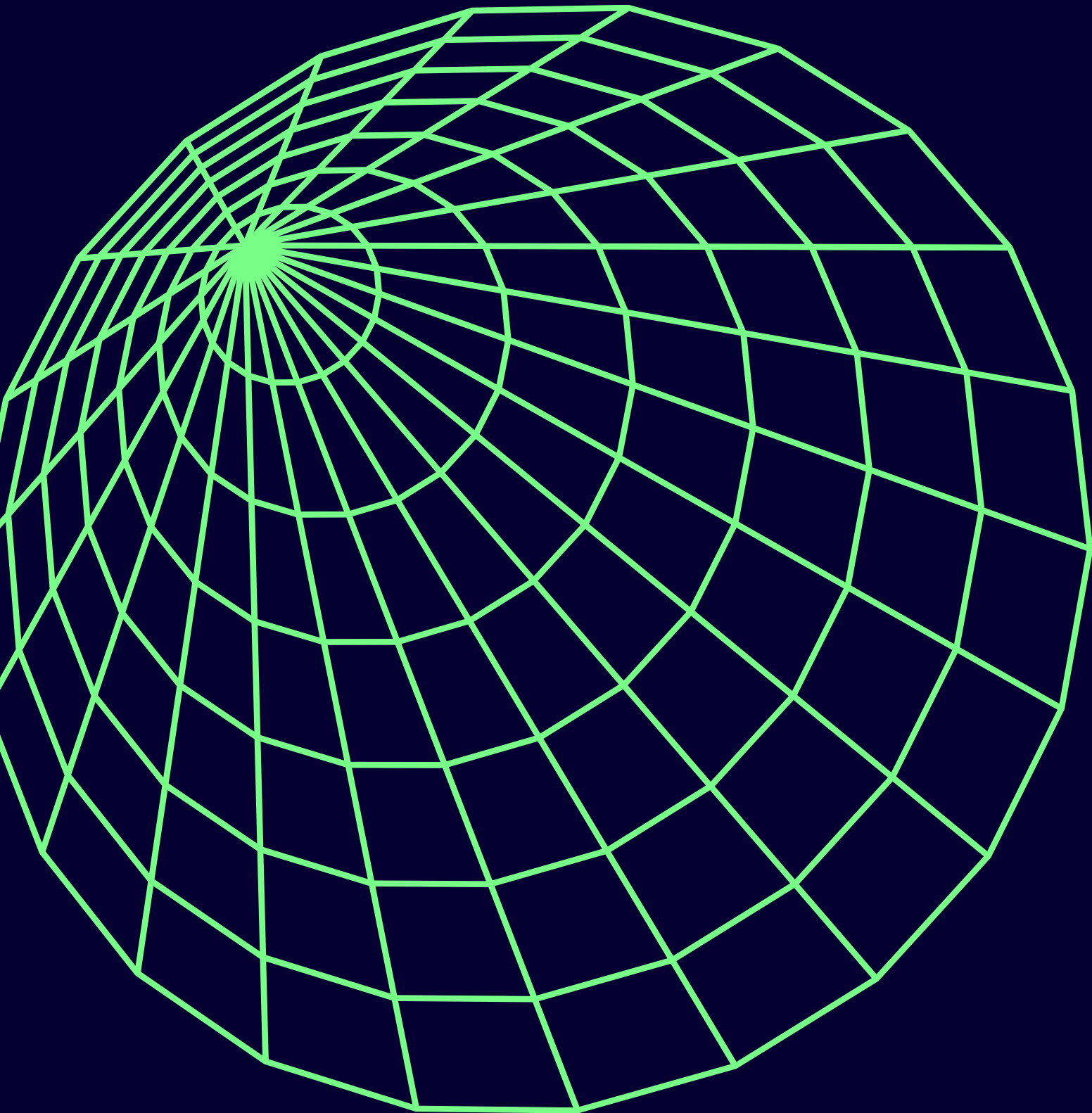
Q2. What metrics are used for model evaluation?

Q3. What are the benefits of using Hybrid Learning models for sales forecasting?

Q4. What are the challenges and limitations of using Hybrid Learning models for sales forecasting?

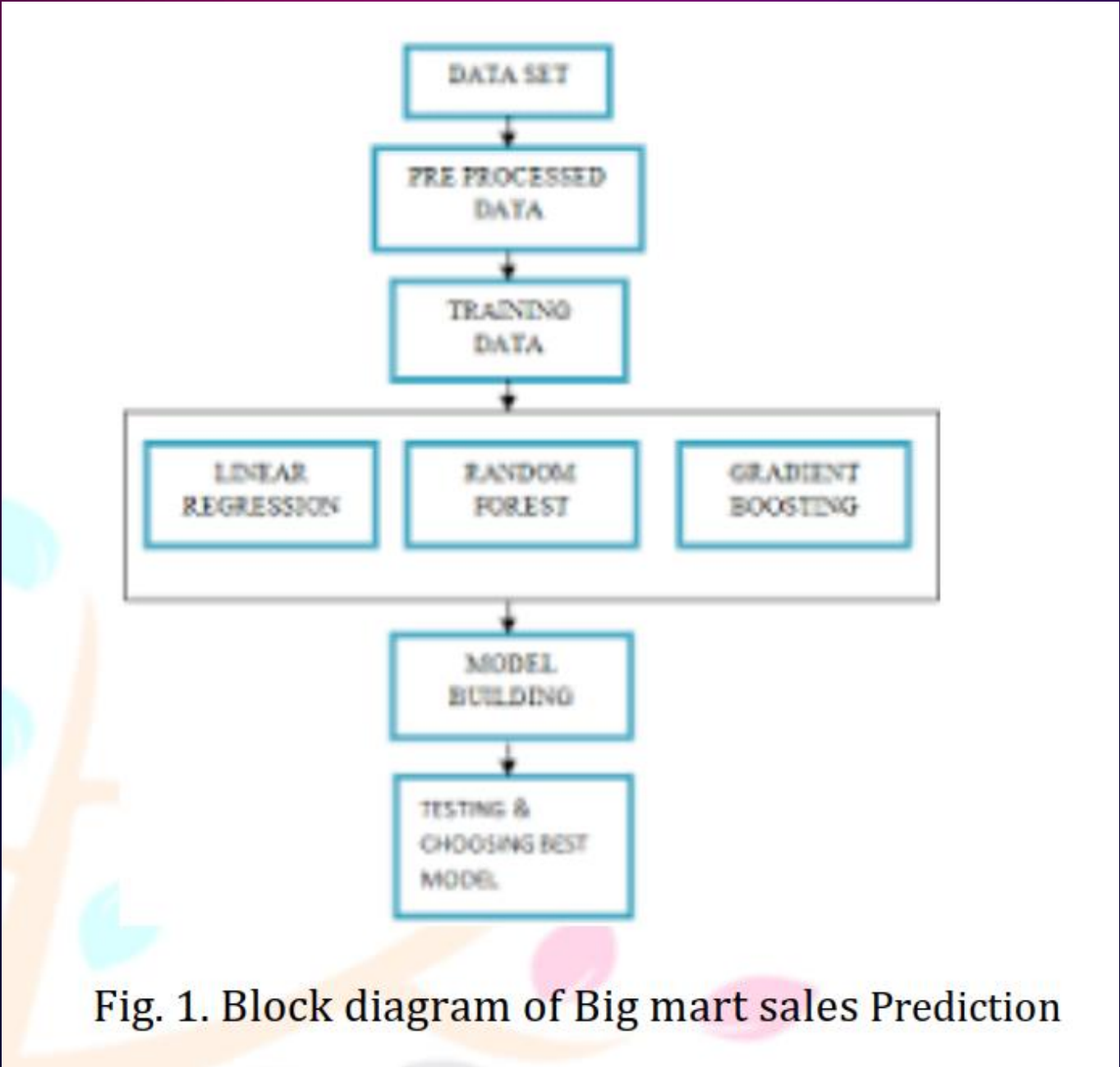


Machine Learning



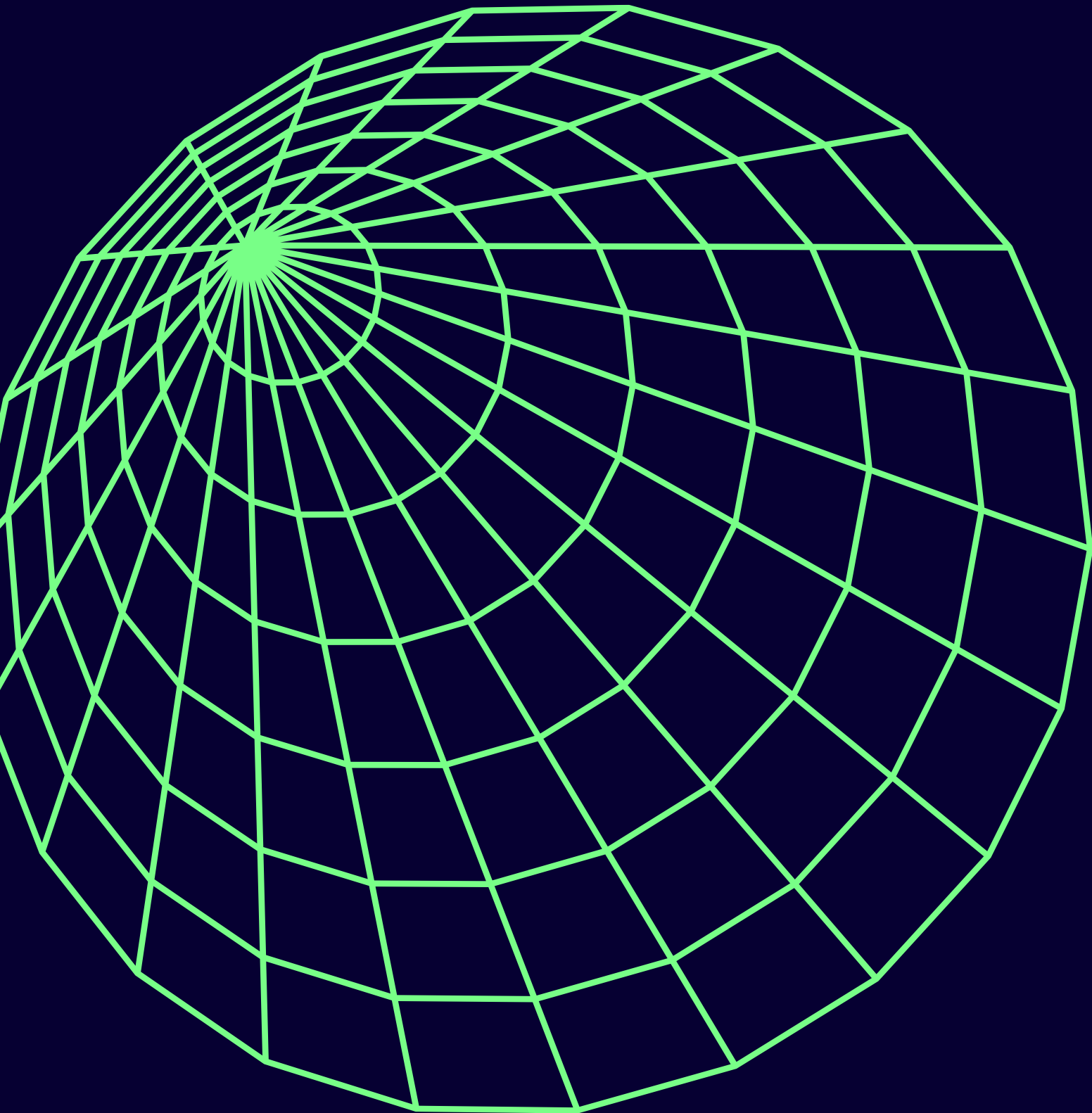
In the paper sales prediction using ML by Hitsh et al. they focused in the retail sales market and they collected Dataset from 2015-2017 which too old and also for retail channel it's the smallest it will better if they got data for wholesalers or Key Accounts (KA) the algorithm used linear regression, random forest and GBA.

Research Methodology



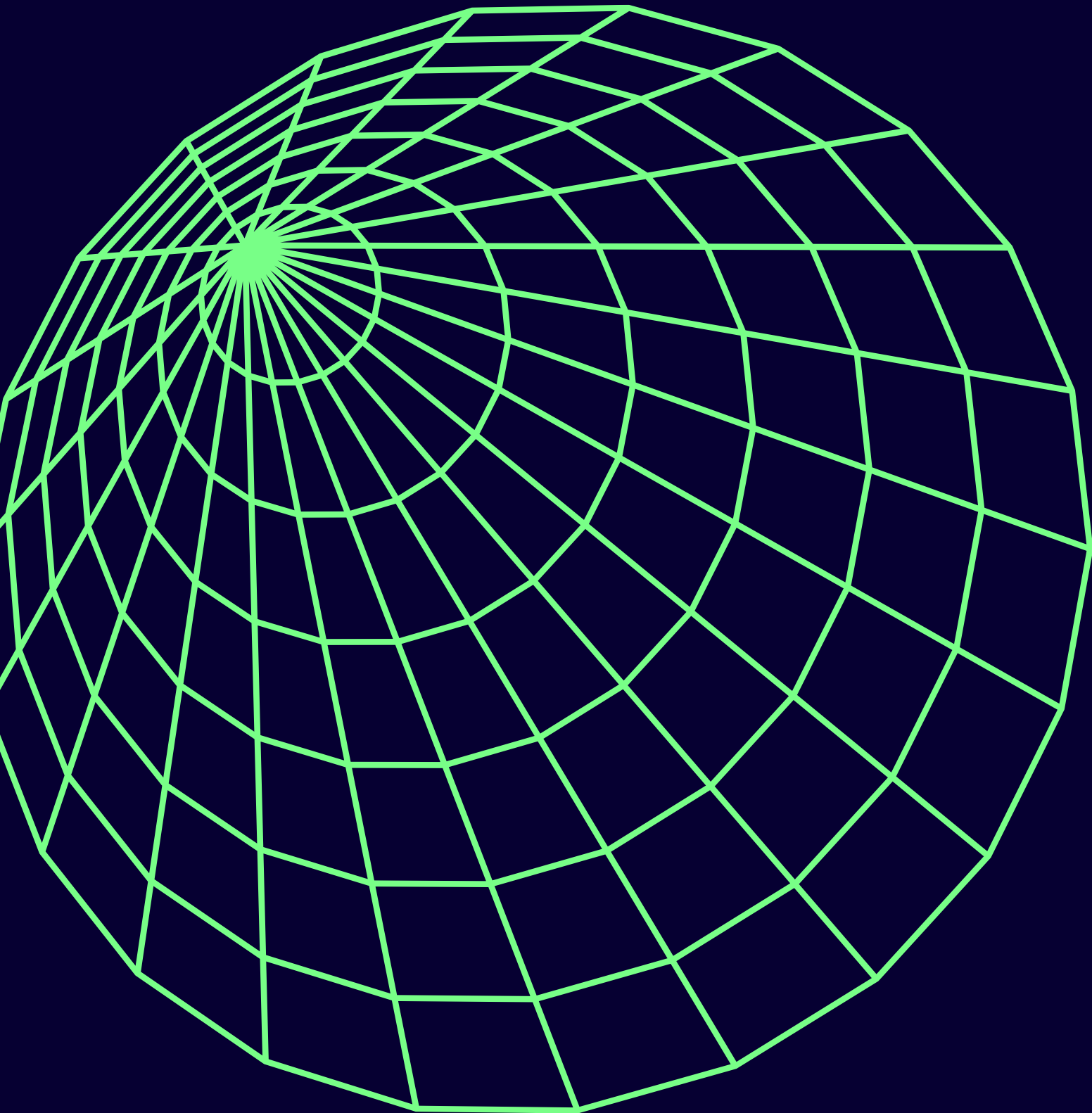
ALGORITHM	ACCURACY	RMSE
Linear Regression	0.58	11.787
Random Forest Regression	0.649	10.821
Gradient boosting algorithm	0.69	10.343

Deep learning



In the paper Retail Sales Forecasting Using Deep Learning: Systematic Literature Review (2022) Linda Eglite et al. machine learning models, including linear regression, random forest, XGBoost, and LSTM, data set 10 retail stores RMSE, MAE and R-squared to evaluate their model and XGBoost shows the best results

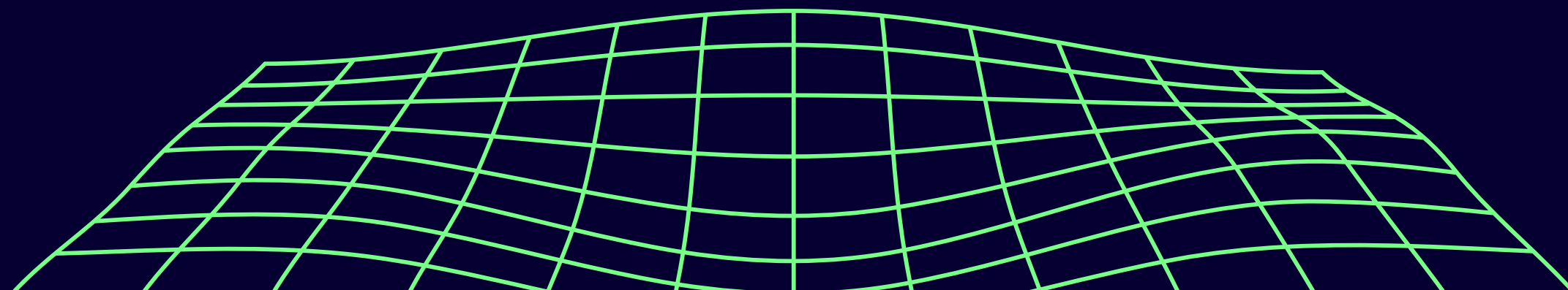
Deep Learning



In the paper Approaching Sales Forecasting Using Recurrent Neural Networks and Transformers (2022) Iván Vallés-Pérez et al. also focused on the retail sales market Dataset from 2013-2017 they provided a trick they named the "random max time step trick," they used seq2seq and transformer architecture.

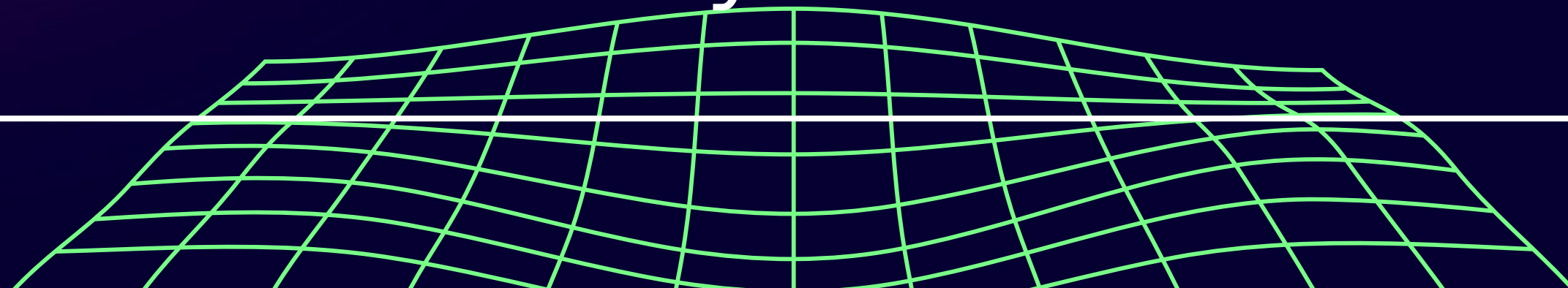
Methods

XGBoost combines multiple weak learners (typically decision trees) to create a strong predictive model. It uses gradient boosting, where each tree corrects the errors of the previous trees.



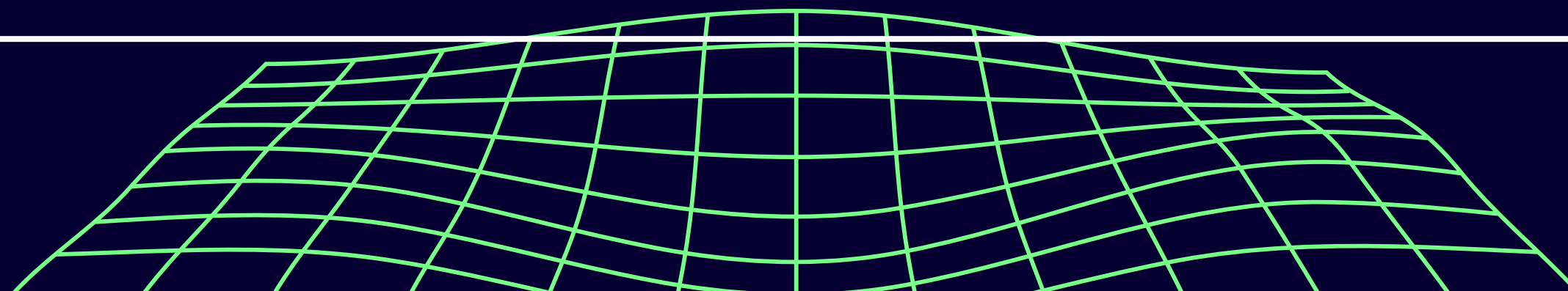
Methods

Long Short-Term Memory (LSTM) is a type of recurrent neural network (RNN) architecture commonly used in machine learning, especially for sequence prediction tasks. Unlike traditional RNNs, LSTMs are designed to address the issue of vanishing gradients, allowing them to capture long-term dependencies in sequential data effectively.



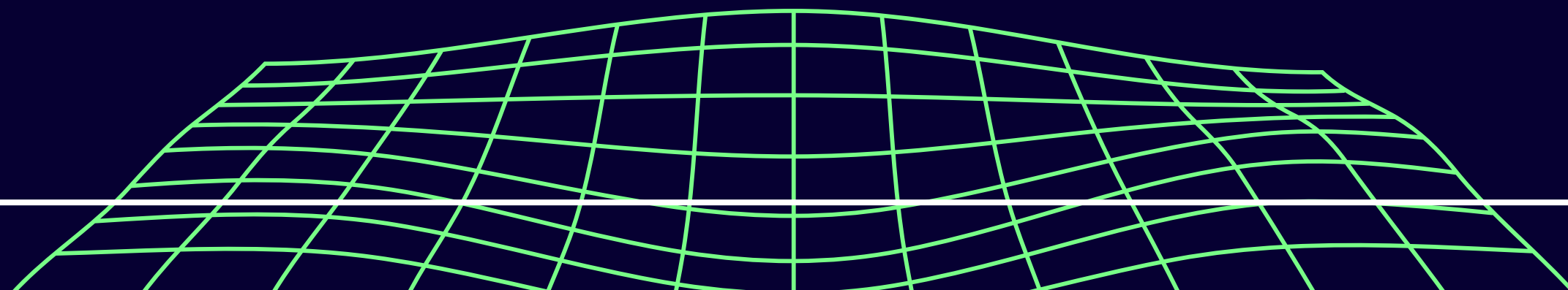
Methods

Gradient Boosting Algorithm is a machine learning technique for regression and classification problems. It builds a strong predictive model by combining multiple weaker models, typically decision trees, iteratively. Here's how it works



Methods

Random Forest is a popular machine learning algorithm primarily used for both classification and regression tasks

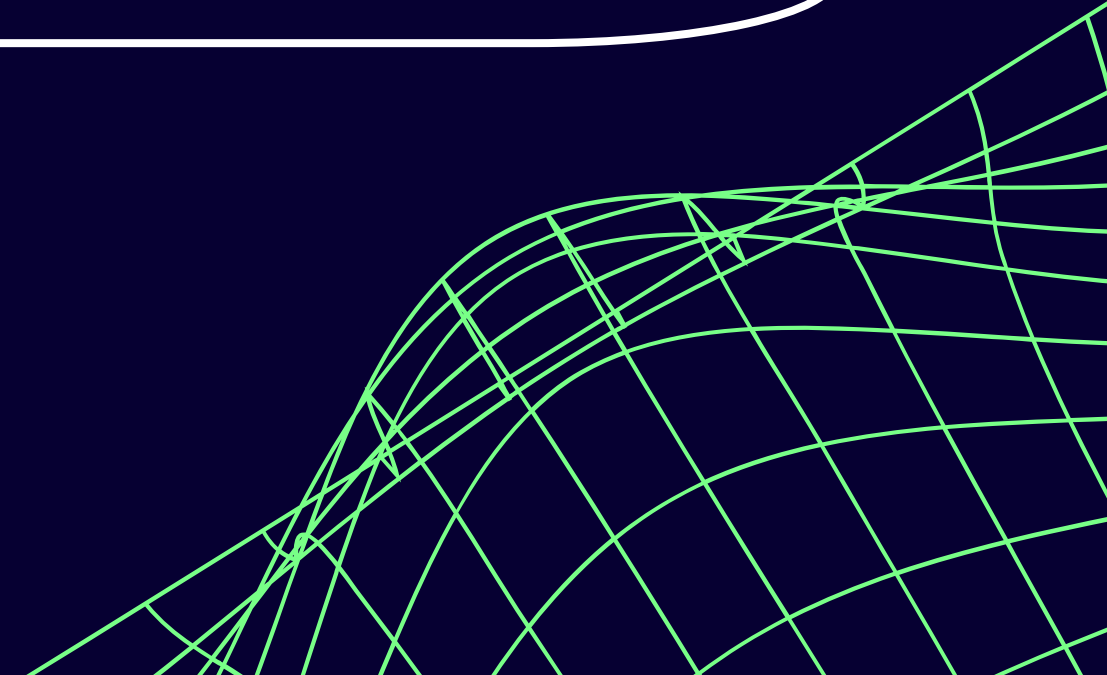


Evaluations Metrics

RMSE (Root Mean Squared Error)

Measures the square root of the average squared differences between predicted values and actual values.

Lower RMSE is the best.



Evaluations Metrics

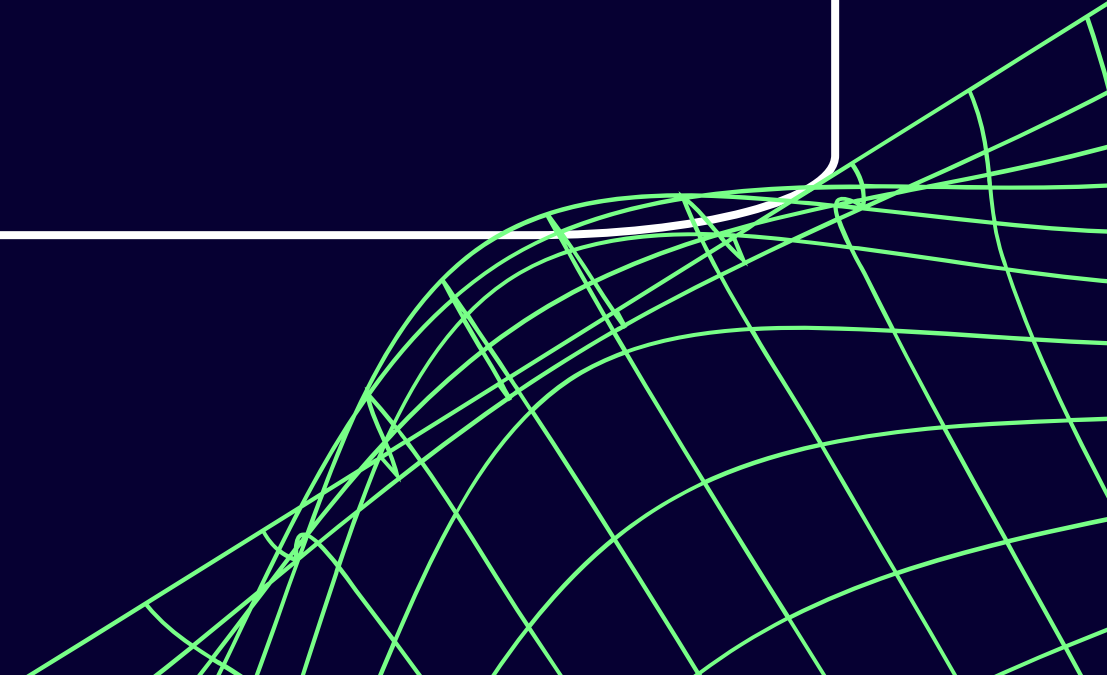
MAE (Mean Absolute Error)

Calculates the average absolute differences between predicted values and actual values.
Lower is the best

Evaluations Metrics

MSE (Mean Squared Error)

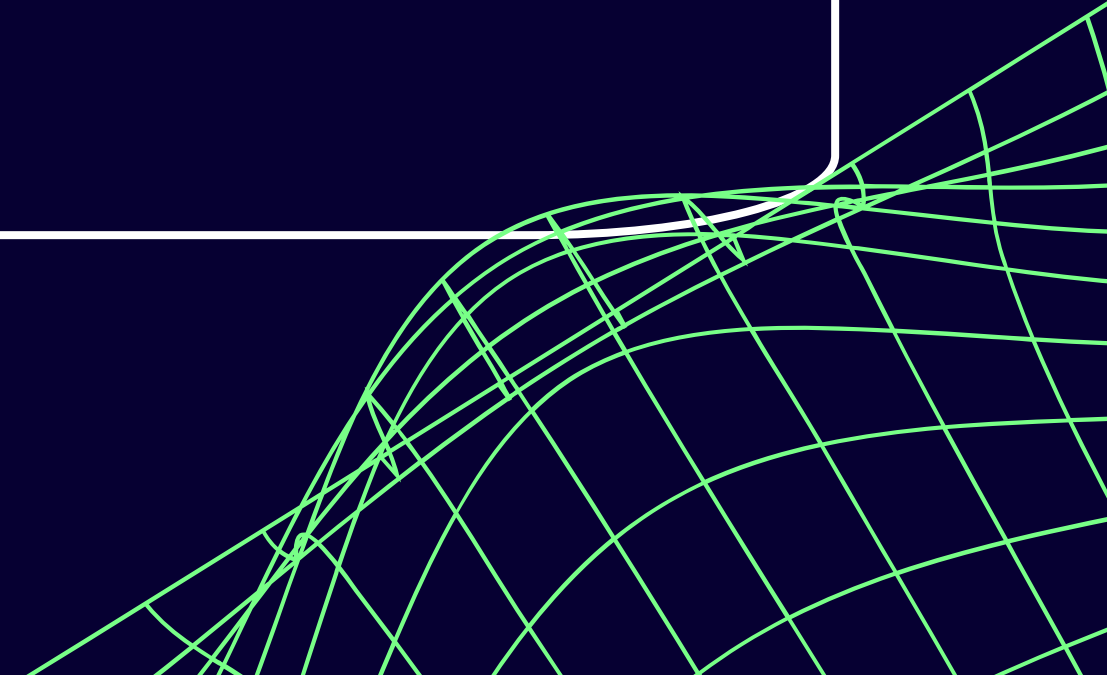
It calculates the average of the squared differences between predicted and actual values. Squaring the errors ensures all differences are positive and emphasizes larger errors.



Evaluations Metrics

MSE (Mean Squared Error)

It calculates the average of the squared differences between predicted and actual values. Squaring the errors ensures all differences are positive and emphasizes larger errors.



The End

