

Fractional Brownian Motion

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陳君彥, b04703091 劉育嘉, b06902008 黃柏豪, b06902124
b04703091@ntu.edu.tw b06902008@ntu.edu.tw b06902124@ntu.edu.tw

Division of Work

陳君彥, b04703091:

- Data initial processing and calculation tool creation.
- Initial creation and testing of XG-boost, LightGBM, and Random Forest Models

劉育嘉, b06902008:

- Indepth testing of tree based methods
- Testing and Creation of select feature models.

黃柏豪, b06902124:

- Creation and testing of neural network based models.
- Creation and testing of blending based models.

1 Introduction

[1,100].

Our testing sets consists of 2,500 simulations.

The goal of this project is to reverse learn model parameters used to simulate a fractional Brownian Motion [1] simulation.

2.1.1 Feature Importance

2.2 Additional Features

2 Features

2.1 Original Features

Our training dataset consists of 47,500 simulations with 10,000 features each. The first 5,000 features represented the mean-square displacements (MSD) of our particles ordered from time $= [1, 5000]$. The second 5,000 features were 50 sets of velocity auto-correlations (VAC) calculated in different methods, ordered by the early VAC being more representative of instantaneous velocity, with later VAC being closer to average velocity. Each sets consists of 100 calculation using the respective VAC, with time intervals from $t =$

3 Individual Model Experiments

3.1 Tree based models

3.1.1 Random Forest

3.1.2 XGBoost

3.1.3 LightGBM

3.2 Neural network models

3.3 Blending

4 Conclusion

References

- [1] Wikipedia, “fractional browning motion,” https://en.wikipedia.org/wiki/Fractional_Brownian_motion.