

Acquisition Functions

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1 Introduction

1.1 Purpose of Acquisition Functions

1.2 Types of Acquisition Functions

2 Decision-Theoretic Acquisition Functions

2.1 Expected Improvement (EI)

2.2 Probability of Improvement (PI)

3 Information-Theoretic Acquisition Functions

3.1 Knowledge Gradient (KG)

3.2 Mutual Information (MI)

3.3 Entropy Search (ES)

Predictive Entropy Search (PES)

Max-Value Entropy Search (MES)

Joint Entropy Search (JES)

4 Acquisition Functions from Multi-Armed Bandits

4.1 Statistical Upper Confidence Bound (UCB)

4.2 Thompson Sampling (TS)

5 Constructing Acquisition Functions

5.1 Approximation: Lookahead

Special Case: One-Step Lookahead

5.2 Approximation: Rollout

5.3 The Multi-Armed Bandit Approach

5.4 The Monte Carlo Approach

6 Computing Acquisition Functions

7 References

- [1] Roman Garnett. 2023. *Bayesian optimization*. Cambridge University Press, Cambridge, United Kingdom ;