

Standard Acquisition Is Sufficient for Asynchronous Bayesian Optimization

Ben Riegler

Tangier, 02 May 2026

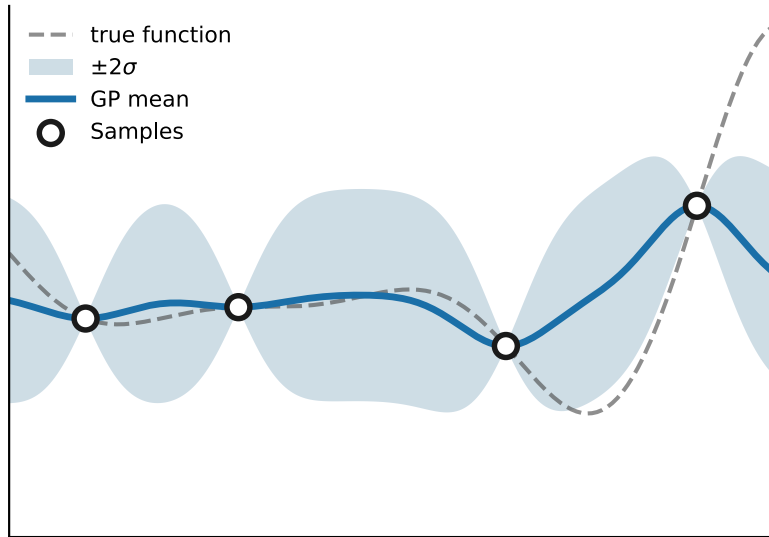


James Odgers



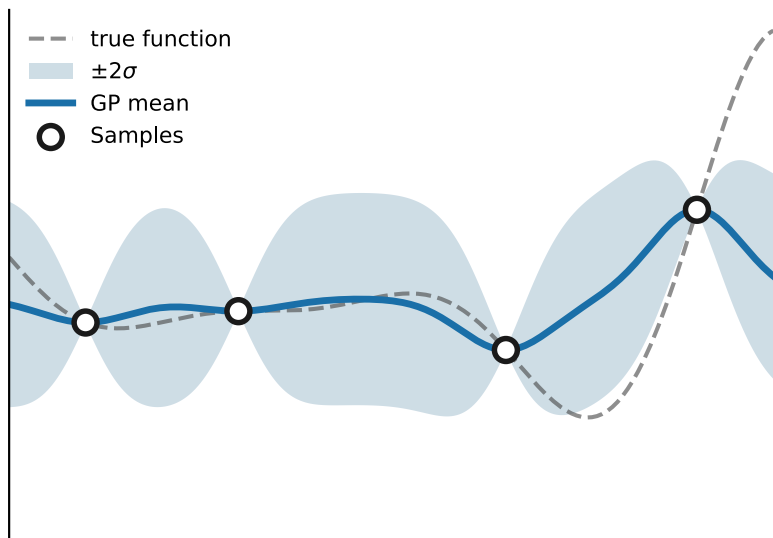
Vincent Fortuin

Bayesian Optimization: Motivating Examples

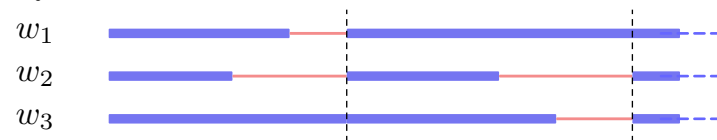


- Optimizing black-box functions by point-wise evaluation
- Evaluations are expensive and should be chosen carefully
- E.g. lab experiments with desired outcome or hyper-parameter tuning for ML models

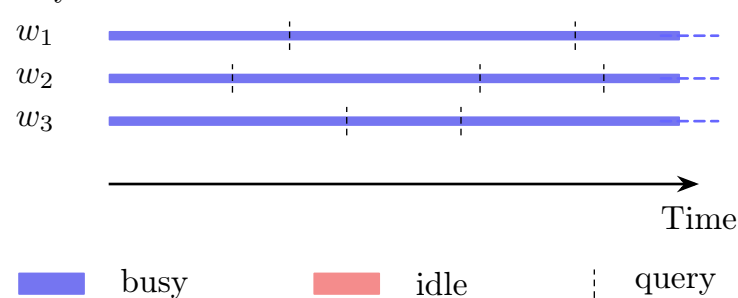
Bayesian Optimization: Make It Fast



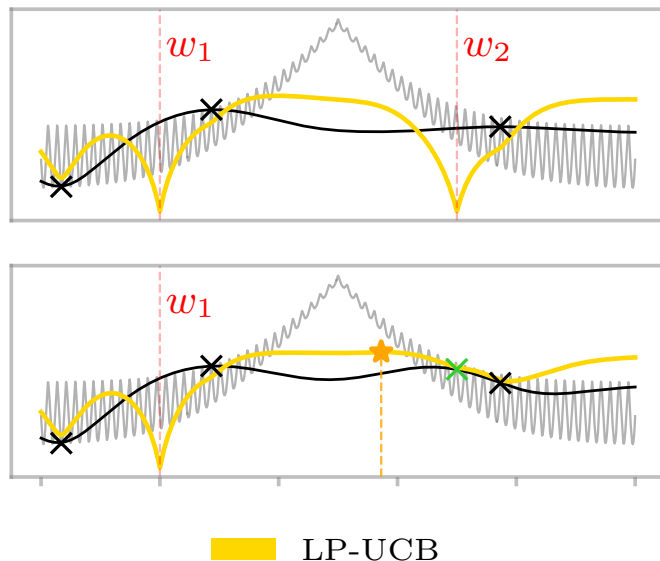
Synchronous



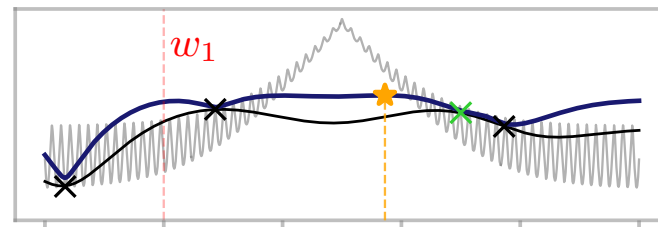
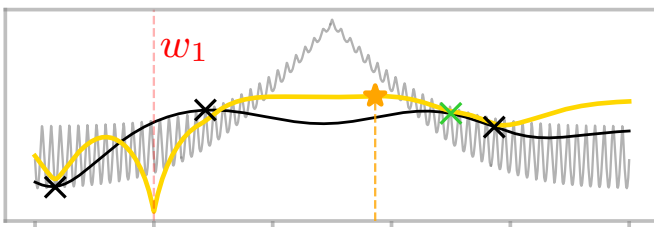
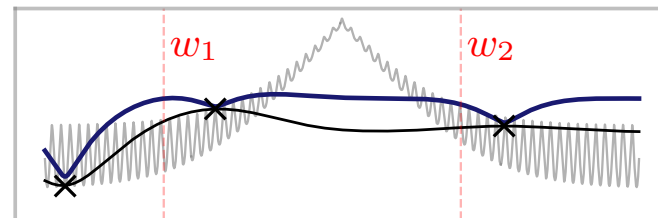
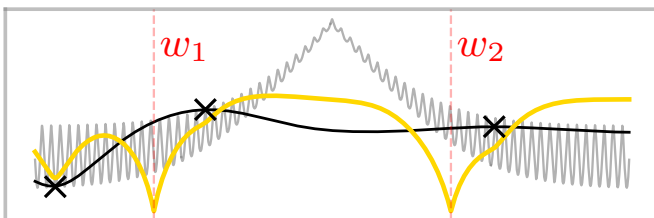
Asynchronous



Literature Assumes Need for Explicit Diversity



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LP-UCB

UCB

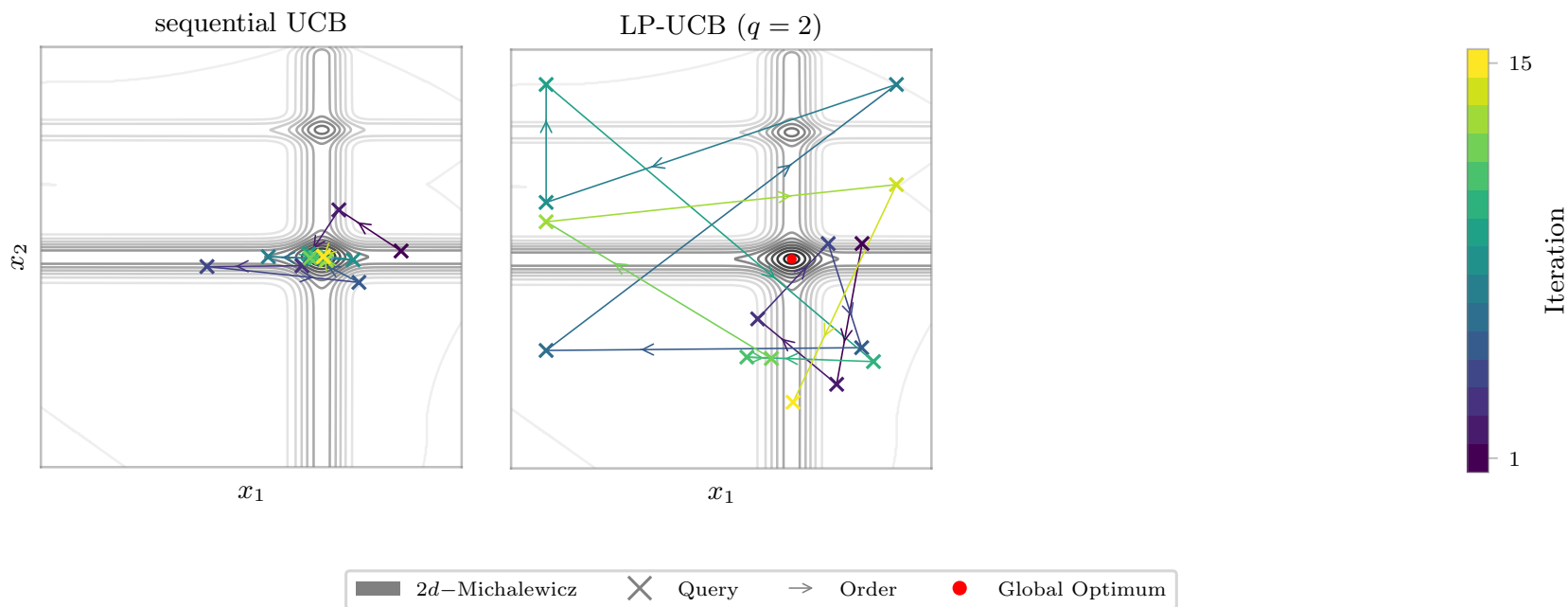
Theorem 1 (Informal. Bound on $\text{BSR}(n)$ for asynchronous UCB). *Let $f \sim \mathcal{GP}(0, k_\phi(\cdot, \cdot))$. Then, for the UCB acquisition function used asynchronously (see Algorithm 1), the Bayes simple regret after n queries can be bounded as*

$$\text{BSR}(n) \lesssim \sqrt{\frac{\xi_q \log(n) \Psi_n}{n}}.$$

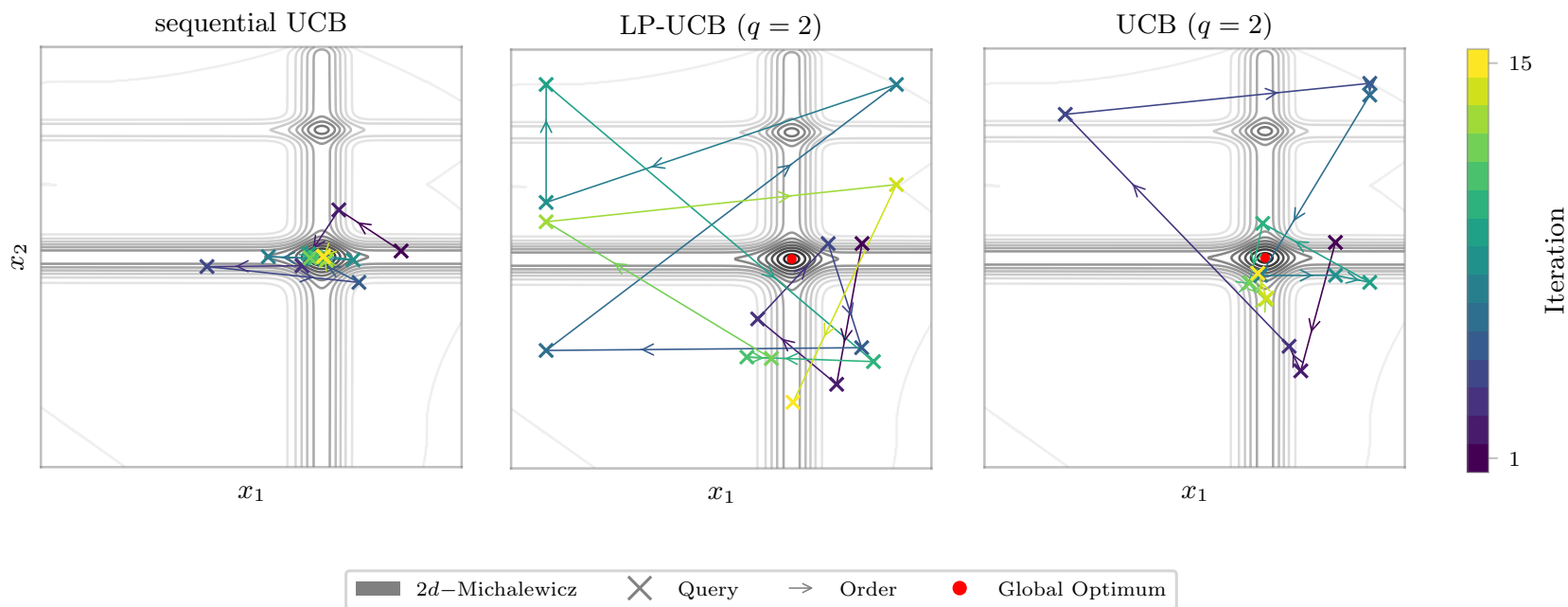
Penalized UCB Over-Explores the Search Space



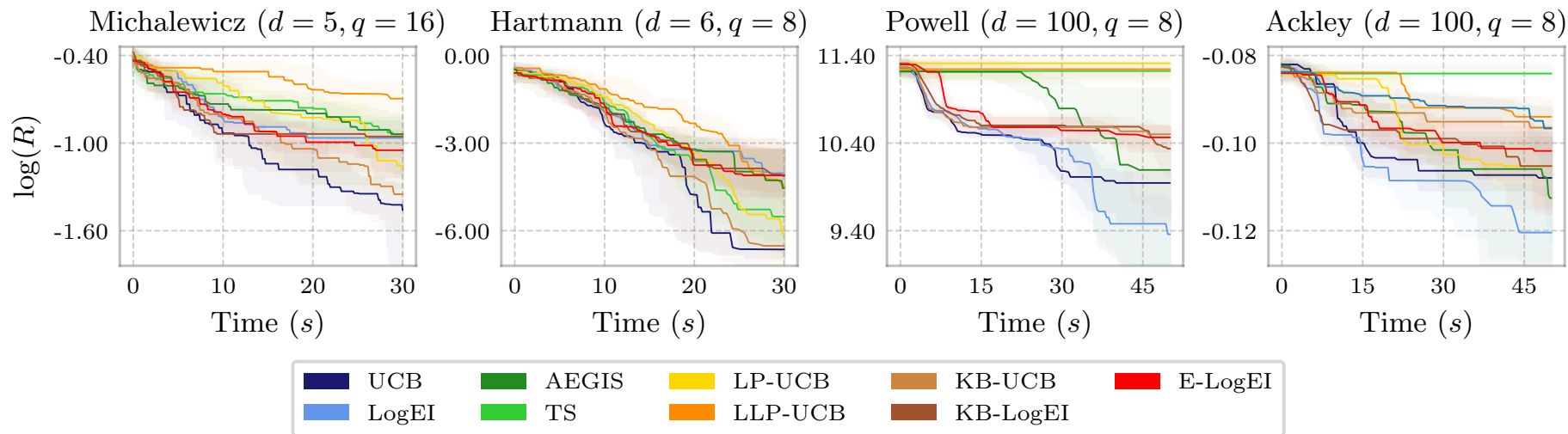
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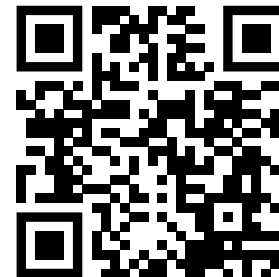
Standard Acquisition Performs Very Well



Key Takeaways

The standard UCB has bounded Bayes simple regret equivalent to Thompson sampling.

Poster #174 @ 3pm today

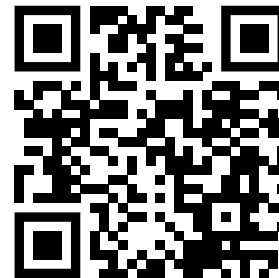


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The standard UCB has bounded Bayes simple regret equivalent to Thompson sampling.

By enforcing diversity, existing methods over-explore the search space.

Poster #174 @ 3pm today



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The standard UCB has bounded Bayes simple regret equivalent to Thompson sampling.

By enforcing diversity, existing methods over-explore the search space.

Standard acquisition functions perform very well, and usually better than existing methods.

Poster #174 @ 3pm today

