Next Generation Performance Optimization powered by ML

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ONE COMPANY, MANY BRANDS

Moviri consultant offers professional services providing 15 years of expertise in Performance Engineering, Security, Data Analytics, and IoT.

Performance

AKAMAS

An innovative solution based on machine learning approaches for auto-tuning. It dramatically reduces time and effort to improve in-production critical services performance and resources usage. Customers feedbacks talks about disruptive results.

Security

cleafy.com

Cleafy protects web and mobile applications from tampering attempts and deploys countermeasures to guarantee data and content integrity at scale.

Analytics

contentwise.tv

ContentWise is the leading user experience automation solution for pay TV, broadcast, OTT and streaming operators.
ContentWise helps its customers' marketing, editorial and content acquisition teams predict user intent, personalize the watching experience, optimize content performance and automate programming.

IoT

arduino.cc

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices that can sense and control objects in the physical and digital world.

What we are going to cover

1. Continuous Performance Testing
2. Continuous Performance Optimization
3. A look at the techniques powering Akamas optimizers
4. Going further: comparing with Twitter optimizers 

Traditional Performance Testing



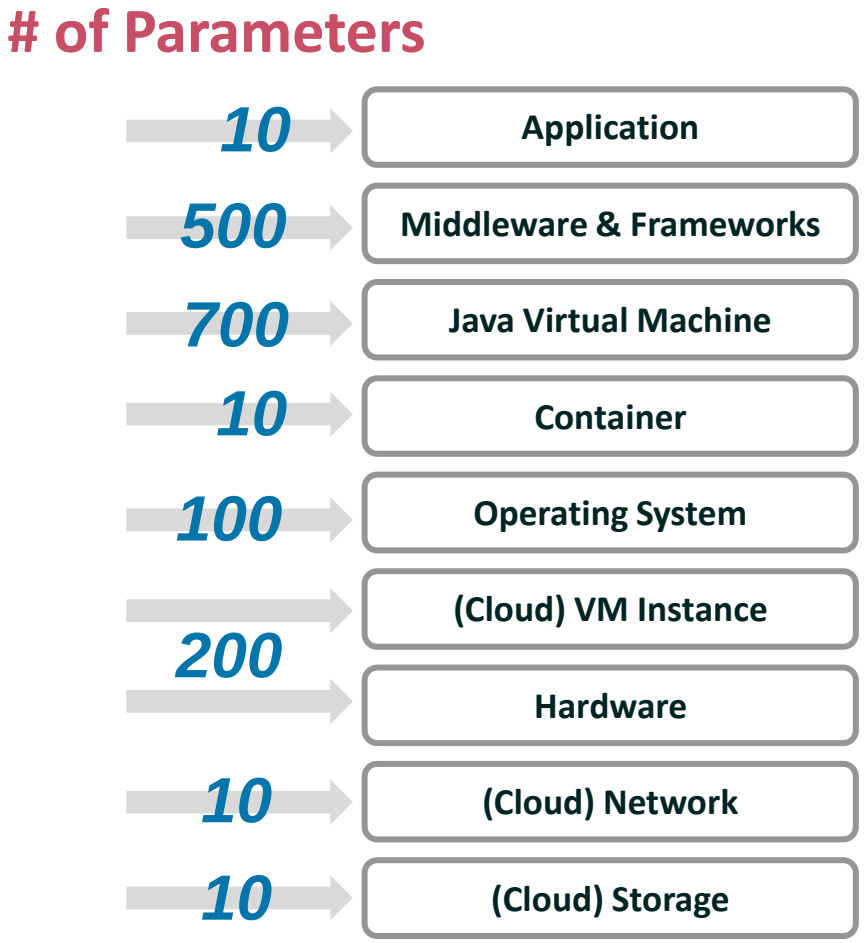




Metrics Analysis
feb 15, 2019 22:35:29 to feb 15, 2019 23:52:26
User 21
Study MongoDB and OS tuning with YCSB sync driver and workload A
Experiment All
Trial All
Component All
Metric All
Trial Start
Trial End
Window Start
Window End
Studies Summary
Study Details
Study Analysis
System
Parameters Ranking
Aggregated Metrics
65 K
60 K
55 K
50 K
45 K
40 K
35 K
30 K
25 K
20 K
120
100
80
60
40
20
0
22:40
22:45
22:50
22:55
23:00
23:05
23:10
23:15
23:20
23:25
23:30
23:35
23:40
23:45
23:50
YCSB update_Min
YCSB update_Max
YCSB update_Count
YCSB update_Avg
YCSB update_9999
YCSB update_999
YCSB update_99
YCSB update_90
YCSB read_Min
YCSB read_Max
YCSB read_Count
YCSB read_Avg
YCSB read_9999
YCSB read_999
YCSB read_99
YCSB read_90
YCSB cleanup_Min
YCSB cleanup_Max
YCSB cleanup_Count
YCSB cleanup_Avg
YCSB cleanup_9999
YCSB cleanup_999
YCSB cleanup_99
YCSB cleanup_90
YCSB Throughput
OS tcp_retrans
OS proc_blocked
OS network_out_byte_rate
OS network_in_byte_rate
OS mem_util
OS mem_fault_minor
OS mem_fault_major
OS load_avg
OS disk_iops_writes
OS disk_iops_reads
OS cpu_util

Akamas
Machine Learning for IT Optimization

Hyper-configuration beyond Human scale

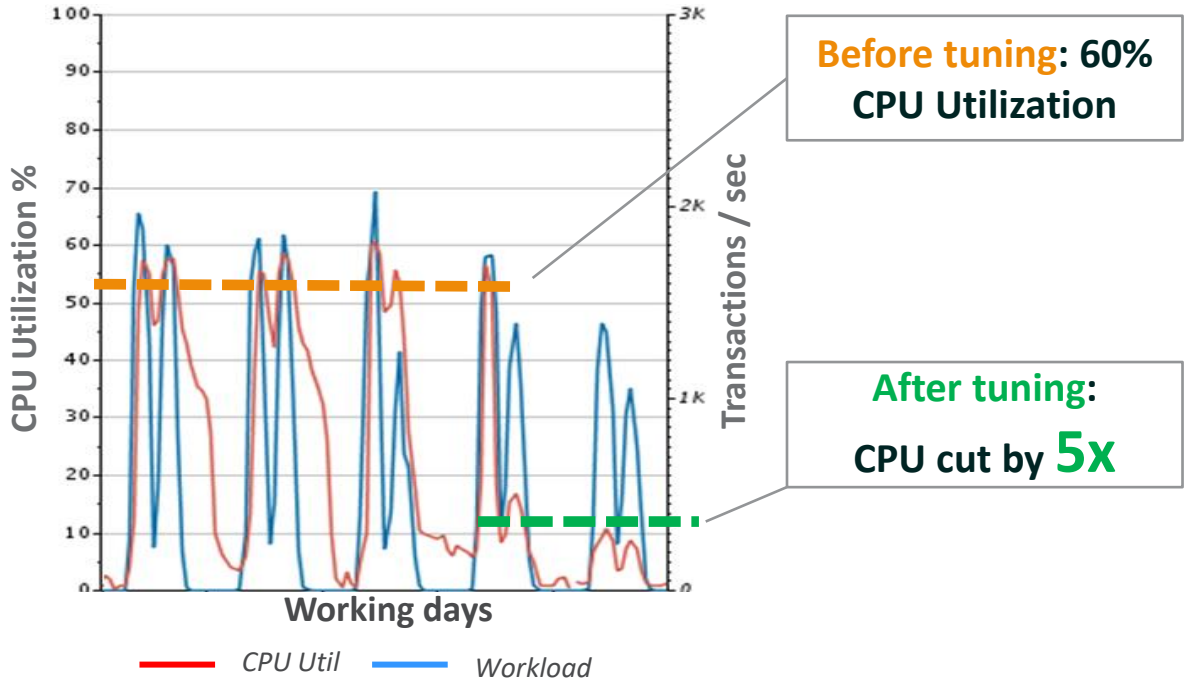


Looking for the optimal settings? It's easy, just try

$$2^{100} =$$

121,267,650,600,228,229,401,496,703,205,376 configurations…

Configurations significantly impact performance and costs



Source: Moviri Computer Measurement Group Best Paper, Texas, 2015

TODAY'S PERFORMANCE TUNING?

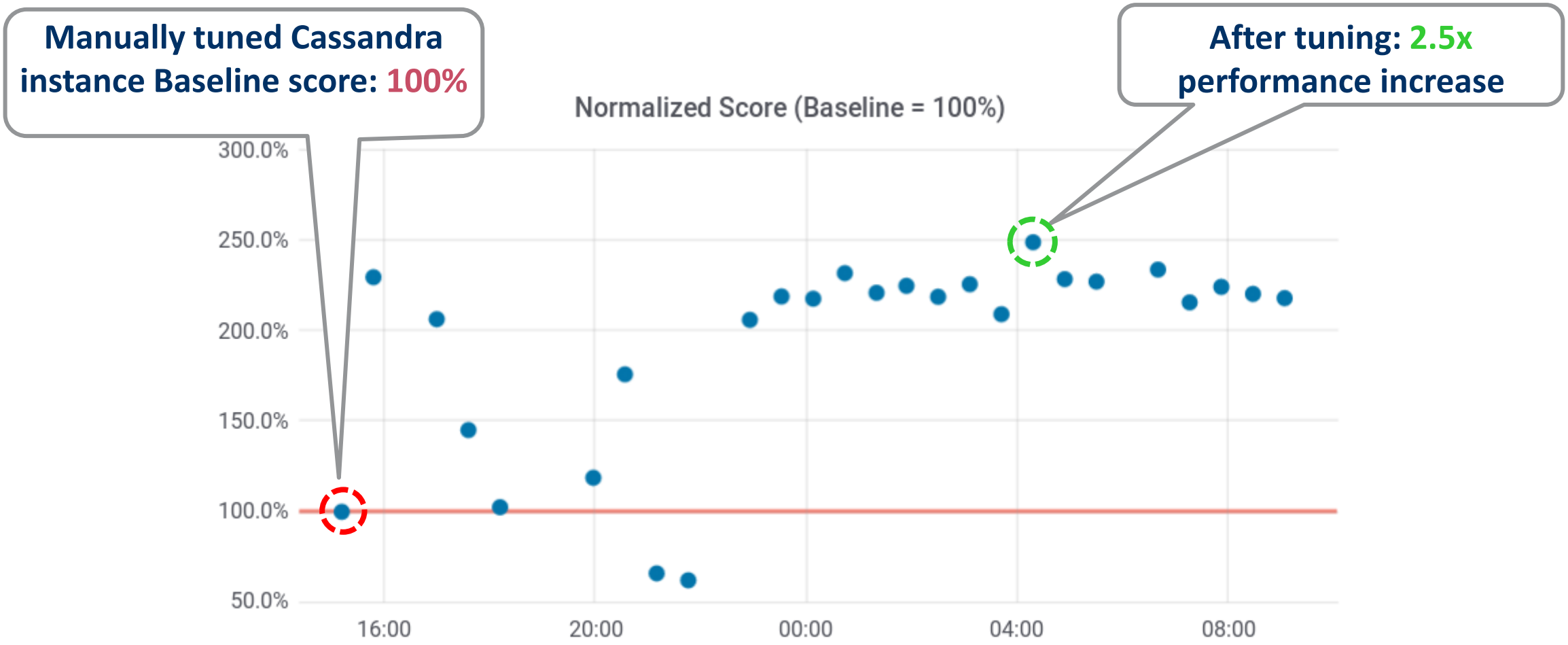
FLYING AN AIRPLANE IN THE LAST CENTURY

PERFORMANCE TUNING DONE RIGHT?

BEING TAKEN TO DESTINATION BY A SELF-DRIVING VEHICLE

What can Akamas achieve?
A look at the Results

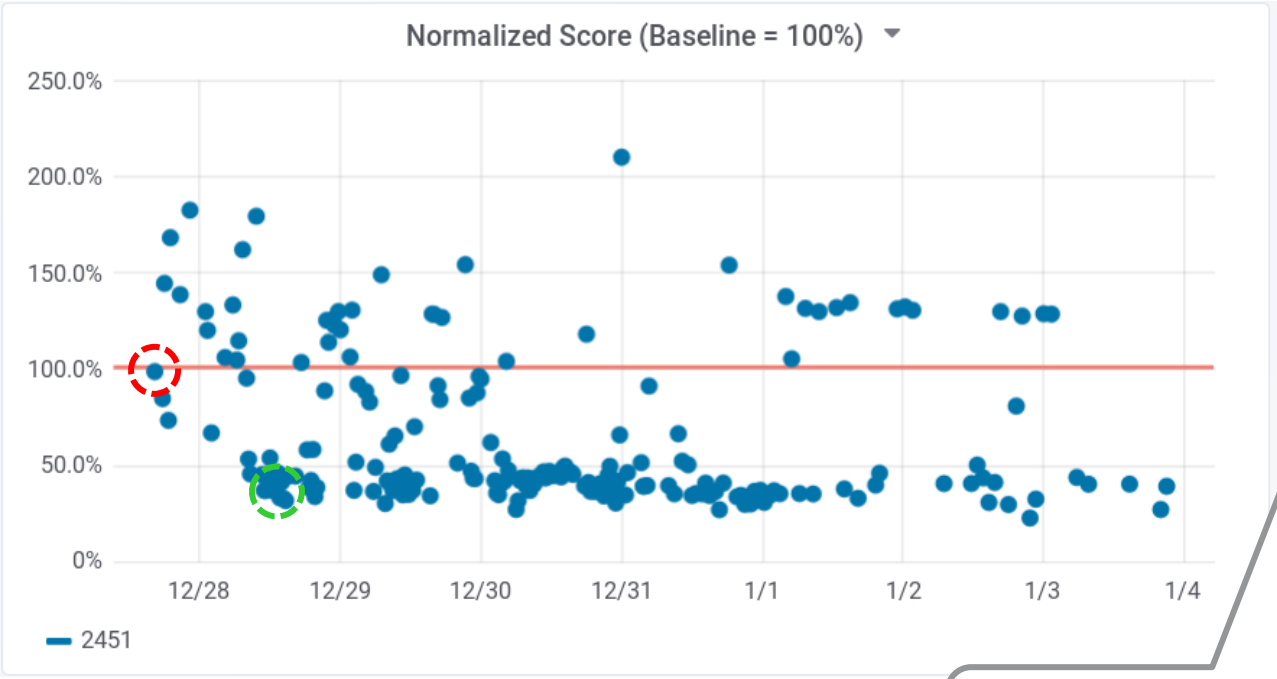
Example: Automatically Optimizing a Cassandra Database

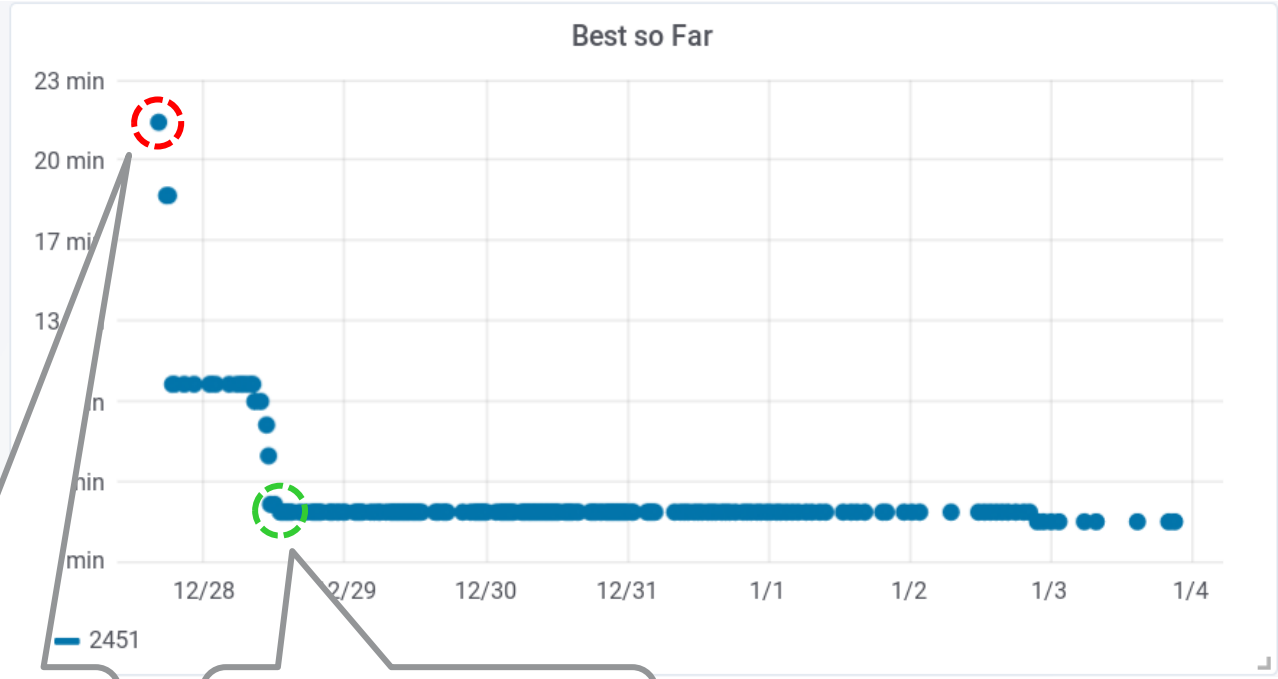


Reduce batch job execution time via Spark tuning

-75%

in 27 hours!



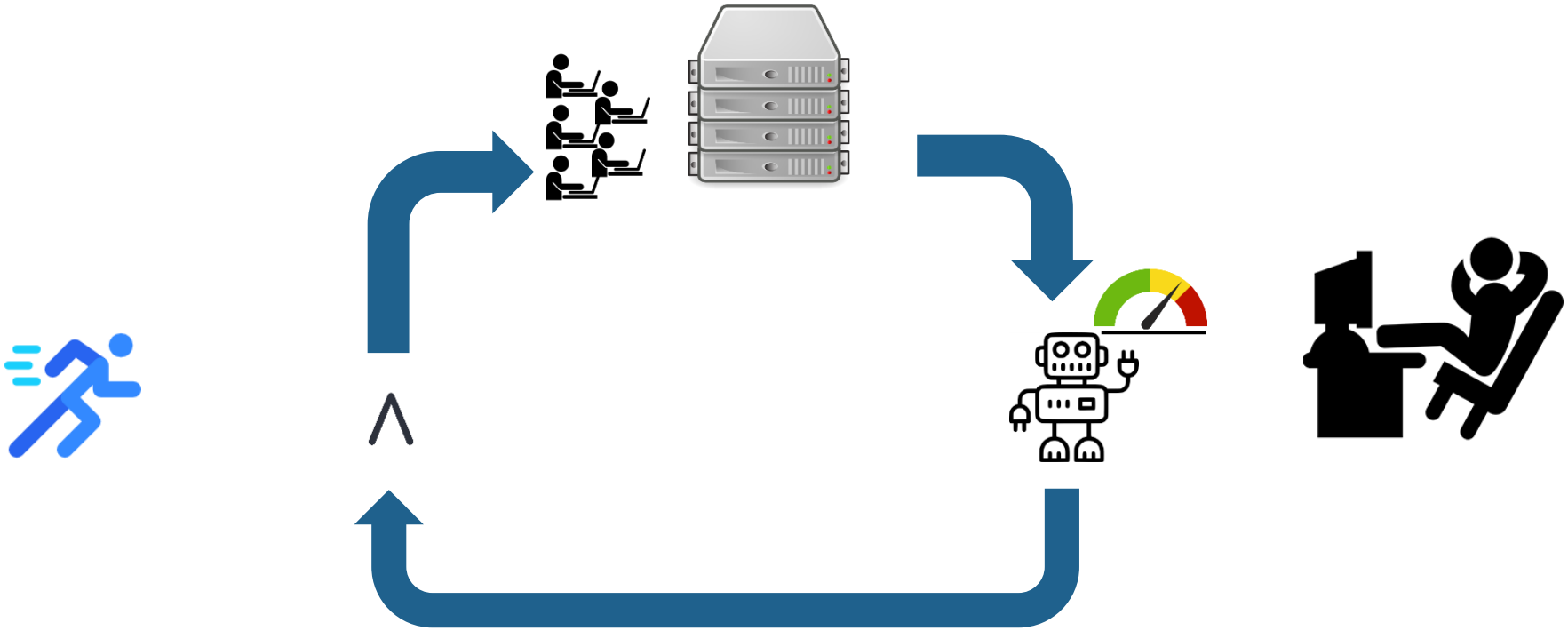


Baseline: 22 minutes

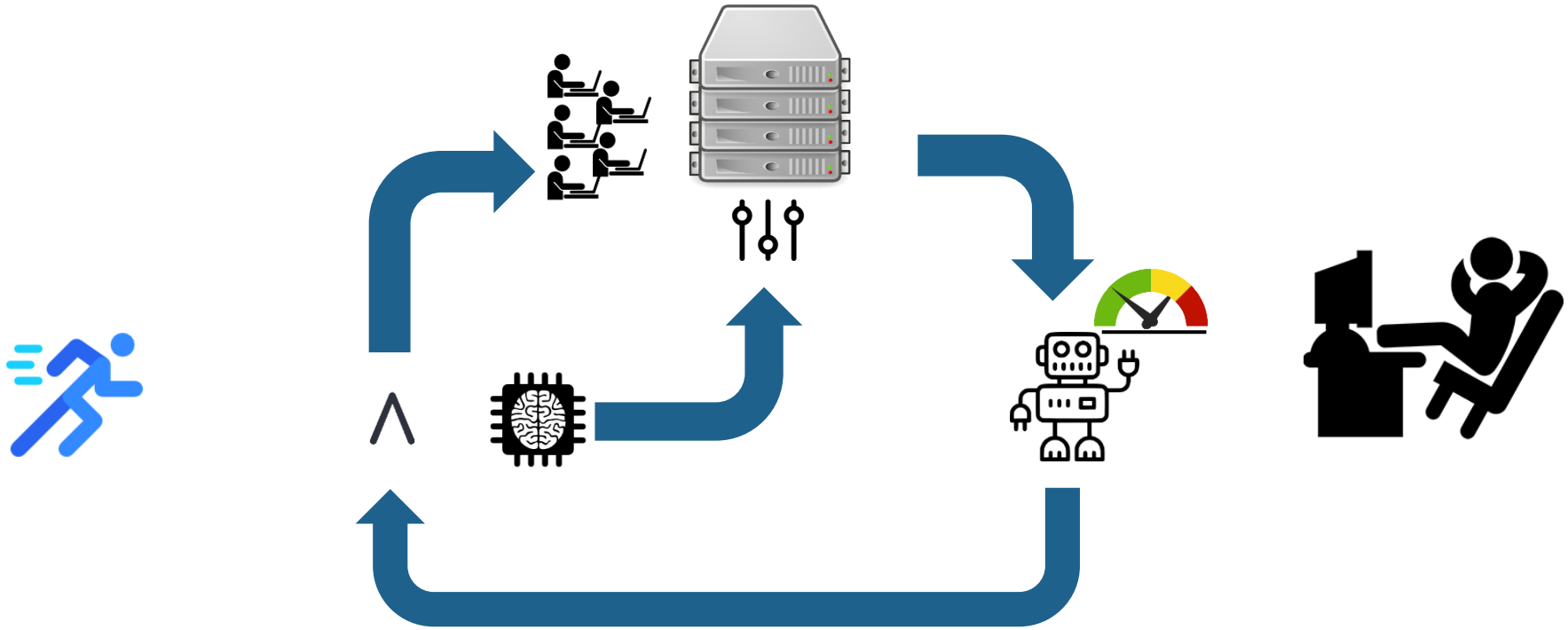
After tuning: 5,4 minutes

What’s Akamas secret sauce?
A peek under the hood

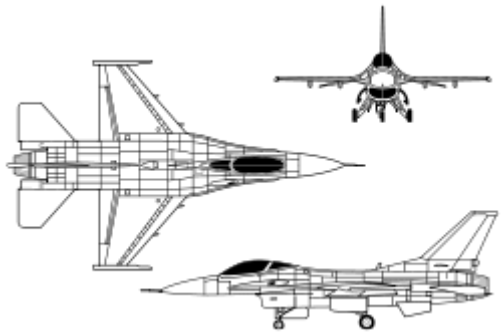
Continuous Performance Testing



Continuous Performance ~~Testing~~ Optimization



State of the Art: ML techniques applied to the problem



Model Based

Queuing Networks

Petri Networks

Linear Programming

Simulation Based

Random Forests

Statistical Machine Learning

Test Based

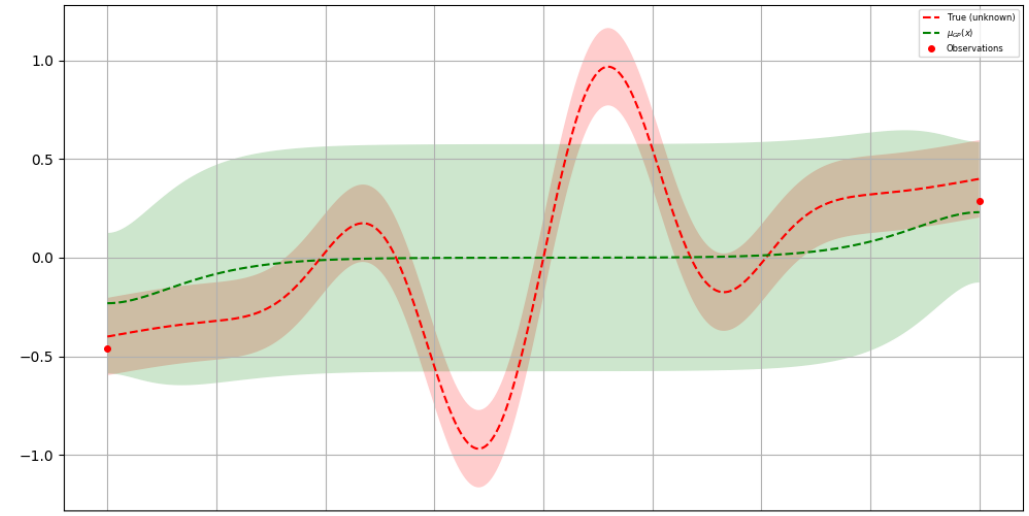
Random Search

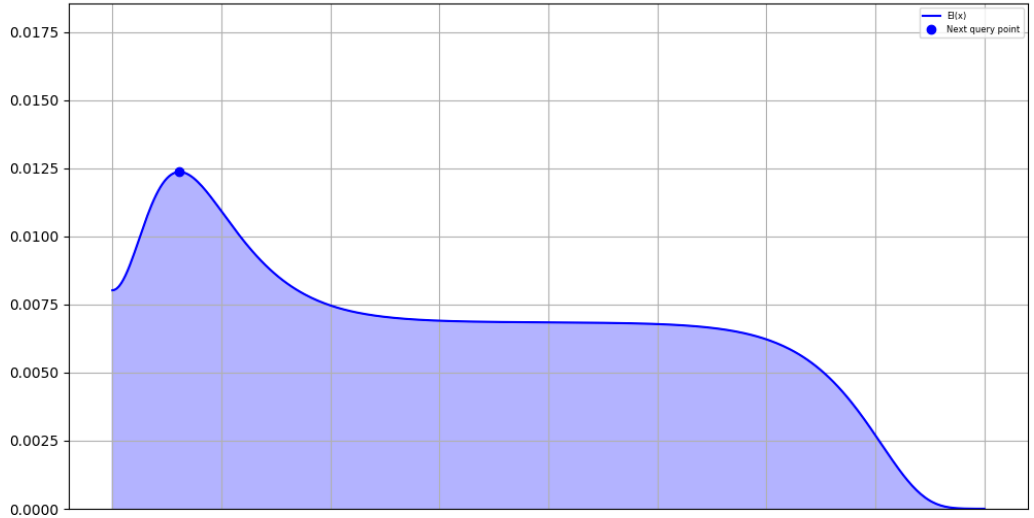
Reinforcement Learning

Bayesian Optimization

Parzen Trees

Bayesian Optimization in a nutshell

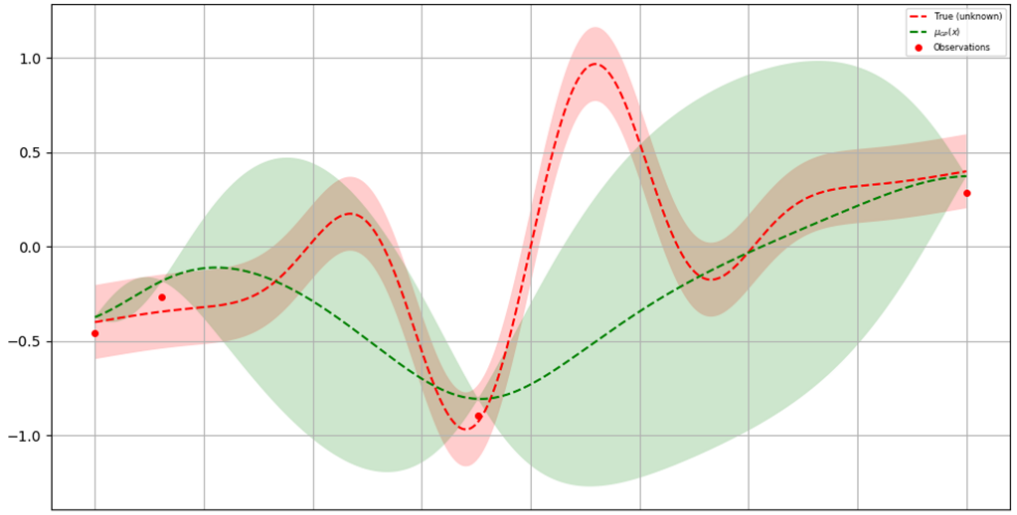


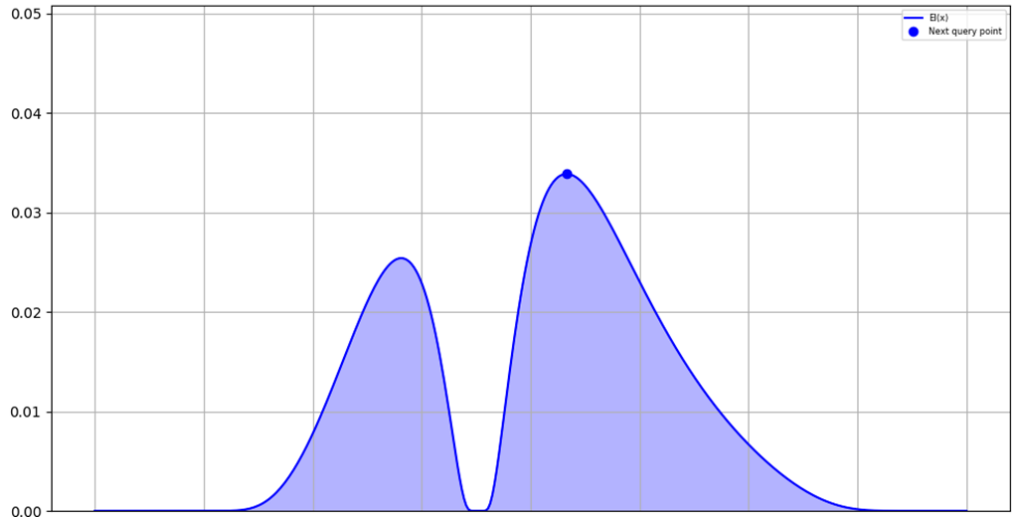


Tested configurations: 2

Best so far: -0.46

Bayesian Optimization in a nutshell

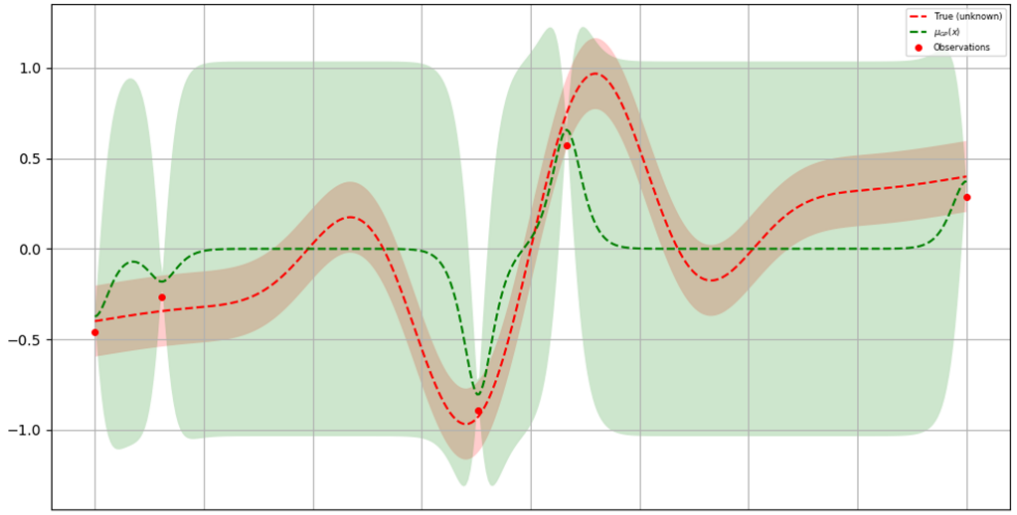


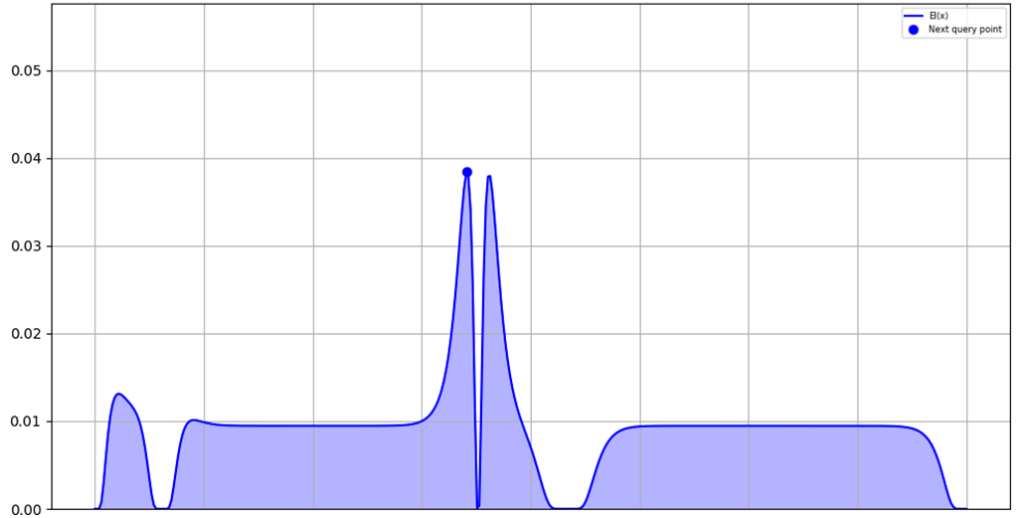


Tested configurations: 4

Best so far: -0.89

Bayesian Optimization in a nutshell

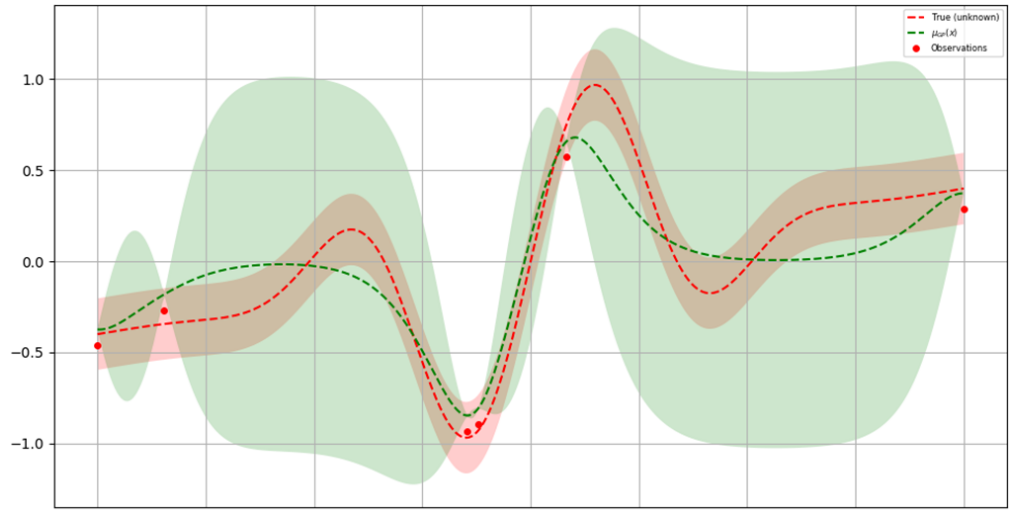


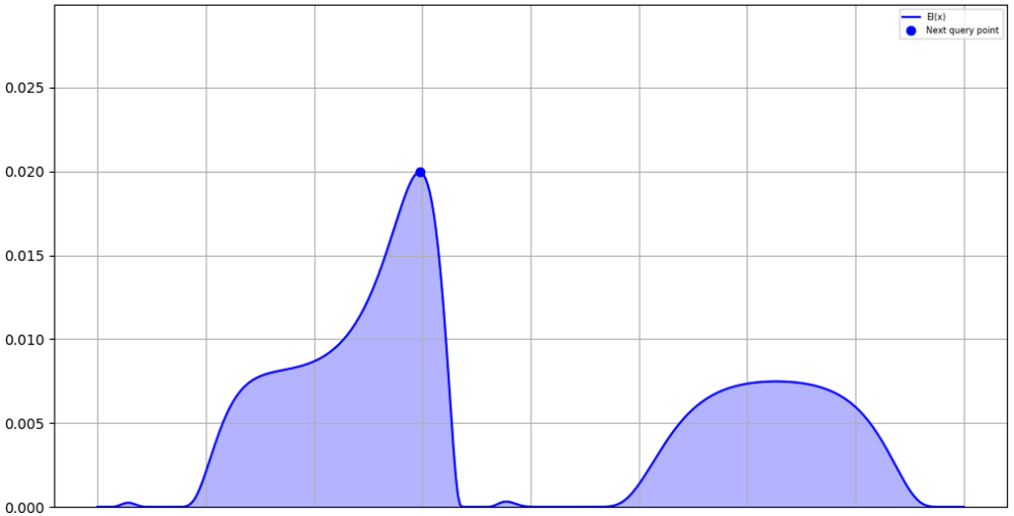


Tested configurations: 5

Best so far: -0.89

Bayesian Optimization in a nutshell

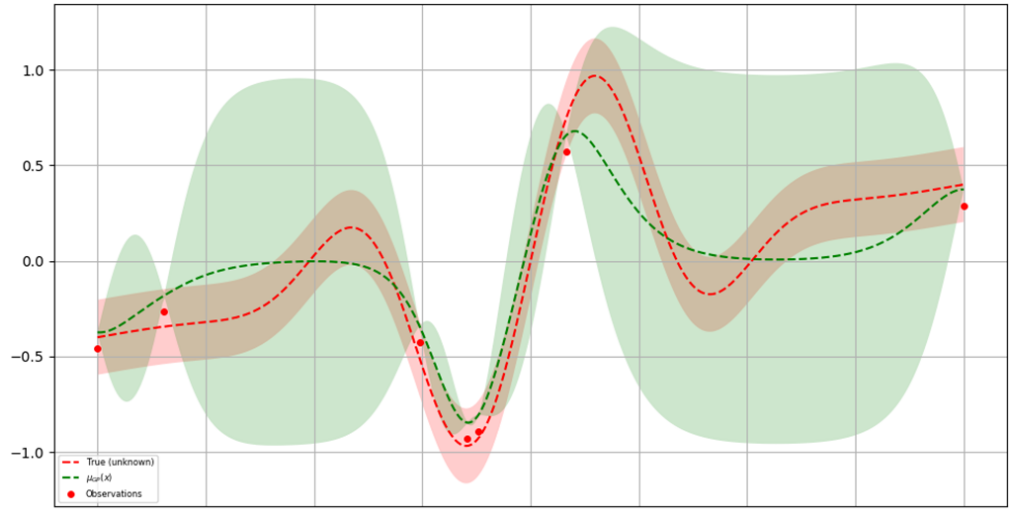


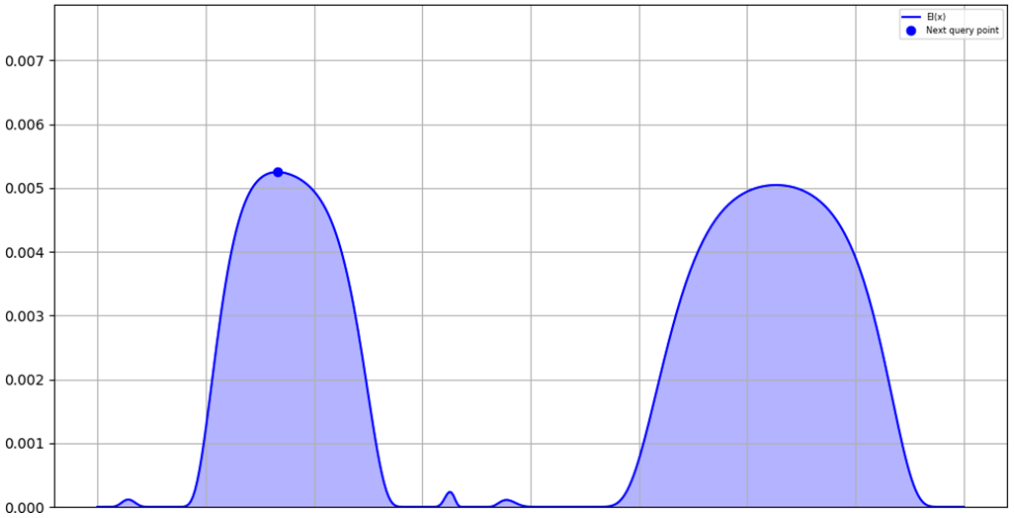


Tested configurations: 6

Best so far: -0.93

Bayesian Optimization in a nutshell

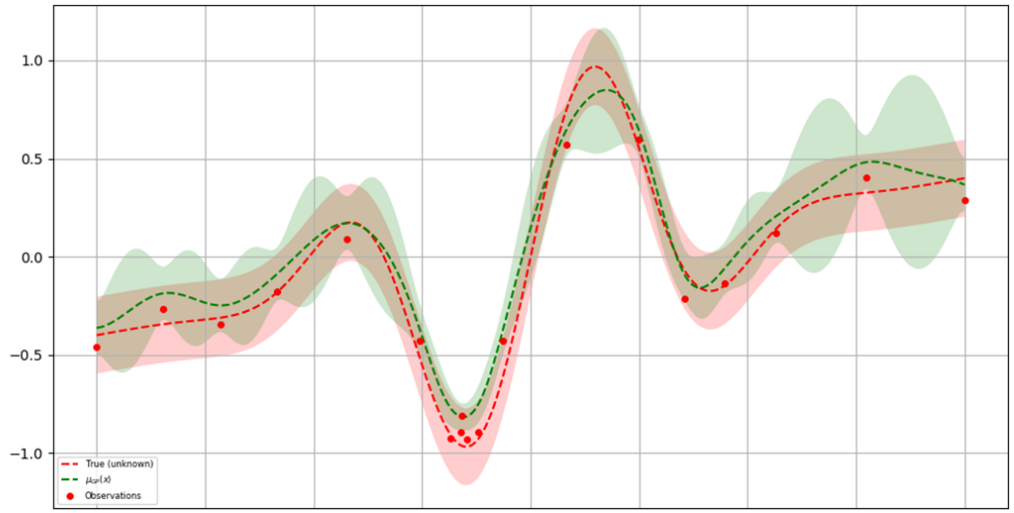


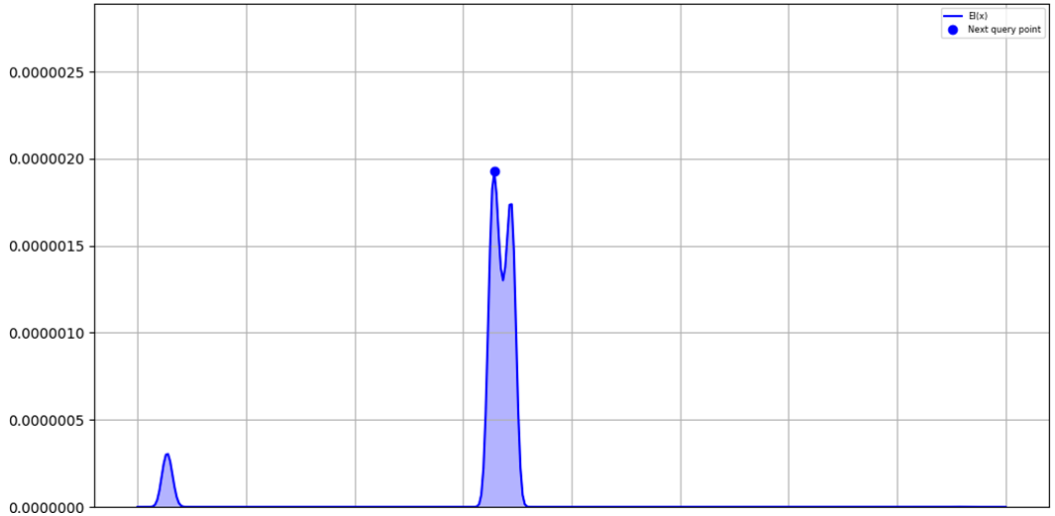


Tested configurations: 7

Best so far: -0.93

Bayesian Optimization in a nutshell

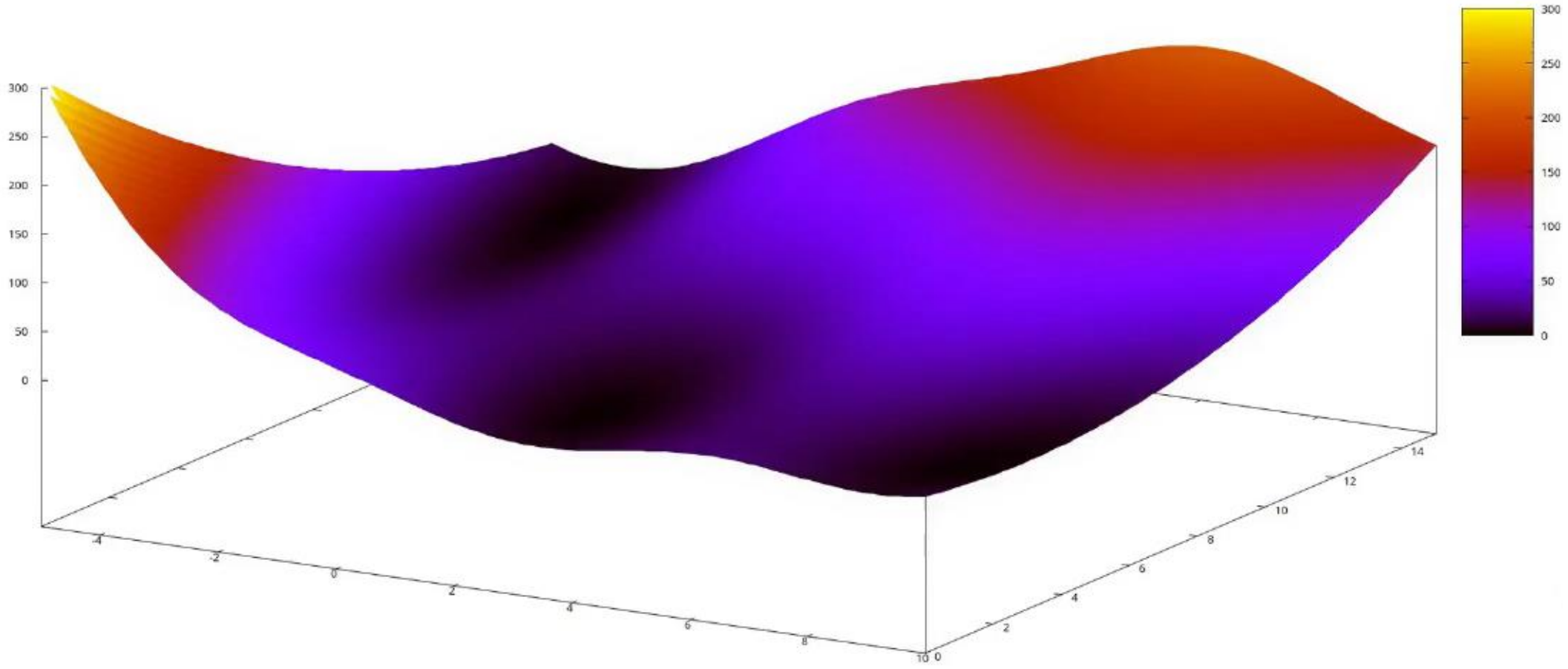




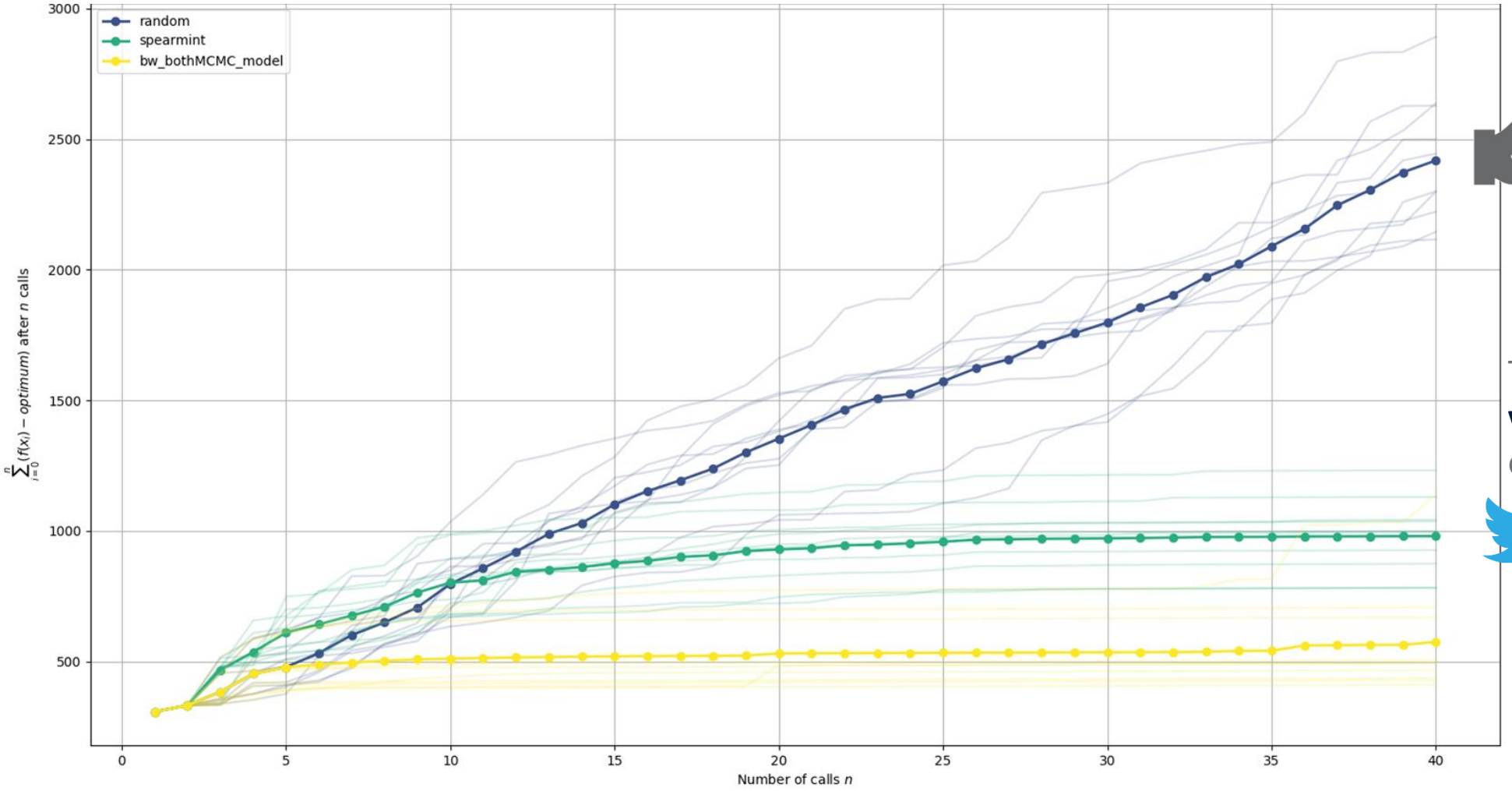
Tested configurations: 19

Best so far: -0.93

Bayesian Optimization in action



Research: Comparing with State of the Art



Regret

Takes into account the **best value** found and the **"cost"** of bad decisions

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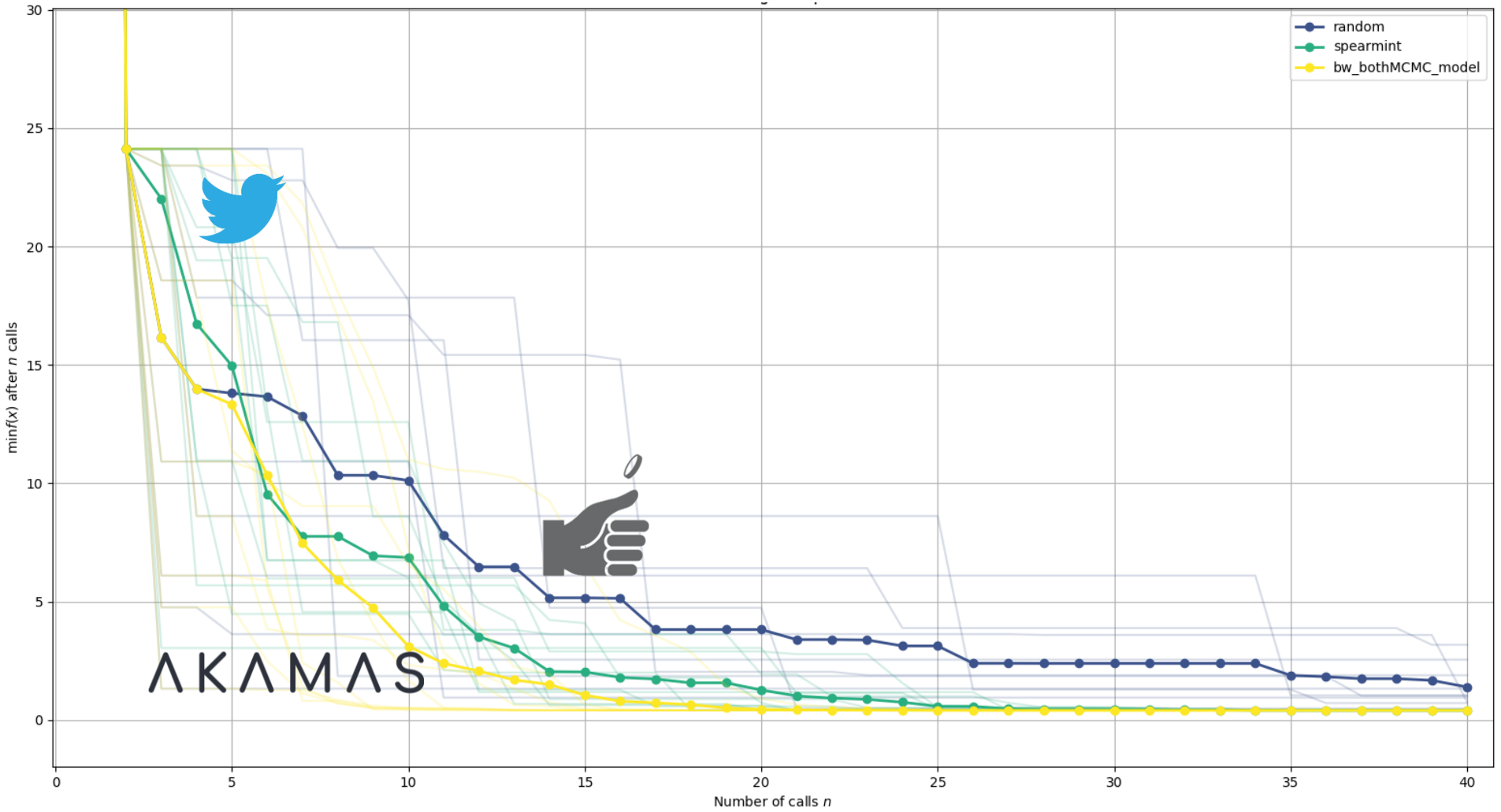
Research: Comparing with State of the Art

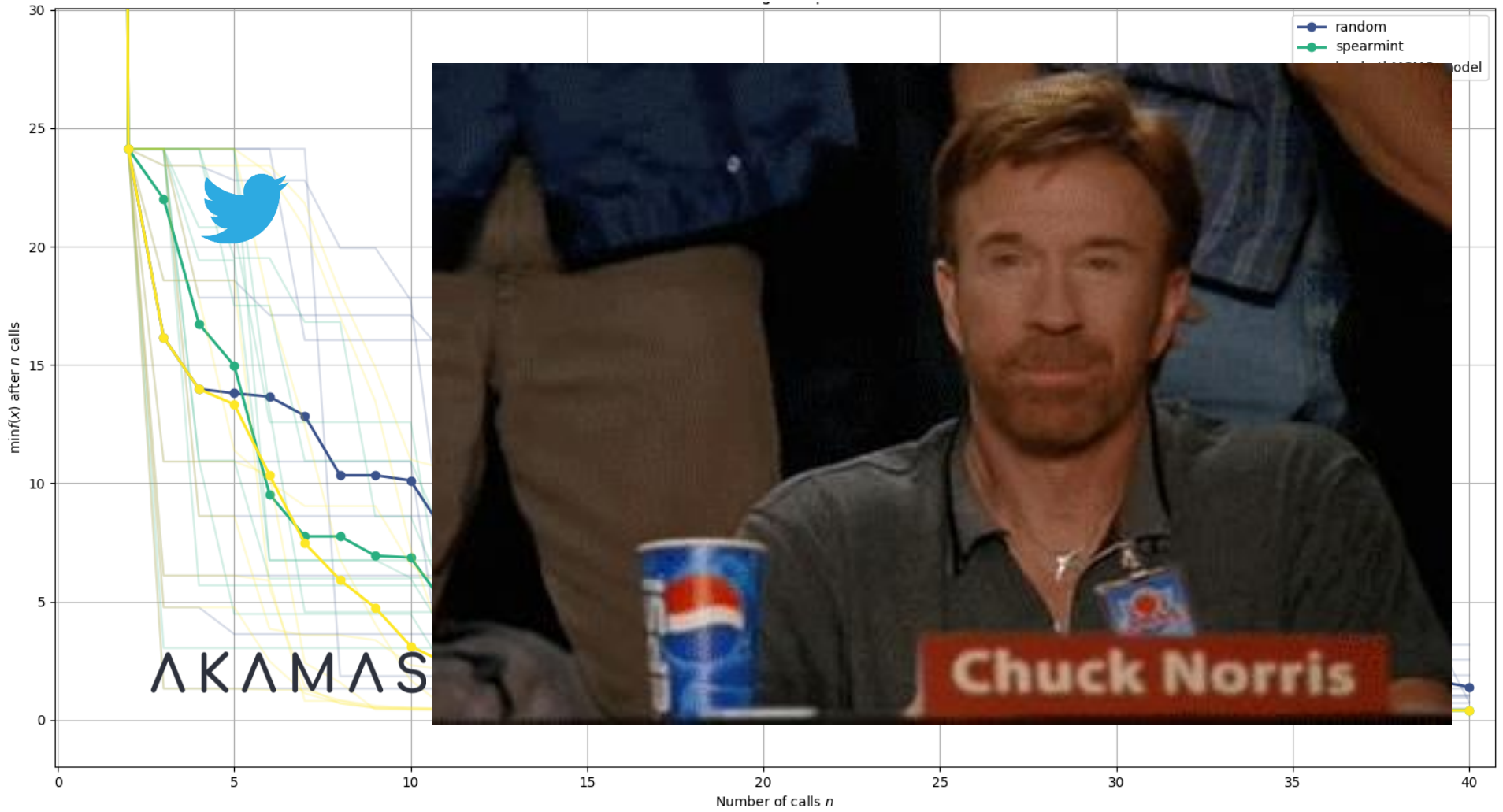


Regret ✓

AUC ✓

Takes into account the **best value** found and the **time it took** to get there

Research: Comparing with State of the Art



Regret ✓

AUC ✓

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2. Apply and advance state of the art
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4. Drink beer on fridays…

Thinking about your master thesis? Let's talk!

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stefano.doni@akamas.io

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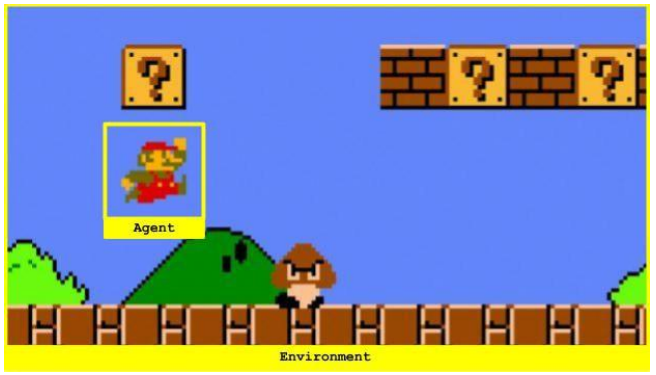
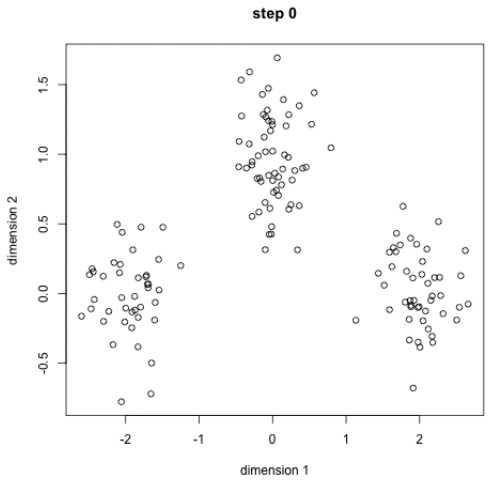
Past Thesis

1. Automatic Online Performance Optimization via Reinforcement Learning

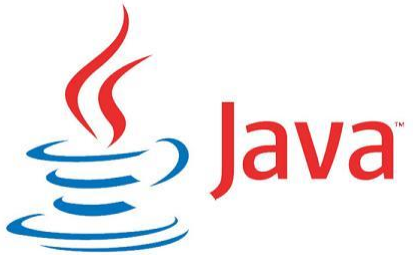


2. Workload characterization for application performance prediction

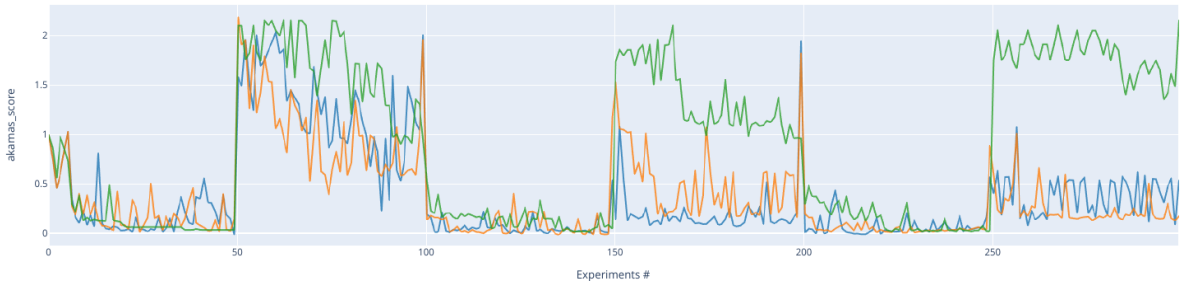


Ongoing Thesis

1. Java optimizations with Tree-Structured Configuration Spaces



2. Online optimization via workload identification



Available Thesis (examples)

1. Surrogate Applications for Performance Optimization
2. Constraints embedding
3. Transfer Learning
4. Embedding strategies for online performance optimization