



# Kruize Hyperparameter Optimization

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Chandrakala Subramanyam  
Saad Khan

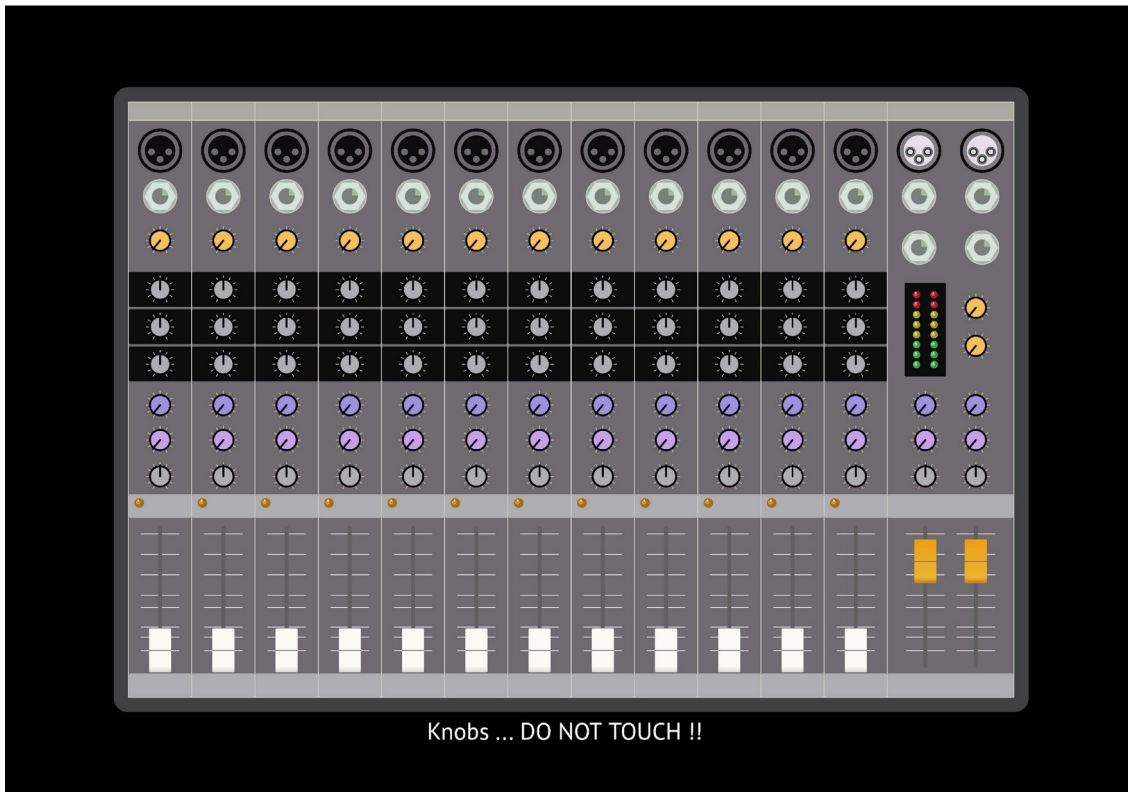
@chandra25ms  
@mercurialsaad

# Agenda

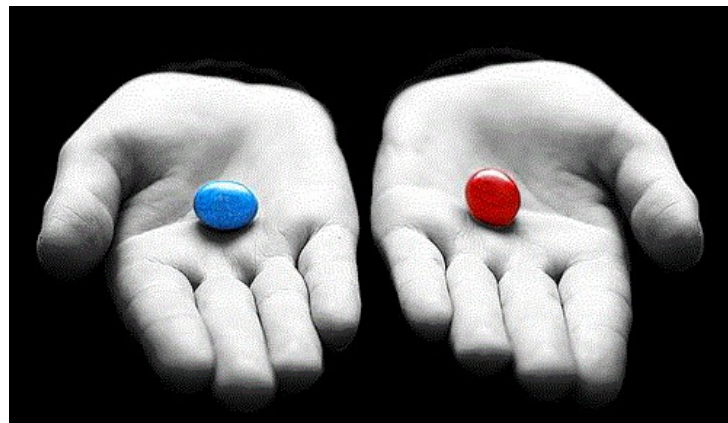
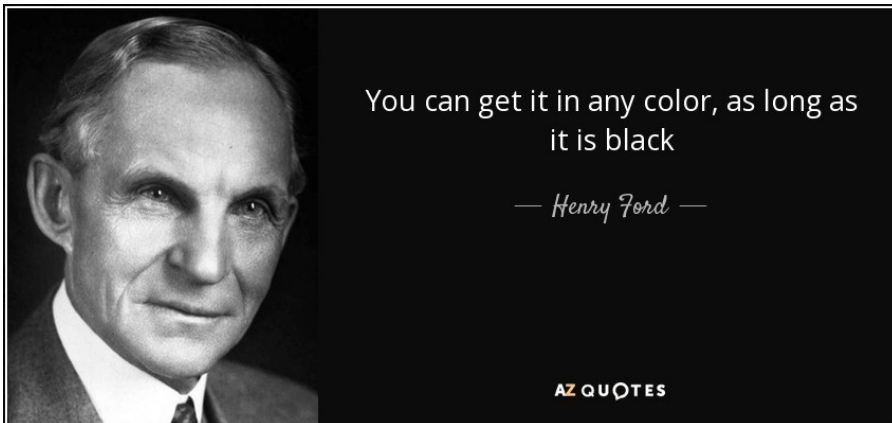
- Challenges / Motivation
- Introduction to Bayesian Optimization / HPO
- Kruize HPO architecture
- HPO Demo
- Experiment results

# Optimize App Stack - Challenges

SRE



# Choices Are Never This Simple!



# Fix the Hyperparameters First!

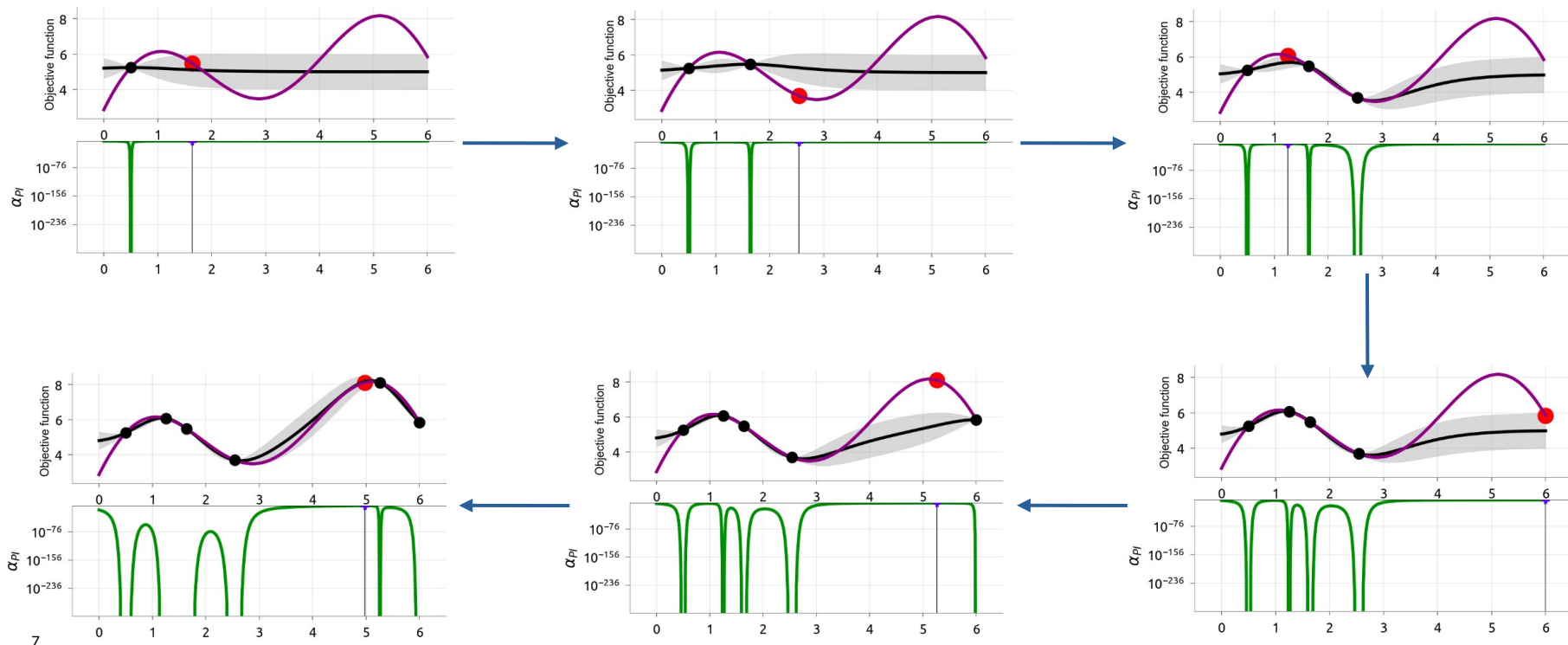
## Examples of Hyperparameters

- Building an ML Model
  - Model architecture
  - Learning rate
  - Number of epochs
  - Number of branches in a decision tree
  - Number of clusters in a clustering algorithm
- Performance Optimization
  - Tunables

# Fixing Hyperparameters - Options

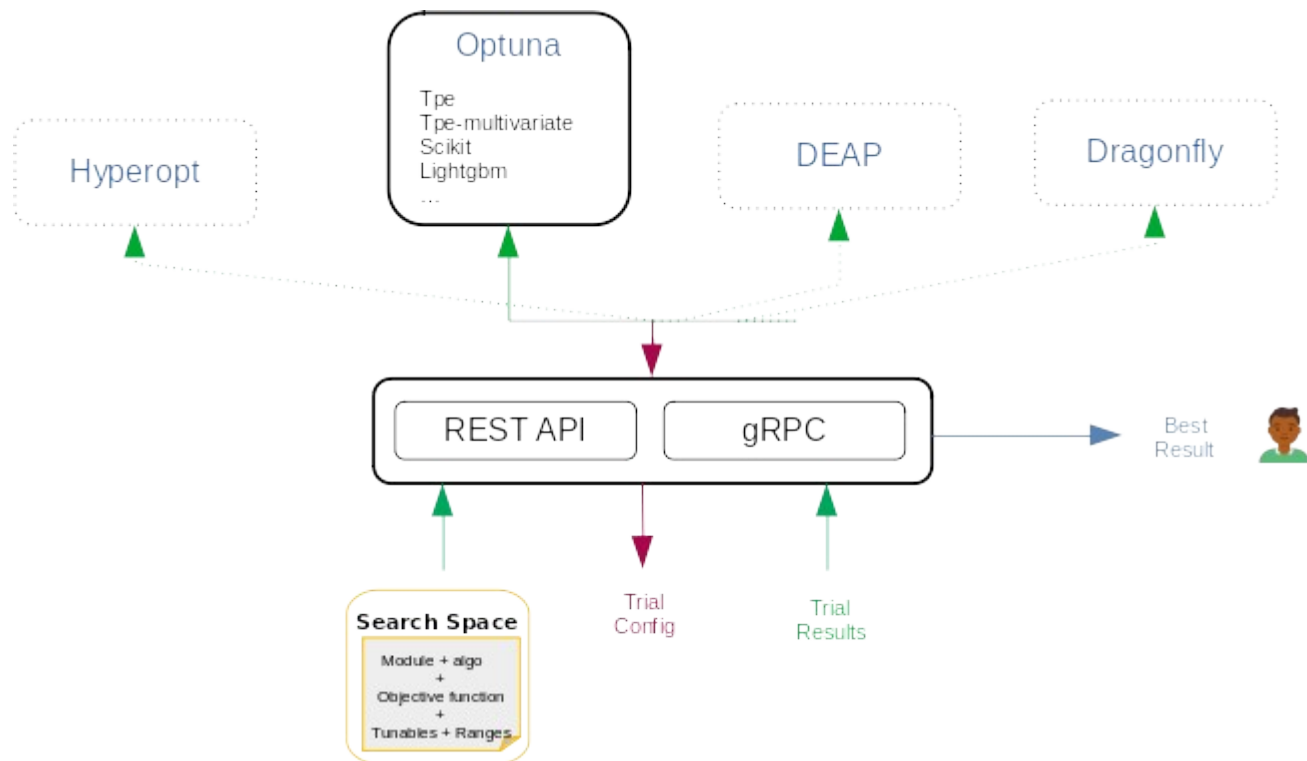
- Manual Search
- Random Search
- Grid Search
- Automated Hyperparameter Tuning - Bayesian Optimization
- ...

# Bayesian Optimization



Ref: <https://distill.pub/2020/bayesian-optimization/>

# Kruise HPO Architecture





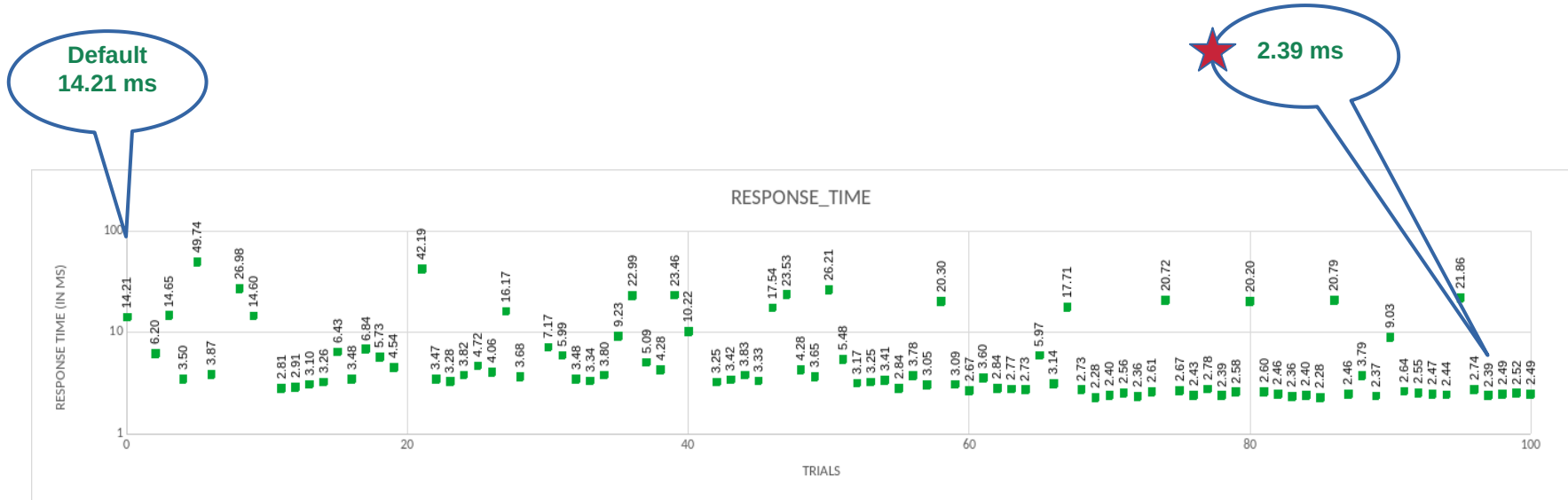
# HPO Demo

Be  
careful  
what you  
wish for !



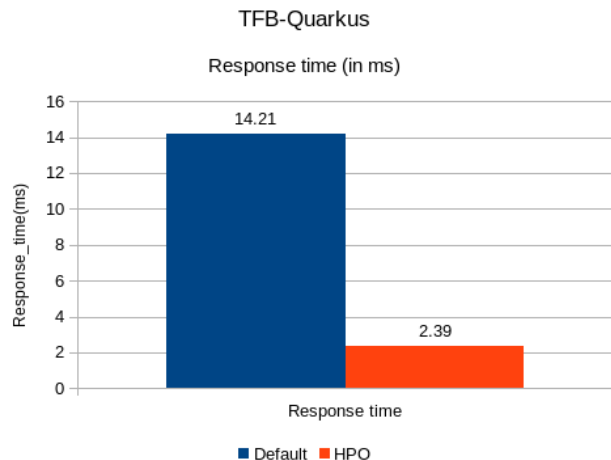
# Kruise HPO vs Default Config

[Obj Fn = maximize(1.25\*Throughput / 1.5\*Response\_time / 0.25\*Max\_response\_time),  
Fixed Resources]

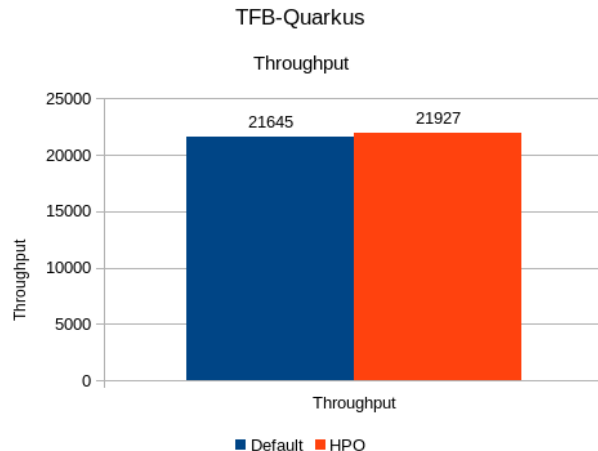


# Kruise HPO vs Default Config

[Obj Fn = maximize( $1.25 * \text{Throughput} / 1.5 * \text{Response\_time} / 0.25 * \text{Max\_Response\_Time}$ ),  
Fixed Resources]



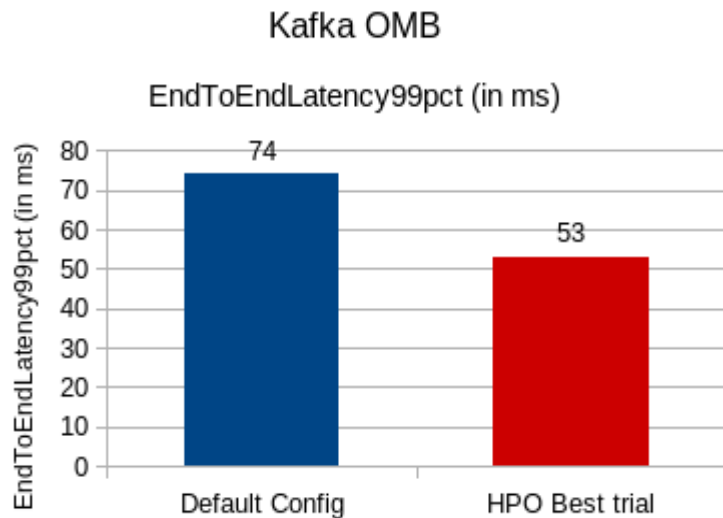
83% better response time



1.3% better throughput

# Kruise HPO - Kafka results

- **Kafka problem definition:** For a given throughput (**50MBs**) determine the optimal value for the kafka parameters ('**batch\_size**', '**linger\_ms**', '**fetch\_min\_bytes**', '**partitions**') that would give the lowest latency.
- **Objective Function:** minimize *aggregatedEndToEndLatency99pct*
- **Results:** 28% reduction in latency



# Interested in HPO?



Kruize Slack

- HPO - <https://github.com/kruize/hpo>
- Kruize Demos - <https://github.com/kruize/kruize-demos>

## Call for collaboration !

kruize@redhat.com

# Thank you!

## Questions?

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