



SES202

Let's tune!

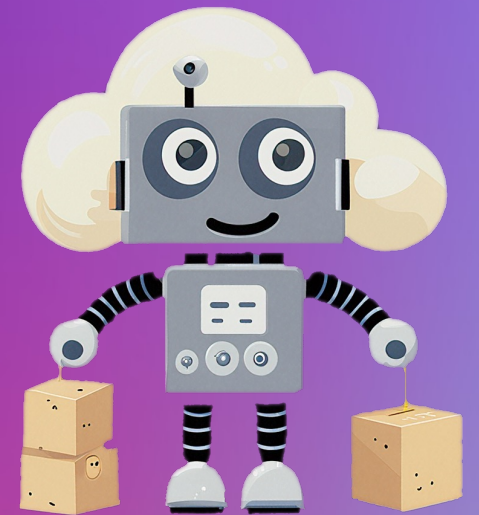
Hyperparameter optimization with Amazon SageMaker

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Agenda

- What is hyperparameter optimization and who needs it?
- What are the challenges with hyperparameters?
- How can I find the optimal values?
- How can I tune my ML models with Amazon SageMaker?
- Demo
- Q&A

What is hyperparameter tuning?

Decision trees

Tree depth
Max leaf nodes
Gamma
Eta
Lambda
Alpha
...

Neural networks

Number of layers
Hidden layer width
Learning rate
Embedding dimensions
Dropout
...

Arbitrary task

(data prep,
download,
inference...)

Parameter 1
Parameter 2
...

Hyperparameters

Challenges with hyperparameters

Search through
multidimensional
space

Find the right
procedure

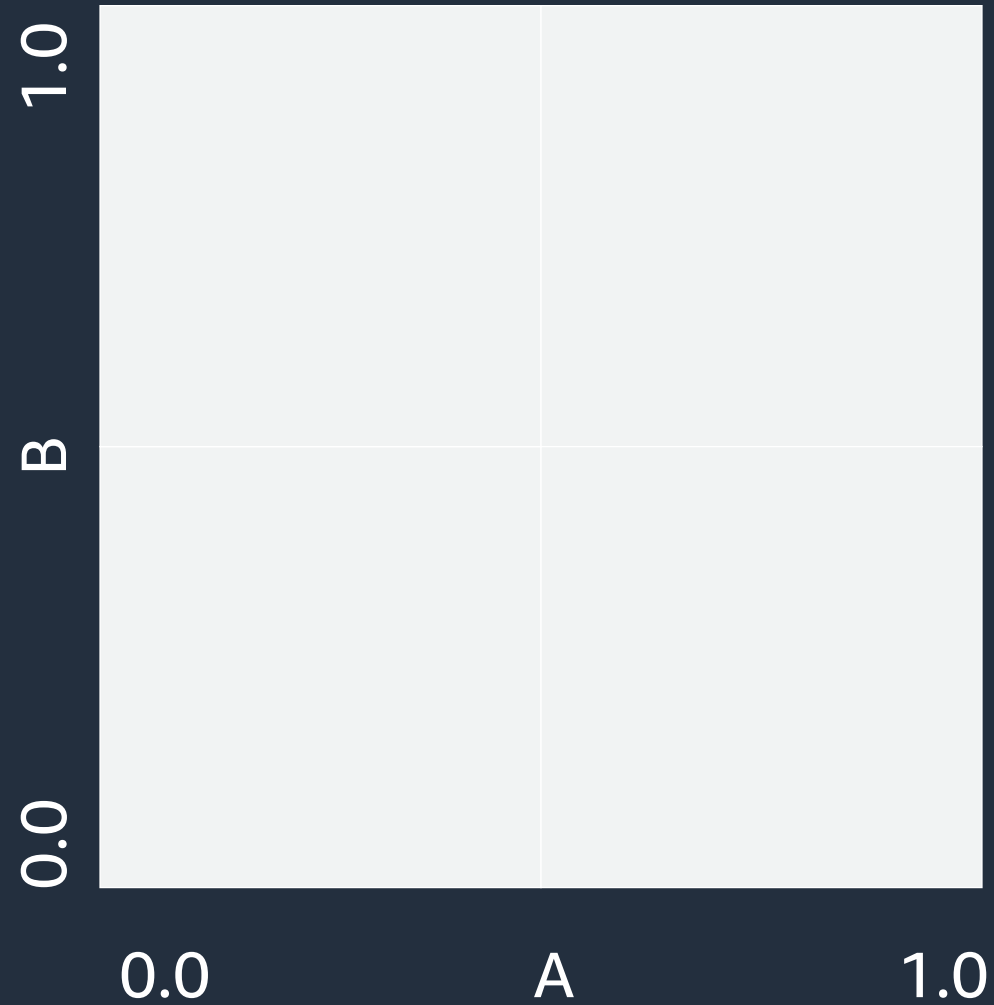
Manage the
underlying
hardware



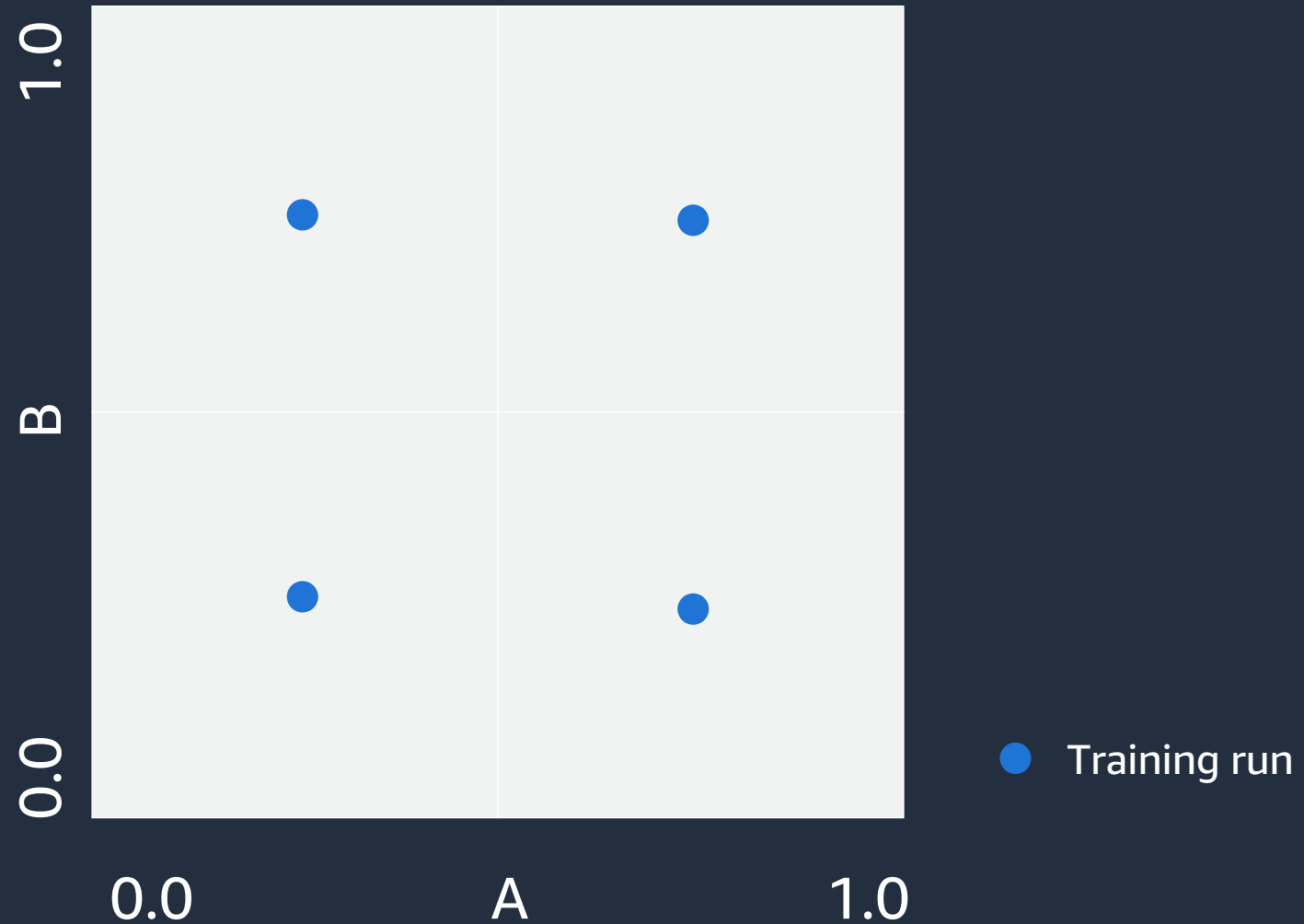
Monitor the
process and
results

Understand the
impact on your
model

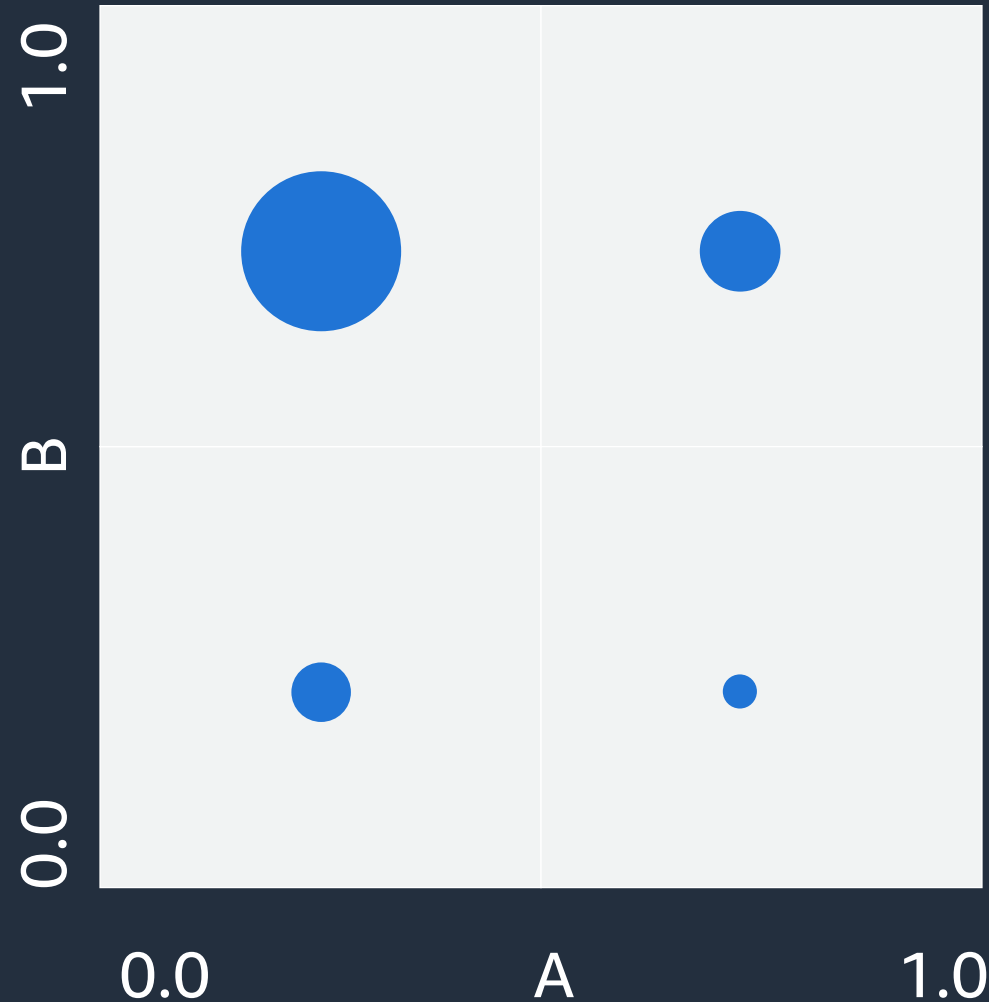
Optimal Hyperparameters?



HPO Strategy - Grid Search



HPO Strategy - Grid Search

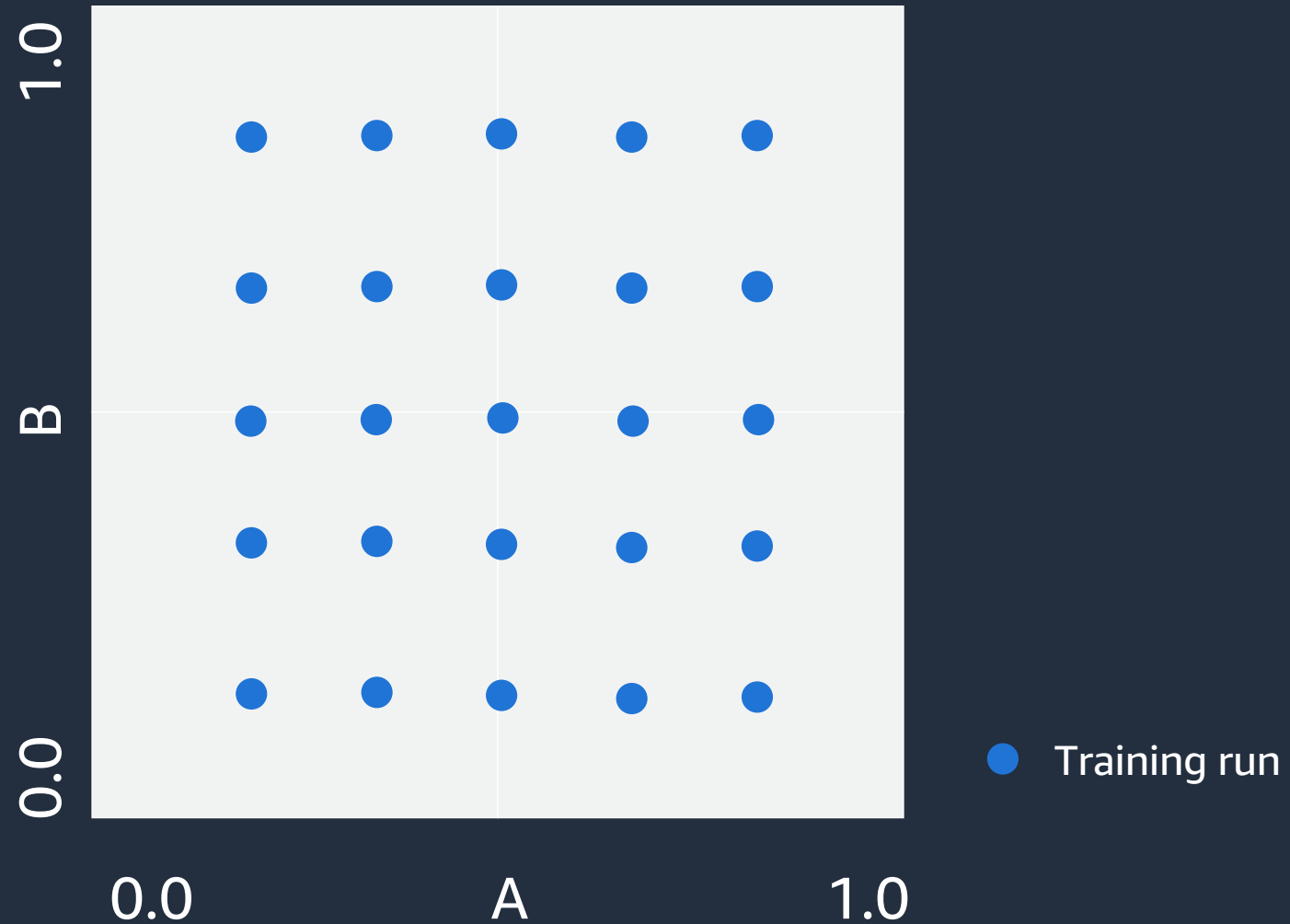


Loss function: measures how well your model predicts the expected outcome (the lower, the better)

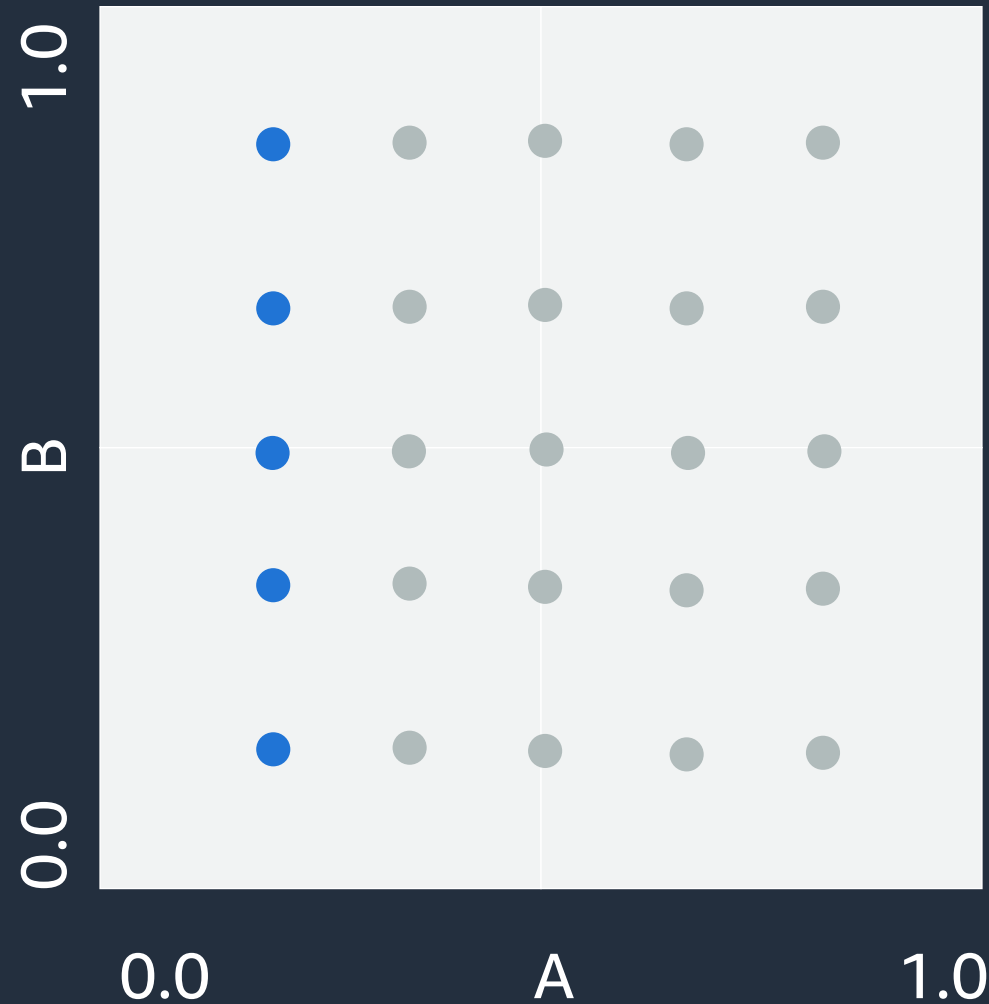
Example: validation error

● Training run
(Diameter = Loss)

HPO Strategy - Grid Search

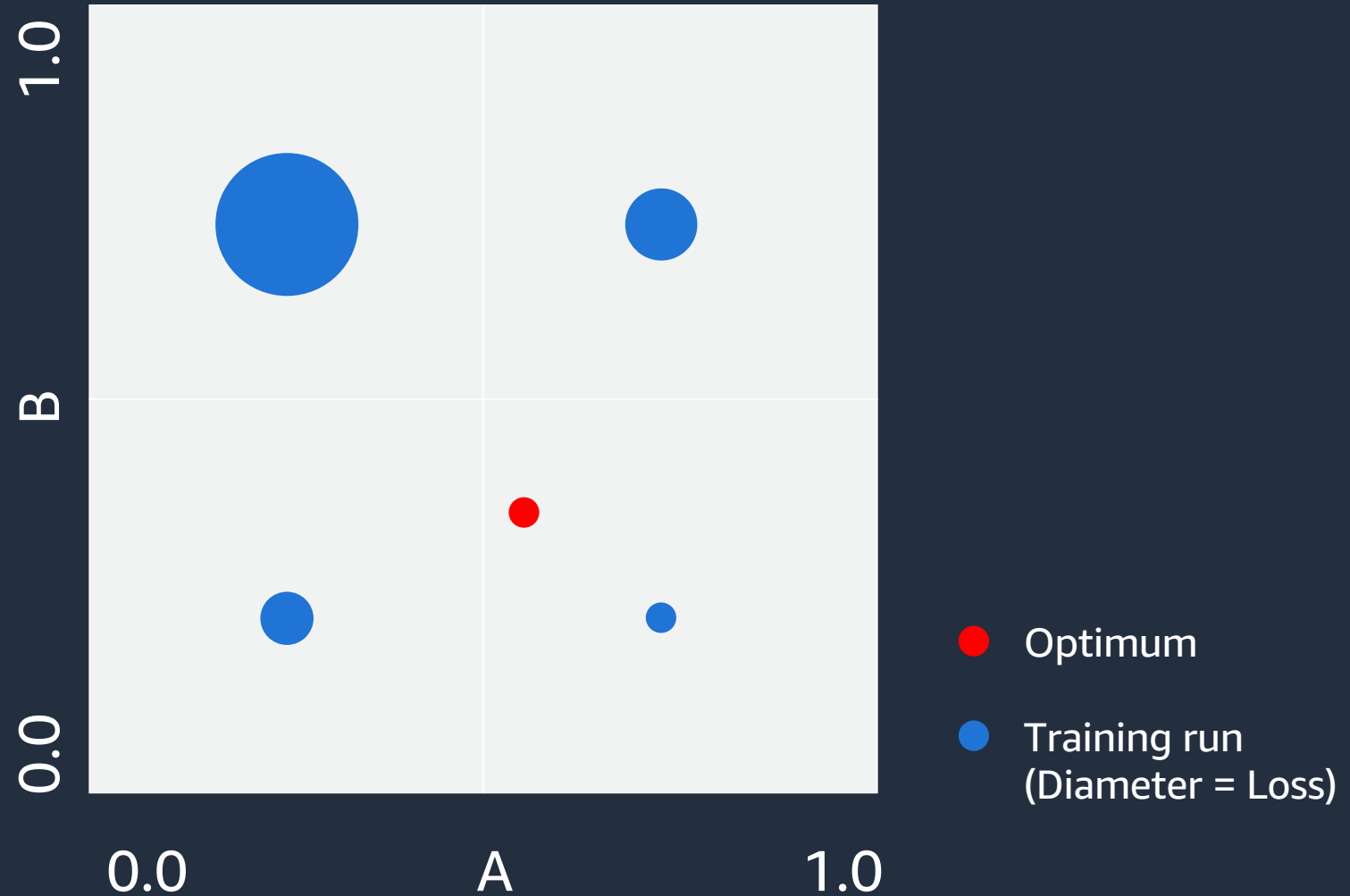


HPO Strategy - Grid Search

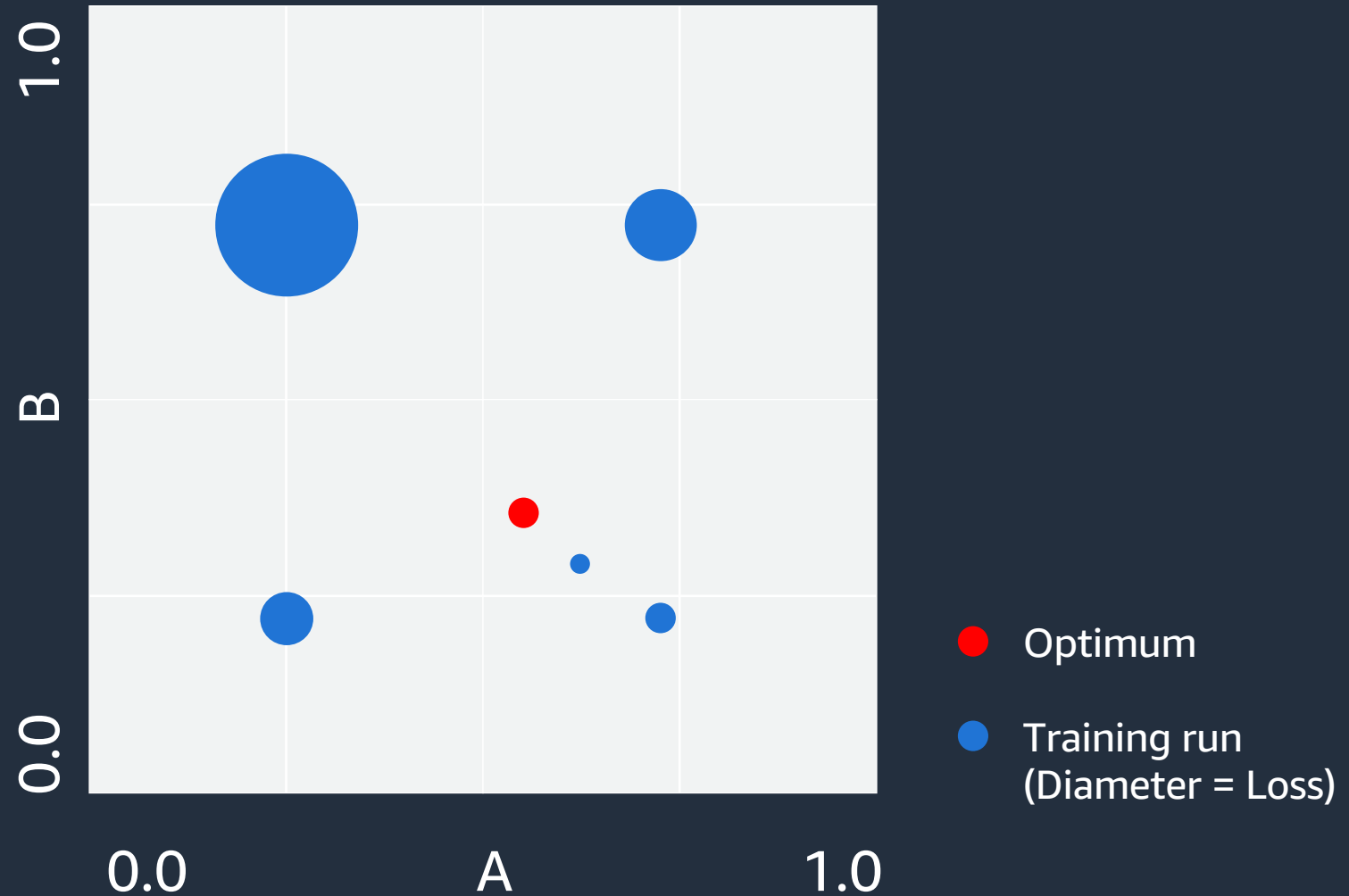


- Training run
- Training run (no additional knowledge)

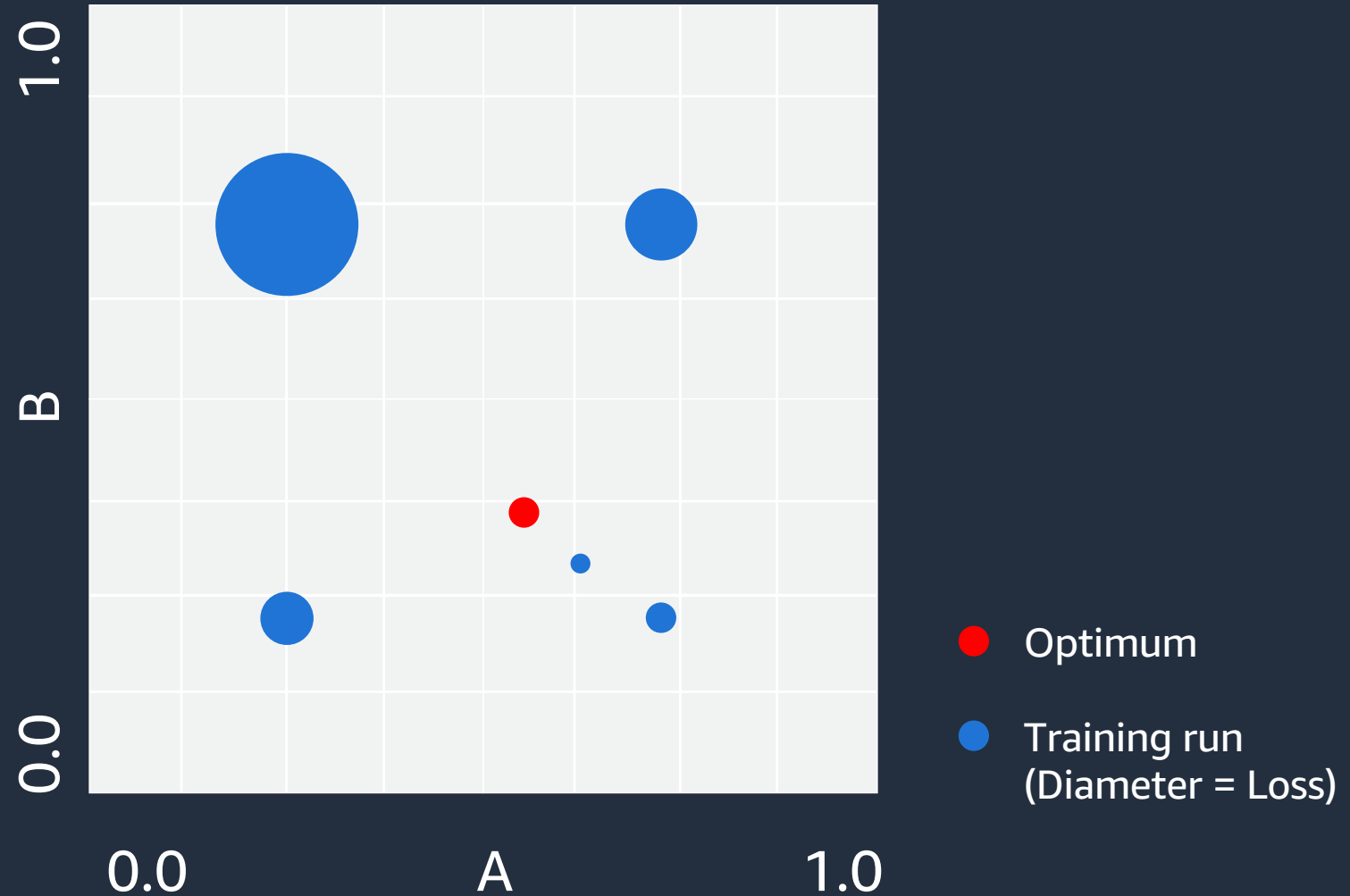
HPO Strategy - Grid Search

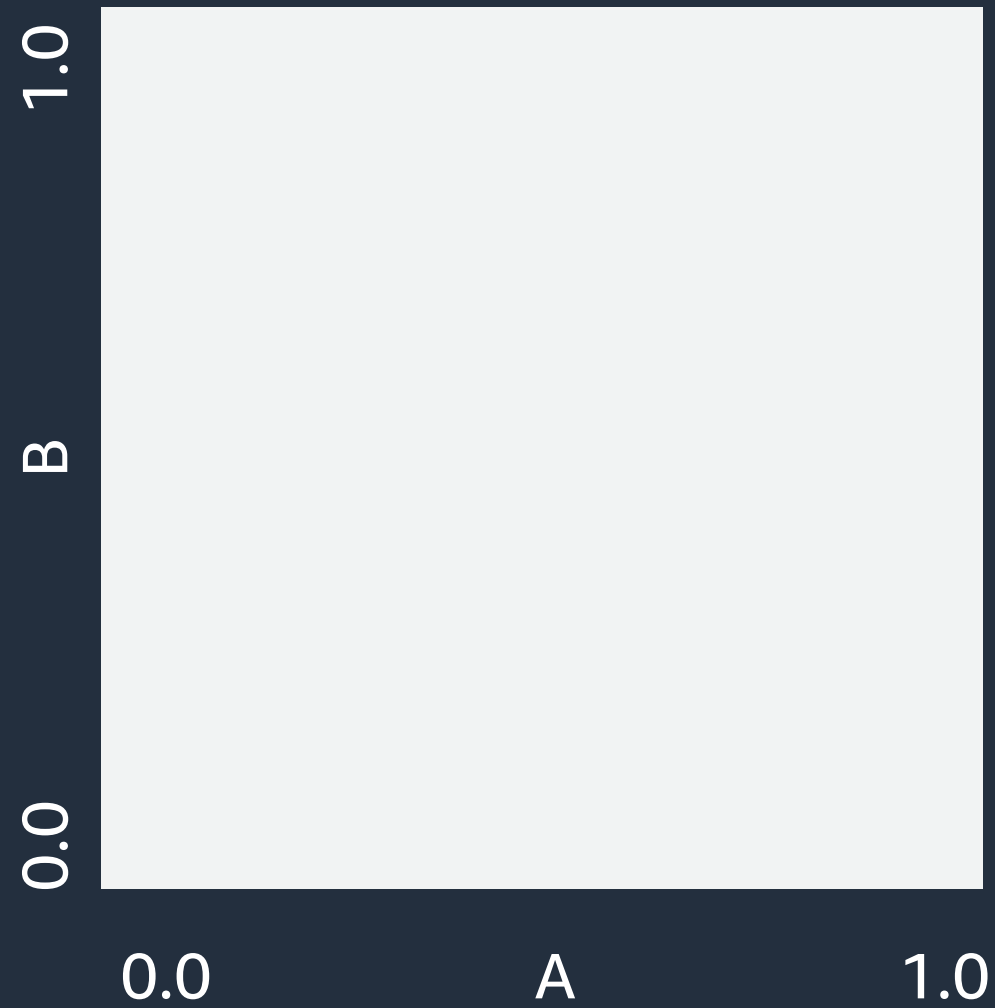


HPO Strategy - Grid Search

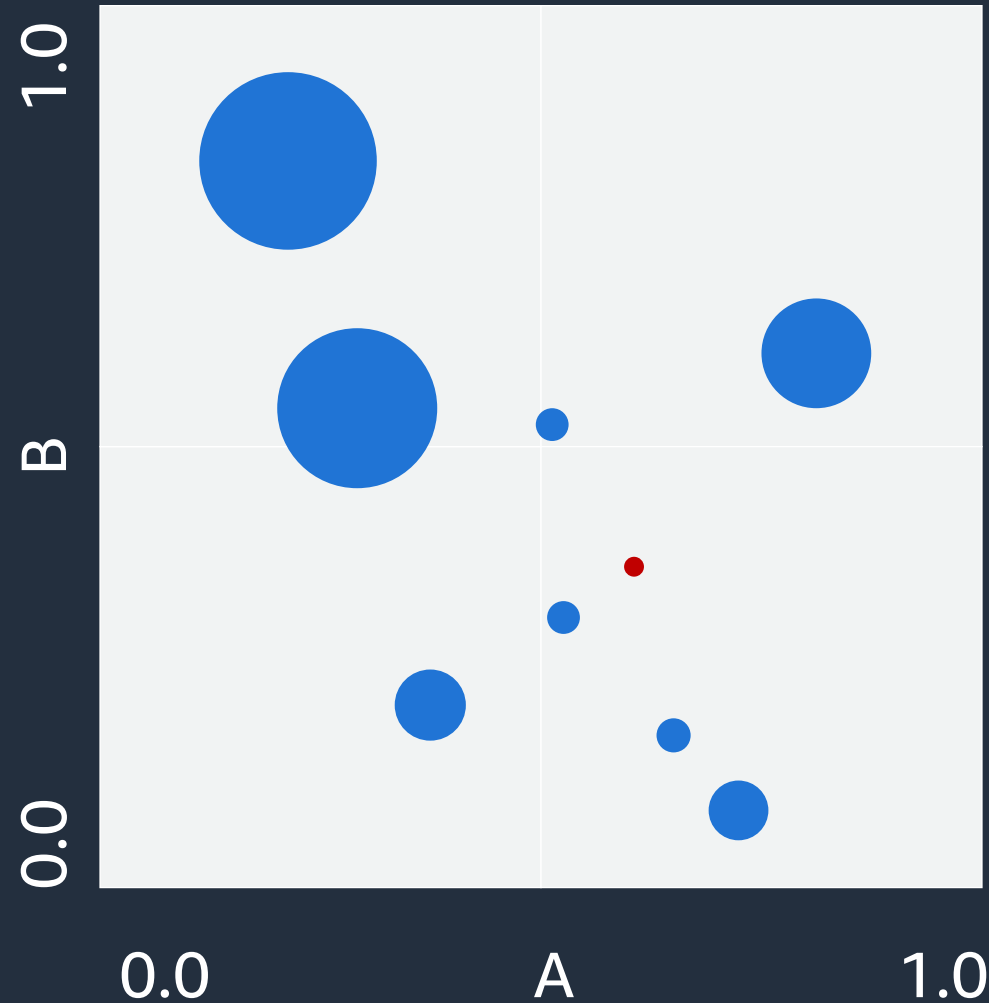


HPO Strategy - Grid Search





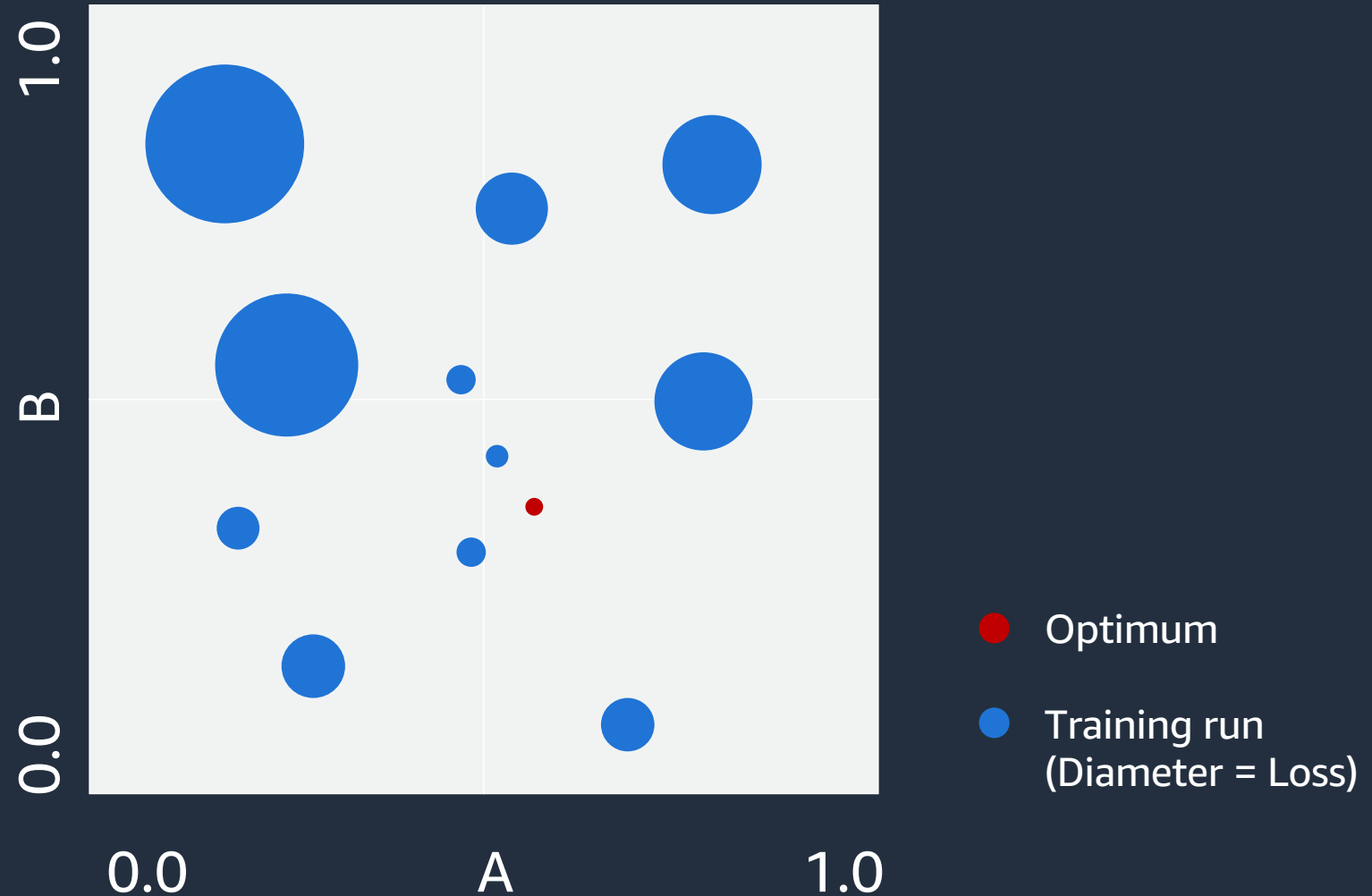
HPO Strategy – Random Search



- Optimum
- Training run (Diameter = Loss)

HPO Strategy – Bayesian Optimization

Explore vs. exploit



Amazon SageMaker Automatic Model Tuning

Automatically tune
hyperparameters in your
algorithms

Tuning at scale
Adjust thousands of different
combinations of algorithm parameters

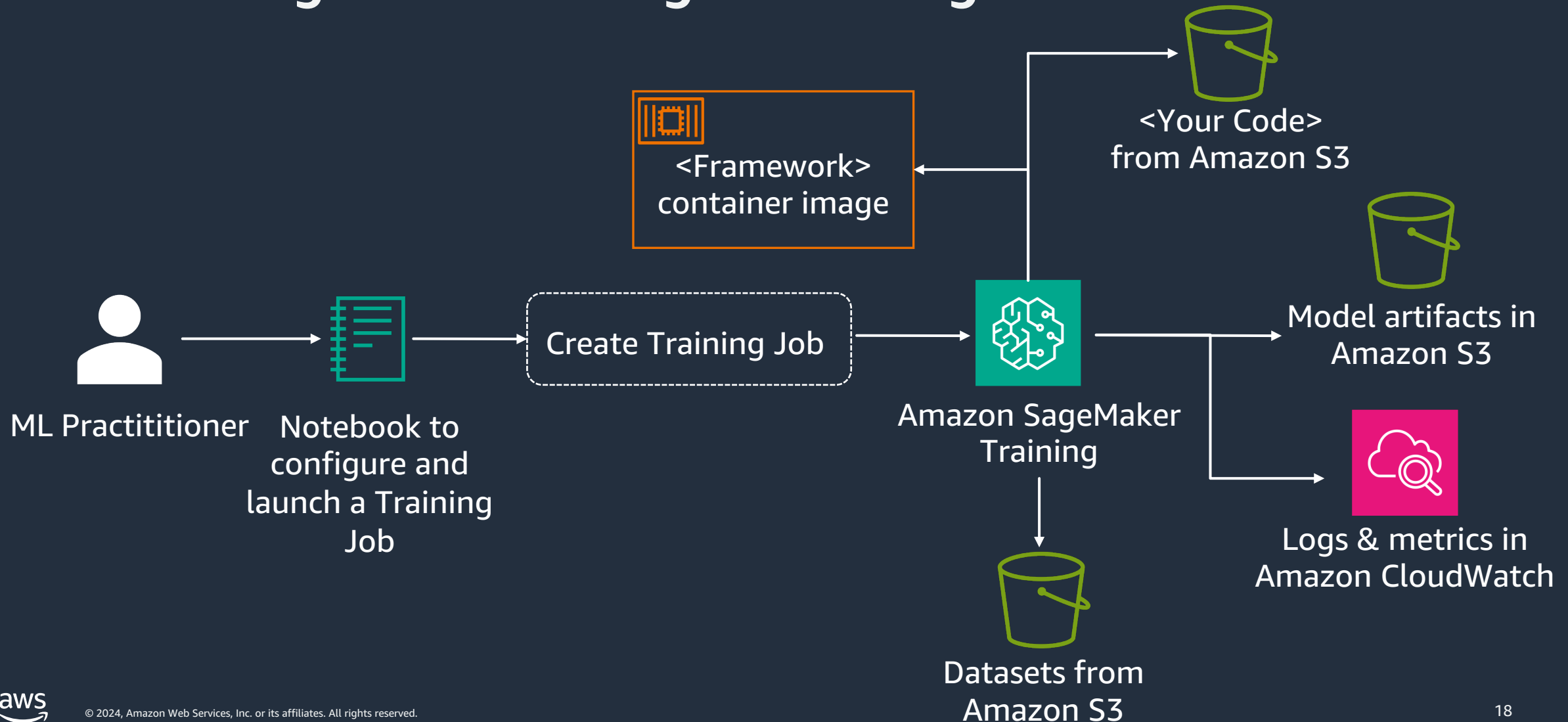
Intelligent
Uses ML to find the best parameters

Faster
Eliminate days or weeks of tedious manual work

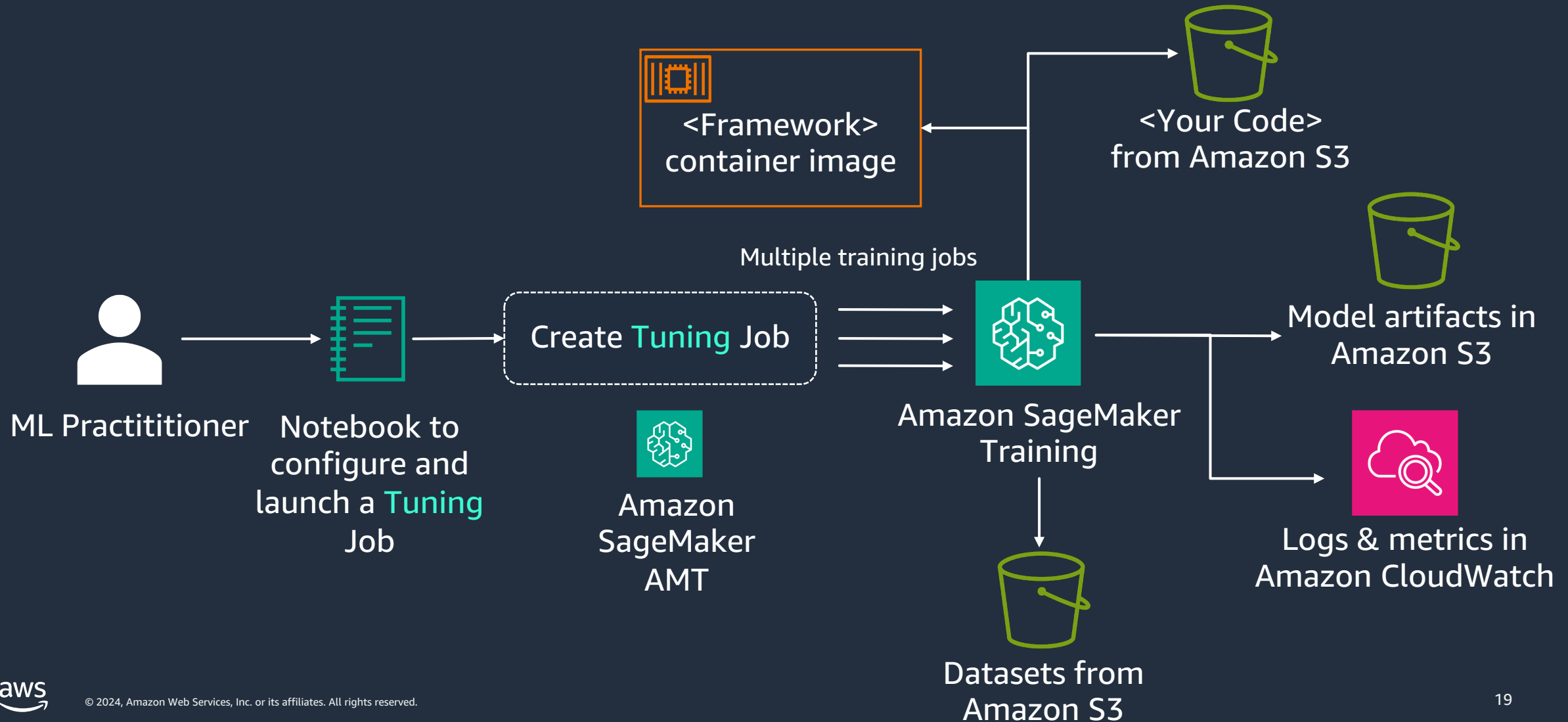
Production-Ready
Serverless managed online service – not just a library



Amazon SageMaker – Single Training Job



Amazon SageMaker – Automatic Model Tuning



Hyperparameter Optimization - Demo

What about the hyperparameter challenges?

- Huge multidimensional space* >>> Right strategy and parallelism
- Finding right procedure* >>> Tuning framework (AMT)
- Managing hardware* >>> Amazon SageMaker
- Monitor the process* >>> Amazon CloudWatch
- Understand the impact* >>> Amtviz interactive visualization

Where can I find more information?



[Amazon SageMaker Automatic Model Tuning web page](#)
Resources and tools to help you tune your ML models



[GitHub Repository \(amazon-sagemaker-amt-visualize\)](#)
GitHub demo notebook to help you onboard to AMT



[Optimize hyperparameters with Amazon SageMaker AMT](#)
Blog post associated to the demo notebook



[Explore advanced techniques for HPO with Amazon SageMaker AMT](#)
2nd blog post associated to the demo notebook



Thank you!

Elina Lesyk

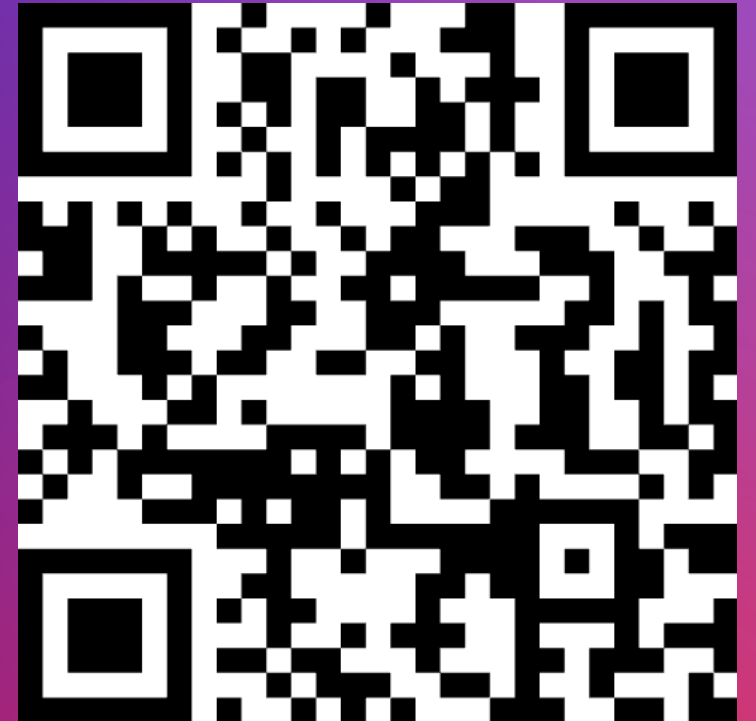
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