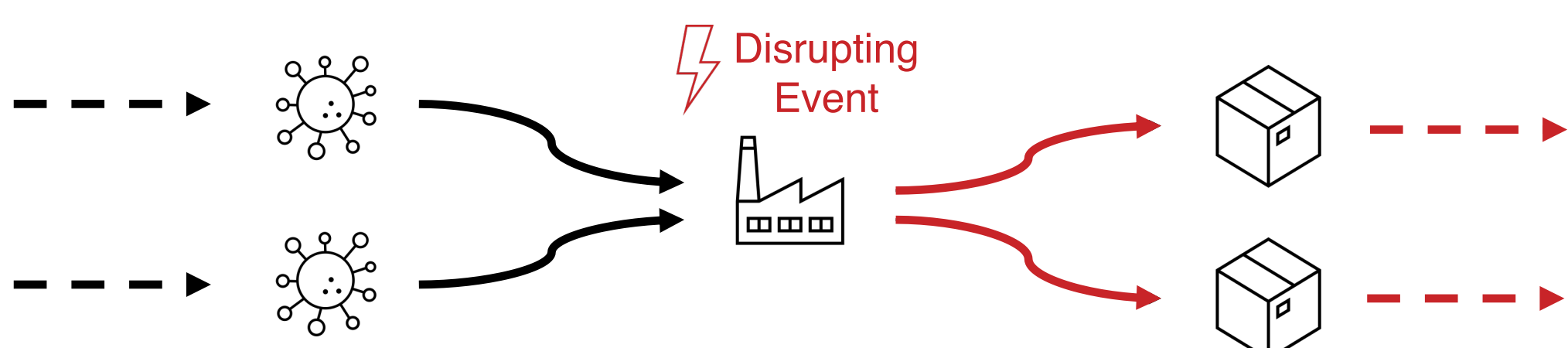


Problem Statement

Supply chain disruptions in pharmaceutical industry entail huge losses. Effective inventory plans are essential for ensuring drug supply continuity, especially during unpredictable events like natural disasters or internal process failures.

Multi-billion\$ losses due to disruptions



- How to track the journey of manufactured products in a supply chain?
- How to measure the impacts of disruptions on facilities?
- How to mitigate them and provide a comprehensive plan for J&J?

Data

Network dataset
Stochastic demand, product and processus information

Disruptions dataset
Two types of scenarios

Minor
Transport, Delivery, Production

Major
Natural Disasters, Geo-Political Crisis

Key figures

650
Disruptions every year

6
Continents concerned

54
Days on average to recover

41
Facilities in the use case

Project Goals

- Implementation of a comprehensive tool to simulate J&J's supply chains facing potential disruptions
- +
- Optimization of order policies to mitigate unexpected disruptions thus making the supply chain more resilient

Methodology

Optimization

Variables

- Identify strategic nodes
- Modify their order policies

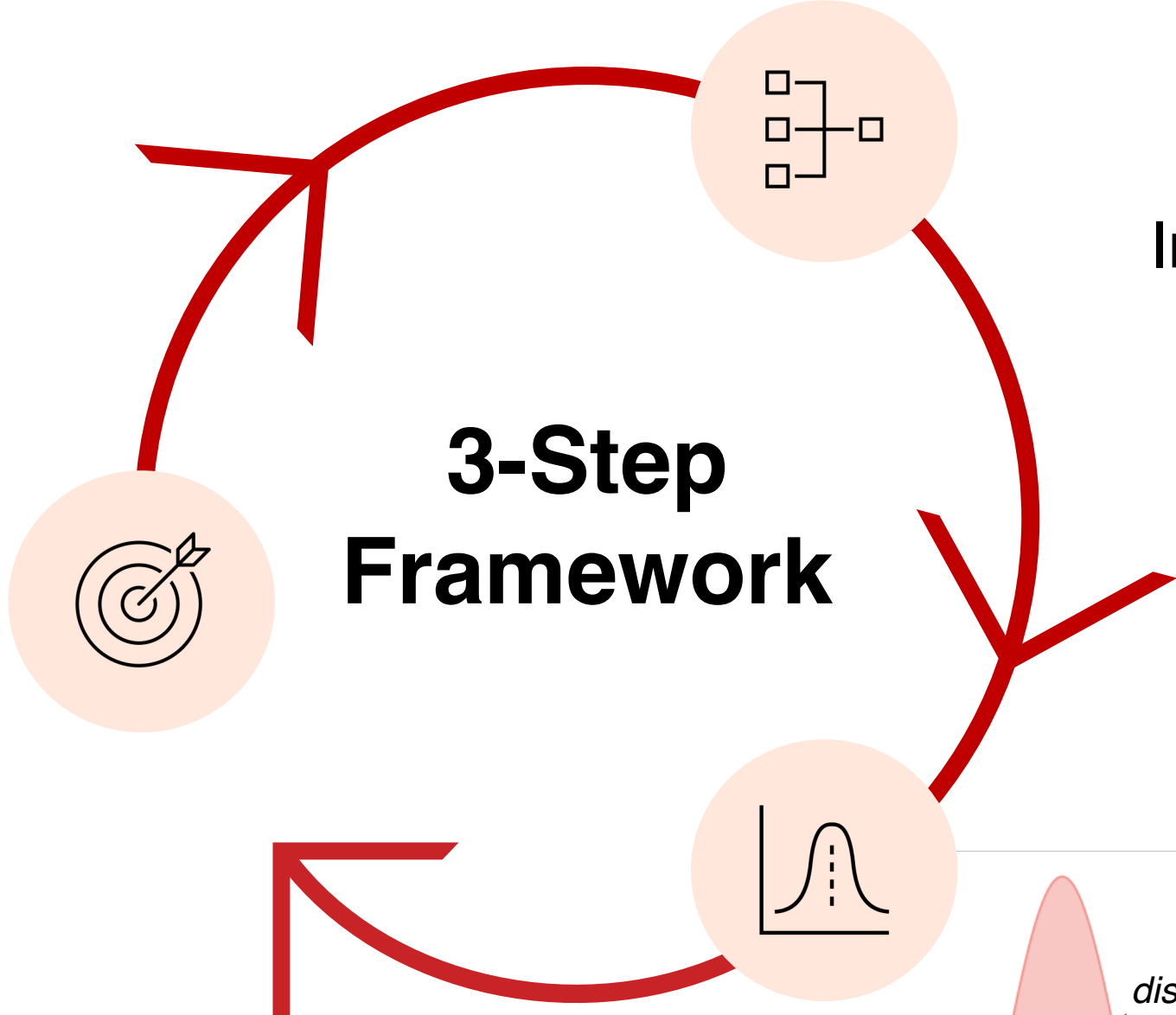
Objective

- Reduce number of expired products
- Improve fulfilled demand

Optimization Algorithms

Non differentiable objective function: exploring derivative free methods as pattern search & particle swarm

3-Step Framework



Simulation

Implementation of a python library:

- Disrupt any node
- Run different stochastic scenarios

Comparison

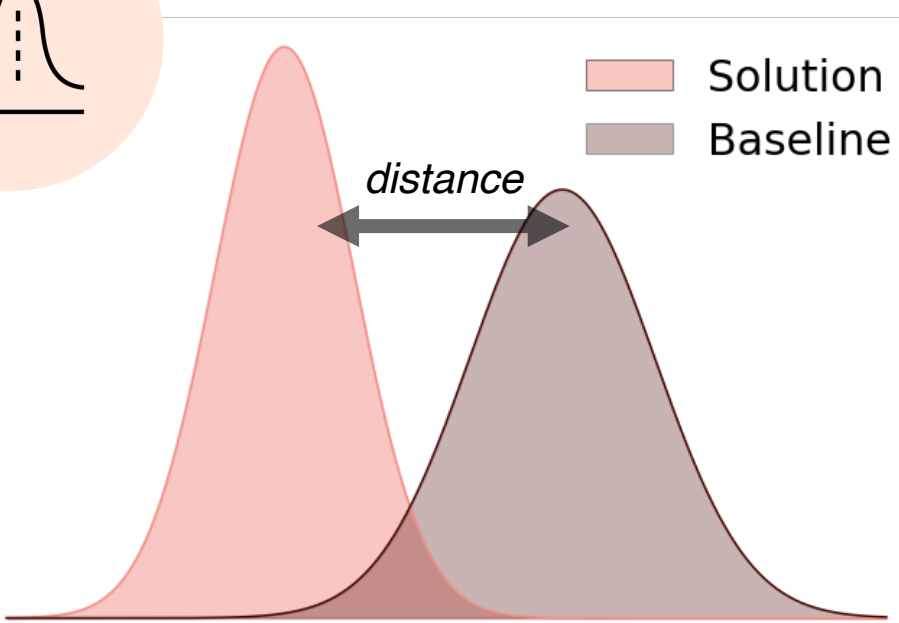
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Average of metrics

✓

Distribution

Robust comparison of solutions using Wasserstein distance

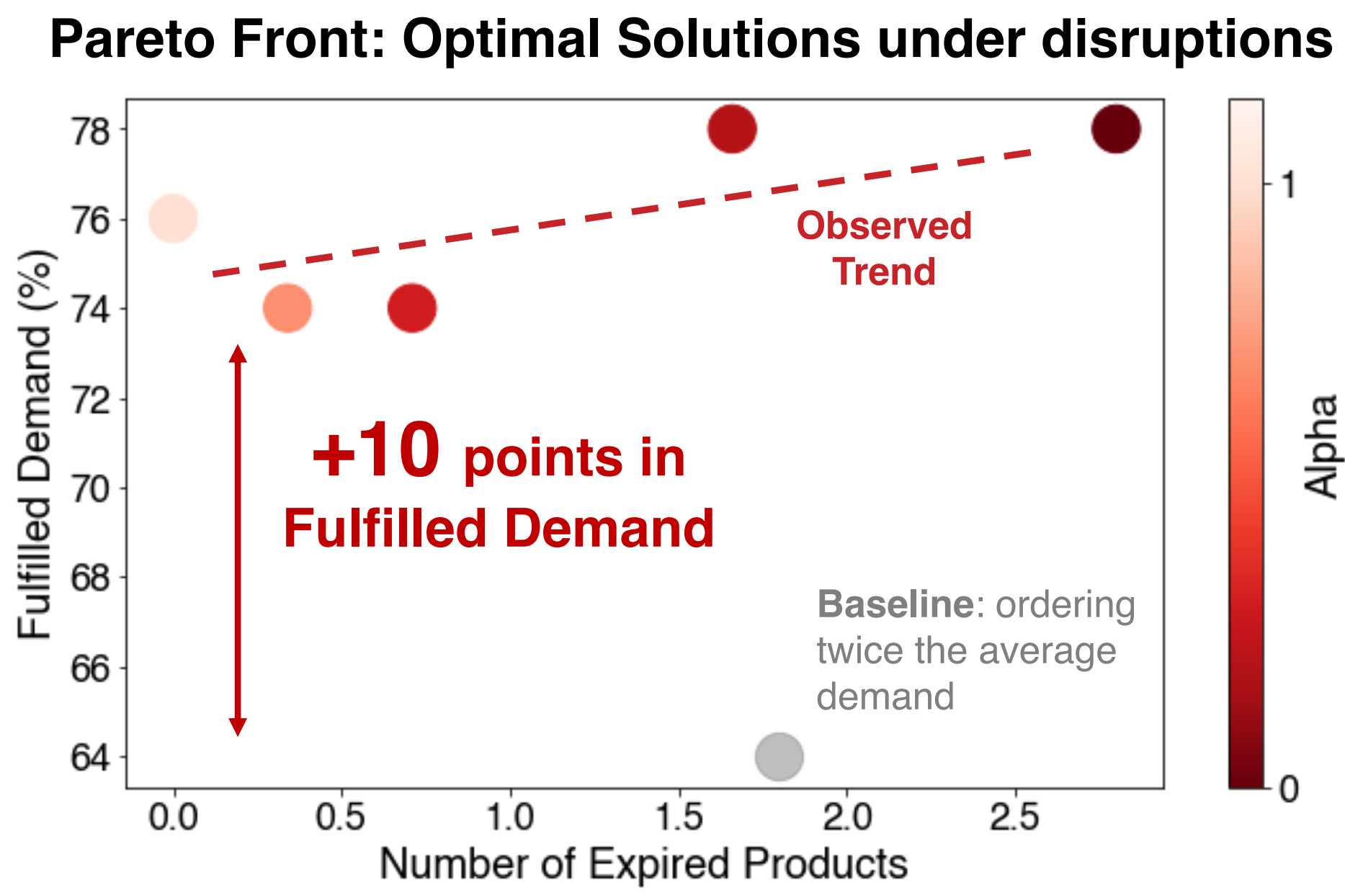


Results

Trade-off between Expired Products (EP) and Fulfilled Demand (FD)

Obj = αEP - FD

Identify the optimal α that balances the significance of each metric



Next Steps

- Providing optimal supply plan to catch potential disruptions before they happen
- Offering different solutions on the pareto front according to risk aversion
- Implementing a robust metric to assess the efficiency of a policy