

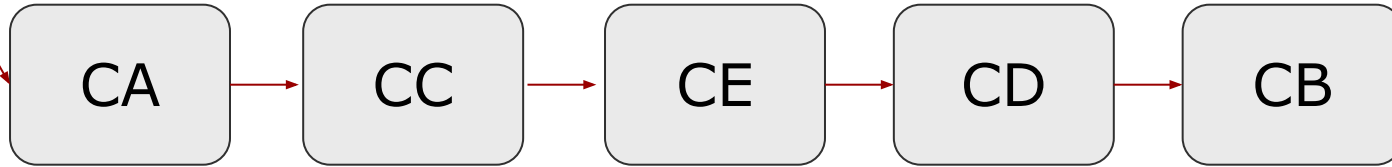


IDA Hackathon Team 1

THE UNIVERSITY OF ALABAMA®

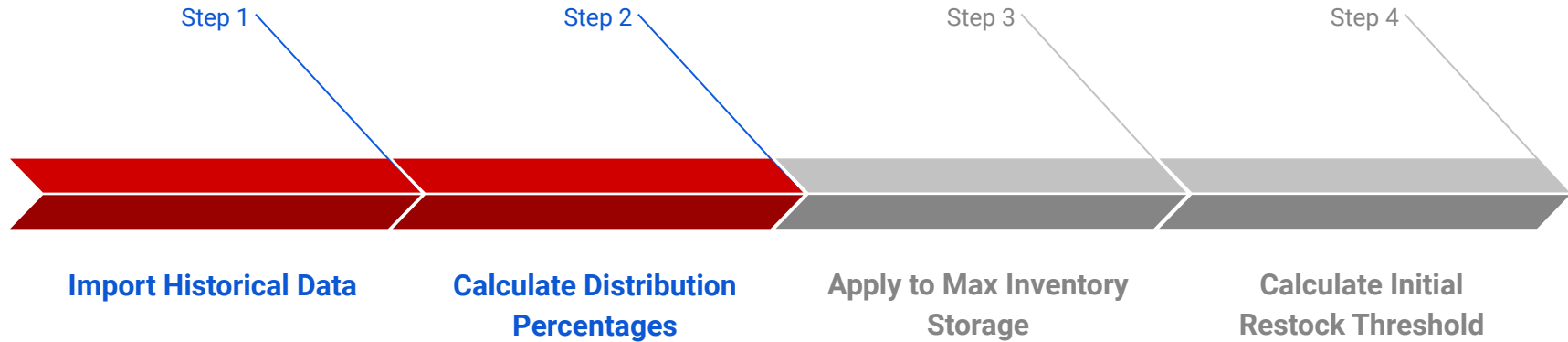


Initial Component Allocation





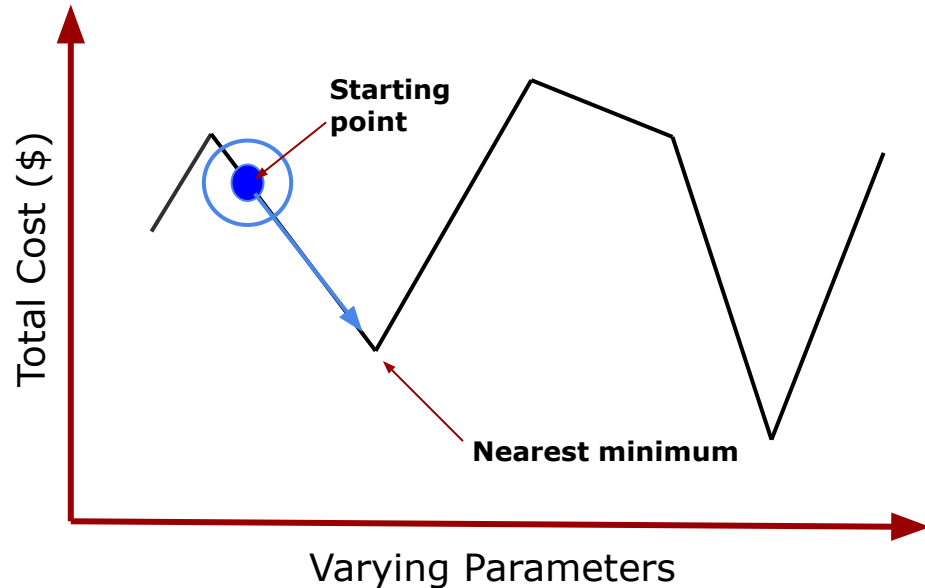
Initial Inventory and Reorder Levels





Reorder and Inventory Initial Optimization: Stochastic Gradient Descent

- Parameter combinations run “downhill” to the lowest total cost nearby
- Strengths:
 - Less computationally intensive than enumeration
- Weaknesses:
 - Could get caught in a relative minimum
 - Still computationally expensive high-variant components





Second Stage Parameter Optimization

Randomized Optimization

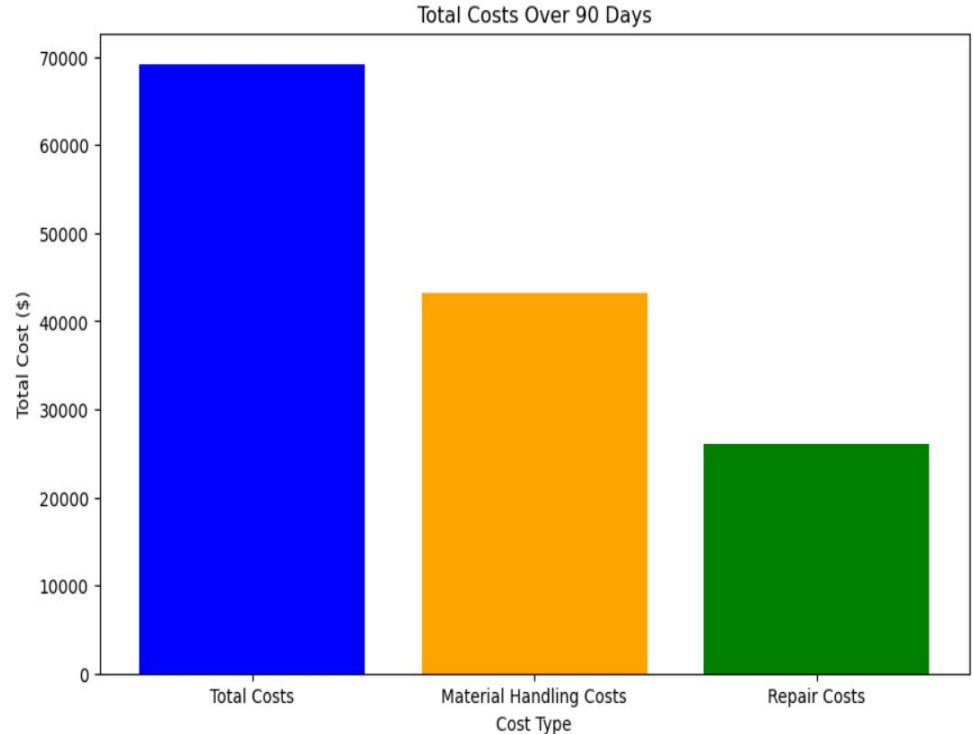
- Started with results from gradient descent
- Changed single variable across all parameters
- If new solution is better, saved as the optimal solution
- Rinse and repeat, changing a single variable in the new optimal solution





Current State KPIs (100 capacity, 1 handler)

- **Average cost per day:**
\$769.12
- **Material Handling cost:**
\$45,000 (\$500*number of workers/day)
- **Total repair cost:**
\$24,220.5
- **Total cost over 90 days:**
\$69,210.5





Effectiveness of Optimization

Cost before optimization:

- Total cost: \$298,122
- Average per day: \$3,312.37

Cost after optimization:

- Total cost: \$69,210.5
- Average cost: \$769.12

Improvement:

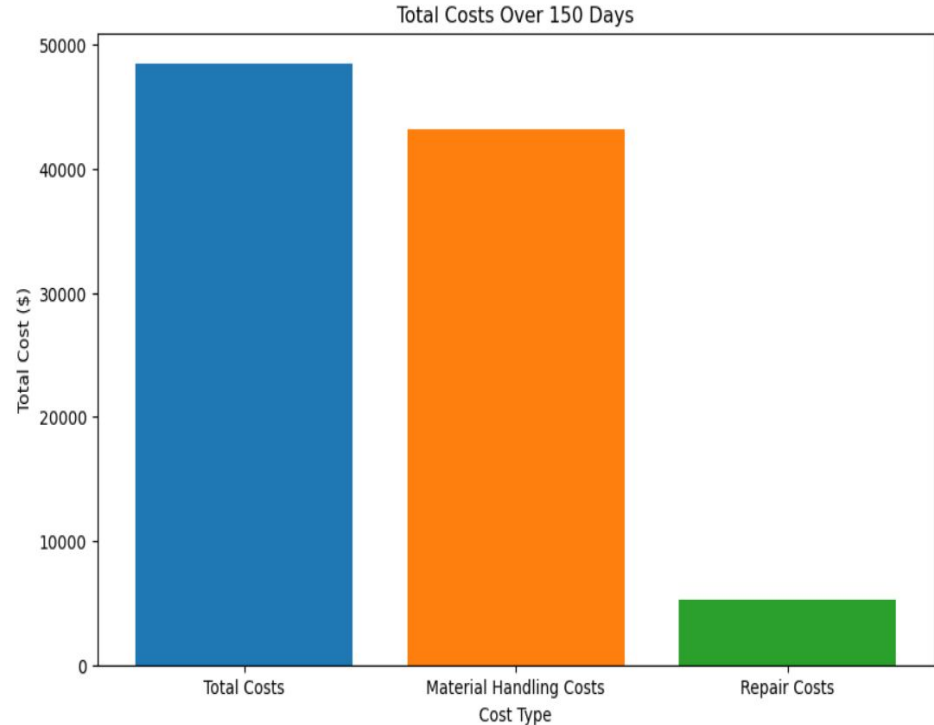
- Total cost reduction of **431%** over 90 days





Future State KPIs (150 capacity, 1 handler)

- **Average cost per day:**
\$538
- **Material Handling cost:**
\$45,000 (No change from 100 capacity)
- **Total repair cost:** \$3,508
- **Total cost over 90 days:**
\$48,508





Key Insights

Estimated Cost (300 days):

- **100 max capacity:** \$230,700
- **150 max capacity:** \$161,700

Recommendations:

- Limit number of handlers to 1
- Prioritize expensive repair, higher variation components at the front of the line
- Don't spend more than \$69,000 on an increase in capacity

Inventory Allocations

var	CA	CB	CC	CD	CE
1	15	11	2	5	2
2	12	64	23	16	4
3	4	22	7	38	11
4	14		15	2	2
5	6		10	22	2
6	15		20	13	18
7	10		17		12
8	15				19
9					25

Restock Threshold

var	CA	CB	CC	CD	CE
1	11	7	1	3	0
2	7	40	16	12	2
3	2	16	4	26	7
4	10		11	1	1
5	4		6	15	1
6	10		11	8	12
7	7		13		8
8	10				15
9					18



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FINAL PARAMETERS

1 Handler

Order:

CA->CC->CE->CD->CB



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Questions?