

Dynamic Pricing Competition: Benchmark your Reinforcement Learning Algorithm

dynamic-pricing-competition.com

AMLD

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<https://haensel-ams.com>

DYNAMIC PRICING



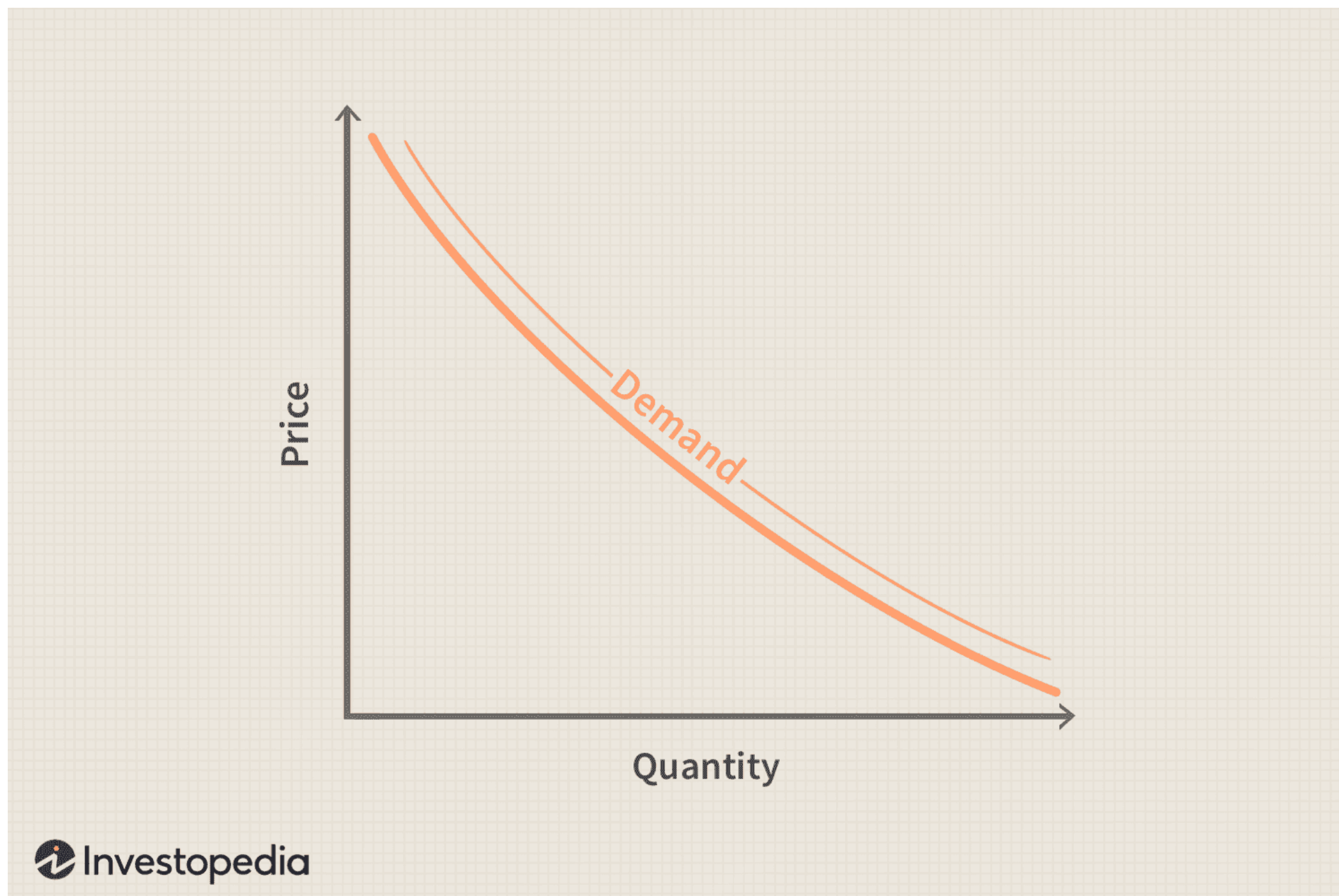
- The practice of using a highly flexible pricing strategy in response to market demands, supply and other external factors

- Amazon had 2.5 million daily price changes in 2013 (average product changes its price every 10 minutes)

amazon

Uber

DYNAMIC PRICING



■ Relationship between price and demand is often unknown

→ Has to be learned from data

DYNAMIC PRICING



Challenges:

- Competitor Sales often unknown
- Exploration vs. Exploitation

DYNAMIC PRICING COMPETITION



- Building a platform for people working on pricing algorithms
- Benchmark and playground
- Low barriers to entry

DYNAMIC PRICING COMPETITION

- 2 players
- 100 selling seasons (each 100 periods)
- Capacity is limited to 80
- Information:
 - Own demand & prices
 - Competitor Prices
 - If Competitor is out of stock



- 3-6 players
- 1000 selling periods
- 3 products with unbounded capacity
- Information:
 - Own demand & prices
 - Competitor Prices

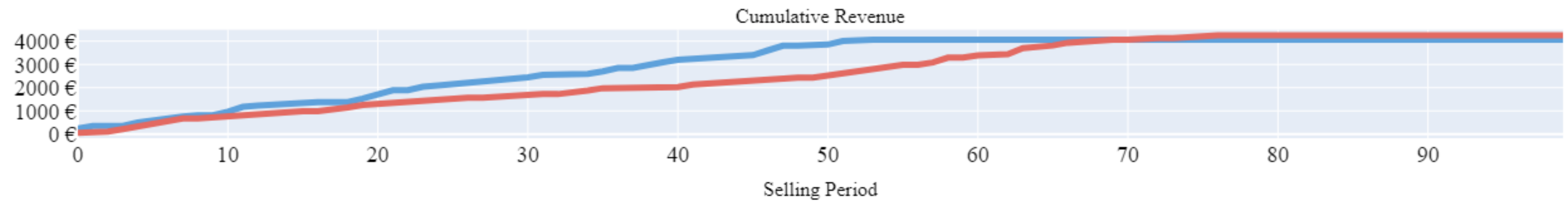
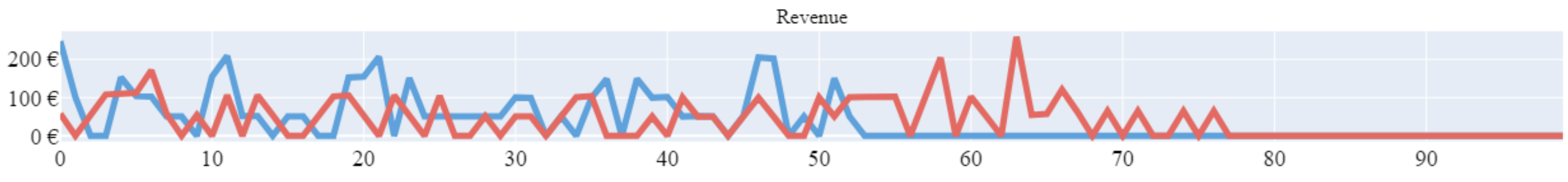
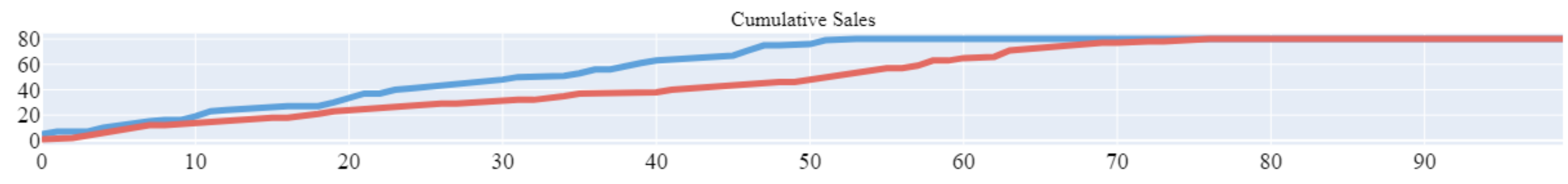
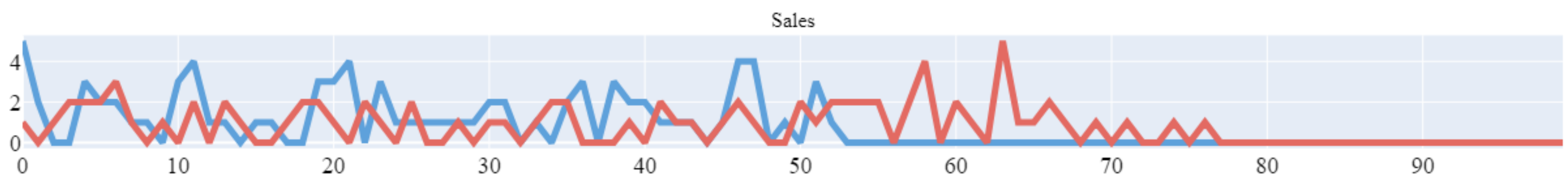
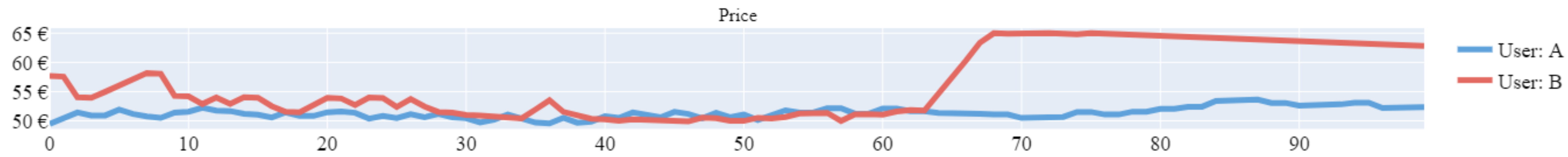


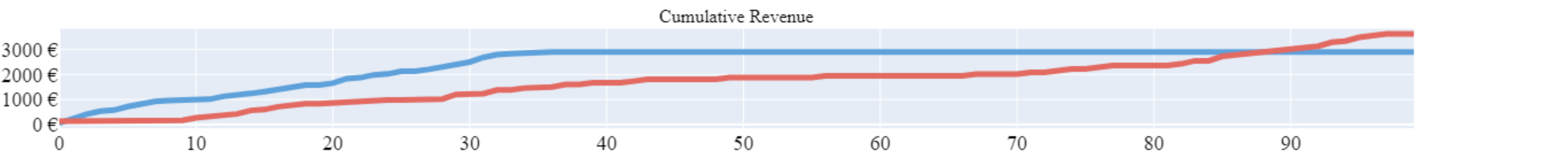
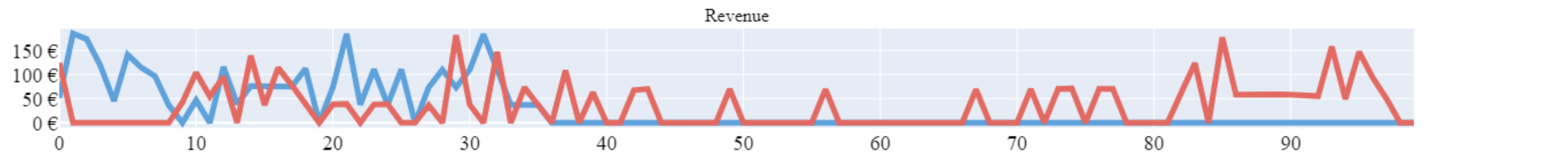
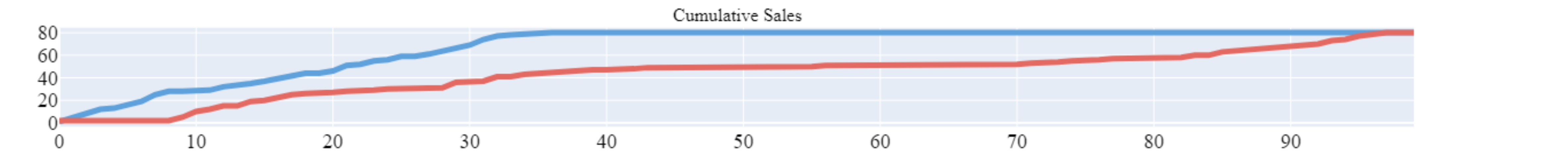
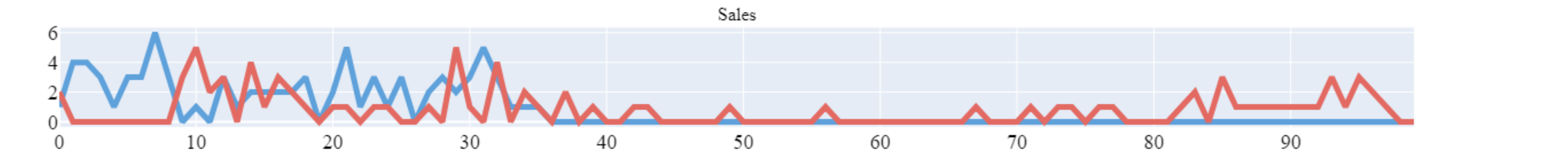
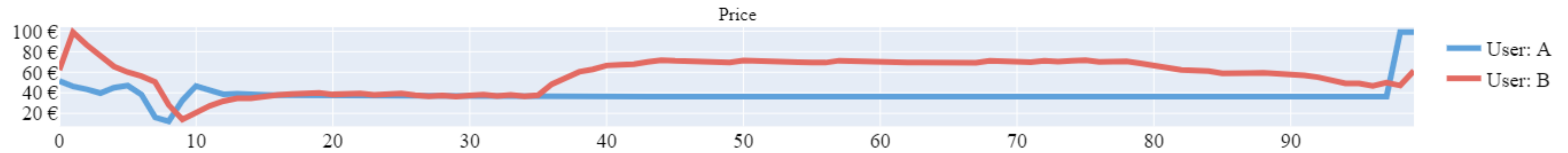
- No player limit
- 1000 selling periods
- 1 product with unbounded capacity
- Information:
 - Own demand & prices
 - Competitor Prices



Dynamic Pricing in Competitive Markets

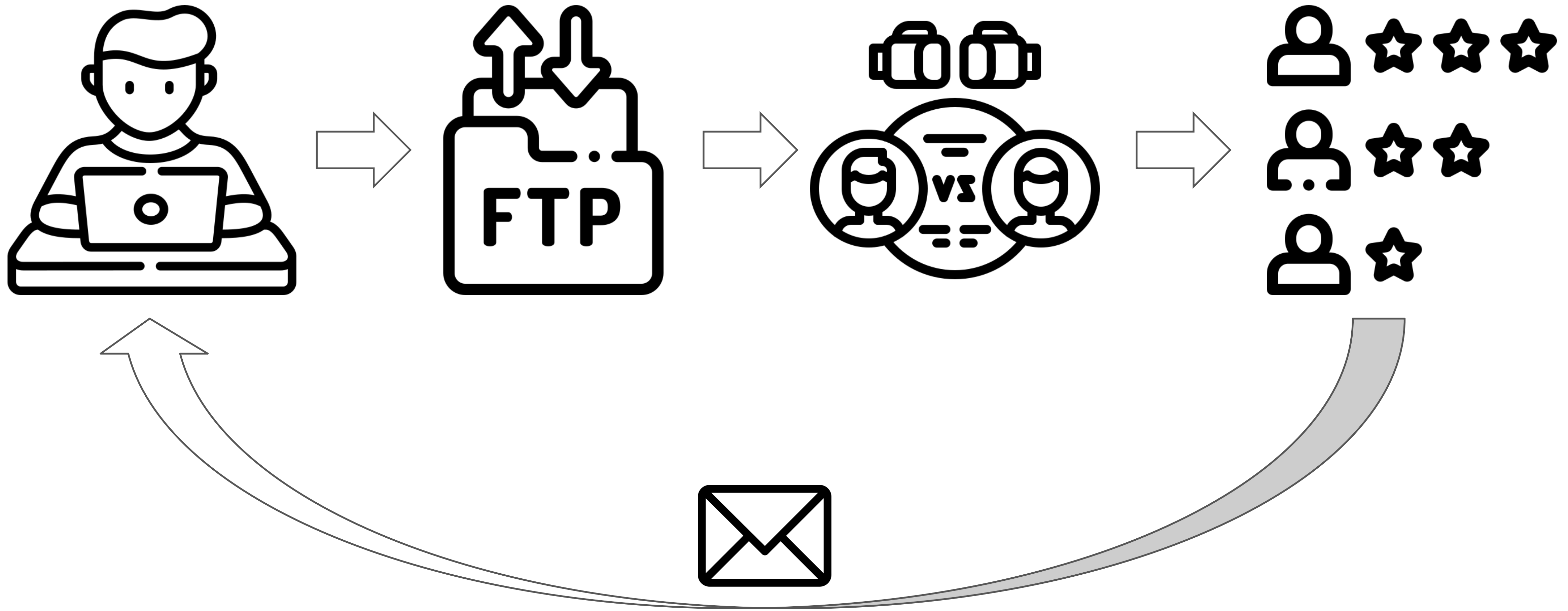
Example



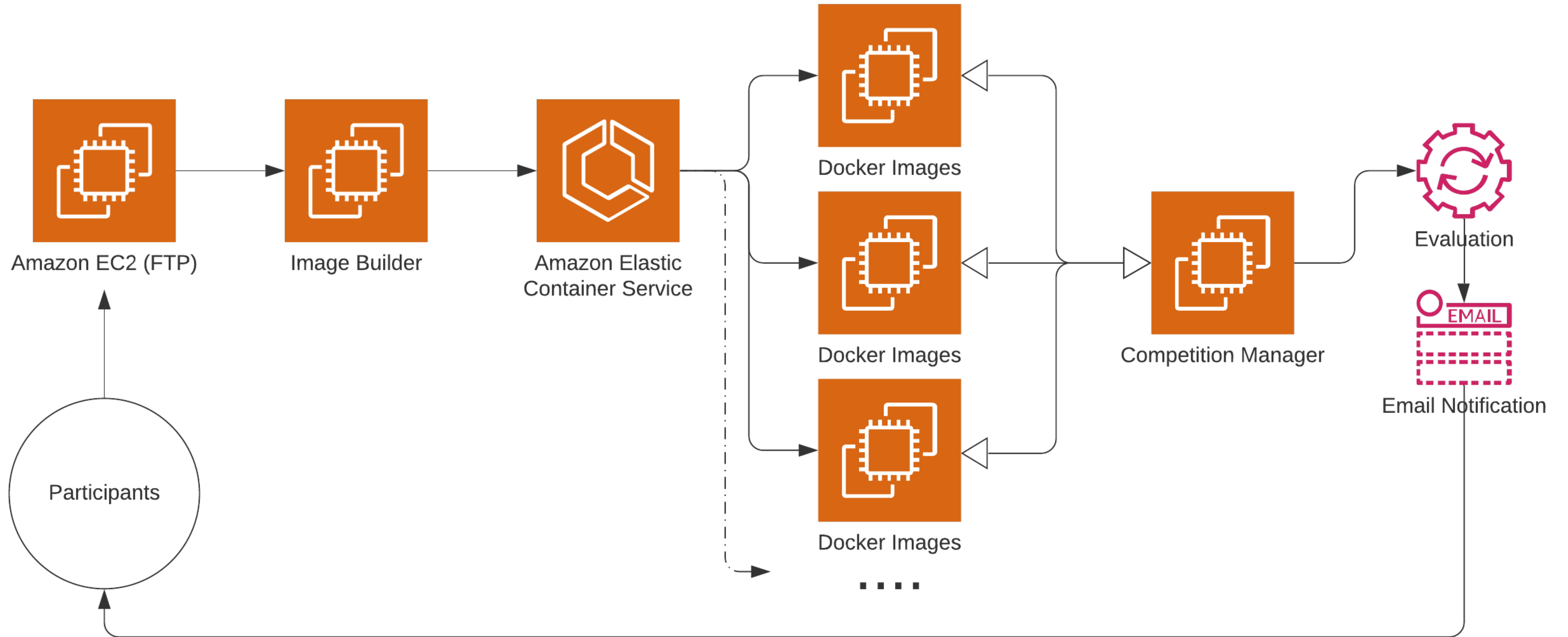


Selling Period

DYNAMIC PRICING COMPETITION



DYNAMIC PRICING COMPETITION



DYNAMIC PRICING COMPETITION

```
C: > Users > Paul > Documents > AMLD > code_requirements.py
1 - Anaconda Environment (Python 3.7)
2
3 - You can use supporting files by importing them in your script from the current working directory
4
5 - your code has to return a price response on average within 0.3 seconds
6
7 - maximum time for a single response is 10 seconds
8
9 - code has to run error free in 97% of the requests
10 |
```

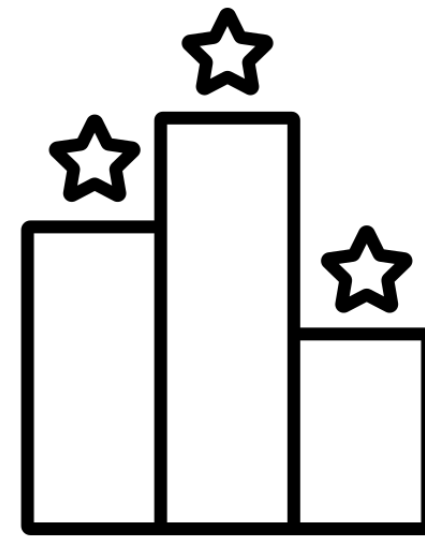
C: > Users > Paul > Documents > AMLD >  example_code.py > ...

```
1  import numpy as np
2
3  def p(current_selling_season,
4        selling_period_in_current_season,
5        prices_historical_in_current_season=None,
6        demand_historical_in_current_season=None,
7        competitor_has_capacity_current_period_in_current_season=True,
8        information_dump=None):
9      """
10     example pricing algorithm (duopoly)
11     """
12     if demand_historical_in_current_season is None :
13         | return ( round(np.random.uniform(30,80),1) , None)
14
15     if not competitor_has_capacity_current_period_in_current_season:
16         | return ( 1000.0 , "Competitor sold out, let's go to 1000")
17
18     dummy_model = model.fit(prices_historical_in_current_season, demand_historical_in_current_season)
19
20     price_prediction = dummy_model.predict(prices_historical_in_current_season[-1])
21
22     information_dump = dummy_model
23
24     return (price_prediction, information_dump)
```

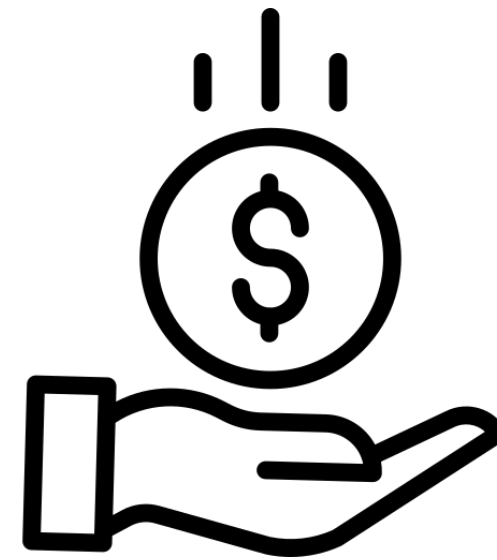
DYNAMIC PRICING COMPETITION



■ You can test your pricing algorithm
in a neutral playing field

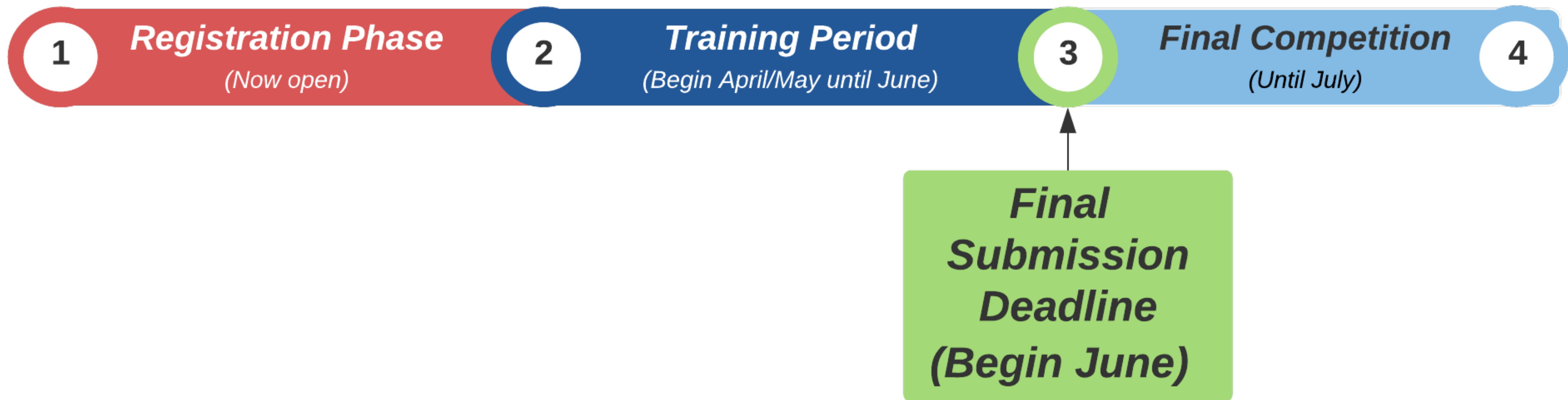


■ Scoring and benchmarking with
participants from diverse backgrounds



■ Win Prize Money

DYNAMIC PRICING COMPETITION





For more information and registration:

<https://dynamic-pricing-competition.com/>

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REFERENCES & SOURCES

■ *Icons*: Flaticon

■ *AWS Setup and Timeline Charts*: Lucidchart

■ <https://www.businessinsider.de/international/amazon-price-changes-2018-8>