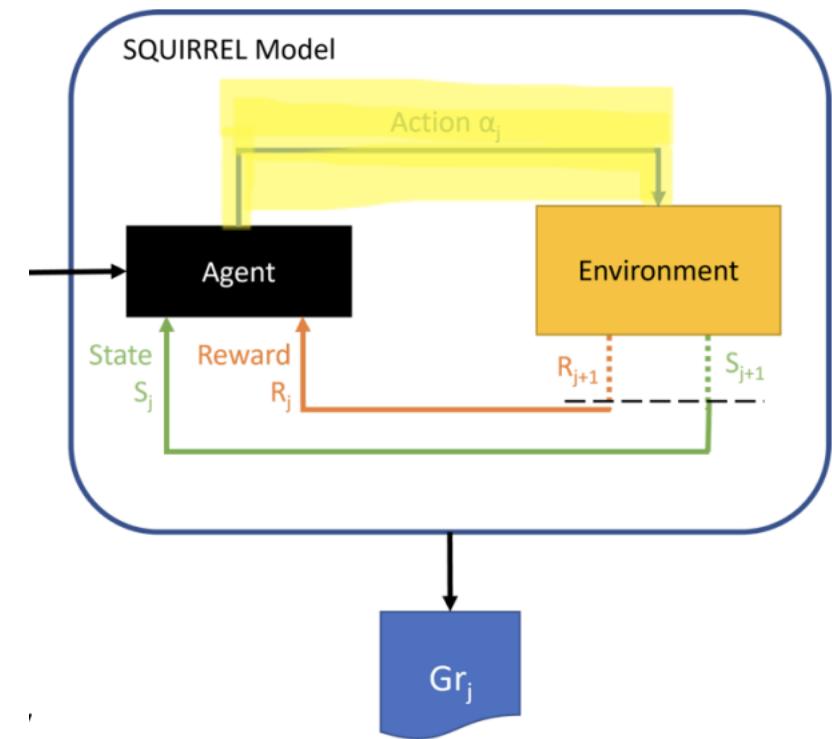


SDAA Sequential Group Recommendations

- Students: Oskari Perikangas, Xiaosi Huang
- Course: DATA.ML.360-2025-2026-1 Recommender Systems
- Date: November 10, 2025



From Static to Dynamic Group Recommendations

The Limitations of User-Based Collaborative Filtering and Group Recommendations

Example: Movie 1276 predictions

- System predicts User 1 would rate it: **5.00**
- System predicts User 2 would rate it: **3.76**
- Disagreement : **1.24**

Challenges:

- Average method and Least misery methods don't learn from previous recommendations
- Some users stay unhappy over multiple rounds
- No adaptation to group dynamics

Solution: SDAA framework

- Recommends movies over multiple rounds
- Adjusts strategy based on user satisfaction
- Balances group happiness and individual fairness

SDAA Implementation

1st satisfaction scores: Decides which movies to recommend to the group

$$score(G, i, j) = (1 - \alpha_j) * avgG(G, i, j) + \alpha_j * leastG(G, i, j)$$

2nd Alpha Adaptation : Measures how unfair the previous round was

$$\alpha_j = max_{u \in G} sat(u, Gr_{j-1}) - min_{u \in G} sat(u, Gr_{j-1})$$

3rd Reward Evaluation: Balances group satisfaction and fairness

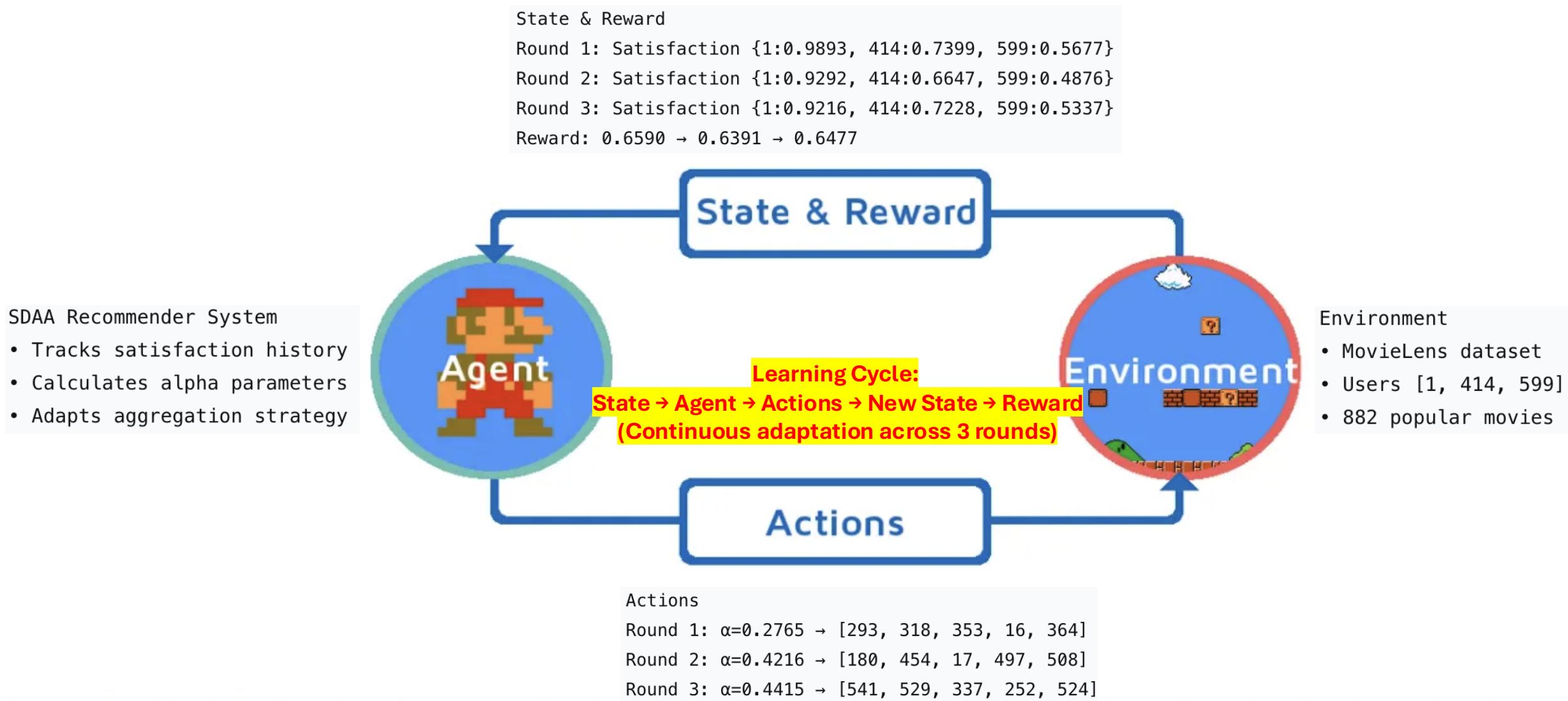
$$R_{sd}(RS^j) = 2 \frac{groupSatO(RS^j) * (1 - groupDisO(RS^j))}{groupSatO(RS^j) + (1 - groupDisO(RS^j))}$$

How Alpha adapts strategy :

Small α_j (users equally satisfied) → More weight on Average method
Large α_j (satisfaction differences) → More weight on Least Misery

- Project result:
- Round 1: $\alpha = 0.2765 \rightarrow 72\% \text{ Average}, 28\% \text{ Least Misery}$
- Round 2: $\alpha = 0.4216 \rightarrow 58\% \text{ Average}, 42\% \text{ Least Misery}$
- Round 3: $\alpha = 0.4415 \rightarrow 56\% \text{ Average}, 44\% \text{ Least Misery}$

SQUIRREL Reinforcement Learning Framework



Reward changes reveal system intelligence:

Round 1 → Round 2 → Round 3
0.6590 → 0.6391 ↓ → 0.6477 ↑

The temporary drop shows smart balancing,
not system failure,
keeps all users engaged long-term,
not just maximizes a number.

