BOSTON UNIVERSITY

Module 8 – AI in the Field

Week 4 – September 22, 2025

BU Faculty of Computing & Data Sciences

Plan for Today

1. Contextual Bandits
2. Linear Bandits
3. Skimming the LinUCB Paper
4. Implementing LinUCB Properly

Vanilla Bandits

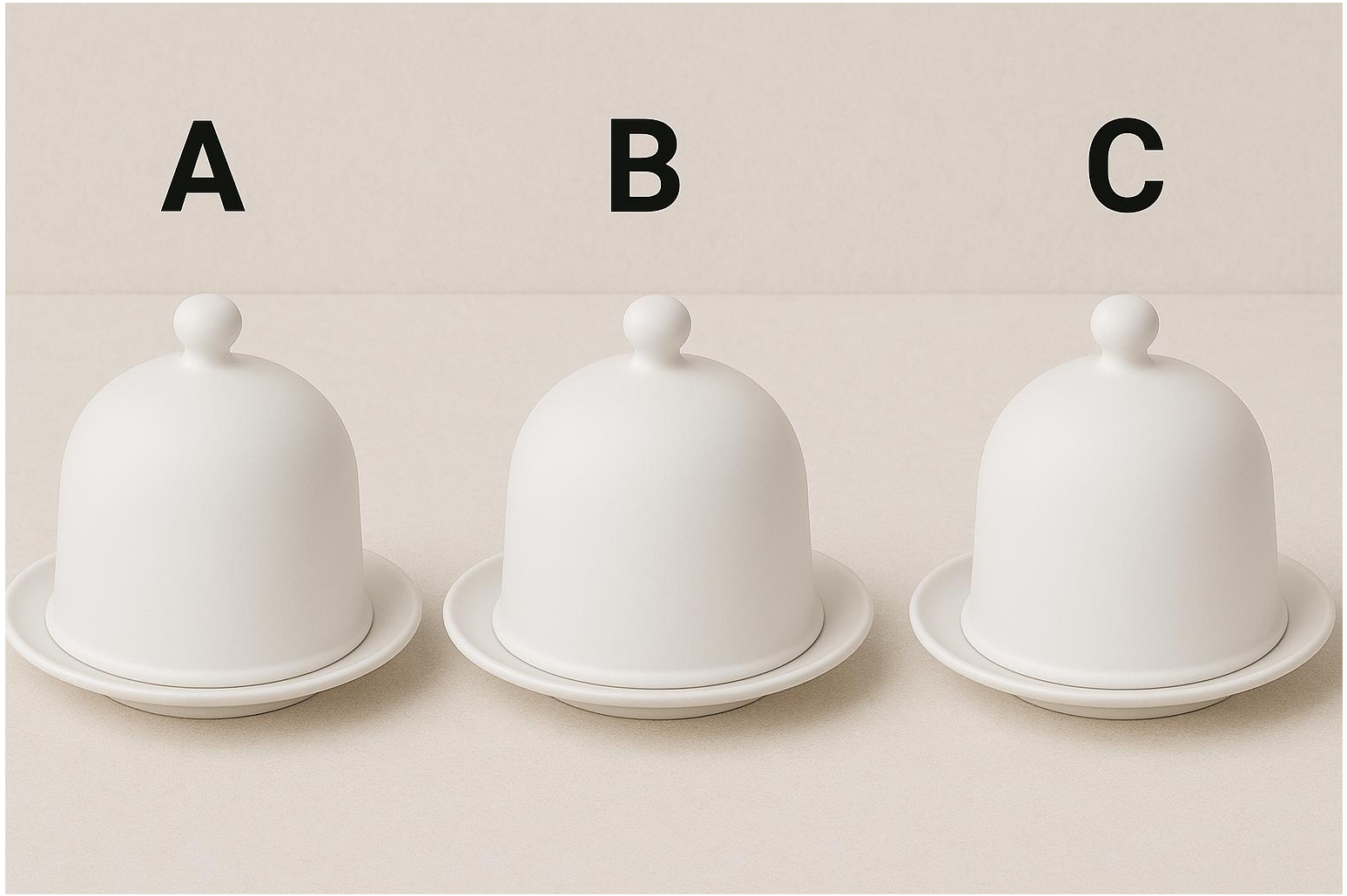


Image by ChatGPT

Contextual Bandits

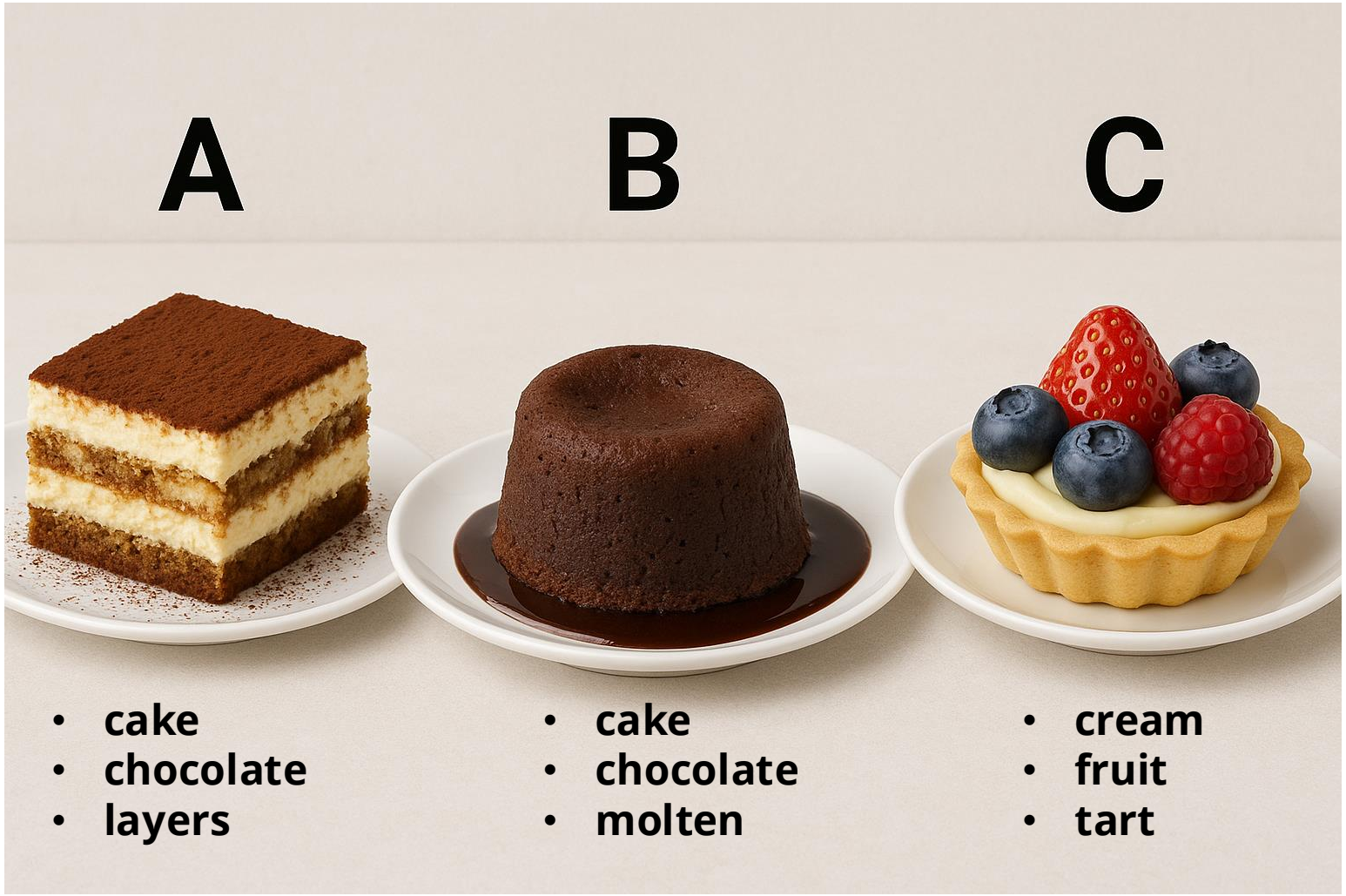


Image by ChatGPT

Context Sharing?

1. Do actions share context variables?

2. Do actions share models?

3. Do actions repeat between rounds?

Dish Context?

1. Cake?
2. Chocolate?
3. Cream?
4. Fruit?
5. Layers?
6. Tart?

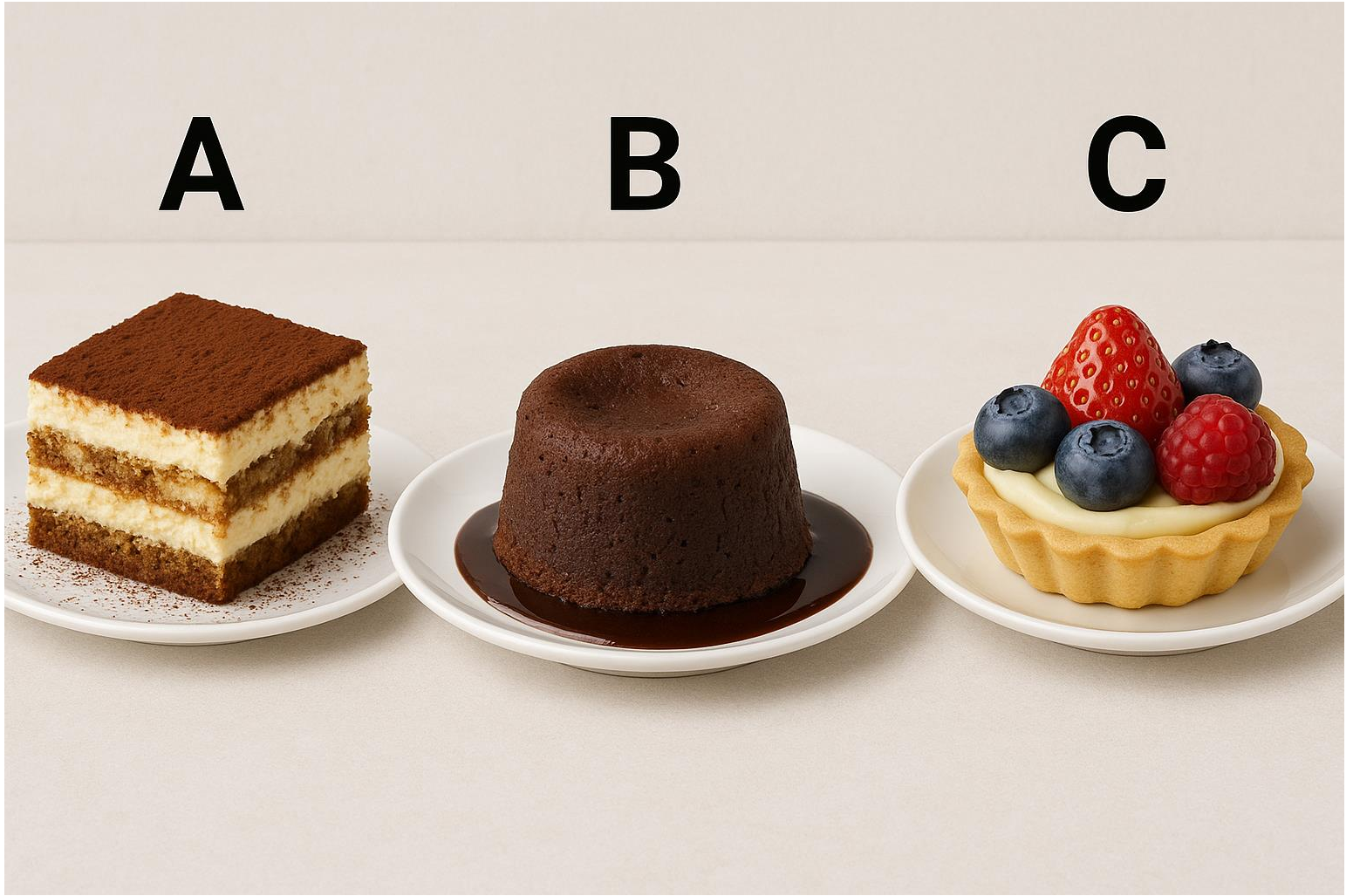


Image by ChatGPT

User Context?

1. Chocoholic?
2. Sweet tooth?
3. Vegetarian?

A. Avid reader
B. Foodie
C. K-pop fan

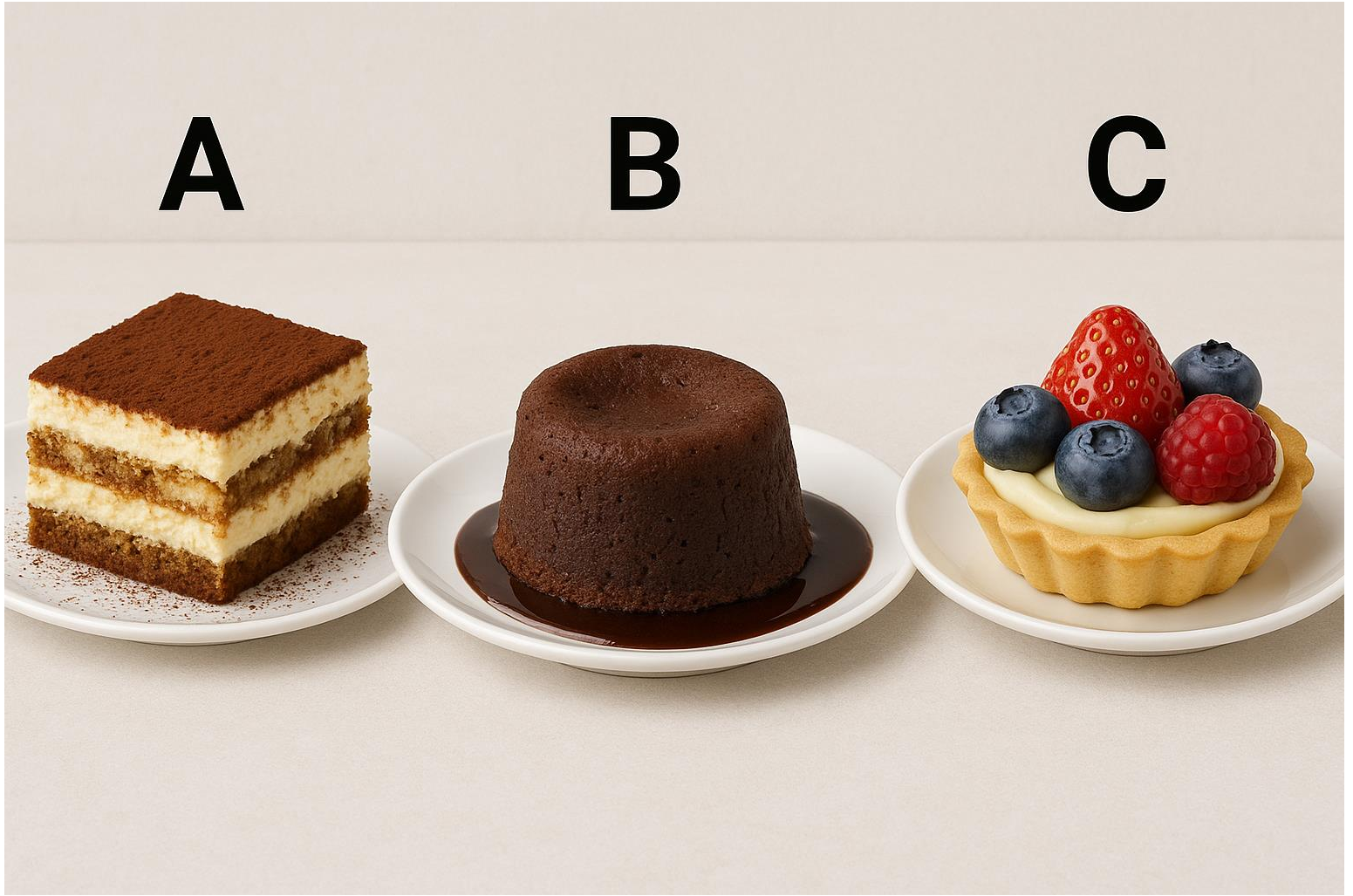


Image by ChatGPT

Media Context?

1. Action
2. Animated
3. Band
4. Demon
5. K pop
6. Romance
7. Self-discovery

Image via Wikipedia

Model per Movie

Given the context from this viewer, what is the probability that they will enjoy this movie?

- **Model of movie's appeal**
- **Input to model from movie's viewers**

Image via Wikipedia

Model per User

Given the context from this movie, what is the probability that I will enjoy it?

- **Model of my preferences**
- **Input to model from movie's context**

Image via Wikipedia

Why not Both?

Given the context from this movie and viewer, what is the probability that the viewer will enjoy the movie?

- **Model of general movie preferences**
- **Input to model from movie and viewer's context**

Image via Wikipedia

Q&A

Any questions?

Linear Bandits

1. TODO

Linear Bandit Rewards

Quiet assumption in many papers: 0-1 rewards

Is it essential?

Modeling Expectations

TODO ridge regression formula

Modeling Variance

1. TODO

How does LinUCB Work?

1. TODO

TODO

1. TODO

Q&A

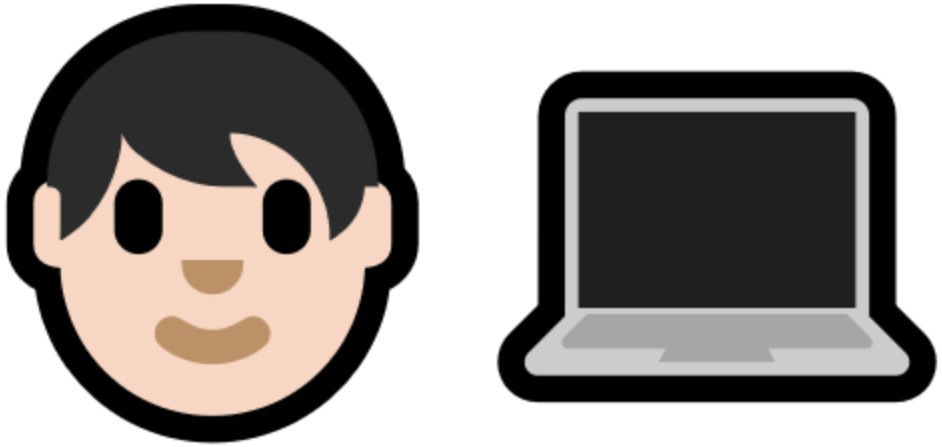
Any questions?

LinUCB Paper Time

Q&A

Any questions?

LinUCB Coding Time



Q&A

Any questions?

Final Q&A

Any other questions?