ENCHANT: EnergyWizard

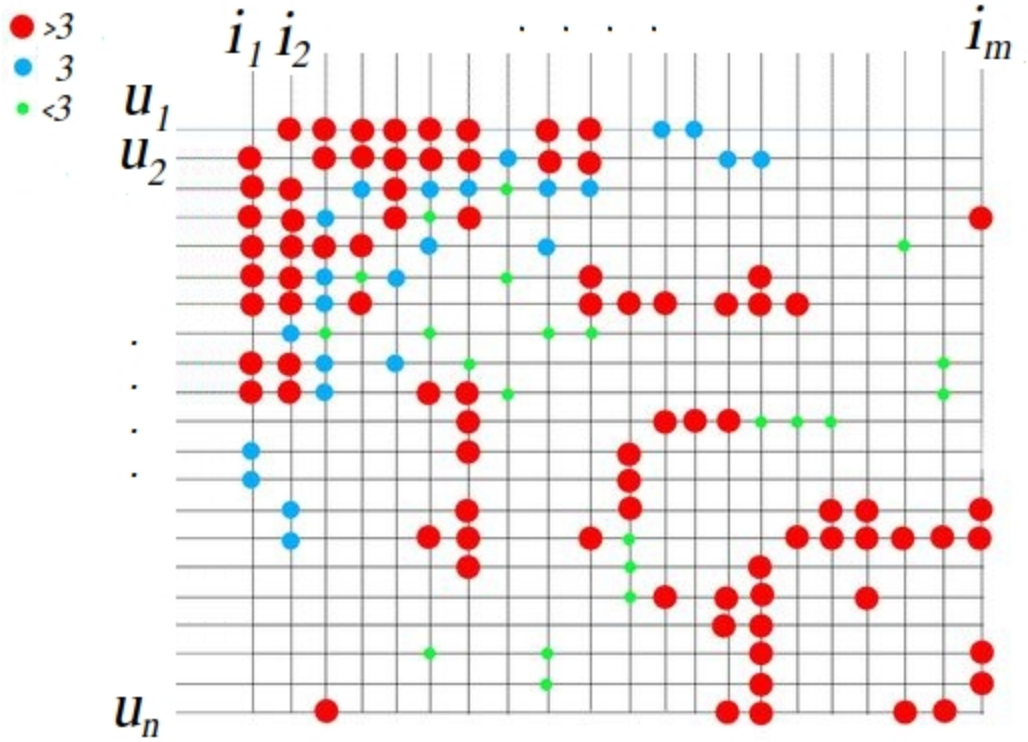
Webinar 07/12/23

WP 6 Objectives

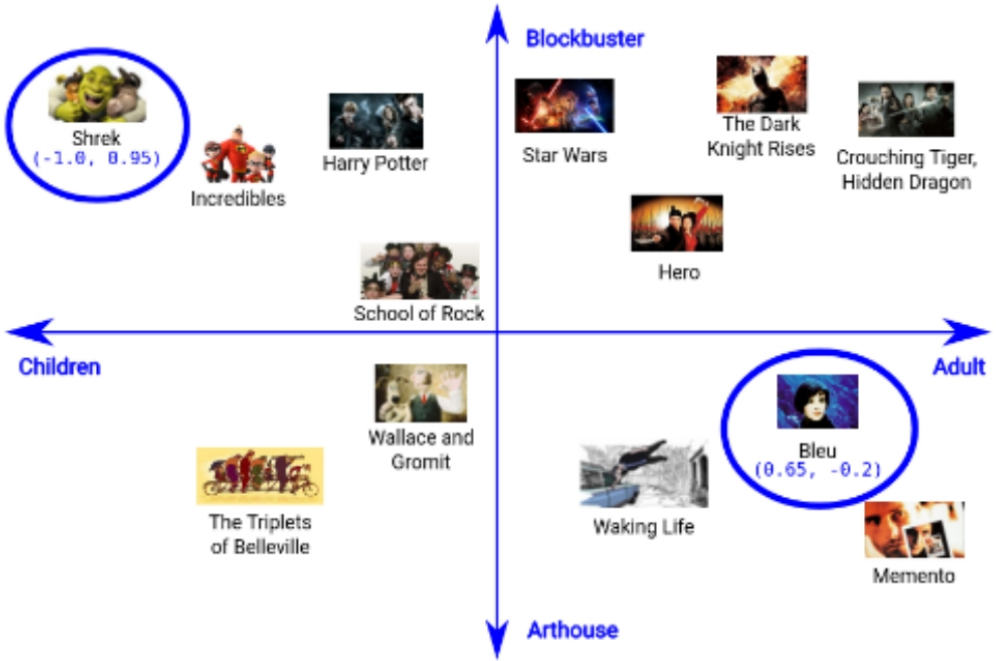
Objectives

- Design **recommender system** based on energy behavioural data obtained from surveys.
  - **Suggest intervention** that leads to best energy saving behavior for a particular user.
- **Analyse** user behavior and come up with **suitable suggestion** towards a green energy shift.
  - **Identify the intervention** type does a particular group of user best respond to.⚠
  - **Identify suitable channel** for reaching out to the end-user.⚠
- Utilize **state-of-the-art methods** for learning from data.

Recommendation System: Survey Input

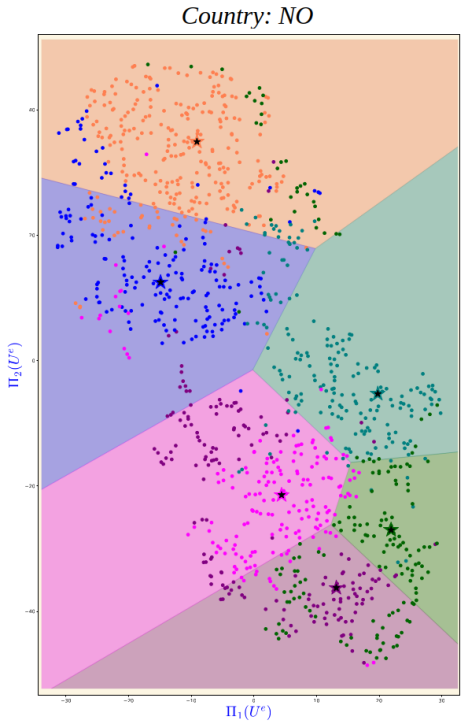


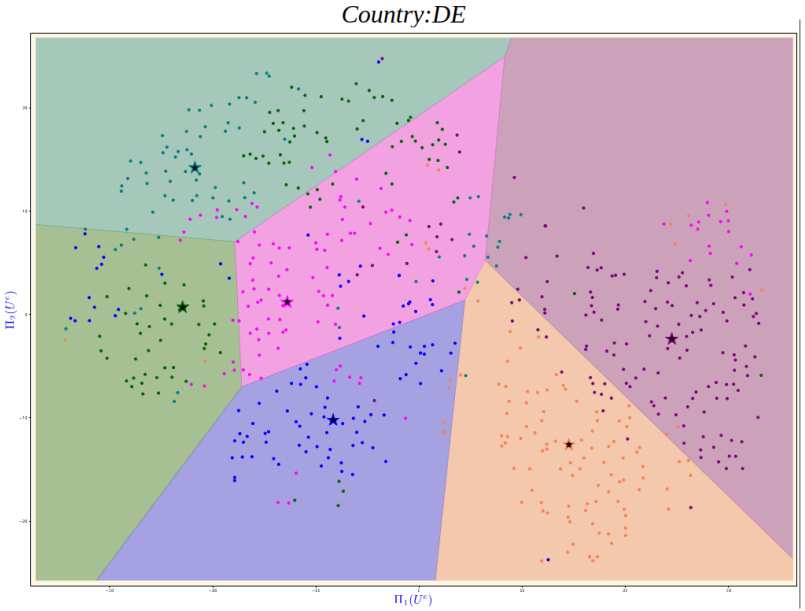
Recommendation System: Embedding vectors

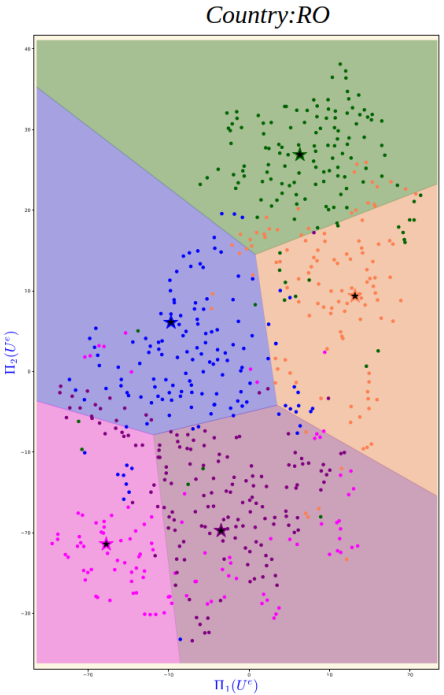


Results

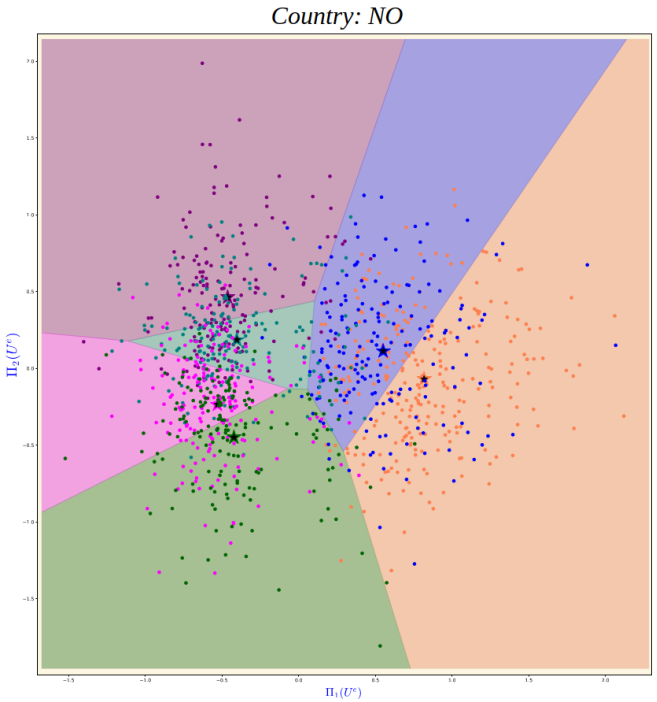
Behavior groups in NO, DE, RO (1)

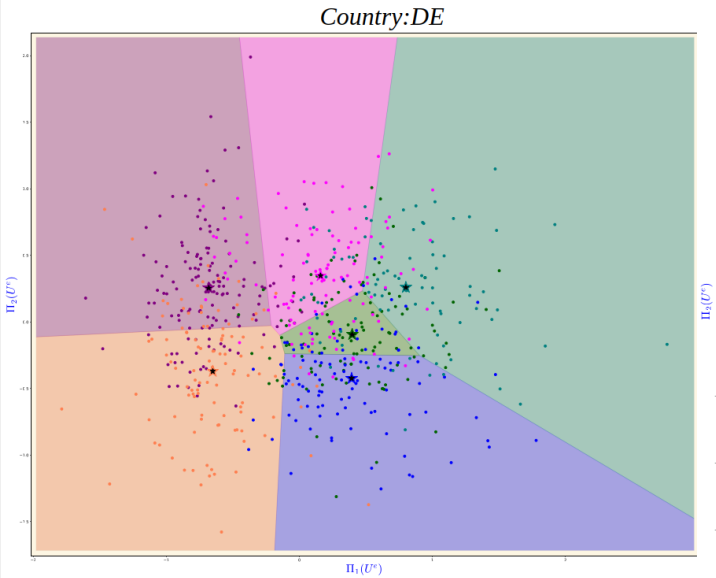


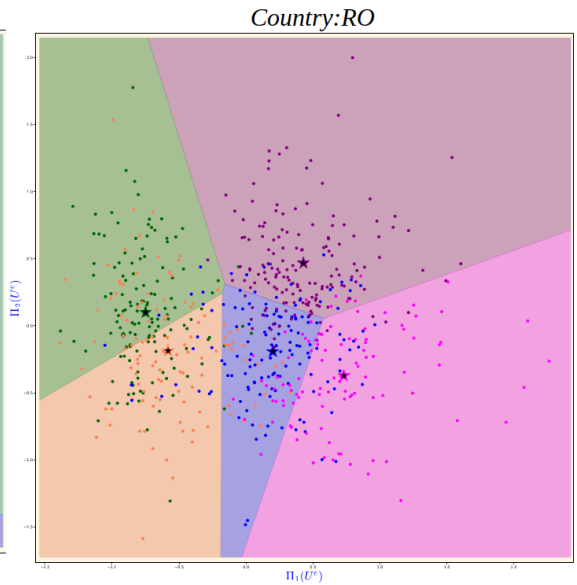




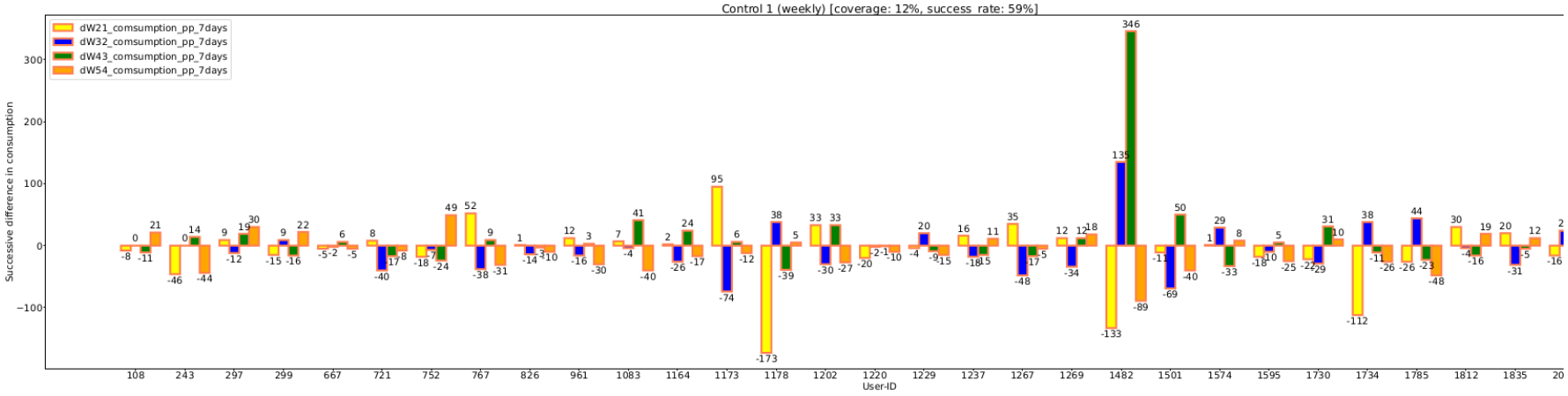
Behavior groups in NO, DE, RO (2)



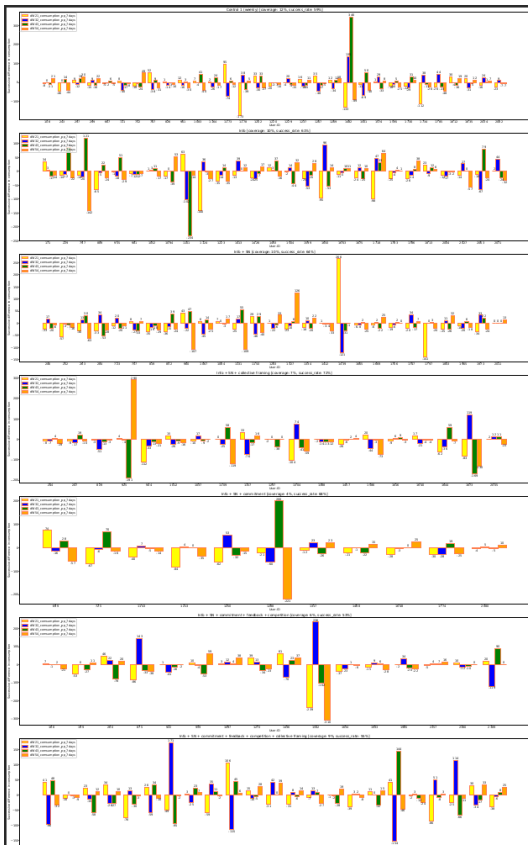


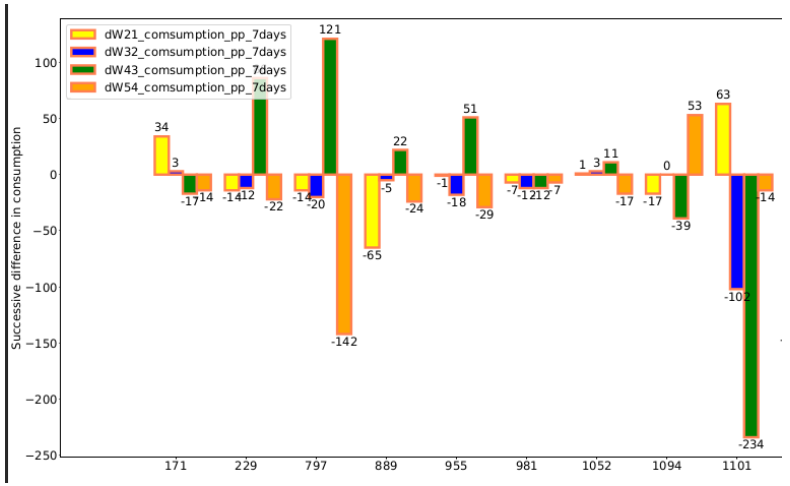


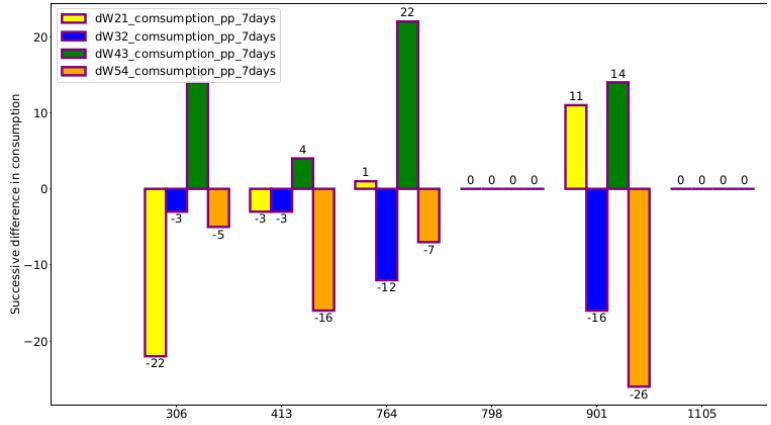
Stratification of interventions



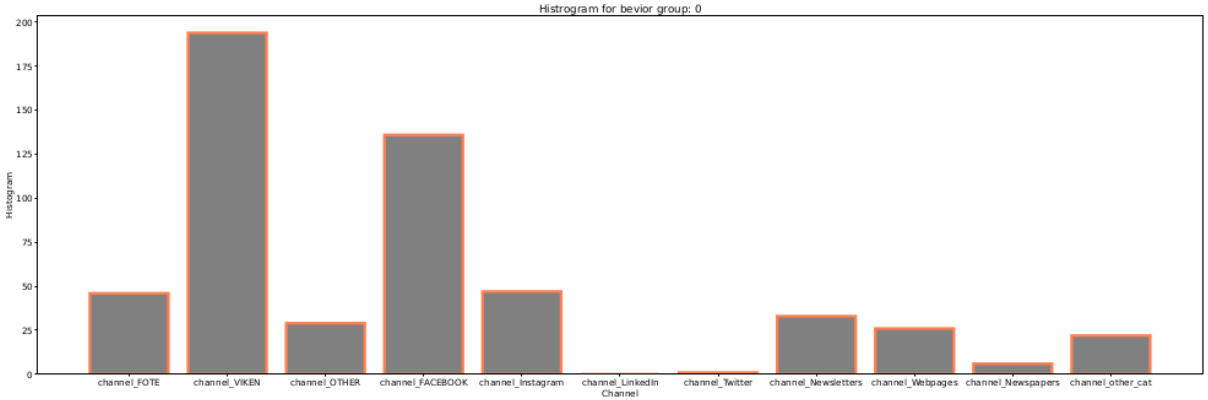
Stratification summary

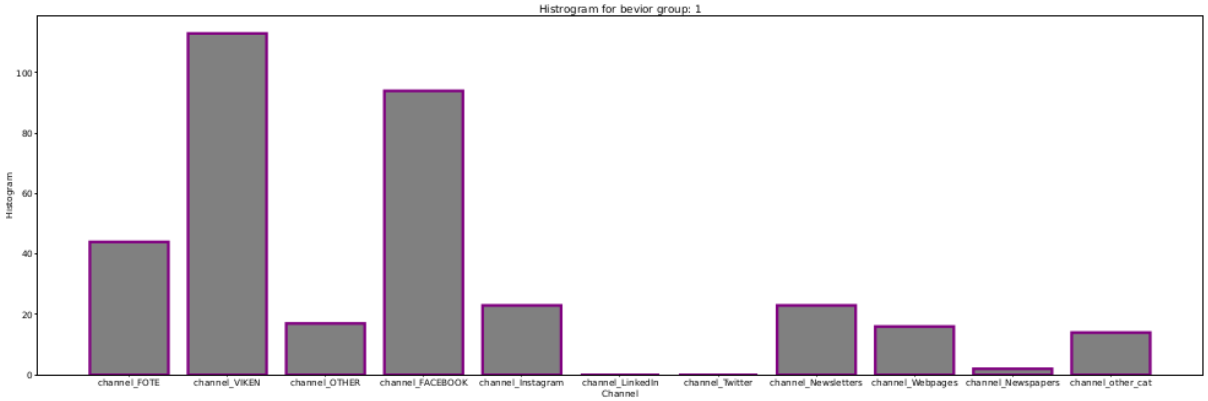






Stratification of channels





Intervention types

- **Feedback on own consumption**; is based on providing feedback to participants on their past and current behaviour, specifically their electricity consumption.
- **Social norms**; are based on providing participants with information about the behaviour of other people and about the socially acceptable standards of behaviour.
- **Information including Simplification;** is based on providing participants with information for example concerning behaviours that lead to energy savings.
- **Monetary incentives**; are based on to what degree people are motivated by financial considerations in the context of energy-related behaviours.
- **Commitment;** here participants are asked to commit to future behaviours or specific behavioural goals that are related to reducing energy consumption and other sustainable behaviours.
- **Competition;** is based on setting up conditions that introduce a contest where participants with the best performance are awarded a prize.
- **Collective vs. individual framing;** both matter for energy-related decisions, but depending on the behavioural context and target audience the effect might vary.

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Stratification summary (NO)

grp	intervention	Coverage %	success_rate %	channel
0	Info + SN + collective framing	7	72	VIKEN, FACEBOOK, FOTE
	Info + SN + commitment	4	68	
	Info + feedback	5	66	
1	Info + SN + commitment + feedback + competition + collective framing	8	79	VIKEN, FACEBOOK, FOTE
	Info + commitment	10	79	
	Info + SN + commitment + feedback + competition	11	78	
2	Info + SN + collective framing	4	72	VIKEN, FACEBOOK, FOTE
	Info + SN + commitment + feedback + competition	9	69	
	Info + feedback	7	65	
3	Info + feedback + competition + collective framing	8	79	VIKEN, FACEBOOK, FOTE
	Control 2 (start-end)	10	77	
	Info + SN	4	71	
4	Info + feedback	3	92	VIKEN, FACEBOOK, FOTE
	Info + commitment	5	83	
	Control 1 (weekly)	5	78	
5	Info + feedback + competition	8	79	VIKEN, FACEBOOK, FOTE
	Info + feedback	6	78	
	Control 2 (start-end)	9	77	

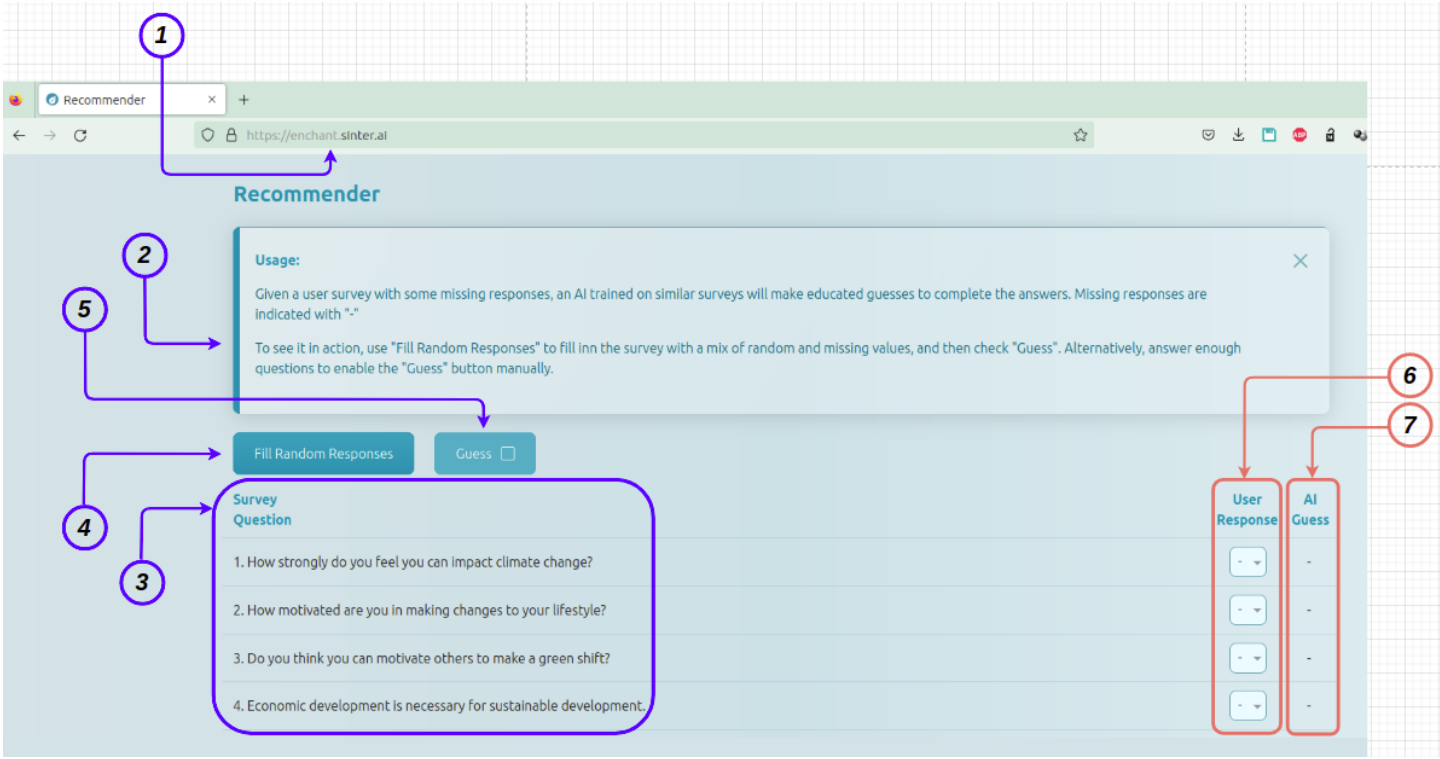
Stratification summary (DE)

grp	intervention	Coverage %	success_rate %	channel
0	Control 2 (start-end)	15	78	BADENOVA, Bills, Newsletters
	Info + SN + commitment	5	75	
	Info + feedback	4	75	
1	Control 2 (start-end)	13	80	BADENOVA, Bills, Newsletters
	Info + SN + commitment	6	75	
	Info + commitment	8	75	
2	Info + SN + collective framing	8	72	BADENOVA, Bills, Newsletters
	Info + SN + commitment + feedback + competition	12	69	
	Info + SN + commitment	7	68	
3	Info + feedback + competition	4	69	BADENOVA, Bills, Newsletters
	Control 1 (weekly)	16	67	
	Info + SN + commitment + feedback + competition	11	67	
4	Control 2 (start-end)	4	81	BADENOVA, Bills, Newsletters
	Info + feedback + competition + collective framing	6	79	
	Info + feedback	7	75	
5	Info	4	75	BADENOVA, Bills, Newsletters
	Info + collective framing	8	68	
	Info + SN	11	67	

Stratification summary (RO)

grp	intervention	Coverage %	success_rate %	channel
0	Control 2 (start-end)	23	90	MUNICIPALITY, FACEBOOK, OTHERS
	Info + SN + commitment + feedback + competition	13	63	
	Info + collective framing	5	63	
1	Control 1 (weekly)	12	71	FACEBOOK, MUNICIPALITY, OTHERS
	Info + feedback + competition	10	66	
	Info + collective framing	17	62	
2	Control 2 (start-end)	3	69	MUNICIPALITY, FACEBOOK, OTHERS
	Info	9	65	
	Info + collective framing	12	63	
3	Control 2 (start-end)	32	80	FACEBOOK, MUNICIPALITY, OTHERS
	Info + SN + commitment + feedback + competition	8	73	
	Info + commitment	15	73	
4	Info + SN + commitment + feedback + competition+ collective framing	14	73	MUNICIPALITY, FACEBOOK, OTHERS
	Info + SN + commitment + feedback + competition	9	67	
	Info + commitment	17	63	

Energy Wizard: Design



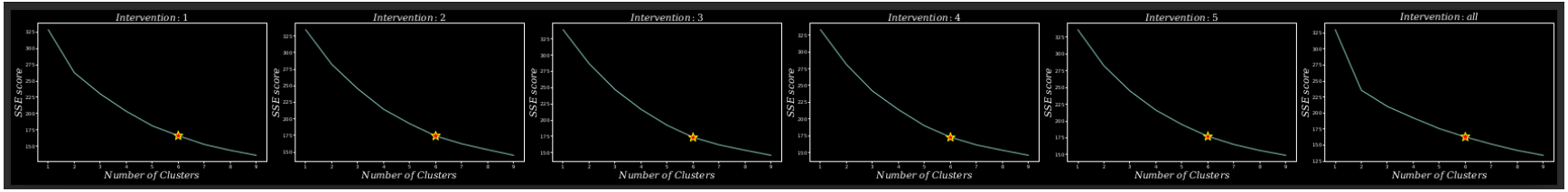
http://enchant.sinter.ai

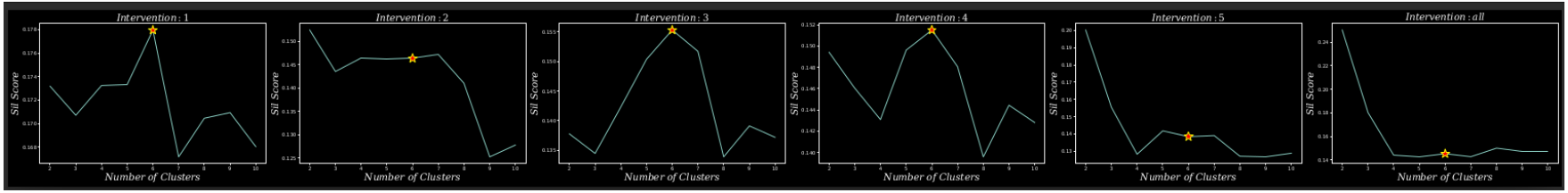
Platform for people

- Mapping the question to attributes in surveys
- Minimize the no. of questions to answer
- Visualize their behavioral stance

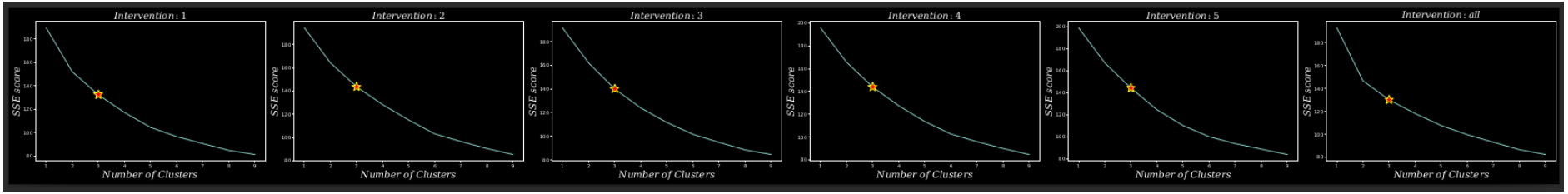
Thank you

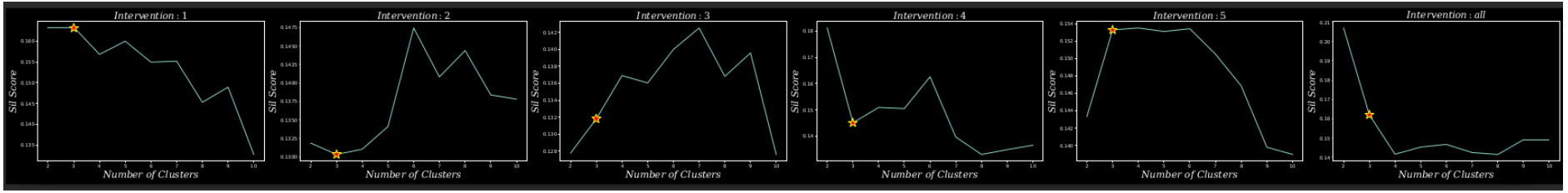
Cluster detection (NO)



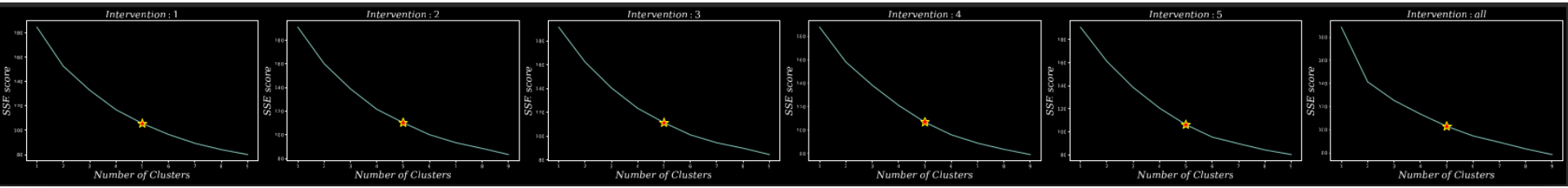


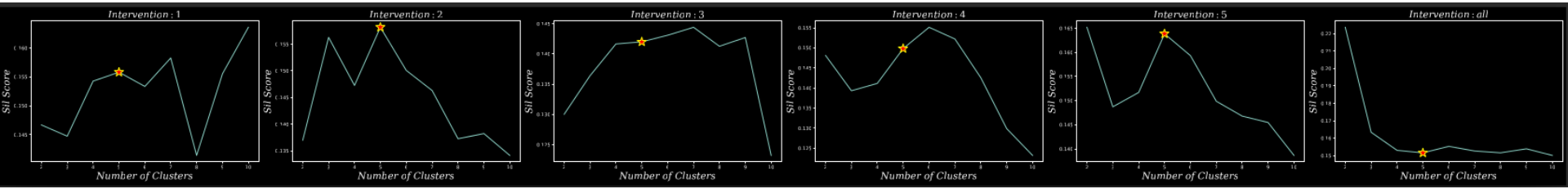
Cluster detection (DE)



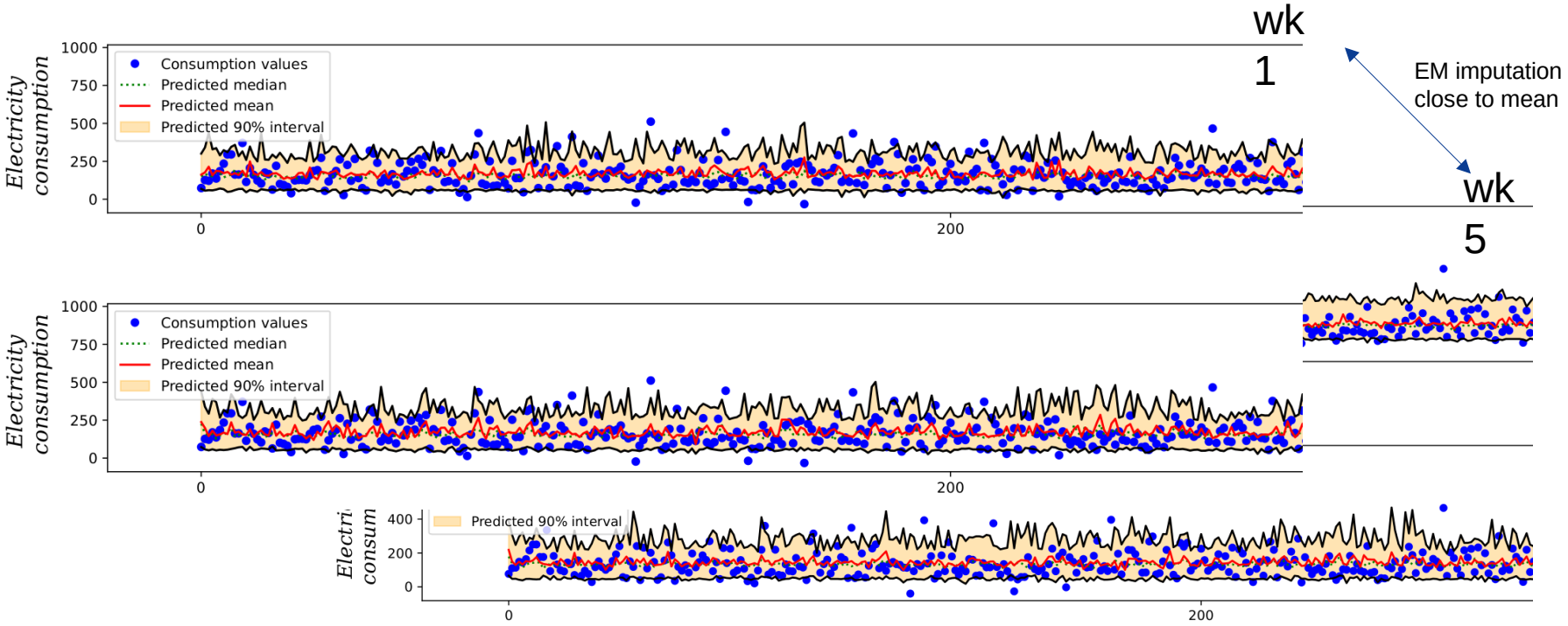


Cluster detection (RO)





Regression

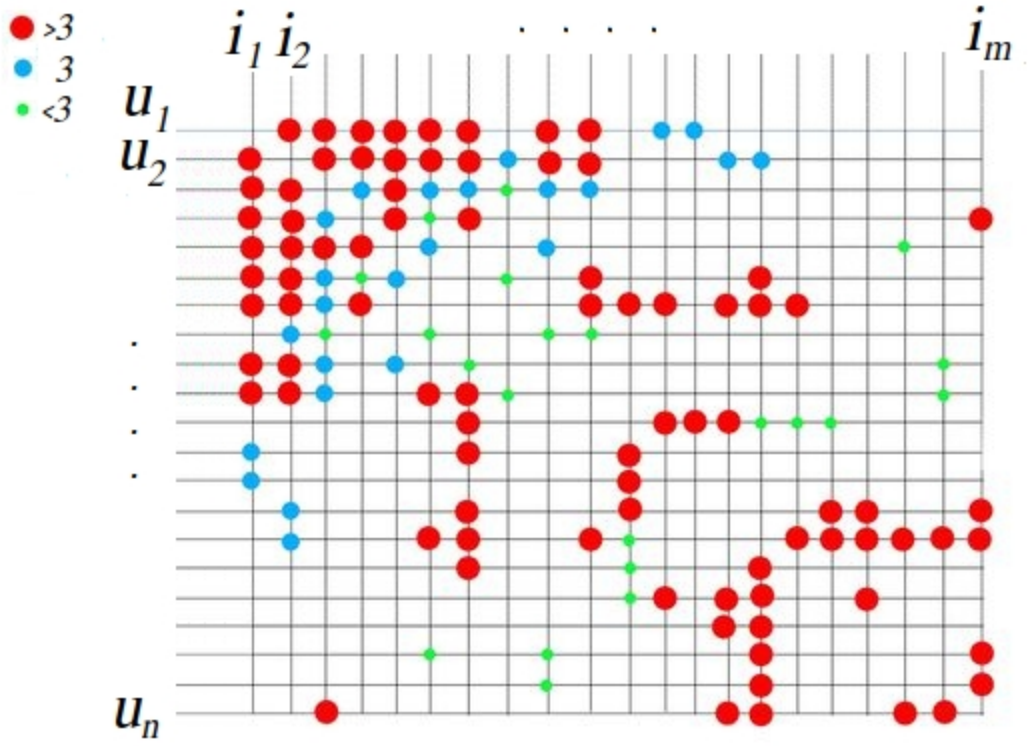

wk
1
EM imputation
close to mean
wk
5
Electricity consumption
Consumption values
Predicted median
Predicted mean
Predicted 90% interval
1000
750
500
250
0
0
200
400

Input from social scientists

- Mapping the question to attributes in surveys
- Check if the results are making sense

Recommender system

RS: Overview (Input)



RS: Overview (Methodology)

- Combines the user’s own preferences with those learned from a group
  - **Content based filtering**
  - **Collaborative filtering**

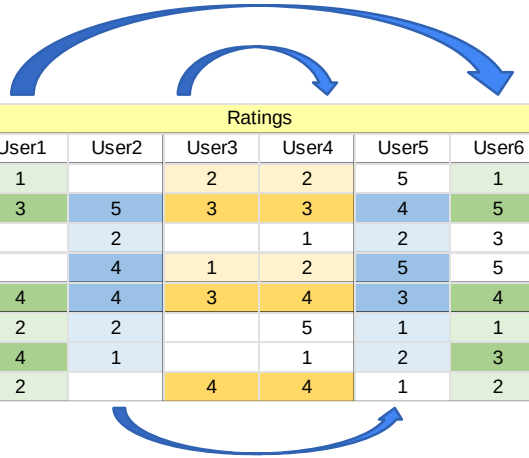
Content based filtering

- Content-Based recommender system tries to guess the features or behaviour of a user given the item's features, he/she reacts positively to.
- Content-based filtering is independent of other users' data when making recommendations to a user.

Genre (Features/Attributes)							Ratings					
Action	Comedy	Horror	Sci-fi	Fantasy	Mystery	Movies	User1	User2	User3	User4	User5	User6
Yes	No	No	No	No	No	Item1	1		2	2	5	1
No	No	Yes	No	No	No	Item2	3	5	3	3	4	5
Yes	No	No	No	No	No	Item3		2		1	2	3
No	Yes	No	No	No	No	Item4		4	1	2	5	5
No	No	Yes	No	No	No	Item5	4	4	3	4	3	4
No	No	No	No	No	Yes	Item6	2	2		5	1	1
No	No	No	Yes	No	No	Item7	4	1		1	2	3
No	No	No	No	Yes	No	Item8	2		4	4	1	2
No	No	Yes	No	No	No	Item9	??					

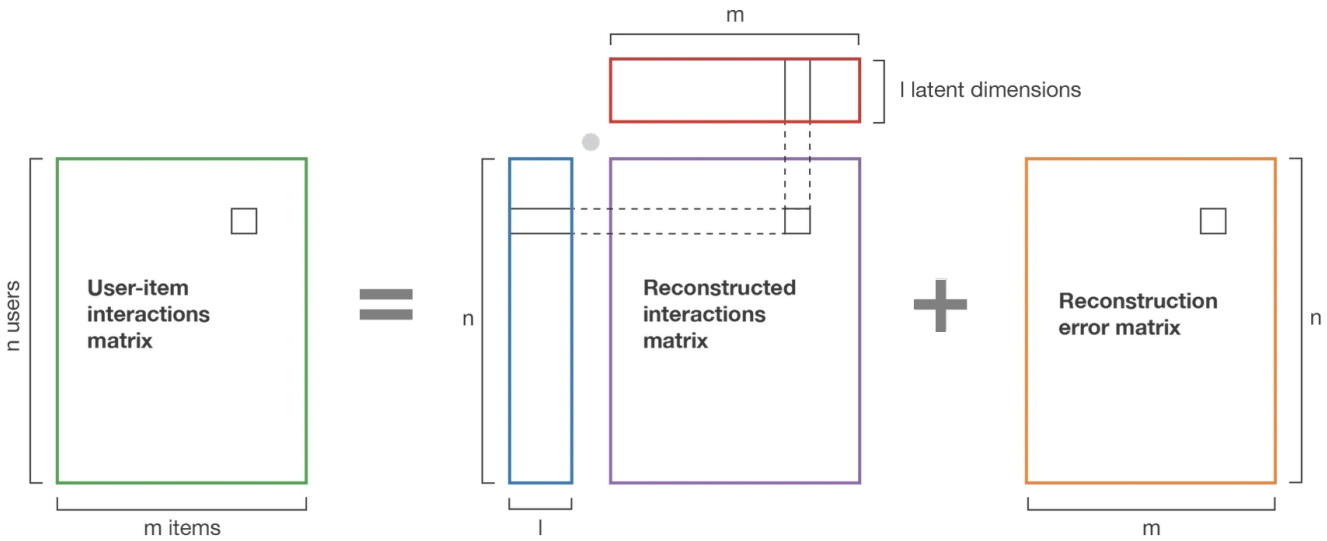
Collaborative filtering

- Collaborative filtering recommender system compares the likes of users to form relative matches. It recommends items based on similarities shared among users.
- Collaborative filtering is independent of the features of the items to be given.



Genre (Features/Attributes)							Ratings					
Action	Comedy	Horror	Sci-fi	Fantasy	Mystery	Movies	User1	User2	User3	User4	User5	User6
Yes	No	No	No	No	No	Item1	1		2	2	5	1
No	No	Yes	No	No	No	Item2	3	5	3	3	4	5
Yes	No	No	No	No	No	Item3		2		1	2	3
No	Yes	No	No	No	No	Item4		4	1	2	5	5
No	No	Yes	No	No	No	Item5	4	4	3	4	3	4
No	No	No	No	No	Yes	Item6	2	2		5	1	1
No	No	No	Yes	No	No	Item7	4	1		1	2	3
No	No	No	No	Yes	No	Item8	2		4	4	1	2

Algorithm of RecoSys



The user-item interations matrix is assumed to be equal to...

... the dot product of a user matrix and a transposed item matrix...

... plus some reconstruction error

$$M^{n \times m} = U^{n \times l} \cdot (I^{m \times l})^T$$