

# Modeling and Exploiting Goal and Action Associations for Recommendations

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## SUMMARY

Considering the fact that in real life users do their selections with certain goals in mind, we recommend items (or actions) that help users fulfilling their intended goals using their past only as a way of identifying goals of interest.

## DESIRED QUALITIES OF MODERN RECOMMENDERS

- ❖ Novelty (not being produced with existing methods )
- ❖ Serendipity (not reproducing the past)
- ❖ Not monopolization of certain items
- ❖ Diversity

User Commitment and Loyalty vs. Short-term System Gain

## GOAL-BASED RECOMMENDATION

### CONSIDERING

A: A set of actions

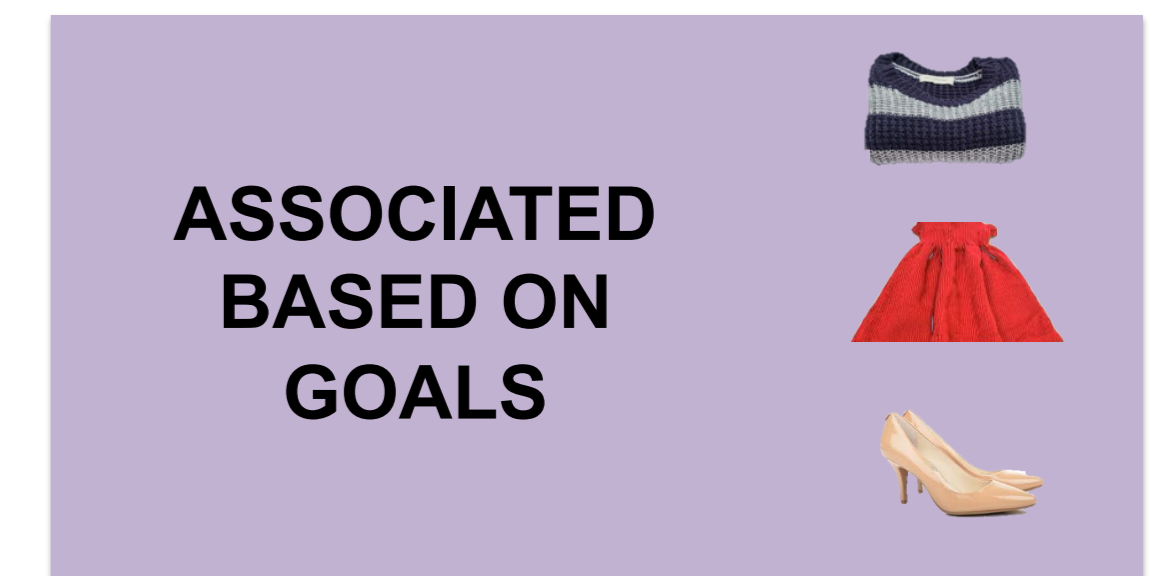
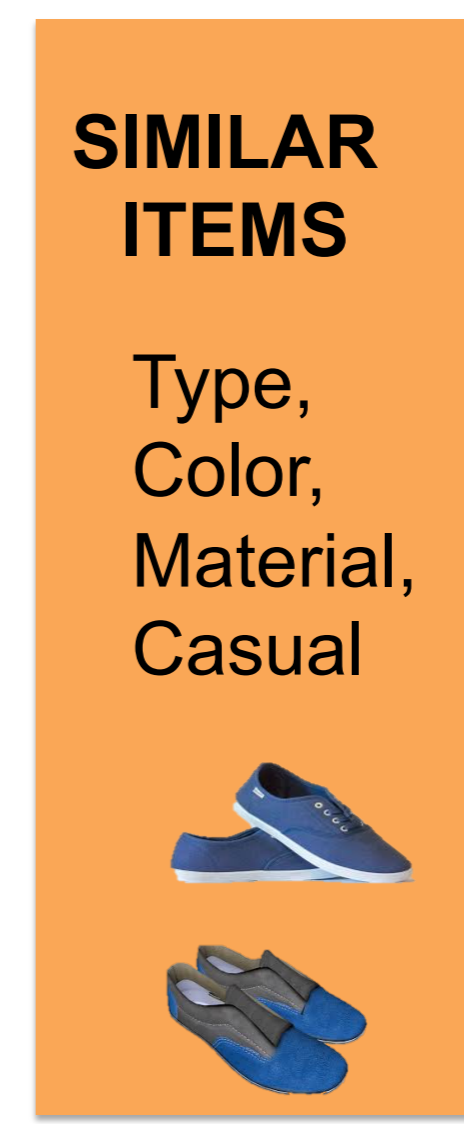
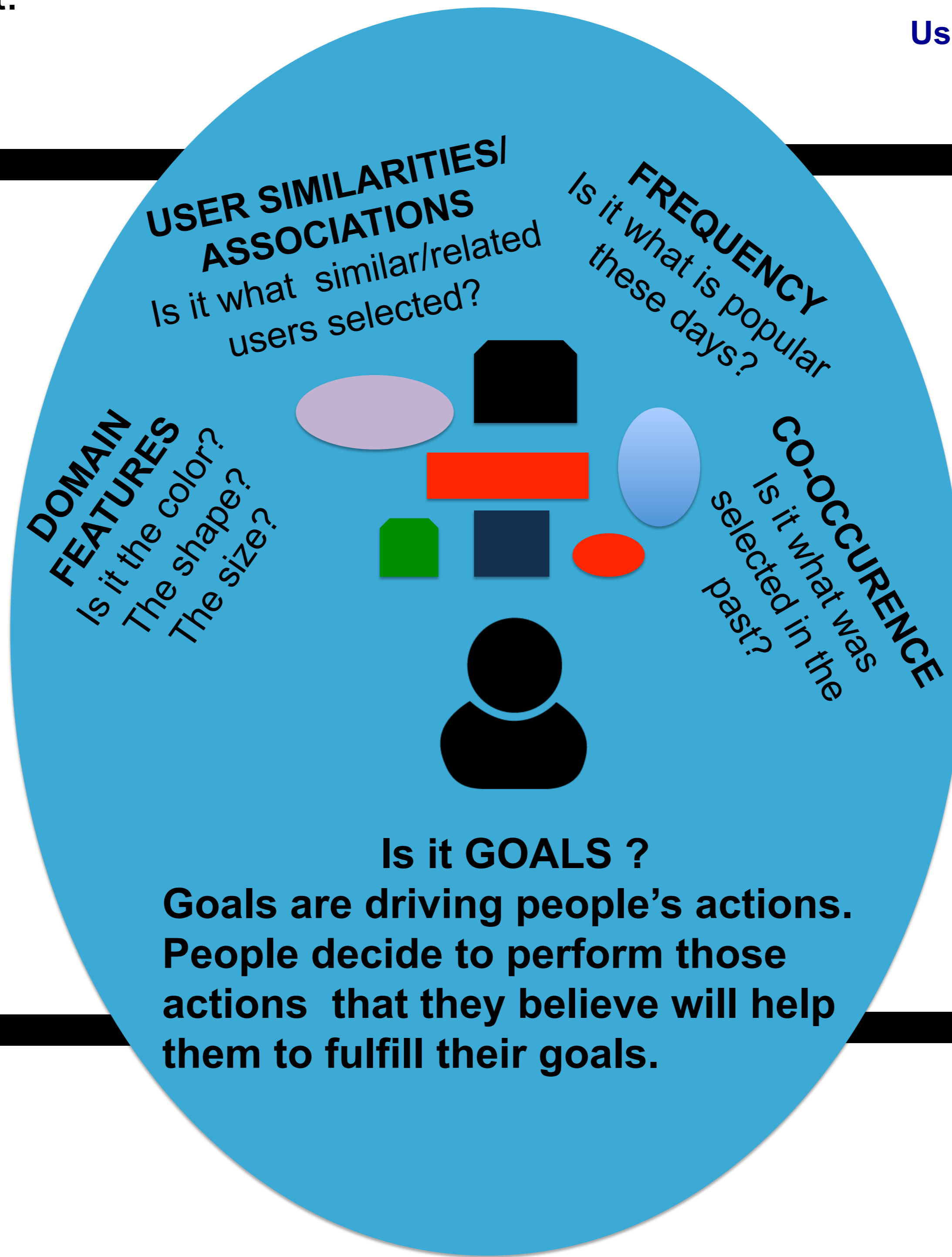
G: A set of goals

IS: Goal Implementation set, where an implementation is  $\langle g, A \rangle, g \in G, A \in 2^A$

H: the actions that the user has already performed

### TO FORM A LIST OF RECOMMENDATION ITEMS BASED ON GOALS

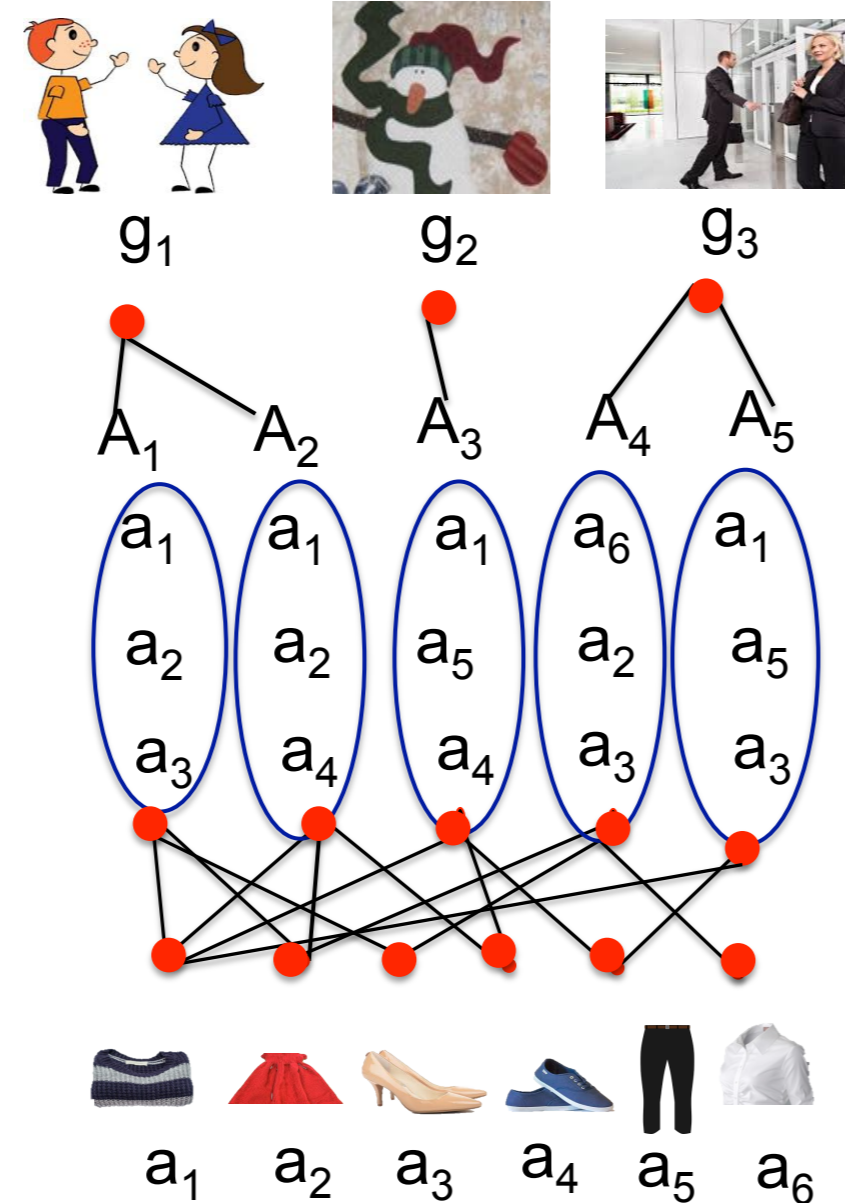
- FIND which GOALS may be of interest
- FIND which ACTIONS may be of interest
- SET PRIORITIES on the GOALS
- QUANTIFY the benefit of each candidate ACTION in conjunction with the intended goals and the actions in the user activity H



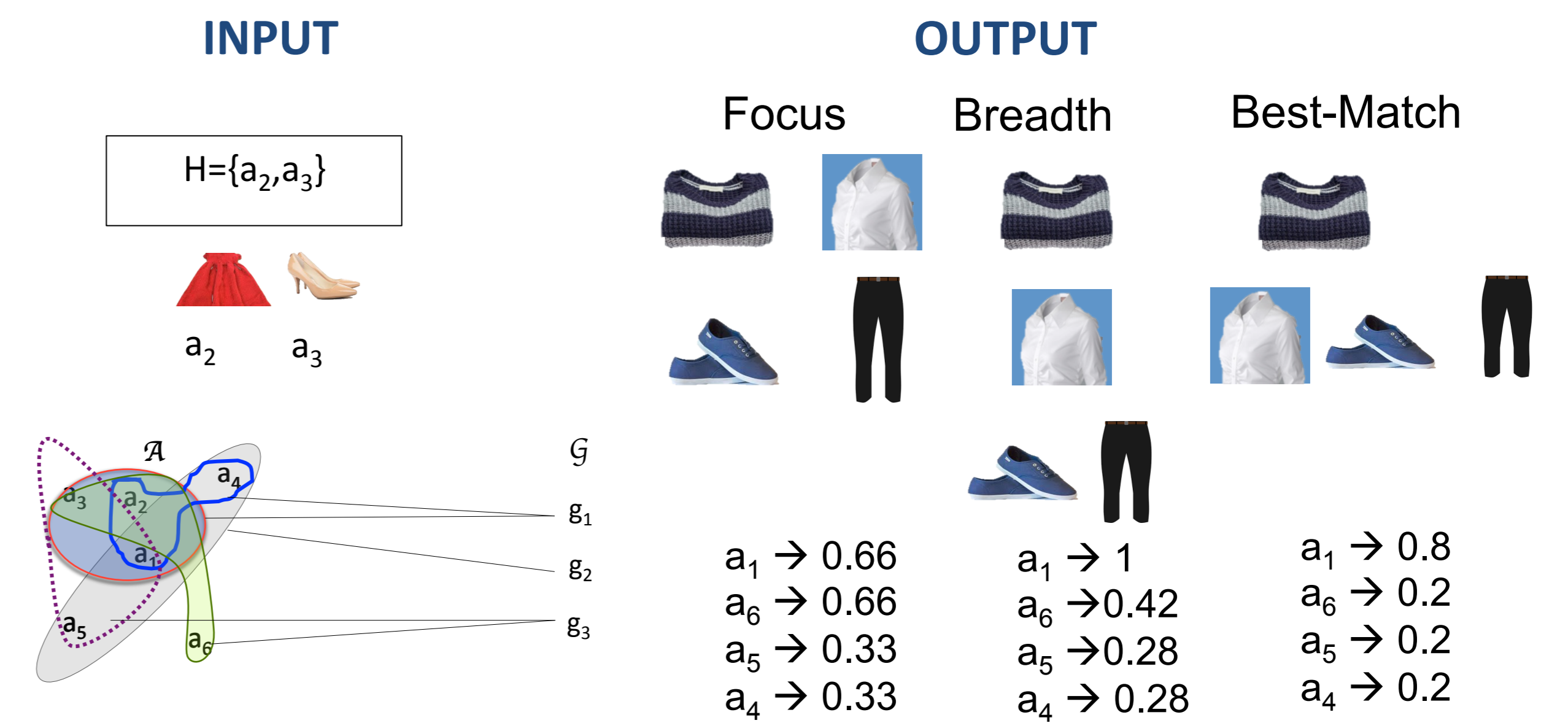
## GOAL MODEL

### Associations among Actions and Goals through Action Sets

Examples of item Collections	In what type of goals do they contribute?	Where can we find this type of information?
Food items	Nutrition goals	Diet sites
	Food recipes	Recipe Web Sites/Books
Courses	Specializations/ Degrees	Online learning platforms
Skills	Job positions	Online Professional Networks
Real-life actions	Life goals	Web site success stories
Clothing items	Everyday activities	Fashion platforms



## GOAL PRIORITY – ACTION RANKING MECHANISMS



## EVALUATION: QUALITY OF RECOMMENDED ITEMS

- Low frequency in goal implementations
- Low frequency in past user activities
- Up to 70% completeness
- Low pairwise action similarity
- Overlapping: < ~2% with items in recommendation lists of standard recommendation techniques
- Negative Correlation with the top-20 most frequent actions in the user activities (Actions that do not reproduce the past)

## EVALUATION: SCALABILITY

Less than one sec even for 1M actions, 12M goal implementations

## REFERENCES

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- [4] Suhrid Balakrishnan. On-demand Set-based Recommendations. In ACM Recommender Systems (ACM RecSys '10). ACM, New York, NY, USA, pp 313-316.
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## FOCUS

Recommends actions that lead to the completion of one of the goals in the user goal space based on a single goal implementation

Completion: overlapping of the user activity with that of the goal implementation

- completeness: considering the total number of required actions
- closeness: considering the number of remaining required actions

## BREADTH

Recommends actions considering the benefit of each candidate action based on all the goal implementations that the specific action participates

Score of candidate action a:

$$\forall \langle g, A \rangle \text{ where } A \cap H \neq \emptyset, \text{ and } a \in A: \sum |A \cap H|$$

## BEST-MATCH

Recommends actions considering the whole goal space of the user, i.e., considering a goal-based user profile

- Represents every action as a vector in the user goal space
- Aggregates the representations of the actions in the user activity into a single vector
- Estimates proximity of the user profile with the candidate actions