RECOMMENDATION FOR NEW USERS WITH PARTIAL PREFERENCES BY INTEGRATING PRODUCT REVIEWS WITH STATIC SPECIFICATIONS

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MOTIVATION AND OUR IDEA

New user

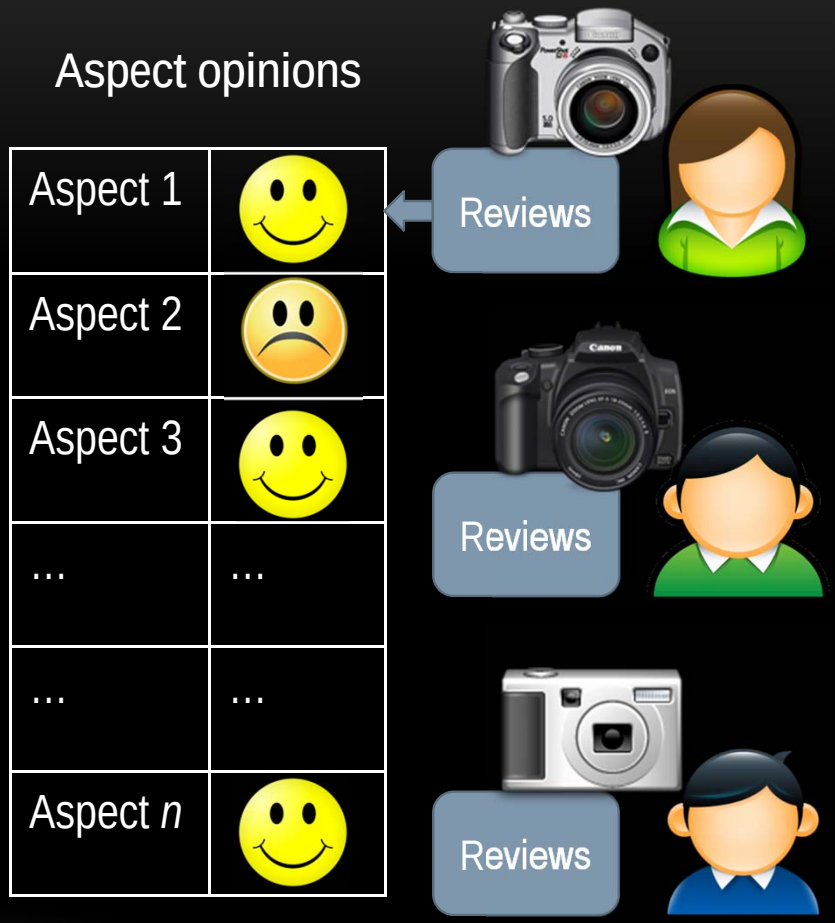
Preference elicitation

Related work

Attributes	Value preferences
Brand	Sony
Sensor resolution	?
Removable flash	?
Thickness	?
Price	<$300
Optical zoom	?
Screen size	?
Weight	<200g

How to estimate the user's preferences on un-stated attributes?

MOTIVATION AND OUR IDEA



Related work: few have fully exploited reviews for helping new users with partial preferences

MOTIVATION AND OUR IDEA

New user

Preferences elicitation

Attributes	Value preferences
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Removable flash	?
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Price	
Optical zoom	?
Screen size	?
Weight	<200g

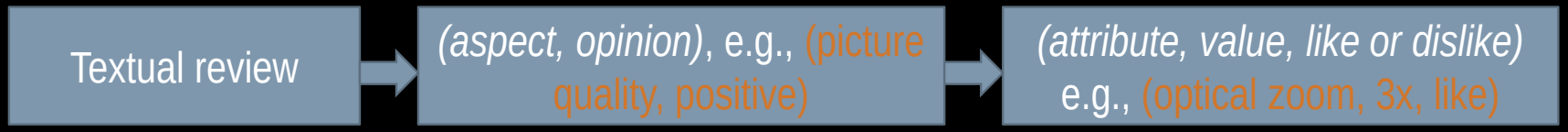
Aspect opinions	
Aspect 1	
Aspect 2	
…	…
Aspect *n*	

To bring reviewers' value preferences on attributes, for helping the new user

How to estimate the user's preferences on un-stated attributes?

RESEARCH QUESTIONS

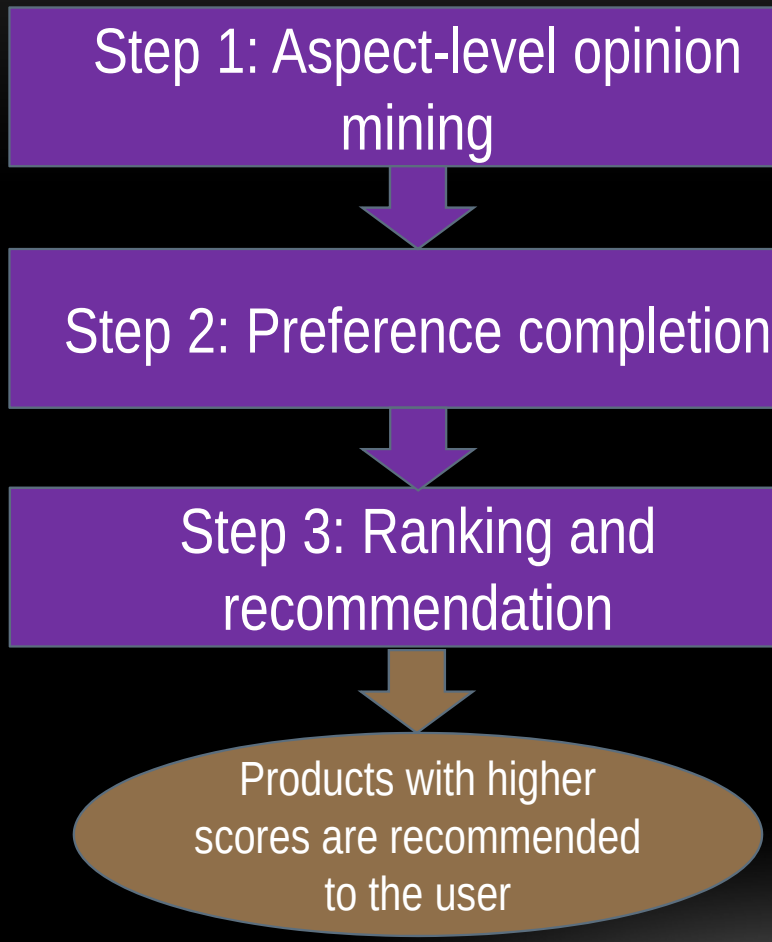
- *How to derive a reviewer's value preferences?*



- *How to incorporate reviewers' value preferences into completing the new user's preferences?*

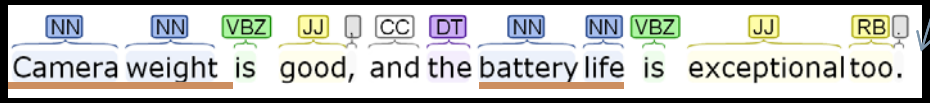
- CompleteRank*:* preference completion and ranking

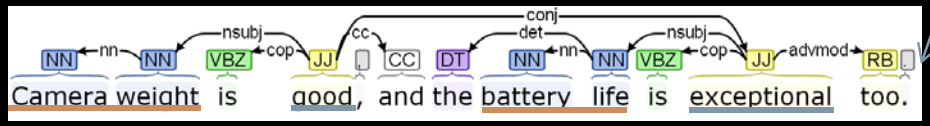
METHODOLOGY - COMPLETERANK



METHODOLOGY

Step 1: Aspect-level opinion mining





Good => *positive*
Exceptional => positive

Extract frequent nouns and noun phrases as aspect candidates via Part-Of-Speech (POS) tagger

Identify opinion words via syntactic dependency parser

Group synonymous aspects via WordNet

Identify the opinion's sentiment polarity by SentiWordNet

Map the opinion to the attribute's static specification => *(attribute, value, like or dislike)*

METHODOLOGY

Step 1: Aspect-level opinion mining

Aspect	Attribute
Picture quality	Optical zoom, sensor resolution
Body	Thickness, height, width, screen size
Money, Price, Cost, …	Price
Weight, Pocket, Heavy, …	Weight
Battery life, Endurance, …	Battery life
…	…

(weight, 570g, like)
(battery life, 15 hours, like)
(price, $370, like)
(resolution, 20.3 megapixels, dislike)

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METHODOLOGY

Step 1: Aspect-level opinion mining

Step 2: Preference completion

User *u*'s preference on attribute *a*

Reviewer $\tilde{u}$'s preference on attribute *a*

Preference similarity

$$\overrightarrow{\bar{\phi}_{ua}} = \begin{cases} (\overrightarrow{\phi_{ua}} + \sum_{\tilde{u} \in N_u} \bar{s}_{u\tilde{u}} \overrightarrow{\tilde{\phi}_{\tilde{u}a}})/2, & \text{if } \phi_{ua} \text{ is not missing} \\ \sum_{\tilde{u} \in N_u} \bar{s}_{u\tilde{u}} \overrightarrow{\tilde{\phi}_{\tilde{u}a}}, & \text{otherwise} \end{cases},$$

John (a new buyer)

Partial preferences on attributes

Aspect opinions

Attributes' value preferences

Rebecca

...

Peter

Reviewers

Like-minded reviewers

John's stated preference on attribute sensor resolution → To adjust John's stated preference by Rebecca's and Peter's preferences on sensor resolution

John's missing preference on attribute screen → To complete John's missing preference by Rebecca's and Peter's preferences on screen

METHODOLOGY

Step 1: Aspect-level opinion mining

Step 2: Preference completion

Step 3: Ranking and recommendation

Products with higher scores are recommended to the user

The matching score of product *p* according to the buyer *u*'s preferences

$$M_{up} = \frac{1}{k} \sum_{a=1}^{k} match_w(\bar{\phi}_{ua}, x_{pa})$$

Inner product of the buyer *u*'s preference vector and the product *p*'s vector on the attribute *a*

EXPERIMENT SETUP

A previous user study

57 users

Full preferences on 8 attributes

?

Target choice

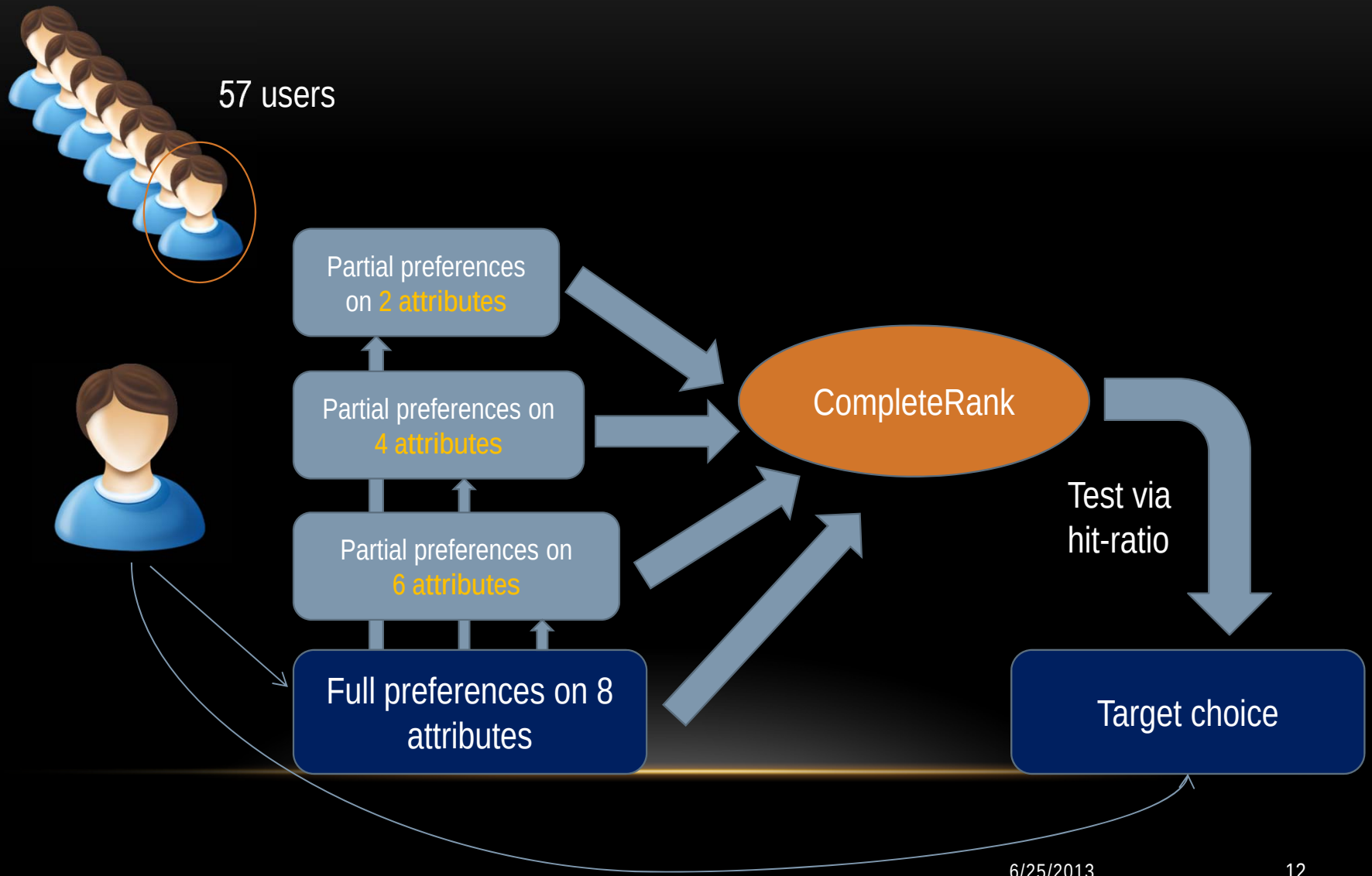
64 digital cameras

Reviewers' value preferences

4904 reviews

amazon.com and you're done.™

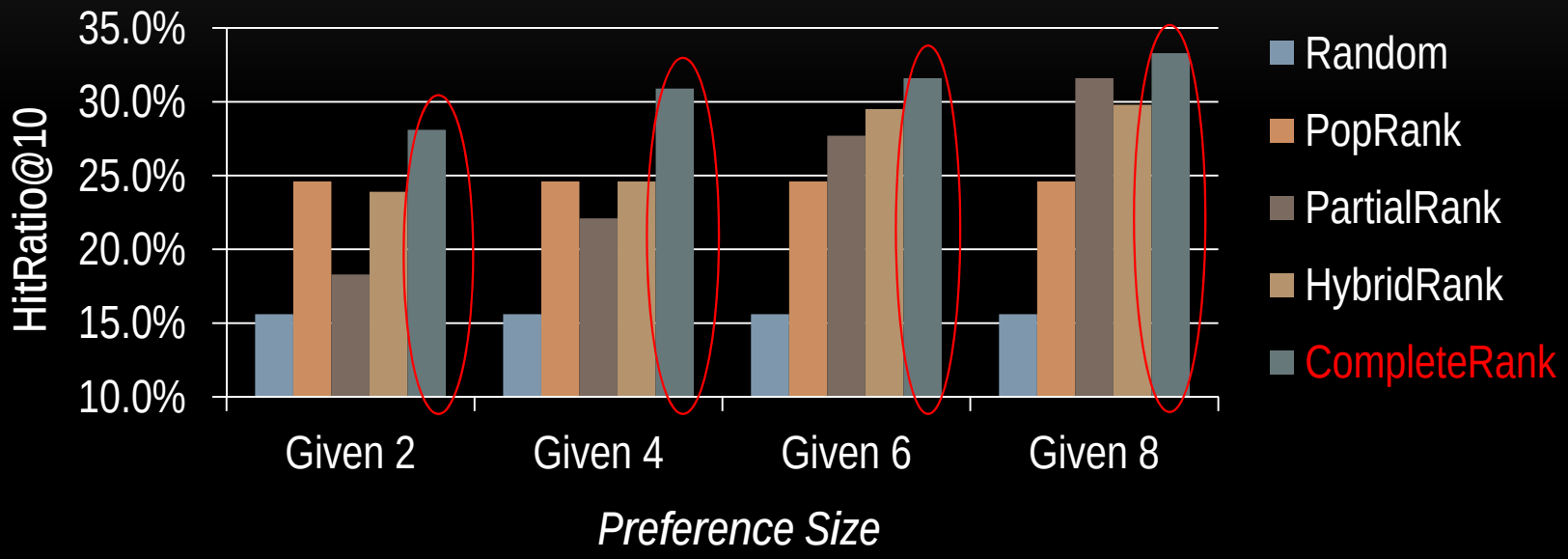
LEAVE-ONE-OUT EVALUATION



COMPARED METHODS

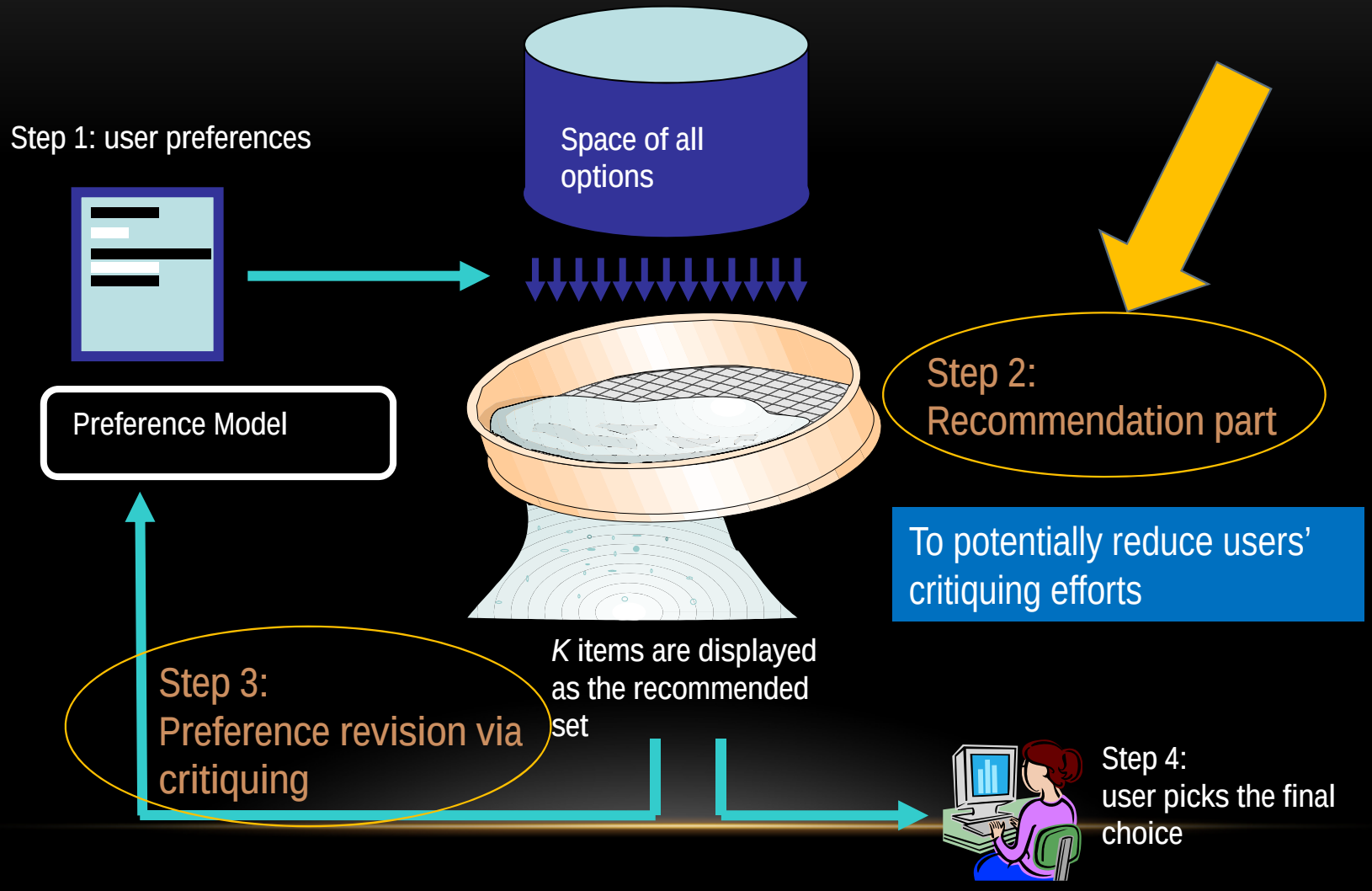
- Random: the probability that the user's target choice appears in top 10 is 0.1563 (10/64)
- PopRank: rank all products by their popularity among reviewers
- PartialRank: match a product to the user's stated (partial) preferences on attributes
- HybridRank: rank products by combining reviewers' opinions and products' matching scores to the user's stated preferences

RESULTS



- CompleteRank is better than all baselines, especially for the buyers with partial preferences
- The usefulness of incorporating online review data for augmenting new-user recommendation
- The usefulness of deriving reviewers' value preferences on the product's attributes

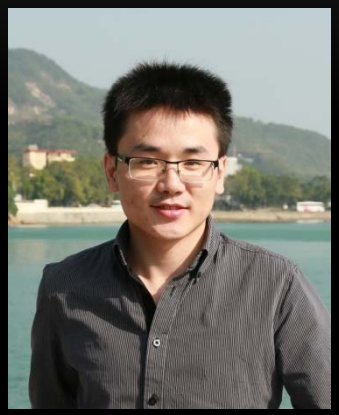
PRACTICAL IMPLICATIONS – CRITIQUING-BASED RECOMMENDER SYSTEMS



FUTURE WORK

1. To learn reviewers' weight preferences on attributes
2. To automatically map aspects to attributes
3. To integrate the algorithm into critiquing-based recommender systems and conduct user evaluations

THANKS!



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