



# Towards User-Adaptive Visualizations

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Graphisme, animation et nouveaux médias



**Long-Term Goal:** Designing user-adaptive information visualization systems that adapt to the specific needs of each viewer.

**Impact of Individual Differences:** Do user characteristics impact Infoviz effectiveness?

**Eye Tracking as an Input Source:** Can gaze data help in predicting a viewer's needs when using a visualization?

## USER-ADAPTIVE VISUALIZATIONS

### Input sources

User behavioral data during visualization processing

- Eye tracking
- Interface actions

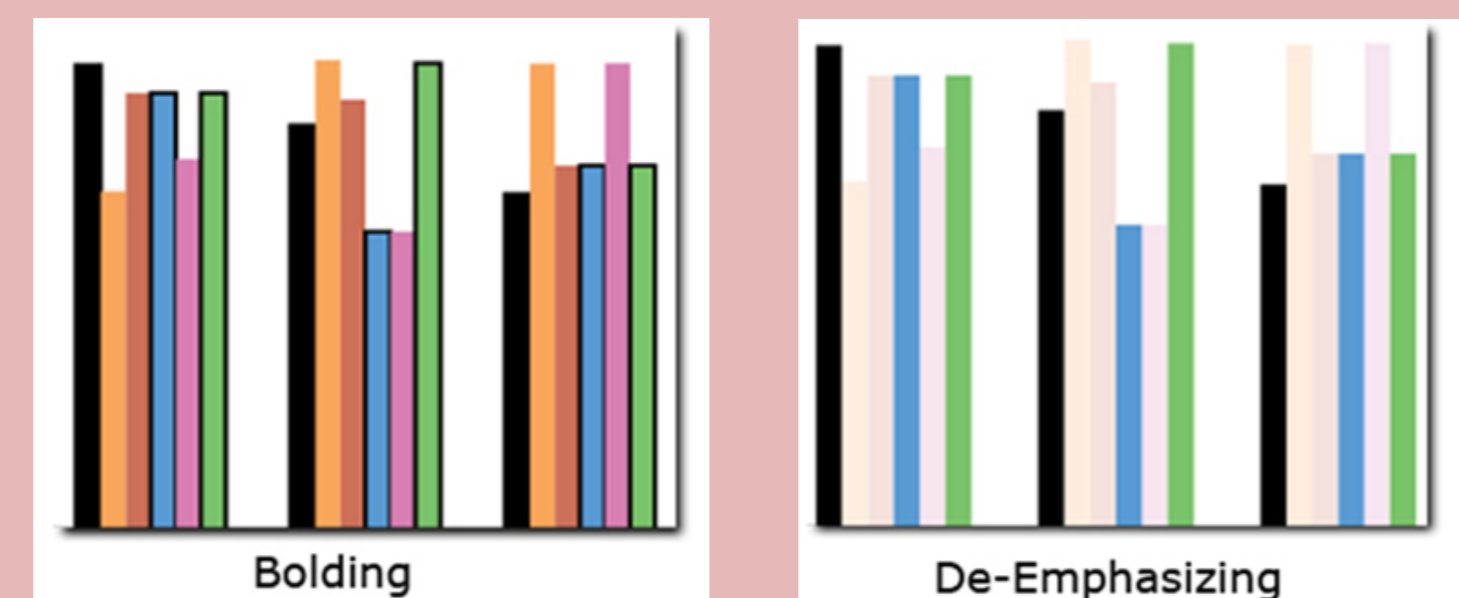
### User states/traits modeled

Real time detection of user traits/states that indicate need of help:

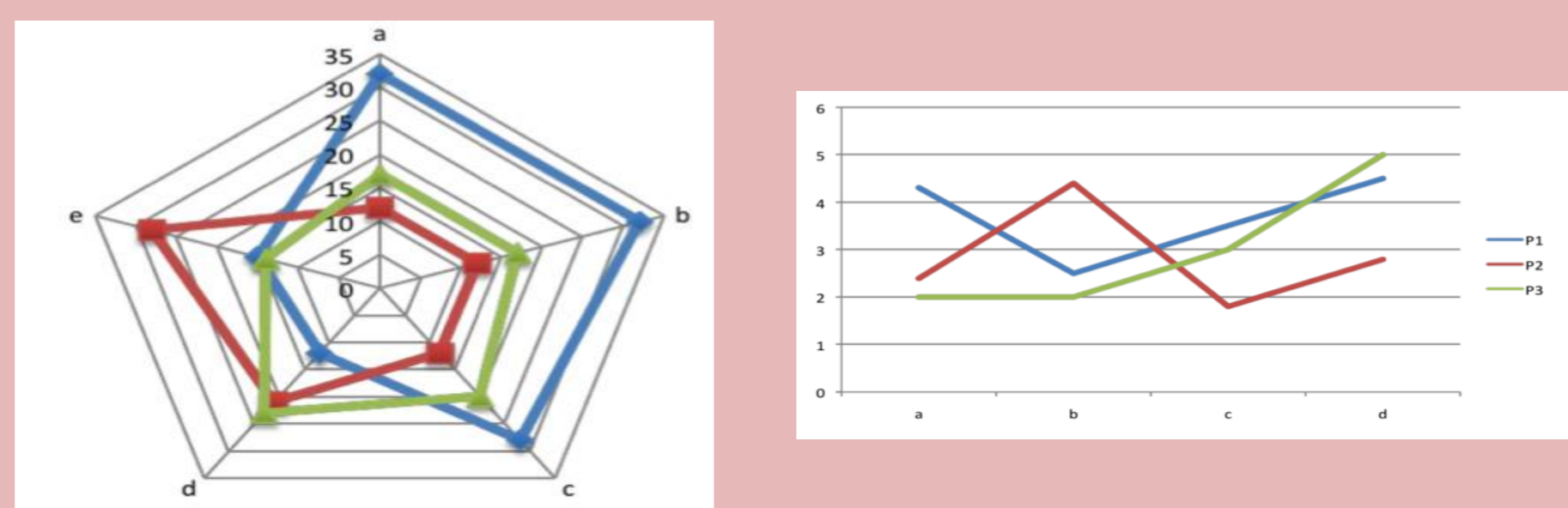
- Relevant cognitive skills (e.g., perceptual speed)
- Expertise
- Confusion
- High cognitive load

### Forms of adaptation

- Adaptive interventions on a given visualization

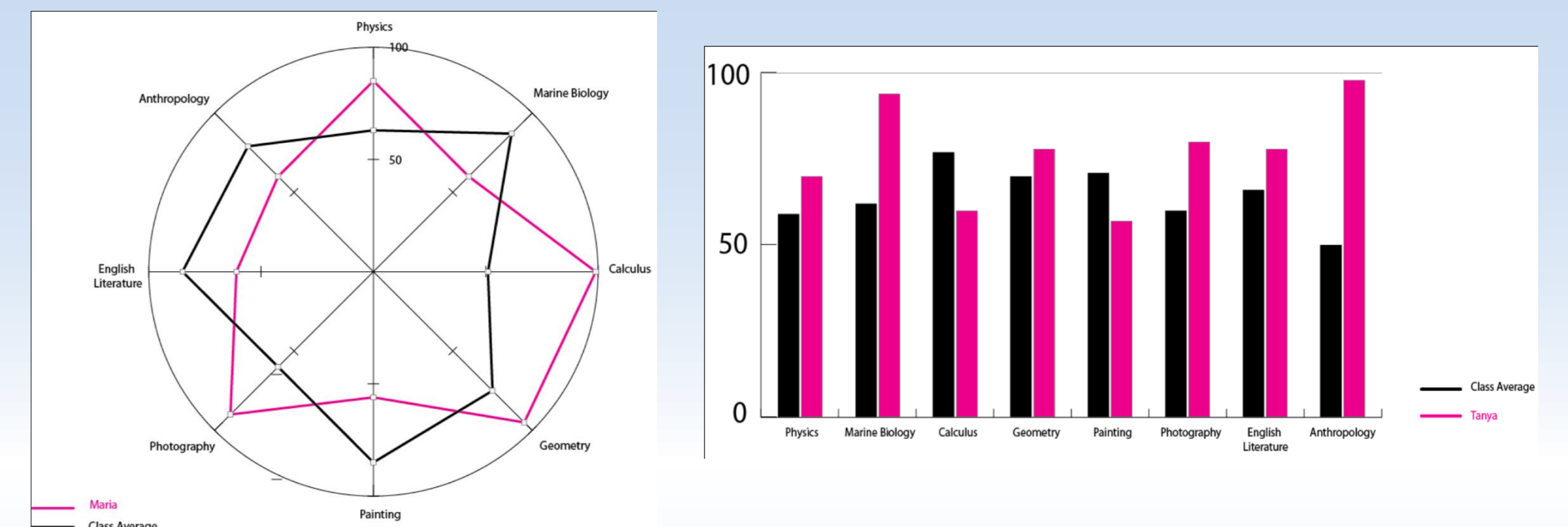


- Recommend a more suitable visualization



## IMPACT OF INDIVIDUAL DIFFERENCES: SOME RESULTS

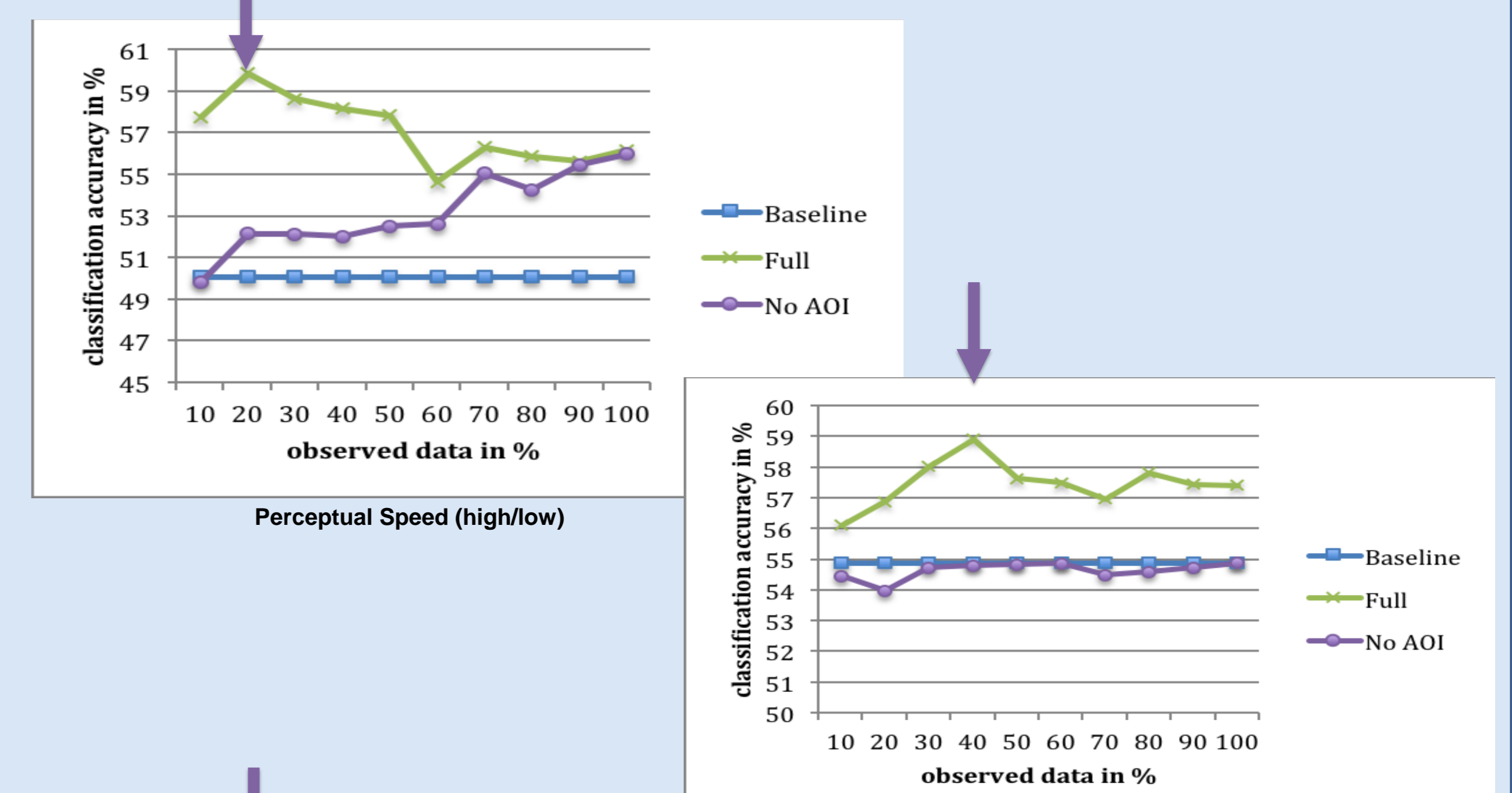
Toker, D., Conati, C., et al. (2012) Towards Adaptive Information Visualization: On the Influence of User Characteristics. UMAP 2012, International Conference on User Modeling, Adaptation, and Personalization, Springer, (full paper, 10 pages).



- ◆ **Perceptual Speed (PS)** impacts completion time across bar and radar graphs (samples above)
  - The higher the perceptual speed, the faster is task completion
  - Users with low PS suffer more with radar graph
- ◆ **Visual working memory (VisualWM)** affects user preferences
  - Users with higher VisualWM give higher preference ratings to radar graphs than users with lower VisualWM
- ◆ **Verbal working memory (VerbWM)** affects perceived ease-of-use
  - Users with lower VerbWM give higher ease-of-use ratings to bar graphs than users with higher VerbWM

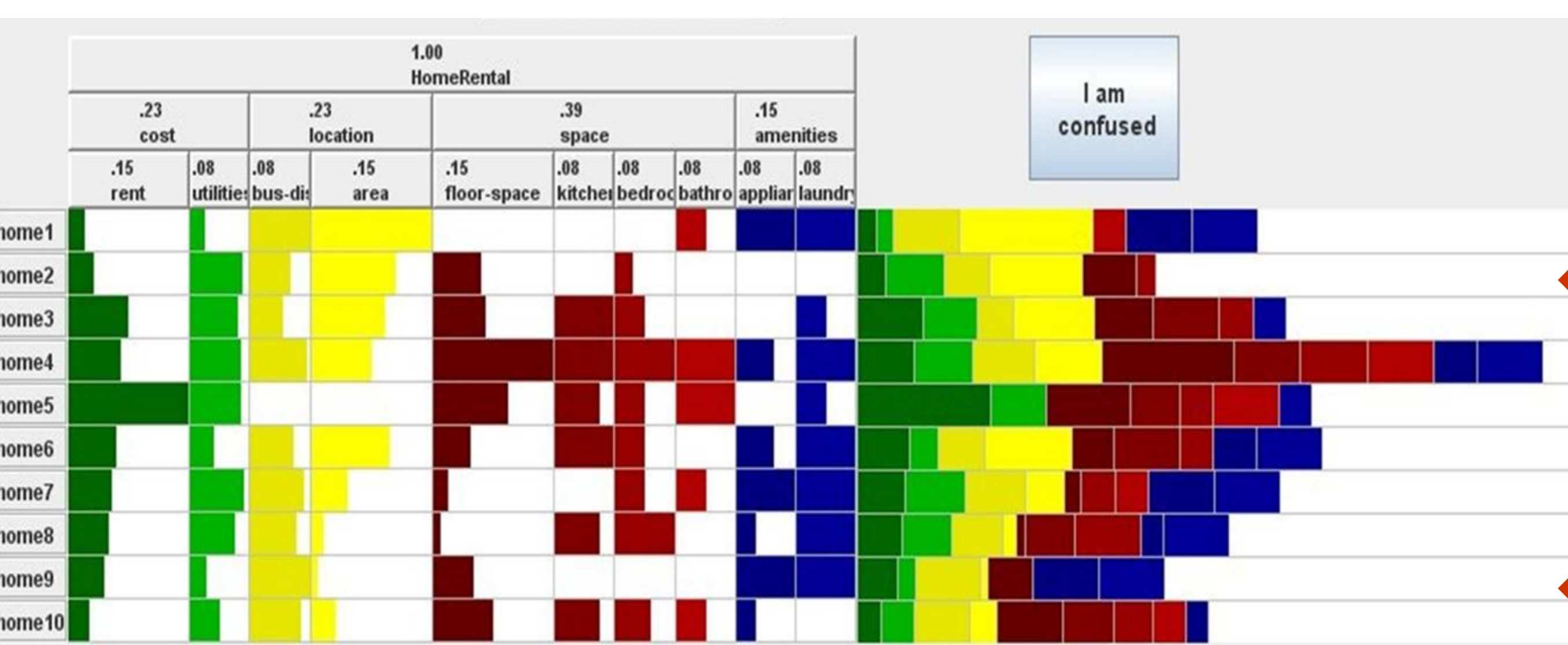
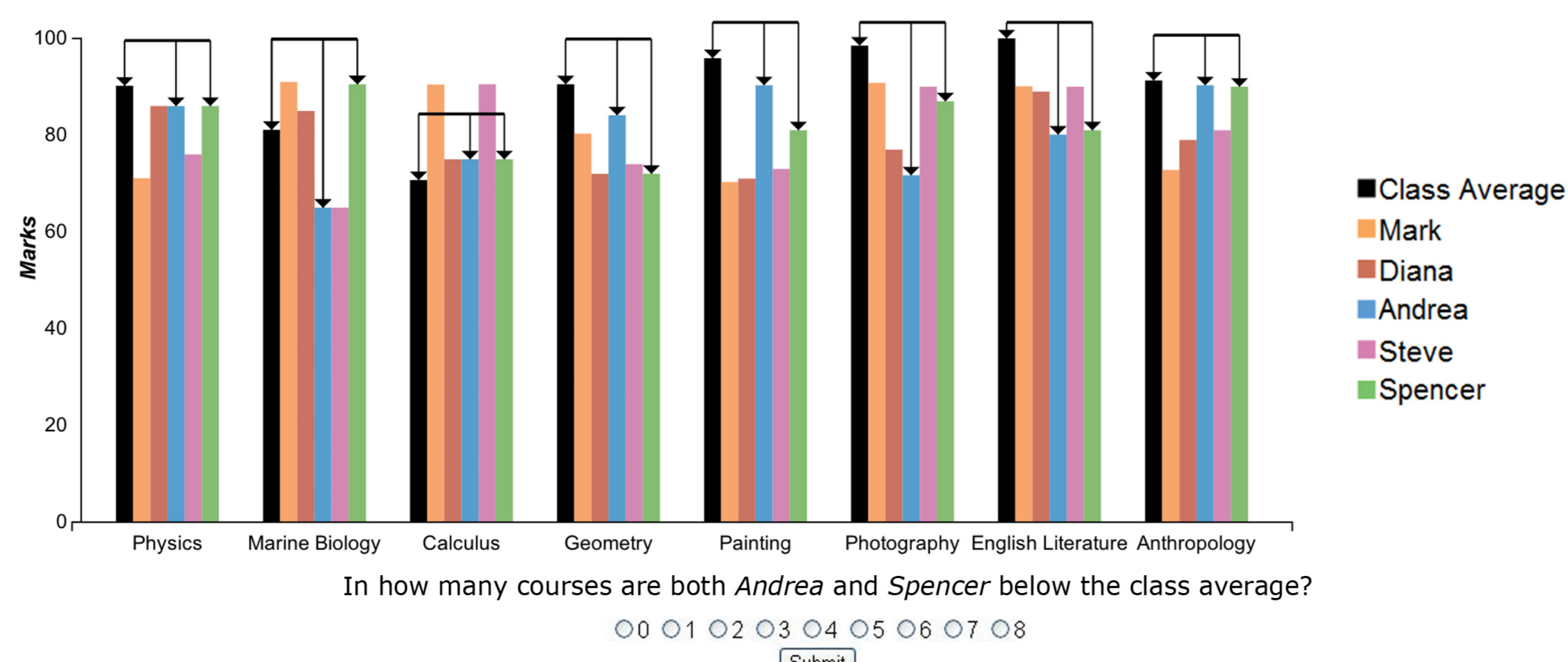
## CAN EYE TRACKING HELP DETECT USER DIFFERENCES IN REAL TIME ?

Steichen, B., Carenini G. and Conati C. (2013) Adaptive Information Visualization: Using Gaze Data to Infer Visualization Types, Tasks, and User Characteristics. IUI 2013, International Conference on Intelligent User Interfaces, ACM (full paper, 12 pages).



## On-going Study 1

- ◆ Compare alternative ways to provide adaptive support



## On-going Study 2

- ◆ Replicate results with **Value Charts**, an interactive visualization that supports decision making
- ◆ Collect Data on Instances of Confusion