

# INTERVENE – Interaction Visualization for Analysing and Improving User Models

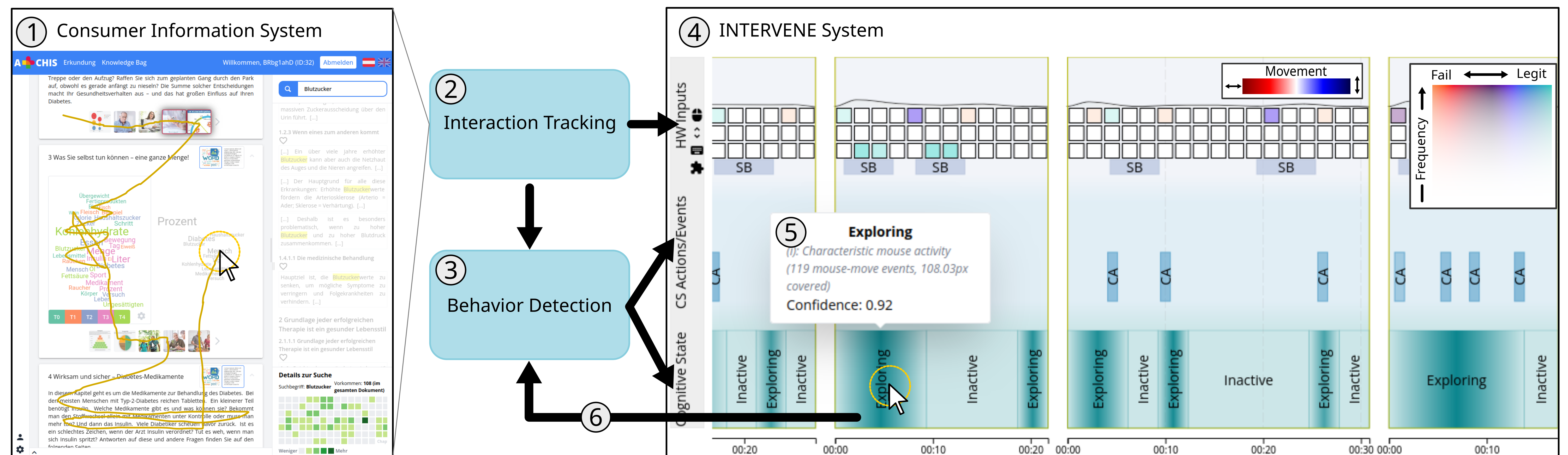


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## Abstract

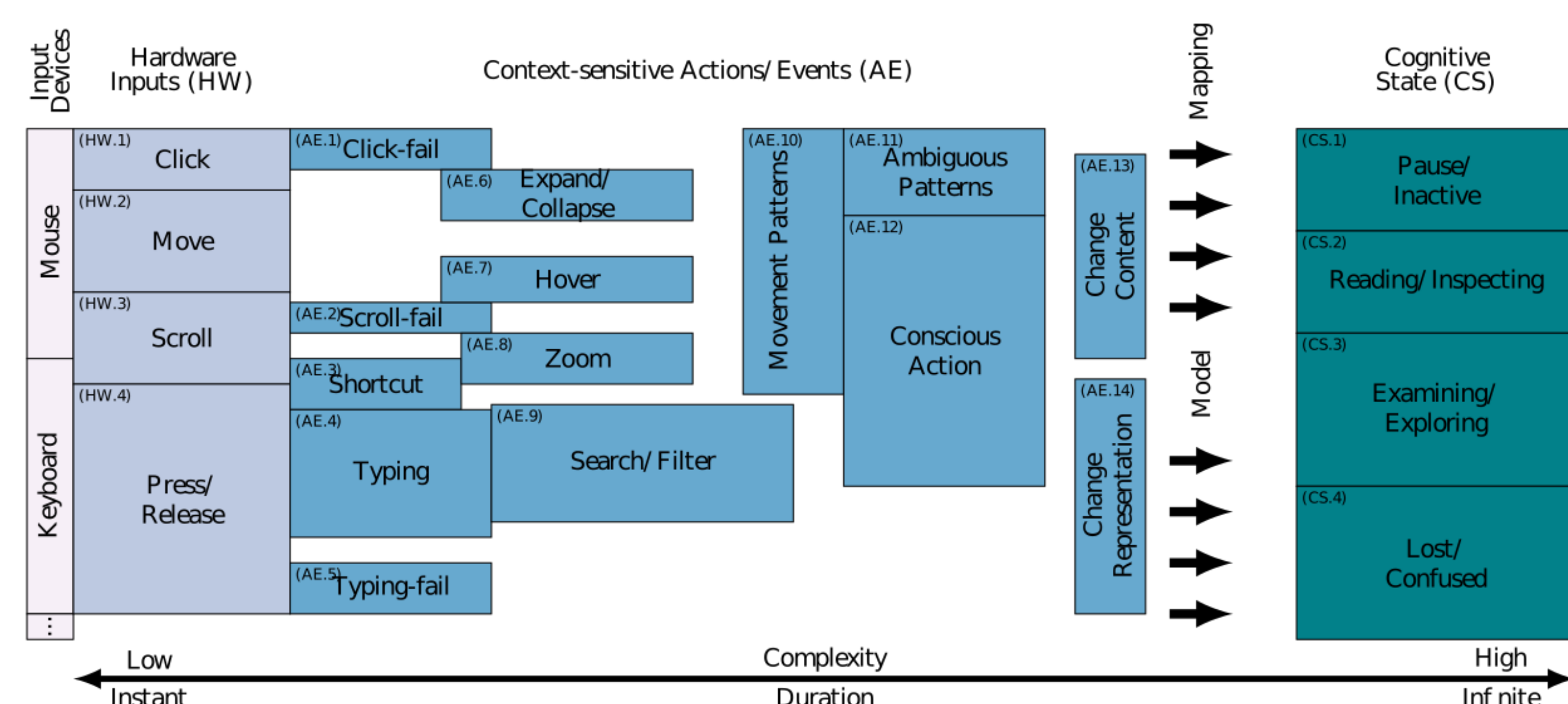
Many web-based systems such as online retail, information systems or search engines track the interactions users have with them. Tracked data can comprise high-level information like dwelling time, reviewed items, and clicked elements, but also fine-grained information in the form of mouse trajectories and keystrokes. While these data are often fed into user- or behavior models in recommender systems, there are few approaches for interactive visual exploration of multi-modal and complex interaction patterns. Yet, the thorough analysis could reveal important insights for the design and evaluation of said models. We propose a suitable visual analysis approach that allows to validate and correct models in an intuitive and interactive manner. Our tool provides insights into concrete user (inter)actions and also estimates more complex behavioral patterns. Level of detail views in our system outlines the certainty of detected behaviors and serve the explainability. Our approach can help engineers to understand user interactions and improve behavioral models.



Our INTERActive bEHavior aNalYSer (INTERVENE) (4) illustrates a user's interaction with a web-based information system (1)<sup>[1]</sup>. To this end, all interactions (mouse and keyboard events) are precisely tracked (2) and fed into models for behavior detection (3). The INTERVENE system allows experts to analyse and validate these models by relating them to the co-occurring interactions and on-demand insights (5). If misclassifications are recognized, these can be annotated and fed back to improve the models (6).

## Behavior Modeling

Our behavior models rely on hierarchic processes/events landscape<sup>[2]</sup> where increasingly complex interaction patterns are described, based on raw hardware inputs together with context. The three complexity tiers (i) *Hardware Inputs*, (ii) *Context-sensitive Actions/Events*, and (iii) *Cognitive States* are also represented in the visual design of the INTERVENE. Their different building blocks are implemented with simple rule-based approaches.



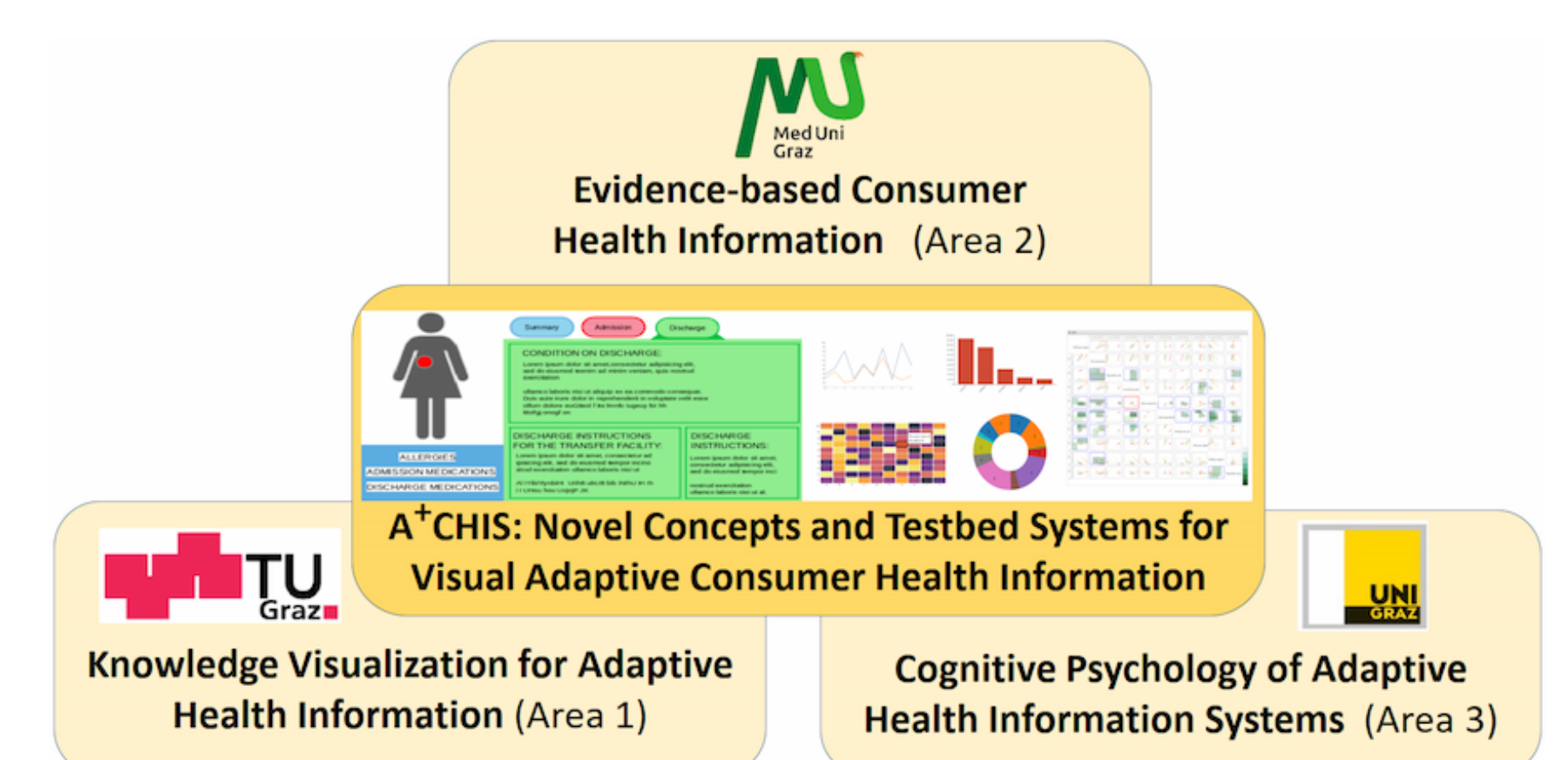
## Future Work

The current implementation of the INTERVENE allows for the interactive exploration and analysis of tracked interactions. The next steps are to (i) build a feedback system, allowing users to annotate misclassified interactions, which is then fed-back to further improve the models, and (ii) evaluate the effectiveness and efficiency of our design on real users.

## The A+CHIS Project

Consumer Health Information Systems generally are indispensable in healthcare. User-centered evidence-based medical information for patients positively influences therapy success, behavior, and cause-effect comprehension. Improved health literacy allows patients to accept medical advice and share decision-making. It helps to prevent misconceptions, mitigate cognitive biases, and improves doctor-patient communication.

Our main research question and objective in this project is: How can evidence-based medical knowledge, cognitive-psychological mechanisms, and novel interactive data visualizations be combined to form adaptive and interactive consumer health information systems that take account of individual health information needs, and increase health literacy by providing a reliable source of medical knowledge?



## References

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- Lengauer, S., Bedek, M.A., Kupfer, C., Shao, L., Albert, D. and Schreck, T. "Recognizing User Behavior from Interactions for Adaptive Consumer Information Systems." *International Conference on Interactive Media, Smart Systems and Emerging Technologies (IMET)*. 2023.