

A semiotic-based framework to assess mental models of XAI systems

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▶ To cite this version:

Clément Arlotti, Nicolas Heulot. A semiotic-based framework to assess mental models of XAI systems. HyCHA 2024 Hybridation Connaissances, Humain et Apprentissage Statistique, Mar 2024, Gif-sur-Yvette, France. hal-04520749

HAL Id: hal-04520749

https://hal.science/hal-04520749

Submitted on 25 Mar 2024

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HyCHA 2024, March 27-28, Palaiseau, France

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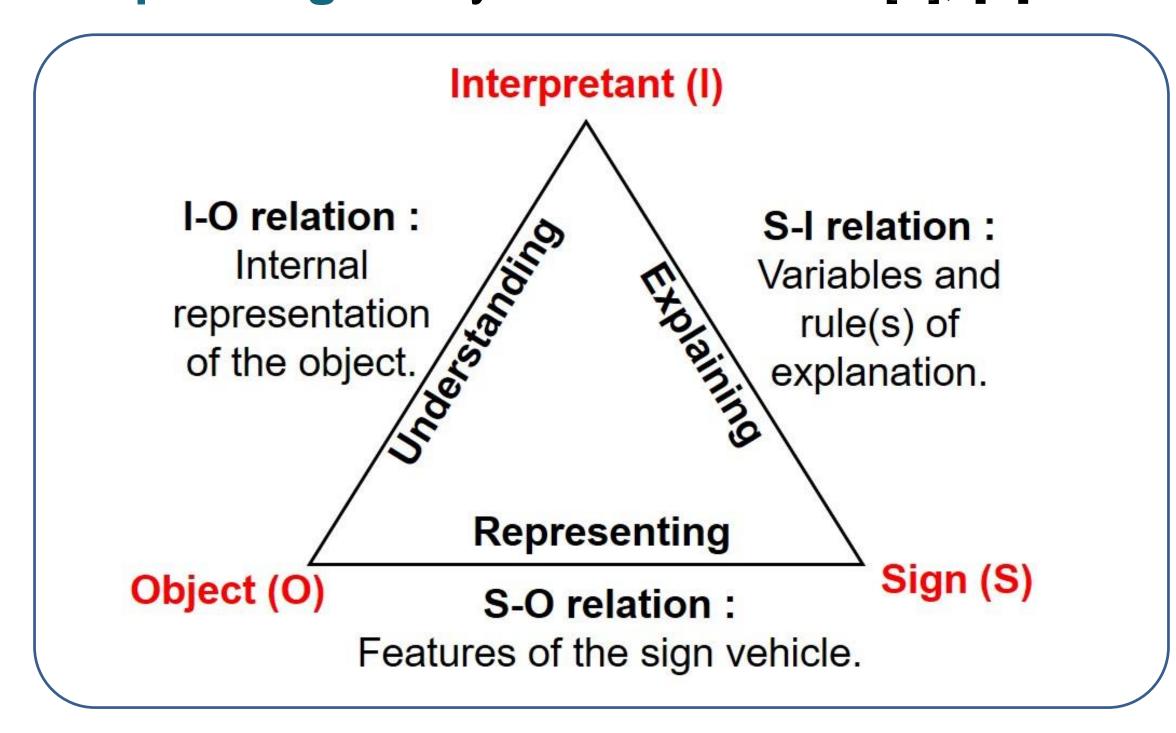
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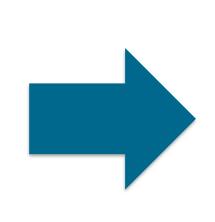
1. Introduction

- Most of current XAI systems are algorithm-centric and hardly fit the way of thinking of their end-users.
- How can we describe the way human stakeholders picture such systems? How to characterize their mental models?
- Semiotic concepts [1], [2] can be used to describe mental models and connect interdisciplinary elements for XAI.

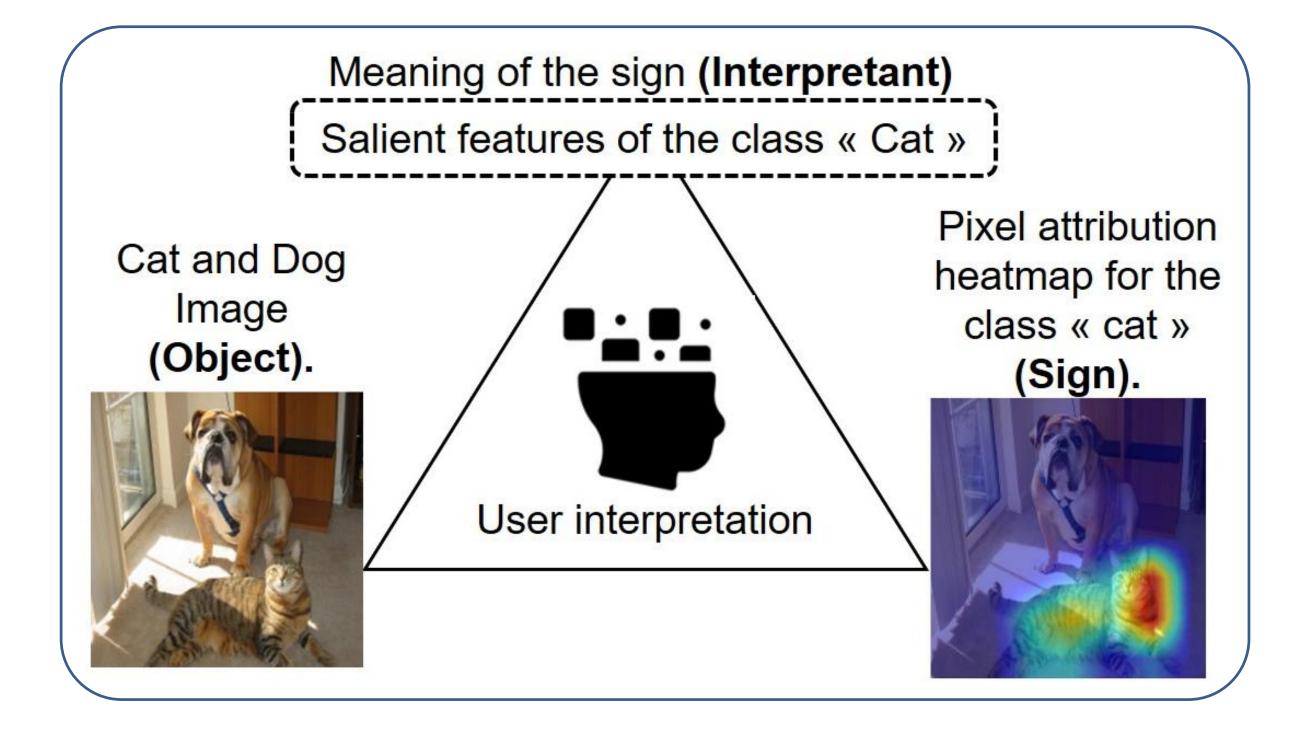
2. What are mental models used for ?

- Representing the system in its environment.
- Understanding the system's functioning.
- Explaining the system's behavior [3], [4].



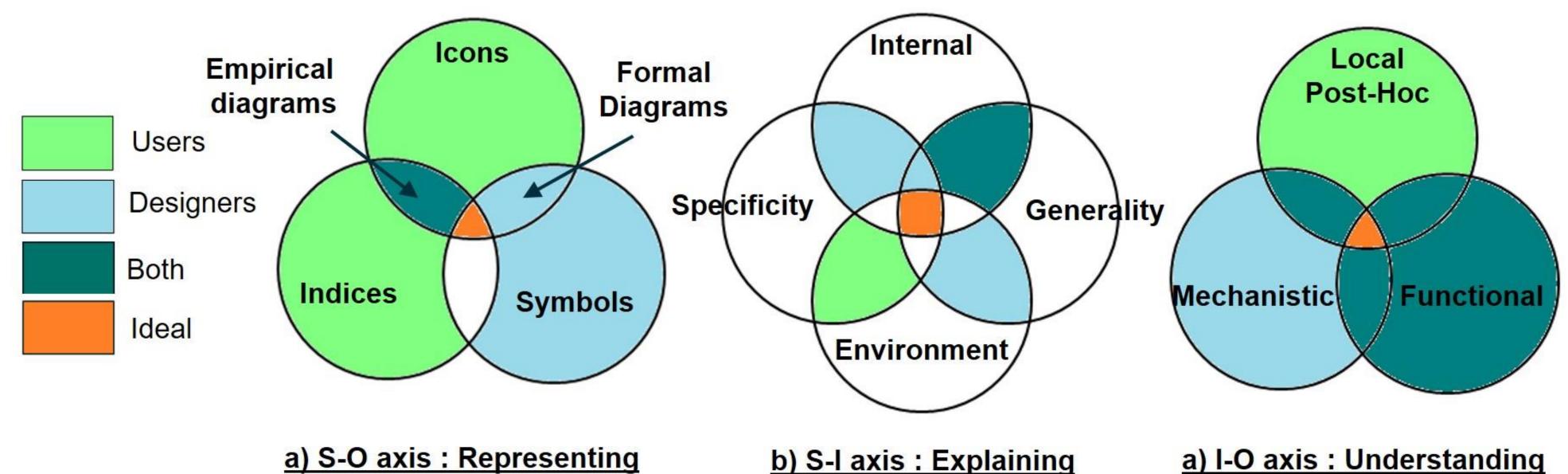


3. Can we use a semiotic approach to describe mental models?



4. How to assess mental models using semiotics?

- Goal: characterize stakeholders mental models components and assess their (mis-)alignment.
- Approach: connection of interdisciplinary concepts [5], [6], [7] to embody formal aspects of the semiotic theory.
- Use case: computer-vision anomaly detection system to monitor the quality of control points in assembly production line.
- Method: group interviews with Users and Designers of the system.
- Results overview:
 - o Users: mostly use empirical diagrams, mechanism-agnostic context-centric explanations, post-hoc understanding.
 - o Designers: mostly use formal diagrams context-agnostic mechanism-centric explanations, mechanistic understanding.



5. Conclusion

- Semiotic-based, user-centered framework to assess (mis-)aligned mental models components.
- Ability to delineate consistent stakeholder profile tendencies based on semiotic categories.
- Highlight the potential of existing work in semiotics to connect interdisciplinary concepts in XAI.

Bibliography

- [1] Peirce C.S., Hoopes J. Peirce on signs: writings on semiotic, University of North Carolina Press (2006).
- [2] Nöth W., The semiotics of models. Sign Systems Studies (2018)
- [3] Rutjes et.al., Considerations on explainable AI and users' mental models. Glasgow Association for Computing Machinery (2019)
- [4] Greca et.al., Mental models, conceptual models, and modelling. International Journal of Science Education. (2000)
- [5] Paéz A., The Pragmatic Turn in Explainable Artificial Intelligence. Minds and Machines. (2019)
- [6] Erasmus et.al., What is Interpretability? Philosophy & Technology. (2021)
- [7] Buijsman S. Defining explanation and explanatory depth in XAI. Minds and Machines. (2022)



