

Human Categorization Learning as Inspiration for Machine Learning Algorithms

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Empirical observations of humans learning to categorize inspired the development of early machine learning algorithms (cf. Unger & Wysotzki, 1981). For example, Hunt, Marin, and Stone (1966) developed a decision-tree learning algorithm based on experiments by Bruner, Goodnow, and Austin (1956). However, nowadays the focus of machine learning lies on efficient categorization and not on cognitive plausibility of the underlying learning algorithms.

Recently Lafond, Lacouture, and Cohen (2009) modeled human categorization behavior with decision-trees, but they did not address the question of how these decision-trees are constructed from training trials. We analyzed their data and could show that a measure of incremental information gain can be an appropriate feature selection criterion (Zeller & Schmid, accepted).

Empirical data imply that humans use (meta-)strategies while learning to categorize (cf. Unger & Wysotzki, 1981). Typically, humans focus first on single features as categorization criteria and only later use conjunctions or disjunctions. As a next step, we plan to conduct case studies where participants, while learning correct categorization with a trial by trial feedback, shall explain their decisions. Based on the results, we intend to design experiments where the material is constructed in such a way that cues enhance or hinder specific strategies. We hope that a deeper understanding of the human process of categorization learning can inspire cognitively plausible machine learning algorithms.

References

- Bruner, J. S., Goodnow, J. J., & Austin, G. A. (1956). *A study of thinking: With an appendix on language by Roger W. Brown*. New York, NY: Wiley.
- Hunt, E. B., Marin, J., & Stone, P. J. (1966). *Experiments in induction*. New York, NY: Academic Press.
- Lafond, D., Lacouture, Y., & Cohen, A. L. (2009). Decision-tree models of categorization response times, choice proportions, and typicality judgments. *Psychological Review*, *116*, 833–855.
- Unger, S., & Wysotzki, F. (1981). *Lernfähige Klassifizierungssysteme (Classification Systems Being Able to Learn)*. Berlin, Germany: Akademie-Verlag.
- Zeller, C., & Schmid, U. (accepted). Rule learning from incremental presentation of training examples: Reanalysis of a categorization experiment. In *13th Biannual Conference of the German Cognitive Science Society (Bremen, Germany, Sept. 2016)*.