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# Classification of Rule Learning Phases in Inductive Reasoning

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## Abstract

Intelligent tutoring systems (ITS) afford complex learning environments in which inductive reasoning is engaged, but where sparse log data complicates the classification of cognitive states. Using a simple rule learning task, we explore the feasibility of verbal think aloud protocols to contribute to machine learning algorithms designed to classify states of rule search, rule discovery, and rule following. Domain-general versus domain-specific contributions to classification are considered through the use of isomorphic rule learning tasks with numeric and spatial stimuli. We trained and tested models both within and across task domains. Models including verbal data outperform models based only on log data with particular improvement in classifying rule discovery. These results provide a foundation for real-time classification of cognitive states during ITS use.