Hypothetical query answering over continuous data streams

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Many modern-day reasoning systems need to react based on information that is received in real-time from different sources. One of the formalisms developed to model this problem from a theoretical perspective uses ideas and techniques from logic programming [4]. In this model, information (facts) arrives at discrete time points via a *datastream*, while the reasoning engine is formalised as a program in Temporal Datalog – a variant of Datalog where all predicates are annotated with a timestamp corresponding to the point of time where they hold. The reasoning tasks are then formulated as queries that need to be answered as time flows.

The formalism of hypothetical answers [1], which we presented at Days in Logic in 2020, extends this framework by defining a hypothetical semantics of answers that are dependent on some information still arriving at the data stream in the future. Our initial work showed that the intuitive approach, using techniques similar to those in abductive logic programming, could be turned into an algorithm that continuously updates a list of hypothetical answers to queries.

Our original work considered only a language without negation, and assumed perfect and instantaneous communication. In this talk, we show how the framework can be extended to deal with both of these aspects, and how their interaction poses challenging theoretical problems [2, 3].

References

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