

2019 NCTS & NCU

Probability Seminar

題目：Transition Calculus: An Illustration of Modeling and Derivation on POMP and POMMs

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地點：國立中央大學鴻經館 M107

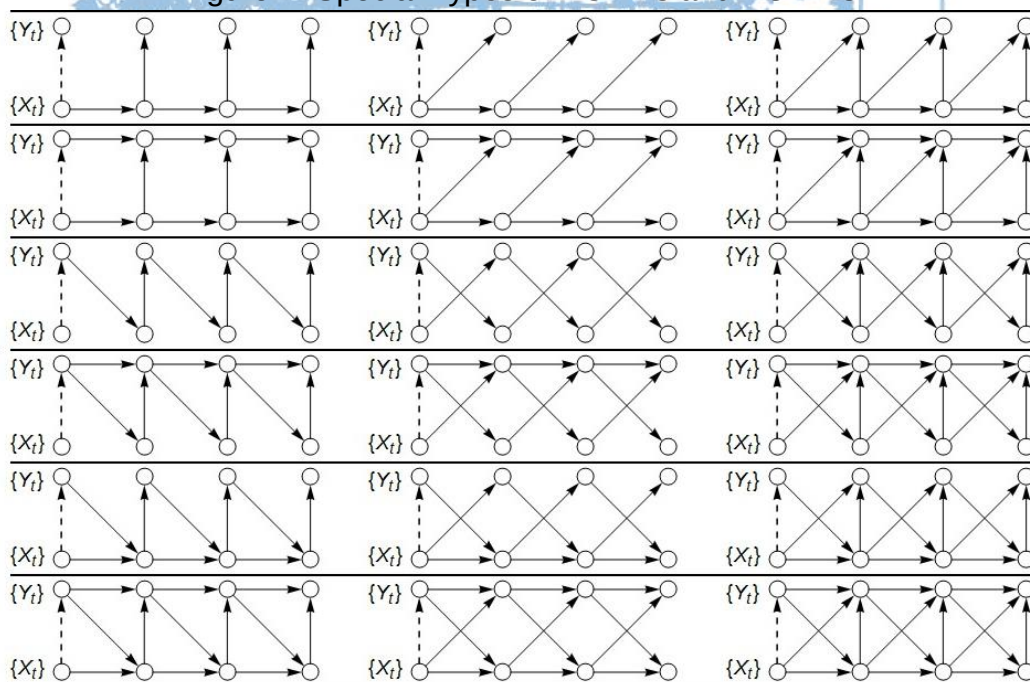
Abstract

In this talk I will mainly analyze the modeling and derivation on partially observed Markov processes and models (POMPs and POMMs), including models depicted in Fig. 1 as special cases. A powerful tool, called transition calculus, is introduced to specify the models and derive distributional properties of the processes. In transition calculus, a Markov chain is regarded as a chain joined by independent transitions. To give a taste of transition calculus, let us consider the following statement:

Given $\{X_t\} \sim \mathcal{M}(\xi_0, \{\mathbf{P}_t\})$, i.e., $X_0 \stackrel{d}{=} \xi_0$ and $\perp_t (X_{t-1} \rightarrow X_t) \stackrel{d}{=} \mathbf{P}_t$, then $X_T \stackrel{d}{=} X_0 \cdot \perp_{t=1}^T (X_{t-1} \rightarrow X_t) \stackrel{d}{=} \xi_0 \cdot \prod_{t=1}^T \mathbf{P}_t$.

Transition calculus provides distributional extension, marginalization, and transition operators that reveal the underlying distributional relationships behind the formulas and recursive algorithms. Moreover, the derivation is visually accessible and easy to comprehend. As an illustration, we derive recursive algorithms for filters proper to different types of models using transition calculus. The content in this talk is only one part of a complete research.

Figure 1: Special Types of POMP and POMMs



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