

Multivariate Ordinal Patterns for Symmetry Approximation in Dynamic Probabilistic Relational Models (DPRMs¹)

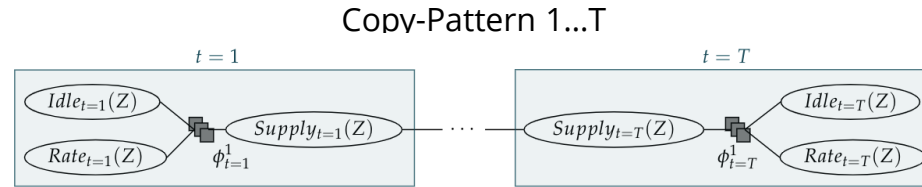
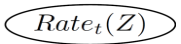
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UNIVERSITÄT ZU LÜBECK
INSTITUT FÜR INFORMATIONSSYSTEME

Exploiting relations for a compact encoding

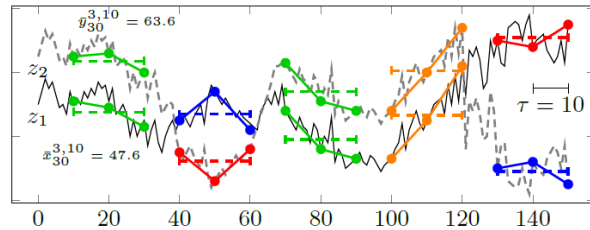
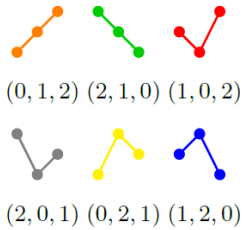
- Split model into conditionally independent parts (**factorization**) through parafactors
- **Parameterize random variables** with logical variables to represent sets of random variables



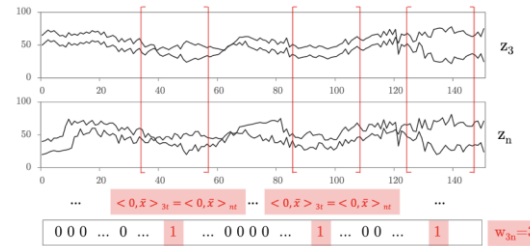
Dynamic Probabilistic Relational Model

Exploiting symmetries

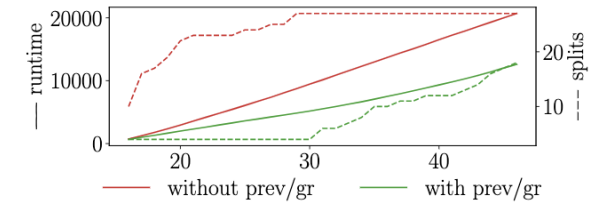
- Treat entities that have similar or approximately similar behavior as a single entity
- Obtaining a **sparse representation** and makes **inference efficient**



Multivariate Ordinal Pattern for a Multivariate Time Series (e.g., Supply, Rate)



Determine Similarity through Counting



Preventing Groundings Results

DPRMs to Time Series

Ordinal Pattern Symbolisation

Similarity Counting

Spectral Clustering

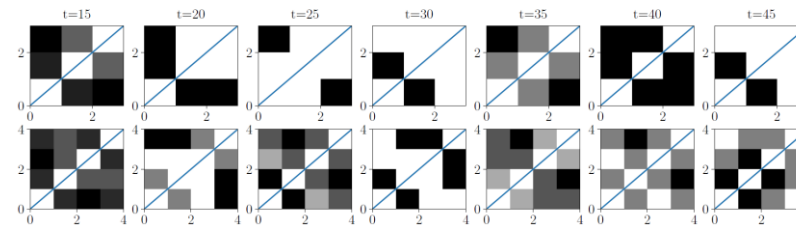
Prevent Groundings A Priori

Realisations Randvars

- random variables observed over time are considered as multivariate time series

$$\mathcal{X} = (((x_t^i)_{i=1}^m)_{t=1}^T)_{j=1}^{|\mathcal{D}(Z)|}$$

$$\mathcal{X}' = \langle o, \bar{x} \rangle^{(T - (\tau(d-1))) \times |\mathcal{D}(Z)|}$$



Heatmap Similarity Graph for two Clusters

$$P(R_{10}(z_1) \mid S_{10}(z_2) = \text{high}, S_{10}(z_3) = \text{high})$$

¹ pronounced *deeper models*