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# Additive Bayesian Network approach applied to time series and longitudinal datasets

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## Motivation

- ABN[1] methodology extends the classical generalized linear model (GLM) framework to **multiple dependent variables**
- The key perspective of ABN is to extract the conditional independence information from a **correlated dataset**
- A suitable methodology to mastermind **complex and messy data** in an exploratory analysis
- Extending ABN to **correlated errors** and **mixed models**

## Summary

- **tsabn** is a time series **extension of abn**
- **tsabn** is distributed as an R package https://git.math.uzh.ch/reinhard.furrer/tsabn
- Several implemented scores: **AIC**, **BIC**, **MDL**
- Errors Autocorrelation: **iterative Cochrane-Orcutt** procedure with **Autoregressive modelling**

## Results

- Perform **structure discovery**
- tsabn modelling empirically identifies associations in complex and high dimensional data as a **machine learning technique**

## Future Work

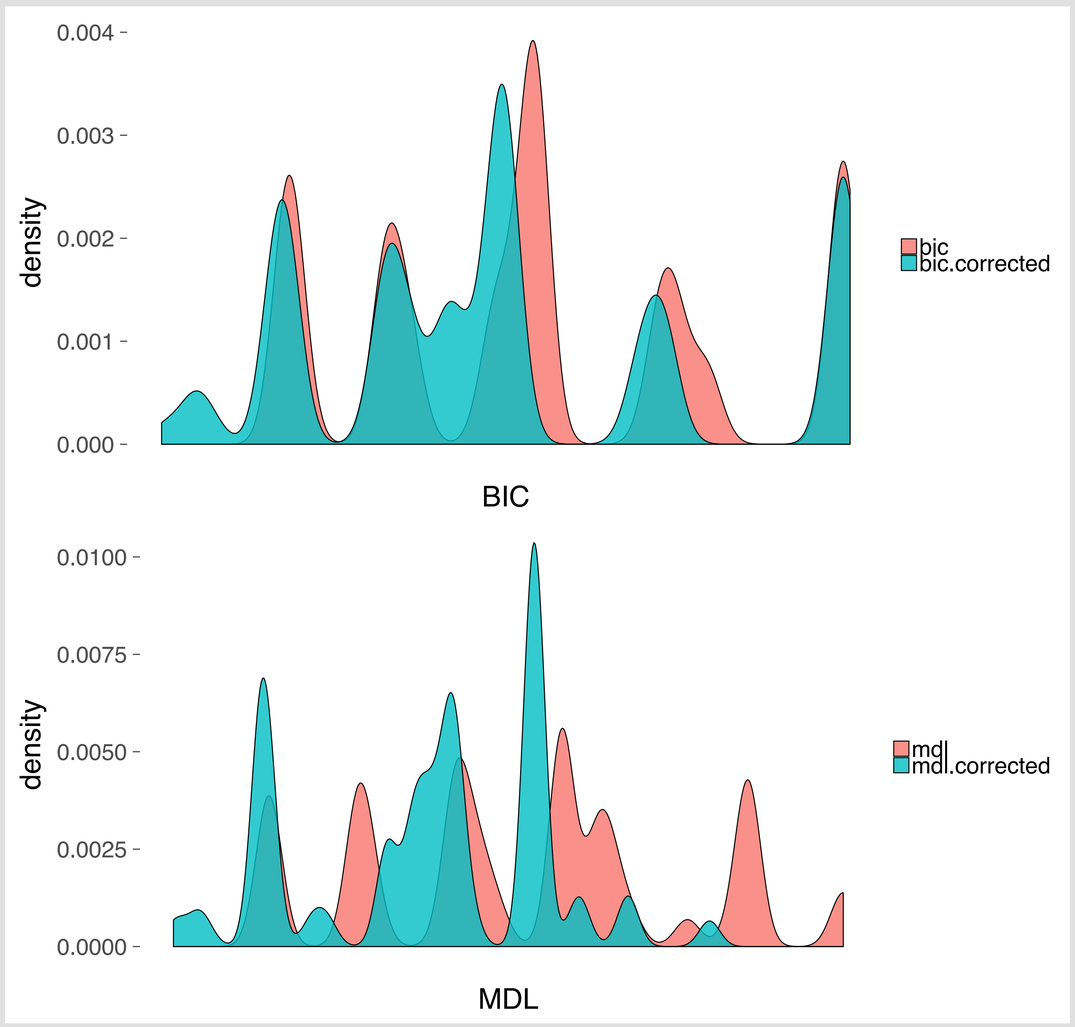
- Implementation of wider classes of **autocorrelation models**
- Implementation of **Granger causality** score for BN learning

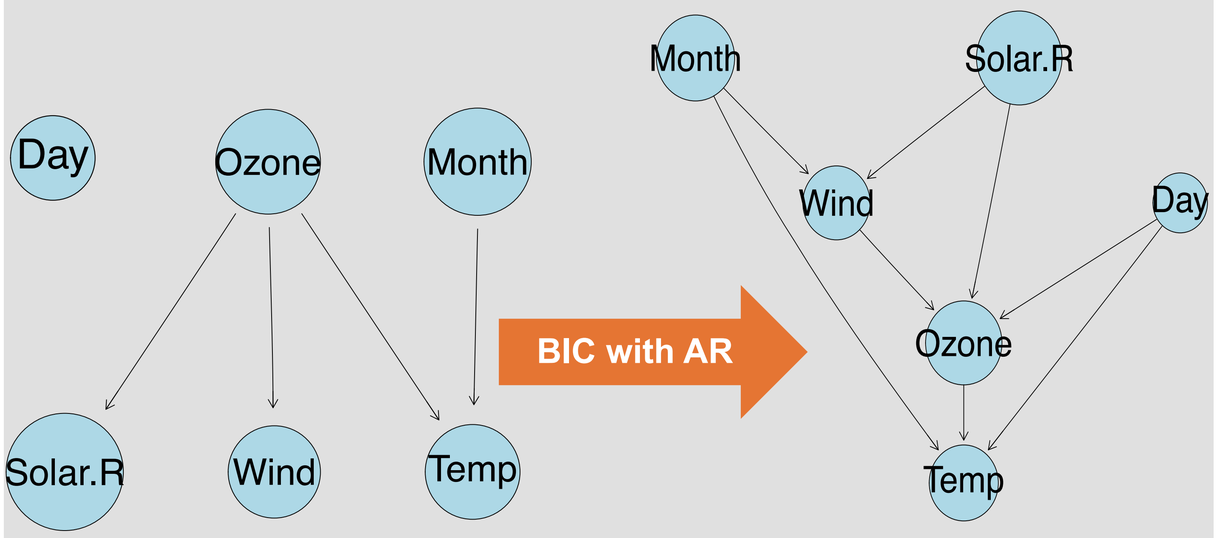
## New York air quality dataset[2]

**Daily readings of the air quality values from May to September 1973**

- 6 variables, n = 111, complete case analysis, unconstrained AR()
- **Ozone**: Mean ozone in parts per billion (Roosevelt Island)
- **Solar.R**: Solar radiation at Central Park
- **Wind**: Average wind speed at LaGuardia Airport
- **Temp**: Maximum daily temperature at LaGuardia Airport

### How the best BN changes with autocorrelation modelling?



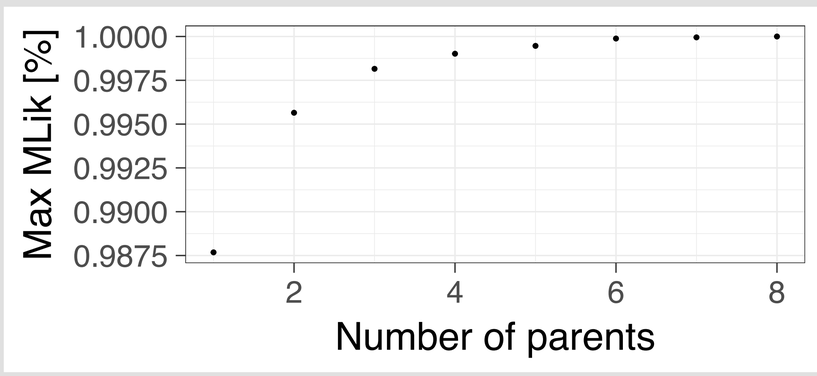



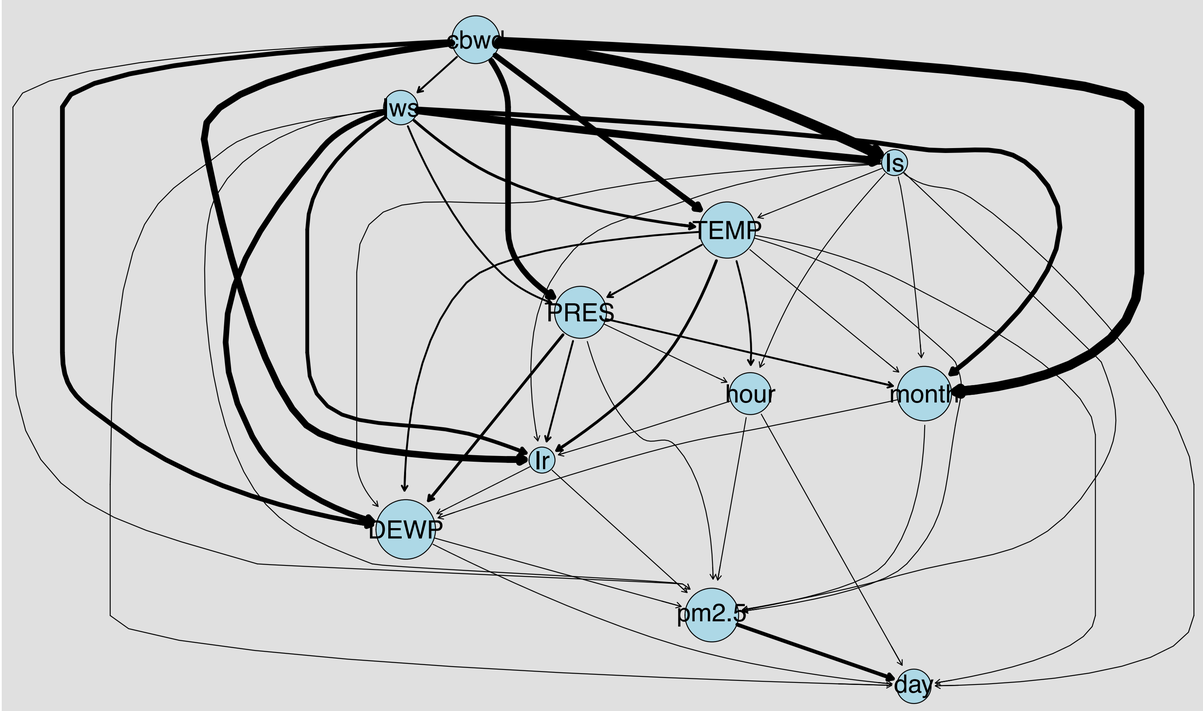

## Beijing air quality dataset[3]

**Hourly readings of the PM2.5 data of US embassy in Beijing with meteorological data from Beijing Capital International Airport from 2010 to 2014**

- 12 variables, n = 41'757, complete case analysis, unconstrained AR
- **pm2.5:** PM2.5 concentration
- **DEWP**: Dew Point
- **TEMP:** Temperature
- **PRES:** Pressure
- **cbwd:** Combined wind direction
- **Iws:** Cumulated wind speed
- **Is:** Cumulated hours of snow
- **Ir:** Cumulated hours of rain

### What is the relationship of the variables, taken into account that seasonal effect is random?

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