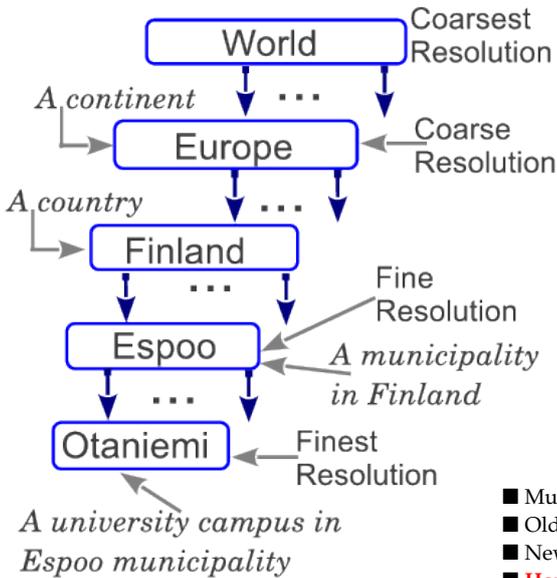


MIXTURE MODELS FROM MULTIREOLUTION 0-1 DATA

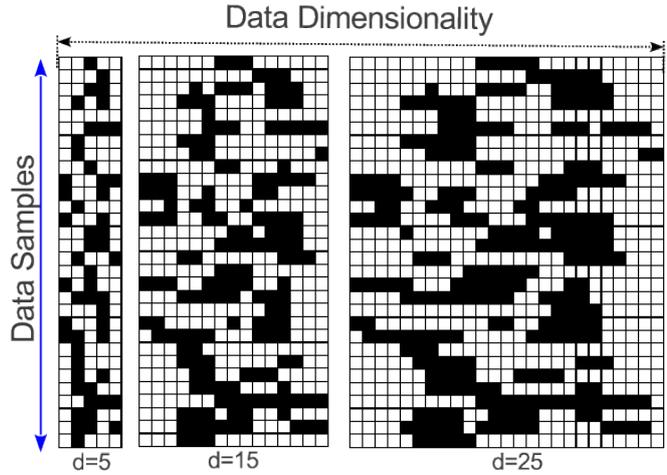
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PART-OF-HIERARCHY: EXAMPLE

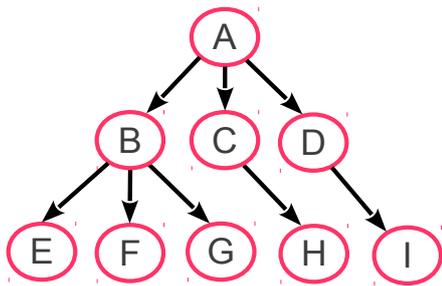


MULTIREOLUTION DATA



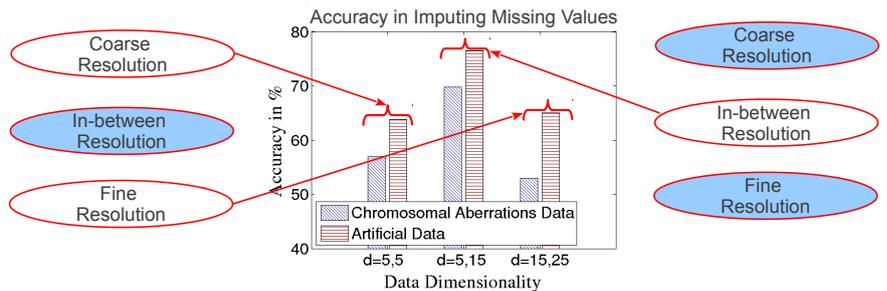
- Multiresolution data is everywhere: biology, computer vision, telecommunications ...
- Older Generation Technology ⇒ Data in Coarse Resolution
- Newer Generation Technology ⇒ Data in Fine Resolution
- **How to analyze data in multiple resolutions in a single analysis?**

BAYESIAN NETWORK FROM MULTIPLE RESOLUTIONS



A ~ Europe; B ~ Finland; C ~ Sweden;
D ~ Denmark; E ~ Espoo; F ~ Tampere;
G ~ Turku; H ~ Stockholm; I ~ Copenhagen;

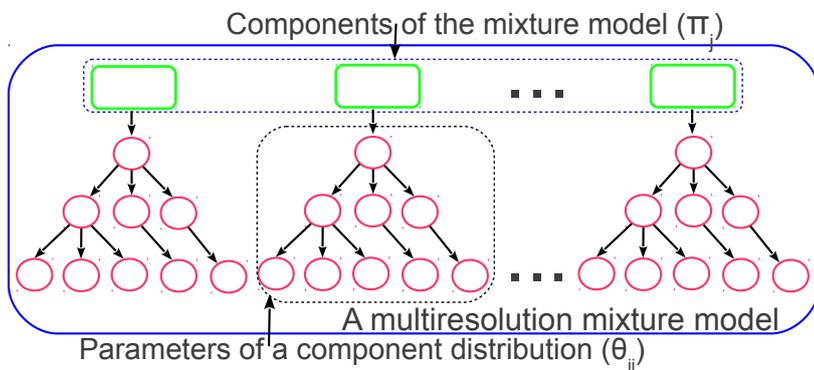
IMPUTING MISSING RESOLUTIONS USING BAYESIAN NETWORKS



For a joint distribution $P(A,B,C)$ and an evidence $B=true$, marginal inference calculation is:
 $P(A | B = true) \propto \sum_C P(A, B = true, C)$.

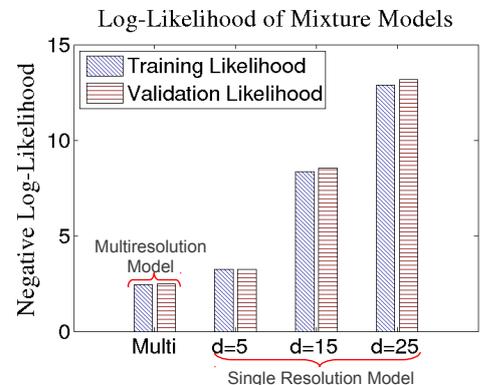
To impute missing values, we draw samples under given evidence from consistent junction tree using BRMLToolbox. Comma in labels in X-axis separates dimensions of two datasets.

MIXTURE MODEL WITH MULTIREOLUTION COMPONENTS



The components of mixture model are Bayesian networks themselves. We use EM algorithm in a 10-fold cross-validation setting to learn parameters of the mixture model.

MIXTURE MODELLING RESULTS



The Y-axis shows the negative log likelihood, therefore, the shorter the bar, better the result



REFERENCES

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- A. S. Willsky. **Multiresolution Markov models for signal and image processing**. *Proceedings of the IEEE*, 90(8):1396–1458, 2002.

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