

# AMiDST TOOLBOX

Session 5: Streaming data, Scalable Learning  
and Temporal Models with the AMIDST Toolbox

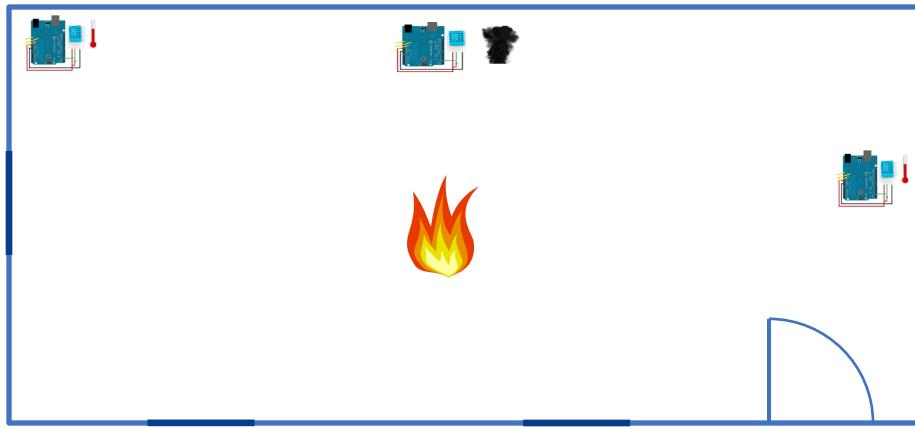
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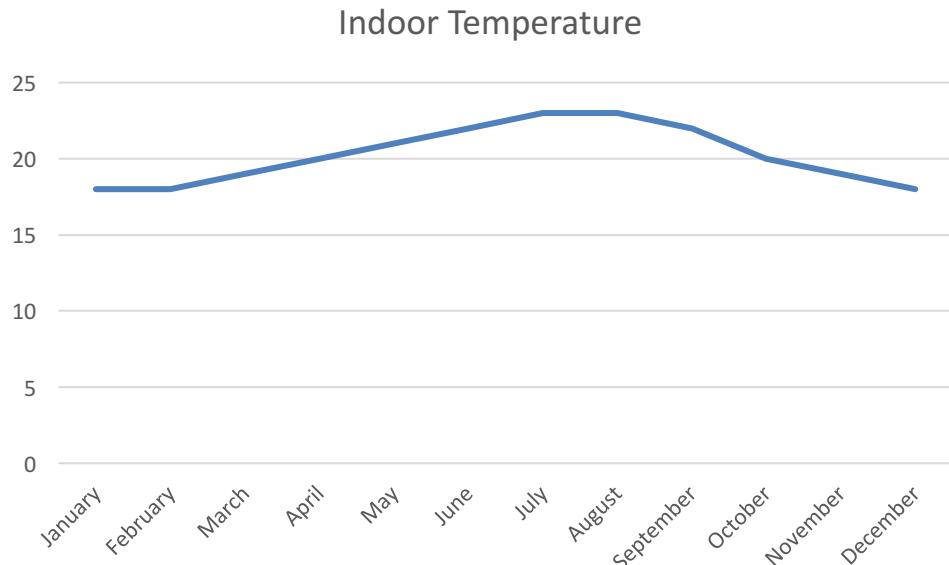
# Learning from Data Streams



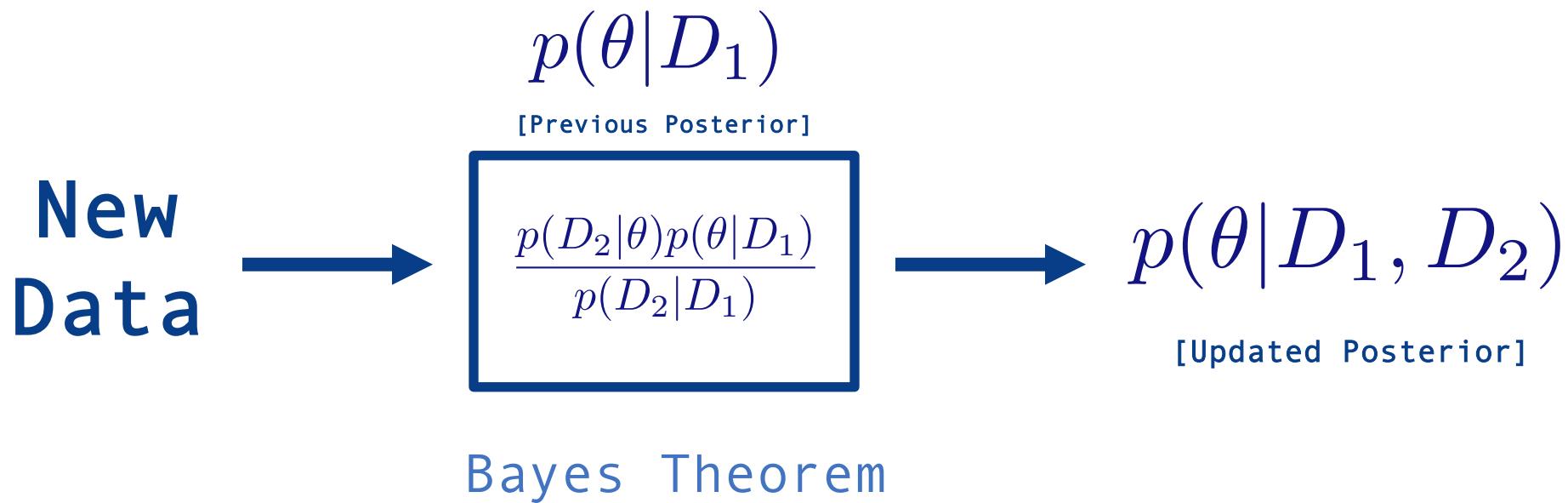
## Fire Detection from smoke and temperature sensors

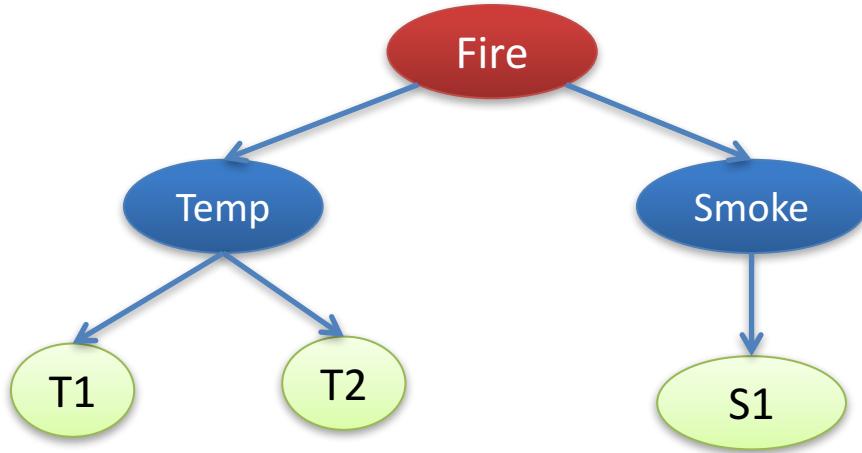


- Data Collected
  - Tons of observations in normal settings (no fire).
  - No observations in the presence of fire.



- Baseline Indoor Temperature
  - Temperature fluctuates over the year.
  - Fire Detector Model should be adjusted.
  - Data Stream Settings (with concept drift).



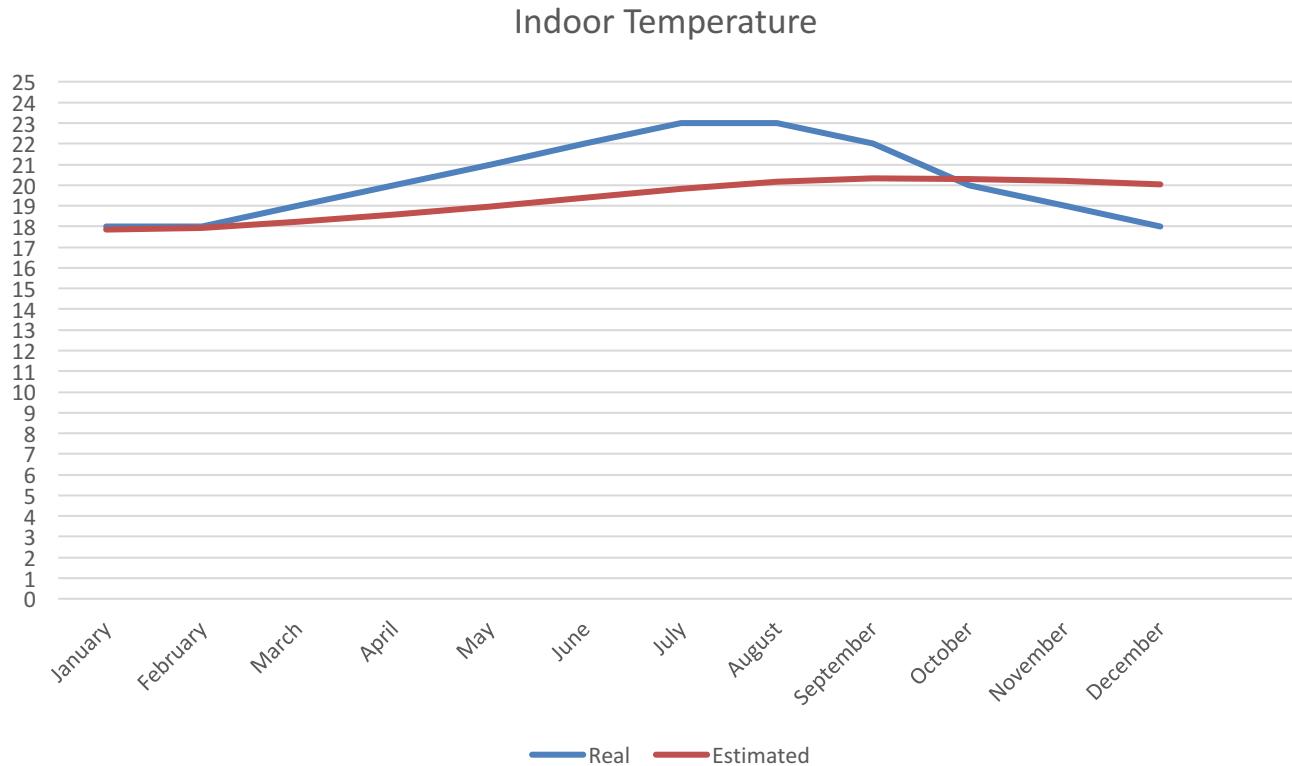


Update the model from a data stream

Continuous model updating

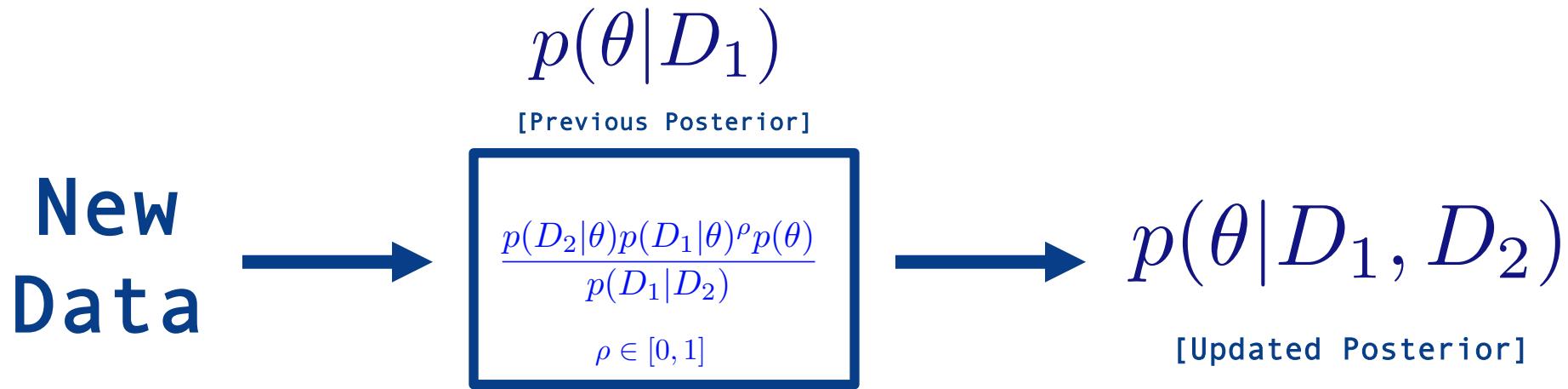
Code: Session5.A\_ModelUpdating.java





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Bayes Theorem  
[Exponential Forgetting]

- Old-data is exponentially down-weighted.
  - Forgetting Mechanism. Focus on the present.

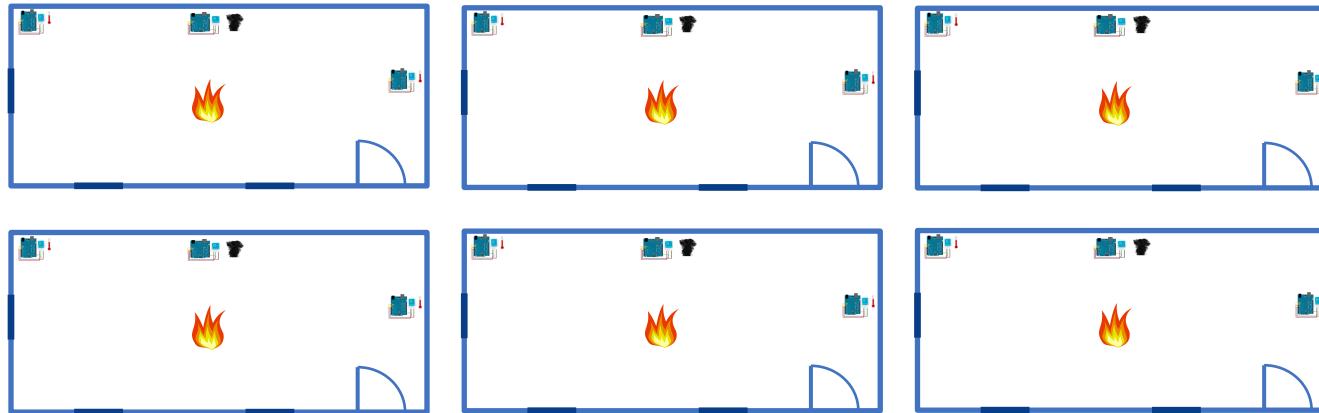
Code: Session5.B\_ModelUpdatingConceptDrift.java



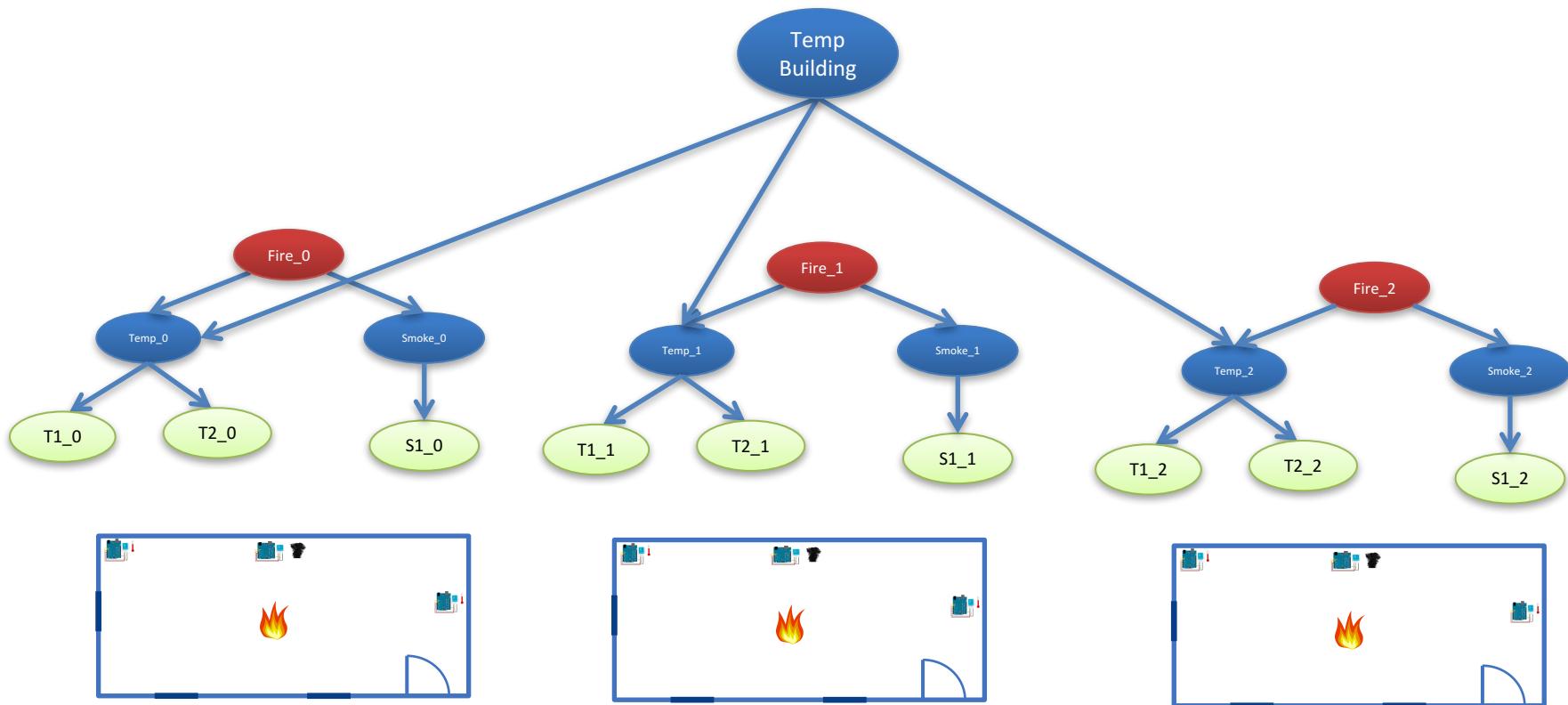
# Scalable Learning



## Fire Detection in a group of rooms

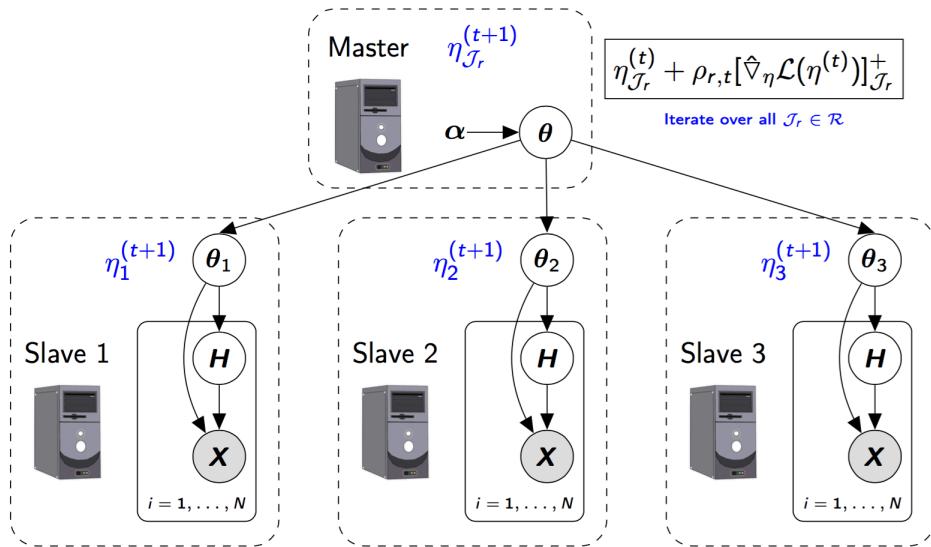


- Fire Detection in a building
  - Fire can happen in any room
  - All rooms share similar indoor temperature



- Fire Detection in a building
  - Fire can happen in any room
  - All rooms share similar indoor temperature

Code: Session5.C\_ScalableModelLearning.java

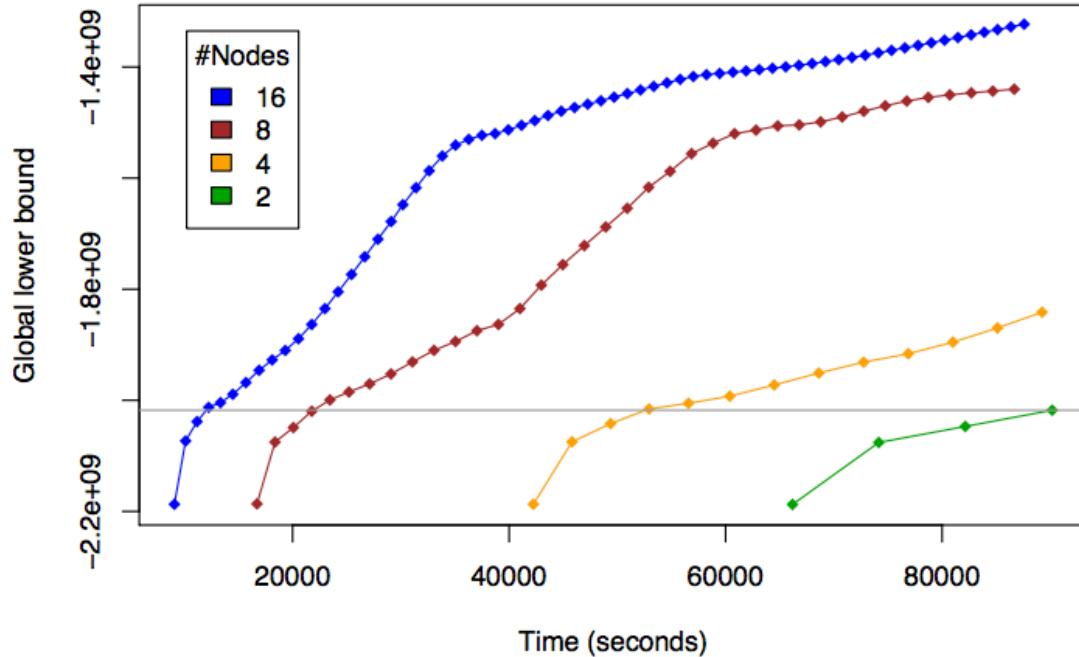


## d-VMP Algorithm

A state-of-the-art distributed Variational Message Passing algorithm.

Masegosa, Andrés R., et al. "d-VMP: Distributed Variational Message Passing." *Proceedings of the Eighth International Conference on Probabilistic Graphical Models*. 2016.





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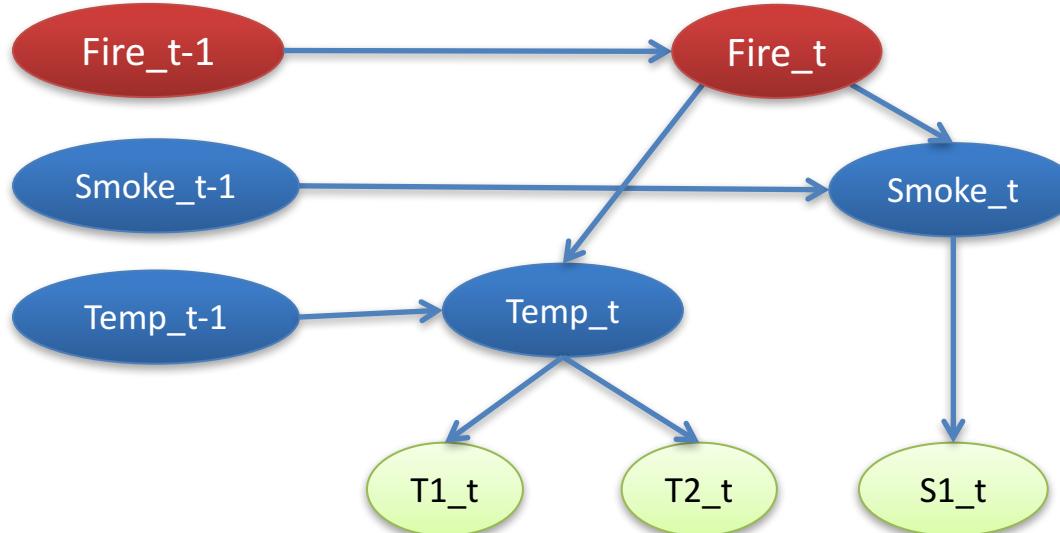
# One billion node probabilistic model

Experiment on a Flink cluster with 16 nodes on AWS.



# Temporal Models





## Encode Temporal Relationships

Temperature tends to be constant.

Code: Session6

# Thanks for your attention

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