intelligent systems
TU Graz

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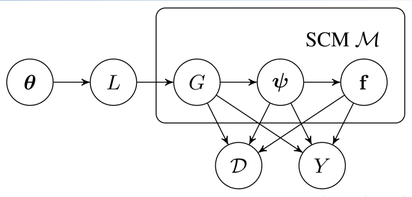
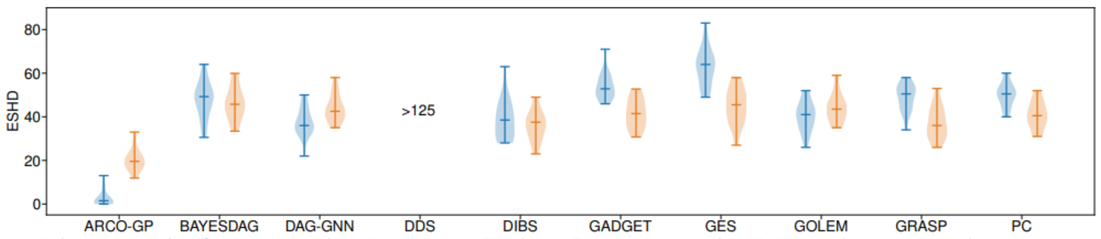
Bayesian Causal Inference



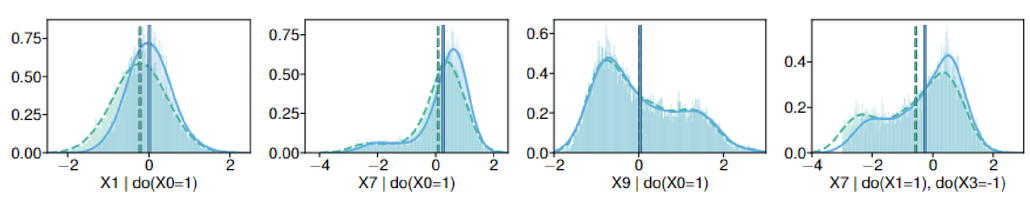
- **Structural Causal Model (SCM) inference**:

1. Infer a causal order L using a neural autoregressive distribution $p(L \mid \boldsymbol{\theta})$
2. Marginalise over causal graphs by limiting the cardinality of parent sets

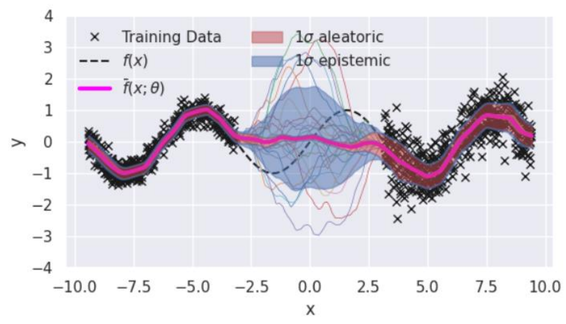
- **Causal discovery:** Expected Structural Hamming Distance (ESHD)



- Blue: Scale free graph; Orange: Erdös-Renyi graph; 20 nodes, 200 data samples
- **Posterior interventional distribution:** Consensus protein interaction graph [Sachs et al. (2005)] ; Green: Ground truth; Blue: Inferred



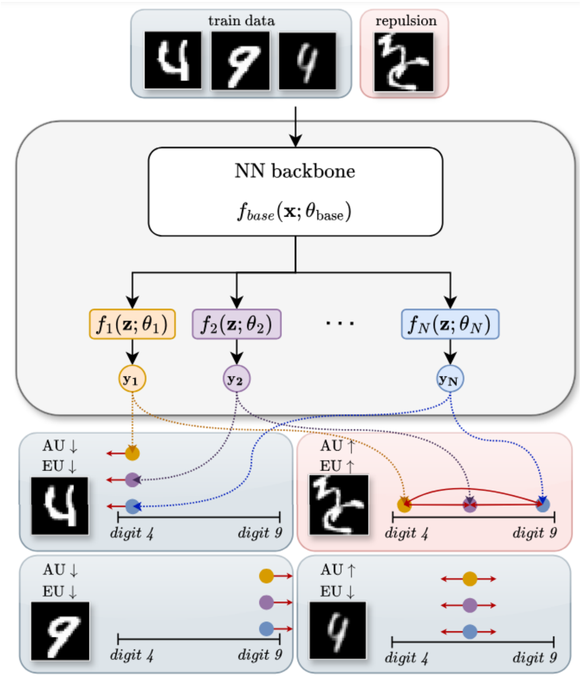
Uncertainty Modeling



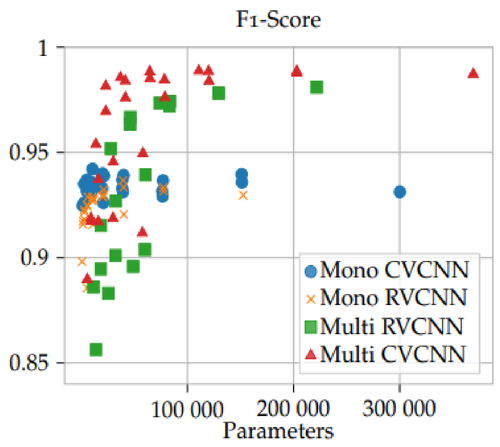
- **Aleatoric uncertainty**: Captures noise inherent in the data (not reduceable)
- **Epistemic uncertainty**: Uncertainty in the model due to lack of knowledge and data

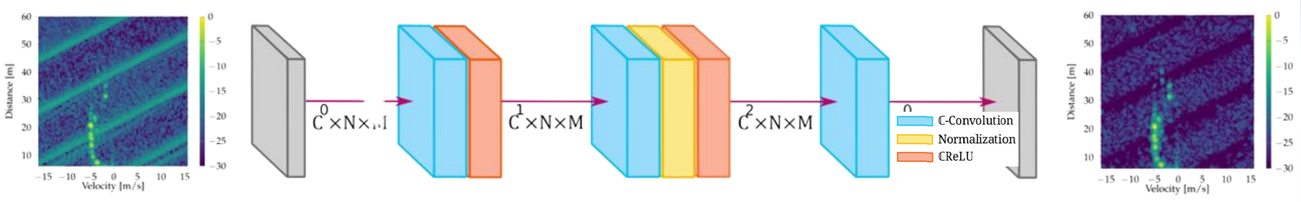
Last-Layer Ensemble:

Repulsive particle-optimization variational inference in function

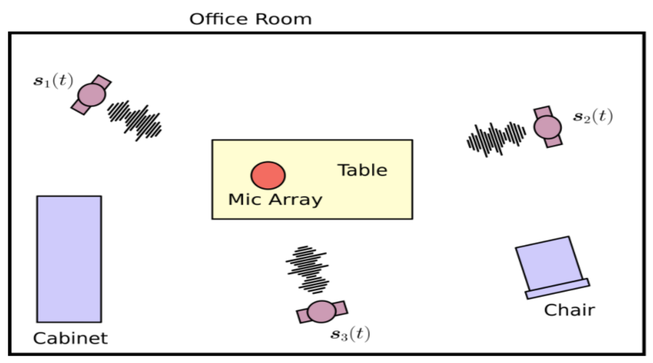


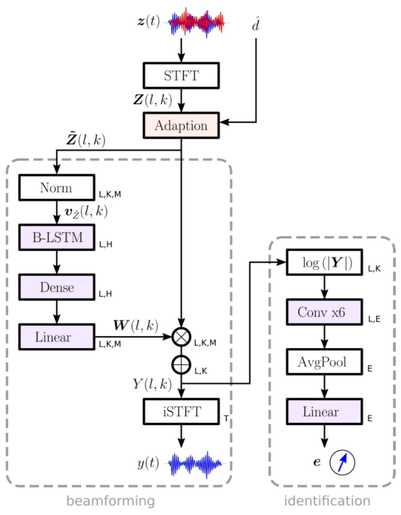
Radar Interference Mitigation





Speech Separation & Dereverberation



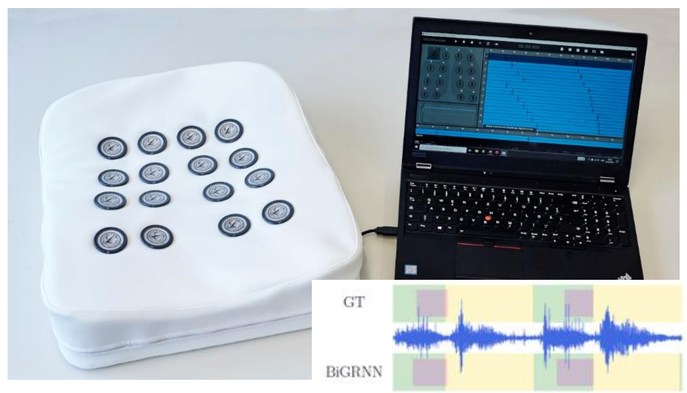


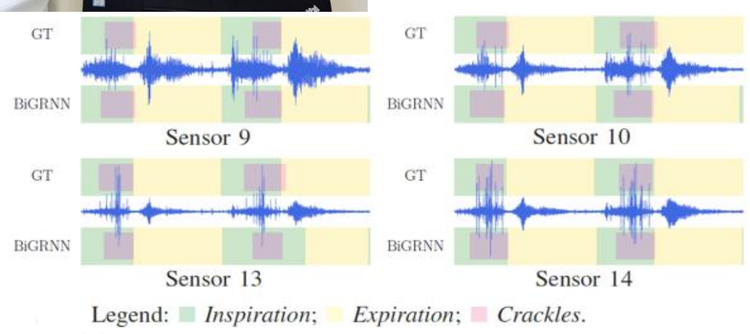
Robust AI for Industry

Meta Learning:

- Transfer learning of many *inhomogenous* source tasks
- Leverage performance by transfering knowledge among tasks
- Fine-tuning of pre-trained model for particular application

Computational Lung Sound Analysis

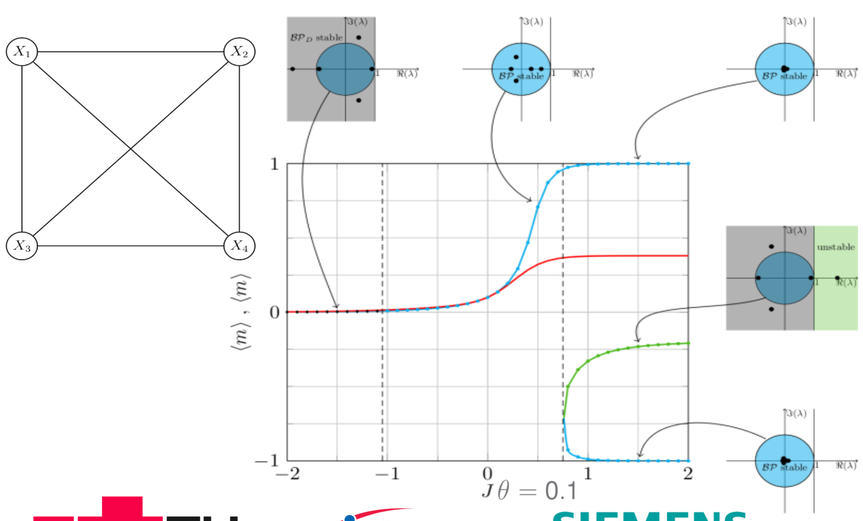




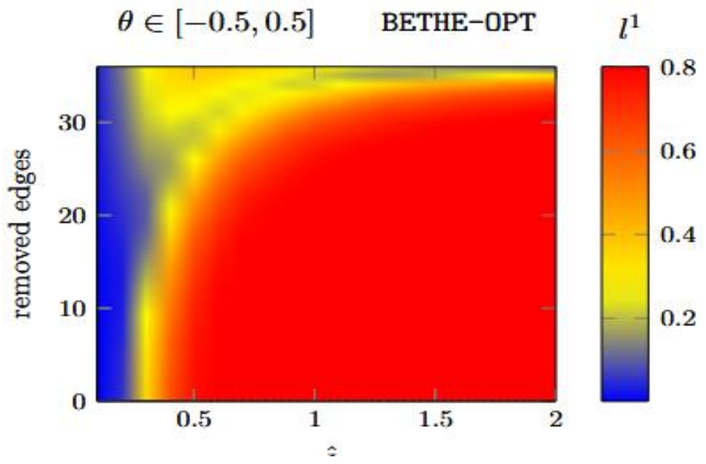
- Recording of data in Vietnam
- Multiple Instance Learning

Analysis of Belief Propagation and Bethe Free Energy Approximations

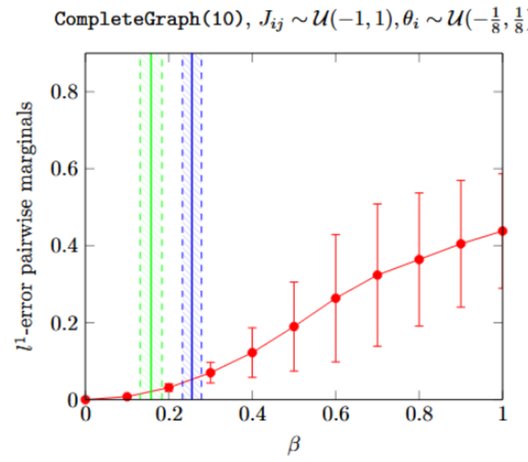
- Fixed point analysis of Belief Propagation



- Graph pruning based on Bethe free energy



- Reliability of Bethe free energy approximation



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