Efficient Probabilistic Inference with Partial Ranking Queries

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**Riffled Independence**

- American Psychological Association Elections
- Top-down decompositions
- Efficient Bayesian Inference
- The hierarchy does not matter!

**Decomposable Inference**

- Efficient Bayesian Inference
- The hierarchy does not matter!
- Partial ranking likelihoods factor with respect to any hierarchy

**Complete Decomposability**

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**Hierarchical Riffled Independence**

- Generative process for a hierarchy
- Partial rankings – a special class of decomposable observations
- Why are partial rankings decomposable?

**Deomposable Inference**

- Efficient Bayesian Inference
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**Partial Rankings**

- Partial rankings – a special class of decomposable observations
- Why are partial rankings decomposable?

**Theory:** The indicator function of any partial ranking is decomposable.

**Proof concepts:**

- Consistency of rankings 
- Consistency of interferences
- Consistency of interactions

**Total running time:**

- Brute force optimization: 70.2s
- Anchors method: 2.3s

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**Structure Learning with Partial Rankings**

- Application: Learning with partial rankings
- Structure learning on Irish election data
- Synthetic data

**Experiments**

- APA structures from partial rankings
- Visits to HuffPo Sarah Palin articles
- Synthetic data
- Irish election data

**Conclusion**

- General structure learning
- Can exploit riffled independence relationships for efficiency during conditioning (on partial rankings)
- Can learn structure/parameters from partial rankings!