Faster Attend-Infer-Repeat with Tractable Probabilistic Models

Karl Stelzner[1], Robert Peharz[2], Kristian Kersting[1,3]

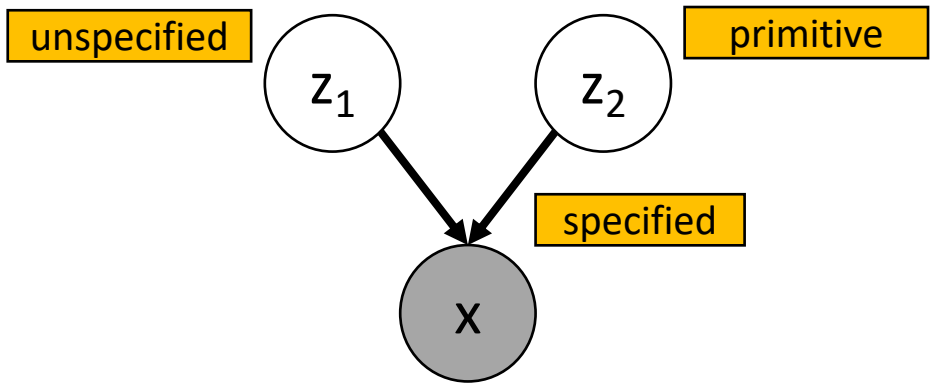
[1] Machine Learning Group, TU Darmstadt
[2] Machine Learning Group, University of Cambridge
[3] Centre for Cognitive Science, TU Darmstadt

ICML 2019

June 13, 2019

Deep Models with Tractable Components

- Deep generative models are a powerful tool
- Scaling is limited by effectiveness of approximate inference
- Can we improve this by combining them with tractable models, such as Sum-Product Networks?



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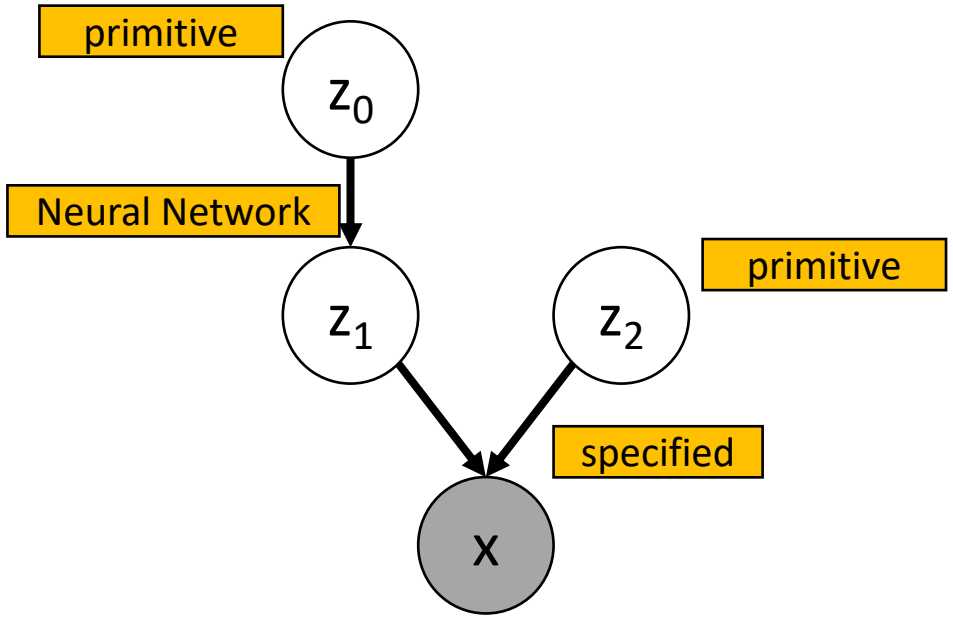

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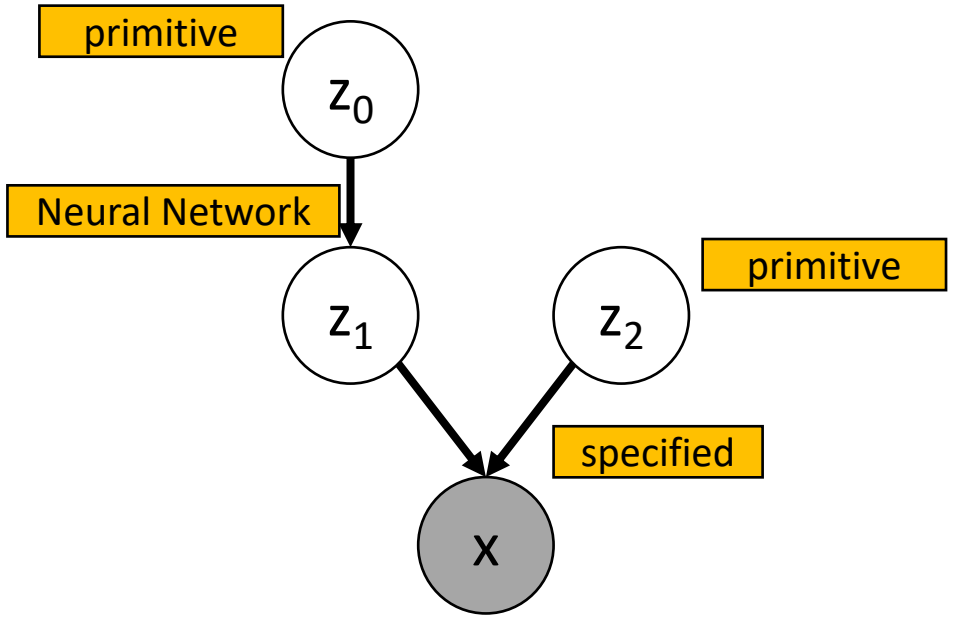
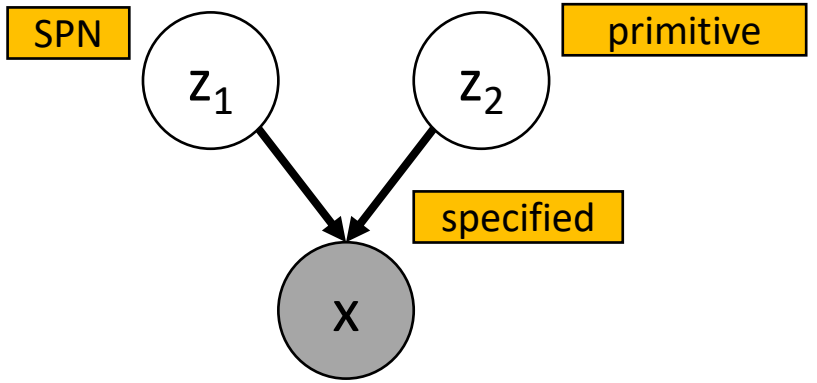
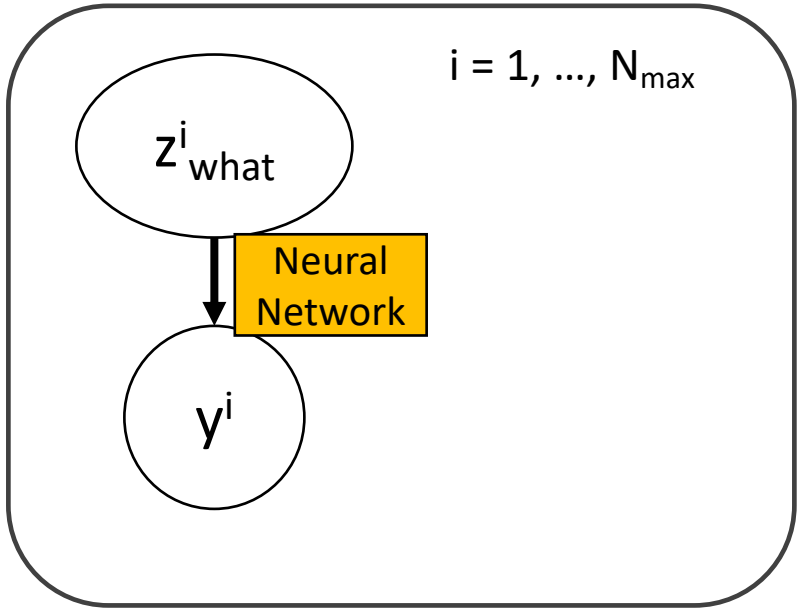
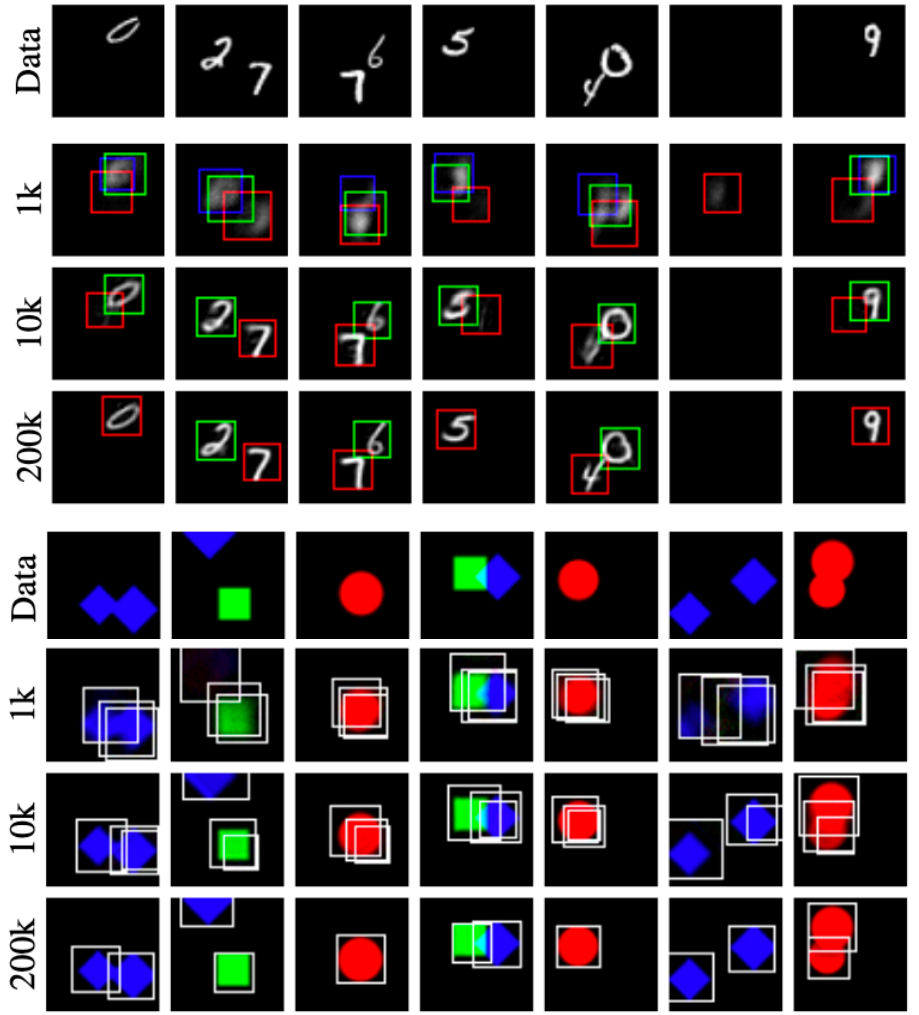




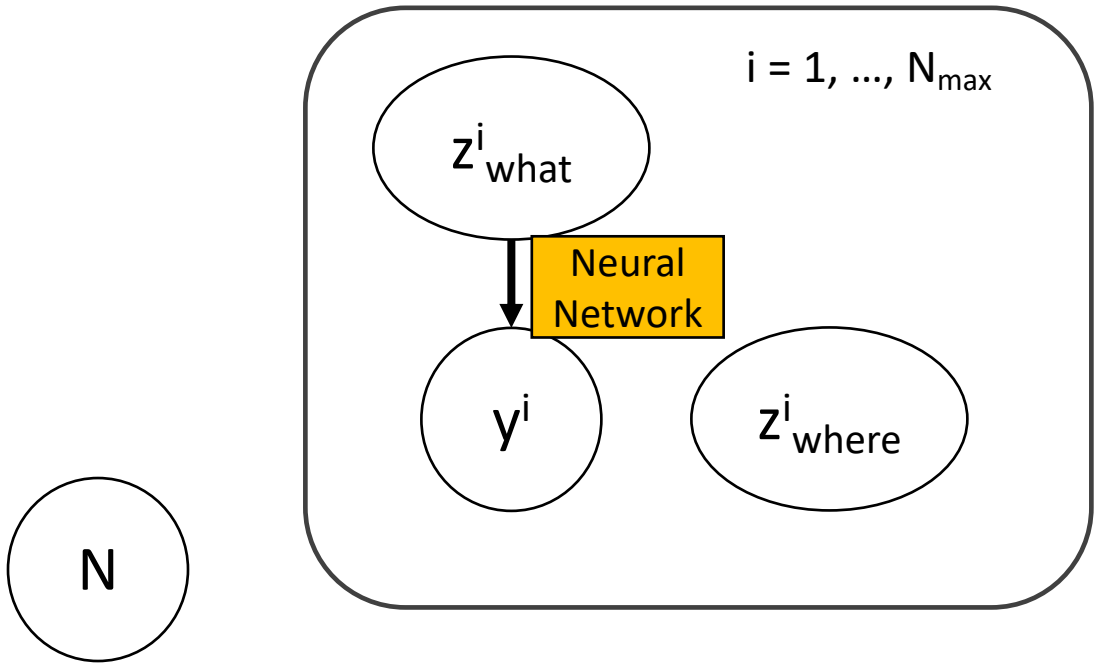
Attend-Infer-Repeat

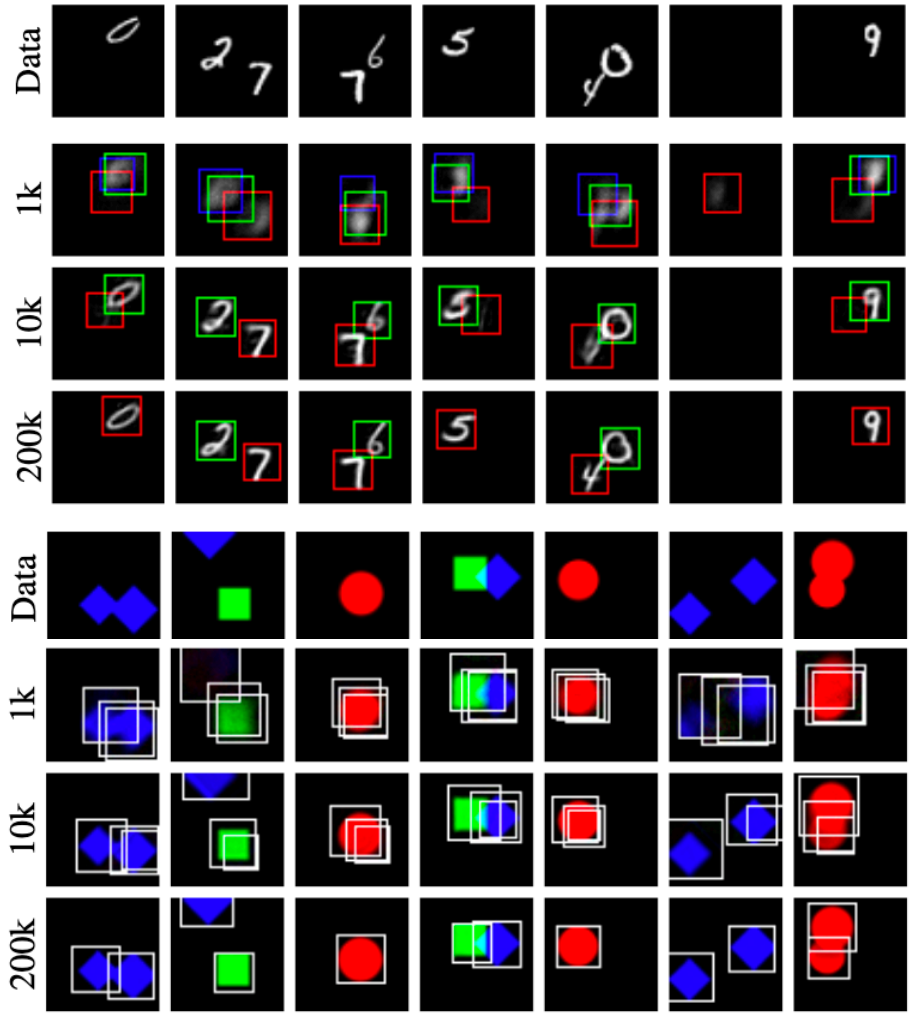




[Eslami, SM Ali, et al. "Attend, infer, repeat: Fast scene understanding with generative models." *NIPS 2016]*

Attend-Infer-Repeat





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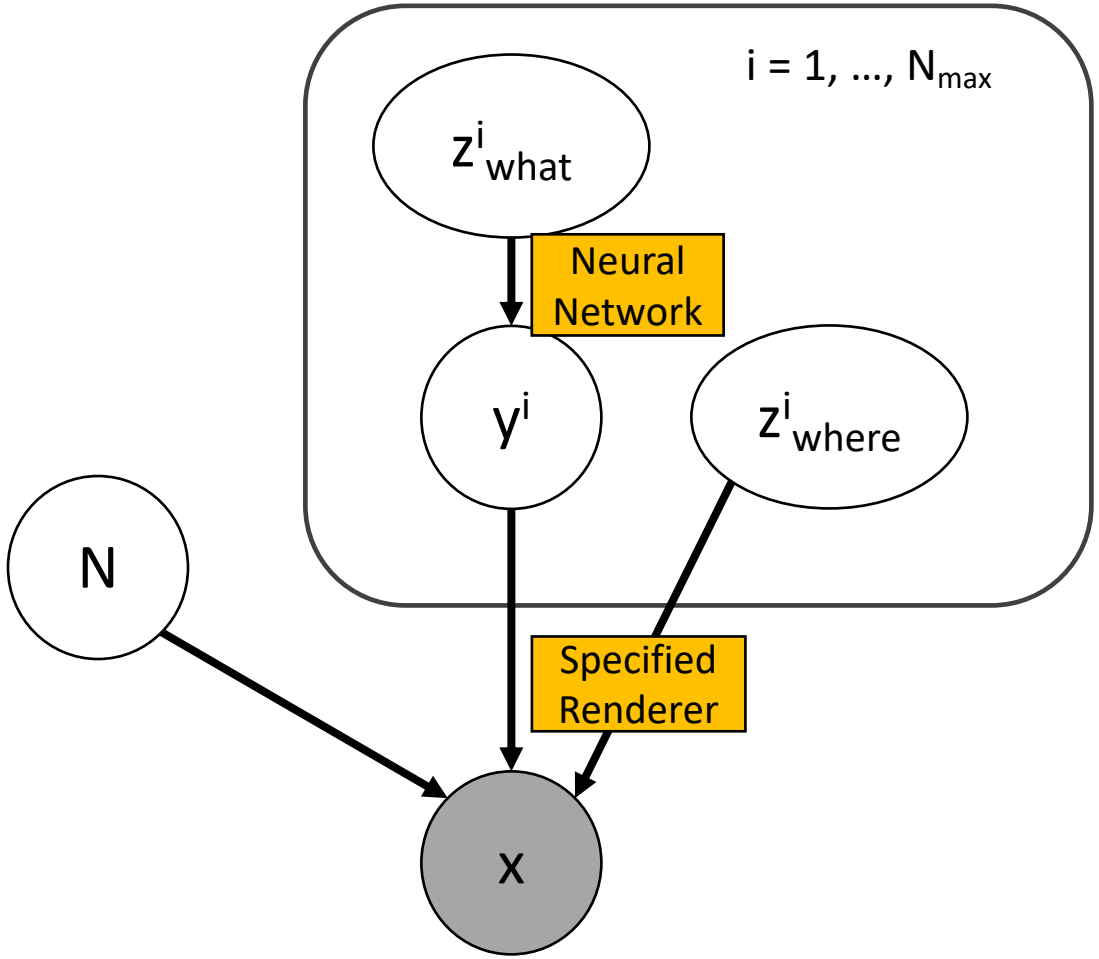

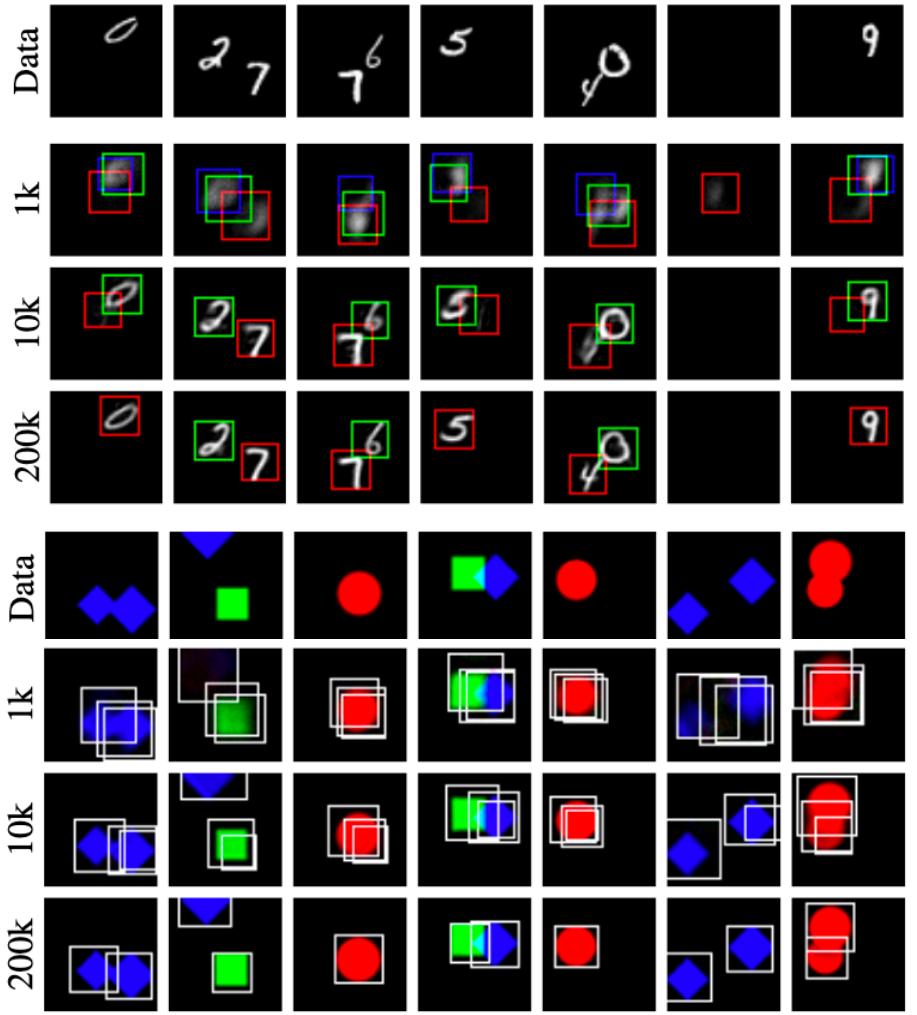

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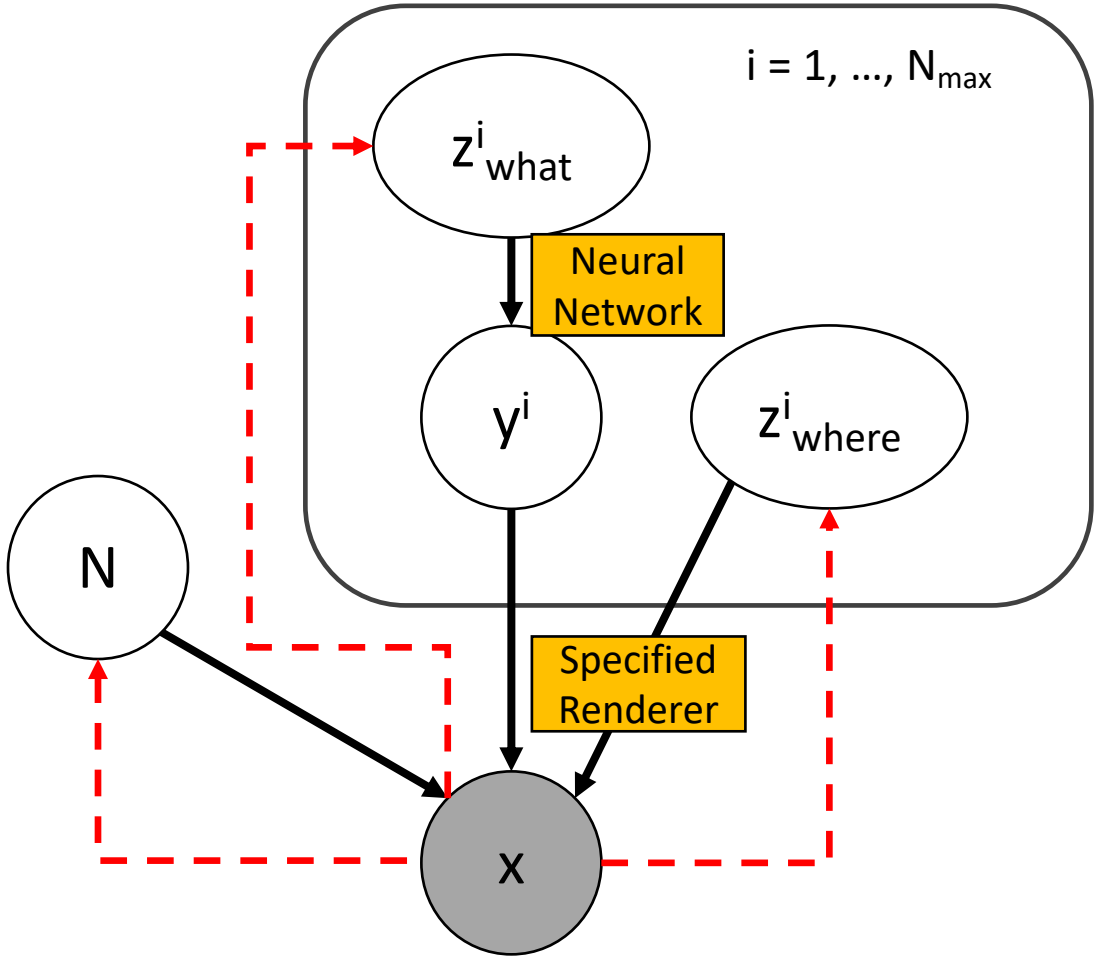
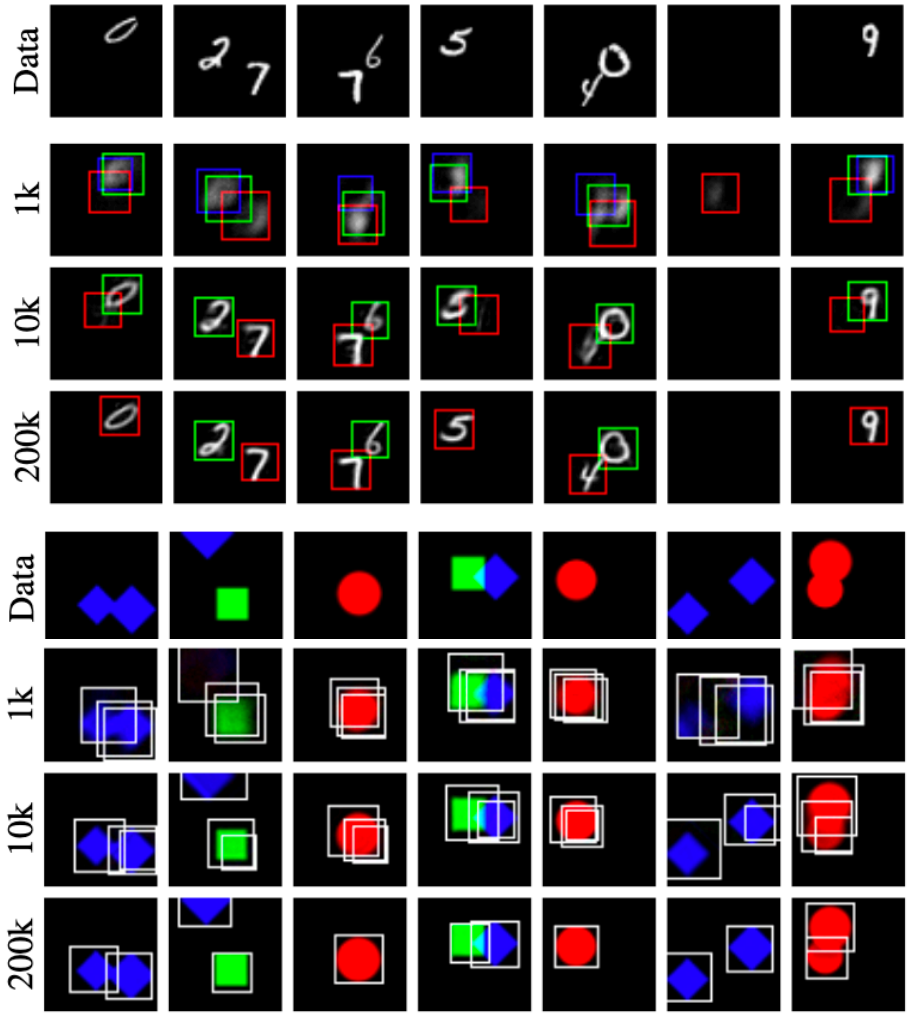
Attend-Infer-Repeat





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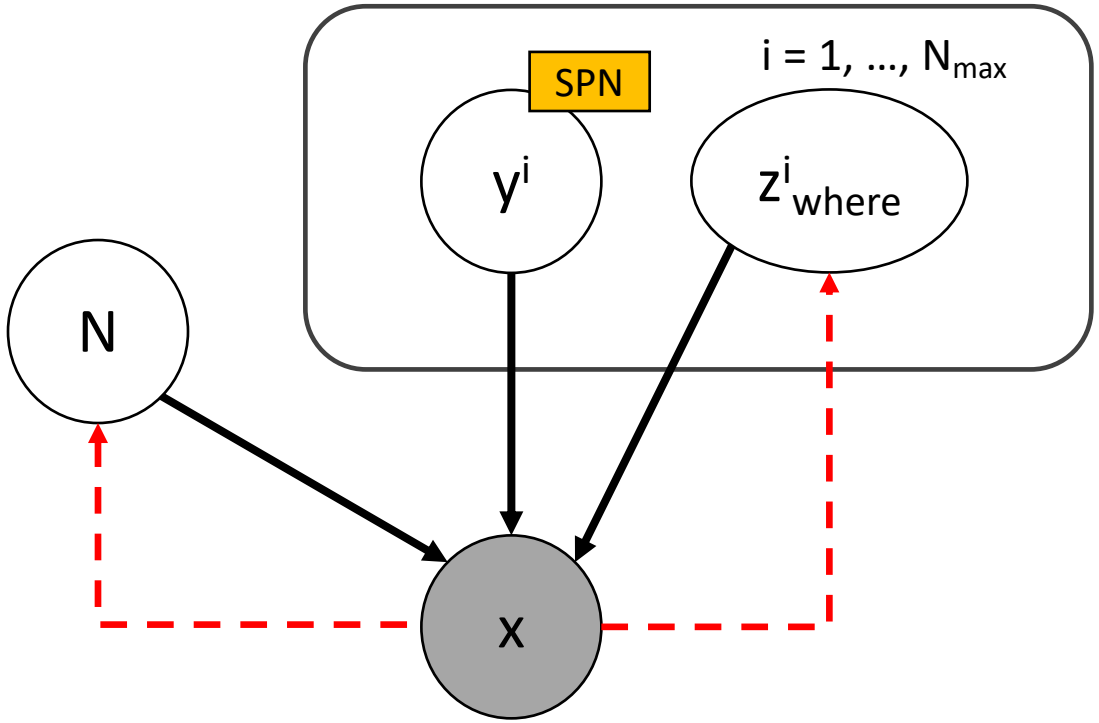
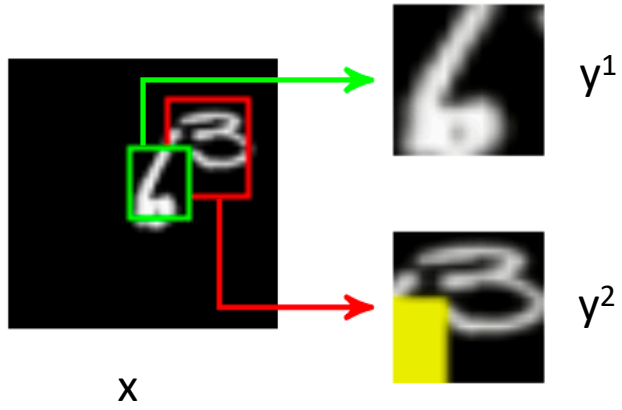
Sum-Product Attend-Infer-Repeat

Use SPN to model objects

Each pixel in y is occluded (unobserved), or can be inferred deterministically from x and z_{where}

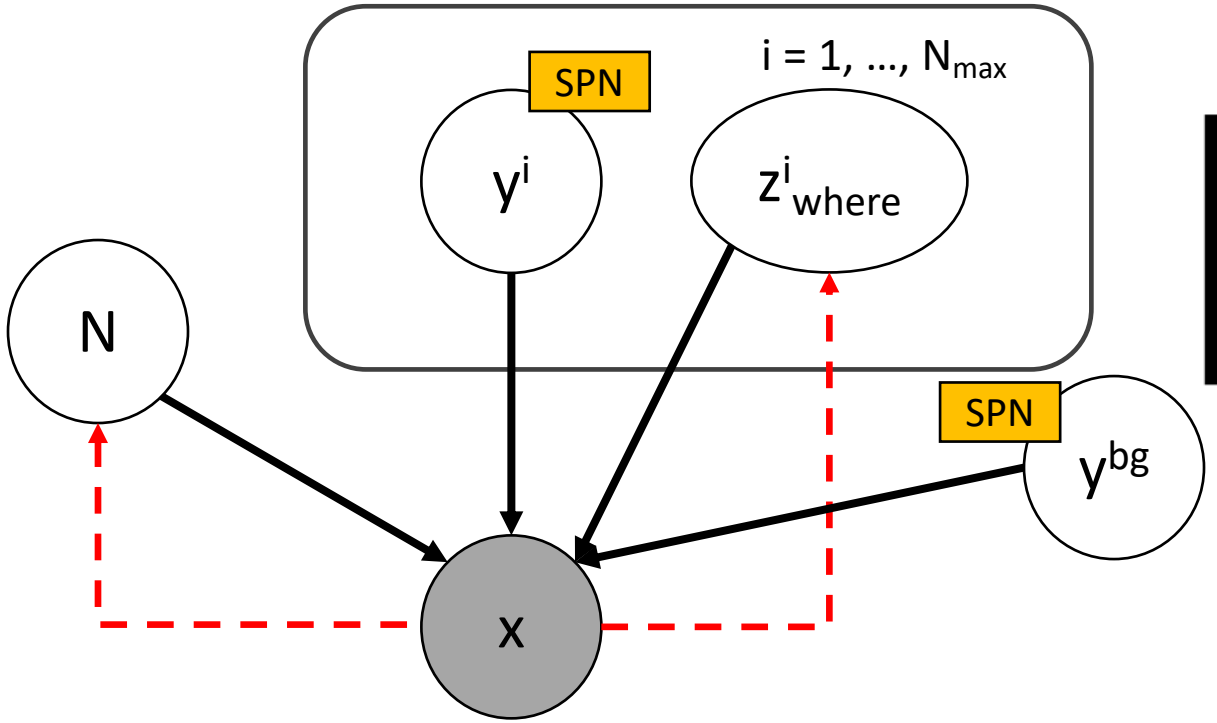


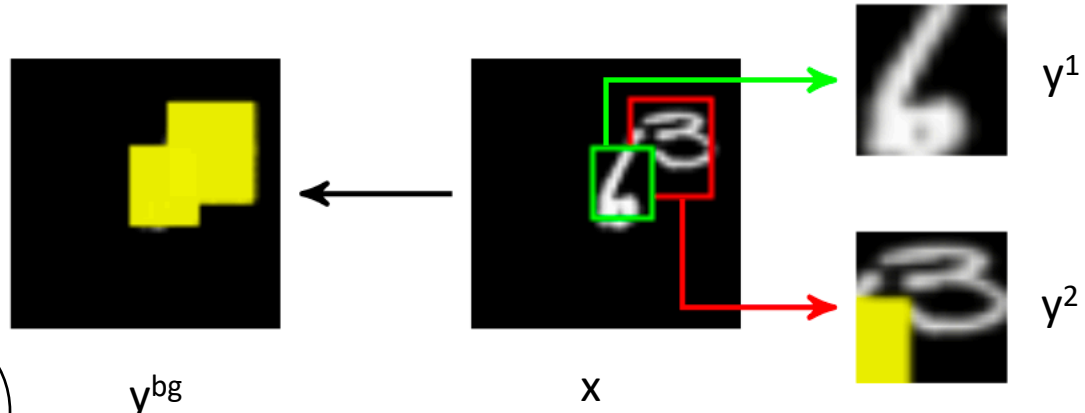


Sum-Product Attend-Infer-Repeat

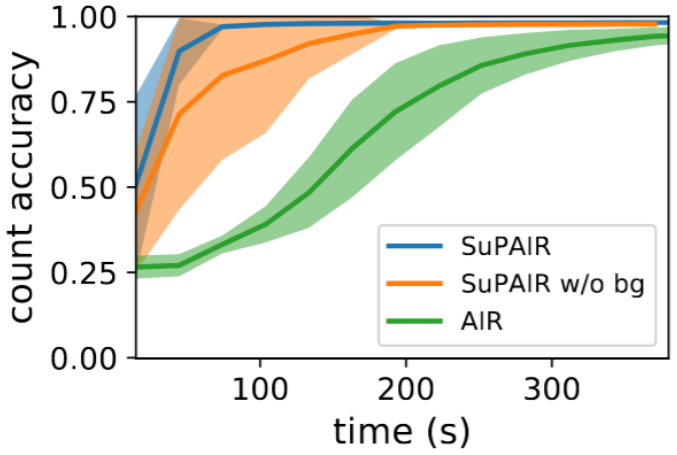
Model background with another SPN

$$p(x \mid N, z_{where}) = p_{bg}(x^{bg=1}) \prod_{i=1}^{N} p_{obj}(x^{i=1})$$

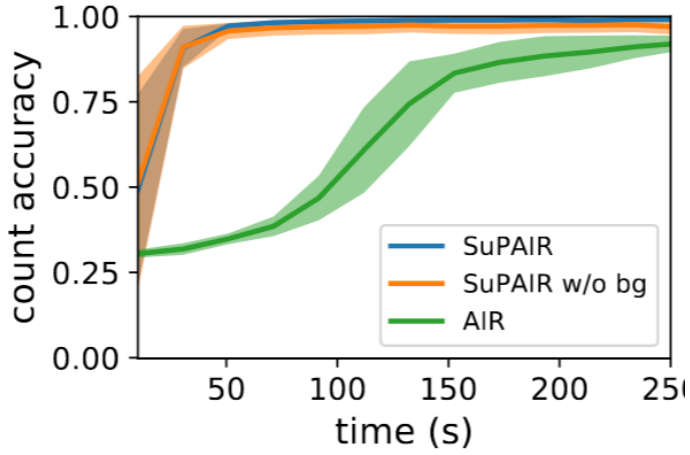




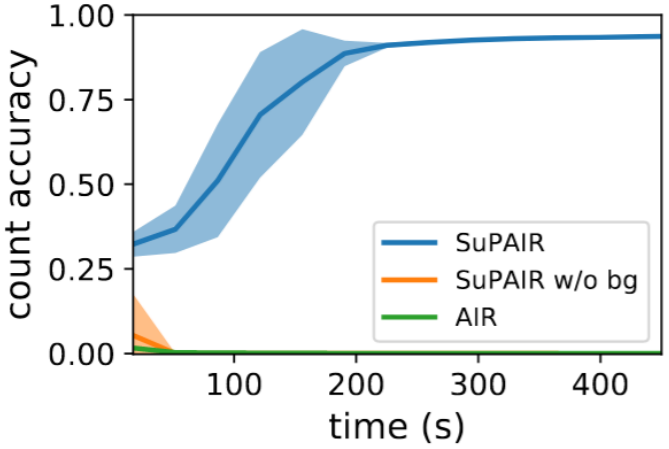
Faster & More Robust Training



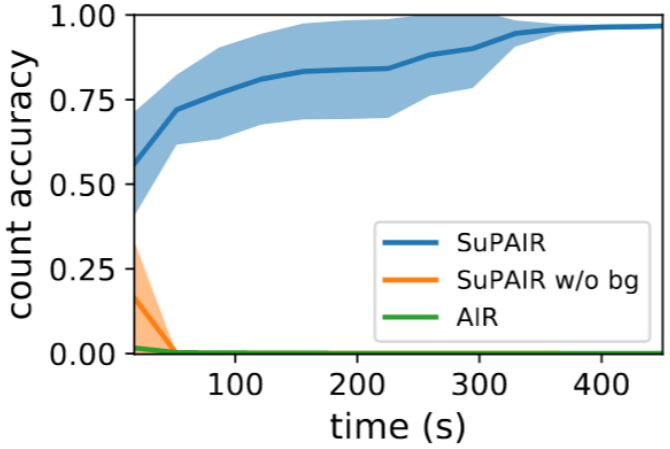
(a) MNIST



(b) Sprites

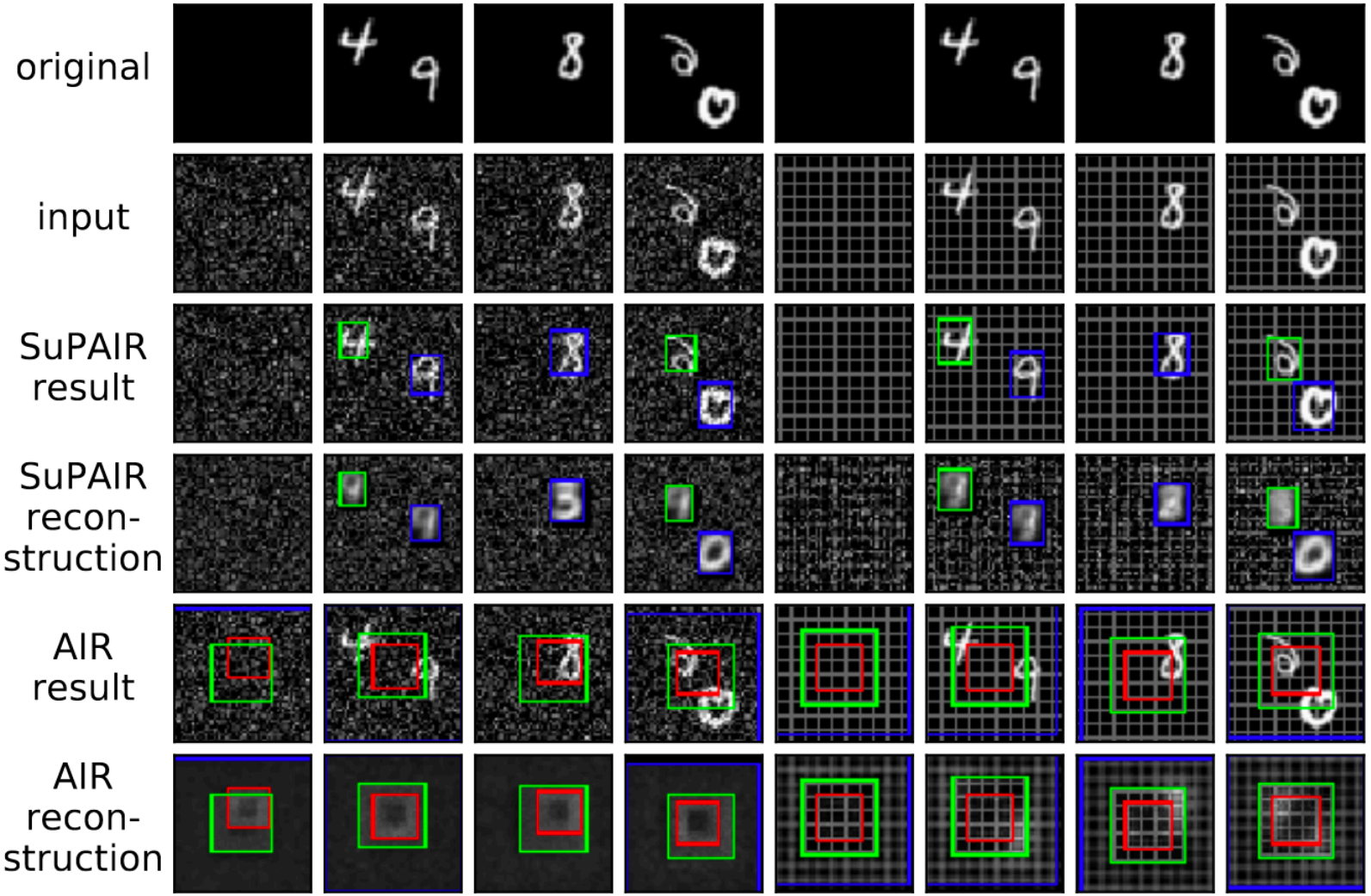


(c) Noisy MNIST

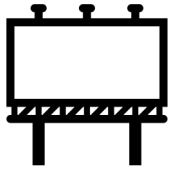


(d) Grid MNIST

Background Model at Work



Thank you!



Pacific Ballroom #89

github.com/stelzner/supair

stelzner@cs.tu-darmstadt.de