

Toward a theory of transfer

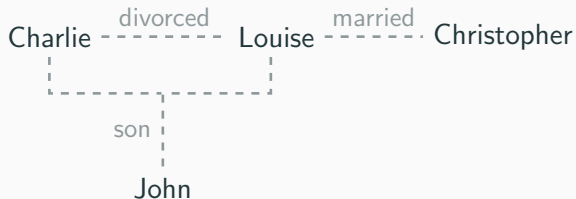
Andrew Lampinen

Lightning Talk, Oct. 4th 2017

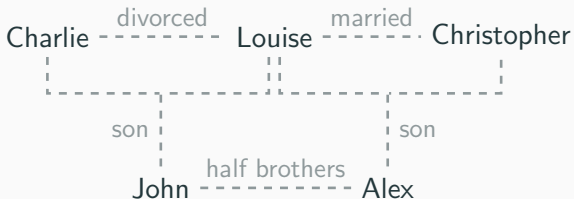
Transfer



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The human condition

The human condition



The human condition



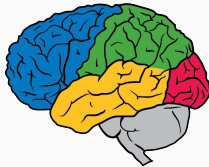
The human condition



The human condition

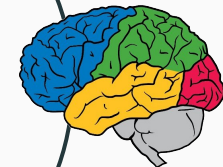


Neural nets transfer too!



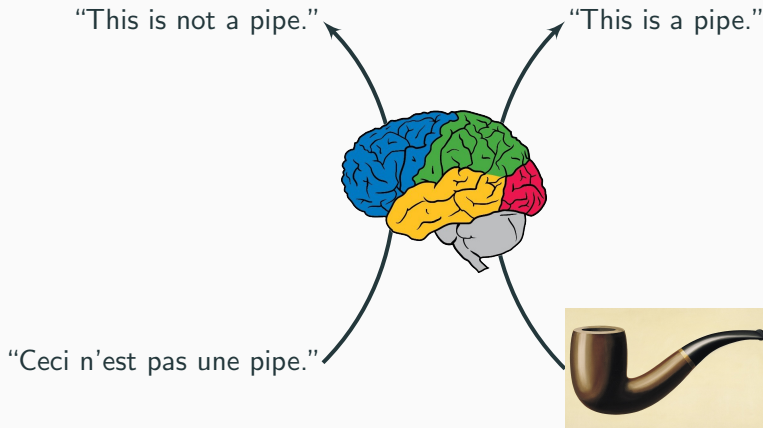
Neural nets transfer too!

"This is not a pipe."



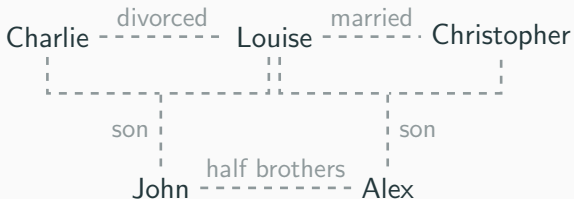
"Ceci n'est pas une pipe."

Neural nets transfer too!

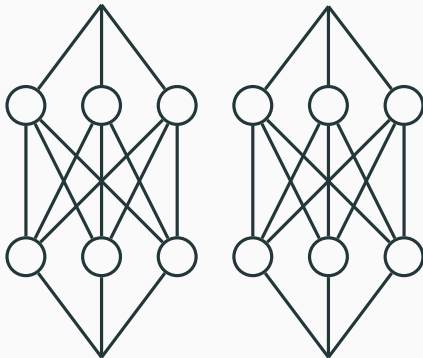


**We suggest that these are similar processes.
Can we develop a theory?**

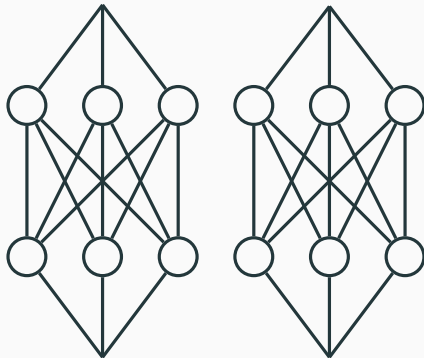
Transfer



Teaching networks about families

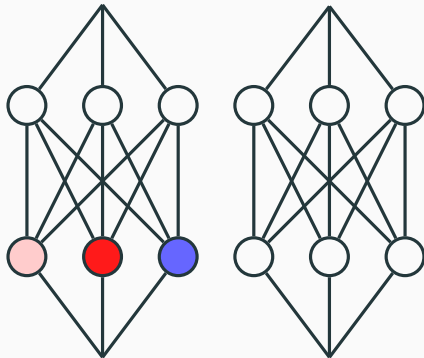


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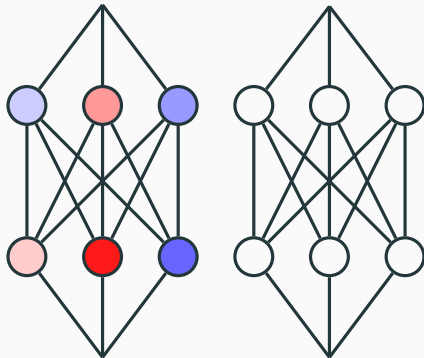
“Who are Alexa’s
parents?”

Teaching networks about families



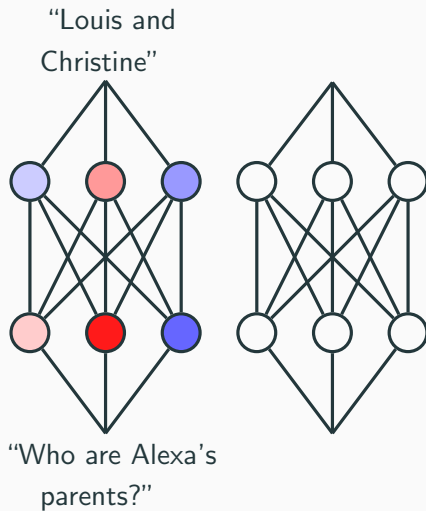
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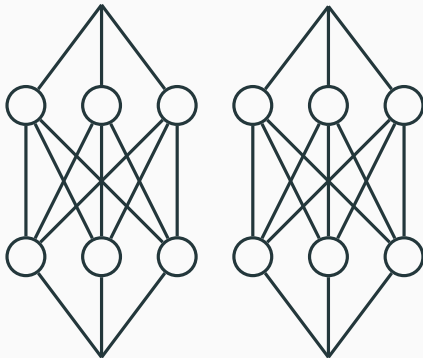


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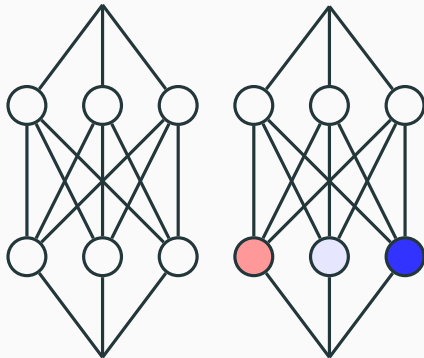


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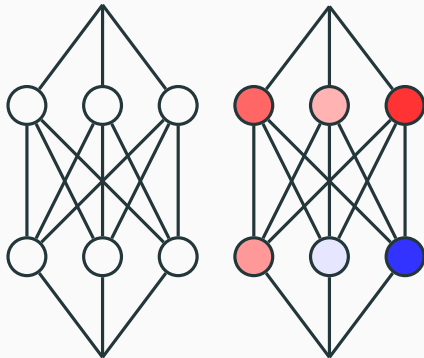
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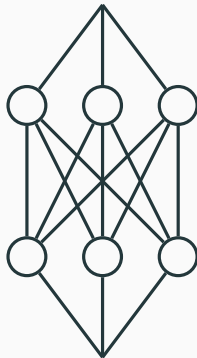
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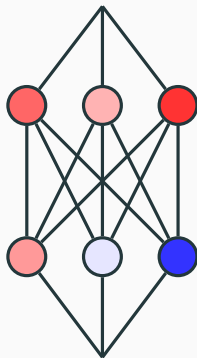


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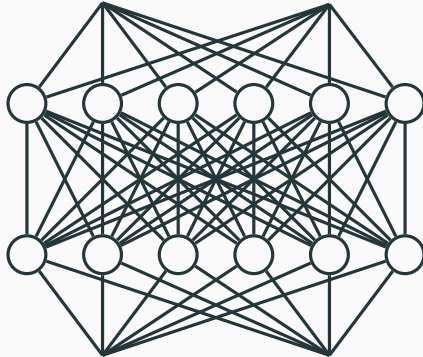


“Louise and
Christopher”

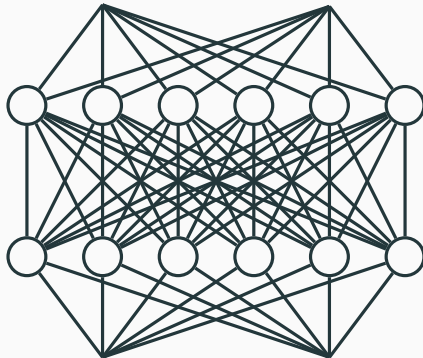


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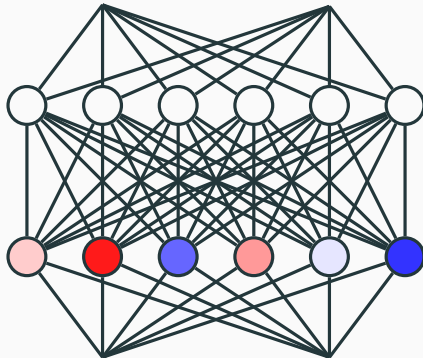


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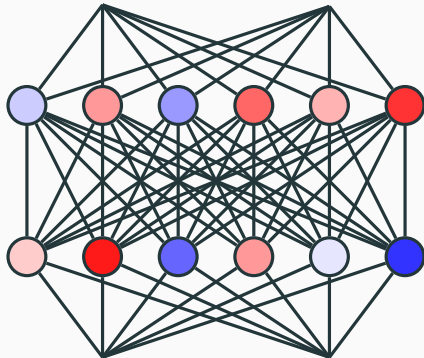
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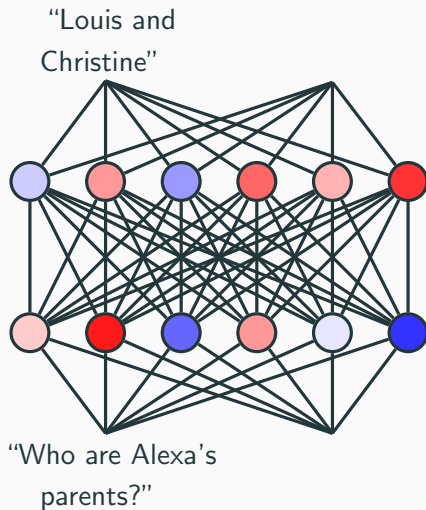
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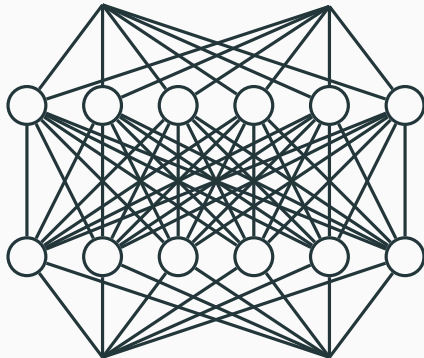


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Teaching networks about families

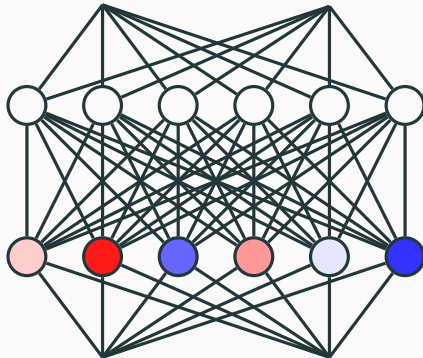


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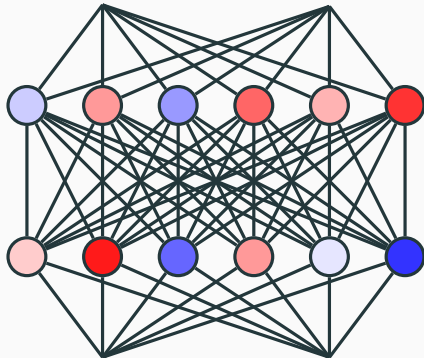
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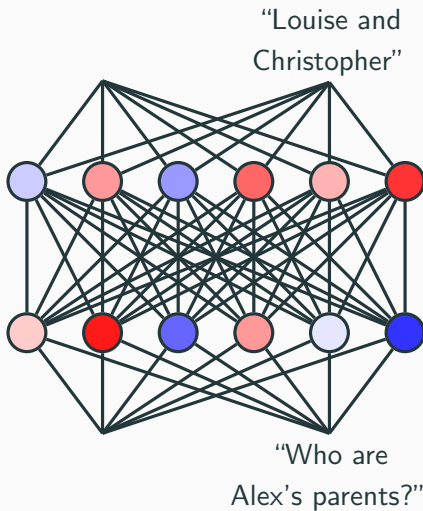
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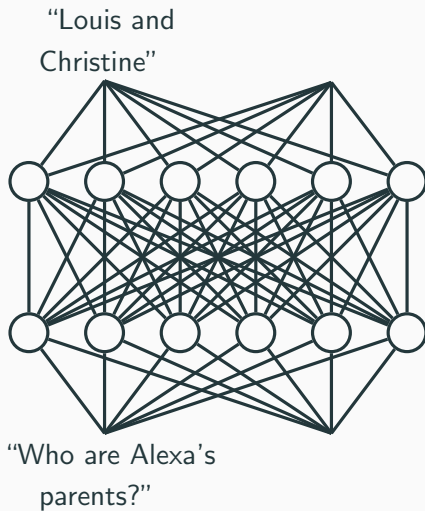


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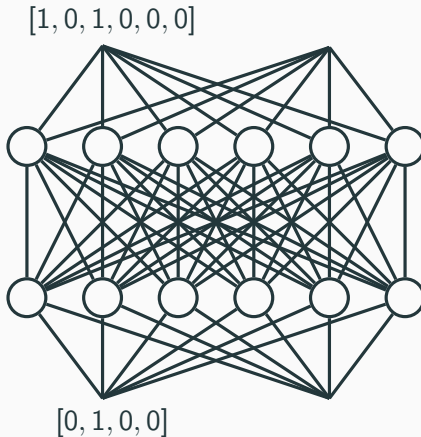
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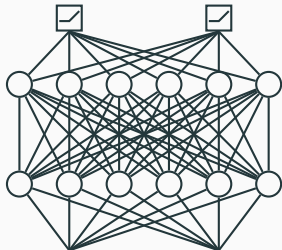
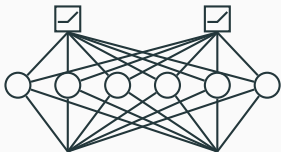
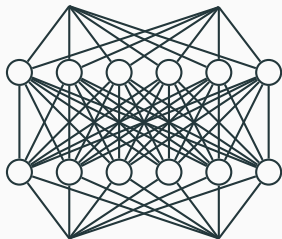
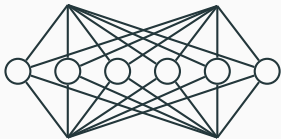
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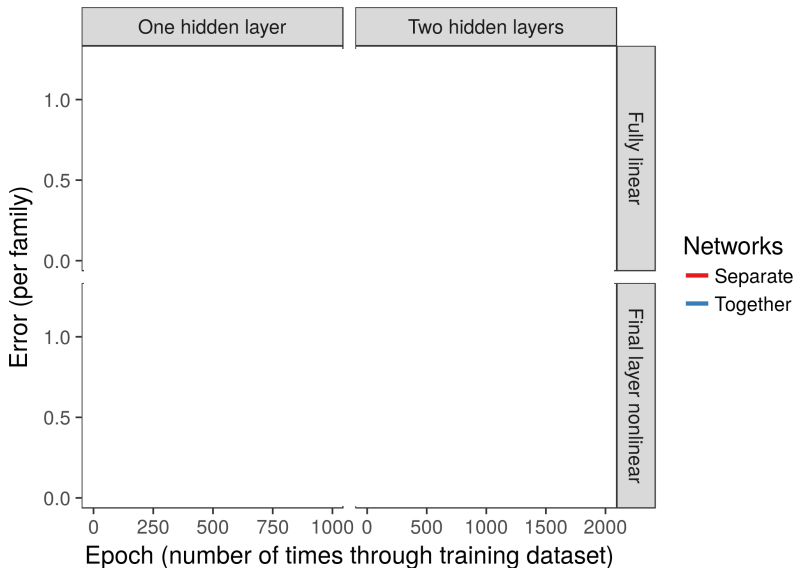
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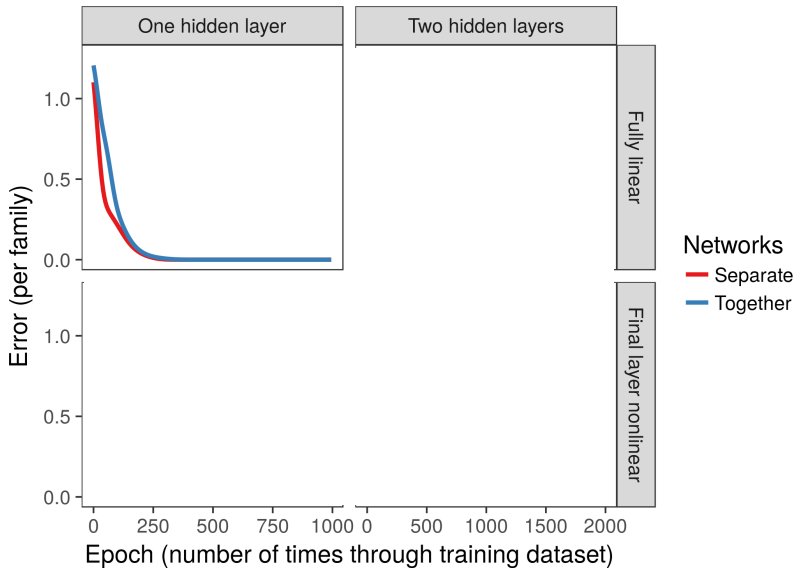
For what networks?



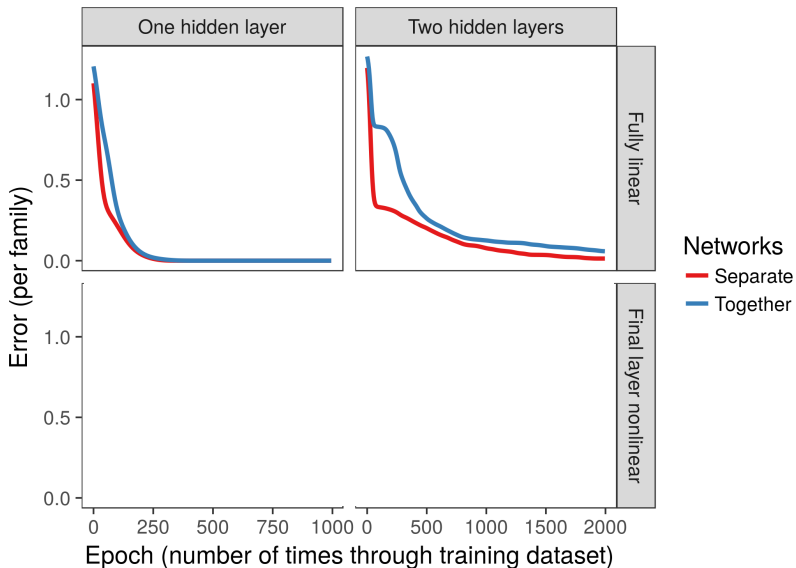
Results



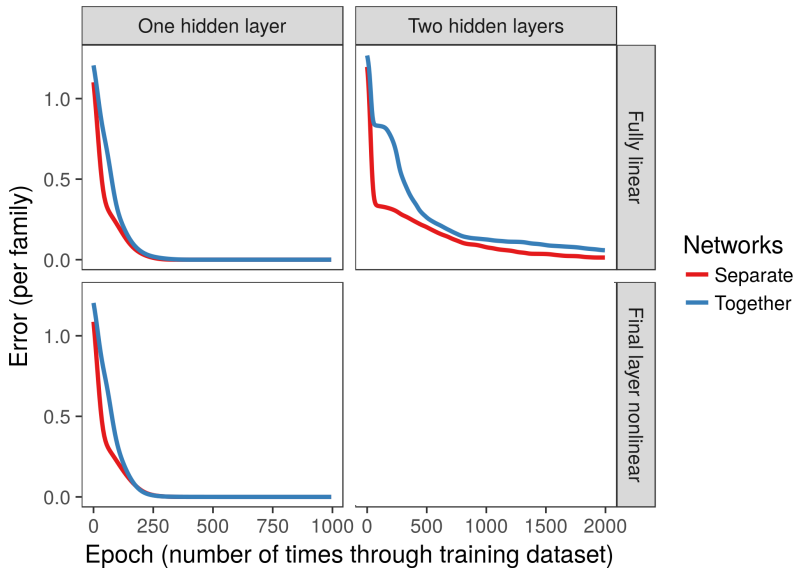
Results



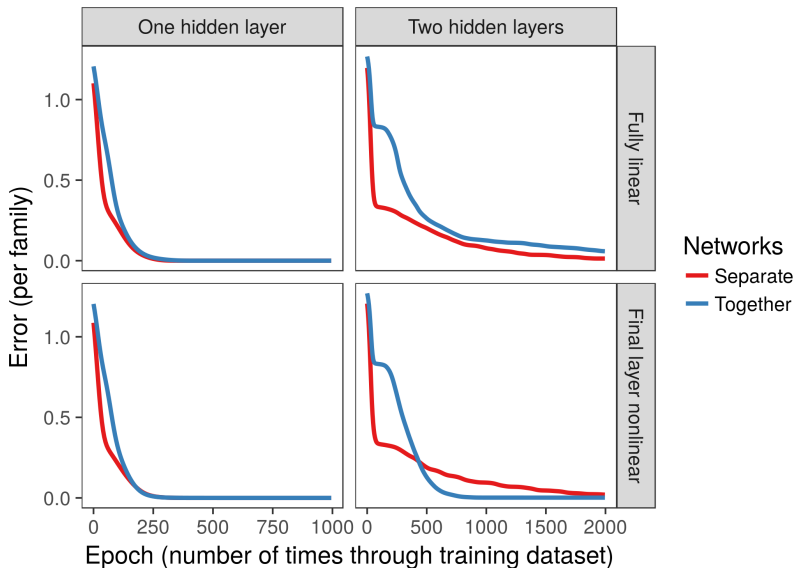
Results



Results



Results



Questions?

References

- Steven S. Hansen, Andrew Lampinen, Gaurav Suri, and James L. McClelland. Building on prior knowledge without building it in. *In press at Behavioral and Brain Sciences*, 2017.
- Geoffrey Hinton. Learning distributed representations of concepts, 1986. ISSN 10414347.
- Andrew Lampinen, Shaw Hsu, and James L. McClelland. Analogies Emerge from Learning Dynamics in Neural Networks. In *Proceedings of the Cognitive Science Society 2017 (Accepted)*, 2017.
- Minh-Thang Luong, Quoc V. Le, Ilya Sutskever, Oriol Vinyals, and Lukasz Kaiser. Multi-task Sequence to Sequence Learning. *Iclr*, pages 1–9, 2016.
- Andrew M. Saxe, James L. McClelland, and Surya Ganguli. Exact solutions to the nonlinear dynamics of learning in deep linear neural networks. *Advances in Neural Information Processing Systems*, pages 1–9, 2013.