

Some Research Themes in Statistical Relational AI

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The following is a list (non-exhaustive, in no particular order) of research themes in statistical relational learning, probabilistic programming and related fields. This document provides pointers to websites, systems, and papers that can serve as an entry point into each research theme. Please don't limit yourself to these pointers. Also explore on:

- <https://scholar.google.com/>
- <https://www.semanticscholar.org/>
- <http://www.starai.org/>

Knowledge Compilation Inference for SRL

In probabilistic programming:

- <http://web.cs.ucla.edu/~guyvdb/papers/FierensTLP15.pdf>
- <http://web.cs.ucla.edu/~guyvdb/papers/VlasselaerJAR16.pdf>

In probabilistic databases:

- <http://www.cs.ox.ac.uk/dan.olteanu/papers/oh-sum08.pdf>
- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.228.6878&rep=rep1&type=pdf>
- <http://arxiv.org/pdf/1201.6569.pdf>
- http://vldb.org/pvldb/vol5/p490_robertfink_vldb2012.pdf

Relational Dependency Networks

- <http://www.jmlr.org/papers/volume8/neville07a/neville07a.pdf>
- <http://research.cs.wisc.edu/machine-learning/shavlik-group/natarajan.mlj12.pdf>
- <http://link.springer.com/article/10.1007/s10994-015-5483-2/fulltext.html>

Relational Reinforcement Learning

- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.157.6670&rep=rep1&type=pdf>
- https://lirias.kuleuven.be/bitstream/123456789/131780/1/2001_ecml_driessens.pdf
- https://dl.dropboxusercontent.com/u/8837915/kd/papers/2006_mlj_driessens.pdf

- https://www.researchgate.net/profile/Kristian_Kersting/publication/221344666_Non-parametric_policy_gradients_A_unified_treatment_of_propositional_and_relational_domains/links/0912f512b40332d977000000.pdf
- <http://web.engr.oregonstate.edu/~afern/papers/srl-book-rrl.pdf>
- <http://mlsurveys.s3.amazonaws.com/74.pdf>

Learning Probabilistic Programs

- <http://www.jmlr.org/proceedings/papers/v28/menon13.pdf>
- <http://dl.acm.org/citation.cfm?id=2736282>
- <https://github.com/brendenlake/BPL>
- <http://web.mit.edu/cocosci/Papers/Science-2015-Lake-1332-8.pdf>
- <https://arxiv.org/pdf/1110.5667v1.pdf>
- <https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/paper-5.pdf>
- <https://arxiv.org/pdf/1608.04428v1.pdf>

Stan and Hamiltonian Monte-Carlo Inference

- <http://mc-stan.org/>
- [https://en.wikipedia.org/wiki/Stan_\(software\)](https://en.wikipedia.org/wiki/Stan_(software))
- <http://www.mcmchandbook.net/HandbookChapter5.pdf>
- <http://jmlr.org/papers/v15/hoffman14a.html>

ProPPR and the Never-Ending Language Learner

- https://en.wikipedia.org/wiki/Never-Ending_Language_Learning
- <http://rtw.ml.cmu.edu/rtw/>
- http://www.cs.cmu.edu/~tom/pubs/NELL_aaai15.pdf
- <http://arxiv.org/pdf/1305.2254.pdf>

Probabilistic Soft Logic and its Applications

- <https://psl.umiacs.umd.edu/>
- <http://arxiv.org/abs/1505.04406>
- <https://psl.umiacs.umd.edu/publications.php>

Lifted Markov-Chain Monte Carlo

- <http://arxiv.org/abs/1206.5396>
- <http://arxiv.org/abs/1304.2694>

- <http://web.cs.ucla.edu/~guyvdb/papers/VdBAAAI15a.pdf>
- <http://papers.nips.cc/paper/4511-on-lifting-the-gibbs-sampling-algorithm.pdf>
- <https://arxiv.org/abs/1606.09594>

Vector-Space Embeddings for Multi-Relational Data

- Non-relational embeddings:
<https://www.tensorflow.org/versions/r0.11/tutorials/word2vec/index.html>
- TransE: https://www.utc.fr/~bordesandokuwiki/media/en/transe_nips13.pdf
- TransH: <https://www.aaai.org/ocs/index.php/AAAI/AAAI14/paper/download/8531/8546>
- TransR: <https://www.aaai.org/ocs/index.php/AAAI/AAAI15/paper/download/9571/9523>
- http://nlp.stanford.edu/pubs/kg_traversal.pdf
- <https://arxiv.org/pdf/1504.06662v2.pdf>
- <http://www.ijcai.org/Proceedings/15/Papers/264.pdf>
- <https://arxiv.org/pdf/1606.08359v1.pdf>
- <http://jmlr.org/proceedings/papers/v48/trouillon16.pdf>
- <https://arxiv.org/pdf/1606.08359.pdf>

Automated Knowledge-Base Construction

- <http://www.akbc.ws/2014/>
- <http://www.akbc.ws/2016/>
- <http://www.riedelcastro.org/publications/papers/riedel13relation.pdf>
- http://link.springer.com/chapter/10.1007/978-3-662-04599-2_8#page-1

Multi-Relational Data Mining

Heterogeneous Network Mining:

- <http://www.morganclaypool.com/doi/abs/10.2200/S00433ED1V01Y201207DMK005>
- <https://arxiv.org/pdf/1511.04854.pdf>

Relational pattern mining:

- <https://people.mpi-inf.mpg.de/~chteflio/publications/amie.pdf>
- <https://arxiv.org/pdf/cs/0206023v1.pdf>

Probabilistic non-relational mining:

- <http://hub.hku.hk/bitstream/10722/138034/1/Content.pdf?accept=1>

Relational Deep Learning

- <https://arxiv.org/pdf/1605.05273.pdf>
- <https://arxiv.org/pdf/1506.05163v1.pdf>

- <https://arxiv.org/abs/1509.09292>
- <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=10501&context=infopapers>

Markov Logic Network Structure Learning

- <http://homes.cs.washington.edu/~pedrod/papers/mlj05.pdf>
- <https://alchemy.cs.washington.edu/papers/mihalkova07a/mihalkova07a.pdf>
- <http://www.machinelearning.org/archive/icml2009/papers/576.pdf>
- <http://homes.cs.washington.edu/~pedrod/papers/mlc10b.pdf>
- http://www.ai.sri.com/~huynh/papers/huynh_mooney_ecml11.pdf
- <http://web.cs.ucla.edu/~guyvdb/papers/VHaarenMLJ15.pdf>

Neural Turing Machines

- <https://arxiv.org/pdf/1410.5401v2.pdf>
- <https://arxiv.org/pdf/1502.05698v10.pdf>
- <https://rockt.github.io/pdf/rocktaschel2016learning.pdf>
- <https://arxiv.org/pdf/1511.06279v4.pdf>

Probabilistic Inverse Graphics

- <http://probcomp.csail.mit.edu/gpgp/>
- https://mrkulk.github.io/www_cvpr15/1999.pdf
- <https://arxiv.org/pdf/1503.03167v4.pdf>
- <https://arxiv.org/pdf/1407.1339v1.pdf>
- <https://dritchie.github.io/>
- <https://dritchie.github.io/pdf/c3.pdf>
- <https://arxiv.org/pdf/1603.06143v1.pdf>

Probabilistic SAT Modulo Theories (SMT)

- <http://web.cs.ucla.edu/~guyvdb/papers/BelleAAAI16.pdf>
- <http://web.cs.ucla.edu/~guyvdb/papers/BelleIJCAI16.pdf>
- <http://www.ai.sri.com/~braz/papers/PIMT.pdf>
- <https://arxiv.org/pdf/1411.0659.pdf>

Decision Making and Planning in SRL

- <https://lirias.kuleuven.be/bitstream/123456789/134702/1/04-icml.pdf>

- <http://www.sciencedirect.com/science/article/pii/S0004370208001884>
- <https://www.jair.org/media/2489/live-2489-3744-jair.pdf>
- <https://lirias.kuleuven.be/bitstream/123456789/270066/1/dtproblog.pdf>
- http://siddharthsrivastava.net/Publications/srrc14_oupomdp.pdf

The Figaro language and system

- <https://www.cra.com/work/case-studies/figaro>
- <https://www.amazon.com/Practical-Probabilistic-Programming-Avi-Pfeffer/dp/1617292338>
- <http://www.cs.tufts.edu/~nr/cs257/archive/avi-pfeffer/figaro.pdf>
- <http://csweb.cs.wfu.edu/~snataraj/StaRAI/accepted/pfeffer.pdf>

Inductive Logic Programming

- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.696.3740&rep=rep1&type=pdf>
- <https://riunet.upv.es/bitstream/handle/10251/64984/Paper.pdf?sequence=3>
- https://en.wikipedia.org/wiki/First_Order_Inductive_Learner
- <http://www.sciencedirect.com/science/article/pii/S0004370298000344>
- <https://www.biostat.wisc.edu/~craven/papers/mlj01.pdf>

BLOG and Open-Universe Models

- <https://bayesianlogic.github.io/>
- <https://people.eecs.berkeley.edu/~russell/papers/ijcai05-blog.pdf>
- <http://research.microsoft.com/en-us/um/people/akolobov/papers/blog-chapter.pdf>
- <https://bayesianlogic.github.io/pages/publications.html>
- <http://freecontent.manning.com/wp-content/uploads/practical-probabilistic-programming-open-universe-situations-with-unknown-number-of-objects.pdf>

Infer.NET, Tabular and Fun (Microsoft)

- <http://research.microsoft.com/en-us/um/cambridge/projects/infernet/>
- <https://www.microsoft.com/en-us/research/wp-content/uploads/2016/07/timebcc16-1.pdf>
- http://research.microsoft.com/en-us/um/cambridge/projects/infernet/InferNet_Intro.pdf
- <https://www.microsoft.com/en-us/research/project/infer-net-fun/>
- <https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/Tabular-POPL2014-talk-SanDiego.pdf>

Lifted Belief Propagation

- <http://homes.cs.washington.edu/~pedrod/papers/aaai08a.pdf>
- <http://homes.cs.washington.edu/~pedrod/papers/aaai14.pdf>
- <https://people.eecs.berkeley.edu/~russell/papers/srl09-lifted.pdf>
- <https://arxiv.org/pdf/1205.2637.pdf>
- <http://web.cs.ucla.edu/~guyvdb/papers/VdBUAI12.pdf>

Neuro-Symbolic Learning

- <https://arxiv.org/pdf/1606.04422.pdf>
- <https://arxiv.org/pdf/1603.06318.pdf>
- <https://arxiv.org/pdf/1705.08968.pdf>
- <https://arxiv.org/pdf/1707.07596.pdf>
- DeepProbLog: <https://arxiv.org/abs/1805.10872>

Neural Theorem Proving

- http://www.akbc.ws/2016/papers/14_Paper.pdf
- <https://arxiv.org/pdf/1705.11040.pdf>
- <https://arxiv.org/pdf/1701.06972.pdf>
- <https://arxiv.org/pdf/1606.04442.pdf>

Visual Genome (Pixels to Graphs)

- <https://arxiv.org/pdf/1706.07365.pdf>
- http://visualgenome.org/static/paper/Visual_Genome.pdf