Luke Vilnis

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Research Interests

Machine Learning
- Representation learning
- Probabilistic modeling
- Structured prediction
- Machine reasoning

Applications
- Common sense knowledge
- Knowledge base construction
- Biomedical science
- Green energy

Education

2012–2021 **Computer Science (PhD)**, *University of Massachusetts*, Amherst, MA.
Advised by Andrew McCallum, 3.92 GPA

2012–2015 **Computer Science (MS)**, *University of Massachusetts*, Amherst, MA.
Advised by Andrew McCallum, 3.9 GPA

2006–2010 **Mathematics, Economics (BS)**, *Duke University*, Durham, NC.
3.44 GPA, 3.67 in major (Math), 3.41 in major (Economics)

Experience

2021–Present **Research Scientist**, *Google*, New York, NY.

2012–2021 **Research Assistant**, *Information Extraction and Synthesis Lab*, University of Massachusetts, Amherst, MA.

Summer 2016 **Research Intern**, *Google*, Mountain View, CA.

Summer 2015 **Research Intern**, *Google*, Mountain View, CA.

Summer 2014 **Research Intern**, *Microsoft*, Redmond, WA.

Fall 2013 **Teaching Assistant, Guest Lecturer**, *CS585: Natural Language Processing*, University of Massachusetts, Amherst, MA.

Summer 2013 **Data Science Intern**, *LinkedIn*, Mountain View, CA.

2008–2012 **Software Engineer**, *Mavenomics Inc.*, Cambridge, MA.
- Designed a functional query/calculation language and implemented the compiler and query engine, coded high performance financial math and simulations, as well as front-end components (UI components, layout managers, data visualization, workflow).

Awards

2017 Best paper at AKBC Workshop 2017

2015 Outstanding paper at ACL 2015

2015 Passed PhD candidacy exam with distinction

2013-2014 Yahoo! Award for Accomplishments in Search and Mining

Publications

- *Capacity and Bias of Learned Geometric Embeddings for Directed Graphs*. Michael Boratko*, Dongxu Zhang*, Nicholas Monath, **Luke Vilnis**, Kenneth L. Clarkson, Andrew McCallum. Neural Information Processing Systems (**NeurIPS**), 2021. *Equal contribution.

- *Improving Local Identifiability for Probabilistic Box Embeddings*. Shib Dasgupta*, Michael Boratko*, Dongxu Zhang, **Luke Vilnis**, Xiang Li, Andrew McCallum. Neural Information Processing Systems (**NeurIPS**), 2020. *Equal contribution.

- *Representing Joint Hierarchies with Box Embeddings*. Dhruvesh Patel*, Shib Sankar Dasgupta*, Michael Boratko, Xiang Li, **Luke Vilnis**, Andrew McCallum. Automated Knowledge Base Construction (**AKBC**), 2020. *Equal contribution.

- *Smoothing the Geometry of Probabilistic Box Embeddings*. Xiang Li*, **Luke Vilnis***, Dongxu Zhang, Michael Boratko, Andrew McCallum. International Conference on Learning Representations (**ICLR**), 2019. *Equal contribution. **Oral presentation.**

- *Embedded-State Latent Conditional Random Fields for Sequence Labeling*. Dung Thai, Sree Harsha Ramesh, Shikhar Murty, **Luke Vilnis**, Andrew McCallum. Conference on Computational Natural Language Learning (**CoNLL**), 2018.

- *Probabilistic Embedding of Knowledge Graphs with Box Lattice Measures*. **Luke Vilnis***, Xiang Li*, Shikhar Murty, Andrew McCallum. Annual Meeting of the Association for Computational Linguistics (**ACL**), 2018. *Equal contribution.

- *Hierarchical Losses and New Resources for Fine-grained Entity Typing and Linking*. Shikhar Murty, Patrick Verga, **Luke Vilnis**, Irena Radonvanovic, Andrew McCallum. Annual Meeting of the Association for Computational Linguistics (**ACL**), 2018. **Oral presentation.**

- *Learning Conditionally Calibrated Equations of State for Direct Fired sCO_2 Cycles with Deep Neural Networks*. **Luke Vilnis**, David Freed, Navid Rafati, Joe Camilo, Andrew McCallum. The 6th International Supercritical CO2 Power Cycles Symposium (**sCO2**), 2018.

- *Unsupervised Hypernym Detection by Distributional Inclusion Vector Embedding*. Haw-Shiuan Chang, ZiYun Wang, **Luke Vilnis**, Andrew McCallum. Annual Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (**NAACL**), 2018.

- *Go for a Walk and Arrive at the Answer: Reasoning Over Knowledge Bases with Reinforcement Learning*. Rajarshi Das*, Shehzaad Dhuliawala*, Manzil Zaheer, **Luke Vilnis**, Ishan Durugkar, Akshay Krishnamurthy, Alex Smola and Andrew McCallum. International Conference on Learning Representations (**ICLR**), 2018. *Equal contribution.

- *Finer Grained Entity Typing with TypeNet*. Shikhar Murty, Patrick Verga, **Luke Vilnis**, Andrew McCallum. Neural Information Processing Systems Workshop on Automated Knowledge Base Construction (**AKBC**), 2017.

- *(Workshop Version) Go for a Walk and Arrive at the Answer: Reasoning Over Knowledge Bases with Reinforcement Learning*. Rajarshi Das*, Shehzaad Dhuliawala*, Manzil Zaheer, **Luke Vilnis**, Ishan Durugkar, Akshay Krishnamurthy, Alex Smola and Andrew McCallum. Neural Information Processing Systems Workshop on Automated Knowledge Base Construction (**AKBC**), 2017. *Equal contribution. **Oral presentation. Best paper award.**

- *Improved Representation Learning for Predicting Commonsense Ontologies*. Xiang Li, **Luke Vilnis**, Andrew McCallum. International Conference on Machine Learning Workshop on Deep Structured Prediction (**ICML WS**), 2017.

- *Low-Rank Hidden State Embeddings for Viterbi Sequence Labeling*. Dung Thai, Shikhar Murty, Trapit Bansal, **Luke Vilnis**, David Belanger, Andrew McCallum. International Conference on Machine Learning Workshop on Deep Structured Prediction (**ICML WS**), 2017.

- *Generating Sentences from a Continuous Space*. Samuel Bowman*, **Luke Vilnis***, Oriol Vinyals, Andrew Dai, Rafal Jozefowicz, Samy Bengio. Conference on Computational Natural Language Learning (**CoNLL**), 2016. *Equal contribution. **Oral presentation.**

- *Adding Gradient Noise Improves Learning for Very Deep Networks*. Arvind Neelakantan*, **Luke Vilnis***, Quoc V. Le, Ilya Sutskever, Lukasz Kaiser, Karol Kurach, James Martens. International Conference on Learning Representations Workshop (**ICLR WS**), 2016. *Equal contribution.

- *Bethe Projections for Non-Local Inference*. **Luke Vilnis***, David Belanger*, Daniel Sheldon, Andrew McCallum. Uncertainty in Artificial Intelligence (**UAI**), 2015. *Equal contribution.

- *Learning Dynamic Feature Selection for Fast Sequential Prediction*. Emma Strubell, **Luke Vilnis**, Kate Silverstein, Andrew McCallum. Annual Meeting of the Association for Computational Linguistics (**ACL**), 2015. **Oral presentation. Outstanding paper award.**

- *Word Representations via Gaussian Embedding*. **Luke Vilnis**, Andrew McCallum. International Conference on Learning Representations (**ICLR**), 2015. **Oral presentation.**

- *Generalized Eigenvectors for Large Multiclass Problems*. **Luke Vilnis**, Nikos Karampatziakis, Paul Mineiro. Neural Information Processing Systems Workshop on Representation and Learning Methods for Complex Outputs (**NIPS WS**), 2014. **Oral presentation.**

- *Training for Fast Sequential Prediction Using Dynamic Feature Selection*. Emma Strubell, **Luke Vilnis**, Andrew McCallum. Neural Information Processing Systems Workshop on Modern Machine Learning and Natural Language Processing (**NIPS WS**), 2014.

- *Optimization and Learning in Factorie*. Alexandre Passos, **Luke Vilnis**, Andrew McCallum. Neural Information Processing Systems Workshop on Optimization for Machine Learning (**NIPS WS**), 2013.

- *Dynamic Knowledge Base Alignment for Coreference Resolution*. Jiaping Zheng, **Luke Vilnis**, Sameer Singh, Jinho Choi, Andrew McCallum. Conference on Computational Natural Language Learning (**CoNLL**), 2013.

Software

- Formerly chief maintainer of FACTORIE toolkit for machine learning and graphical models.