

Nicola De Cao

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Work Experience

- Jan 2022 **Research Scientist**, *Huggingface*, London, UK.
Present Fundamental research in sparse retrieval system in combination with large language models.
- Jun 2020 **Research Engineer**, *Facebook AI Research (FAIR)*, London, UK.
Feb 2021 Fundamental research in entity linking and retrieval using large-scale (multilingual) generative language models that led to two publications.
- Jun 2019 **Applied Scientist**, *Amazon Development Center*, Berlin, Germany.
Sept 2019 Unsupervised topic modelling for improving Amazon Search.
- Jan 2017 **Research Assistant**, *University of Amsterdam*, Amsterdam, Netherlands.
July 2018 Developing a generative adversarial network formulation for molecular graph prediction (*de novo* drug discovery) and developing variational auto-encoders in non-euclidean latent spaces (i.e., hyper-spheres and rotation lie groups). That led to three publications.
- Jan 2016 **Research Assistant**, *University of Padua*, Padua, Italy.
Jul 2016 Developed a supporting software tool and performed research in the area of botnet's detection for the SPRITZ Security and Privacy Research Group.
- Apr 2012 **Software Developer**, *SirJo Industrial Automation*, Schio, Italy.
Jul 2018 Full-stack web developer and database administrator.

Education

- Sept 2018 **PhD in Machine Learning**, *University of Edinburgh/Amsterdam*, United Kingdom.
present Machine Learning and Deep Learning for Natural Language Processing. Worked on interpretable and controllable language models, graph-based questions answering, entity linking, and probabilistic models.
- Sept 2016 **MSc in Artificial Intelligence**, *University of Amsterdam*, The Netherlands.
Sept 2018 9/10 Cum Laude (top 2% national)
- Sept 2013 **BSc in Computer Science**, *University of Padua*, Italy.
Sept 2016 110/110 Cum Laude (first of my class)

Technical and Personal Skills

- **Programming/markup Languages:** Proficient in Python, Java, C/C++, LaTeX
Also ability with Matlab, SQL, PHP, JavaScript, HTML, .NET
- **Technological Skills:** Proficient in Pytorch, Tensorflow, NumPy/SciPy, Matplotlib
Also ability with Pandas, Caffe2, Theano, Scikit-learn
- **Research Skills:** Good mathematical background, writing skills, mentoring students, works well in a team.

Selected Publications (see [Google Scholar](#) for a full list)

1. **Nicola De Cao**, Ledell Wu, Kashyap Papat, Mikel Artetxe, Naman Goyal, Mikhail Plekhanov, Luke Zettlemoyer, Nicola Cancedda, Sebastian Riedel, and Fabio Petroni. *Multilingual autoregressive entity linking*. Transactions of the Association for Computational Linguistics (ACL), 2021. Link to [pdf](#) and source code on [github](#).
2. **Nicola De Cao**, Wilker Aziz, and Ivan Titov. *Highly Parallel Autoregressive Entity Linking with Discriminative Correction*. Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing (EMNLP), 2021. **Oral**; link to [pdf](#) and source code on [github](#).
3. **Nicola De Cao**, Wilker Aziz, and Ivan Titov. *Editing Factual Knowledge in Language Models*. Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing (EMNLP), 2021. **Oral**; link to [pdf](#) and source code on [github](#).
4. **Nicola De Cao**, Gautier Izacard, Sebastian Riedel, Fabio Petroni. *Autoregressive Entity Retrieval*. In Proceedings of the 9th International Conference on Learning Representations (ICLR), 2021. **Spotlight (top 5%)**; link to [pdf](#)

and source code on [github](#).

5. Michael Sejr Schlichtkrull, **Nicola De Cao**, Ivan Titov. *Interpreting Graph Neural Networks for NLP With Differentiable Edge Masking*. In Proceedings of the 9th International Conference on Learning Representations (ICLR), 2021. **Spotlight (top 5%)**; link to [pdf](#).
6. **Nicola De Cao** and Wilker Aziz. *The Power Spherical distribution*. Proceedings of the 37th International Conference on Machine Learning (ICML), INNF+ 2020 Workshop, 2020. Link to [pdf](#) and source code on [github](#).
7. **Nicola De Cao**, Michael Schlichtkrull, Wilker Aziz, and Ivan Titov. *How do Decisions Emerge across Layers in Neural Models? Interpretation with Differentiable Masking*. Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP), 2020. Link to [pdf](#) and source code on [github](#).
8. **Nicola De Cao**, Wilker Aziz, and Ivan Titov. *Block Neural Autoregressive Flow*. 35th Conference on Uncertainty in Artificial Intelligence (UAI), 2019. Link to [pdf](#) and source code on [github](#).
9. **Nicola De Cao**, Wilker Aziz, and Ivan Titov. *Question answering by reasoning across documents with graph convolutional networks*. Conference of the North American Chapter of the Association for Computational Linguistics (NAACL), 2019. Link to [pdf](#).
10. **Nicola De Cao** and Thomas Kipf. *MolGAN: An implicit generative model for small molecular graphs*. ICML 2018 workshop on Theoretical Foundations and Applications of Deep Generative Models, 2018. Link to [pdf](#) and source code on [github](#).
11. Tim R. Davidson*, Luca Falorsi*, **Nicola De Cao***, Thomas Kipf, and Jakub M. Tomczak. *Hyperspherical variational auto-encoders*. 34th Conference on Uncertainty in Artificial Intelligence (UAI), 2018 – *equal contributions. **Oral**; link to [pdf](#) and source code on [github \(for tensorflow\)](#) and for [pytorch](#).

Invited talks

- Jun 2021 **University of Texas**, Austin, Texas.
A look at Interpretability in NLP
- May 2021 **Facebook AI Research**, London, UK.
Towards Editing Factual Knowledge in Language Models.
- May 2021 **Beuth University**, Berlin, Germany.
Using Autoregressive Models for any task and Editing their Knowledge
- May 2021 **Ubabel**, Lisbon, Portugal.
Editing Factual Knowledge in Language Models and its applications
- May 2021 **SAP**, Berlin, Germany.
Towards automating Question-Answering: from automatic KB construction to reasoning with graph NNs
- Feb 2021 **Microsoft Research**, Cambridge, UK.
Question-Answering: graph-based approaches and entity retrieval.
- Feb 2021 **Twitter**, Cambridge, UK.
Graph Neural Networks meet NLP: exploiting structure and unstructured data.
- Nov 2020 **DeepMind**, London, UK.
Autoregressive Entity Retrieval: a novel efficient and powerful cross-encoding for retrieval
- Oct 2020 **École Normale Supérieure**, Paris, France.
Interpretability in NLP. Interpretation of transformers and graph neural networks with differentiable masking
- Sept 2019 **UCLA IPAM**, Los Angeles, California.
Workshop From Passive to Active: Generative and Reinforcement Learning with Physics
- Sept 2019 **USC ISI**, Los Angeles, California.
Graph Neural Networks for NLP with an application to Question Answering
- June 2018 **University of Padua**, Padua, Italy.
Deep Generative Models: An overview on Variational AutoEncoders and Generative Adversarial Networks

Extra

- o **Reviewing:** NeurIPS 2021; EMNLP 2021; NAACL 2021; NeurIPS 2020; ICML 2020; ICML 2019; ICLR 2019.
- o **Teaching:** assistant for Natural Language Models and Interfaces (2021) offered at the University of Amsterdam for bachelor's in artificial intelligence