Nicola De Cao

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Work Experience

Oct 2022 – Present **Research Scientist**, *Google Research*, London, United Kingdom.
Fundamental research in Deep Learning for Search Engines and Question Answering algorithms.

Jan 2022 – July 2022 **Research Scientist Intern**, *Huggingface*, London, United Kingdom.
Research in sparse retrieval system in combination with large language models.

Jun 2020 – Feb 2021 **Research Engineer Intern**, *Facebook AI Research (FAIR)*, London, United Kingdom.
Fundamental research in entity linking and retrieval using large-scale (multilingual) generative language models that led to two publications.

Jun 2019 – Sept 2019 **Applied Scientist Intern**, *Amazon Development Center*, Berlin, Germany.
Unsupervised topic modelling for improving Amazon Search.

Jan 2017 – July 2018 **Research Assistant**, *University of Amsterdam*, Amsterdam, Netherlands.
Developing a generative adversarial network formulation for molecular graph prediction (*de novo* drug discovery) and developing variational auto-encoders in non-euclidean latent spaces.

Jan 2016 – Jul 2016 **Research Assistant**, *University of Padua*, Padua, Italy.
Developed a supporting software tool and performed research in the area of botnet's detection for the SPRITZ Security and Privacy Research Group.

Education

Sept 2018 – Sept 2022 **PhD in Machine Learning for NLP**, *University of Edinburgh/Amsterdam*, United Kingdom.
Machine Learning and Deep Learning for Natural Language Processing. Worked on interpretable and controllable language models, graph-based questions answering, entity liking, and probabilistic models.

Sept 2016 – Sept 2018 **MSc in Artificial Intelligence**, *University of Amsterdam*, The Netherlands.
9/10 Cum Laude (top 2% national)

Sept 2013 – Sept 2016 **BSc in Computer Science**, *University of Padua*, Italy.
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, and .NET
- **Technological Skills:** Proficient in Pytorch, Tensorflow, NumPy/SciPy, Matplolib
  Also ability with Pandas, Scikit-learn, and Seaborn
- **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 Popat, 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 (TACL), 2022. 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

May 2022 **ACL 2022 – 6th Workshop on Structured Prediction for NLP**, Dublin, Ireland.
Autoregressive Retrieval

Apr 2022 **University of Cambridge**, Cambridge, United Kingdom.
Multilingual Autoregressive Entity Linking

Jun 2021 **University of Texas**, Austin, Texsas.
A look at Interpretability in NLP

May 2021 **Facebook AI Research**, London, United Kingdom.
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, United Kingdom.
Question-Answering: graph-based approaches and entity retrieval.

Feb 2021 **Twitter**, Cambridge, United Kingdom.
Graph Neural Networks meet NLP: exploiting structure and unstructured data.

Nov 2020 **DeepMind**, London, United Kingdom.
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

Extra

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