

# Alexis TOUMI

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## EDUCATION

- 2018 – 2022 **DPHil Computer Science**, *University of Oxford*.  
*Thesis proposal: Quantum Structures for Linguistics, Cognition and Artificial Intelligence*, supervised by Prof. Bob Coecke and Dr. Dan Marsden, see [1, 2, 3, 4, 5, 6, 7, 8, 9].
- 2016 – 2018 **MSc Mathematics & Computer Science**, *University of Oxford*, Distinction.  
*Thesis: Categorical Compositional Distributional Questions, Answers & Discourse Analysis*, supervised by Prof. Bob Coecke. This followed the publications [11] and [12].
- 2012 – 2015 **BSc Computer Science**, *University of Oxford*, First-Class Honours.  
*Thesis: Equilibrium Checking in Reactive Modules Games*, supervised by Prof. Michael Wooldridge and Dr. Julian Gutierrez. This was followed by two publications [13] and [14].

## AWARDS

- 2018 **Oxford – DeepMind Graduate Scholarship in Computer Science**.
- 2018 **Wolfson Harrison UK Research Council Quantum Foundation Scholarship**.
- 2013 **New College Academic Scholarship**.

## TEACHING

- 2019 **Quantum Computer Science**, *University of Oxford*, Class Tutor.  
String diagrams for quantum processes, ZX-calculus, quantum foundations and algorithms.
- 2019 **Logic & Proof**, *University of Oxford*, Class Tutor.  
Propositional logic, SAT and constraint satisfaction, first-order logic and unification.
- 2018 **Computational Complexity**, *University of Oxford*, Class Tutor.  
Turing machines and reductions, randomisation, introduction to descriptive complexity.
- 2018 **Data Science with Python**, *ESILV Paris*, Teaching Assistant.  
Feature extraction from images, clustering, classification. Methodology for model evaluation.

## INDUSTRY

- 2019 – 2021 **Research Scientist – Part Time**, *Cambridge Quantum Computing*, Oxford.  
Natural language processing on noisy intermediate-scale quantum (NISQ) hardware, see [7, 8].
- 2017 – 2018 **Data Scientist**, *Institut de Recherche et d'Histoire des Textes – CNRS*, Paris.  
Deep learning for the automated analysis of manuscripts from the Middle Ages, see [10].
- 2015 – 2016 **Data Scientist – R&D Intern**, *Tinyclues*, Paris.  
Tensor factorisation on complex relational data: users, products, emails, clicks and sales.
- 2014 – 2015 **Data Scientist – Summer Intern**, *Yonderlabs*, Berlin.  
Probabilistic graphical models (HMM and CRF) applied to natural language processing.

## PUBLICATIONS

- [1] B. Coecke, G. De Felice, K. Meichanetzidis, and A. Toumi. “How to Make Qubits Speak”. In: *Quantum Computing in the Arts and Humanities* (invited contribution, to appear).
- [2] G. de Felice, E. Di Lavore, M. Román, and A. Toumi. “Functorial Language Games for Question Answering”. In: *Proceedings ACT 2020*. EPTCS, 2021. DOI: [10.4204/EPTCS.333.21](https://doi.org/10.4204/EPTCS.333.21).
- [3] G. de Felice, A. Toumi, and B. Coecke. “DisCoPy: Monoidal Categories in Python”. In: *Proceedings ACT 2020*. EPTCS, 2021. DOI: [10.4204/EPTCS.333.13](https://doi.org/10.4204/EPTCS.333.13).
- [4] A. Toumi, R. Yeung, and G. de Felice. “Diagrammatic Differentiation for Quantum Machine Learning”. In: *ArXiv e-prints* (2021). arXiv: [2103.07960](https://arxiv.org/abs/2103.07960).
- [5] B. Coecke, G. de Felice, K. Meichanetzidis, and A. Toumi. “Foundations for Near-Term Quantum Natural Language Processing”. In: *ArXiv e-prints* (2020). arXiv: [2012.03755](https://arxiv.org/abs/2012.03755).
- [6] G. de Felice, K. Meichanetzidis, and A. Toumi. “Functorial Question Answering”. In: *Proceedings ACT 2019*. EPTCS, 2020. DOI: [10.4204/EPTCS.323.6](https://doi.org/10.4204/EPTCS.323.6).
- [7] K. Meichanetzidis, S. Gogioso, G. De Felice, N. Chiappori, A. Toumi, and B. Coecke. “Quantum Natural Language Processing on Near-Term Quantum Computers”. In: *Quantum Physics and Logic (QPL)*. 2020. arXiv: [2005.04147](https://arxiv.org/abs/2005.04147).
- [8] K. Meichanetzidis, A. Toumi, G. de Felice, and B. Coecke. “Grammar-Aware Question-Answering on Quantum Computers”. In: *ArXiv e-prints* (2020). arXiv: [2012.03756](https://arxiv.org/abs/2012.03756).
- [9] D. Shiebler, A. Toumi, and M. Sadrzadeh. “Incremental Monoidal Grammars”. In: *SYCO 6, Sixth Symposium on Compositional Structures* (2020). arXiv: [2001.02296](https://arxiv.org/abs/2001.02296).
- [10] E. Boros, A. Toumi, E. Rouchet, B. Abadie, D. Stutzmann, and C. Kermorvant. “Automatic Page Classification in a Large Collection of Manuscripts Based on the International Image Interoperability Framework”. In: *International Conference on Document Analysis and Recognition*. 2019. DOI: [10.1109/ICDAR.2019.00126](https://doi.org/10.1109/ICDAR.2019.00126).
- [11] B. Coecke, G. de Felice, D. Marsden, and A. Toumi. “Towards Compositional Distributional Discourse Analysis”. In: *Proceedings CAPNS 2018*. EPTCS, Nov. 2018. DOI: [10.4204/EPTCS.283.1](https://doi.org/10.4204/EPTCS.283.1).
- [12] B. Coecke, F. Genovese, M. Lewis, D. Marsden, and A. Toumi. “Generalized Relations in Linguistics & Cognition”. In: *Theoretical Computer Science* (2018). DOI: [10.1016/j.tcs.2018.03.008](https://doi.org/10.1016/j.tcs.2018.03.008).
- [13] M. Wooldridge, J. Gutierrez, P. Harrenstein, E. Marchioni, G. Perelli, and A. Toumi. “Rational Verification: From Model Checking to Equilibrium Checking”. In: *Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence*. 2016. DOI: [10.1016/j.artint.2017.04.003](https://doi.org/10.1016/j.artint.2017.04.003).
- [14] A. Toumi, J. Gutierrez, and M. Wooldridge. “A Tool for the Automated Verification of Nash Equilibria in Concurrent Games”. In: *Theoretical Aspects of Computing - ICTAC 2015 - 12th International Colloquium Cali, Colombia, October 29-31, 2015, Proceedings*. 2015, pp. 583–594. DOI: [10.1007/978-3-319-25150-9\\_34](https://doi.org/10.1007/978-3-319-25150-9_34).

## SOFTWARE

I am the developer of [DisCoPy](#) [3], the Python library for computing with monoidal categories.

## LANGUAGES

Human    Fluent in English and French. Basic German and beginner Arabic.  
Machine    Advanced Python. Working knowledge of Haskell, Scala, C, SQL.