Alexis TOUMI

EDUCATION

2018 – 2022 **D.Phil. Computer Science**, *University of Oxford*.
Thesis: **Category Theory for Quantum Natural Language Processing**, supervised by Prof. Bob Coecke and Dr. Dan Marsden, see [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11].

2016 – 2018 **M.Sc. Mathematics & Computer Science**, *University of Oxford*, Distinction.
Thesis: **Categorical Compositional Distributional Questions, Answers & Discourse Analysis**, supervised by Prof. Bob Coecke. This followed the publications [13] and [14].

2012 – 2015 **B.Sc. 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 [15] and [16].

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.

WORK EXPERIENCE

Oct 2022 – **Post-doctoral researcher**, *Laboratoire d'Informatique & Systèmes*, Marseille.
Formal methods for quantum cellular automata and distributed quantum computing.

May–Jul 2022 **General Manager**, *Le Lab Quantique*, Paris.
Administration of a French nonprofit that promotes the emergence of quantum technologies.

2019 – **Research Scientist**, *Cambridge Quantum Computing*, Oxford, Part time.
Natural language processing on noisy intermediate-scale quantum hardware, see [9, 10].
Applied category theory for quantum computing and artificial intelligence, see [6].

2017 – 2018 **Data Scientist**, *IRHT – CNRS & Teklia*, Paris.
Deep learning for the automated analysis of manuscripts from the Middle Ages, see [12].

+33 7 52 93 77 99 alexis@toumi.email alexis.toumi.xyz

2015 – 2016 **Machine Learning Engineer**, *Tinyclues*, Paris, Internship.
Tensor factorisation on complex relational data: users, products, emails, clicks and sales.

2014 – 2015 **Data Scientist**, *Yonderlabs*, Berlin, Internship.
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* (2022). arXiv: 2107.06776.

[2] A. Toumi, G. de Felice, and R. Yeung. "DisCoPy for the Quantum Computer Scientist". In: *Quantum Physics and Logic (QPL)* (2022). arXiv: 2205.05190.

[3] G. de Felice, E. Di Lavore, M. Román, and A. Toumi. "Functorial Language Games for Question Answering". In: *Proceedings ACT 2020*. 2021. DOI: 10.4204/EPTCS.333.21.

[4] 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.

[5] L. McPheat, G. Wijnholds, M. Sadrzadeh, A. Correia, and A. Toumi. "Anaphora and Ellipsis in Lambek Calculus with a Relevant Modality: Syntax and Semantics". In: *CoRR* abs/2110.10641 (2021). arXiv: 2110.10641.

[6] A. Toumi, R. Yeung, and G. de Felice. "Diagrammatic Differentiation for Quantum Machine Learning". In: *Quantum Physics and Logic (QPL)* (2021). arXiv: 2103.07960.

[7] 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.

[8] G. de Felice, K. Meichanetzidis, and A. Toumi. "Functorial Question Answering". In: *Proceedings ACT 2019*. EPTCS, 2020. DOI: 10.4204/EPTCS.323.6.

[9] 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.

[10] 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.

[11] D. Shiebler, A. Toumi, and M. Sadrzadeh. "Incremental Monoidal Grammars". 2020.

[12] 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.

[13] 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.

[14] 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. URL: https://doi.org/10.1016/j.tcs.2018.03.008.

[15] 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.

[16] 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.

LANGUAGES

Human	Fluent in English and French. Basic German and beginner Arabic.
Machine	Advanced Python. Working knowledge of Haskell, Scala, C, SQL. I am the developer of DisCoPy [4, 2], the Python library for monoidal categories.