Christopher Thomas Chubb

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HIGHLIGHTS

- PhD and BSc (Adv. Maths) (Hons.) from University of Sydney, Australia
- Postdocs in both the David Poulin group at the Université de Sherbrooke and Renato Renner group at ETH Zurich
- Total of 15 papers, including:
    - 1 invited topical review, 10 peer-reviewed publications, 4 pre-prints
    - Total citations of 833 and h-index of 10
    - Publications in Nature Communications, Communications in Mathematical Physics, Physical Review Letters and Physical Review X
    - A JPA topical review with 420 citations, selected for the JPA Highlights of 2017, and 2nd most viewed JPA article to date (~38k total downloads)
    - 7 first-author papers, and 6 papers independent of doctoral supervisors, 1 single-author paper
    - Consistent growth in yearly citations:
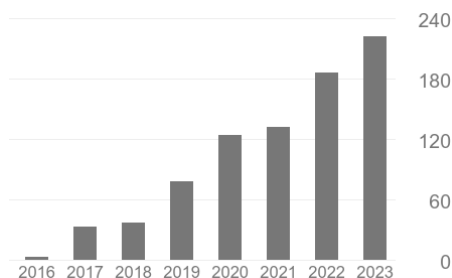
- Total of 34 talks (16 invited, 19 contributed) including 2 QIP talks and 3 TQC talks.

EMPLOYMENT

2021 – present	**Postdoctoral Scholar**, ETH Zurich, Zürich, Switzerland
2019 – 2020	**Postdoctoral Fellow**, Université de Sherbrooke, QC, Canada
2014 – 2019	**Casual Tutor**, University of Sydney, NSW, Australia

EDUCATION

2015 – 2019	**Doctor of Philosophy**, University of Sydney, NSW, Australia

- Supervisors: Prof. Steven T. Flammia, Dr. Marco Tomamichel
- Auxiliary Supervisor: Prof. Andrew C. Doherty
- Thesis: *Noise in Quantum Information Processing*

2011 – 2014	**Bachelor of Science (Advanced Mathematics) (Honours)**, University of Sydney, NSW, Australia

- Majors: Physics and Pure Mathematics
- First Class Honours with University Medal
- Honours supervisor: Dr. Steven T. Flammia
- Honours thesis: *Efficient approximation of degenerate ground states of gapped spin chains*

2010/01	**Australian Science Physics Olympiad Summer School**, Monash University, Victoria, Australia

Papers

Papers numbered by appearance on the arXiv

Unpublished preprints

15) ***Tensor Network Decoding Beyond 2D***
C. Piveteau, **C.T. Chubb**, J.M. Renes
arXiv:2310.10722

14) ***Quantum-embeddable stochastic matrices***
F. Shahbeigi, **C.T. Chubb**, R. Kukulski, Ł. Pawela, and K. Korzekwa
arXiv:2305.17163

13) ***Quantum dichotomies and coherent thermodynamics beyond first-order asymptotics***
P. Lipka-Bartosik, **C.T. Chubb**, J.M. Renes, M. Tomamichel, and K. Korzekwa
arXiv:2303.05524

11) ***General tensor network decoding of 2D Pauli Codes***
C.T. Chubb
arXiv:2101.04125

Topical Reviews

2) ***Hand-waving and Interpretive Dance: An Introductory Course on Tensor Networks***
J.C. Bridgeman and **C.T. Chubb**
Journal of Physics A: Mathematical and Theoretical **50**, 223001 (2017), Highlights of 2017
arXiv:1603.03039

Peer-reviewed Journal Articles

12) ***Tailoring three-dimensional topological codes for biased noise***
E. Huang, A. Pesah, **C.T. Chubb**, M. Vasmer, and A. Dua
PRX Quantum **4**, 030338 (2023)
arXiv:2211.02116

10) ***Tailoring surface codes for highly biased noise***
D.K. Tuckett, A.S. Darmawan, **C.T. Chubb**, S. Bravyi, S.D. Bartlett, and S.T. Flammia
Physical Review X **9**, 041031 (2019)
arXiv:1812.08186

9) ***Avoiding irreversibility: engineering resonant conversions of quantum resources***
K. Korzekwa, **C.T. Chubb**, and M. Tomamichel
Physical Review Letters **122**, 110403 (2019)
arXiv:1810.02366

8) ***Statistical mechanical models for quantum codes with correlated noise***
C.T. Chubb and S.T. Flammia
Annales de l'Institut Henri Poincaré D **8**, 2, 269–321 (2021)
arXiv:1809.10704

7) ***Moderate deviation analysis of majorisation-based resource interconversion***
C.T. Chubb, M. Tomamichel, and K. Korzekwa
Physical Review A **99**, 032332 (2019)
arXiv:1809.07778

6) ***Energy cost of entanglement extraction in complex quantum systems***
C. Bény, **C.T. Chubb**, T. Farrelly, and T.J. Osborne
Nature Communications **9**, 3792 (2018)
arXiv:1711.06658

5) ***Beyond the thermodynamic limit: finite-size corrections to state interconversion rates***
C.T. Chubb, M. Tomamichel, and K. Korzekwa
Quantum **2**, 108 (2018)
arXiv:1711.01193

4) ***Moderate deviation analysis for classical communication over quantum channels***
C.T. Chubb, V.Y.F. Tan, and M. Tomamichel
Communications in Mathematical Physics **355**, 3 (2017)
arXiv:1701.03114

3) ***Approximate symmetries of Hamiltonians***
C.T. Chubb and S.T. Flammia
Journal of Mathematical Physics **58**, 082202 (2017)
arXiv:1608.02600

1) ***Computing the Degenerate Ground Space of Gapped Spin Chains in Polynomial Time***
C.T. Chubb and S.T. Flammia
Chicago Journal of Theoretical Computer Science **2016**, 9 (2016)
arXiv:1502.06967

CONFERENCE PROCEEDINGS

- ***Moderate deviation analysis for classical communication over quantum channels***
  C.T. Chubb, V.Y.F. Tan, and M. Tomamichel
  Proc. of the 2017 IEEE International Symposium on Information Theory (ISIT), 1544–1548 (2017)

TALKS

INVITED

Quantum dichotomies and coherent thermodynamics beyond first-order asymptotics

2023/04	National University of Singapore, Singapore
2023/04	University of Sydney, NSW, Australia

General tensor network decoding of 2D Pauli Codes

2021/12	Jagiellonian University, Kraków, Poland
2021/04	Freie Universität Berlin, Germany
2020/08	IBM Research, NY, USA

Avoiding irreversibility: engineering resonant conversions of quantum resources

2019/08	University of Technology Sydney, NSW, Australia

Statistical mechanical models for quantum codes with correlated noise

2023/04	University of Sydney, NSW, Australia
2019/01	QuArC, Microsoft Research, WA, USA
2018/11	Perimeter Institute, ON, Canada
2018/11	Yale University, CT, USA
2018/11	California Institute of Technology, CA, USA
2018/10	University of New Mexico, NM, USA
2018/10	Université de Sherbrooke, QC, Canada

Moderate deviation analysis for classical communication over quantum channels

2017/07	Freie Universität Berlin, Germany

Approximate symmetries of Hamiltonians

2017/07	California Institute of Technology, CA, USA
2016/11	Massachusetts Institute of Technology, MA, USA

CONTRIBUTED

* indicates a talk given by a co-author

Tensor Network Decoding Beyond 2D

*2024/01	QIP 2024, Taipei, Taiwan

Quantum dichotomies and coherent thermodynamics beyond first-order asymptotics

2023/09	QM 2023 Mohammed V University, Rabat, Morocco
*2023/08	AQIS 2023 Korea Institute for Advanced Study, Seoul, South Korea
2022/09	BIID 2022 Southern University of Science and Technology, Shenzhen, China

General tensor network decoding of 2D Pauli Codes

2021/07	TQC 2021, University of Latvia, Riga, Latvia

Avoiding irreversibility: engineering resonant conversions of quantum resources

2019/06	BIID 2019, University of Technology Sydney, NSW, Australia
*2019/07	ISIT 2019, Maison de la Mutualité, Paris, France

Moderate deviation analysis of majorisation-based resource interconversion

*2018/12	AIP 2018, Perth, WA, Australia

Statistical mechanical models for quantum codes with correlated noise

2018/12	AIP 2018, Perth, WA, Australia
2018/06	TQC 2018, University of Technology Sydney, NSW, Australia
2019/08	QEC 2019, Senate House, London, UK

Beyond the thermodynamic limit: finite-size corrections to state interconversion rates
  *2018/09   AQIS 2018, Nagoya University, Japan
Moderate deviation analysis of majorisation-based resource interconversion
  2018/01   QIP 2018, QuTech, Delft, The Netherlands
  2017/07   BIID 2017, National University of Singapore, Singapore
  2017/06   ISIT 2017, Aachen, Germany
  2017/06   TQC 2017, Université Pierre-et-Marie-Curie, Paris, France
Approximate symmetries of Hamiltonians
  2017/06   TQC 2017, Université Pierre-et-Marie-Curie, Paris, France
  2016/12   AIP 2016, Brisbane, QLD, Australia
Polynomial-time ground state approximation of degenerate gapped spin chains
  2014/12   AIP 2014, Australian National University, Canberra, ACT, Australia

TEACHING

LECTURING

2023/09   **Tensor networks**
Invited summer school lectures (3×1.5hr lectures)
Quantum Information Paris Summer School 2023, Quantum Information Center Sorbonne and Paris Center For Quantum Technologies

2023/03   **QEC Decoding: Decoding and statistical mechanics**
Invited tutorial (1hr)
YITP Quantum Error Correction Workshop

2022/07   **Decoding - Current directions: Decoding and statistical mechanics**
Invited summer school lectures (2×1.5hr)
IBM Quantum Error Correction Summer School

2016, 2017   **Hand-waving and Interpretive Dance: An Introduction to Tensor Networks**
Informal seven lecture course presented with Jacob C. Bridgeman

MASTERS STUDENTS

Ongoing   **Jan Seyfried** (cosupervised with Marco Tomamichel)
Thesis title: *TBD*

2023   **Pablo Dominguez Alvarez** (cosupervised with Mischa Woods)
Thesis title: *Characterization of clocks in the absence of an external temporal reference*

OTHER STUDENTS SUPERVISED

2023   **Jan Seyfried**, Semester thesis student (cosupervised with Marco Tomamichel)
Thesis title: *A new approach to the sample complexity of quantum state tomography*

2023   **David Voderholzer**, Proseminar student

2023   **Viviane Kuss**, Proseminar student

2022   **Benjamin Campillo Avleira**, Proseminar student

2022   **Jakob Ekert**, Proseminar student

2022   **Leonie Goeb**, Proseminar student

2022   **Orane Valette**, Proseminar student

2021   **Chloé Vernière**, Proseminar student

2021   **Giobbi Luca**, Proseminar student

2021   **Martin Sandfuchs**, Proseminar student

2016   **Doriane Drolet**, Exchange student from Université de Sherbrooke

2016   **David M. Long**, Senior project student

2016   **Eric Huang**, Talented Students Programme project student

TUTORING

2017, 2018   **Senior Statistical Mechanics**
Computational lab tutor, setting and marking of assignments and exams

Professional activities

Conference program committees:
- Beyond IID in Information Theory 11, University of Tübingen, Tübingen, Germany (BIID 2023)
- 15th Conference on the Theory of Quantum Computation, Communication and Cryptography, Riga, Latvia (TQC 2020)

Conference refereeing:
- Annual Conference on Quantum Information Processing (QIP)
- IEEE Symposium on Information Theory (ISIT)
- International Conference on Information Technology and Science (ICITS)
- International Conference on Quantum Cryptography (QCrypt)
- Theory of Quantum Computation, Communication and Cryptography (TQC)

Journal refereeing:
- Communications in Mathematical Physics (CMP)
- IEEE Transactions on Information Theory (TIT)
- Journal of Mathematical Physics (JMP)
- Nature Physics
- New Journal of Physics (NJP)
- npj Quantum Information (npjQI)
- Physical Review Letters (PRL)
- Quantum Information and Computing (QIC)
- Quantum Journal
- Science Bulletin
- SciPost Physics Core
- SIAM Journal on Computing (SICOMP)

Miscellaneous

- Citizenship: Australian
- Languages: English (mother tongue), German (ein bisschen)
- Erdős number: 4 (C.T. Chubb → S.T. Flammia → A.W. Harrow → M. Szegedy → P. Erdős)

References

Assoc. Prof. Marco Tomamichel
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Jagiellonian University, Krakow, Poland
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