.curriculum vitæ

18th July 2023

Mario Krenn

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e-Mail: mario.krenn@mpl.mpg.de

website: mariokrenn.wordpress.com

Professional Experience

since 09.2021: Research group leader (*Artificial Scientist Lab*)

Max Planck Institute for the Science of Light (Theory Division), Erlangen, Germany.

01.2019-08.2021: FWF Erwin Schrödinger Postdoctoral Fellow

01.2019-05.2021: group of Alán Aspuru-Guzik

University of Toronto (Department of Chemistry & Computer Science)

Vector Institute for Artificial Intelligence, Toronto, Canada

05-08.2021:

Institute for Advanced Research in Artificial Intelligence (IARAI), Vienna, Austria

12.2017-12.2018: Postdoctoral Fellow (group of Anton Zeilinger)

University of Vienna (Faculty of Physics)

IQOQI Vienna, Austria

10.2012-11.2017: Graduate research assistant (Pre Doc) (group of Anton Zeilinger)

University of Vienna (Faculty of Physics)

IQOQI Vienna, Austria

Education

- **10.2012-11.2017:** PhD in Physics at University of Vienna in the group of Anton Zeilinger (topic: Quantum experiments with spatial modes of photons in large real and Hilbert spaces). Finished with distinction.
- **09.2009-09.2012**: Master studies at Vienna's University of Technology. Master thesis in the group of Anton Zeilinger (topic: Investigation of complex spatial mode structures of photons). Finished with distinction.
- **10.2006-06.2009**: Bachelor studies at Vienna's University of Technology.

Scientific Publications

2023:

66) Johannes Pseiner, Manuel Erhard, Mario Krenn
Quantum interference between distant creation processes
arXiv:2304.03683 (2023).

65) Alston K. Y. Bliokh, E. Karimi, M. J. Padgett, M. A. Alonso, M. R. Dennis, A. Dudley, A. Forbes, S. Zahedpour, S. W. Hancock, H. M. Milchberg, S. Rotter, F. Nori, Ş. K. Özdemir, N. Bender, H. Cao, P. B. Corkum, C. Hernández-García, H. Ren, Y. Kivshar, M. G. Silveirinha, N. Engheta, A. Rauschenbeutel, P. Schneeweiss, J. Volz, D. Leykam, D. A. Smirnova, K. Rong, B. Wang, E. Hasman, M. F. Picardi, A. V. Zayats, F. J. Rodríguez-Fortuño, C. Yang, J. Ren, A. B. Khanikaev, A. Alù, E. Brasselet, M. Shats, J. Verbeeck, P. Schattschneider, D. Sarenac, D. G. Cory, D. Pushin, M. Birk, A. Gorlach, I. Kaminer, F. Cardano, L. Marrucci, M. Krenn, F. Marquardt,
Roadmap on structured waves
arXiv:2301.05349 (2023).

64) Alston Lo, Robert Pollice, AkshatKumar Nigam, Andrew D. White, Mario Krenn, Alán Aspuru-Guzik
Recent advances in the Self-Referencing Embedding Strings (SELFIES) library
Digital Discovery (2023).

63) Kaiyi Qian, Kai Wang, Leizhen Chen, Zhaohua Hou, Mario Krenn, Shining Zhu, Xiao-Song Ma
Multiphoton non-local quantum interference controlled by an undetected photon
Nature Communications **14**, 1480 (2023).

62) Lan-Tian Feng, Ming Zhang, Di Liu, Yu-Jie Cheng, Guo-Ping Guo, Dao-Xin Dai, Guang-Can Guo, Mario Krenn, Xi-Feng Ren
Observation of nonlocal quantum interference between the origins of a four-photon state in a silicon chip
Optica **10**(1), 105-109 (2023).

61) Mario Krenn, Jonas Landgraf, Thomas Foesel, Florian Marquardt
Artificial Intelligence and Machine Learning for Quantum Technologies
Phys. Rev. A **107**, 010101 (2023)

2022:

60) Sören Arlt,Carlos Ruiz-Gonzalez, Mario Krenn
Digital Discovery of a Scientific Concept at the Core of Experimental Quantum Optics
arXiv:2210.09981.

59) Carlos Ruiz-Gonzalez, Sören Arlt, Jan Petermann, Sharareh Sayyad, Tareq Jaouni, Ebrahim Karimi, Nora Tischler, Xuemei Gu, Mario Krenn
Digital Discovery of 100 diverse Quantum Experiments with PyTheus
arXiv:2210.09980.

58) Mario Krenn, Robert Lorenzo Buffoni, Bruno Coutinho, Sagi Eppel, Jacob Gates Foster, Andrew Gritsevskiy, Harlin Lee, Yichao Lu, Joao P. Moutinho, Nima Sanjabi, Rishi Sonthalia, Ngoc Mai Tran, Francisco Valente, Yangxinyu Xie, Rose Yu, Michael Kopp Alán Aspuru-Guzik
Predicting the Future of AI with AI: High-quality link prediction in an exponentially growing knowledge network
arXiv:2210.00881

57) Alba Cervera-Lierta, Mario Krenn, Alán Aspuru-Guzik
Design of quantum optical experiments with logic artificial intelligence
Quantum **6**, 836 (2022).

56) Mario Krenn, Robert Pollice, Si Yue Guo, Matteo Aldeghi, Alba Cervera-Lierta, Pascal Friederich, Gabriel dos Passos Gomes, Florian Häse, Adrian Jinich, AkshatKumar Nigam, Zhenpeng Yao, Alán Aspuru-Guzik
On scientific understanding with artificial intelligence
Nature Review Physics **4**, 761 (2022) (2022).

55) Mario Krenn, Qianxiang Ai, Senja Barthel, Nessa Carson, Angelo Frei, Nathan C. Frey, Pascal Friederich, Théophile Gaudin, Alberto Alexander Gayle, Kevin Maik Jablonka, Rafael F. Lameiro, Dominik Lemm, Alston Lo, Seyed Mohamad Moosavi, José Manuel Nápoles-Duarte, AkshatKumar Nigam, Robert Pollice, Kohulan Rajan, Ulrich Schatzschneider, Philippe Schwaller, Marta Skreta, Berend Smit, Felix Strieth-Kalthoff, Chong Sun, Gary Tom, Guido Falk von Rudorff, Andrew Wang, Andrew White, Adamo Young, Rose Yu, Alán Aspuru-Guzik
SELFIES and the future of molecular string representations
Cell Patterns **3**(10), 100588 (2022).

54) Luca Thide, Mario Krenn, AkshatKumar Nigam, Alán Aspuru-Guzik
Curiosity in exploring chemical space: Intrinsic rewards for molecular reinforcement learning
Machine Learning: Science and Technology **3** (3), 035008 (2022).

53) Armin Hochrainer, Mayukh Lahiri, Manuel Erhard, Mario Krenn, Anton Zeilinger
Quantum Indistinguishability by Path Identity: The awakening of a sleeping beauty
Reviews of Modern Physics **94** (2), 025007 (2022).

52) Daniel Flam-Shepherd, Tony Wu, Xuemei Gu, Alba Cervera-Lierta, Mario Krenn, Alán Aspuru-Guzik
Learning Interpretable Representations of Entanglement in Quantum Optics Experiments using Deep Generative Models
Nature Machine Intelligence **4**, 544–554 (2022).

51) Alba Cervera-Lierta, Mario Krenn, Alán Aspuru-Guzik, Alexey Galda
Experimental high-dimensional Greenberger-Horne-Zeilinger entanglement with superconducting transmon qutrits
Phys. Rev. Applied **17**, 024062 (2021).

2021:

50) Mario Krenn, Jakob Kottmann, Nora Tischler, Alán Aspuru-Guzik
Conceptual understanding through efficient inverse-design of quantum optical experiments
Phys. Rev. X **11**(3), 031044 (2021).
[Scientific American]

49) Thomas Adler, Manuel Erhard, Mario Krenn, Johannes Brandstetter, Johannes Kofler, Sepp Hochreiter
Quantum Optical Experiments Modeled by Long Short-Term Memory
Photonics **8**(12), 535 (2021).

48) Cynthia Shen, Mario Krenn, Sagi Eppel, Alán Aspuru-Guzik
Deep Molecular Dreaming: Inverse machine learning for de novo molecular design with surjective representations
Machine Learning: Science and Technology **2**(3), 03LT02 (2021).

47) Pascal Friederich, Mario Krenn, Isaac Tamblyn, Alán Aspuru-Guzik
Scientific intuition inspired by machine learning generated hypotheses
Machine Learning: Science and Technology **2**(2), 025027 (2021).

46) Jakob S. Kottmann, Mario Krenn, Thi Ha Kyaw, Sumner Alperin-Lea, Alán Aspuru-Guzik
Quantum Computer-Aided design of Quantum Optics Hardware
Quantum Science and Technology **6**(3), 035010 (2021).

45) Akshat Nigam, Robert Pollice, Mario Krenn, Gabriel Gomes, Alan Aspuru-Guzik
Beyond Generative Models: Superfast Traversal, Optimization, Novelty, Exploration and Discovery (STONED) Algorithm for Molecules using SELFIES
Chemical Science **12**(20), 7079 (2021).

44) Robert Pollice, Gabriel dos Passos Gomes, Matteo Aldeghi, Riley J. Hickman, Mario Krenn, Cyrille Lavigne, Michael Lindner-D'Addario, AkshatKumar Nigam, Cher Tian Ser, Zhenpeng Yao, and Alán Aspuru-Guzik
Data-Driven Strategies for Accelerated Materials Design
ACS Accounts of Chemical Research, **54**(4) 849-860 (2021).

2020:

43) Xuemei Gu, Mario Krenn,
View & Perspective: Compact Greenberger-Horne-Zeilinger state generation via frequency combs and graph theory
Frontiers of Physics **15** (6), 1-4 (2020).

42) Mario Krenn, Manuel Erhard, Anton Zeilinger
Computer-inspired Quantum Experiments
Nature Reviews Physics **2**, 649 (2020).

41) Mario Krenn, Florian Häse, AkshatKumar Nigam, Pascal Friederich, Alán Aspuru-Guzik
Self-Referencing Embedded Strings (SELFIES): A 100% robust molecular string representation
Machine Learning: Science and Technology **1** (4), 045024 (2020).
[most downloaded and cited paper of the journal]

40) Jaroslav Kysela, Manuel Erhard, Armin Hochrainer, Mario Krenn, Anton Zeilinger
Experimental High-Dimensional Entanglement by Path Identity
PNAS **117**(42), 26118-26122 (2020).

39) Xiaoqin Gao, Manuel Erhard, Anton Zeilinger, Mario Krenn
Computer-inspired concept for high-dimensional multipartite quantum gates
Physical Review Letters **125**, 050501 (2020).

38) Manuel Erhard, Mario Krenn, Anton Zeilinger
Advances in High Dimensional Quantum Entanglement
Nature Reviews Physics **2**, 365 (2020).

37) Xuemei Gu, Lijun Chen, Mario Krenn
Quantum Experiments and Hypergraphs: Multi-Photon Sources for Quantum Interference, Quantum Computation and Quantum Entanglement
Physical Review A **101**(3), 033816 (2020).

36) AkshatKumar Nigam, Pascal Friederich, Mario Krenn, Alán Aspuru-Guzik
Augmenting Genetic Algorithms with Deep Neural Networks for Exploring the Chemical Space
International Conference on Learning Representations (ICLR-2020).

35) Xuemei Gu, Lijun Chen, Mario Krenn
Phenomenology of complex structured light in turbulent air
Optics Express **28**(8), 11033 (2020).

34) Mario Krenn, Anton Zeilinger

Predicting Research Trends with Semantic and Neural Networks with an application in Quantum Physics

PNAS **117**(4), 1910-1916 (2020)

Research Highlight: Nature Review Physics

33) Mario Krenn

Viewpoint: Physics Insights from Neural Networks

APS Physics **13**, 2 (2020)

2019:

32) Yi-Han Luo, Han-Sen Zhong, Manuel Erhard, Xi-Lin Wang, Li-Chao Peng, Mario Krenn, Xiao Jiang, Li Li, Nai-Le Liu, Chao-Yang Lu, Anton Zeilinger, Jian-Wei Pan

Quantum Teleportation in High Dimensions

Physical Review Letters **123**(7), 070505 (2019).

Editor's suggestion & Synopsis in Physics,

31) Mario Krenn, Xuemei Gu, Daniel Soltesz

Questions on the Structure of Perfect Matchings inspired by Quantum Physics

Proceedings of the 2nd Croatian Combinatorial Days, 57-70, (2019)

30) Xuemei Gu, Lijun Chen, Anton Zeilinger, Mario Krenn

Quantum Experiments and Graphs III: High-Dimensional and Multi-Particle Entanglement

Physical Review A **99**(3), 032338 (2019)

29) Xuemei Gu, Manuel Erhard, Anton Zeilinger, Mario Krenn

Quantum Experiments and Graphs II: Quantum Interference, Computation and State Generation

PNAS **116**(10), 4147, (2019)

28) Xiaoqin Gao, Mario Krenn, J. Kysela, Anton Zeilinger

Arbitrary d-dimensional Pauli X-Gates of a flying Qudit

Physical Review A **99**(3), 023825 (2019)

2018:

27) Manuel Erhard, Mehul Malik, Mario Krenn, Anton Zeilinger

Experimental GHZ entanglement beyond qubits

Nature Photonics, **12,** 759-764 (2018)

26) Mario Krenn, Anton Zeilinger

On Small Beams with Large Topological Charge II: Photons, Electrons and Gravitational Waves
New Journal of Physics **20** (6), 063006 (2018).

25) Xuemei Gu, Mario Krenn, Manuel Erhard, Anton Zeilinger
Gouy Phase Radial Mode Sorter for Light: Concepts and Experiments
Physical Review Letters **120**(20), 103601 (2018).

24) Manuel Erhard, Robert Fickler, Mario Krenn, Anton Zeilinger
Twisted Photons: New Quantum Perspectives in High Dimensions
Nature Light: Science and Applications 7, **17146** (2018).
LSA Outstanding Paper 2019, Web of Science: Highly Cited Paper

23) Alexey A. Melnikov, Hendrik Poulsen Nautrup, Mario Krenn, Vedran Dunjko, Markus Tiersch, Anton Zeilinger, Hans Briegel
Active learning machine learns to create new quantum experiments
PNAS **115**(6), 1221 (2018).
Cozzarelli Prize 2018, Web of Science: Highly Cited Paper

2017:

22) Mario Krenn, Xuemei Gu, Anton Zeilinger
Quantum Experiments and Graphs: Multiparty States as coherent superpositions of Perfect Matchings
Physical Review Letters **119**(24), 240403 (2017).
entry in OEIS database

21) Feiran Wang, Manuel Erhard, Amin Babazadeh, Mehul Malik, Mario Krenn, Anton Zeilinger
Generation of the complete four-dimensional Bell basis
Optica 4 (12), 1462-1467 (2017).

20) Amin Babazadeh, Manuel Erhard, Feiran Wang, Mehul Malik, Rahman Nouroozi, Mario Krenn, Anton Zeilinger
High-Dimensional Single-Photon Quantum Gates: Concepts and Experiments
Physical Review Letters **119**(18), 180510 (2017).

19) Sahar Alipour, Mario Krenn, Anton Zeilinger
Quantum gate description for induced coherence without induced emission and its applications
Physical Review A **96** (4), 042317 (2017).

18) P. Erker, Mario Krenn, Marcus Huber
Quantifying high dimensional entanglement with two mutually unbiased bases
Quantum **1**, 22 (2017).

17) Mario Krenn, Mehul Malik, Manuel Erhard, Anton Zeilinger

Orbital angular momentum of photons and the entanglement of Laguerre–Gaussian modes
Phil. Trans. R. Soc. A **375** (2087), 20150442 (2017).

16) Mario Krenn, Armin Hochrainer, Mayukh Lahiri, Anton Zeilinger
Entanglement by Path Identity
Physical Review Letters 118 (8), 080401 (2017).

2016:

15) Mario Krenn, Mehul Malik, Thomas Scheidl, Rupert Ursin, Anton Zeilinger
Quantum communication with photons
Book chapter in "Optics in Our Time", 455-482 (2016).

14) Mario Krenn, Johannes Handsteiner, Matthias Fink, Robert Fickler, Rupert Ursin, Mehul Malik, Anton Zeilinger
Twisted light transmission over 143 km
PNAS **113**(48), 13648 (2016).
Web of Science: Highly Cited Paper

13) Nora Tischler, Mario Krenn, Robert Fickler, Xavier Vidal, Anton Zeilinger, Gabriel Molina-Terriza
Quantum optical rotatory dispersion
Science Advances **2**, e1601306 (2016).

12) Florian Schlederer, Mario Krenn, Robert Fickler, Mehul Malik, Anton Zeilinger
Cyclic transformation of orbital angular momentum modes
New Journal of Physics **18**, 043019 (2016).

11) Mario Krenn, Mehul Malik, Robert Fickler, Radek Lapkiewicz, Anton Zeilinger
Automated Search for new Quantum Experiments
Physical Review Letters **116**(9), 090405 (2016).
Editor's suggestion & Focus in Physics, Nature Physics Research Highlights

10) Mario Krenn, Nora Tischler, Anton Zeilinger
On Small Beams with Large Topological Charge
New Journal of Physics, **18**(3), 033012 (2016).

9) Mehul Malik, Manuel Erhard, Marcus Huber, Mario Krenn, Robert Fickler, Anton Zeilinger
Multi-photon entanglement in high dimensions
Nature Photonics **10**, 248 (2016)
Web of Science: Highly Cited Paper

2015:

8) William N. Plick, Mario Krenn
Physical meaning of the radial index of Laguerre-Gauss beams
Physical Review A **92**(6), 063841 (2015).

7) Mario Krenn, Johannes Handsteiner, Matthias Fink, Robert Fickler, Anton Zeilinger
Twisted photon entanglement through turbulent air across Vienna
PNAS, **112**(46), 14197 (2015).

2014:

6) Mario Krenn, Robert Fickler, Matthias Fink, Johannes Handsteiner, Mehul Malik, Thomas Scheidl, Rupert Ursin, Anton Zeilinger
Communication with spatially modulated light through turbulent air across Vienna
New Journal of Physics, **16**(11), 113028 (2014).
30.000+ views of video @ youtube, Nature News, Science News, Web of Science: Highly Cited Paper

5) Mario Krenn, Marcus Huber, Robert Fickler, Radek Lapkiewicz, Sven Ramelow, Anton Zeilinger
Generation and confirmation of a (100× 100)-dimensional entangled quantum system
PNAS, **111**(17), 6243 (2014).
Commentary @ PNAS, Web of Science: Highly Cited Paper

2013:

4) Robert Fickler, Mario Krenn, Radek Lapkiewicz, Sven Ramelow, Anton Zeilinger
Real-time imaging of quantum entanglement
Scientific reports, **3** (2013).
140.000+ views of video @ youtube, Nature Physics News&Views

3) William N. Plick, Mario Krenn, Robert Fickler, Sven Ramelow, Anton Zeilinger
Quantum orbital angular momentum of elliptically symmetric light
Physical Review A **87**(3), 033806 (2013).

2) Mario Krenn, Robert Fickler, Marcus Huber, Radek Lapkiewicz, William N. Plick, Sven Ramelow, Anton Zeilinger
Entangled singularity patterns of photons in Ince-Gauss modes
Physical Review A **87**(1), 012326 (2013).

2012:

1) Robert Fickler, Radek Lapkiewicz, William N. Plick, Mario Krenn, Christoph Schaeff, Sven Ramelow, Anton Zeilinger

Quantum entanglement of high angular momenta
Science, **338**(6107), 640-643 (2012).
Physics World Top 10 breakthroughs for 2012, Web of Science: Highly Cited Paper

Fundings, Awards and Honors

- 2020.10: IOP Quantum2020, International Quantum Technology Emerging Researcher Award, Highly Commended, "*in recognition of significant achievement and exceptional promise for future contributions to the field of quantum science and technology.*"
- 2019.03: Erwin Schrödinger Fellowship of the FWF (Austrian Science Fund) for project "*Complex Computer-Designed Quantum Experiments*" [J4309], (164.480Euro)
- 2019.03: PNAS Cozzarelli Prize 2018 (Physical and Mathematical Sciences), "*recognizes outstanding contributions to the scientific disciplines represented by the National Academy of Sciences (NAS)*"
- 2018.11: Loschmidt Prize 2018 for "*an outstanding dissertation in the field of physics or chemistry at Austrian universities*" from the Chemical-Physical Society Austria.
- 2018.03: Doc.Award 2018 for "*outstanding doctoral theses at the University of Vienna*", from the University of Vienna.

Panel Discussions

2023.06.26: Participating at panel discussion "AI for Science", International Conference for Science of Science and Innovation, Chicago, USA, invited talk
AI as a source of inspiration in physics.

2022.12.03: Participating at panel discussion on "*Philosophy of Science in the AI Era*" at the ML&Physical science workshop at NeurIPS 2022.

Scientific Talks

2023.07.18: Theoretical physics seminar, University of Augsburg (Germany), invited talk,
AI as a source of inspiration in physics.

2023.07.06: Annual Conference of the British Society for the Philosophy of Science, Bristol, UK, invited talk,
AI as a source of inspiration in physics.

2023.06.30: "Machine Learning Summer School on applications in Science" in Krakau, Poland. Invited lecture,
AI as a source of inspiration in physics.

2023.06.26: International Conference for Science of Science and Innovation, Chicago, USA, invited talk
AI as a source of inspiration in physics.

2023.05.04: Vienna Bio Center (Max Peruty Labs), Biophysics Seminar, invited talk,
AI as a source of inspiration in physics.

2023.04.21: Philosophy of Contemporary and Future Science (Lingnan, Hongkong), invited online talk,
AI as a source of inspiration in physics.

2023.04.10: ML and (Quantum) Physics WS, Obergurgl (Austria), invited talk
AI as a source of inspiration in physics.

2023.03.17: Tampere University (Finland), inaugural Physics Colloquium talk,
AI as a source of inspiration in physics.

2023.01.27: ICFO Barcelona (Spain), invited Talk,
AI as a source of inspiration in physics.

2023.01.19: aQa Leiden (Netherlands), invited Talk,
AI as a source of inspiration in physics.

2023.01.11: ELLIS unconference (La Palma, Spain), invited Talk,
AI as a source of inspiration in physics.

2022.12.15: Quantum Info & Tech Seminar, University of Stuttgart, invited Talk,
Computer-Designed Quantum Experiments.

2022.11.23: New Frontiers in Machine Learning and Quantum, Waterloo Canada, invited talk
Towards an Artificial Muse for new Ideas in Quantum Physics

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2022.11.11: QTML 2022, Neaples, Italy, invited talk
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.09.27: ML workshop, Galileo Galilei Institute (Florence), invited talk
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.09.22: ML4Science workshop, University Hamburg, invited talk
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.09.04: DFG Tagung, invited talk
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.07.06: Friedrich-Alexander-Universität Erlangen-Nürnberg, Physics Colloquium
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.07.06: University of Exeter (Quantum Non-Equilibrium) Seminar
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.06.24: ESA's Advanced Concepts Team Seminar,
Towards an Artificial Muse for new Ideas in Quantum Physics

2022.05.26: Bayer AG, Seminar, virtual
Can androids dream of scientific understanding?

2022.05.26: Meeting of young German Physical Society, Germany
From Artificial Intelligence to Artificial Scientists

2022.05.26: Photonics North 2022, invited talk, Canada,
Getting inspirations and ideas from Artificial Intelligence for Quantum Optics

2021.12.10: Perimeter ML Seminar, Canada
Predicting and Suggesting research trends with Semantic and Neural Networks with an application in Quantum Physics

2021.12.01: Quantum Theory Group Seminar, FAU, Erlangen, Germany
On computer-inspired Quantum Experiments and scientific understanding

2021.11.11: Bavarian Graduate School of Comp. Engineering, FAU, Germany
Predicting and Suggesting research trends with Semantic and Neural Networks

2021.11.10: Guest lecture, University of Rochester, USA
SELFIES: A 100% robust molecular representation for ML in chemistry

2021.11.02: IBM Zurich Seminar, Switzerland
SELFIES: A 100% robust molecular representation for ML in chemistry

2021.07.07: Machine Learning for Quantum X workshop, KIT, Germany
On computer-inspired Quantum Experiments and scientific understanding

2021.06.30: Artificial Scientific Discovery workshop, MPL, Germany
On computer-inspired Quantum Experiments and scientific understanding

2021.04.30: ETH Zurich, Switzerland
On computer-inspired Quantum Experiments

2021.04.23: 4th University of Florida Drug Discovery Symposium (online)
A 100% robust molecular string representation for ML in Chemistry

2021.03.04: Carnegie Mellon University, Scientific ML Webinar Series
A 100% robust molecular string representation for ML in Chemistry

2021.02.23: Max Planck Research Group Symposium, Germany
On computer-inspired Quantum Experiments

2021.02.17: Max Planck Institute for the Science of Light, Seminar (online), Germany
On computer-inspired Quantum Experiments

2020.11.24: Q-Turn 2020, online
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.11.18: National University of Singapore, Quantum Machine Learning Seminar, online
Predicting and Suggesting research trends with Semantic and Neural Networks with an application in Quantum Physics

2020.11.12: TU Delft, Quantum Nanoscience Seminar, online
Towards Computer-Inspired Quantum Physics Research

2020.11.10: Quantum Techniques in Machine Learning (QTML) 2020, online
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.10.19: Quantum 2020, online

Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.09.19: NetSci MMXX, Machine Learning In Network Science Symposium
Predicting research trends with semantic and neural networks with an application in quantum physics

2020.08.20: Matter lab Seminar, University of Toronto, Canada, online
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.06.30: A.I. Socratic Circles - AISC, online
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.06.25: Photonics Online Meetup #POM20Ju
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.06.19: Max Planck Institute for the Science of Light, Seminar (online), Germany
Conceptual understanding through efficient inverse-design of quantum optical experiments

2020.04.23: A.I. Socratic Circles - AISC, online
SELFIES: A 100% robust representation of semantically constrained Graphs, for deep generative models

2019.11.14: Chemistry Postdoc Seminar, University of Toronto, Canada
SELFIES: A robust representation for chemistry and beyond

2019.08.16: Matter lab Seminar, University of Toronto, Canada
SELFIES: A robust representation for chemistry and beyond

2019.07.14: FQMT19, Prague, Czech Republic - invited
On Computer inspired Science

2019.06.20: ICOAM19, Ottawa, Canada - invited
On Computer inspired Science

2019.01.17: Matter lab Seminar, University of Toronto, Canada
On Computer inspired Quantum Experiments

2018.12.19: IQOQI Vienna Seminar, Vienna, Austria
Towards Predicting and Suggesting Quantum Physics Research

2018.12.18: Machine Learning Seminar, University of Linz, Austria
On computer-inspired Quantum Experiments

2018.12.14: SFB Meeting, Vienna University of Technology, Austria - invited
On Computer-designed Quantum Experiments

2018.11.27: Loschmidt-Prize Talk, University of Vienna, Austria
On computer-inspired Experiments for Quantum Physics

2018.11.22: ÖAW A.I. Initiative, Vienna, Austria
On Computer-inspired Quantum Experiments

2018.09.28: Croatian Combinatorial Days, University of Zagreb, Croatia - invited
A conjecture about Perfect Matchings motivated by Quantum Mechanic s

2018.09.03: PHOTON18, Birmingham, United Kingdom - invited
On Computer-inspired Quantum Experiments

2018.02.22: Highlight-Talk at FÖP, Faculty for Physics, University of Vienna, Austria) - invited
O*n Computer inspired Quantum Experiments*

2018.01.17: IQOQI Vienna Seminar, Vienna, Austria
Quantum Experiments and Graphs

2017.09.20: ICOAM17, Anacapri, Italy
On Computer-designed Quantum Experiments

2017.07.14: FQMT17, Prague, Czech Republic – invited
On Computer-designed Quantum Experiments

2017.05.30: Budapest-Vienna Quantum Meeting, Vienna, Austria – invited
On Computer-designed Quantum Experiments

2017.05.17: IQOQI Vienna Seminar, Vienna, Austria
Entanglement by Path Identity

2016.09.29: ÖPG Meeting 2016, University of Vienna, Austria
Automated Search for new Quantum Experiments

2016.04.08: SFB Meeting, Vienna University of Technology, Austria
Automated Search for new Quantum Experiments

2016.03.18: APS March Meeting, Baltimore, USA - invited

Twisted photon entanglement through turbulent air across Vienna

2015.12.14: Quantum Optics Lab Seminar, University of Warsaw, Poland
Automated Search for new Quantum Experiments

2015.12.09: Quantum Information Seminar, University of Stockholm, Sweden
Automated Search for new Quantum Experiments

2015.11.11: Institute for Theoretical Physics Seminar, University of Innsbruck, Austria
Automated Search for new Quantum Experiments

2015.07.27: ÖPG Meeting 2015, Vienna, Austria
Twisted photon entanglement through turbulent air across Vienna

2015.07.27: ICOAM 2015, New York, USA
Twisted photon entanglement through turbulent air across Vienna

2015.07.27: FQMT 2015, Prague, Czech Republic – invited
Twisted photon entanglement through turbulent air across Vienna

2015.06.03: IQOQI Vienna Seminar, Vienna, Austria
Automated Search for new Quantum Experiments

2014.04.02: IQOQI Vienna Seminar, Vienna, Austria
OAM meets Free-Space

2013.09.05: ÖPG Meeting 2013, Linz, Austria
Studies of Quantum Entanglement in 100 Dimensions

2013.05.08: Quantum Theory Seminar, UAB, Barcelona, Spain
Quantum-Experiments in high-dimensional Hilbert-Spaces

2013.05.07: Quantum Theory Seminar, ICFO, Barcelona, Spain
Quantum-Experiments in high-dimensional Hilbert-Spaces

2013.03.20: IQOQI Vienna Seminar, Vienna, Austria
Spatial mode structures of photons

2012.03.20: IQOQI Vienna Seminar, Vienna, Austria
Entanglement of complex Structures of Photons

2012.03.12: International OAM Workshop, Vienna, Austria
Entanglement of complex Structures of Photons

2012.03.12: APS March Meeting, Boston, USA
Entanglement of complex Structures of Photons

Scientific Poster Presentations

- **10.2020**: Quantum 2020, online (*Predicting research trends with semantic and neural networks with an application in quantum physics*)
- **12.2019**: NeurIPS 2019, Graph Representation Learning Workshop, Vancouver, Canada (*SELFIES: a robust representation of semantically constrained graphs with an example application in chemistry*)
- **10.2018**: 43. SFB Meeting, Innsbruck, Austria (*Towards Predicting Quantum Physics*)
- **02.2016**: Quantum Optics 2016, Obergurgl, Austria (*Automated Search for new Quantum Experiments*)
- **12.2015**: 31. SFB Meeting, Vienna, Austria (*Twisted photon entanglement through turbulent air across Vienna*)
- **05.2015**: Quantum Physics of Nature 2015, Vienna, Austria (*100-dimensional quantum entanglement*)
- **10.2014**: Quantum Optics VII, Mar del Plata, Argentina (*100-dimensional quantum entanglement*)
- **05.2014**: Quantum [Un]Speakables II, Vienna, Austria (*100-dimensional quantum entanglement*)
- **04.2014**: 25. SFB Meeting, Vienna, Austria (*100-dimensional quantum entanglement*)
- **07.2013**: FQMT13, Prague, Czech Republic (*100-dimensional quantum entanglement*)
- **06.2013**: ICOAM13, Glasgow, Scotland (*100-dimensional quantum entanglement*)
- **02.2013**: 19. SFB Meeting, Innsbruck, Austria, (*Entanglement in 100 dimensions*)
- **08.2012**: QCMC 2012, Vienna, Austria (*Entanglement of Ince-Gauss Modes of Photons*)

Teaching and supervising:

- **2021-onwards:** Supervising 2 PhD students, 1 Master student, 1 Bachelor student
- **2014-2020**: (Co)-Supervising PhD, Master, Bachelor, Summer Students
- **02.2015-09.2017**: Instructor for course "Laboratory Quantum Optics" at Faculty of Physics, University of Vienna

- **02.2016, 03.2016, 07.2016:** Quantum Physics Seminar for Students at *Internationale Akademie Traunkirchen*, Austria.
- **10.2015 & 07.2016:** 3 days (24h) Workshop on Quantum Physics for Students at *Internationale Akademie Traunkirchen*, Austria.
- **03.-09.2015**: Instructor for course "Exercises for Theoretical Physics" at Faculty of Physics, University of Vienna
- **10.2008-02.2009**: Tutor for "Mathematical methods of theoretical physics" at Institute of Theoretical Physics, Vienna's Technical University

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Service:

- **Organizer** of the IEEE Science4Cast AI competition, December 2021
- **Organizer** of IOP's *'SELFIES and the future of molecular string representations'* workshop, August 2021
- **Co-Organizer** of *AI and Photonics* session at Photonics North 2021 conference
- **Co-Organizer** of *AI and Photonics* session at Photonics North 2020 conference
- **Reviewer for** Nature, Physical Review Letters, Nature Photonics, Nature Communications, Science Advances, Machine Learning: Science and Technology, NeurIPS Machine Learning and the Physical Sciences workshop, Physical Review A, New Journal of Physics, Optics Express, Optics Letters, Quantum Information Processing, IEEE Photonics

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Outreach activities

- **05.2022:** Lange Nacht der Wissenschaften, MPL, Erlangen, Public Talk: „Von kuenstlicher Intelligenz zu kuenstlichen Wissenschaftern"
- **12.2020**: My suggestion on visualizing neural networks for the general public has been built at the Vienna Technical Museum, and is part of a two-year exception on Artificial Intelligence: link
- **06.2020:** Official renaming of four moon craters by the IAU, following my suggestion: link1, link2
- **11.2019**: Co-author for invited article "Quantenteleportation in höheren Dimensionen" (with Manuel Erhard) for german popular science magazine *Physik in unserer Zeit* (2 pages) – link.

- **01.2018**: Co-author for invited article "Mit Lichtschrauben ans Quantenlimit" (with Robert Fickler and Anton Zeilinger) for german popular science magazine *Physik in unserer Zeit* (9 pages) – link.
- **07.2016**: Author for invited article "Quantenexperimente aus dem Computer" for german popular science magazine *Spektrum der Wissenschaft* (3 pages) – link.
- **06.2016**: Invited participant in panel discussion about science and artificial intelligence at the Lindau Nobel Laureate Meetings (panel involving Vinton Cerf and Rainer Blatt) - link
- **01.2016**: Demonstration of a quantum physics experiment at GLUON "Art & Science", Brussels, Belgium.
- **since 2015**: Senior Fellow at Internationale Akademie Traunkirchen (Seminars and Workshops for High-school and University Students on Quantum Physics) - link
- **11.2014**: Youtube video on "Communication with spatially modulated light through turbulent air across Vienna" (31.000+ views) - link
- **03.2014**: Participant of TV documentary "alpha-Academy - Die Welt der Quantenphysik", ORF+BR alpha - link
- **11.2014**: Talk at Falling Walls Lab Berlin (Breaking the wall of … Quantum Physics in 100 Dimensions) - link
- **06.2014**: Talk at Falling Walls Lab Vienna (Breaking the wall of … Quantum Physics in 100 Dimensions) – qualified for Final in Berlin - link
- **05.2013**: Youtube video on "Real-Time Imaging of Quantum Entanglement" (117.000+ views) - link
- **07.2012**: Participant of Documenta in Kassel, Germany (largest modern art exhibition with ~1.000.000 guests; on quantum physics) - link