Curriculum vitae

András Pál Gilyén

Alfréd Rényi Institute of Mathematics, Budapest, Hungary

Education

- PhD studies at Centrum Wiskunde & Informatica / **U. of Amsterdam**, Netherlands (2015-2019)

  PhD degree in computer science with *Cum laude [top 5%]* (May, 2019)
  Dissertation: "*Quantum Singular Value Transformation & Its Algorithmic Applications*"
  Advisor: Prof. Ronald de Wolf; co-advisor: Prof. Harry Buhrman

- Part III of the Mathematical Tripos, **University of Cambridge**, UK (2012-2013)

  Master of Advanced Study degree in Mathematics with *Merit* (October, 2013)

- Mathematics studies at **Eötvös Loránd University**, Budapest, Hungary (2007-2014)

  Mathematician Master's degree with *Outstanding grade* (June, 2014)
  Thesis: "*Quantum walk based search methods and algorithmic applications*"
  Advisor: Dr. Katalin Friedl

  Mathematician Bachelor's degree with *Honours* (June, 2010)
  Thesis: "*A Matematikai Tudás Fája*" ("*The Mathematical Tree of Knowledge*")
  Advisor: Prof. László Lovász

- Gymnasium, **St. Margaret**, Budapest, Hungary (2001-2007)

  Matura (school-leaving exam) with *Outstanding grade* (June, 2007)

Positions

- Marie Curie fellow at the **Alfréd Rényi Institute of Mathematics**, Budapest, Hungary (01/09/2021-

- Google Research Fellow at the **Simons Institute for the Theory of Computing** for participating in "The Quantum Wave in Computing" program at **UC Berkeley**, CA, USA. (14/01/2020-31/05/2020)

- Postdoctoral scholar at the **Institute for Quantum Information and Matter, Caltech**, Pasadena, CA, USA. (01/09/2019 - 30/08/2021) [Also received offers from **MIT** and **Stanford**.]

- Research Intern at the **Quantum Architectures and Comp. Group, Microsoft Research**, Redmond, WA, USA. (08/05/2017 - 28/07/2017)

- Assistant research fellow at the **Dep. of Quantum Optics and Quantum Information**, Wigner Research Centre for Physics of the Hung. Acad. of Sci., Budapest, Hungary (15/09/2014-30/09/2015)

- Research Intern at the **Statistical and Biological Physics Research Group (ERC COLL-MOT)**, Eötvös Loránd University, Budapest, Hungary (16/07/2014-15/08/2014)

- Research Intern at the **Computational Systems Neuroscience Lab**, Wigner Research Centre for Physics of the Hungarian Academy of Sciences, Budapest, Hungary (01/08/2013-31/08/2013)

Research interest and experience

- Quantum and classical algorithms and complexity

- Quantum linear algebra and quantum simulation

- Discrete and convex optimisation

- Quantum walks, stochastic and iterated processes

- Quantum and classical machine learning and property testing

Competitions and Awards

- **Cor Baayen Young Researcher Award** of the European Research Consortium for Informatics and Mathematics, awarded annually to a promising young researcher in computer science or applied mathematics (Shared with Ninon Burgos). (2019)

- **Best student paper award** for "*Improvements in Quantum SDP-Solving with Applications*" in Track A of the 46th International Colloquium on Automata, Languages, and Programming (ICALP). (2019)

- 2nd prize at the "**Microsoft Quantum Challenge**" awarded for my project entitled "*Testing quantum state engineering protocols via LIQUi|⟩ simulations*". (2016)

- Received the "Tehetség-ösztöndíj" (Talent scholarship) of Dr. László Sólyom, former President of the Hungarian Republic, for funding my studies at the University of Cambridge. (2011)

- 1st prize with the project "*Hungarosphere*" at the 16th National Scientific and Innovation Contest for Youth, Hungary. (The project was about building a special spherical robot.) (2007)

- The European Patent Office's "**Prize for Originality**" for my project "*Compass implemented on a mobile phone*", at the 18th European Union Contest for Young Scientist Stockholm, Sweden. (2006)

- 1st prize with my project "*Compass implemented on a mobile phone*" at the 15th National Scientific and Innovation Contest for Youth, Hungary. (2006)

- 1st prize at national "Arany Dániel" Mathematics Competition, Hungary. (2005)

Grants awarded

- Marie Skłodowska-Curie Individual Fellowship by the EU's Horizon 2020 Programme hosted at the Alfréd Rényi Institute of Mathematics (01/09/2021-30/08/2025)

- Sponsored Research Agreement by the Amazon Center for Quantum Computing for collaborative research at the Alfréd Rényi Institute of Mathematics (01/09/2021-29/11/2024)

Students and postdocs

- João Doriguello, postdoc (2024-)

- Sára Pituk, PhD student (2021-)

- Jakab Csatári, MSc student (2023-24)

- Blanka Kövér, Boglárka Kulcsár, Roland Botond Miklósi (Eötvös Univesity), Balázs Németh (University of Cambridge), Research interns (Research Experiences for Undergraduates program) (07/2022)

- Arthur Vinciguerra (École normale supérieure de Lyon), Research intern (05-07/2022)

Teaching

- Lecturer at the "*Institute for Advanced Study's PCMI Graduate Summer School*", **Park City Mathematics Institute**, Utah, USA. (16/07-05/08/2023)

- Lecturer at the "*Quantum Computing Summer School*", **Bad Honnef Physics School**, Germany (14-19/08/2022)

- Lecturer at the "*Summer School in Post-Quantum Cryptography*", **Eötvös Loránd University**, Budapest, Hungary (1-5/08/2022)

- Theory of Computing exercise classes for Mathematics students at **Eötvös Loránd University**, Budapest, Hungary (Spring semester, 2022,'23,'24)

- Quantum Computing lectures at the **Eötvös Loránd University**, Budapest, Hungary (Autumn semester, 2021,'22,'23)

- Doctoral committee member of Brandon Augustino at the Lehigh University, PA, USA. (2021-2023)

- Speaker at *"The 4th Advanced School in Computer Science and Engineering on The Mathematics of Quantum Computation"*, Israel **Institute for Advanced Studies**, Jerusalem, Israel (15-19/12/2019)

- Quantum Computing teaching assistant, **University of Amsterdam** (Spring semesters, 2017-2019)

- Physics Introduction exercise classes for Electrical Engineer students at **Budapest University of Technology and Economics**, Hungary (Autumn and Spring semesters, 2014/15)

- Quantum Computing lectures for students of the **Eötvös Collegium** at Eötvös Loránd University, Budapest, Hungary (Spring semester, 2014)

- Linear Algebra exercise classes for Information Technology students at **Eötvös Loránd University**, Budapest, Hungary (Autumn semester, 2010)

Talks at Conferences and Workshops

- *"A Quantum Speed-Up for Approximating the Top Eigenvector of a Matrix via Improved Tomography"* at the "Near-Term Quantum Computers: Fault Tolerance + ... + Quantum Algorithms" Workshop, The Simons Institute for the Theory of Computing, Berkeley, CA, USA (22-26/04/2024)

- **Invited brainstormer:** Quantum Now Unconference, Pyhä, Lapland, Finland (03-06/04/2024)

- **Invited talk:** *"Quantum Thermal State Preparation"* Invited Session T45: Recent Advances in Quantum Algorithms, APS March Meeting, Minneapolis, MN, USA (02-08/03/2024)

- **Invited talk:** *"Quantum algorithmic tools for simulating open quantum systems"* Workshop I: Quantum Algorithms for Scientific Computation, Mathematical and Computational Challenges in Quantum Computing Program, Institute for Pure and Applied Math., UCLA, CA, USA (02-06/10/2023)

- **Invited talk:** *"Quantum Thermal State Preparation"* Workshop on Foundations of Quantum Computing, Royal Holloway, University of London, Egham, UK (05-06/09/2023)

- *"Quantum gradient computation with Gaussian noise"* 20th (EUROPT) Workshop on Advances in Continuous Optimization, Budapest, Hungary (23-25/08/2023)

- *"Efficient quantum Metropolis algorithms"* 4th **QCTiP** (Quantum Computing Theory in Practice), Cambridge, UK (17-19/04/2023)

- *"A streamlined quantum algorithm for topological data analysis with exponentially fewer qubits"* 26th **QIP** (Annual Conf. on Quantum Inf. Proc.), Ghent, Belgium (6-10/02/2023)

- **Invited talk:** *"High-dimensional linear algebra in quantum algorithms: from quantum walks to matrix inversion"* Workshop on Quantum Algorithms in Number Theory, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada [held virtually] (19-21/04/2022)

- **Invited talk:** *"Quantum Algorithms for Quantum Information Processing Tasks"* Quantum Numerical Linear Algebra Worksop, Institute for Pure and Applied Mathematics, UCLA, CA, USA [held virtually] (24-27/01/2022)

- *"Limitations of the Macaulay matrix approach for using the HHL algorithm to solve multivariate polynomial systems"* Quantum Cryptanalysis Workshop, Dagstuhl, Germany (17-22/10/2021)

- **Invited talk:** *"(Sub)Exponential Advantage of Adiabatic Quantum Computation With No Sign Problem"* at the "Quantum Wave in Computing Reunion", The Simons Institute for the Theory of Computing, Berkeley, CA, USA (12-16/07/2021)

- **Invited talk:** "*(Sub)Exponential advantage of adiabatic quantum computation with no sign problem*" at the "Quantum Complexity: Theory and Application" Workshop, Dagstuhl, Germany (28/06-02/07/2021)

- "*(Sub)Exponential advantage of adiabatic quantum computation with no sign problem*" 53$^{\text{rd}}$, **STOC** (ACM Symp. on the Th. of Comp.), Italy [held virtually] (21-25/06/2021)

- **Invited talk:** "*(Sub)Exponential advantage of adiabatic quantum computation with no sign problem*" at the "Adiabatic Quantum Computing Conference", Tokyo Institute of Technology, Japan [held virtually] (22-25/06/2021)

- **Invited talk:** "*Quantum Information Processing by Quantum Singular Value Transformation*" at the SIAM Conference on Computational Science and Engineering (CSE21), Fort Worth, Texas, USA [held virtually] (1-5/03/2021)

- **Plenary talk:** "*(Sub)Exponential advantage of adiabatic quantum computation with no sign problem*" 24$^{\text{th}}$ **QIP** (Annual Conf. on Quantum Inf. Proc.), Munich, Germany [held virtually] (1-5/02/2021)

- "*Quantum-inspired algorithms for solving low-rank linear equation systems with logarithmic dependence on the dimension*" **ISAAC** (Int. Symp. on Alg. and Comp.), Hong Kong, China [held virtually] (14-18/12/2020)

- **Invited talk:** "*Quantum-Inspired Classical Algorithms*" at the "Quantum Programming" Satellite Workshop of GPU Day, Wigner RCP, Budapest, Hungary [held virtually] (21/10/2020)

- **Invited talk:** "*Quantum Singular Value Transformation: a synthesis of high-level algorithms and efficient circuits*" Google's Quantum Summer Symposium, Los Angeles, CA, USA [held virtually] (22-23/07/2020)

- **Invited talks** given during the "The Quantum Wave in Computing" Program at The Simons Institute for the Theory of Computing, Berkeley, CA, USA (14/01 - 15/05/2020)

    - "*Quantum Algorithms – An Overview of Techniques*" at the "Boot Camp" (27-31/01/2020)
    - "*Quantum Singular Value Transformation and Its Algorithmic Applications*" at the "Boot Camp" (27-31/01/2020)
    - "*Overview of Quantum Algorithmic Tools*" at the "Quantum Cryptanalysis of Post-Quantum Cryptography" workshop (22-24/02/2020)
    - "*Techniques for Hamiltonian Simulation and Beyond*" at the "Quantum Algorithms" workshop (25-28/02/2020)

- **Tutorial** on "*Quantum algorithms*" 23$^{\text{rd}}$ **QIP** (Annual Conf. on Quantum Inf. Proc.), Shenzhen, China. (04-10/01/2020)

- "*Some new distributional property testing results*" Quantum Cryptanalysis Workshop, Dagstuhl, Germany (13-18/10/2019)

- **Invited talk:** "*Quantum Singular Value Transformation & Its Algorithmic Applications*" Quantum Information Theory and Mathematical Physics Workshop, Budapest U. of Tech., Hungary (2-5/09/2019)

- "*Quantum singular value transformation and beyond: exponential improvements for quantum matrix arithmetics*" 51$^{\text{st}}$, **STOC** (ACM Symp. on the Th. of Comp.), Phoenix, AZ, USA (23-26/06/2019)

- **Invited plenary talk:** "*Quantum Singular Value Transformation & Its Algorithmic Applications*" 14$^{\text{th}}$ **TQC** (Conference on the Theory of Quantum Comp.), U. of Maryland, MD, US (3-5/06/2019)

- "*Quantum singular value transformation and beyond: exponential improvements for quantum matrix arithmetics*" 22$^{\text{nd}}$ **QIP** (Annual Conf. on Quantum Inf. Proc.), Boulder, CO, USA. (14-18/01/2019)

- *"Optimizing quantum optimization algorithms via faster quantum gradient comp."*
  30$^{\text{th}}$ **SODA** (ACM-SIAM Symp. on Discrete Algorithms), San Diego, CA, USA (6-9/01/2019)

- **Invited talk:** *"Quantum singular value transformation and beyond: exponential improvements for quantum matrix arithmetics"* **Quantum Innovators** in Computer Science and Mathematics, U. of Waterloo, Canada (22-26/10/2018)

- **Invited talk:** *"Improvements in Quantum SDP Solving"*
  Challenges in Quantum Computation, Simons Institute, Berkeley, CA, USA (11-15/06/2018)

- **Invited talk:** *"Optimizing quantum optimization algorithms via faster quantum gradient comp."*
  Heilbronn Quantum Algorithms Meeting 2018, Cambridge, UK (12/04/2018)

- **Invited talk:** *"Optimizing quantum optimization algorithms via faster quantum gradient comp."*
  Aspen Winter Conf. on Advances in Quant. Alg. and Comp., Aspen, CO, USA (11-17/03/2018)

- *"On preparing ground states of gapped Hamiltonians: An efficient Quantum Lovász Local Lemma"*
  58$^{\text{th}}$ **FOCS** (IEEE Symp. on Foundations of Computer Sci.), Berkeley, CA, USA (15-17/10/2017)

- **Invited talk:** *"Optimizing Quantum Optimization Algorithms"*
  Workshop on Quantum Algorithms and Devices, Redmond, WA, USA (19/07/2017)

- *"On preparing ground states of gapped Hamiltonians: An efficient Quantum Lovász Local Lemma"*
  20$^{\text{th}}$ **QIP** (Conference on Quantum Information Processing), Seattle, WA, USA (16-20/01/2017)

Outreach

- **Panelist** at the *"Panel Discussion on Potential for Quantum Advantage in Machine Learning"*, held as part of the **Quantum Colloquium** of the Simons Institute, Berkeley, CA, USA (30/03/2021)

Organisation and community work

- Organizer of the Arbeitsgemeinschaft: "Quantum Signal Processing and Nonlinear Fourier Analysis", Mathematisches Forschungsinstitut Oberwolfach, Germany (06-11/10/2024)

- Organizer of the Consortium Meeting and Workshop on Hybrid Quantum-Classical Computing, Rényi Institute, Budapest, Hungary (29/11-01/12/2023)

- Program committee member of the 64th Annual Symposium on Foundations of Computer Science (FOCS 2023), held in Santa Cruz, CA, USA (6-9/11/2023)

- Organizer of the Quantum Generalizations of Graph Theory Workshop, Erdős Center, Budapest, Hungary (23-25/06/2022)

- Program committee member of the 25th Annual Conference on Quantum Information Processing, held in Pasadena, CA, USA (7-11/03/2022)

- Organizer of the Quantum Computer Science Seminar Series in Budapest (Spring semester, 2014) [held virtually]

- Program committee member of the 24th Annual Conference on Quantum Information Processing, held in Munich, Germany (1-5/02/2021)

- Refereed papers for several journals (J. of the ACM, SIAM J. of Computing, Theory of Comp., Comm. in Math. Phys., New J. of Physics, npj Quantum Inf., Quantum J., Quantum Inf. & Comp.) and conferences (FOCS, STOC, QIP, TQC, Crypto, ITCS, ICALP, STACS, MFCS).

- Program committee member of the 2nd International Conference for Young Quantum Information Scientists, held in Barcelona, Spain (19-21/10/2016)

- Leader of the Technology Division of the National Association of Research Students, Hungary (2007-2009)

- Student-Chairman of the "Induction Scientific Student Society" in St. Margaret Gymnasium, Budapest, Hungary (2006-2007)

Research visits

- Visiting Scientist at the "Quantum Algorithms, Complexity, and Fault Tolerance" program, Simons Institute for the Theory of Computing, UC Berkeley (22/04-10/05/2024)

- IT University of Copenhagen, Denmark, hosted by Michael J. Kastoryano (12-16/04/2024)

- Centre for Quantum Technologies (CQT), National University of Singapore, hosted by Miklós Sántha (09-12/01/2024)

- Visiting Scientist at the "Extended Reunion: The Quantum Wave in Computing", Simons Institute for the Theory of Computing, UC Berkeley (30/05/2022-17/06/2022)

- Visiting Scientist at the "Summer Cluster in Quantum Computation", Simons Institute for the Theory of Computing, UC Berkeley (28/06/2021-28/07/2021)

- Quantum AI Lab, Google Venice Headquarters, Venice, CA, hosted by Ryan Babbush (04/11/2019)

- DAMTP, University of Cambridge, UK, hosted by Johannes Bausch (12/06 - 14/06/2019)

- Center for Theoretical Physics, MIT, Cambridge, hosted by Aram Harrow (15/10 - 19/10/2018)

- Summer Cluster: Challenges in Quantum Computation, Simons Institute for the Theory of Computing, UC Berkeley (06/06 - 05/07/2018)

- Quantum Architectures and Computation Group, Microsoft Research, hosted by Nathan Wiebe (28/05 - 01/06/2018)

- Quantum information and computing group, JILA, CU Boulder, hosted by Graeme Smith (19-21/03/2018)

- Max Planck Institute of Quantum Optics, Garching, hosted by Ignacio Cirac (19-23/02/2018)

- Joint Center for Quantum Information and Computer Science, University of Maryland, hosted by Andrew Childs (23-27/10/2017)

- Institute for Quantum Information and Matter, California Institute of Technology, hosted by Fernando Brandão (01-02/08/2017)

- Quantum Architectures and Computation Group, Microsoft Research, hosted by Nathan Wiebe (23-27/01/2017)

- Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, hosted by Igor Jex (15-19/06/2015)

Participation in industrial innovation

- My "Mobile Compass" Java application was commercialised through the Hungarian WAP site of T-Mobile for 2 years (2006-2007). About 2500 downloads were registered during this period.

Patents

- US Patent application on: Phase Arithmetic for Quantum Computation (with Nathan Wiebe, 2019)

Languages

- Hungarian, English

Books

[30] DALZELL, A. M., MCARDLE, S., BERTA, M., BIENIAS, P., CHEN, C.-F., GILYÉN, A., HANN, C. T., KASTORYANO, M. J., KHABIBOULLINE, E. T., KUBICA, A., SALTON, G., WANG, S., AND BRANDÃO, F. G. S. L. Quantum algorithms: A survey of applications and end-to-end complexities. arXiv: 2310.03011, 2023 – Accepted for publication by Cambridge University Press.

Publications

[29] DING, J., GHEORGHIU, V., GILYÉN, A., HALLGREN, S., AND LI, J. Limitations of the Macaulay matrix approach for using the HHL algorithm to solve multivariate polynomial systems. arXiv: 2111.00405, 2023

[28] VAN APELDOORN, J., CORNELISSEN, A., GILYÉN, A., AND NANNICINI, G. Quantum tomography using state-preparation unitaries. In *Proceedings of the 36th ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2023, pp. 1265–1318. arXiv: 2207.08800

[27] GILYÉN, A., SONG, Z., AND TANG, E. An improved quantum-inspired algorithm for linear regression. *Quantum* **6**:754, 2022. arXiv: 2009.07268

[26] GILYÉN, A., LLOYD, S., MARVIAN, I., QUEK, Y., AND WILDE, M. M. Quantum algorithm for Petz recovery channels and pretty good measurements. arXiv: 2006.16924, 2020

[25] GILYÉN, A., HASTINGS, M. B., AND VAZIRANI, U. (Sub)Exponential advantage of adiabatic quantum computation with no sign problem. In *Proceedings of the 53rd ACM Symposium on the Theory of Computing (STOC)*, 2021, pp. 1357–1369 Earlier version available on arXiv: 2011.09495.

[24] APERS, S., GILYÉN, A., AND JEFFERY, S. A unified framework of quantum walk search. In *Proceedings of the 38th Symposium on Theoretical Aspects of Computer Science (STACS)*, 2021, pp. 6:1–6:13. arXiv: 1912.04233

[23] CHIA, N.-H., GILYÉN, A., LIN, H.-H., LLOYD, S., TANG, E., AND WANG, C. Quantum-inspired algorithms for solving low-rank linear equation systems with logarithmic dependence on the dimension. In *Proceedings of the 31st International Symposium on Algorithms and Computation (ISAAC)*, 2020, pp. 47:1–47:17 Earlier version available on arXiv: 1811.04909.

[22] BEN-DAVID, S., CHILDS, A. M., GILYÉN, A., KRETSCHMER, W., PODDER, S., AND WANG, D. Symmetries, graph properties, and quantum speedups. In *Proceedings of the 61st IEEE Symposium on Foundations of Computer Science (FOCS)*, 2020, pp. 649–660. arXiv: 2006.12760

[21] KOLLÁR, B., GILYÉN, A., TKÁČOVÁ, I., KISS, T., JEX, I., AND ŠTEFAŇÁK, M. Complete classification of trapping coins for quantum walks on the two-dimensional square lattice. *Physical Review A* **102**(1):012207, 2020. arXiv: 2002.08070

[20] CHIA, N.-H., GILYÉN, A. P., LI, T., LIN, H.-H., TANG, E., AND WANG, C. Sampling-based sublinear low-rank matrix arithmetic framework for dequantizing quantum machine learning. *Journal of the ACM* **69**(5), 2022. Earlier version in STOC'20, arXiv: 1910.06151

[19] BANNINK, T., BUHRMAN, H., GILYÉN, A., AND SZEGEDY, M. The interaction light cone of the Discrete Bak-Sneppen, Contact and other local processes. *Journal of Statistical Physics* **176**(6):1500–1525, 2019. arXiv: 1903.12607

[18] AMBAINIS, A., GILYÉN, A., JEFFERY, S., AND KOKAINIS, M. Quadratic speedup for finding marked vertices by quantum walks. In *Proceedings of the 52nd ACM Symposium on the Theory of Computing (STOC)*, 2020, p. 412–424. arXiv: 1903.07493

[17] GILYÉN, A., AND LI, T. Distributional property testing in a quantum world. In *Proceedings of the 11th Innovations in Theoretical Computer Science Conference (ITCS)*, 2020, pp. 25:1–25:19. arXiv: 1902.00814

[16] VAN APELDOORN, J., GILYÉN, A., GRIBLING, S., AND DE WOLF, R. Convex optimization using quantum oracles. *Quantum* **4**:220, 2020. arXiv: 1809.00643

[15] GILYÉN, A., SU, Y., LOW, G. H., AND WIEBE, N. Quantum singular value transformation and beyond: Exponential improvements for quantum matrix arithmetics. In *Proceedings of the 51st ACM Symposium on the Theory of Computing (STOC)*, 2019, pp. 193–204. arXiv: 1806.01838

[14] CHAKRABORTY, S., GILYÉN, A., AND JEFFERY, S. The power of block-encoded matrix powers: Improved regression techniques via faster Hamiltonian simulation. In *Proceedings of the 46th International Colloquium on Automata, Languages, and Programming (ICALP)*, 2019, pp. 33:1–33:14. arXiv: 1804.01973

[13] VAN APELDOORN, J., AND GILYÉN, A. Improvements in quantum SDP-solving with applications. In *Proceedings of the 46th International Colloquium on Automata, Languages, and Programming (ICALP)*, 2019, pp. 99:1–99:15. arXiv: 1804.05058

[12] GILYÉN, A., ARUNACHALAM, S., AND WIEBE, N. Optimizing quantum optimization algorithms via faster quantum gradient computation. In *Proceedings of the 30th ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2019, pp. 1425–1444. arXiv: 1711.00465

[11] VAN APELDOORN, J., GILYÉN, A., GRIBLING, S., AND DE WOLF, R. Quantum SDP-solvers: Better upper and lower bounds. *Quantum* **4**:230, 2020. Earlier version in FOCS'17. arXiv: 1705.01843

[10] GILYÉN, A., AND SATTATH, O. On preparing ground states of gapped Hamiltonians: An efficient quantum Lovász local lemma. In *Proceedings of the 58th IEEE Symposium on Foundations of Computer Science (FOCS)*, 2017, pp. 439–450. arXiv: 1611.08571

[9] GILYÉN, A. Testing quantum state engineering protocols via LIQ$Ui|\rangle$ simulations. Tech. rep., 2$^{\text{nd}}$ prize winner entry at the Microsoft Quantum Challange, 2016

[8] GILYÉN, A., KISS, T., AND JEX, I. Exponential sensitivity and its cost in quantum physics. *Scientific Reports* **6**:20076, 2016. arXiv: 1508.03191

To be peer-reviewed `arXiv` preprints:

[7] CHEN, C.-F., KASTORYANO, M. J., AND GILYÉN, A. An efficient and exact noncommutative quantum gibbs sampler. arXiv: 2303.09207, 2023

[6] CHEN, C.-F., KASTORYANO, M. J., BRANDÃO, F. G. S. L., AND GILYÉN, A. Quantum thermal state preparation. arXiv: 2303.18224, 2023

[5] MCARDLE, S., GILYÉN, A., AND BERTA, M. A streamlined quantum algorithm for topological data analysis with exponentially fewer qubits. arXiv: 2209.12887, 2022

[4] MCARDLE, S., GILYÉN, A., AND BERTA, M. Quantum state preparation without coherent arithmetic. arXiv: 2210.14892, 2022

[3] CORNELISSEN, A., BAUSCH, J., AND GILYÉN, A. Scalable benchmarks for gate-based quantum computers. arXiv: 2104.10698, 2021

[2] CHAO, R., DING, D., GILYÉN, A., HUANG, C., AND SZEGEDY, M. Finding angles for quantum signal processing with machine precision. arXiv: 2003.02831, 2020

[1] VAN APELDOORN, J., AND GILYÉN, A. Quantum algorithms for zero-sum games. arXiv: 1904.03180, 2019