

Assistant Professor (Tenure-Track)  
Department of Electrical and Computer Engineering  
The University of Arizona, Tucson, AZ, USA  
Website: <https://ece.engineering.arizona.edu/faculty-staff/faculty/narayanan-rengaswamy>  
Scholar: <https://scholar.google.com/citations?user=qkAERWAAAAAJ&hl=en>

[narayananr@arizona.edu](mailto:narayananr@arizona.edu)  
(520) 626-0737

## PROFESSIONAL EXPERIENCE

### **Assistant Professor (Tenure-Track), Aug. 2022 – Present**

*Department of Electrical and Computer Engineering, The University of Arizona, Tucson, AZ, USA*

### **Postdoctoral Research Associate, Sep. 2020 – Aug. 2022**

*Department of Electrical and Computer Engineering, The University of Arizona, Tucson, AZ, USA*

### **Research Associate, Jun. 2020 – Sep. 2020**

*Department of Electrical and Computer Engineering, Duke University, Durham, NC, USA*

### **Graduate Research Intern, Jun. 2015 – Aug. 2015**

*Alcatel-Lucent Bell Labs, Stuttgart, Germany*

### **Undergraduate Summer Intern, Jun. 2012 – Jul. 2012**

*Ericsson India Global Services Private Limited, Chennai, India*

## EDUCATION

### **Ph.D. in Electrical Engineering, Jan. 2016 – May 2020**

*Duke University, Durham, NC, USA*

*Cumulative GPA: 3.912/4*

Dissertation: Classical Coding Approaches to Quantum Applications

(Defense: <https://www.youtube.com/watch?v=cvAcaujp7Wo>)

Advisors: Prof. Henry D. Pfister and Prof. Robert Calderbank

### **M.S. in Electrical Engineering, Aug. 2013 – Dec. 2015**

*Texas A&M University, College Station, TX, USA*

*Cumulative GPA: 3.875/4*

Thesis: On Cyclic Polar Codes and the Burst Erasure Performance of Spatially-Coupled LDPC Codes

Advisors: Prof. Henry D. Pfister and Prof. Krishna R. Narayanan

### **B.Tech. in Electronics and Communication Engineering, Jun. 2009 – May 2013**

*Amrita University, Coimbatore, Tamilnadu, India*

*Cumulative GPA: 9.70/10*

Project: Wireless Electrocardiogram Monitoring for Cardiac Patients on Android Platform

Advisor: Prof. E. P. Sumesh

## HONORS and ACHIEVEMENTS

### **Computing's Top 30 Early Career Professionals, IEEE Computer Society**

2025

– Eligibility: full-time professionals and entrepreneurs within 15 years of earning a Bachelor's degree who have demonstrated technical expertise, influence, and inspired others

### **Best Paper Award, Third Place, in Quantum Algorithms Track, IEEE Quantum Week, Albuquerque**

2025

– Paper: Z. Chen, J. O. Weinberg, and N. R., "Fault tolerant quantum simulation via symplectic transvections,"; presented by my Ph.D. student Z. Chen

– Largest quantum conference in the world (557 paper submissions, 265 accepted, 47.6% acceptance rate)	
<b>Best Paper Award, First Place, in Quantum Algorithms Track, IEEE Quantum Week, Montreal</b>	2024
– Paper: S. K. Borah, A. K. Pradhan, N. Raveendran, N. R., and B. Vasić, “Non-binary hypergraph product codes for qudit error correction”; presented by Ph.D. student S. K. Borah (co-advised by me)	
– Largest quantum conference in the world (460 paper submissions, 222 accepted, 48.3% acceptance rate)	
<b>Keynote Speaker and Panelist, Fault Tolerant Quantum Technologies Workshop, Benasque, Spain</b>	2024
– Delivered a one-hour talk on “Unitary Synthesis of Logical Circuits” and participated in the Theory Panel along with Andrew Doherty, Anirudh Krishna, and Barbara Terhal in this two-week workshop	
<b>Long-Term Visitor, Simons Institute for the Theory of Computing, UC Berkeley</b>	2024
– Invited to participate in the following Spring 2024 programs of this prestigious institute: “Error-Correcting Codes: Theory and Practice” and “Quantum Algorithms, Complexity, and Fault Tolerance”	
<b>National Level Finalist, NSF-ERC Perfect Pitch Competition, Washington D.C.</b>	2022
– Represented our Center for Quantum Networks (CQN) after winning the internal competition	
– Recording of my Perfect Pitch in the national finals: <a href="https://youtu.be/75YHhf0p5L8?t=1947">https://youtu.be/75YHhf0p5L8?t=1947</a>	
<b>Contributed Talk at Quantum Information Processing (QIP) Conference, Shenzhen, China</b>	2020
– Our paper “On Optimality of CSS Codes for Transversal $T$ ” was one of the 73 out of 283 submissions that were accepted as talks in this highly selective flagship conference of the field	
<b>German Academic Exchange Service (DAAD) RISE Professional Scholarship</b>	2015
– One of the 34 scholarship recipients selected by the committee, among all the 184 applicants	
– Funded 3-month summer research internship in Alcatel-Lucent Bell Labs, Stuttgart, Germany	
– Published two conference papers and one journal paper based on this work	
<b>Distinction in Undergraduate Studies, Amrita University, India</b>	2013
– Ranked first in my campus, third in the university (across three engineering campuses)	
<b>Ericsson Excel Certification in Telecommunications</b>	2012
– Attended leading Ericsson researcher’s lectures, passed exam and completed an internship	
<b>Central Board of Secondary Education (CBSE) Merit Scholarship</b>	2010-11, 2011-12
<b>Amrita TIDE Best Innovation Award</b>	2011 – 2012
– As a team, developed an Integrated Village Development System; created a web portal for a job classifieds system; used Software Defined Radio (SDR) to demonstrate digital connectivity between places, with only partial internet dependence	

## TEACHING

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Instructor, <b>NSF Center for Quantum Networks (CQN) Annual Winter School</b>	Jan. 2023, '24, '25, '26
Instructor, <b>ECE 633: Quantum Information Processing and Quantum Error Correction</b>	Fall 2025
Instructor, <b>ECE 340A: Introduction to Communications</b>	Fall 2022, '23, '24, '25
Instructor, <b>ECE 455/555: Introduction to Quantum Mechanics and Quantum Information Processing</b>	Spring 2024, '25
Lectures on Quantum Error Correction for <b>ECE 635: Error Correction Coding</b>	Spring 2021
Teaching Assistant, <b>ECE 590-09: Error Correcting Codes</b>	Fall 2017
Teaching Assistant, <b>ECE 485: Digital Audio Processing</b>	Spring 2017

Teaching Assistant, **ECE 403/404: Capstone (Senior) Design**

Spring, Fall 2015

Student Lectures, **Channel Coding**

Fall 2015

Several other one-off lectures, informal presentations, tutorial-type talks, and one-on-one teaching sessions at all institutions

## **SERVICE**

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### **Professional Societies:**

**Member**, American Association for the Advancement of Science (AAAS), since January 2026

**Senior Member**, IEEE (Information Theory Society, Computer Society), since July 2025

**Member**, American Mathematical Society (AMS), since January 2024

### **Committees:**

**Hiring Committee**, Fall 2024, ECE Department SPFI Faculty Position in Quantum Information Science

**Executive Committee**, 2023-24, ECE Department

**Graduate Recruitment and Awards Committee (GRAC)**, since Fall 2022, ECE Department

**Hiring Committee**, Fall 2022, ECE Department Faculty Position in Quantum Information Science

### **Organizer of Conferences and Workshops:**

2026:

**Co-Organizer**, **CQN Winter School**, NSF-ERC Center for Quantum Networks

**Co-Organizer**, **Quantum Error Correction Tutorial**, American Physical Society March Meeting

**Finance Co-Chair**, IEEE Information Theory Workshop

2025:

**Tutorials Program Committee**, IEEE International Conference on Quantum Computing and Engineering (QCE)

2024:

**Program Co-Chair**, Quantum Information Knowledge (QuIK) Workshop,  
International Symposium on Information Theory (ISIT 2024)

**TPC Member**, QCom(p) Workshop: Workshop on Quantum Communication and Computing,  
16th International Conference on COMmunication Systems & NETworkS (COMSNETS 2024)

2023:

**TPC Member**, 10th International Conference on Nanoscale Computing and Communication (ACM NanoCom)

**TPC Member**, IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS 2023)

**Co-organizer**, two special sessions on quantum codes in International Symposium on Topics in Coding (ISTC)

2022:

**Posters Program Committee**, IEEE International Conference on Quantum Computing and Engineering (QCE)

**Organizing Committee**, NSF-ERC Center for Quantum Networks (CQN) Summer Retreat Workshop

### **Reviewer for Grant Proposals:**

2025:

National Science Foundation (NSF) Directorate of Engineering (ENG)

2024:

National Science Foundation (NSF) Directorate of Engineering (ENG)

United States Department of Energy (DOE) Basic Energy Sciences (BES) program

United States Department of Energy (DOE) Advanced Scientific Computing Research (ASCR) program

2023:

Natural Sciences and Engineering Research Council (NSERC) of Canada

### **Editor for Journals:**

**Lead Editor**, IEEE Journal on Selected Areas in Information Theory Special Issue on Quantum Error Correction and Fault Tolerance, 2025

**Editor**, Quantum, since July 2024

**Reviewer** for Journals, Conferences, and Books:

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Physical Review X  
Cambridge University Press  
NPJ Quantum Information (Nature Portfolio Journal)  
Physical Review Letters  
IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences  
Quantum Information Processing  
Physical Review X Quantum  
Designs, Codes and Cryptography  
IEEE BITS the Information Theory Magazine  
Physical Review A  
IEEE Transactions on Quantum Engineering  
IEEE Access  
IEEE Transactions on Communications  
Proceedings of the Royal Society A  
Quantum Science and Technology  
Quantum  
IEEE Transactions on Vehicular Technology  
IEEE Transactions on Information Theory

2025:

Quantum Information Processing (QIP)  
IEEE International Symposium on Information Theory (ISIT)  
IEEE International Conference on Quantum Communications, Networking, and Computing (QCNC)

2024:

IEEE Information Theory Workshop (ITW)  
The Theory of Quantum Computation, Communication and Cryptography (TQC)  
QCom(p): Workshop on Quantum Communication and Computing, 16th International Conference on COMMunication Systems & NETWORKS (COMSNETS)

2023:

10th International Conference on Nanoscale Computing and Communication (ACM NanoCom)  
IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)  
International Symposium on Topics in Coding (ISTC)  
IEEE International Symposium on Information Theory (ISIT)  
The Theory of Quantum Computation, Communication and Cryptography (TQC)

2022:

IEEE Information Theory Workshop (ITW)  
IEEE International Symposium on Information Theory (ISIT)

2021:

Quantum Information Processing (QIP)

2020:

IEEE Information Theory Workshop (ITW)  
IEEE International Symposium on Information Theory (ISIT)

2018:

IEEE Information Theory Workshop (ITW)  
IEEE International Symposium on Information Theory (ISIT)

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## THESES

2. **N. R.**, “Classical Coding Approaches to Quantum Applications,” Ph.D. Dissertation, Duke University, 2020. [Online]. Available: <http://arxiv.org/abs/2004.06834>.
1. **N. R.**, “On Cyclic Polar Codes and the Burst Erasure Performance of Spatially-Coupled LDPC Codes,” Master’s thesis, Texas A&M University, 2015. [Online]. Available: <http://arxiv.org/abs/2004.06875>.

## PEER-REVIEWED JOURNAL PAPERS

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17. A. Patil, M. Pacenti, B. Vasić, S. Guha, and **N. R.**, “Quantum repeater protocol using quantum error correction for distillation,” *accepted in IEEE Internet Computing*, 2026. [Online]. Available: <https://arxiv.org/abs/2405.00849>
16. Z. Chen, **N. R.**, “Tailoring fault-tolerance to quantum algorithms,” *IEEE Journal on Selected Areas in Information Theory*, vol. 6, pp. 311–324, 2025. [Online]. Available: <https://arxiv.org/abs/2404.11953>
15. **N. R.**, N. Raveendran, A. Raina, and B. Vasić, “Entanglement purification with quantum LDPC codes and iterative decoding,” *Quantum*, vol. 8, p. 1233, 2024. [Online]. Available: <https://arxiv.org/abs/2210.14143>
14. N. Raveendran, J. Valls, A. K. Pradhan, **N. R.**, F. Garcia-Herrero, and B. Vasić, “Soft syndrome iterative decoding of quantum LDPC codes and hardware architectures,” *EPJ Quantum Technology*, vol. 10, no. 1, p. 45, 2023.
13. H. D. Pfister, C. Piveteau, J. M. Renes, and **N. R.**, “Belief propagation for classical and quantum systems: Overview and recent results,” *IEEE BITS the Information Theory Magazine*, pp. 1–14, 2023.
12. Y. Ouyang and **N. R.**, “Describing quantum metrology with erasure errors using weight distributions of classical codes,” *Phys. Rev. A*, vol. 107, no. 2, p. 022620, 2023. [Online]. Available: <http://arxiv.org/abs/2007.02859>
11. N. Raveendran, **N. R.**, F. Rozpędek, A. Raina, L. Jiang, and B. Vasić, “Finite rate QLDPC-GKP coding scheme that surpasses the CSS Hamming bound,” *Quantum*, vol. 6, p. 767, Jul. 2022. [Online]. Available: <https://arxiv.org/abs/2111.07029>
10. S. Brandsen, M. Lian, K. D. Stubbs, **N. R.**, and H. D. Pfister, “Adaptive procedures for discriminating between arbitrary tensor-product quantum states,” *Phys. Rev. A*, vol. 106, no. 1, p. 012408, 2022. [Online]. Available: <https://arxiv.org/abs/1912.05087>
9. X. Tan, **N. R.**, and R. Calderbank, “Approximate unitary 3-designs from transvection Markov chains,” *Designs, Codes and Cryptography*, pp. 1–24, 2022. [Online]. Available: <https://arxiv.org/abs/2011.00128>
8. J. Hu, Q. Liang, **N. R.**, and R. Calderbank, “Mitigating coherent noise by balancing weight-2 z-stabilizers,” *IEEE Transactions on Information Theory*, vol. 68, no. 3, pp. 1795–1808, 2022. [Online]. Available: <https://arxiv.org/abs/2011.00197>
7. **N. R.**, K. P. Seshadreesan, S. Guha, and H. D. Pfister, “Belief propagation with quantum messages for quantum-enhanced classical communications,” *npj Quantum Inf.*, vol. 7, no. 1, p. 97, 2021. [Online]. Available: <http://arxiv.org/abs/2003.04356>
6. T. Pllaha, **N. R.**, O. Tirkkonen, and R. Calderbank, “Un-Weyl-ing the Clifford Hierarchy,” *Quantum*, vol. 4, p. 370, 2020. [Online]. Available: <http://arxiv.org/abs/2006.14040>
5. **N. R.**, R. Calderbank, M. Newman, and H. D. Pfister, “On optimality of CSS codes for transversal  $T$ ,” *IEEE J. Sel. Areas in Inf. Theory*, vol. 1, no. 2, pp. 499–514, 2020. [Online]. Available: <http://arxiv.org/abs/1910.09333>. Presented at *QIP 2020* as a talk.
4. **N. R.**, R. Calderbank, S. Kadhe, and H. D. Pfister, “Logical Clifford synthesis for stabilizer codes,” *IEEE Trans. Quantum Engg.*, vol. 1, 2020. [Online]. Available: <http://arxiv.org/abs/1907.00310>
3. T. Can, **N. R.**, R. Calderbank, and H. D. Pfister, “Kerdock Codes Determine Unitary 2-Designs,” *IEEE Trans. Inform. Theory*, vol. 66, no. 10, pp. 6104–6120, 2020. [Online]. Available: <http://arxiv.org/abs/1904.07842>
2. **N. R.**, R. Calderbank, and H. D. Pfister, “Unifying the Clifford hierarchy via symmetric matrices over rings,” *Phys. Rev. A*, vol. 100, no. 2, p. 022304, 2019. [Online]. Available: <http://arxiv.org/abs/1902.04022>
1. V. Aref, **N. R.**, and L. Schmalen, “Finite-Length Analysis of Spatially-Coupled Regular LDPC Ensembles on Burst-Erasure Channels,” *IEEE Trans. Inform. Theory*, vol. 64, no. 5, pp. 3431 – 3449, 2018. [Online]. Available: <https://arxiv.org/abs/1611.08267>.

## PREPRINTS

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7. S. Cheng and **N. R.**, “Adaptive entanglement distillation,” *submitted to npj Quantum Information (Nature Portfolio Journal)*, 2025. [Online]. Available: <https://arxiv.org/abs/2504.11670>

6. A. K. Pradhan, N. Raveendran, **N. R.**, and B. Vasić, “Linear time iterative decoders for hypergraph-product and lifted-product codes,” *revised and resubmitted to IEEE Trans. Inf. Theory*, 2025. [Online]. Available: <https://arxiv.org/abs/2504.01728>
5. O. Novak and **N. R.**, “Explaining robust quantum metrology by counting codewords,” *revised and resubmitted to IEEE Trans. Quantum Engg.*, 2025. [Online]. Available: <https://arxiv.org/abs/2503.15743>
4. P. J. Nadkarni, **N. R.**, and B. Vasić, “Tutorial on Quantum Error Correction for 2024 Quantum Information Knowledge (QuIK) Workshop,” *arXiv preprint arXiv:2407.12737*, 2024. [Online]. Available: <https://arxiv.org/abs/2407.12737>
3. **N. R.**, A. Raina, N. Raveendran, and B. Vasić, “Distilling GHZ States using Stabilizer Codes,” *arXiv preprint arXiv:2109.06248*, 2021. [Online]. Available: <https://arxiv.org/abs/2109.06248>
2. **N. R.** and H. D. Pfister, “A semiclassical proof of duality between the classical BSC and the quantum PSC,” *arXiv preprint arXiv:2103.09225*, 2021. [Online]. Available: <http://arxiv.org/abs/2103.09225>
1. **N. R.**, R. Calderbank, S. Kadhe, and H. D. Pfister, “Synthesis of Logical Clifford Operators via Symplectic Geometry,” *arXiv preprint arXiv:1803.06987*, 2018. [Online]. Available: <http://arxiv.org/abs/1803.06987>

## PEER-REVIEWED CONFERENCE PAPERS

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19. Z. Chen, J. O. Weinberg, and **N. R.**, “Fault tolerant quantum simulation via symplectic transvections,” in *IEEE International Conference on Quantum Computing and Engineering (QCE)*, 2025. [Online]. Available: <https://arxiv.org/abs/2504.11444>. **[Best Paper Award, Third Place, in Quantum Algorithms Track]**
18. S. K. Borah, A. K. Pradhan, N. Raveendran, **N. R.**, and B. Vasić, “Non-binary hypergraph product codes for qudit error correction,” in *IEEE International Conference on Quantum Computing and Engineering (QCE)*, 2024, pp. 98–108. **[Best Paper Award, First Place, in Quantum Algorithms Track]**
17. O. Novak and **N. R.**, “GNarsil: Splitting stabilizers into gauges,” in *IEEE International Conference on Quantum Computing and Engineering (QCE)*, 2024, pp. 109–116. [Online]. Available: <https://arxiv.org/abs/2404.18302>
16. Z. Chen and **N. R.**, “Tailoring fault-tolerance to Trotter circuits,” in *IEEE International Conference on Quantum Computing and Engineering (QCE)*, 2024, pp. 134–140.
15. A. Kang, S. Guha, **N. R.**, and K. P. Seshadreesan, “Trapped ion quantum repeaters with entanglement distillation based on quantum LDPC codes,” in *2023 IEEE International Conference on Quantum Computing and Engineering (QCE)*, vol. 1. IEEE, 2023, pp. 1165–1171.
14. A. K. Pradhan, N. Raveendran, **N. R.**, X. Xiao, and B. Vasić, “Learning to decode trapping sets in QLDPC codes,” in *2023 12th International Symposium on Topics in Coding (ISTC)*. IEEE, 2023, pp. 1–5.
13. **N. R.**, A. Raina, N. Raveendran, and B. Vasić, “GHZ distillation using quantum LDPC codes,” in *2023 12th International Symposium on Topics in Coding (ISTC)*. IEEE, 2023, pp. 1–5.
12. N. Raveendran, **N. R.**, A. K. Pradhan, and B. Vasić, “Soft syndrome decoding of quantum LDPC codes for joint correction of data and syndrome errors,” in *IEEE International Conference on Quantum Computing and Engineering (QCE)*, Sep. 2022. [Online]. Available: <https://arxiv.org/abs/2205.02341>
11. J. Hu, Q. Liang, **N. R.**, and R. Calderbank, “CSS Codes that are Oblivious to Coherent Noise,” in *Proc. IEEE Int. Symp. Inform. Theory*, 2021, pp. 1481–1486.
10. **N. R.** and H. D. Pfister, “On the Duality Between the BSC and Quantum PSC,” in *Proc. IEEE Int. Symp. Inform. Theory*, 2021, pp. 2232–2237.
9. **N. R.**, K. P. Seshadreesan, S. Guha, and H. Pfister, “A Belief Propagation-based Quantum Joint-Detection Receiver for Superadditive Optical Communications,” in *Conf. Lasers Electro-Optics*, 2021, p. FW3N.8. [Online]. Available: [https://www.osapublishing.org/abstract.cfm?uri=CLEO\\_{\\_}QELS-2021-FW3N.8](https://www.osapublishing.org/abstract.cfm?uri=CLEO_{_}QELS-2021-FW3N.8)
8. S. Brandsen, M. Lian, K. D. Stubbs, **N. R.**, and H. D. Pfister, “Adaptive procedures for discriminating between arbitrary tensor-product quantum states,” in *Proc. IEEE Int. Symp. Inform. Theory*, 2020, pp. 1933–1938. [Online]. Available: <http://arxiv.org/abs/1912.05087>
7. **N. R.**, K. P. Seshadreesan, S. Guha, and H. D. Pfister, “Quantum advantage via qubit belief propagation,” in *Proc. IEEE Int. Symp. Inform. Theory*, 2020, pp. 1824–1829. Video: <https://www.youtube.com/watch?v=L38Y1INdnq0>

6. **N. R.**, R. Calderbank, M. Newman, and H. D. Pfister, “Classical coding problem from transversal  $T$  gates,” in *Proc. IEEE Int. Symp. Inform. Theory*, 2020, pp. 1891–1896. [Online]. Available: <http://arxiv.org/abs/2001.04887>. Video: <https://www.youtube.com/watch?v=E7v1k6dW0gQ>
5. T. Can, **N. R.**, R. Calderbank, and H. D. Pfister, “Kerdock Codes Determine Unitary 2-Designs,” in *Proc. IEEE Int. Symp. Inform. Theory*, pp. 2908–2912, July 2019.
4. **N. R.**, R. Calderbank, S. Kadhe, and H. D. Pfister, “Synthesis of Logical Clifford Operators via Symplectic Geometry,” in *Proc. IEEE Int. Symp. Inform. Theory*, pp. 791–795, June 2018.
3. V. Aref, **N. R.**, and L. Schmalen, “Spatially Coupled LDPC Codes Affected by a Single Random Burst of Erasures,” in *Proc. Int. Symp. on Turbo Codes & Iterative Inform. Process.*, pp. 166–170, Sep. 2016. [Online]. Available: <https://arxiv.org/abs/1607.00918>.
2. **N. R.**, L. Schmalen, and V. Aref, “On the Burst Erasure Correctability of Spatially Coupled LDPC Ensembles,” in *Proc. IEEE Intl. Zurich Seminar on Commun.*, pp. 155–159, March 2016.
1. **N. R.** and H. D. Pfister, “Cyclic Polar Codes,” in *Proc. IEEE Int. Symp. Inform. Theory*, pp. 1287–1291, June 2015.

## PATENTS

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3. **N. R.** and S. Cheng, “Systems and Methods for Adaptive Error Correction for Entanglement Distillation in Quantum Networks,” *Provisional Patent Application No. 63/788,694*, filed April 14, 2025, University of Arizona. Co-Inventor.
2. Z. Chen, **N. R.**, and J. Weinberg, “Systems and Methods for Trotter-based Universal Fault Tolerance,” *Provisional Patent Application No. 63/788,626*, filed April 14, 2025, University of Arizona. Co-Inventor.
1. **N. R.**, K. P. Seshadreesan, S. Guha, and H. D. Pfister, “Enhanced signal processing using quantum computation,” *US Patent Application No. 18/273,344*, filed April 25, 2024, University of Arizona. Co-Inventor.

## SOFTWARE

3. Error Correction based Entanglement Distillation: [https://github.com/nrenga/ghz\\_distillation\\_qec](https://github.com/nrenga/ghz_distillation_qec)
2. Belief Propagation with Quantum Messages: <https://github.com/nrenga/bpqm>
1. Logical Clifford Synthesis: <https://github.com/nrenga/symplectic-arxiv18a>

## MEDIA

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### Articles

4. Katy Smith, “Big Idea Challenge powers orbital data center development,” *UA Office of Research and Partnerships News*, December 12, 2025. <https://tinyurl.com/3d5mmxnw>
3. Chris Quirk, “U of A researchers accelerate quantum computing at \$125M center,” *UA News*, December 11, 2025. <https://tinyurl.com/yc3759fz>
2. Vic Verbalaitis, “Summer Research Program opens doors to quantum information careers,” *UA ECE News*, August 20, 2025. <https://tinyurl.com/57sft72e>
1. Alexandra Pere, “University of Arizona Researchers Secure Federal Grants for Quantum Error Correction Advances,” *UA News*, March 10, 2025. <https://tinyurl.com/4knf2fdv>

### Recordings

9. “Error Correction for Quantum Networks”, *CQN Winter School Short Course*, co-taught with Ph.D. students Michele Pacenti and Sijie Cheng, Jan. 8, 2025: <https://www.youtube.com/watch?v=M14Qua5SqIw> (523 participants)
8. “Error Correction for Quantum Networks”, *CQN Winter School Short Course*, co-taught with Ph.D. students Michele Pacenti and Sijie Cheng, Jan. 8, 2024: [https://www.youtube.com/watch?v=Hv5-ZKc3f\\_g](https://www.youtube.com/watch?v=Hv5-ZKc3f_g) (462 participants)
7. “Classical and Quantum Error Correction”, *CQN Winter School Short Course*, co-taught with Bane Vasić, Jan. 5, 2023: <https://www.youtube.com/watch?v=u2N4MlpgVUY> (about 100 participants)

6. NSF-ERC Perfect Pitch Competition national-level finals, Sep. 21, 2022: <https://youtu.be/75YHhf0p5L8?t=1947>
5. “Mitigating Coherent Noise in Quantum Computing using the Classical MacWilliams Identities”, *CCSP Seminar*, University of Maryland, Apr. 8, 2021: <https://www.youtube.com/watch?v=PFr6Ux1GMbg>
4. “Error Correction for Quantum Computing and Communications”, *Modeling, Computation, Nonlinearity, Randomness and Waves Seminar*, University of Arizona, Apr. 1, 2021: <https://arizona.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=d759cd00-b0c0-4068-bc90-ad08012c18d6>
3. “What is Quantum Computing and How does Quantum Error Correction Work?”, *Math/Stat Virtual Tea*, Mount Holyoke College, Sep. 17, 2020: <https://www.youtube.com/watch?v=XmsgxawVceQ>
2. “Quantum Error Correction: Overview and Connections to Classical Coding Theory”, *Seminar*, Indian Institute of Technology Hyderabad and International Institute of Information Technology Hyderabad, Jun. 17-18, 2020: <https://www.youtube.com/watch?v=dAVUA2iiyK0>, [https://www.youtube.com/watch?v=1LysQ\\_h8pgg](https://www.youtube.com/watch?v=1LysQ_h8pgg)
1. “Classical Coding Approaches to Quantum Applications”, *Ph.D. Defense*, Duke University, Mar. 18, 2020: <https://www.youtube.com/watch?v=cvAcaujp7Wo>

## VISITS, TALKS, POSTERS AND WORKSHOPS

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59. **Invited Talk** – “Introduction to Fault-Tolerant Quantum Computing,” *AICTE Training and Learning (ATAL) Faculty Development Program on Quantum Technologies*, virtual, January 21, 2026.
58. **Invited Talk** – “Classical Weight Enumerators in Quantum Sensing,” *Algebraic Coding and Cryptography Seminar Series (ACCESS) Seminar*, virtual, October 7, 2025.
57. **Invited Talk** – “SIFT: Subroutine-Inspired Fault-Tolerance,” *Triangle Quantum Computing Seminar*, North Carolina State University, virtual, September 19, 2025.
56. **Invited Talk** – “SQALE: Scalable Quantum Architectures by Leveraging Error-correction,” *College of Science Quantum Day*, University of Arizona, Tucson, AZ, May 9, 2025.
55. **Invited Talk** – “Quantum-Enhanced Communication for Low-Photon Environments,” *RTX-UA Research Day*, University of Arizona, Tucson, AZ, April 9, 2025.
54. **Invited Talk** – “The MacWilliams Identities in Quantum Error Correction,” *Special Session on Coding Theory*, Clemson University, Clemson, SC, March 8, 2025.
53. **Invited Talk** – “Quantum Error Correction: Review and State-of-the-art,” *Guest Lecture for Quantum Computing Systems Course* (virtual), University of California, San Diego, CA, February 13, 2025.
52. **Invited Talk** – “From Quantum Sensing to Classical Weight Enumerators,” *Special Session on Coding and Sensing, Information Theory and Applications Workshop*, Bahia Resort, San Diego, CA, February 10, 2025.
51. **Invited Talk** – “Algebra in Fault Tolerant Quantum Computing,” *Applied Algebra Seminar*, Department of Mathematics, Virginia Tech, Blacksburg, VA, January 30, 2025.
50. **Invited Talk** – “Unitary Synthesis of Logical Circuits,” *Quantum Science Center Seminar*, Oak Ridge National Laboratory, Oak Ridge, TN, January 29, 2025.
49. **Invited Talk** – “Distilling Entanglement via Quantum Error Correction,” *Quantum Networks Workshop*, Institute for Mathematical and Statistical Innovation, University of Chicago, October 2, 2024.
48. **Invited Talk** – “GNarsil: Splitting Stabilizers into Gauges,” *60th Annual Allerton Conference on Communication, Control and Computing*, National Center for Supercomputing Applications, University of Illinois Urbana-Champaign (UIUC), September 26, 2024.
47. **Keynote Talk** – “Unitary Synthesis of Logical Circuits,” *Fault Tolerant Quantum Technologies (FTQT) Workshop*, Benasque Science Center, Benasque, Spain, August 15, 2024.
46. **Tutorial** – “Short Tutorial on Quantum Error Correction,” *First Quantum Information Knowledge (QuIK) Workshop*, IEEE International Symposium on Information Theory, Athenaeum Intercontinental, Athens, Greece, July 7, 2024.
45. **Invited Talk** – “Tailoring Fault-Tolerance to Quantum Algorithms,” *QuICS Seminar*, Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland, College Park, MD, May 2, 2024.

44. **Invited Talk** – “Quantum Error Correction for Fault-Tolerant Quantum Systems,” *Mathematical Physics and Probability Seminar*, Department of Mathematics, University of Arizona, Tucson, AZ, April 17, 2024.
43. **Invited Talk** – “Algebraic Coding Problems from Quantum Fault Tolerance,” *Application-Driven Coding Theory Workshop*, Simons Institute for the Theory of Computing, University of California Berkeley, CA, March 5, 2024. <https://www.youtube.com/watch?v=hbm6vYp5yRc>
42. **Invited Talk** – “Fault Tolerant Quantum Computing with Quantum LDPC Codes,” *Information Theory and Applications (ITA) Workshop*, Bahia Resort, San Diego, CA, February 19, 2024.
41. **Lightning Talk** – “Tailoring QEC Codes for Target Algorithms,” *Advances in Quantum Coding Theory Workshop*, Simons Institute for the Theory of Computing, University of California Berkeley, CA, February 16, 2024.
40. **Invited Talk** – “Algebraic Codes for Quantum Fault-Tolerance,” *Joint Mathematics Meetings*, Moscone North/South Center, San Francisco, CA, January 4, 2024.
39. **Invited Talk** – “Towards Quantum LDPC code-based Networked Quantum Computing,” *International Symposium on Topics in Coding (ISTC)*, Oceanopolis, Brest, France, September 5, 2023.
38. **Invited Talk** – “Quantum Error Correction based Entanglement Purification,” *Optica Quantum 2.0*, Hyatt Regency Denver at Colorado Convention Center, Denver, CO, June 19, 2023.
37. **Invited Talk** – “Quantum Error Correction is Essential for Scalability,” *Arizona Quantum Initiative (AQI) Inaugural Workshop*, University of Arizona, April 12, 2023. [Online]. Available: <https://aqi.arizona.edu/events/inaugural-workshop>
36. **Talk** – “Entanglement Purification with Quantum LDPC Codes and Iterative Decoding”, *APS March Meeting*, Caesars Forum Convention Center, Las Vegas, Mar. 8, 2023.
35. **Invited Talk** – “Quantum Error Correction for Quantum Computing and Networking”, *Arizona Photonics Days*, UA Tech Park, Tucson, Jan. 27, 2023.
34. **Invited Talk** – “Entanglement Purification with Quantum LDPC Codes and Iterative Decoding”, *Arizona Quantum Initiative (AQI) Seminar*, University of Arizona, Dec. 2, 2022.
33. **Poster** – “Entanglement Purification with Quantum LDPC Codes and Iterative Decoding”, *NSF-ERC Site Visit to Center for Quantum Networks (CQN)*, University of Arizona, Oct. 25, 2022.
32. **Talk** – “Entanglement Purification with Quantum LDPC Codes and Iterative Decoding”, *Seminar*, University of Chicago, Oct. 20, 2022.
31. **Invited Talk** – “Error Correction for Quantum Applications”, *ECE Departmental Seminar*, University of Arizona, Sep. 8, 2022.
30. **Talk** – “NSF-ERC Center for Quantum Networks: An Overview”, *Joint Meeting with Quantinuum and the United States Air Force Academy*, Denver, CO, Aug. 11, 2022.
29. **Invited Talk** – “Entanglement Purification Protocols from Stabilizer Codes”, *QNT Quantum Network Architecture Workshop*, Quantum Network Technologies, July 15, 2022.
28. **Invited Talk** (jointly with Nithin Raveendran) – “Tutorial on Quantum Error Correction and Recent Developments in Quantum LDPC Codes”, *Information Theory and Applications (ITA) Workshop*, May 23, 2022.
27. **Invited Talk** (jointly with Nithin Raveendran and Filip Rozpedek) – “Finite Rate QLDPC-GKP Coding Scheme that Surpasses the CSS Hamming Bound”, *IBM Quantum Network Colloquium*, Apr. 14, 2022.
26. **Talk** – “Distilling GHZ States using Stabilizer Codes”, *Beyond IID in Information Theory Workshop*, Sep. 27 – Oct. 1, 2021. Video: <https://www.youtube.com/watch?v=B18BKnuntTA>
25. **Talk** – “Distilling GHZ States using Stabilizer Codes”, *Quantum Error Correction Meeting*, Duke University, Sep. 16, 2021.
24. **Invited Talk** – “Mitigating Coherent Noise in Quantum Computing using the Classical MacWilliams Identities”, *CCSP Seminar*, University of Maryland, Apr. 8, 2021. Video: <https://www.youtube.com/watch?v=PFr6Ux1GMbg>

23. **Invited Talk** – “Error Correction for Quantum Computing and Communications”, *Modeling, Computation, Nonlinearity, Randomness and Waves Seminar*, University of Arizona, Apr. 1, 2021. Video: <https://arizona.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=d759cd00-b0c0-4068-bc90-ad08012c18d6>
22. **Invited Talk** – “What is Quantum Computing and How does Quantum Error Correction Work?”, *Math/Stat Virtual Tea*, Mount Holyoke College, Sep. 17, 2020. Video: <https://www.youtube.com/watch?v=XmsgxawVceQ>
21. **Invited Talk** – “Quantum Error Correction: Overview and Connections to Classical Coding Theory”, *Seminar*, Indian Institute of Technology Hyderabad and International Institute of Information Technology Hyderabad, Jun. 17-18, 2020. Videos: <https://www.youtube.com/watch?v=dAVUA2iiyK0> , [https://www.youtube.com/watch?v=1LysQ\\_h8pgg](https://www.youtube.com/watch?v=1LysQ_h8pgg)
20. **Ph.D. Defense Talk** – “Classical Coding Approaches to Quantum Applications”, *Department of Electrical and Computer Engineering*, Duke University, Mar. 18, 2020. Video: <https://www.youtube.com/watch?v=cvAcaujp7Wo>
19. **Talk** – “Classical Coding Approaches to Quantum Applications”, *Institute for Quantum Information (IQI) Seminar*, California Institute of Technology (Host: Prof. John Preskill), Feb. 11, 2020, and *Quantum Information Seminar*, Google Quantum AI, Venice, CA (Host: Dr. Jarrod McClean), Feb. 12, 2020.
18. **Invited Talk and Poster** – Graduation Day Talk and Poster at the *Information Theory and Applications Workshop (ITA)*, San Diego, USA, Feb. 2-7, 2020.
17. **Contributed Talk** – “On Optimality of CSS Codes for Transversal  $T$ ”, *23rd Annual Conference on Quantum Information Processing (QIP)*, Shenzhen, China, Jan. 7, 2020. Video: <https://www.koushare.com/video/videoPreview/2001.0289>
16. **Talk** – “On Optimality of CSS Codes for Transversal  $T$ ”, *Institut Quantique Seminar*, Université de Sherbrooke (Host: Prof. David Poulin), Oct. 28, 2019, and *Institute for Quantum Computing (IQC) Seminar*, University of Waterloo (Host: Prof. David Gosset), Nov. 5, 2019.
15. **Visit** – Prof. Jean-Pierre Tillich, *INRIA Research Center*, Paris, July 22-25, 2019.
14. **Talk** – “Integer Symmetric Diagonal (ISD) Gates and Codes that Support Physical  $T$  Gates”, *Quantum Information Seminar*, Technical University of Delft (Host: Prof. Barbara Terhal), July 16, 2019, and University of Sheffield (Host: Prof. Earl Campbell), Aug. 5, 2019.
13. **Poster** – “Unifying the Clifford Hierarchy via Symmetric Matrices over Rings”, *14th Conference on the Theory of Quantum Computation, Communication and Cryptography*, University of Maryland, Jun. 3-7, 2019, and *5th International Conference on Quantum Error Correction*, Senate House, London, July 29 – Aug. 2, 2019.
12. **Poster** – “Kerdock Codes Determine Unitary 2-Designs”, *22nd Annual Conference on Quantum Information Processing*, University of Colorado Boulder, Jan. 14-18, 2019, and *14th Conference on the Theory of Quantum Computation, Communication and Cryptography*, University of Maryland, Jun. 3-7, 2019.
11. **Poster** – “Symplectic Matrices for Logical Clifford Synthesis and Diagonal Unitaries in the Clifford Hierarchy”, *22nd Annual Conference on Quantum Information Processing*, University of Colorado Boulder, Jan. 14-18, 2019.
10. **Poster** – “Synthesis of Logical Clifford Operators via Symplectic Geometry”, *13th Conference on the Theory of Quantum Computation, Communication and Cryptography*, University of Technology Sydney, Jul. 14-20, 2018.
9. **Poster** – “Synthesis of Logical Operators for Quantum Computers using Stabilizer Codes”, *North American School of Information Theory*, Texas A&M University, May 20-23, 2018.
8. **Talk** – “Synthesis of Logical Operators for Quantum Computers using Stabilizer Codes”, *Seminar, Department of Electrical Engineering*, Indian Institute of Technology Madras (Host: Prof. Pradeep Sarvepalli), Apr. 26, 2018.
7. **Poster** – “Logical Operators for CSS Codes: A Binary Perspective”, *Duke IBM Day*, Duke University, Oct. 31, 2017.
6. **Workshop** – *Beyond I.I.D. in Information Theory*, National University of Singapore, Jul. 24-28, 2017.
5. **Poster** – “Deterministic Compressed Sensing and Recovery of Large Supports”, *North American School of Information Theory*, Georgia Institute of Technology, Jun. 6-9, 2017.
4. **Workshop** – *Communications, Inference, and Computing in Molecular and Biological Systems*, University of Southern California, Dec. 3-4, 2015.

3. Talk – “The Burst Erasure Correctability of Spatially Coupled LDPC Ensembles”, *Information Sciences and Systems Seminar*, Texas A&M University, Nov. 4, 2015.
2. Talk – “Cyclic Polar Codes”, *Information Sciences and Systems Symposium*, Texas A&M University, Oct. 19, 2015.
1. Poster – “Cyclic Polar Codes: How to Achieve Higher Rates than Binary Polar Codes at Finite Blocklengths?”, *Eighth Annual Winedale Workshop*, Round Top, Texas, Oct. 9, 2015.

## REFERENCES

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1. **Prof. Hongyi “Michael” Wu**, Department Head of ECE, University of Arizona, [wu.static.arizona.edu/](http://wu.static.arizona.edu/)
2. **Prof. Bane Vasić**, Department of ECE, University of Arizona, [ecl.silicon-studio.com/pme.uchicago.edu/group/jiang-group](http://ecl.silicon-studio.com/pme.uchicago.edu/group/jiang-group)
3. **Prof. Saikat Guha**, Department of ECE, University of Maryland, [ece.umd.edu/clark/faculty/1891/Saikat-Guha](http://ece.umd.edu/clark/faculty/1891/Saikat-Guha)
4. **Prof. Kenneth R. Brown**, Department of ECE, Duke University, [ece.duke.edu/faculty/kenneth-brown](http://ece.duke.edu/faculty/kenneth-brown)