Edo **Giusto**

Assistant Professor (RTD-A) · Ph.D. in Computer and Systems Engineering

University of Naples Federico II - Department of Electrical Engineering and Information Technology

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Research Interests

Unlocking the potential of Quantum Computing (QC) demands a collaborative, interdisciplinary strategy that tackles: *reliability assessments* of quantum computing devices; *compilation* and *problem mapping* across diverse architectures; *applications* of QC to complex problems. My commitment lies in pushing the boundaries of our comprehension and expertise in these areas, ultimately aiming to leverage the game-changing capabilities of QC for the benefit of society and of our planet.

Education

SQMS - Fermilab — *Batavia, IL, US*

US Quantum Information Summer School (USQIS) — *Aug. 7-15 2023*

Politecnico di Torino - Dept. of Control and Computer Engineering — *Torino, IT*

Ph.D. in Computer and Systems Engineering — *Nov. 2017 - Sept. 2021*

Thesis: *Sensor-based ICT systems for Smart Societies.* Defining guidelines for the correct and scientifically-sound design of a device operating in the IoT domain. Tasks taken into account: data acquisition, data transmission, and data authenticity and safe-storage.

Advisor: *Prof. Maurizio Rebaudengo*. Committee: *Antonio Liotta, Julio Perez, Luca Sterpone, Giovanni Pau, Enrico Natalizio*.

Eidgenössische Technische Hochschule (ETH) Zürich — *Zurich, CH*

Quantum Information for Developers - Summer school — *Sept. 8-12, 2019*

MITxPRO Professional Certificate Program — *MIT - Online Course*

Applications of Quantum Computing — *Apr. 2018 - Oct. 2018*

Politecnico di Torino — *Torino, IT & Paris, FR*

Master's Degree in Computer Engineering — *Sept. 2014 - July 2017*

Design and implementation of a low-cost, high-precision air pollution monitoring IoT device. Master's thesis project carried out at LiP6 - Université Pierre et Marie Curie, Paris, France.

Advisors: *Prof. Maurizio Rebaudengo* in Politecnico di Torino and by *Prof. Giovanni Pau* in UPMC, Paris.

Politecnico di Torino — *Torino, IT*

Bachelor's Degree in Computer Engineering — *Sept. 2010 - Mar. 2015*

Experience

University of Naples, Federico II - Department of Electrical Engineering and Information Technology — *Naples, Italy*

Assistant Professor - RTD-A — *Dec. 29th, 2023 - Ongoing*

- PNRR CN1 - National Centre for HPC, Big Data and Quantum Computing, Spoke 9 - Digital Society & Smart Cities.

Supervisor: *Prof. Nicola Mazzocca.*

University of Illinois, Urbana-Champaign — *Urbana-Champaign, IL, US*

Visiting — *Nov. 27 - Dec. 1 2023*

- Visiting period in the DEPEND research group at the *Coordinated Science Lab*. Hosted by *Prof. Ravishankar K. Iyer* and *Dr. Phuong Cao*.

SQMS - Fermi National Accelerator Laboratory — *Batavia, IL, US*

NGI Enrichers - Fellow — *Aug. 2023 - Dec. 2023*

- *CRIT-Q - Cosmic ray impact on transmon qubits*: Characterization of transient faults impact caused by cosmic rays on superconducting quantum devices. Expedition made possible by the European Union *NGI Enrichers fellowhip*.

Supervisor: *Dr. Silvia Zorzetti.*

Politecnico di Torino - Department of Control and Computer Engineering *Torino, Italy*

Postdoctoral Research Assistant *Apr. 2022 - Ongoing*

- Reliability assessment of Quantum Computing devices, compilation and problem mapping, applications of Quantum Computing for IoT, Industry 4.0 and Financial domains.
- Investigation on Wireless Sensor Network applications for low-cost air pollution monitoring tasks.

Supervisors: *Prof. Maurizio Rebaudengo, Prof. Bartolomeo Montrucchio.*

Funded Projects

Qubip - Quantum-oriented Update to Browsers and Infrastructures for the PQ Transition *Torino, IT*

Funding by: European Commission *Sept. 2023 - Ongoing*

Aiding transition to PQC by addressing key components of digital infrastructure, validating practical use cases, and contributing to standardization and policy efforts. Amount: ≈ US $6'000'000 (our portion ≈ US $55'000).

EQUO - European QUantum ecOsystems *Torino, IT*

Funding by: European Commission *Jan. 2023 - Ongoing*

Design, develop and test mature QKD nodes with high TRL level (8-9) with cutting-edge technology developed in Europe, ready for integration in telecommunication networks, both for metro and long-distance scenario. Amount: ≈ US $6'000'000 (our portion ≈ US $500'000).

Quantum Computing for Financial Industry *Torino, IT*

Funding by: Intesa San Paolo S.p.A. *Oct. 2021 - Ongoing*

Improvement of a quantum algorithm for Credit Risk Analysis. Project conducted in collaboration with *IBM Italy*. Amount: undisclosed.

Quantum Computing for Telecommunications Industry *Torino, IT*

Funding by: TIM S.p.A. *June 2019 - Ongoing*

Study of possible applications of Quantum Computing in the Telecommunications domain and development of dedicated Quantum Algorithms. Amount: ≈ US $30'000/year.

Quantum Computing for Automotive Industry *Torino, IT*

Funding by: General Motors *2018 - 2020*

Study of applications of Quantum Computing in the automotive sector. Amount: ≈ US $25'000.

Honors & Awards

2023	**NGI - Next Generation Internet Enrichers - Transatlantic Fellowship,** Funding to carry out a 5-months visiting research period at SQMS - Fermilab. Amount: ≈ US $25'000 .	*Fellowship*
2021	**Politecnico di Torino,** 3rd Year PhD Award Competition 2021. Amount: ≈ US $1'500.	*3rd Prize*
2020	**Politecnico di Torino,** 2nd Year PhD Award Competition 2020. Amount: ≈ US $1'500.	*3rd Prize*
2020	**IBM Quantum,** Challenge 2020 Achievement.	*IBM Quantum Challenge Badge*
2019	**IBM Quantum,** Qiskit Advocate Badge.	*Qiskit Advocate Badge*
2019	**IBM Qiskit Camp Europe 2019 - Quantum Computing Hackathon,** Winning team member, *"Quantum Synth: a quantum-computer-based music synthesizer"*. Team composed by: Costa Hamido, O.; Ghazi Vakili, M.; Giusto, E.; Baiardi, A.; and Cirillo, G.A. Video description available *here*. Related conference publication available *here*.	*Community Choice Award*

Publications - Journal papers

Complete list at *here*

A Systematic Methodology to Compute the Quantum Vulnerability Factors for Quantum Circuits

IEEE Transactions on Dependable and Secure Computing (Impact Factor: 7.3) *2023*

D. Oliveira, E. Giusto, B. Baheri, Q. Guan, B. Montrucchio, P. Rech; https://doi.org/10.1109/TDSC.2023.3313934 - Citations: 2

A More General Quantum Credit Risk Analysis Framework

MDPI Entropy (Impact Factor: 2.7) *2023*

E. Dri, A. Aita, E. Giusto, D. Ricossa, D. Corbelletto, B. Montrucchio, R. Ugoccioni; Volume 25, number 4, 2023. https://doi.org/10.3390/e25040593 - Citations: 2.

Air-to-Ground Transmission and Near Real-Time Visualization of FBG Sensor Data via Cloud Database

IEEE Sensors Journal (Impact Factor: 4.3) *2022*

A. Marceddu, G. Quattrocchi, A. Aimasso, E. Giusto, L. Baldo, M. Ghazi Vakili, M. D. L. Dalla Vedova, B. Montrucchio, P. Maggiore; https://doi.org/10.1109/JSEN.2022.3227463 - Citations: 4.

A fuzzy control system for energy-efficient wireless devices in the Internet of vehicles

Wiley International Journal of Intelligent Systems (Impact Factor: 7 - Acceptance Rate: 12%.) *2021*

M. Collotta, R. Ferrero, E, Giusto, M. Ghazi Vakili, J. Grecuccio, X Kong, I. You; https://doi.org/10.1002/int.22353. Citations: 12.

A Densely-Deployed, High Sampling Rate, Open-Source Air Pollution Monitoring WSN

IEEE Transactions on Vehicular Technologies (Impact factor: 6.8) *2020*

B. Montrucchio, E. Giusto, M. Ghazi Vakili, S. Quer, C. Fornaro; Volume 69, Issue 12. https://doi.org/10.1109/TVT.2020.3035554 - Citations: 40.

Combining Blockchain and IoT: Food-Chain Traceability and Beyond

MDPI Energies (Impact Factor: 3.2) *2020*

J. Grecuccio, E. Giusto, F. Fiori, M. Rebaudengo ; *Combining Blockchain and IoT: Food-Chain Traceability and Beyond*. Volume 13 (15), 3820. https://doi.org/10.3390/en13153820 - Citations: 60.

Quantum pliers cutting the Blockchain

IEEE IT Professional (Impact factor: 2.6) *2020*

E. Giusto, M. Ghazi Vakili, F. Gandino, C. Demartini, B. Montrucchio; Vol.22, Issue 6. https://doi.org/10.1109/MITP.2020.2974690 - Citations: 1.

Publications - Conference Proceedings

Complete list at *here*

Quantum Kernel Estimation With Neutral Atoms For Supervised Classification: A Gate-Based Approach

Bellevue, WA, US

IEEE International Conference on Quantum Computing and Engineering (QCE23) *Sept. 17–22, 2023*

M. Russo, E. Giusto, B. Montrucchio; https://doi.org/10.1109/QCE57702.2023.00032.

BBQ-mIS: a parallel quantum algorithm for graph coloring problems

Bellevue, WA, US

WIHPQC @ IEEE International Conference on Quantum Computing and Engineering (QCE23) *Sept. 17–22, 2023*

C. Vercellino, G. Vitali, P. Viviani, E. Giusto, A. Scionti, A. Scarabosio, O. Terzo, B. Montrucchio; WIHPQC, Third International Workshop on Integrating High-Performance and Quantum Computing, co-located with QCE23. https://doi.org/10.1109/QCE57702.2023.10198.

Towards An End-To-End Approach For Quantum Principal Component Analysis

Bellevue, WA, US

QML @ IEEE International Conference on Quantum Computing and Engineering (QCE23) *Sept. 17–22, 2023*

E. Dri, A. Aita, T. Fioravanti, G. Franco, E. Giusto, G. Ranieri, D. Corbelletto, B. Montrucchio; International Workshop on Quantum Machine Learning: From Foundations to Applications, co-located with QCE23. https://doi.org/10.1109/QCE57702.2023.10175. Citations: 1.

Understanding the Effect of Transpilation in the Reliability of Quantum Circuits

Bellevue, WA, US

StableQ @ IEEE International Conference on Quantum Computing and Engineering (QCE23) *Sept. 17–22, 2023*

N. Dilillo, E. Giusto, E. Dri, B. Baheri, Q. Guan, B. Montrucchio, P. Rech; Quantum System Stability and Reproducibility Workshop, co-located with QCE23. https://doi.org/10.1109/QCE57702.2023.10220

Neural optimization for quantum architectures: graph embedding problems with Distance Encoder Networks

Torino, IT

IEEE International Computer Software and Applications Conference (COMPSAC) (Acceptance rate: 26%) *June 26-30, 2023*

C. Vercellino, G. Vitali, P. Viviani, A. Scionti, A. Scarabosio, O. Terzo, E. Giusto, B. Montrucchio; https://doi.org/10.1109/COMPSAC57700.2023.00058.

Comparison of heuristic approaches to PCI planning for Quantum Computers

Las Vegas, NV, US

IEEE International Conference on Consumer Electronics (ICCE23) *Jan. 6-8, 2023*

G. Barillaro, A. Boella, F. Gandino, M. Ghazi Vakili, E. Giusto, G. Mondo, B. Montrucchio, A. Scarabosio, A. Scionti, O. Terzo , G. Vitali ; https://doi.org/10.1109/ICCE56470.2023.10043394. Citations: 1.

Towards practical Quantum Credit Risk Analysis

Teddington, UK

NPL Joint Symposium on Quantum Technologies *Sept. 13-14, 2022*

E. Dri, E. Giusto, A. Aita, B. Montrucchio; https://doi.org/10.1088/1742-6596/2416/1/012002. Citations: 2.

Neural-powered unit disk graph embedding: qubits connectivity for some QUBO problems

Broomfield, CO, US

IEEE International Conference on Quantum Computing and Engineering (QCE22) *Sept. 18-23, 2022*

C. Vercellino, P. Viviani, G. Vitali, A. Scionti, A. Scarabosio, O. Terzo, E. Giusto, B. Montrucchio; https://doi.ieeecomputersociety.org/10.1109/QCE53715.2022.00038

QuFI: a Quantum Fault Injector to Measure the Reliability of Qubits and Quantum Circuits *Baltimore, MD, US*

IEEE/IFIP International Conference on Dependable Systems and Networks (DSN22) (Acceptance rate: 18%) *June 27-30, 2022*

D. Oliveira, E. Giusto, E. Dri, N. Casciola, B. Baheri, Q. Guan, B. Montrucchio, P. Rech; https://doi.org/10.1109/DSN53405.2022.00025. Citations: 5.

Quantum synth: a quantum-computing-based synthesizer *Graz, AT*

ACM International Conference on Audio Mostly (AM'20) *Sept. 15-17, 2020*

O. Costa Hamido, G.A. Cirillo, E. Giusto; Pages 265–268. https://doi.org/10.1145/3411109.3411135. Citations: 10.

Talks

University of Illinois, Urbana-Champaign *Urbana-Champaign, IL, US*

Noisy Qubits: reliability issues in the quantum era *Nov. 29th, 2023*

- Presentation on noise-related issues in Quantum Computing and description of tools to analyze them. Presentation given at the attention of *Prof. Ravishankar K. Iyer* and the DEPEND research group.

University of Illinois, Chicago *Chicago, IL, US*

Noisy Qubits: reliability issues in the quantum era *Nov. 14th, 2023*

- Presentation on noise-related issues in Quantum Computing and description of tools to analyze them. Presentation given at the attention of the Quantum Information Science Society at UIC.

DSN23 *Porto, PT*

Quantum Computing Reliability: Problems, Tools, and Potential Solutions *June 27th, 2023*

- Tutorial on Quantum Computing Fault Injection. Co-organized with my colleagues Prof. Paolo Rech (UniTn), Prof. Devesh Tiwari (Northeastern U.), Dr. Emanuele Dri (PoliTo), Prof. Qiang Guan and Dr. Betis Baheri (Kent State U.).

INFN (National Institute for Nuclear Physics), La Sapienza University *Rome, IT*

Understanding transient fault propagation in superconducting quantum circuits *Nov. 21st, 2022*

- Seminar on Quantum Computing Fault Injection. Presentation given at the attention of *Dr. Laura Cardani* and her research group.

NASA Goddard Space Flight Center *Greenbelt, MD, US*

Understanding transient fault propagation in superconducting quantum circuits *June 30th, 2022*

- Seminar on Quantum Computing Fault Injection. Presentation given at the attention of *Dr. Michael Campola* and his collaborators.

New York University, Center for Quantum Phenomena *NYC, NY, US*

Understanding transient fault propagation in superconducting quantum circuits *June 23rd, 2022*

- Seminar on Quantum Computing Fault Injection. Presentation given at the attention of *Prof. Javad Shabani* and his research group.

Biennale Tecnologia - Politecnico di Torino - Open Campus Event *Torino, IT*

Quantum Computing Demo *Nov. 7-10, 2019*

- Booth activity dedicated to Quantum Computing, presentation of practical use cases for the financial domain. In collaboration with *Intesa Sanpaolo S.p.A.*.

Festival della Tecnologia - Politecnico di Torino - Open Campus Event *Torino, IT*

Quantum Computing Demo *Nov. 7-10, 2019*

- Booth activity dedicated to Quantum Computing, presentation of *Quantum synth*, the Quantum Computer-based Synthesizer.

Politecnico di Torino *Torino, IT*

Quantum Computing Perspectives *June 20, 2019*

- Presentation on practical applications of Quantum Computing. Presentation given at the attention of *Prof. Matteo Sonza Reorda* and the CAD&Reliability Research Group

Teaching

2^{nd} level Master Course on *Quantum Communication and Computing* *Politecnico di Torino, IT*

Lecturer *Jan. 2023*

- Module on Quantum Annealing. (Italian Language).

Master Degree *Politecnico di Torino, IT*

Teaching Assistant *Oct. 2019 - Oct. 2020*

- Computer Architectures (CS+EE major - English Language)
  - AY 2019/2020. Teaching reviews: 3.26/4.

Bachelor Degree

Politecnico di Torino, IT

Teaching Assistant

Oct. 2018 - Ongoing

- Introduction to Computer Science (all majors - Italian Language).
  - AY 2018/2019. Teaching reviews: 3.19/4.
- Algorithms and Programming (EE major - Italian Language)
  - AY 2020/2021. Teaching reviews: 3.31/4.
  - AY 2021/2022. Teaching reviews: 3.38/4.
  - AY 2022/2023. Teaching reviews: 3.204/4.
- Programming Techniques (CS major - English Language)
  - AY 2020/2021. Teaching reviews: 3.225/4.
  - AY 2021/2022. Teaching reviews: 3.31/4.
  - AY 2022/2023. Teaching reviews: 3.056/4.

Master Course - New Technologies 4.0 (for Leonardo S.p.A.)

Politecnico di Torino, IT

Lecturer

July 2020

- Lesson on Radio Frequency IDentification (RFID), A.Y. 2019/2020. (Italian Language).

Samsung Innovation Camp (for Samsung Italy)

Torino, IT

Lecturer

Nov. - Dic. 2022

- 10 hours course on Internet of Things. (Italian Language).

Lanzi S.r.l.

Torino, IT

Lecturer

Apr. 2020

- 10 hours course on Internet of Things. (Italian Language).

Torino High Schools

Politecnico di Torino, IT

Lecturer

Apr. 2022 - Ongoing

- *Computer Engineering is(/and) Creativity*. Course to foster female enrollment in computer engineering degree. (Italian Language).

Mentoring

Graduate Students

Politecnico di Torino, IT

Mentor

Nov. 2017 - Ongoing

- Emanuele Dri (PhD student), Application of QC to the Financial domain.
- Marco Russo (PhD student), Quantum Machine Learning Techniques for Classification.
- Chiara Vercellino (PhD student), Embedding on Neutral Atom Quantum Machines.
- Giacomo Vitali (PhD student). QC + HPC integration strategies.
- Gustavo Ramirez (PhD student). Low-cost air pollution monitoring HW platforms.
- Pietro Chiavassa (PhD student). Data analysis and reliability in air pollution monitoring applications.
- Antonio Marceddu (PhD student). SW tools for structural monitoring.

- Emanuela Allocca, Quantum algorithms for financial problems.
- Lorenzo Bergadano, Quantum machine learning approaches for sensor calibration.
- Gabriele Iurlaro, Quantum Machine Learning on Neutral Atoms Machines.
- Nadir Casciola, Fault injection for Quantum Circuits.
- Nicola Dilillo (now PhD student @ Politecnico di Torino), Transient fault detectors for quantum circuits.
- Davide Integlia, Quantum paths finding algorithm.
- Marzio Vallero (now PhD student at University of Trento), Quantum Machine Learning Fault Injection.
- Giusy Iaria (now PhD student @ Politecnico di Torino) Quantum Machine Learning for Image Classification.
- Alessandra Musone, Big Data and Quantum Computing.
- Naouras Latiri. Exploiting LoRaWan for air pollution monitoring.
- Gabriele Telesca. Mobile app development for crowd-sensing monitoring.
- Cosmin Solomon. Exploiting Bluetooth for crowd-sensing monitoring.

QubiTo - Student Organization

Politecnico di Torino, IT

Mentoring and Administrative Support

Apr. 2023 - Ongoing

- Aiding the establishment of a student organization dedicated to Quantum Computing.

CLIK @ PoliTo - Contamination Lab Innovation Kitchen

Politecnico di Torino, IT

Mentor for student multidisciplinary industrial projects

2019 - 2023

- TOSA Challenge, AY 2019/2020. Topic: Industrial pallet de-wrapping machine.
- Sea&Symphony Challenge, AY 2021/2022. Topic: Innovative Safe Packaging to ship large and fragile electro-mechanical devices.
- Lavazza Challenge, AY 2022/2023. Innovative and sustainable packaging, delivery and closed-circle solutions for coffee.

Service

Politecnico di Torino - Department of Control and Computer Engineering

Torino, IT

Diversity and Inclusion Board member

Jan. 2021 - Ongoing

- Member of the Departmental Board on Diversity and Inclusion. Definition and implementation of practices towards gender equality in academia. Organization of high-school outreach courses to foster female enrollment in computer engineering degree.

Politecnico di Torino - Department of Control and Computer Engineering

Torino, IT

Research Assistants Representative

Nov. 2022 - Aug. 2023

- Representative for the body of Research Assistants affiliated with the Department. Participating to Department board meetings with voting rights.

CTE NEXT - House of Emerging Technologies

Torino, IT

Technical Representative for Politecnico di Torino

Nov. 2021 - Aug. 2023

- Technical Representative for PoliTo within the CTE NEXT consortium for technology transfer. Support in the definition and development of urban experimentation projects regarding: smart road, urban air mobility, industry 4.0, innovative urban services. Technologies exploited: 5G, IoT, Big Data, AI, Blockchain. Website: *https://ctenext.it/en/*

Research Community Engagement

IEEE ICCE 2024

Track Chair

- Track: *Quantum In Consumer Technology*.

IEEE Quantum Week 2023

Member at large

- Technical Committee Member for *Quantum Technologies and Systems Engineering (QTEM) track*.
- Technical Committee Member for *Quantum System Stability and Reproducibility Workshop*.
- Organizing Committee Member for *Workshop on Quantum in Consumer Technology*.

IEEE Consumer Technology Society

Technical Committee Member

- Technical Committee Member for *Quantum in Consumer Technology*.

Peer Reviewing - Journals

- IEEE - *Transaction on Nuclear Science*
- IEEE - *Internet of Things*
- IEEE - *Consumer Electronics Magazine*
- Elsevier - *Transportation Research*
- Elsevier - *Internet of Things*
- Springer - *Nature*

Peer Reviewing - Conferences

- ACM - *Design Automation and Test in Europe (DATE)* 2024
- IEEE - *Quantum Computing and Engineering (QCE)* 2023
- IEEE - *International Conference on Consumer Electronics (ICCE)* 2022, 2023, 2024

Society Memberships

- ACM - member
- IEEE - member - Quantum Community

Open Source Projects

QuFI

Torino, IT

Developer

June 2021 - Ongoing

- Development of *QuFI - Quantum Fault Injector*. Flexible tool highlighting the susceptibility of qubits to various noise sources. Related paper accepted at *DSN 22*.

Quantum Synth

Schilthorn, CH

Developer

Sept. 12-15, 2019

- Development of *Quantum synth*, the Quantum Computer-based Synthesizer. The project won the Community Choice Award at IBM Qiskit Camp Europe 2019. Video description available *here*. Related paper accepted at *AM'20*.

Referees

Prof. Maurizio Rebaudengo *Torino, IT*

Full Professor, Politecnico di Torino | Ph.D. Advisor

- Web page: https://www.polito.it/en/staff?p=maurizio.rebaudengo
- Email: maurizio.rebaudengo@polito.it
- Phone: +39 347 4420569

Dr. Travis S Humble *Oak Ridge, TN, US*

Director, Quantum Science Center, Oak Ridge National Laboratory

- Web page: https://www.ornl.gov/staff-profile/travis-s-humble
- Email: humblets@ornl.gov
- Phone: +1 (865) 574 6162

Dr. Silvia Zorzetti *Batavia, IL, US*

Deputy Head, Quantum Computing co-design department, Fermi National Accelerator Laboratory | Ecosystem

Thrust Leader, SQMS

- Web page: https://sqmscenter.fnal.gov/profile/silvia-zorzetti/
- Email: zorzetti@fnal.gov
- Phone: +1 (630) 840 4137

General Information

Mother tongue Italian
English Language Certification TOEFL 101/120
Citizenship Italian