Mohammad **Ghazi Vakili**

PH.D. STUDENT IN COMPUTER ENGINEER @ POLITECNICO DI TORINO

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"Philosophy is like trying to open a safe with a combination lock: each little adjustment of the dials seems to achieve nothing, only when everything is in place does the door open."— Ludwig Wittgenstein.

Research activities

Industrial internet of things platform for Industry 4.0 applications
Politecnico di Torino

MAY 2017 - PRESENT   *Turin (Italy)*

The term "Industry 4.0" has been devised to refer to the most recent, just started, fourth industrial revolution, that depicts factories as intelligent environments, whose composing elements (e.g. machines, storage systems,etc.) are seen as smart components, able to communicate with each other and to take decisions autonomously. Benefits for the industrial world are various, ranging from a more flexible adaptation of the production chain, to the continuous monitoring of products' and machines' state, to more natural human-machine interaction paradigms, etc. Nowadays, industrial competitiveness also means great variety and customization of products, very short time to market and shortened life cycles for goods. To address these challenges, manufacturing industries are adopting different strategies and advanced technologies, often referred to as Industry 4.0, Internet of Things (IoT) and Industrial IoT (IIoT), just to mention a few of them. One of the main goals of research in factory automation is progressively moving from traditional production control and automation approaches to intelligent systems, and to this aim the Internet of Things paradigm can be a suitable solution: merging the production line automation systems with Internet by using IoT technology can achieve several targets. One of the possibility is to take advantage of Cloud Computing, for instance data storage or a real-time analysis using remote computing power. It offers various solutions to provide a dynamic and flexible infrastructure to host processing resources as on-demand Service. In this way, Smart manufacturing is ready for the future, thanks to flexibility and responsiveness.

Quantum Computing
Politecnico di Torino

OCTOBER 2018 - PRESENT   *Turin (Italy)*

I have started studying Quantum Computing around two years ago under the supervision of my tutor, Prof. Claudio Demartini, and Prof. Bartolomeo Montrucchio. Also, I have attended the course offered by MITxPro in Application on Quantum computing in 2018. Then, I have attended the summer school Quantum Information for Developers at ETH Zurich in September 2019. After that, I have been admitted to Qiskit Camp Europe in the same month, where our team won the Community Choice Award IBM Qiskit Camp Europe Sep. 2019 for "Quantum Synth: a quantum-computer-based music synthesizer". My research goal is to work on applications for quantum algorithms for the future of the factory (FoF). My research interests are on quantum information, representation theory and optimization carried out with quantum programming languages. As an engineer, I would like to develop new solutions by using edge technology to solve real problems. In particular, I would like to bridge quantum computing and my past research activity in factories, i.e. predictive maintenance and scheduling problems in industries. In this road map, I have done some development in optimization for PCI problems in 5G with the TIM (Telecom Italia).

Education and training

Ph.D. Student in Computer and Control Engineering
Politecnico di Torino

MAY 2017 – PRESENT   *Turin (Italy)*

- Data mining concepts and algorithms
- Experimental modeling
- Nano & Quantum Computing
- Parallel and distributed computing
- Visualization and visual analytic
- Writing Scientific Papers in English
- Intellectual Property Rights, Technology Transfer and Hi-Tech Entrepreneurship
- "Quantum information: from entanglement to post-quantum theories", PoliTo Ph.D. Excellence course taught by Vlatko Vedral and Chiara Marletto, University of Oxford.
- "Excellence Course on Heuristics for Combinatorial Optimization" by prof. T. G. Crainic, Université du Québec à Montréal.

Summer School in Quantum Information for developers (QuID)

ETH
Zurich (Switzerland)

Sep. 2019

- Introduction to Quantum Computing
- Quantum Algorithms
- ProjectQ
- Quantum Machine Learning
- Circuit Decomposition
- Thermodynamics of Quantum Computing
- Qiskit Tutorial
- Quantum Error Correction
- Q Tutorial

Applications of Quantum Computing - MITxPRO Professional Certificate Program

Massachusetts Institute of Technology
Online courses

Apr. 2018 – Oct. 2018

- Introduction to Quantum Computing - *Certificate link*
- Quantum Algorithms for Cybersecurity, Chemistry, and Optimization - *Certificate link*
- Practical Realities of Quantum Computation and Quantum Communication - *Certificate link*
- Requirements for Large-Scale Universal Quantum Computation - *Certificate link*

Master of Science in Mechatronic Engineering

Politecnico di Torino
Turin (Italy)

Oct. 2013- Apr. 2016

- Robotics
- Software architecture for automation
- Integrated design laboratory
- Industrial networks and real-time operating systems
- Electronic systems for mechatronics
- Automation and planning of production systems (Optimization problems on Automation)
- Modelling and simulation of mechatronic systems
- Identification and control methodologies
- Dynamics of electrical machines
- Modern design of control systems
- Operating systems for embedded systems
- Fundamentals of electronic systems

Bachelor of Science in Telecommunications Engineering

Islamic Azad University
Iran (Tehran)

Oct. 2002- Sept. 2006

- Engineering mathematical
- Statistics
- Circuits theory
- Electronics
- High frequency Electronics
- Power Electronics
- Control (Digital and analog)
- Signal Systems
- Computer Architecture
- Logic Circuits
- Microprocessors
- Communication
- Antennas, Fields and Waves
- Radar Systems
- Electrical machines
- Electromagnetism
- Microwaves
- Communication Circuits

Skills

Categories	Industrial IoT development, Quantum Computing, Modeling, Control Systems, Embedded Systems, Robotic
Programming	Python, C/C++, Qiskit, Matlab, Node.JS, LaTeX
Operating system	Linux, Windows, Mac OS
Databases	MySQl, Cassandra, Kafka, Mongodb
Engineering software	LabVIEW 2015, MATLAB®& Simulink®, mbed®compiler, Keil®uVision, WinCC, Simatic Manager Step7, PSpice
Languages	English, Persian, Italian(A2)

Working Experience

Politecnico di Torino
Torino, Italy

PH.D. STUDENT (XXXIII CYCLE)
May 2017 - PRESENT

The Ph.D. program aims on analyzing the state of the art of intelligent systems employed in the Industry, and at designing and developing new solutions that could bring benefits to this field. Developed solutions could range from the real-time monitoring of the production line, to the automation of productive processes, to the support during the identification of new suppliers/customers/employers on the basis of information related to industry's materials and processes, and recently by applying the quantum computing algorithms in optimization and machine learning.

- Industrial IoT Platforms
- Information System
- C++, Python, Matlab®
- Quantum Computing
- Wireless Sensor Network
- Working on 6TiSCH protocol
- Real-time Operating system for embedded Systems
- Specific Scheduling and Optimization Algorithms
- Industrial Network (Modbus, Profibus, Fieldbus, Hart)

LINKS Foundation
Torino, Italy

TECHNICAL RESEARCHER
Jul. 2016 – Apr. 2017

I've been involved in "Methods and Technologies for advanced manufacturing (Industry 4.0)" project in collaboration of Istituto Superiore Mario Boella (ISMB) (now named LINKS Foundation). The main objective of this project was the development and implementation of new solutions based on Industry 4.0 framework for SMEs (small/medium enterprises).

Politecnico di Torino
Torino, Italy

GRADUATE SCHOLARSHIP - RESEARCHER
Dec. 2013 – Apr. 2016

- Internet of Things
- Robotics
- Identification Control Methodology
- Real-time Operating system for embedded systems
- Industrial Network (Modbus, Profibus, Fieldbus, Hart)
- PLC, HMI
- C++ and PHP Programing

Projects

Quantum Computing and Quantum Networking
Telecom Italia TIM

SEP. 2019 – 2020
Torino. Italy

Project funded by Telecom Italia TIM®. The objective of the project is to apply quantum annealing to PCI Planning in 5G for Telecommunication domain.

Quantum Synth
Qiskit Camp

SEP. 2019
Schilthorn, Switzerland

"Quantum Synth" is an interface application for IBM quantum computers that produces the musical note based on the quantum circuit. The framework works on real quantum hardware in the presence of noise. The notes are generated based on the quantum circuit and the result is altered due to noise. This project won the community choice in IBM Qiskit camp Europe in September 2019 among 25 teams from different university and countries.

Connected Manufacturing
Politecnico di Torino

SEP. 2018 – JUL. 2019
Torino. Italy

Project funded by General Motors®. The objective of the project is to design a framework for the automatic supply of damaged vehicle parts.

Quantum Computing for automotive industry
Politecnico di Torino

APR. 2018 – JUL. 2019
Torino. Italy

Project funded by General Motors®. The objective of the project is the feasibility of using the quantum computing in the automotive industry.

PhotoNext
Politecnico di Torino

JUN. 2018 – PRESENT
Torino. Italy

I participate to the PhotoNext (www.photonext.polito.it) research project at Politecnico di Torino, Italy. Implementation of a fully comprehensive and flexible IoT platform to retrieve and analyse data from a set of Fibre Bragg Grating (FBG) sensors.

Vibration Isolation for seat vehicle *Politecnico di Torino*

2015 - 2016 *Torino. Italy*

I have worked with a team to design a Vibration Isolation system for seat vehicle, the project was founded by FCA (Fiat-Chrysler Automobiles) for increasing comfort factor of the passenger in the Fiat Panda. A small and efficient vibration isolation device has been developed that can be used in this particular B segment car. I was responsible for modeling of the system in Matlab®

Teaching

Management of the innovation and product development ICT (Teaching Assistant) *Politecnico di Torino*

TORINO, ITALY *Mar. 2019 – Jun. 2019*

Master of science-level of the Bologna process in Engineering And Management

Information systems(Teaching Assistant) *Politecnico di Torino*

TORINO, ITALY *Oct. 2018 – Jan. 2019*

Master of science-level of the Bologna process in Engineering And Management

Management of the innovation and product development ICT(Teaching Assistant) *Politecnico di Torino*

TORINO, ITALY *Mar. 2018 – Jun. 2018*

Master of science-level of the Bologna process in Engineering And Management

Awards

2019 **Winner,** Community Choice Award IBM Qiskit Camp Europe Sep. 2019. " Quantum Synth: a quantum-computer-based music synthesizer". Team members: Costa Hamido, O., Ghazi Vakili, M., Giusto, E., Baiardi, A., and Cirillo, G.A. *Schilthorn, Switzerland*

Publications

Evaluating and Modeling IEEE 802.15.4 TSCH Resilience against Wi-Fi Interference in New-Generation Highly-Dependable Wireless Sensor Networks *Ad Hoc Networks*

2020 (IN PRESS) *ELSEVIER*

ELSEVIER Ad Hoc Networks

Quantum Pliers Cutting the Blockchain *IEEE IT Professional*

2020 (IN PRESS) *IEEE Computer Society*

IEEE IT Professional Magazine

Ubiquitous fridge with natural language interaction *Conference Proceedings*

SEP. 2019 *Pisa, Italy*

Ubiquitous fridge with natural language interaction, 2019 EEE International Conference on RFID Technology and Applications (RFID-TA).

Open Source Fog Architecture for Industrial IoT Automation Based on Industrial Protocols *Conference Proceedings*

JUL. 2019 *Wisconsin. USA*

Open Source Fog Architecture for Industrial IoT Automation Based on Industrial Protocols, 2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC).

Industrial data-collector by enabling OPC-UA standard for Industry 4.0 *Conference Proceedings*

JUL. 2018 *Imperia. Italy*

Industrial data-collector by enabling OPC-UA standard for Industry 4.0, 2018 14th IEEE International Workshop on Factory Communication Systems (WFCS).

DIIG Distributed Industrial IoT Gateway *Conference Proceedings*

JUL. 2017 *Torino. Italy*

DIIG Distributed Industrial IoT Gateway, The 41st Annual IEEE Computer Software and Applications Conference(COMPSAC 2017),Turin, Italy (Total Scopus citations: 11).

Evaluating Success of Innovation Ideas in Social Computing Technologies Using Fuzzy Expert System *Conference Proceedings*

JUN. 2012 *Vancouver, Canada*

Evaluating Success of Innovation Ideas in Social Computing Technologies Using Fuzzy Expert System, The 3rd FTRA International Conference on Mobile, Ubiquitous, and Intelligent Computing (MUSIC 2012), Vancouver, Canada (2012).

Evaluating Online Shopping Stores Based on Web Site Attributes Using Fuzzy Expert System

2012

Evaluating Online Shopping Stores Based on Web Site Attributes Using Fuzzy Expert System, Based on Web Site Attributes Using Fuzzy Expert System" International Conference on Advances in Computer Science and Application (CSA 2012), Amsterdam, Netherlands. (2012).

Evaluating Online Shopping Stores Based on Web Site Attributes Using Fuzzy Expert System

JUL. 2012

A Fuzzy Expert System for Evaluating Value Innovation In Social Computing Platforms Based on Blue Ocean Strategy (Case Study: WBB Platform), ICOMP 2012 Conference. Las Vegas, NV, July 16 -19, (2012).