Publications

Journal Papers

- **Lavagna, L., Carillo, S., & Panella, M.**
  A topical review on time-independent perturbation theory in one-dimensional quantum systems.
  Physica Scripta, **100** (10), 1–33, 2025.
  https://doi.org/10.1088/1402-4896/ae0a8f
  Keywords: one-dimensional quantum systems; perturbation theory; quantum computing.

- **Lavagna, L., Piperno, S., Ceschini, A., & Panella, M.**
  Small graph perturbations, QAOA, and the MaxCut problem.
  AVS Quantum Science, 1–14, 2025.
  Publisher: AIP Publishing; AVS Science and Technology of Materials, Interfaces and Processing.
  ISSN: 2639-0213.
  Keywords: quantum approximate optimization algorithm; MaxCut problem; graph perturbations; quantum computing.

- **Buttitta, G., Lavagna, L., Bonacorsi, S., Barbarito, C., Moliterno, M., Saito, G., Oddone, I., Verdone, G., Raimondi, S., & Panella, M.**
  Machine Learning-Guided microfluidic optimization of clinically inspired liposomes for nanomedicine applications.
  International Journal of Pharmaceutics, **686**, 126362, 2025.
  https://doi.org/10.1016/j.ijpharm.2025.126362
  Keywords: machine learning; artificial intelligence; liposomes; microfluidics; nanomaterial; nanomedicine.

Conference Papers

- **Lavagna, L., Ceschini, A., Rosato, A., & Panella, M.**
  Novel Quantum Approaches to Hyperdimensional Computing for Neural Networks.
  In *Proceedings of the International Joint Conference on Neural Networks (IJCNN 2025)*, Rome, Italy, IEEE, pp. 1–8, 2025.
  https://doi.org/10.1109/IJCNN64981.2025.11229083
  Keywords: Hands; quantum computing; accuracy; computational modeling; neural networks; machine learning; computer architecture; computational efficiency; quantum circuit; testing.

- **Casalbore, M., Lavagna, L., Rosato, A., & Panella, M.**
  Hybrid Quantum-Classical Framework for Anomaly Detection in Time Series with QUBO formulation and QAOA.
  In *Proceedings of the International Joint Conference on Neural Networks (IJCNN 2025)*, Rome, Italy, IEEE, pp. 1–8, 2025.
  https://doi.org/10.1109/IJCNN64981.2025.11228152
  Keywords: statistical analysis; time series analysis; pipelines; qubit; noise; computer architecture; quantum circuit; anomaly detection; optimization; tuning.

- **De Falco, F., Lavagna, L., Ceschini, A., Rosato, A., & Panella, M.**
  Evolving hybrid quantum-classical GRU architectures for multivariate time series.
  In *IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2024)*, IEEE
  Computer Society, pp. 1–6, 2024.
  https://doi.org/10.1109/MLSP58920.2024.10734792
  Keywords: multivariate time series; quantum computing; quantum gated recurrent units; quantum
  machine learning.

- **Lavagna, L., Ceschini, A., Rosato, A., & Panella, M.**
  A layerwise-multi-angle approach to fine-tuning the quantum approximate optimization algorithm.
  In *Proceedings of the International Joint Conference on Neural Networks (IJCNN 2024)*, IEEE, pp. 1–
  6, 2024.
  https://doi.org/10.1109/IJCNN60899.2024.10650075
  Keywords: quantum approximate optimization algorithm; layerwise-multi-angle approach; quantum
  computing.

- **Lavagna, L., De Falco, F., Ceschini, A., Rosato, A., & Panella, M.**
  Trade-offs in Cryptosystems by Boolean and Quantum Circuits.
  In *Proceedings of the IEEE International Symposium on Circuits and Systems (ISCAS 2025)*, IEEE, pp.
  1–5, 2025.
  https://doi.org/10.1109/ISCAS56072.2025.11043205
  Keywords: fault tolerance; circuits and systems; encryption; quantum mechanics; circuit theory.

Other

- **Cacioppo, A., De Falco, F., Di Luzio, F., Giagu, S., Lavagna, L. & Panella, M.**
  Quantum-Enhanced Fraud Detection: A Comparative Study on Real-World Financial Data In *3rd
  Workshop on Quantum Computing @ INFN Milano, Italia* (02/2026).

- **Lavagna, L., De Falco, F., & Panella, M.**
  Quantum Hyperdimensional Computing for Pattern Completion.
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2025)*, pp. 1–1, 2025.

- **Lavagna, L., De Falco, F., & Panella, M.**
  The Effectiveness of Classical and Hybrid Models for MaxCut problem.
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2025)*, pp. 1–1, 2025.

- **Lavagna, L., De Falco, F., & Panella, M.**
  Is the QAOA the Ultimate Solution for the MaxCut problem?
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2025)*, pp. 1–1, 2025.

- **Ceschini, A., Lavagna, L., De Falco, F., Rosato, A., & Panella, M.**
  Circuiti neurali quantistici per il processamento di grafi, immagini e serie temporali.
  In *Memorie ET2025*, Gruppo Nazionale Ricercatori di Elettrotecnica, Italia, pp. 1–2, 2025.

- **Lavagna, L., Ceschini, A., Piperno, S., Casalbore, M., Rosato, A., & Panella, M.**
  Soluzioni quantistico-classiche per ottimizzazione e rilevamento di anomalie.
  In *Memorie ET2025*, Gruppo Nazionale Ricercatori di Elettrotecnica, Italia, pp. 1–2, 2025.

- **Rosato, A., Lavagna, L., & Panella, M.**
  Integrazione del calcolo iperdimensionale nei circuiti digitali, nelle reti neurali e nelle architetture computazionali quantistiche.
  In *Memorie ET2025*, Gruppo Nazionale Ricercatori di Elettrotecnica, Italia, pp. 1–2, 2025.

- **Ceschini, A., Lavagna, L., De Falco, F., Rosato, A., & Panella, M.**
  Convergenza e generalizzazione nelle reti neurali quantistiche.
  In *Memorie ET2024*, Gruppo Nazionale Ricercatori di Elettrotecnica, Italia, pp. 1–2, 2024.

- **De Falco, F., Piperno, S., Lavagna, L., Ceschini, A., Rosato, A., & Panella, M.**
  Enhancing QAOA Ansatz via Multi-Parameterized Layer and Blockwise Optimization.
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2024)*, pp. 1–3, 2024.

- **Lavagna, L., De Falco, F., Piperno, S., Ceschini, A., Rosato, A., & Panella, M.**
  Quantum Generative Modeling via Straightforward State Preparation.
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2024)*, University of Melbourne, Melbourne, Australia, pp. 1–1, 2024.

- **Piperno, S., Lavagna, L., De Falco, F., Ceschini, A., Rosato, A., Windridge, D., & Panella, M.**
  Quantum Enhanced Knowledge Distillation.
  In *Proceedings of Quantum Techniques in Machine Learning (QTML 2024)*, University of Melbourne, Melbourne, Australia, pp. 1–1, 2024.