

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.
- **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., 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.
- **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., 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., 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.
- **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.
- **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.
- **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.