Lufter C.W. **Liu**

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Research Interests

Quantum Information, Quantum Computing, Computer Simulating Physics.

Education

National Cheng Kung University (NCKU) *Tainan, Taiwan*

B.S. in Civil Engineering *06/2020*

- Overall GPA: 3.55/4.3, Physics Major: 4.16/4.3
- Courses: Physcis (QM I&II, EM I&II, SS), Engineering, Material Science, Computational Science

Research Experience

***Research Assistant* , Physics Dept. Matterwave Lab,** Prof. Pei Chen Kuan *Tainan, Taiwan*

Multiple Way Quantum Walk (MWQW) *08/2019 - PRESENT*

- Discussed the error tolerance when implementing MWQW in matterwave systems by using analytical and numerical methods.
- Deployed a computer program that simulates and visualizes MWQW, which enhanced our working efficiency.
- Improved the defects in previous asymptotic analysis methods when implementing Schrödinger's approach to MWQW.
- Presented the recursive relations in MWQW and its exit probability p_∞ from an automation perspective.

Sensitive Measurements Through Matter Waves.

- Research on implementing double-diffraction Bloch oscillation to cancel the phase perterbation when performing sensitive measurements.

***Research Assistant*, Civil Engineering Dept. AI Material Lab,** Prof. Yun Che Wang *Tainan, Taiwan*

Machine learning in material design. [**APCOM2019**] [**CTAM2020**] *02/2019 - 06/2020*

- Applied generative adversarial networks (GAN) to generate high fidelity microstructure images.
- Proposed regression VGG networks (rVGG) that can predict mechanical properties from material images with 95% accuracy.
- Outperformed Finite Element Methods (FEM) in predicting time over 100 times.
- Investigated an Bayesian-optimization model that can fine-tune GAN-generated microstructure geometry through the raid labeling of rVGG.

Constructing homogenous materials unsing computational methods.

- Implemented pruning protocol on 96 core CPUs to generate auxetic networks inspired by "Auxetic metamaterials from disordered networks".
- Implemented a stochastic protocol to produce large scale homogenous microstructure datasets by two-point correlation function.

Publication

[1] **Chun Wei Liu**, Pei Chen Kuan *Symmetric Quantum Walk With Phase Transition Feature*. (In preperation, to be summited in Dec. 2020).

[2] **Chun Wei Liu**, Jyun-Ping Wang, Yun-Che Wang *Design of Viscoelastic Materials Through Machine Deep Learning*. (In preperation, to be summited in Nov. 2020).

[3] Yun-Che Wang, **Chun Wei Liu**, Pei-Chen Cheng, Jyun-Ping Wang, Tsai-Wen Ko *Design of Chiral Metamaterials via Deep Neural Networks*. 44th National Conference on Theoretical and Applied Mechanics, 2020.

Honors & Awards

2020 **Chairman Special Award (entering final round),** IBMq Qiskit Hackthon Taiwan

2018 **5th Place (out of 250 students),** Asia Pacific Mechanics Contest for College Students

2016 **Dean's list ,** GPA in top 5% of the department

Presentation

***Design of Viscoelastic Auxetic Materials Through Machine Deep Learning* |Link** *Taipei, Taiwan*

Asian Pacific Congresson Computational Mechanics (APCOM2019) *12/2019*

- Discussed the use of VGG networks as an alternative of Finite Element Methods (FEM) when labeling mechanical properties for microstructures.

Selected Projects

Predicting Handwriting Recognition With Parametrized Quantum Circuit

For IBMq Qiskit Hackthon Taiwan 2020 *09/2020*

- Implemented 4qubit-Ry gate circuits in predicting MNIST dataset with the learning curve converged after ten iterations.
- Analized the potential in predicting molecular ground state energies with Quantum LSTM Meta-Learner and VQE.

Extracurricular Activity

American Language Program, School of Professional Studies, Columbia University *New York City, NY*

Student *07/2018 - 08/2018*

- Passed the intensive C1-level English program and visited some advanced academic facilities to prepare for my graduate studies.

Skills

Languages: Python, C/C++, MATLAB **Libraries/Tools:** Qiskits, Tensorflow, PyTorch **Other Technologies:** GNU/Linux, Raspberry Pi, GCP, Git, LAMMPS, LaTeX