Ocular Disease Recognition via Hybrid Classical & Quantum Neural Network

Reza MD Zakiul Karim Dhruba, Nasif Tajwar Chowdhury

Week 1 (20 October - 27 October):

10 Papers Reviewed:

Classical:

Name	Link
1. Combining EfficientNet with ML-Decoder classification head for multi-label retinal disease classification.	https://link.springer.com/article/10.1007/s00521-024-09820-w
2. A new technique for cataract eye disease diagnosis in deep learning.	https://core.ac.uk/download/pdf/599380282.pdf
3. Improving Automated Detection of Cataract Disease through Transfer Learning using ResNet50	Improving Automated Detection of Cataract Disease through Transfer Learning using ResNet50 | Engineering, Technology & Applied Science Research
4. Combining convolutional neural networks and self-attention for fundus diseases identification	Combining convolutional neural networks and self-attention for fundus diseases identification | Scientific Reports
5. Deep Learning for Ocular Disease Recognition: An Inner-Class Balance**	https://onlinelibrary.wiley.com/doi/full/10.1155/2022/5007111

Quantum:

Name	Link
1. Quantum Optical Convolutional Neural Network: A Novel Image Recognition Framework for Quantum Computing	Quantum Optical Convolutional Neural Network: A Novel Image Recognition Framework for Quantum Computing | IEEE Journals & Magazine | IEEE Xplore
2. Retrieval of exudate-affected retinal image patches using Siamese quantum classical neural network	https://ietresearch.onlinelibrary.wiley.com/doi/full/10.1049/qtc2.12026
3. Medical image diagnosis based on adaptive Hybrid Quantum CNN	Medical image diagnosis based on adaptive Hybrid Quantum CNN | BMC Medical Imaging
4. Automated Detection of Retinopathy of Prematurity Using Quantum Machine Learning and Deep Learning Techniques	https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10237183

10 **Limitations** / **Future Works** suggested in the papers:

1. Generate GAN-based synthetic images for the imbalanced data problem. (classical 1)
2. Segmentation to improve performance. (classical 2)
3. Limited Qubits. (quantum 2)
4. Enhance accuracy, especially for glaucoma detection.(Classical 3)
5. Explore other hybrid quantum models.,Optimize quantum circuits and architecture. (Quantum 3)

5 most commonly used CNNs/QNNs:

1. CNN: EfficientNet-B4 + EfficientNet-B5 (Reason: less prone to overfitting, less costly, and faster to train with) (classical 1)
2. CNN: VGG-19 (Visual Geometry Group) (classical 2)
3. CNN: VGG-19 (classical 5)
4. CNN: DarkNet-19 (quantum 4)
5. Parameterized quantum circuit (PQC) (quantum 2)
6. HQCNN (quantum 3)

Notebook link:
https://colab.research.google.com/drive/1spEXPEgQioupq07X0Iq9THdZccbA4TOx#scrollTo=f0fvDltSFAAj