QMedicine - Where Quantum AI Meets Health

Team 6 :QMed

Meet Our Team

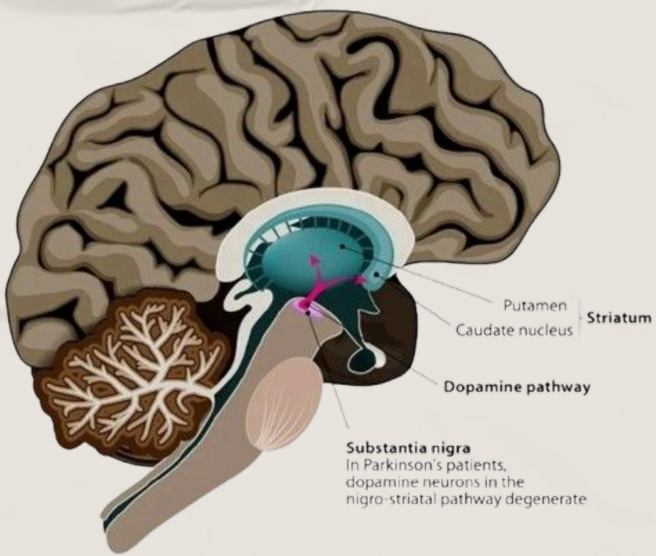
Problem Statement

Parkinson's Disease is a disorder from losing dopamine neurons.

The challenge? symptoms appear only after 60% of neurons are lost, making early diagnosis hard.

Why does early detection matter?
Because it **can slow progression,** improve quality of life, and enable timely treatment—every moment counts.

PARKINSON'S DISEASE



Motivation

- Parkinson’s mortality
  2019: **329,000** deaths worldwide which is **more than double** 2000

- Doctors face a blind spot in early detection of Parkinson’s
  symptoms only appear **after damage** is done

- AI & Quantum Machine Learning bring a new hope
  by uncovering hidden patterns in voice, movement, and brain signals long before humans can detect them.

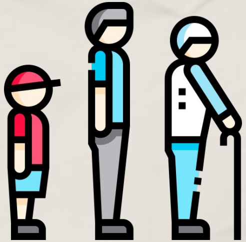
- The motivation? **Detect Parkinson’s early**, before it steals mobility, independence, quality of life

Dataset Overview

Subjects

188 PD patients
& 64 healthy

Age Range

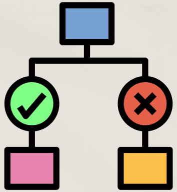


33– 87 years

Dataset Size

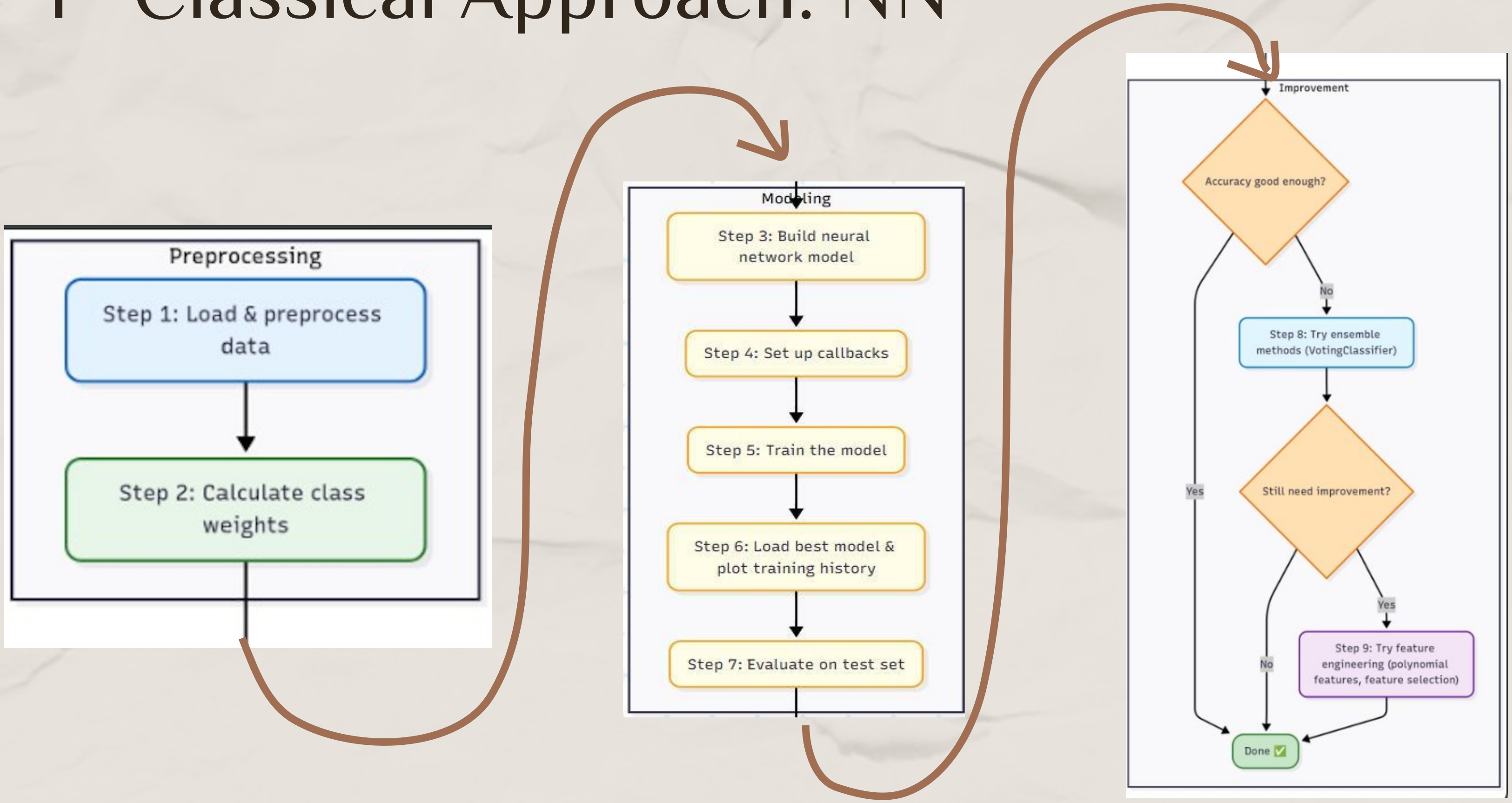
756 instances
& 754 features

Task



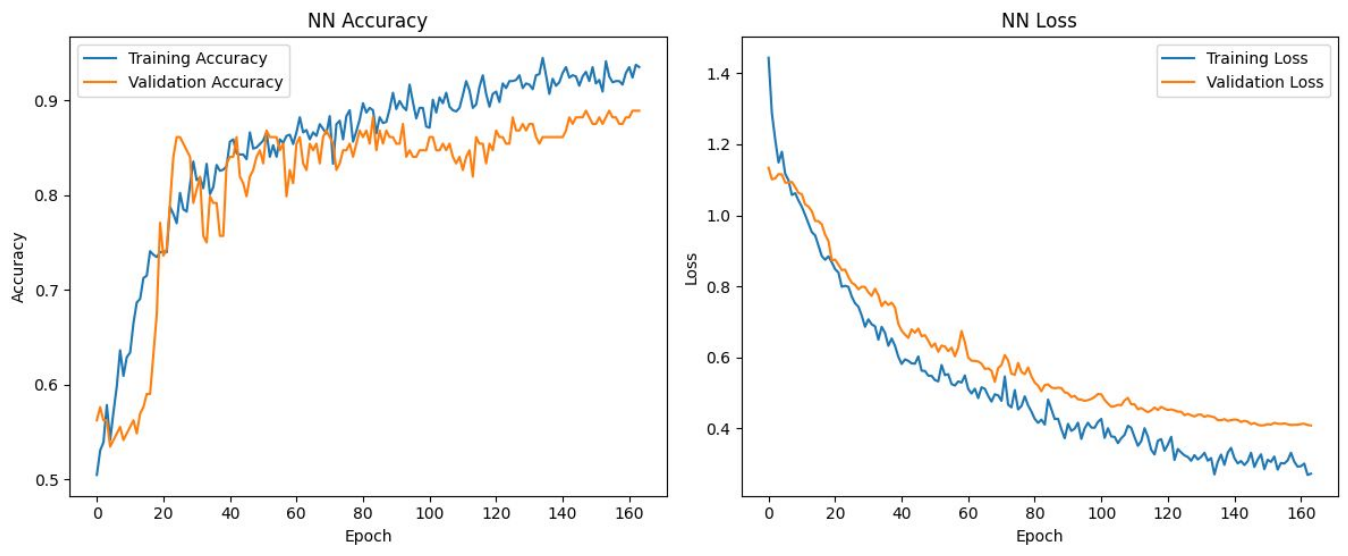
Binary
Classification

1st Classical Approach: NN

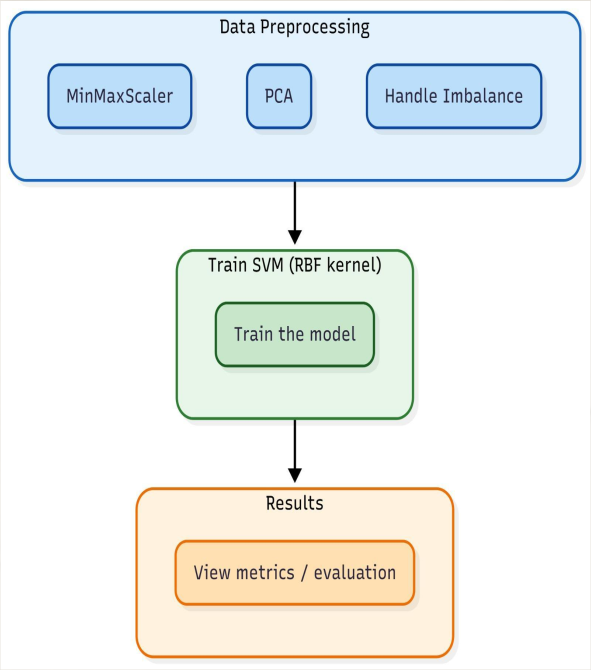


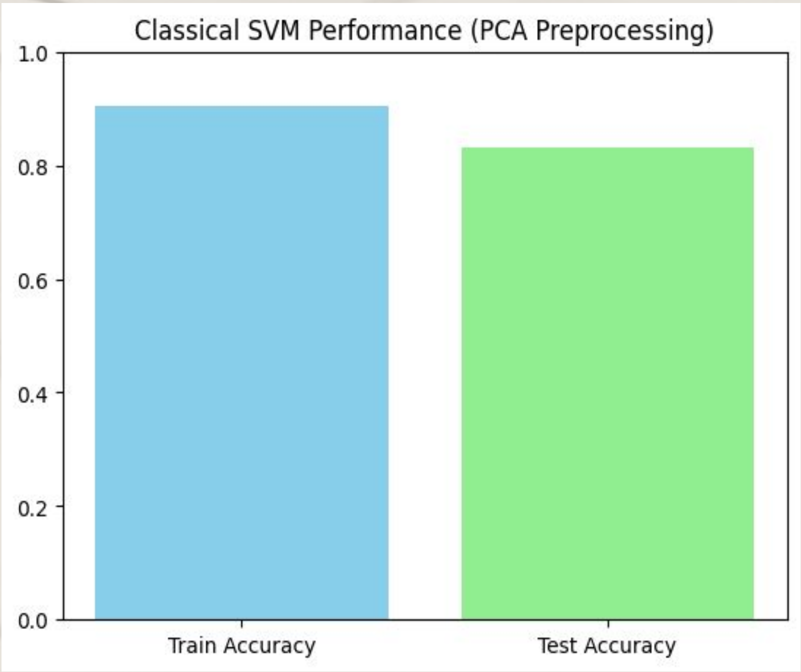
1st Classical Results

Accuracy: 95.29%
Precision: 94.25%
Recall: 96.47%
F1 Score: 95.35%



2nd Classical Approach & Result: SVM





Why Quantum Machine learning ??

High-Dimensional Power

Better suited for complex medical data

Speed Advantage

Potential for faster computation on certain tasks

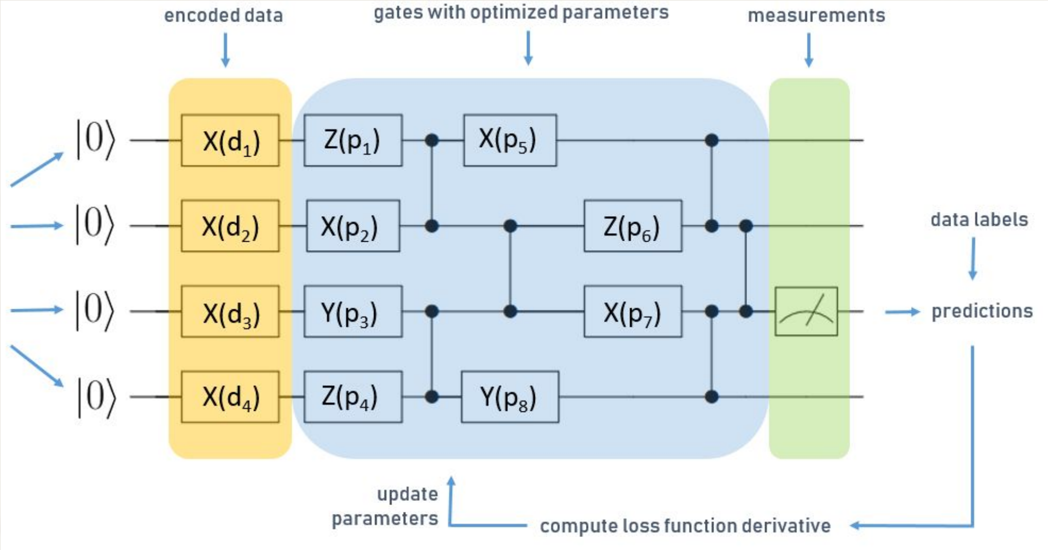
Deeper Insights in Healthcare

May uncover hidden patterns and support earlier Parkinson's detection

Full benefits depend on future fault-tolerant quantum computers

Our Quantum Solution

VQC Methodology



Quantum variants:
1-Quantum encoding: **Angle encoding** and **Amplitude encoding**
2-Ansatz: **Real Amplitude** and **EfficientSU2**

VQC Results

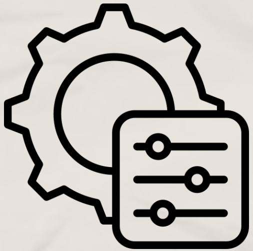
	Qubits	Feature Map	Ansatz	Reps	Optimizer	Accuracy
0	4	Z	RealAmplitudes	6	SPSA	0.6776
1	4	Z	RealAmplitudes	10	SPSA	0.7500
2	4	ZZ	RealAmplitudes	6	SPSA	0.5592
3	4	Z	RealAmplitudes	6	SPSA	0.6974
4	4	ZZ	EfficientSU2	6	COBYLA	0.6118
5	6	ZZ	RealAmplitudes	8	SPSA	0.6382
6	6	Z	EfficientSU2	8	COBYLA	0.6711

Best model: 75% accuracy | 4 qubits | Z Feature map | RealAmplitudes | 10 reps | SPSA

Simple and more expressive

Preprocessing Before QSVM

1. Scaling



MinMaxScaler

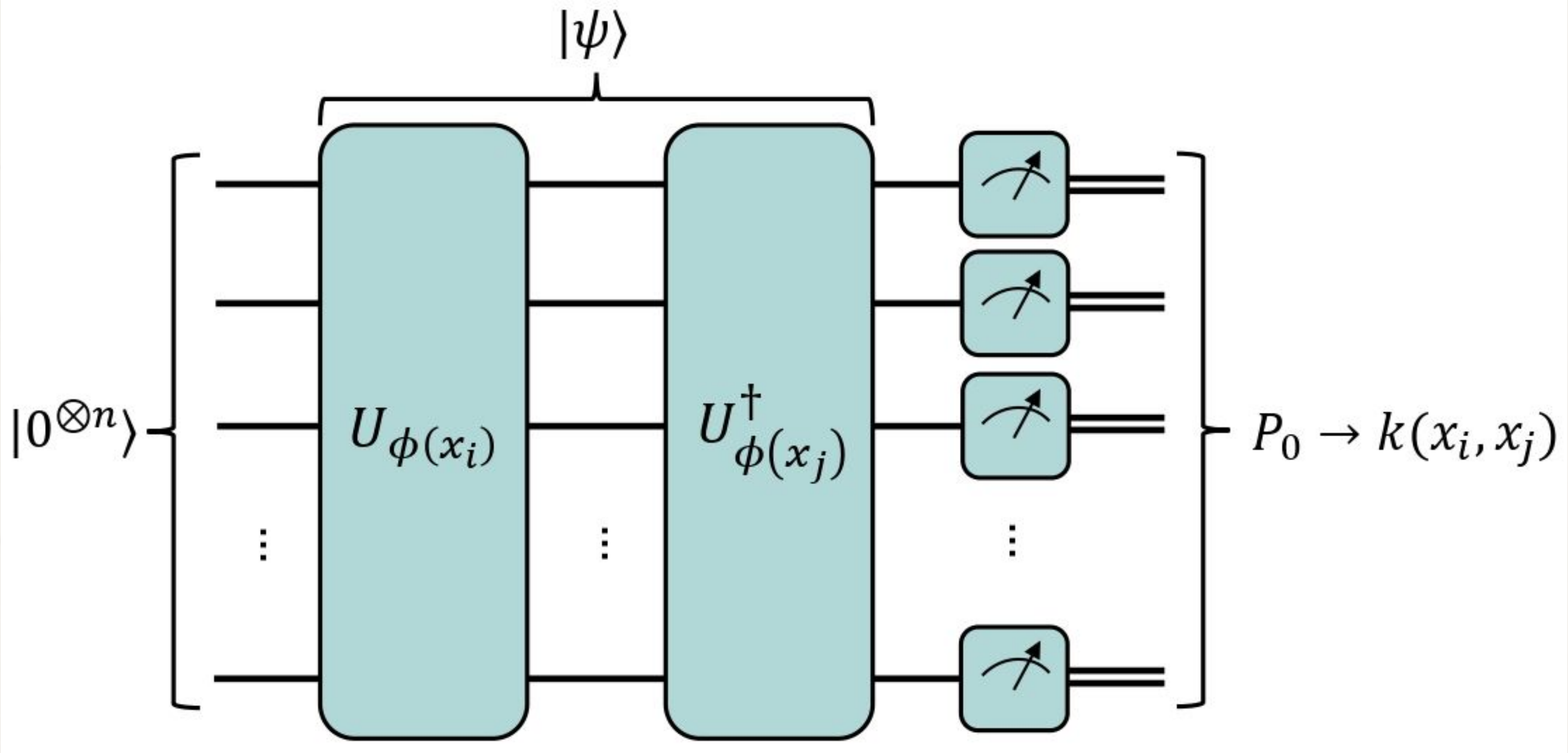
2. Dimensionality Reduction

PCA –> num qubits

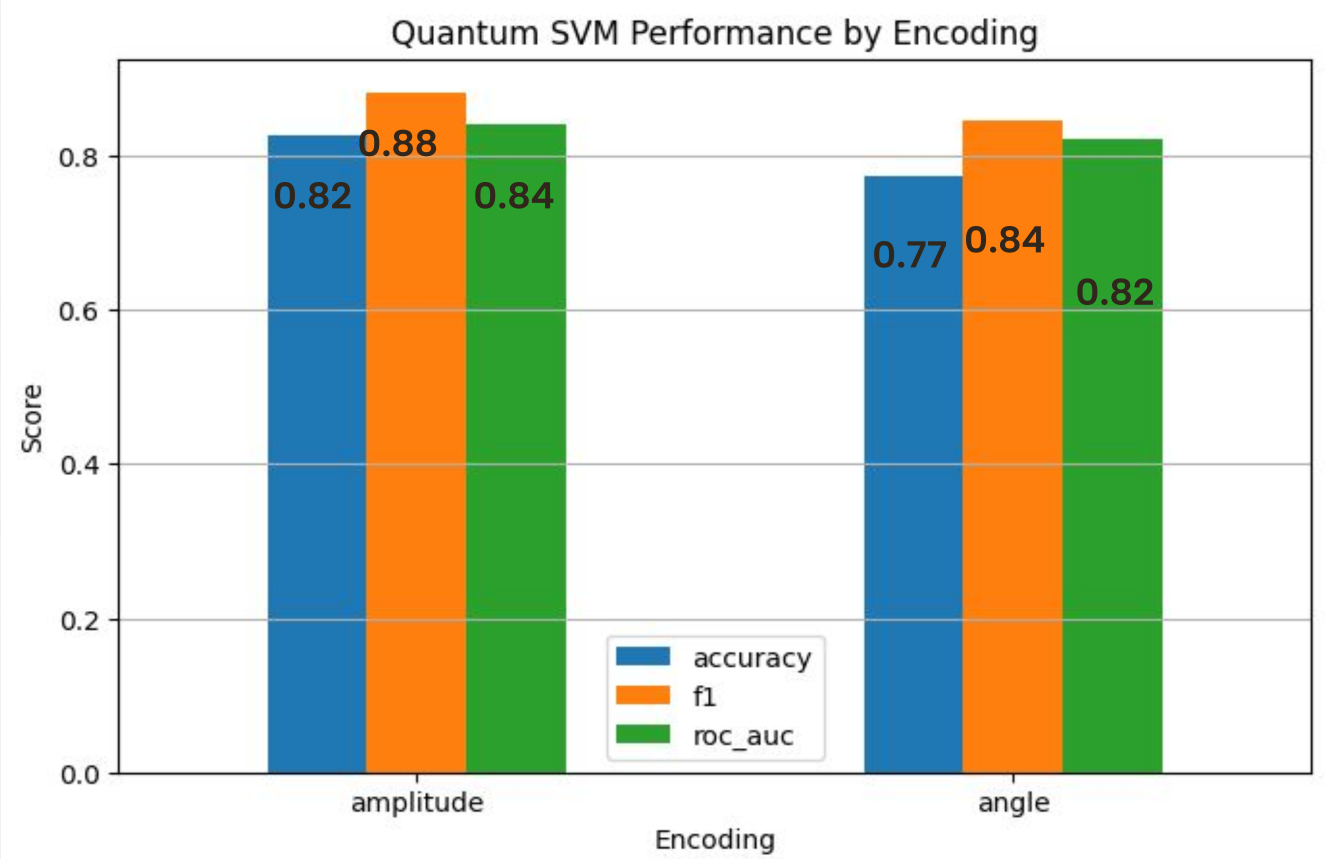
3. Handle imbalance

Used weighted classes

QSVM Methodology



Results of QSVM



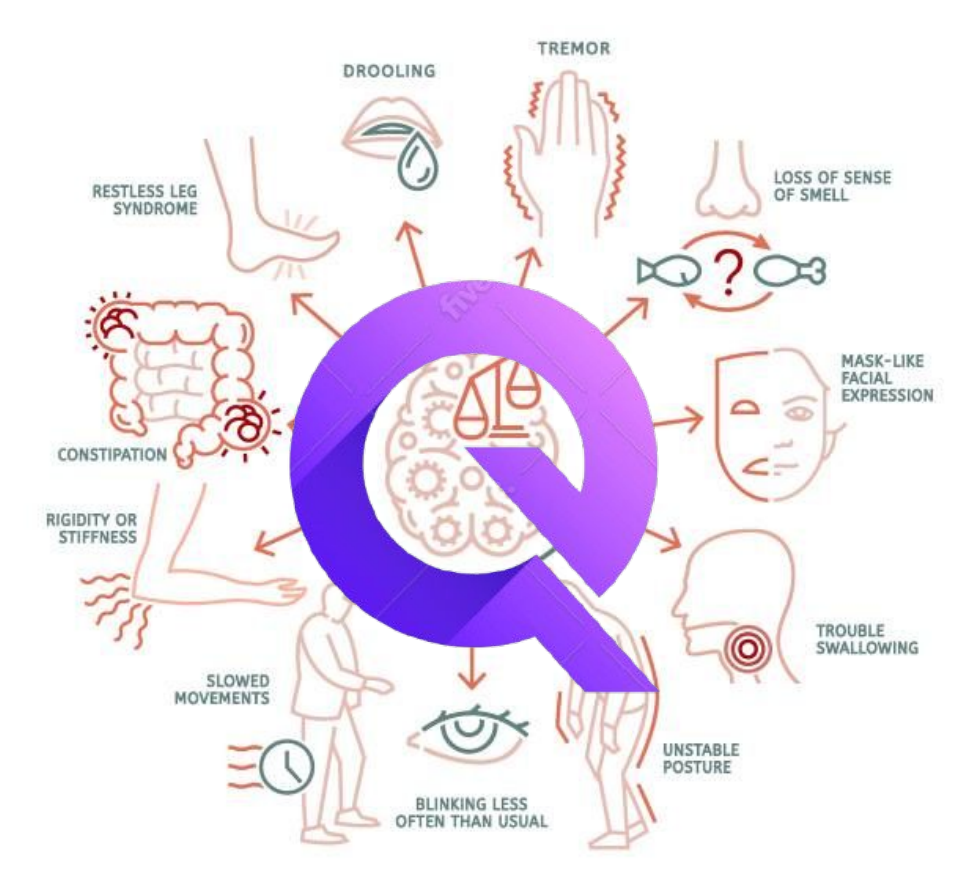
Quantum Vs Classical

Best QSVM	SVM
Accuracy: 82%	Accuracy: 92%

Best VQC	Best NN
Accuracy: 75%	Accuracy: 95.3%

Resources

- Vatsavai, D., et al. **A quantum inspired machine learning approach for multimodal Parkinson's disease screening.** Scientific Reports 15.1 (2025): 11660.
- Burri, S. R., et al. **Quantum Computing–Enabled Parkinson's Disease Diagnosis and Treatment: Opportunities and Challenges**. 2023 7th Int. Conf. on Computing, Communication, Control And Automation (ICCUBEA). IEEE, 2023.
- Vatsavai, D., et al. **A quantum inspired predictor of Parkinson's disease built on a diverse, multimodal dataset.** arXiv preprint arXiv:2411.18640 (2024).
- Swarna, S. R., et al. **Parkinson's disease prediction using adaptive quantum computing.** 2021 3rd Int. Conf. on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV). IEEE, 2021.



QMedicine: Together, we move beyond symptoms, towards solutions.

THANK YOU