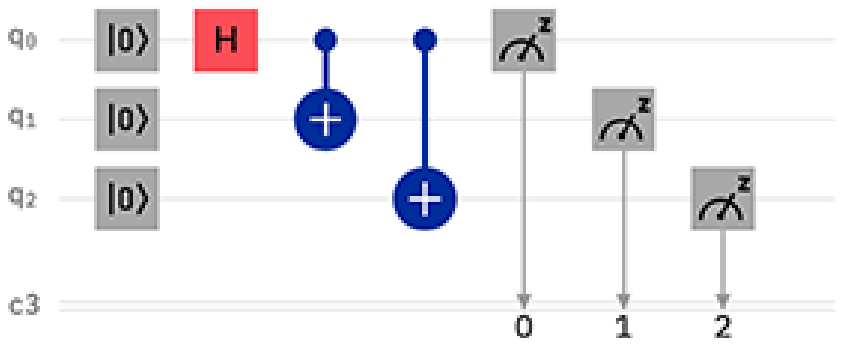



*Representative image

# Quantum Enhanced Machine Learning

(Image classification problem)

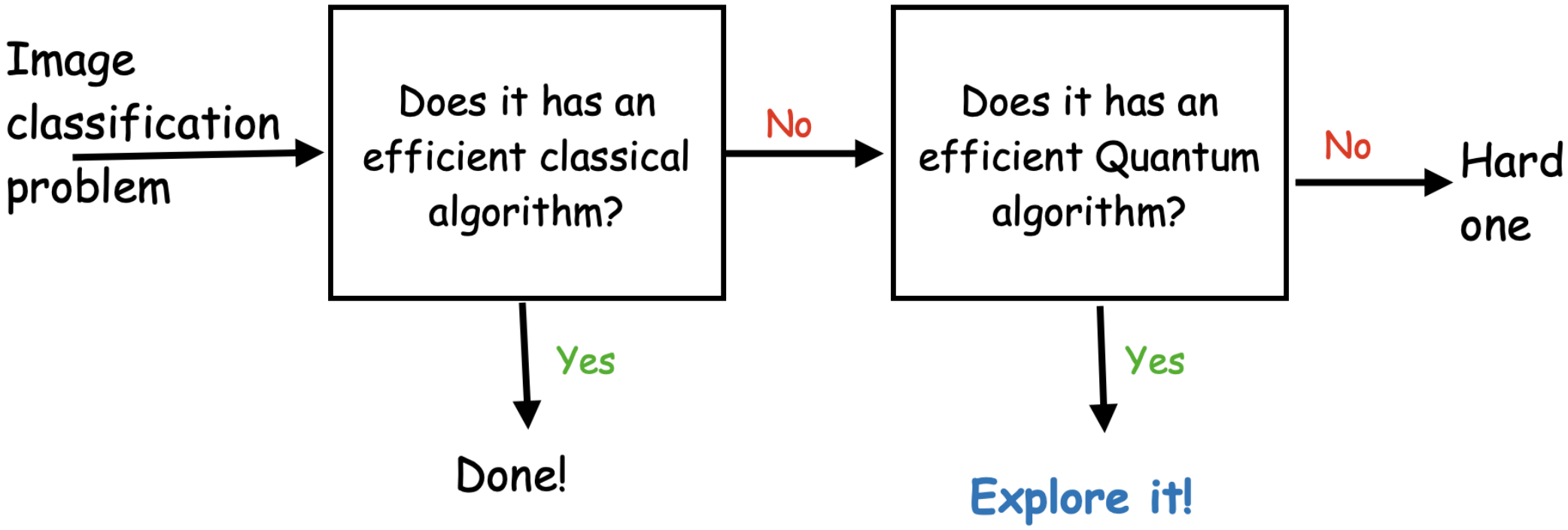
Manish Kumar

(Quantum Tech.

M. Tech, IISc)

[[ manishkumar7@iisc.ac.in ]]

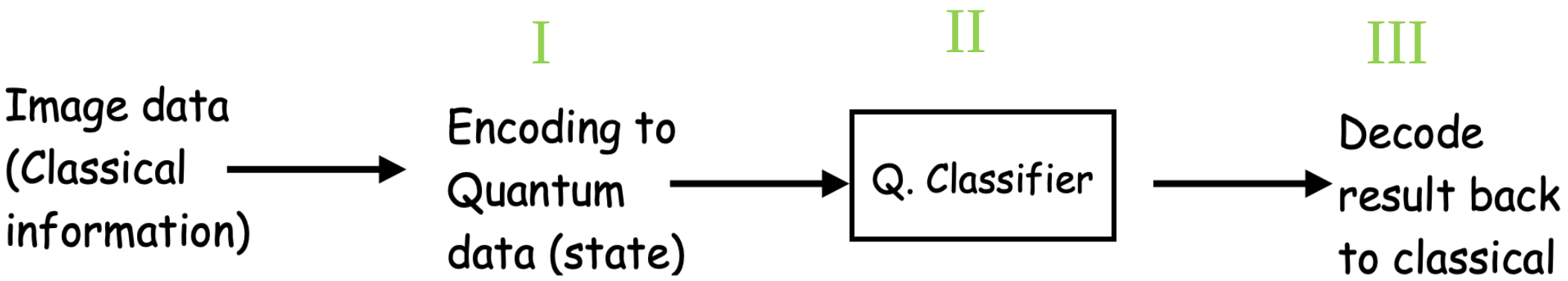
# • Context of the problem




**Explore and implement Quantum strategy that can aid in the image classification problem**

- It could be Quantum classifier (the primary aim) or,
- It could be Quantum subroutine [possibility of Grover speedup in the classical classifier]

# • A general Quantum classifier for classical data




- **Primarily, step-I, II and III are influenced by nature of data set and final goal (how much error we would like to tolerate.)**
- **Potential choices of classifier would be Quantum CNN or certain other tools. (This part is something that I would like to explore once I have developed descent understanding of data set and our expectations to it.)**

**Refrences:** https://www.tensorflow.org/quantum/tutorials/qcnn

https://www.nature.com/articles/s41534-018-0116-9

# • My personal experience to Quantum classification*

- **Scenario: QML Hackathon**
- **Data : Fashion MNIST data set.**
- **Goal: Binary classification.**
- **Observation: SVM with kernel trick was made much efficient via Quantum approach.**
- **Remarks:**

1. **We implemented the simulation task on Qiskit.**
2. **But some other participant reported Tensorflow-Quantum to provide more functionality for the task. (I need to cross check the claim.)**

**Refrences:** https://github.com/108mk/MIT_iQuHACK_2023.git

# • How I can contribute to the project

- **Resources: 3-months and team support**
- **Goal: Precisely demonstrate at least some concrete cases where we can get quantum enhancement. And then benchmark it with evidences.**

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- **Approach [[ with tentative duration ]]:**

1. **Figure out main challenges faced by current classical classifier in the project. [[ 1-2 week]]**
2. **Decide which QML model would serve the best. [[1-2 week, literature review ]]**
3. **Decide which framework or program to use. [[ Part of the above task ]]**
4. **Implementation [[ depends on several factors, but a month or so]]**
5. **Benchmarking and demonstration [[ 1-2 weeks ]]**

**•Extra:**

1. **Would love to discuss with you why quantum algorithm even work at first place!**

- Thanks for your time !!!