Quantum KNN

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KNN

K nearest neighbors (KNN) is a supervised machine learning algorithm

- Powerful method for data classification

- An object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its k nearest neighbours

Procedure

- KNN has three basic steps.

  1. Calculate the distance.

  2. Find the k nearest neighbours.

  3. Vote for classessn
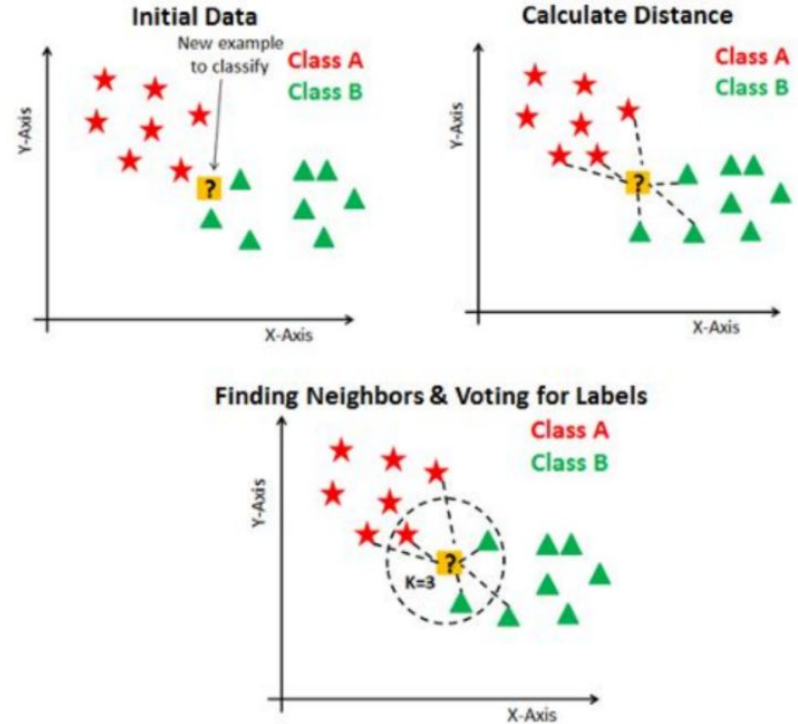
Translating KNN Algo into Quantum KNN

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1. **Determining distance**
   - Quantum Circuits to replicate Distance measurement
   - Using Q-States α and β, find the overlap b/w them

2. **Find the k nearest neighbours**
   - Compare β state with other set of states φ
   - Get state with the max possible overlap with β

3. **Majority vote for classes**
   - Sort for majority and determine the class

Applications

Real World Usage

- Determining POIs in On-Demand

delivery systems

- Recommendation Systems

- Search Engines based on semantic

similarity

- Document classification

- Pattern detection

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Algo

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- Quantum Algorithm for K-Nearest Neighbors Classification Based on the Metric of Hamming Distance
- This implementation considers a dataset of numbers 0-8 in binary form and classify it into even or odd.
- the results are not stable as the vector dimension of data point is 3 and the number of points are 6 (too low!!)

DataSets

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- IRIS Dataset
- Number Classification (Even or Odd).

OBSERVATION

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```
['1 1' '1 0'] 2
['1 1' '1 0'] 2
for  KNN k=4, accuracy=0.00%
for QKNN k=4, accuracy=100.00%
[1. 1.]
[0. 0.]
[1, 1]
```

References

1. KNN Visualization
2. KNN Algo – TDS
3. Quantum KNN – Theoretical Gains

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GITHUB

REPOSITORY

https://github.com/atshaya-anand/Quantum-Knn

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