



# Quantum based Neural Network Classifier and its Application for Firewall to Detect Malicious Web Request (QNN-F)

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- Objective:**
- (1) To design and develop a quantum based neural network classifier.
  - (2) To get connection weights are threshold using quantum computing concept.
  - (3) To get optimal value of learning rate parameters like fuzzyfication parameter and cluster centorids.
  - (4) Design and develop a firewall using quantum based neural network to detect malicious Web request.

## Working of QNN-F

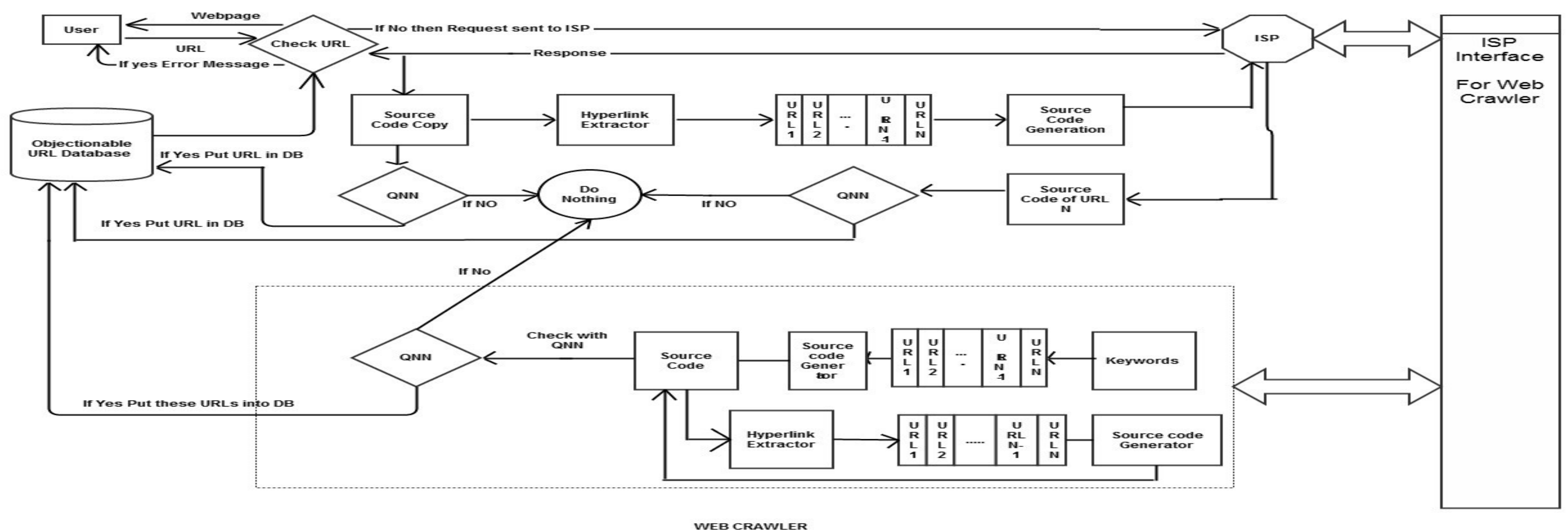


Fig. 1 Architecture of QNN-F

## Proposed Approach

- 1) The Quantum based Neural Network (QNN) uses quantum concept to evolve connection weights and threshold of Neuron.
- 2) The quantum computing concept uses qubits in place of binary bits which provide large search space probabilistically to find optimal value of required parameter.
- 3) The proposed QNN-F having five major components as following
  - (a) Web Crawler
  - (b) Requested Web Page Analyzer
  - (c) Hyperlinked Analyzer
  - (d) Feature Extractor
  - (e) Quantum based Neural Network

## Conclusion

- 1) The proposed approach uses the quantum concept to classify objectionable Web request by user and Web crawler help to update objectionable URLs database automatically.
- 2) Experimental results are measured on the parameters like accuracy, sensitivity, and specificity and find improvement in results as compare to other methods.

## Future Work

- 1) To propose a quantum based algorithm for multi class classification using.
- 2) To optimize metacongitive learning using quantum computing concept.
- 3) Planning for hardware realization to quantum based neural network learning algorithm.

## Publication

- 1) Om Prakash Patel, Aruna Tiwari, **Novel Quantum Inspired Binary Neural Network Algorithm**, Sadhana - Academy Proceedings in Engineering Sciences, Springer, (SCIE Index, last 5-year Impact factor- 0.65), June, 2016 (In Press)
- 2) Omprakash Patel, Aruna Tiwari, Ojas Gupta, Vikram Patel, **A Quantum-based Neural Network Classifier and its application for Firewall to Detect Malicious Web Request**, IEEE Symposium Series on Computational Intelligence”, 7-10 Dec. 2015, Captown, South Africa, pp. 67 - 74, 2015

## References

- 1) T. C. Lu, G.-R. Yu, and J.-C. Juang, “Quantum-based algorithm for optimizing artificial neural networks,” IEEE Transactions on Neural Networks and Learning Systems, vol. 24, no. 8, pp. 1266–1278, August 2013.
- 2) O. P. Patel, A. Tiwari, “Quantum inspired binary neural network algorithm,” in Proceeding of 2014 International Conference on Information Technology (ICIT). IEEE, pp. 270–274, 2014.