Unit-III Quantum Machine Learning and Optimization: Quantum machine learning (QML) models – QSVM, QNN, QCNN, Quantum Linear Regression, Variational Quantum Classifier (VQC), Quantum k-means clustering; kernel methods, Quantum Boltzmann Machines; Quantum optimization techniques: QAOA, quantum annealing.

Unit-IV: Introduction to quantum simulation tools and platforms: Google CIRQ, Amazon Braket, IBM Qiskit, Pennylane, Q#, Tensorflow quantum, Tket/pyket, XACC, Project Q, Quantum Development Kit (QDK).

Readings:

1. Elias F. Combarro, Samuel González-Castillo, and Alberto Di Meglio. A Practical Guide to Quantum Machine Learning and Quantum Optimization: Hands-on Approach to Modern Quantum Algorithms. Packt Publishing Ltd, 2023.
2. Noson S. Yanofsky and Mirco A. Mannucci. Quantum computing for computer scientists. Cambridge University Press, 2008.
3. Douglas R. Stinson and Maura B. Paterson. Cryptography, Theory and Practice, CRC Press, 2019.
4. Santanu Pattanayak. Quantum Machine Learning with Python: Using Cirq from Google Research and IBM Qiskit. Apress, 2021.
5. Santanu Ganguly. Quantum Machine Learning: An Applied Approach. Apress, 2021.
6. https://docs.quantum.ibm.com/
7. https://quantumai.google/cirq/experiments/textbook_algorithms

MCSE308: SOFTWARE QUALITY ASSURANCE AND TESTING [3-0-1]

Course Objectives:

Course Learning Outcomes : On completion of this course, the student will be able to:
CO1: understand quality management processes.
CO2: understand the importance of standards in the quality management process and role of SQA function in an organization.
CO3: gain knowledge of statistical methods and process for software quality assurance
CO4: understand the need and purpose of software testing. CO5: model the quantitative quality evaluation of the software products.

Syllabus :
Unit-I Introduction: Concept of Software quality, product and process quality, software quality metrics, quality control and total quality management, quality tools and techniques, quality standards, defect management for quality and improvement.
Unit-II Designing software quality assurance system: Statistical methods in quality assurance, fundamentals of statistical process control, process capability, Six-sigma quality.
Unit-III Testing: Test strategies, test planning, functional testing, stability testing and debugging techniques.
Unit-IV Reliability: Basic concepts, reliability measurements, predictions and management.
Readings:

1. N.S. Godbole, Software Quality Assurance: Principles and Practice for the New Paradigm (2nd Ed.), Narosa Publishing, 2017.

2.G. Gordon Schulmeyer (4th eds.), Handbook of Software Quality Assurance Artech House,Inc, 2008.
3. G. O'Regan, A Practical Approach to Software Quality, Springer Verlag, 2002.
4. Daniel Galin, Quality Assurance: From theory to implementation, Pearson Education Ltd., 2004
5. S.H. Kan, Metrics and Models in Software Quality Engineering (2nd ed.), Pearson Education Inc., 2003.
6. J.D. McGregor and D.A. Sykes, A Practical Guide to Testing, Addison-Wesley, 2001.
7. Glenford J. Myers, The Art of Software Testing (2nd ed.), John Wiley, 2004.
8. D. Graham, E.V. Veenendaal, I. Evans and R. Black, Foundations of Software Testing, Thomson Learning, 2007.

MCAE310 Social Networks

Course Objectives: The course aims to equip students with various SNA approaches to data collection, cleaning, and pre-processing of network data.

Course Learning Outcomes: On completing this course, the student will be able to:

CO1: Explain the basic concepts and principles of social network.

CO2: Identify different types of social networks and their characteristics.

CO3: Implement and apply various social network analysis techniques, such as, influence maximization, community detection, link prediction, and information diffusion.

CO4: Apply network models to understand phenomena such as social influence, diffusion of innovations, and community formation.

Unit-I: Introduction to Social Network Analysis: Introduction to Social Network Analysis, Types of Networks, Nodes Edges, Node Centrality, betweenness, closeness, eigenvector centrality, network centralization, Assortativity, Transitivity, Reciprocity, Similarity, Degeneracy and Network Measure, Networks Structures, Network Visualization, Tie Strength, Trust, Understanding Structure Through User Attributes and Behavior.

Unit-II: Link Analysis and Link Prediction: Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis and Algorithms, Page Rank, Personalized PageRank, DivRank, SimRank, PathSim. Temporal Changes in a Network, Evaluation Link Prediction Algorithms, Heuristic Models,Probabilistic Models, Applications of Link Prediction.

Unit-III: Community Detection: Applications of Community Detection, Types of Communities, Community Detection Algorithms, Disjoint Community Detection, Overlapping Community Detection, Local Community Detection, Evaluation of Community Detection Algorithms.

Unit-IV: Influence Maximization: Applications of Influence Maximization, Diffusion Models, Independent Cascade Model, Linear Threshold Model, Triggering Model, Time-Aware Diffusion Model, Non-Progressive Diffusion Model. Influence