

Objective: To employ near-term quantum computing techniques in addressing a problem aligned with the United Nations Sustainable Development Goals (SDGs).

Instructions:

1. Problem Identification (10 marks):

- Teams should identify a pressing problem related to one or more of the UNESCO Sustainable Development Goals.
- Justification of the chosen problem's relevance and impact should be provided.
- If necessary, identify and justify the selection of a pertinent dataset to be utilized in the algorithm.

2. Algorithm Development (10 marks):

- Design and develop a near-term quantum computing algorithm to address the identified problem.
- Explain the choice of quantum algorithm and its suitability to tackle the problem at hand.
- Provide a step-by-step breakdown of the algorithm, elucidating the quantum principles and techniques employed.

3. Implementation and Execution (10 marks):

- Implement the designed algorithm in a Jupyter Notebook.
- The code should be well-commented, elucidating the functionality of each section/block of code.
- Execute the algorithm and present the results clearly, and interpretably.

4. Report Submission (10 marks):

- Submit a comprehensive report elucidating the problem, algorithm, and the results obtained.
- The report should include an introduction, methodology, results, discussion, and conclusion sections.
- Clarity of expression, logical coherence, and the inclusion of illustrative examples to explain complex topics will be valued.

Deliverables:

- A Jupyter Notebook containing the implemented algorithm and explanations.
- A report elucidating the problem chosen, the quantum algorithm developed, and an analysis of the results.

Group Composition:

- Students may form teams of 2, with a provision for one team to have 3 members.

Evaluation Criteria:

- Relevance and Difficulty of the Problem: How pertinent is the problem to the SDGs, and what is the level of challenge posed by the problem?
- Algorithm Design: Logical coherence, creativity, and effectiveness of the quantum algorithm in addressing the identified problem.

- Implementation: Clarity, correctness, and efficiency of the code. Thoroughness in commenting and explanation.
- Report: Depth of analysis, clarity of expression, organization, and coherence in presenting the findings.

This assignment seeks to foster a deeper understanding of quantum computing applications, collaborative problem-solving, and the intertwining of technology with global sustainable development goals.