**FAST NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCE**

**CLINICAL INSIGHT PREDICTION SYSTEM (CIPS)**

**PROJECT PROPOSAL**

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| **Course:** | **Machine Learning (LAB)** |

**Introduction:**We propose to develop an Advanced Patient Outcome Prediction System using machine learning to help healthcare providers identify patients at risk of adverse medical outcomes. This system will analyze various clinical parameters, vital signs, and laboratory results to predict patient outcomes and suggest appropriate medical interventions.

**Problem Statement:**Critical medical conditions often develop rapidly, and early identification is crucial for patient survival. Traditional medical scoring systems may miss subtle patterns that indicate deteriorating patient health. Our system aims to address this by providing data-driven outcome predictions using comprehensive patient data.

**Dataset Overview:**We are using a robust clinical dataset containing:  
• Size: ~59,000 records  
• Key Features:  
o Demographic factors **(age, gender, BMI)**  
o Vital signs **(heart rate, blood pressure, respiratory rate)**  
o Laboratory values **(blood work, kidney function, cardiac markers)**  
o medical history **(hypertension, diabetes, cardiac conditions)**  
o Clinical measurements **(EF, NT-proBNP, blood gases)**

**Project Objectives:**

1. Develop a machine learning model to predict patient outcomes
2. Identify key clinical parameters that significantly influence outcomes
3. Create a risk stratification system
4. Provide actionable insights for medical professionals

**Methodology:**

1. **Data Preprocessing:**  
   o Handle missing values using medical domain-appropriate methods  
   o Normalize clinical parameters  
   o Feature selection based on medical significance
2. **Model Development:**  
   o Implement multiple ML algorithms (Logistic Regression, Random Forest, Neural Networks)  
   o Perform hyperparameter optimization  
   o Develop ensemble methods for robust predictions
3. **Evaluation:**  
   o Use metrics like accuracy, precision, recall   
   o Implement k-fold cross-validation  
   o Compare model performances with existing medical scoring systems

**Expected Outcomes:**

1. A reliable patient outcome prediction model
2. Insights into critical clinical parameters
3. Comparative analysis of different ML approaches
4. Visualization of risk factors and their relationships

**Tools and Technologies:**• Python  
• Scikit-learn  
• Pandas  
• NumPy   
• Matplotlib/Seaborn  
• Statsmodels for statistical analysis