**National University of Computer & Emerging Sciences, Karachi Computer Science Department**

**Summer 2023, Lab Manual – 09**

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| **Course Code: AI-2002** | **Course: Artificial Intelligence Lab** |
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**Lab Tasks**

**Task#01:**

In a manufacturing facility, a company specializes in producing high-precision machinery. They aim to develop a diagnostic system using a Hidden Markov Model (HMM) to detect whether a machine is operating normally or experiencing a malfunction based on the observation of certain sensor readings. The HMM model consists of two possible states: normal and malfunction, as well as two possible observations: within the normal range and outside the normal range.

The manufacturing company collects data from a set of machines during their normal operation. The dataset includes sensor readings such as temperature, pressure, vibration, and electrical current. For each reading, the dataset specifies whether the machine was in a normal or malfunctioning state. Once the model meets the desired performance criteria, it is deployed in the manufacturing facility. The system continuously monitors the sensor readings from the machines in real-time. Whenever the observed readings fall outside the normal range, the HMM model predicts whether the machine is operating normally or experiencing a malfunction.

**Task#02:**

Using a Hidden Markov Model, diagnose whether a person is healthy or sick based on the observation of cough or no cough. The model has two possible states: healthy and sick, and two possible observations: cough and no cough.