AI in Medical Equipment's

Lab Experiments VI

Objectives and Requirements

1. **AI-assisted Wearable ECG Monitoring:**
   - Aim:
     - To enhance ECG monitoring through wearable devices with AI analysis.
   - Objectives:
     - Develop AI algorithms for real-time analysis of wearable ECG data.
     - Implement anomaly detection for early identification of cardiac irregularities.
   - Requirements:
     - Wearable ECG data.
     - Machine learning models for anomaly detection.

2. **Automated Dosage Adjustment in Insulin Pumps:**
   - Aim:
     - To optimize insulin dosage in real-time based on continuous glucose monitoring.
   - Objectives:
     - Develop AI algorithms for predicting glucose trends.
     - Implement closed-loop systems for adaptive insulin pump adjustments.
   - Requirements:
     - Continuous glucose monitoring data.
     - AI models for predictive analytics.

3. **AI-powered Dental Radiography Interpretation:**
   - Aim:
     - To improve dental radiography interpretation through AI.
   - Objectives:
     - Develop deep learning models for detecting dental conditions from X-rays.
     - Implement real-time analysis for precise diagnosis.
   - Requirements:
     - Dental radiography datasets.
     - Deep learning frameworks for image analysis.

4. **Smart Wearables for Epileptic Seizure Prediction:**
   - Aim:
     - To develop wearables for predicting epileptic seizures in advance.
   - Objectives:
     - Develop AI algorithms for analyzing physiological signals indicative of impending seizures.
     - Implement real-time alerts for patients and caregivers.
   - Requirements:
     - Physiological data from wearables.
     - Machine learning models for seizure prediction.

5. **AI-guided Robotic Exoskeletons for Rehabilitation:**
   - Aim:
     - To enhance rehabilitation using AI-assisted robotic exoskeletons.
   - Objectives:
     - Develop AI algorithms for tracking patient movements and adjusting exoskeleton support.
     - Implement personalized rehabilitation programs based on AI assessments.
   - Requirements:
     - Motion tracking data.
     - AI models for movement analysis and control.

6. **Automated Capnography Analysis:**
   - Aim:
     - To automate the analysis of capnography data for respiratory monitoring.
   - Objectives:
     - Develop AI algorithms for interpreting capnography waveforms.
     - Implement real-time alerts for abnormal respiratory patterns.
   - Requirements:
     - Capnography data.
     - Machine learning models for waveform analysis.

7. **AI-assisted Ophthalmic Imaging for Retinopathy Screening:**
   - Aim:
     - To improve the screening of diabetic retinopathy through AI analysis of retinal images.
   - Objectives:
     - Develop deep learning models for identifying retinopathy signs.
     - Implement automated screening programs in ophthalmic clinics.
   - Requirements:
     - Retinal image datasets.
     - Deep learning frameworks for image classification.

8. **Smart Inhalers with Medication Adherence Monitoring:**
   - Aim:
     - To enhance medication adherence through inhalers with embedded sensors.
   - Objectives:
     - Integrate sensors into inhalers for monitoring usage patterns.
     - Develop AI algorithms for analyzing adherence and providing feedback.
   - Requirements:
     - Sensor-equipped inhalers.
     - AI models for usage pattern analysis.

9. **AI-guided Surgical Robots for Minimally Invasive Procedures:**
   - Aim:
     - To improve the precision of surgical robots in minimally invasive surgeries.
   - Objectives:

- o Develop AI algorithms for real-time analysis of surgical scenes.
- o Implement adaptive control systems for robotic instruments.
- Requirements:
  - o Surgical robot video and control data.
  - o AI models for scene analysis and control.

10. **Smart Wheelchairs with AI-based Navigation:**
- Aim:
  - o To develop wheelchairs with AI-powered navigation systems for improved mobility.
- Objectives:
  - o Develop computer vision algorithms for real-time scene analysis.
  - o Implement autonomous navigation capabilities with obstacle avoidance.
- Requirements:
  - o Wheelchair-mounted sensors.
  - o Computer vision and control algorithms.

These experiments highlight the continuous evolution of AI applications in medical equipment, aiming to improve diagnostics, treatment, and patient care across various healthcare domains.