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Capstone

ITAI 2277 Capstone Project Proposal: TriagePal AI Powered Pre-Analysis Tool

Option Selected: B- Student Group Proposed Project

TriagePal is an AI-powered telehealth tool that supports triage nurses and patients by analyzing user-uploaded images (rashes, eyes, wounds) and text-based symptoms before or during ER visits. It streamlines preliminary assessments to reduce ER delays, assists nurses in prioritizing patients, and empowers patients with clear health insights. TriagePal delivers two key outputs:

- **Patient-Friendly Summary:** A simple explanation of health findings like “This rash may need urgent care. Share this with your doctor.”
- **Clinician Report:** A structured summary with triage urgency and key observations for example “Possible infection; high urgency; features: redness, swelling”.

By integrating Computer Vision, NLP, and Machine Learning, TriagePal enhances ER efficiency and patient care, aligning with real-world telehealth needs.

Problem Analysis

Emergency Rooms face overwhelming patient volumes, requiring nurses to make rapid, accurate triage decisions. Patients often provide limited or vague information, such as unprocessed photos of rashes, eye conditions, or wounds, or brief symptom descriptions (“itchy arm”). This slows assessments and risks errors. TriagePal addresses this by pre-analyzing images and text to deliver actionable insights, enabling nurses to prioritize cases efficiently and accurately. By reducing triage delays, TriagePal improves patient outcomes and supports overburdened ER staff, tackling challenges like long wait times and staffing shortages.

Justification for TriagePal:

1. Integrating AI Technologies

- a. Computer vision- Image analysis of rashes/eyes/wounds
- b. NLP – Symptom parsing
- c. Machine Learning, Deep Learning– Triage scoring

2. Real World Application
 - a. Addresses Emergency Room inefficiencies like hospital wait times, validated by research.
3. Collaboration
 - a. GitHub
 - b. Teams virtual meetings
 - c. In person meetings
4. Documentation
 - a. Reports
 - b. User guides
 - c. Live demo
5. Evaluation/ Refinement
 - a. Measure performance F1 score minimum 85% for image classification and refines based on simulated user feedback.

Technical Approach

Inputs:

- Images- User uploaded photos of skin rashes, eyes/iris condition or wounds
- Text Symptoms and pre-existing conditions – Sickle Cell Trait, Migraines, itchy rash on right arm.

Processing

- Computer Vision: Analyze images using CNNs (TensorFlow/PyTorch) for classification of rash types, wound severity – Need datasets like Diverse Dermatology images, eyes and wounds
- NLP: Parse symptoms text using BERT to extract medical entities mapping
- Machine Learning: Ensemble model using Random Forest or Neural net that integrates images and text features to score triage urgency (low, medium, high)

Outputs:

- Clinician report: Summary – “High likelihood of infection, features: redness and swelling urgency: high see contact and share with doctor.
- Patient Summary- Simple explanation “ Your wound may need quick attention”

Architecture:

- Frontend: Streamlit web app for uploads and results display
- Backend: Python based ML pipeline for deployment
- Evaluation: Metrics include precision/recall for image classification, accuracy for triage scoring and user testing for output clarification.

Resource Management

- Tools/Frameworks: Python, Google Colab, GitHub etc.
- Datasets: Find on Kaggle, GitHub, open datasets, synthetic data via GANs if needed

Risk Mitigation: Bias- Use diverse datasets, varied skin tones etc

- Accuracy: Include disclaimers
- Privacy:
- Ethical Considerations:
 - Non-Diagnostic: TriagePal is an assistive tool, with clear disclaimers to avoid misuse
 - Privacy: Implement HIPPA inspired anonymization, no user data stored
 - Evaluation Tests for equitable performance across demographics refine based on fairness.