DR.D. Y. PATIL INSTITUTE OF TECHNOLOGY, PIMPRI, PUNE
Department of Computer Engineering
Class-SE (Computer)

Academic Year: 2024 - 25	**Synopsis**	**Term:** I/II

1. Group Id

41

2. Group Member Names and Roll Number

1. Saurabh Hembade(SCOB46)

2.Harshvardhan Lokhande(SCOB31)

3.Dipak Gayakwad (SCOB44)

4.Abhijeet Kothimbire (SCOB28**)**

3. Project Title

Organ finder : Connecting Lives, Saving Lives

4. Project Option

Internal project

5. Internal Guide and PBL Lab Faculty

Prof. Vasudha Phaltankar

Prof. Sarika Sawarkar

6. Sponsorship and External Guide

Please write if any sponsorship

7. Technical Keywords (As per ACM Keywords)

1. Organ Detection & Matching
    a. Organ Identification using AI
    b. Organ Compatibility Matching
    c. AI – Based Matching Algorithms

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2. AI & Machine Learning
    a. Humanized AI Models
    b. Predictive Analytics for Organ Availability
    c. Deep Learning for Medical Imaging
    d. Adaptive Learning Systems

3. Medical Imaging & Segmentation
    a. Organ Segmentation (CT/MRI)
    b. Image Processing Techniques
    c. Annotation & Labeling Tools
    d. Real-time Organ Detection

4. Database Management
    a. Donor & Recipient Records
    b. Real-time Organ Availability Logs
    c. Cloud-Based Medical Database
    d. Data Consistency & Integrity

5. System Design & Architecture
    a. Modular System Architecture
    b. RESTful API Integration
    c. Scalable Cloud Infrastructure
    d. Fault-Tolerant System Design

6. Web & Mobile Technologies
    a. Cross- platform App Development
    b. Mobile Development (Android)
    c. Android & iOS Integration
    d. Real-time Notifications

7. User Experience & Interface
    a. Patient- Centric Design
    b. . Accessibility & Inclusivity
    c. UX Research & Testing
    d. Intuitive Navigation Flow

8. Data Analytics
    a. Real -time Data Dashboards
    b. Organ Demand-Supply Trends
    c. Predictive Statistical Models
    d. Interactive Visual Reports

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8. Problem Statement

One of the most important medical treatments that can save many lives is organ transplantation. Finding a suitable organ donor for a recipient is still a very difficult and time-sensitive process, even with medical advancements. Lack of an intelligent, integrated system that can effectively match donors and recipients, provide real-time information about organ availability, and guarantee safe, dependable communication between hospitals, patients, and medical professionals is one of the main issues in this field.

Many organ allocation systems in use today are dispersed, decentralized, and rely on manual procedures. Even though an appropriate organ might be available elsewhere, this frequently results in considerable delays in finding one. Ineffective matching algorithms, a lack of real-time updates, and restricted data exchange between healthcare organizations and patients

9. Abstract

Although organ transplantation is a vital, life-saving medical operation, inefficiencies in current systems make the process of locating appropriate organ donors still quite difficult. Often the loss of life that could otherwise be saved results from delays in finding suitable organs, inadequate real-time data sharing between hospitals, and limited access to donor information. With an artificial intelligence-driven solution meant to revolutionize the organ donation and transplantation ecosystem, this project, "Organ Finder: Connecting Lives, Saving Lives," The suggested system enables real-time organ tracking, intelligent donor-recipient matching, and safe data management by including artificial intelligence, medical imaging, and cloud-based technologies. The platform gives humanized AI interactions top priority, so guaranteeing ethical and compassionate communication in addition to technical efficiency. With an eye toward data privacy, user access.

10. Goals and Objectives

- To **save lives** by developing an AI-powered system that intelligently matches organ donors with recipients based on real-time medical compatibility.
- To create a **human-centered platform** that supports emotionally sensitive decision-making with a compassionate, intuitive user experience.
- To enable **real-time organ tracking and availability updates** across hospitals and transplant centers.
- To implement a **cloud-based, scalable architecture** for seamless and synchronized data sharing among healthcare networks.
- To provide **interactive dashboards and data visualizations** for monitoring

organ demand, supply trends, and system performance.

- To increase **transparency and trust** in the organ donation ecosystem using explainable AI and ethical practices.
- To raise **awareness and encourage participation** in organ donation through accessible mobile and web platforms.
- To promote **collaboration between humans and AI**, where technology supports but never replaces the empathy of medical professionals
- To build a system that not only functions efficiently but **connects lives with care, trust, and innovation**.

11. Review of Conference/Journal Papers supporting Project idea

Several conference and journal papers discuss project ideas related to attendance management systems, employing various technologies and methodologies. A review of these papers is as follows:

- AI driven Organ Matching & allocation
  - Smart Match: Revolutionizing Organ Allocation through Artificial Intelligence
    Deshpande (2024) introduces "Smart Match," an AI-based system that enhances organ matching precision by leveraging machine learning algorithms. It addresses complexities in donor-recipient pairing, immunosuppression management, and post-operative care, aiming to minimize waitlist mortality and improve patient outcomes.
  - Adaptively Weighted Top-N Recommendation for Organ Matching
    Shojaee et al. (2021) propose the AWTR method, treating organ matching as a top-N recommendation problem. This approach improves upon traditional scoring models by emphasizing the accuracy of top-N ranked matches, utilizing historical data and donor-recipient covariates.
  - Learning Matching Representations for Individualized Organ Transplantation Allocation
    Xu et al. (2021) present a model that learns data-driven rules for organ matching using observational data. Their approach outperforms traditional methods by estimating transplant outcomes under counterfactual matches, enhancing donor-recipient compatibility predictions.

- Organ segmentation and imaging :
  - Organ Finder – A New AI-Based Organ Segmentation Tool for CT
    Edenbrandt et al. (2022) developed Organ Finder 2.0, a convolutional

neural network trained on a diverse dataset of CT scans. This tool accurately segments 22 organs, achieving an average Dice index of 0.93, facilitating precise organ identification in CT imaging.

- Multi-Site Organ Segmentation with Federated Partial Supervision and Site Adaptation
  Liu et al. (2023) address challenges in multi-site organ segmentation by employing federated learning and site adaptation techniques. Their model aggregates data from multiple sites while maintaining privacy, achieving performance comparable to centrally trained models.

- Donor Screening and predictive analytics :
  - Automated Screening of Potential Organ Donors Using a Temporal Machine Learning Model
    Chassé et al. (2023) developed a neural network-based model that analyzes longitudinal clinical and laboratory data to identify potential organ donors. The model demonstrated high accuracy and robustness across various donor subgroups.
  - A Transformer-Based Deep Learning Approach for Fairly Predicting Post-Liver Transplant Risk Factors
    Li et al. (2023) introduced a deep learning model that predicts multiple post-transplant risk factors. By employing a multi-task learning framework and fairness algorithms, the model ensures equitable predictions across different patient demographics.

- Comprehensive Revies On AI Organ transplantation :
  - The Impact of Artificial Intelligence and Machine Learning in Organ Retrieval and Transplantation: A Comprehensive Review
    This 2025 review discusses the transformative role of AI and ML in organ transplantation, highlighting advancements in donor-recipient matching, surgical planning, predictive analytics, and operational efficiency within transplant centers.

12. Plan of Project Execution

- **Phase 1: Requirements Gathering & Analysis (Week 1-2)**
  - **Tasks:**
    - **Task 1**: Conduct meetings with medical professionals, organ transplant centers, and stakeholders to understand the challenges and requirements for organ transplantation

- **Task 2:** Define functional requirements (e.g., organ detection, matching algorithm, real-time tracking) and non-functional requirements (e.g., system performance, data security).
- **Task 3**: Define user roles (e.g., donor, recipient, transplant center administrator) and their permissions (e.g., data access, updates, reporting).

- **Deliverables**:
  - Functional and non-functional requirements document
  - User roles and permissions outline

- **Phase 2: System Design (Week 2-4)**
  - **Tasks:**
    - **Task 1**: Create a system architecture diagram, showing the integration of the frontend, backend, AI models, and cloud-based data storage.
    - **Task 2**: Design the database schema for storing organ matching data, donor-recipient information, and transplant details.
    - **Task 3**: Finalize the technology stack (e.g., Python for AI model development, cloud database solutions like AWS or Firebase, mobile technologies for frontend).
  - **Deliverables**:
    - System architecture diagram
    - Database schema
    - Finalized technology stack

Phase 3: Development and Implementation (Week 4-8)

- **Tasks**
  - **Task 1:** Research and implement the organ detection model using deep learning techniques (e.g., U-Net, V-Net).
  - **Task 2**: Train the model using medical imaging datasets to ensure accurate organ detection.
  - **Task 3**: Develop and integrate an organ matching algorithm using donor-recipient data and machine learning (e.g., recommendation systems).
- **Frontend Development**
  - **Task 1**: Design and build web and mobile user interfaces (for transplant centers, medical professionals, and patients).
  - **Task 2**: Integrate AI models for real-time organ tracking and matching within the frontend.
- **Integration of Real Time Tracking**
  - **Task 1**: Implement GPS tracking for organ transportation.
  - **Task 2:** Integrate real-time notifications for transplant centers about organ availability and transportation.
- **Deliverables:**
  - Developed AI models for organ detection and matching
  - Backend API integration and cloud database setup
  - Frontend applications for organ matching and tracking

- **Phase 4: Testing (Week 9-10)**
  - **Tasks**
    - **Task 1**: Perform unit testing for individual modules (organ detection model, matching algorithm, frontend interface).
    - **Task 2:** Perform integration testing to ensure smooth

interaction between different components (AI model, database, frontend).

- **Task 3:** Conduct performance testing to ensure the system can handle real-time data and multiple users simultaneously.
- **Task 4:** Conduct security testing to ensure data protection and compliance with HIPAA and GDPR.

- **Deliverables**
  - Unit, integration, and performance testing reports
  - Security audit and vulnerability testing report

- **Phase 5: Deployment (Week 10-11)Frontend Development**
  - **Tasks**
    - **Task 1:** Deploy the web and mobile applications to cloud servers (e.g., AWS, Google Cloud).
    - **Task 2:** Set up monitoring systems to track system performance, identify issues, and gather user feedback.
    - **Task 3**: Provide training to medical professionals and transplant center staff on how to use the system.
  - **Deliverables:**
    - Deployed system on cloud servers
    - Monitoring and feedback systems in place
    - User training and support materials

Phase 6: Maintenance and Updates (Ongoing)Tasks:

- **Tasks**
  - **Task 1:** Continuously monitor the system for performance

issues, errors, and security vulnerabilities.

- **Task 2:** Collect feedback from medical professionals, transplant centers, and patients to identify areas for improvement.
- **Task 3:** Release regular updates to enhance system functionality, fix bugs, and improve AI model accuracy.

- **Deliverables**
  - Ongoing system performance reports
  - Update and enhancement logs
  - User feedback collection and improvement plans

Project Guide
Name and Sign

PBL Lab Faculty
Name and Sign

PBL Coordinator
Mrs. Vasudha Phaltankar
Ms. Rubi Mandal

HOD
Dr. Vinod Kimbahune