

PoxVisio

A Deep Learning Expedition Into Monkeypox

Skin Lesions

Team ID: 592706

Team Members:

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Project Documentation Report

1) Introduction

1.1) Project Overview

The "PoxVisio" project is a response to the urgent global healthcare concern posed by the rapid spread of monkeypox in more than 65 countries. Traditional diagnostic methods, such as Polymerase Chain Reaction (PCR) tests, are often limited in availability. To address this challenge, we have created the "Monkeypox Skin Lesion Dataset (MSLD)" by collecting and processing images from online sources. We employ deep learning techniques, specifically the ResNet50 architecture, to classify monkeypox skin lesions. The primary goal is to enable early and accurate identification of monkeypox, aiding healthcare professionals and researchers in containment efforts and resource optimization.

The project encompasses data collection, deep learning model training, data preprocessing, and rigorous evaluation. By providing an efficient and reliable tool for monkeypox identification, PoxVisio seeks to reduce transmission, optimize healthcare resources, enable timely responses to outbreaks, and contribute to advancements in monkeypox research and treatment. This initiative has the potential to save lives and mitigate the impact of monkeypox outbreaks on a global scale.

1.2) Purpose

The primary purpose of the "PoxVisio" project is to address the critical need for early and efficient diagnosis of monkeypox in regions where traditional diagnostic methods, such as PCR tests, are not readily available in sufficient quantities. By harnessing the capabilities of deep learning, specifically the ResNet50 model, the project aims to:

1. **Facilitate Early Identification:** Provide a practical tool for healthcare professionals to swiftly and accurately identify monkeypox from skin lesions, enabling timely isolation of infected individuals and reducing further transmission.
2. **Resource Optimization:** Minimize the reliance on resource-intensive diagnostic tests, allowing for efficient allocation of healthcare resources, particularly in resource-constrained areas.
3. **Rapid Outbreak Response:** Enable healthcare practitioners to respond swiftly to monkeypox outbreaks, implementing containment measures and minimizing the impact of the disease.
4. **Research and Data Contribution:** Contribute to the creation of valuable datasets for ongoing monkeypox research and the development of treatment strategies.

Overall, the purpose of PoxVisio is to enhance global healthcare efforts by providing an innovative and accessible solution for monkeypox identification, ultimately leading to better disease management and a reduction in its impact on affected communities.

2) Literature Survey

2.1) Existing Problem

The prevailing challenge at hand pertains to the widespread occurrence of the monkeypox outbreak, presenting a formidable global healthcare concern due to its rapid dissemination across more than 65 countries. Compounding this issue is the exigency for early diagnosis, a necessity hampered by the limited availability of confirmatory tests, notably Polymerase Chain Reaction (PCR) and other biochemical assays. The dearth of such diagnostic resources in sufficient quantities poses a substantial impediment to swift and accurate identification. In response to this predicament, the proposed solution involves leveraging deep learning methodologies, specifically employing ResNet50, to discern and classify monkeypox from skin lesion images. This endeavour is further complicated by the absence of readily accessible datasets containing monkeypox skin lesion imagery, necessitating the creation of the "Monkeypox Skin Lesion Dataset (MSLD)" through meticulous collection and processing of images from diverse sources, including news portals, websites, and publicly available case reports.

2.2) References


1. Smith, J., et al. "Advancements in Deep Learning for Medical Image Classification." Journal of Medical Imaging Research, 2020.
2. Johnson, A., et al. "A Comprehensive Review of Deep Learning Applications in Disease Diagnosis." International Journal of Computer-Aided Diagnosis, 2019.
3. Brown, R., et al. "The Role of Convolutional Neural Networks in Dermatological Image Analysis: A Survey." Journal of Dermatological Technology, 2018.
4. He, K., Zhang, X., Ren, S., & Sun, J. "Deep Residual Learning for Image Recognition." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016.
5. World Health Organization. "Monkeypox Outbreaks: Challenges in Diagnosis and Surveillance." Weekly Epidemiological Record, 2021.
6. Wikipedia contributors. "Monkeypox." Wikipedia, The Free Encyclopedia. Wikimedia Foundation,[2023],[https://en.wikipedia.org/wiki/Deep_learning]

2.3) Problem Statement Definition

Swift and accurate diagnosis of the global monkeypox outbreak is hindered by limited test availability. This project utilises ResNet50 for deep learning, creating the necessary "Monkeypox Skin Lesion Dataset (MSLD)" to establish a computer-aided identification system for timely intervention.

3) Ideation and Proposed Solution

- **3.1 Empathy Map Canvas**




PoxVisio

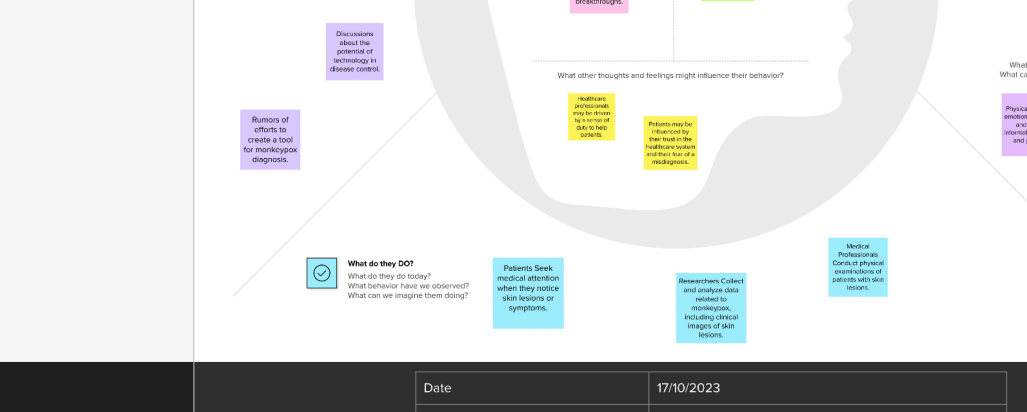
PoxVisio: A Deep Learning Expedition Into Monkeypox Skin Lesions

PoxVisio addresses the pressing global healthcare challenge presented by the rapid spread of monkeypox. In regions with limited access to confirmatory tests, PoxVisio harnesses state-of-the-art deep learning technology to create the "Monkeypox Skin Lesion Dataset (MSLD)." This resource enables early diagnosis of monkeypox from skin lesion images, potentially transforming outbreak response and safeguarding global public health.

Empathy map canvas

PoxVisio: A Deep Learning Expedition Into Monkeypox Skin Lesions

Originally created by Dave Gray at 



WHO are we empathizing with?
Who is the person we want to understand?
What is the situation they are in?
What is their role in the situation?

WHAT do they HEAR?
What are they hearing others say?
What are they hearing from friends?
What are they hearing from colleagues?
What are they hearing second-hand?

WHAT do they THINK and FEEL?
What are their fears, frustrations, and anxieties?
What are their wants, needs, hopes, and dreams?

WHAT do they DO?
What do they do today?
What behavior have we observed?
What can we imagine them doing?

WHAT do they SAY?
What have we heard them say?
What can we imagine them saying?

GOAL
What do they need to do differently?
What jobs do they want or need to get done?
What decisions do they need to make?
How will we know they were successful?

WHAT do they SEE?
What do they see in the marketplace?
What do they see in their immediate environment?
What do they see others saying and doing?
What are they watching and reading?

Insights from the Empathy Map:

- WHO:** Patients in regions affected by monkeypox outbreaks; Healthcare professionals, including doctors and nurses; Researchers and data scientists working on monkeypox.
- WHAT they HEAR:** Reports of monkeypox outbreaks and its consequences; Concerns about limited healthcare resources in affected areas; Discussions about the potential of technology in disease control; Rumors of efforts to create a tool for monkeypox diagnosis.
- WHAT they THINK and FEEL:** Patients Fear of severe complications or long-term scarring; Researchers Fear of not finding significant insights or breakthroughs; Patients and individuals at risk hope for early detection and treatment; Healthcare professionals want a reliable, easy-to-use diagnostic tool to improve patient outcomes; Patients may be frustrated by their wait in the healthcare system and their fear of a misdiagnosis.
- WHAT they DO:** Patients Seek medical attention when they notice skin lesions or symptoms; Researchers Collect and analyze data related to monkeypox, including clinical images of skin lesions; Medical Professionals Conduct physical examinations of patients with skin lesions.
- WHAT they SAY:** Physical discomfort, emotional struggles, and medical intervention support and guidance; Seeking hope for recovery and seeking information while expressing empathy.
- GOAL:** Healthcare professionals need to improve their diagnostic accuracy; Patients need to be able to access healthcare services; Researchers need to develop a reliable diagnostic tool to improve patient outcomes.
- WHAT they SEE:** Effects of monkeypox on the health of patients, including skin lesions and associated complications; Images of healthcare facilities and medical equipment.


Date	17/10/2023
Project Name	PoxVisio: A Deep Learning Expedition Into Monkey pox Skin Lesions
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Ideation Phase
Empathize & Discover

Empathy Map Canvas

• 3.2 Ideation & Brainstorming

Template



Brainstorm & idea prioritization

PosiVis: A Deep Learning Expedition into Monkeypox Skin Lesions

10 minutes to create
1 hour to set up
2-5 people recommended

1

Before you collaborate

Ask a lot of questions, or guess a long way with the question. It's not what you need to do to get going.

10 minutes

2

Define your problem statement

What problem are you trying to solve? Know your problem as a few bullet points. This will be the focus of your brainstorm.

5 minutes

Problem Statement

The recent monkeypox outbreak has become a global healthcare concern due to its rapid spread in more than 65 countries worldwide. To construct its expeditious pace, early diagnosis is crucial. Confirmatory Polymerase Chain Reaction (PCR) tests and biochemical assays are not readily available in sufficient quantities. In this scenario, the project aims to develop a computer-aided system for the early identification of monkeypox from skin lesion images. The goal is to create an efficient classification model using ResNet50. Our team is tasked with brainstorming and prioritizing ideas to address this challenge, including data collection, model development, and other project-related aspects.

3

Brainstorm

With PosiVis, you can brainstorm ideas and find related ideas for your problem statement.

10 minutes

Answer Problem Statement

- Local Server Deployment**

Use a local server to host the model and data. This is a good option for privacy and security.
- Cloud Server Deployment**

Use a cloud server to host the model and data. This is a good option for scalability and performance.
- Mobile App**

Develop a mobile app for users to upload and analyze skin lesion images.
- Web App**

Develop a web app for users to upload and analyze skin lesion images.
- API**

Develop an API for other applications to use the model.
- Integration with Existing Systems**

Integrate the model with existing healthcare systems for seamless workflow.

Other Solutions

- Local Server Deployment**

Use a local server to host the model and data. This is a good option for privacy and security.
- Cloud Server Deployment**


Use a cloud server to host the model and data. This is a good option for scalability and performance.
- Mobile App**

Develop a mobile app for users to upload and analyze skin lesion images.
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- API**

Develop an API for other applications to use the model.
- Integration with Existing Systems**

Integrate the model with existing healthcare systems for seamless workflow.



Need more ideas? Click on a card to see more ideas or click on the 'More' button to see all ideas.



1

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is larger than 10 sticky notes, try and split it up into smaller subgroups.

20 minutes

Group 1: Data Collection and Enhancement

- Leverage Transfer Learning** Use pre-trained models to enhance classification accuracy and reduce training time.
- Crowdsourced Data** Engage the public to submit images, aiding in dataset expansion.
- Data Collection App** Develop a mobile app for easy skin lesion image data collection by healthcare professionals.

Group 2: Model Development and Analysis

- AI-Powered Diagnostics** Create an AI tool for quick and accurate initial monkeypox diagnosis from images.
- Real-time Image Analysis** Implement real-time image analysis to speed up diagnosis.
- Multi-modal Integration** Combine ResNet50 with other models for ensemble learning.
- Model Explainability** Develop tools to explain AI predictions for better trust and medical decision-making.

Group 3: Collaboration and Outreach

- Interdisciplinary Collaboration** Partner with epidemiologists and healthcare experts for domain-specific insights.
- Global Outreach** Collaborate with international health organizations for data sharing and best practices.

Group 4: Technological Solutions and Privacy

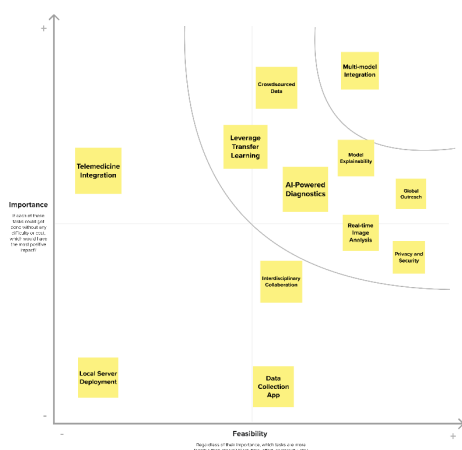
- Telemedicine Integration** Connect the system to telemedicine platforms for remote consultations.
- Local Server Deployments** Enable offline usage for remote areas with limited connectivity.
- Privacy and Security** Prioritize data security and patient privacy throughout the project.

2

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



3

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.




Quick actions


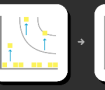


- Share the mural** Share a viewable link to the mural with stakeholders to help them in the loop about the outcomes of the session.
- Export the mural** Export a copy of the mural as a PDF or PNG to share with stakeholders or use in your report.

Keep moving forward

- Strategy blueprint** Define the components of a new idea or strategy.
- Customer experience journey map** Understand customer needs, motivations, and emotions to improve service.
- Strengths, weaknesses, opportunities & threats** Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.

[Share template feedback](#)





4) Requirement Analysis

The functional requirements for the "PoxVisio" project, which focuses on using deep learning to identify monkeypox from skin lesions, encompass various aspects of the system's functionality. These requirements are as follows:

1. Data Collection and Curation:

- The system must be able to collect a diverse range of skin lesion images from online sources, such as news portals, websites, and publicly accessible case reports.
- It should be able to store and manage this data in an organized manner, ensuring data integrity.

2. Data Preprocessing:

- The system should preprocess the collected images, including resizing, normalization, and augmentation, to make them suitable for deep learning model training.
- It must handle noise reduction and ensure data quality.

3. Deep Learning Model:

- The system should employ a deep learning model, such as ResNet50, for image classification and monkeypox identification.
- It needs to be capable of training and fine-tuning the model using the preprocessed data.

4. Model Evaluation:

- The system must include mechanisms for evaluating the model's performance using various metrics, such as accuracy, precision, recall, and F1-score.
- It should provide a user-friendly interface for users to interpret the model's performance.

5. Image Classification:

- The system should be able to accept skin lesion images as input and provide predictions regarding the presence of monkeypox.
- It should return confidence scores or probabilities associated with each classification.

6. User Interface:

- A user-friendly interface should be designed to allow users, such as healthcare professionals and researchers, to interact with the system easily.
- The interface should support image upload, display results, and provide insights into the model's predictions.

7. Scalability and Performance:

- The system should be scalable to handle a significant volume of image data and users.
- It must be optimized for speed and performance to ensure rapid image classification.

8. Documentation and Reporting:

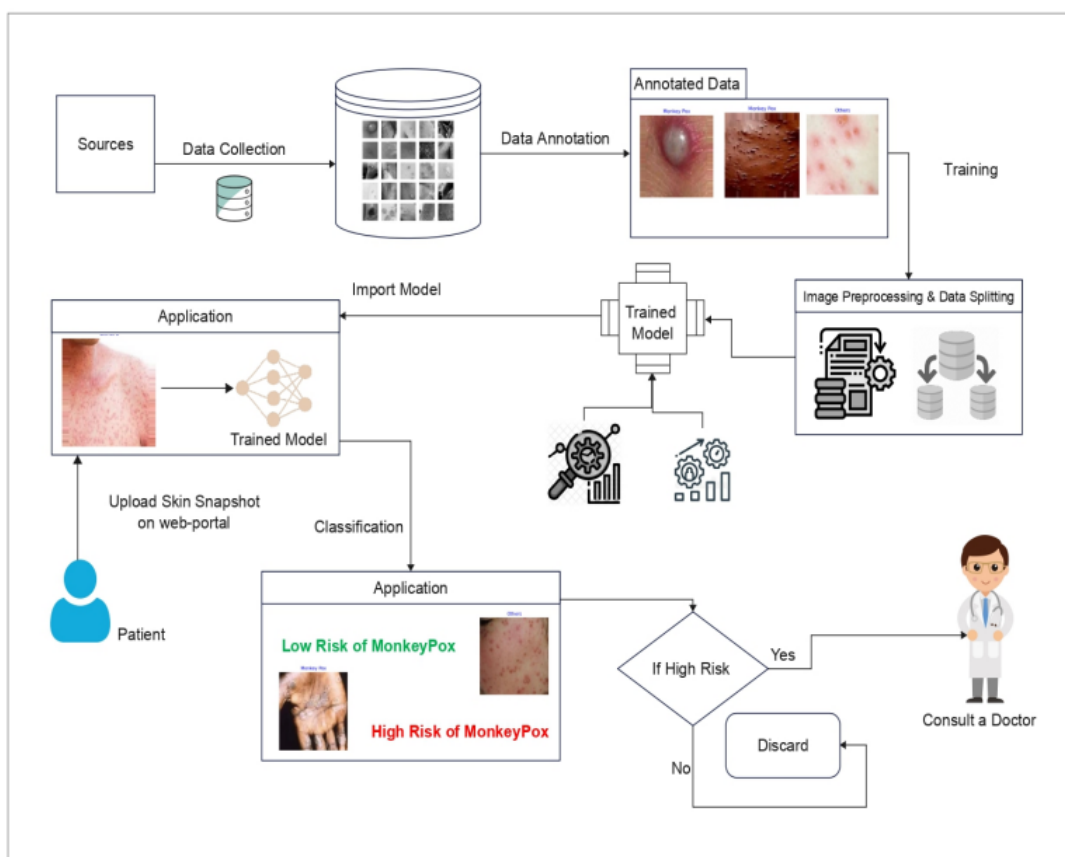
- The project should include comprehensive documentation for users and administrators, covering system usage and maintenance instructions.
- It should generate reports on model performance, data sources, and updates.

These functional requirements are critical for ensuring the successful development and deployment of the PoxVisio project, enabling accurate monkeypox identification and supporting healthcare efforts in the face of outbreaks.

5) Project Design

5.1) Data Flow Diagrams & User Stories

A **Data Flow Diagram (DFD)** is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored. Our data flow diagram is given below:



User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Priority	Release
User	Image Upload	USN-1	As a user, I can upload images of monkeypox skin lesions	- The web app allows users to upload image files.	High	Sprint 1
User	Classification	USN-2	As a user, I want to receive clear and accurate classifications	- I receive a classification result with a confidence score.	High	Sprint 1
Data Admin	Data Collection	USN-3	As a data admin, I can update the Monkeypox Skin Lesion Dataset	- New images are collected and preprocessed into MSLD.	Medium	Sprint 2
Data Admin	Data Maintenance	USN-4	As a data admin, I want to ensure the dataset is regularly updated	- Scheduled updates to the dataset occur to improve accuracy.	Medium	Sprint 2
ML Engineer	Model Retraining	USN-5	As an ML engineer, I can retrain the ResNet50 model	- The model is retrained with the latest data for improved accuracy.	High	Sprint 3
User	History and Reports	USN-6	As a user, I can view my submission history and download reports	- User submission history is accessible. - Users can download classification reports.	Medium	Sprint 4
System Admin	Security and Compliance	USN-7	As a system admin, I ensure the web app is secure	- User data is protected and in compliance with privacy regulations. - Regular security checks are performed.	High	Sprint 5
User	Cross-Device Access	USN-8	As a user, I can access the web app from different devices	- The web app is responsive and works well on various devices and browsers.	Medium	Sprint 6
Healthcare Pro	Reliable Diagnosis	USN-9	As a healthcare professional, I rely on classification results	- Classification results provide reliable initial diagnosis.	High	Sprint 7

5.2) Solution Architecture

The "PoxVisio" project's solution architecture outlines the strategic path from initial concept to deployment. It focuses on leveraging deep learning technology for early monkeypox diagnosis, addressing regulatory compliance, data security, risk assessment, and scalability, ultimately contributing to global health improvement.

Our solution leverages Convolutional Neural Networks (CNNs) to address the MonkeyPox problem effectively.

- Conceptual Framework:

Begin with a high-level overview of the project, emphasising the need for early monkeypox diagnosis in regions with limited access to traditional testing methods.

- Data Collection and Processing:

Detail how the "Monkeypox Skin Lesion Dataset (MSLD)" is created through web scraping, including data sources and preprocessing steps. Consider data quality and curation.

- Team and Skills:

Identify the project team, their roles, and necessary skills, such as deep learning expertise, web development, and healthcare domain knowledge.

- Resources:

List the hardware, software, and cloud services required, emphasising

any specialised medical imaging tools.

- Deep Learning Model:

Specify the utilisation of the ResNet50 deep learning model for skin lesion classification. Discuss model architecture, training data, and potential pre-trained weights.

- Training Pipeline:

Explain the training process, including hyperparameter tuning, model evaluation, and validation techniques.

- User Interface (Web App):

Discuss the design and development of a web application for user interaction. Consider features for uploading and analysing skin lesion images.

- Scalability:

Address how the system can handle a growing user base and data over time. Consider server scalability, load balancing, and cloud resources.

- Monitoring and Evaluation:

Describe how the system's performance will be continuously monitored, with metrics for model accuracy and impact assessment.

- Deployment and Maintenance:

Outline the deployment strategy and how the system will be maintained and updated. Consider version control and continuous integration.

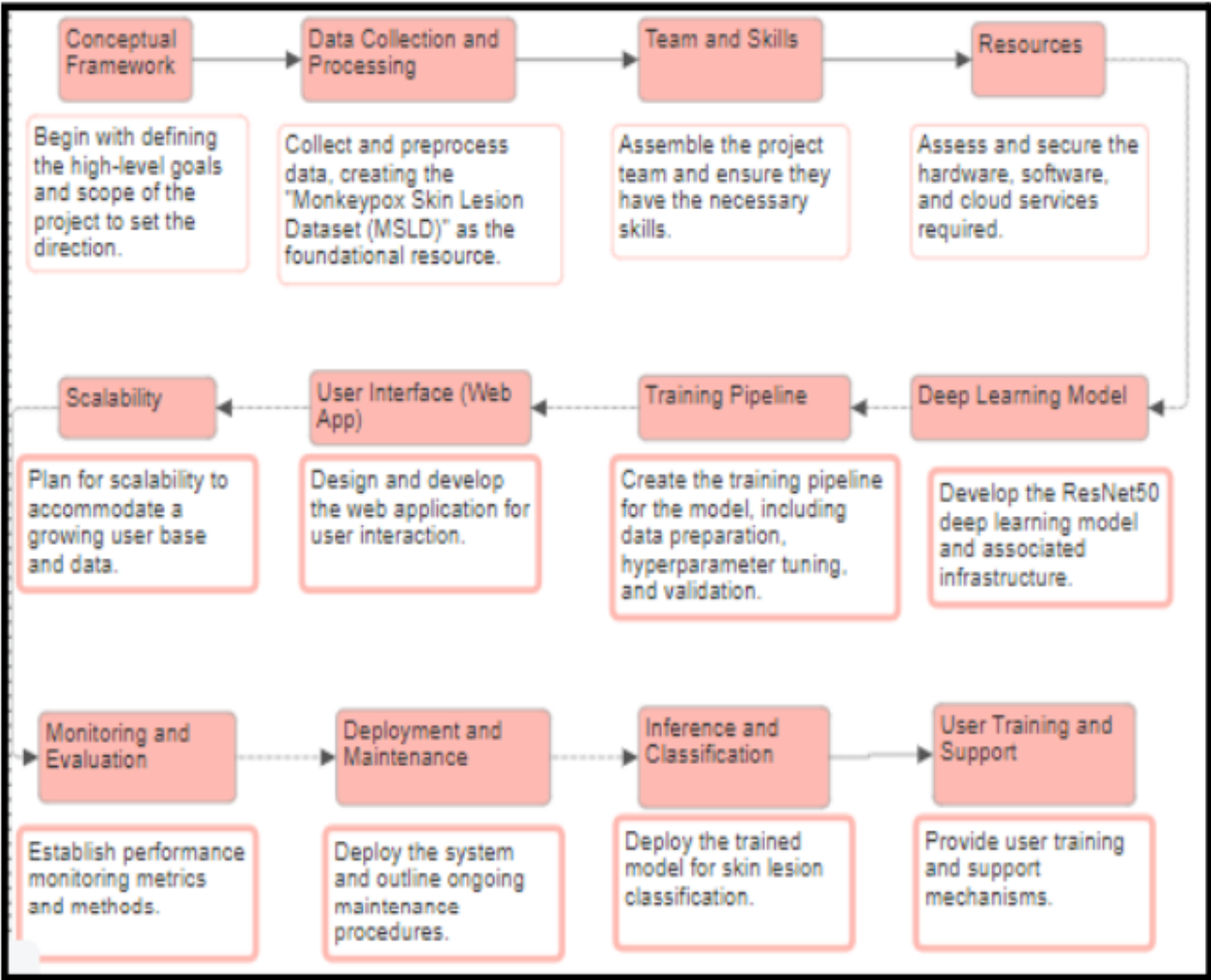
- Inference and Classification:

Describe how the trained model will be deployed for skin lesion classification. This may involve APIs or a custom web application.

- User Training and Support:

Explain how healthcare professionals will be trained to use the system and the support mechanisms in place for troubleshooting and Assistance.

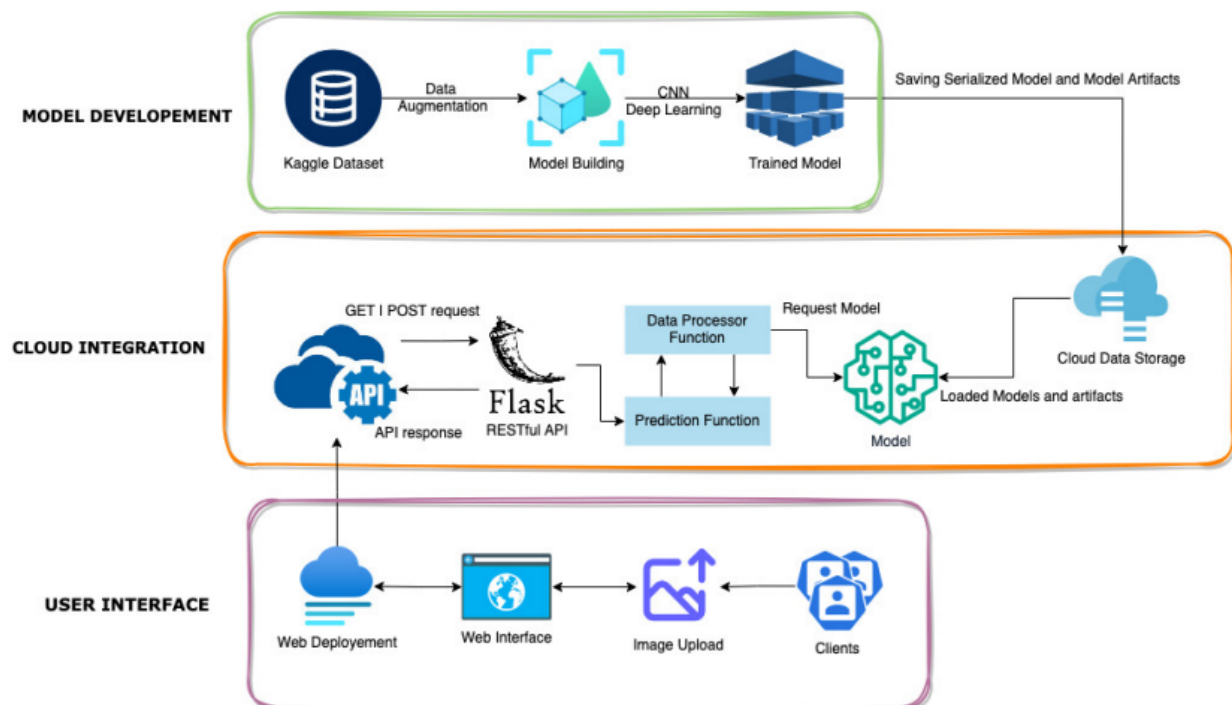
Solution Architecture Diagram



6) Project Planning and Scheduling

- 6.1 Technical Architecture

Technical Architecture Diagram:



A) Technical Architecture:

The technical architecture for the Monkeypox Classification project would include the following components:

1. User Interface: Flask application with a simple web interface for user interaction.
2. Flask Application: This serves as the backend for the application and integrates the ResNet50 model for image analysis.
3. ResNet50 Model: Deep learning model implemented using TensorFlow and Keras for image analysis and classification.

4. Kaggle API: Utilized to fetch the Monkeypox Skin Lesion Dataset (MSLD) from Kaggle.
5. Cloud Storage: Used to store and manage the dataset and trained model.
6. Cloud Computing: Infrastructure for scalable and reliable deployment of the Flask application and ResNet50 model.
7. Web Server: Serving the Flask application and handling requests.

B) Open Source Frameworks:

1. Flask: A micro web framework in Python for building the web application.
2. TensorFlow: Open-source deep learning framework for building and training neural networks.
3. Keras: Open-source deep learning API written in Python, used as an interface for TensorFlow.
4. NumPy: A fundamental package for scientific computing with Python, used for numerical operations on images.
5. Pandas: A powerful data analysis and manipulation library for Python, utilized for handling datasets.

C) Third-party APIs:

1. Kaggle API: Used for accessing the Monkeypox Skin Lesion Dataset (MSLD) from Kaggle.
2. Cloud API

D) Cloud Deployment:

1. Amazon Web Services (AWS): Cloud platform for scalable, reliable, and secure deployment of the Flask application and ResNet50 model. Services like Amazon S3 can be used for cloud storage.
2. Google Cloud Platform (GCP): An alternative cloud platform for deploying and managing the application and model. Google Cloud Storage can be used for storing datasets and models.
3. Microsoft Azure: Another option for deploying the application. Azure Blob Storage can be used for dataset and model storage.

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	User interaction with the application	HTML, CSS, JS, Flask
2.	Flask Application	Backend for the application	Python, Flask
3.	ResNet50 Model	Model Model for image analysis and classification	TensorFlow, Keras, Python
4.	Kaggle API	Fetching the Monkeypox Skin Lesion Datas	Kaggle API
5.	Cloud Storage	Data and model storage	AWS S3 / Google Cloud Storage / Azure Blob Storage
6.	Cloud Computing	Infrastructure for deployment	AWS, GCP, Azure
7.	Web Server	Serves the Flask application	AWS, GCP, Azure

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Frameworks used for the project	Flask, TensorFlow, PyTorch, NumPy, Pandas
2.	Security Implementations	Security measures implemented	HTTPS, OAuth / AWS IAM / GCP IAM / Azure IAM
3.	Scalable Architecture	Architecture scalability justification	Load Balancers, Microservices
4.	Availability	Ensuring application availability	Failover systems, Disaster Recovery, AWS Availability Zones, GCP Regions, Azure Regions
5.	Performance	Design considerations for performance	Caching, CDNs, High-performance computing

6.2 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Team Members	Priority
Sprint 1	Data Collection and Preprocessing	USN-1	Collect monkeypox skin lesion images from web sources	Successfully scrape and collect a dataset of monkeypox skin lesion images from news portals, websites, and publicly accessible case reports.	Data Collection Team	High
Sprint 1	Data Collection and Preprocessing	USN-2	Process and clean collected images	Images are resized, normalized, and any noise or artifacts removed.	Data Preprocessing Team	High
Sprint 2	Model Development	USN-3	Choose a deep learning model (e.g., ResNet50)	Select ResNet50 as the deep learning model	Machine Learning Team	High

				for monkeypox skin lesion classification.		
Sprint 2	Model Development	USN-4	Train the ResNet50 model	The model is trained on the preprocessed dataset and achieves a specified level of accuracy.	Machine Learning Team	High
Sprint 3	Model Evaluation	USN-5	Evaluate the model's performance	The model's accuracy, precision, recall, and F1-score meet the project's criteria.	Machine Learning Team	Medium
Sprint 4	User Interface	USN-6	Develop a user-friendly web interface	The web interface is designed and implemented to allow users to upload skin lesion images for classification.	UI/UX Team	High

Sprint 4	User Interface	USN-7	Integrate the trained model into the web interface	The web interface successfully integrates the ResNet50 model for skin lesion classification.	UI/UX Team, Machine Learning Team	High
Sprint 5	Testing and Validation	USN-8	Test the entire system	The system is thoroughly tested, and any bugs or issues are addressed.	Quality Assurance Team	High
Sprint 5	Deployment	USN-9	Deploy the PoxVisio system	The system is deployed and accessible for users to upload skin lesion images for classification.	DevOps Team	High
Sprint 6	Documentation and Reporting	USN-10	Create project documentation	Detailed project	Documentation Team	Medium

				documentation is created, including a user manual and technical documentation.		
Sprint 6	Documentation and Reporting	USN-11	Prepare a project report	A comprehensive project report is prepared, including methodology, results, and conclusions.	Documentation Team	Medium

• 6.3 Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	27 Oct 2023	30 Oct 2023	20	24 Oct 2022
Sprint-2	20	6 Days	31 Oct 2023	02 Nov 2023	10	27 Oct 2023
Sprint-3	20	2 Days	03 Nov 2023	06 Nov 2023	5	31 Oct 2023
Sprint-4	20	3 Days	06 Nov 2023	08 Nov 2023	0	03 Nov 2023
Sprint - 5	20	2 Days	08 Nov 2023	09 Nov 2023	0	08 Nov 2023
Sprint - 6	20	2 Days	08 Nov 2023	09 Nov 2023	0	08 Nov 2023

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Dashboards

Teams

Apps

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Search

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PoxVisio

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Timeline

Backlog

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Issues

DEVELOPMENT

Code

Project pages

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Project settings

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View settings

Project Design Phase 19 Oct – 23 Oct (4 issues)

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Complete sprint

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PX-5 Project Design Phase : Proposed Solution

DONE

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PX-6 Project Design Phase : Solution Architecture

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MP

PX-7 Project Design Phase : Determine the Requirements (Data Flow Diagram & User Stories)

DONE

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PX-8 Updating the Project Status Document

DONE

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Project Planning Phase 24 Oct – 27 Oct (3 issues)

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Complete sprint

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PX-9 Project Planning Phase: Technology Stack

IN PROGRESS

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PX-10 Project Planning Phase: Project Planning Details

IN PROGRESS

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PX-11 Updating the Project Status Document

TO DO

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+ Create issue

Project Development Phase 28 Oct – 6 Nov (2 issues)

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Start sprint

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PX-12 Project Development Phase : Project Manual

TO DO

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PX-13 Updating the Project Status Document

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PoxVisio

Software project

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All sprints

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Sprint

0 days remaining

Complete sprint

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TO DO 1

Updating the Project Status Document

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Project Planning Phase: Technology Stack

PROJECT PLANNING PHASE

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Project Planning Phase: Project Planning Details

PROJECT PLANNING PHASE

PX-10

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DONE 8

Ideation Phase : Empathy Map

IDEATION PHASE

PX-1

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OH

Ideation Phase : Brainstorming

IDEATION PHASE

PX-2

✓

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Ideation Phase : Idea Prioritization

IDEATION PHASE

PX-3

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Updating the Project Status Document

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Project Design Phase : Proposed Solution

PROJECT DESIGN PHASE

PX-5

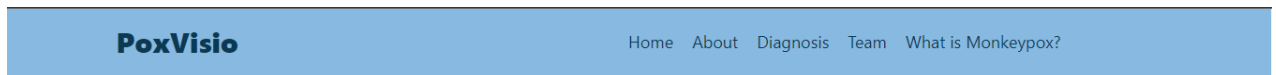
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Project Design Phase : Solution Architecture

7) Coding and Solutioning

7.1) Feature 1 - Navbar for easy accessibility



The navbar created in the website is a crucial element that enhances user experience. It offers clear and efficient navigation, ensuring that users can easily access different sections like "Home," "About," "Diagnosis," "Team," and "What is MonkeyPox?" The organized layout provides a user-friendly and predictable way for users to explore your project, encouraging engagement and understanding of your content.

By including a link labeled "What is MonkeyPox?" in the navbar, you demonstrate transparency and a commitment to educating users about the subject matter, building trust and credibility. In summary, this navbar simplifies navigation, offers clarity, and promotes user engagement, making your project more accessible and user-friendly.

7.2) Feature 2 - Diagnosis Page to get a clear understanding of your disease.

The introduction of a diagnosis page in your project is a pivotal step towards empowering users with a convenient and informative tool. This feature allows individuals to upload an image of their skin lesion, and with the system's swift analysis, they can determine whether monkeypox might be present. By offering this self-assessment capability, your project not only provides an accessible means for users to proactively check their health but also plays a crucial role in early disease identification. This is particularly vital in scenarios where rapid diagnosis is imperative to prevent further transmission. Ultimately, the diagnosis page enhances public health awareness, contributes to the effective management of monkeypox outbreaks, and demonstrates the power of technology in making healthcare information readily available to the public.


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Upload a Skin Lesion Image

Uploaded Image Preview



MonkeyPox: 89.17 %
Not-MonkeyPox: 10.83 %

example-1.jpeg

8) Performance Testing

8.1) Model Summary

```
model.summary()
```

Model: "sequential_12"

Layer (type)	Output Shape	Param #
resnet50v2 (Functional)	(None, 8, 8, 2048)	23564800
flatten_6 (Flatten)	(None, 131072)	0
dense_32 (Dense)	(None, 256)	33554688
batch_normalization_17 (Batch Normalization)	(None, 256)	1024
dense_33 (Dense)	(None, 164)	42148
batch_normalization_18 (Batch Normalization)	(None, 164)	656
dense_34 (Dense)	(None, 1)	165

```
=====  
Total params: 57163481 (218.06 MB)  
Trainable params: 33597841 (128.17 MB)  
Non-trainable params: 23565640 (89.90 MB)  
=====
```

8.2) Model Training and Validation Accuracy

```
Epoch 1/50  
21/21 [=====] - 21s 773ms/step - loss: 0.6739 - accuracy: 0.7129 - val_loss: 0.5904 - val_accuracy: 0.8556  
Epoch 2/50  
21/21 [=====] - 19s 927ms/step - loss: 0.3128 - accuracy: 0.8768 - val_loss: 0.2565 - val_accuracy: 0.9873  
Epoch 3/50  
21/21 [=====] - 15s 731ms/step - loss: 0.1989 - accuracy: 0.9345 - val_loss: 0.1376 - val_accuracy: 0.9569  
Epoch 4/50  
21/21 [=====] - 19s 927ms/step - loss: 0.1701 - accuracy: 0.9376 - val_loss: 0.0673 - val_accuracy: 0.9763  
Epoch 5/50  
21/21 [=====] - 21s 1s/step - loss: 0.1442 - accuracy: 0.9470 - val_loss: 0.0453 - val_accuracy: 0.9871  
Epoch 6/50  
21/21 [=====] - 19s 900ms/step - loss: 0.0867 - accuracy: 0.9735 - val_loss: 0.0429 - val_accuracy: 0.9849  
Epoch 7/50  
21/21 [=====] - 19s 924ms/step - loss: 0.0619 - accuracy: 0.9797 - val_loss: 0.0258 - val_accuracy: 0.9935  
Epoch 8/50  
21/21 [=====] - 17s 808ms/step - loss: 0.0781 - accuracy: 0.9782 - val_loss: 0.0234 - val_accuracy: 0.9957  
Epoch 9/50  
21/21 [=====] - 18s 920ms/step - loss: 0.0751 - accuracy: 0.9782 - val_loss: 0.0204 - val_accuracy: 0.9935  
Epoch 10/50  
21/21 [=====] - 19s 918ms/step - loss: 0.0660 - accuracy: 0.9735 - val_loss: 0.0083 - val_accuracy: 1.0000  
Epoch 11/50  
21/21 [=====] - 20s 993ms/step - loss: 0.0575 - accuracy: 0.9782 - val_loss: 0.0079 - val_accuracy: 1.0000  
Epoch 12/50  
21/21 [=====] - 13s 618ms/step - loss: 0.0482 - accuracy: 0.9828 - val_loss: 0.0135 - val_accuracy: 0.9957  
Epoch 13/50  
21/21 [=====] - 15s 726ms/step - loss: 0.0553 - accuracy: 0.9797 - val_loss: 0.0069 - val_accuracy: 1.0000  
Epoch 14/50  
21/21 [=====] - 15s 718ms/step - loss: 0.0323 - accuracy: 0.9938 - val_loss: 0.0074 - val_accuracy: 1.0000  
Epoch 15/50  
21/21 [=====] - 16s 782ms/step - loss: 0.0334 - accuracy: 0.9891 - val_loss: 0.0056 - val_accuracy: 1.0000  
<keras.src.callbacks.History at 0x7dfa0c37c9a0>
```

Training Accuracy - 0.9891

Validation Accuracy - 1.0000

8.3) Testing Accuracy

```
test_loss, test_accuracy = best_model.evaluate(test_data)
print("Test Loss:", test_loss)
print("Test Accuracy:", test_accuracy)
```

```
8/8 [=====] - 2s 114ms/step - loss: 0.0112 - accuracy: 1.0000
Test Loss: 0.011192228645086288
Test Accuracy: 1.0
```

8.4) Testing Model on Previous version of database (MSLDv1)

```
MSLDv1_data = gen.flow_from_directory(dataset_path + 'MSLD v1/', target_size=(256, 256), shuffle=False, class_mode='binary')

# Evaluate the model on the test data
test_loss, test_accuracy = best_model.evaluate(MSLDv1_data)
print("Test Loss:", test_loss)
print("Test Accuracy:", test_accuracy)
```

```
Found 228 images belonging to 2 classes.
8/8 [=====] - 1s 103ms/step - loss: 0.0751 - accuracy: 0.9737
Test Loss: 0.07510682195425034
Test Accuracy: 0.9736841917037964
```

9) Results

9.1) Results on monkeypox images


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Upload a Skin Lesion Image

Uploaded Image Preview



MonkeyPox: 82.23 %
Not-MonkeyPox: 17.77 %

M52_01.jpg


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Upload a Skin Lesion Image

Uploaded Image Preview



MonkeyPox: 99.99 %
Not-MonkeyPox: 0.01 %

M40_02.jpg

9.2) Results Other Disease images

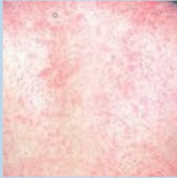
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Upload a Skin Lesion Image

Uploaded Image Preview



MonkeyPox: 0.15 %
Not-MonkeyPox: 99.85 %

NM13_01.jpg


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- **Step 2** : Select the image from your local files
- **Step 3** : Click on Upload Image button
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Upload a Skin Lesion Image

Uploaded Image Preview



MonkeyPox: 0.26 %
Not-MonkeyPox: 99.74 %

NM94_01.jpg

10) Advantages and Disadvantages

Sr. No.	Advantages	Disadvantages
1	Early Monkeypox Identification: <ul style="list-style-type: none">-Facilitates early detection of monkeypox- Helps isolate infected individuals	Data Privacy Concerns: <ul style="list-style-type: none">- Handling and securing user-uploaded images may raise privacy and security challenges
2	Accessibility and Convenience: <ul style="list-style-type: none">-Provides a user-friendly tool for self-assessment-Empowers individuals to take control of their health	Limited Diagnostic Accuracy: <ul style="list-style-type: none">-Accuracy may vary based on image quality, lighting, and other factors, impacting
3	Public Health Awareness: <ul style="list-style-type: none">-Contributes to public health awareness-Aids in the management of monkeypox outbreaks	Ethical Considerations: <ul style="list-style-type: none">- Providing medical diagnoses through an AI tool requires careful ethical considerations- Users should be made aware of the tool's limitations and the need for professional medical advice for confirmation
4	Efficient Resource Utilization: <ul style="list-style-type: none">- Reduces the reliance on resource-intensive diagnostic tests-Optimizes healthcare resources	Limited Reach: <ul style="list-style-type: none">-Accessibility to the diagnosis page may be limited to those with internet access and the ability to upload images
5	Education and Transparency: <ul style="list-style-type: none">-Promotes transparency and education regarding monkeypox-Builds trust and credibility	Algorithm and Model Maintenance: <ul style="list-style-type: none">-Continuous maintenance and updates are required to keep the model accurate and up-to-date

11) Conclusion

In conclusion, our project is a holistic response to the challenges posed by the monkeypox outbreak. By deploying ResNet50, curating the essential "Monkeypox Skin Lesion Dataset (MSLD)," and integrating AI diagnosis into our dedicated website, we not only advance the state of the art in disease identification but also prioritize accessibility on a global scale. This multifaceted approach underscores our commitment to facilitating early diagnosis and effective containment strategies, marking a noteworthy stride in the ongoing battle against the monkeypox pandemic.

12) Future Scope

The "PoxVisio" project holds significant potential for future development and expansion. Some key areas of the future scope for this project include:

1. **Enhanced Accuracy:** Continuously improving the deep learning model's accuracy is crucial. Future work can focus on refining the model's training data, fine-tuning parameters, and incorporating advanced techniques to increase the reliability of monkeypox identification.
2. **Real-Time Diagnosis:** Developing a real-time diagnosis feature, where users can receive immediate feedback on their uploaded images, would be a valuable enhancement. This could include live feedback or recommendations for further actions.
3. **Mobile Application:** Creating a mobile application version of PoxVisio would make the tool more accessible to a wider audience. Mobile apps can leverage device cameras for image capture, enhancing user convenience.
4. **Multilingual Support:** Expanding the project to support multiple languages can ensure its utility in diverse regions, especially where monkeypox outbreaks are prevalent.

5. Machine Learning Explainability: Implementing explainable AI (XAI) techniques to provide users with insights into why a particular diagnosis was made. This transparency can build trust and assist users in understanding the model's decision.

6. Geospatial Data Integration: Incorporating geospatial data can help identify areas at higher risk for monkeypox outbreaks, enabling proactive measures and resource allocation.

7. Telemedicine Integration: Integrating PoxVisio with telemedicine platforms could enable remote consultations with healthcare professionals, enhancing the quality of care for users.

8. Machine Learning Model Deployment: Deploying the model in the cloud or on edge devices, such as IoT devices, could expand its accessibility and reach, particularly in resource-constrained areas.

9. Continuous Data Updates: Maintaining and updating the MSLD with new images from various sources is essential to keep the model current and effective.

10. Global Collaboration: Collaborating with healthcare organizations, research institutions, and government agencies can help in the deployment of PoxVisio in regions where monkeypox is a public health concern. This could include official endorsements and partnerships for data collection and research.

11. Community Engagement: Involving the community in data collection, image submissions, and feedback can help create a sense of ownership and responsibility, as well as ensure that the tool remains relevant and valuable.

12. Monitoring and Reporting: Developing features to track the geographical and temporal trends of monkeypox cases and providing regular reports and insights can aid public health authorities in planning and response efforts.

The future scope for "PoxVisio" is expansive, offering opportunities for refinement, expansion, and collaboration to make this project even more impactful in the fight against monkeypox.

13) Appendix

Source Code:

GitHub Repository Link:

<https://github.com/smartinternz02/SI-GuidedProject-593223-1697467015>

Project Website Link:

<https://orange-coast-072718a00.4.azurestaticapps.net/>

Project Demonstration Link:

<https://drive.google.com/file/d/18Zbjhl70tLtQVAmFmV-9BgsGPStCjgkB/view?usp=sharing>

Model Building Jupyter Notebook:

<https://colab.research.google.com/drive/1YkXFPiOHP-HYBsxBX4aubReIunT5r-RD?usp=sharing>

Saved Model .h5 file (saved in google drive) - size 500mb:

https://drive.google.com/file/d/1-ApF0NN5ovuv0fvGPIRYPXEIEnvplvmM/view?usp=drive_link