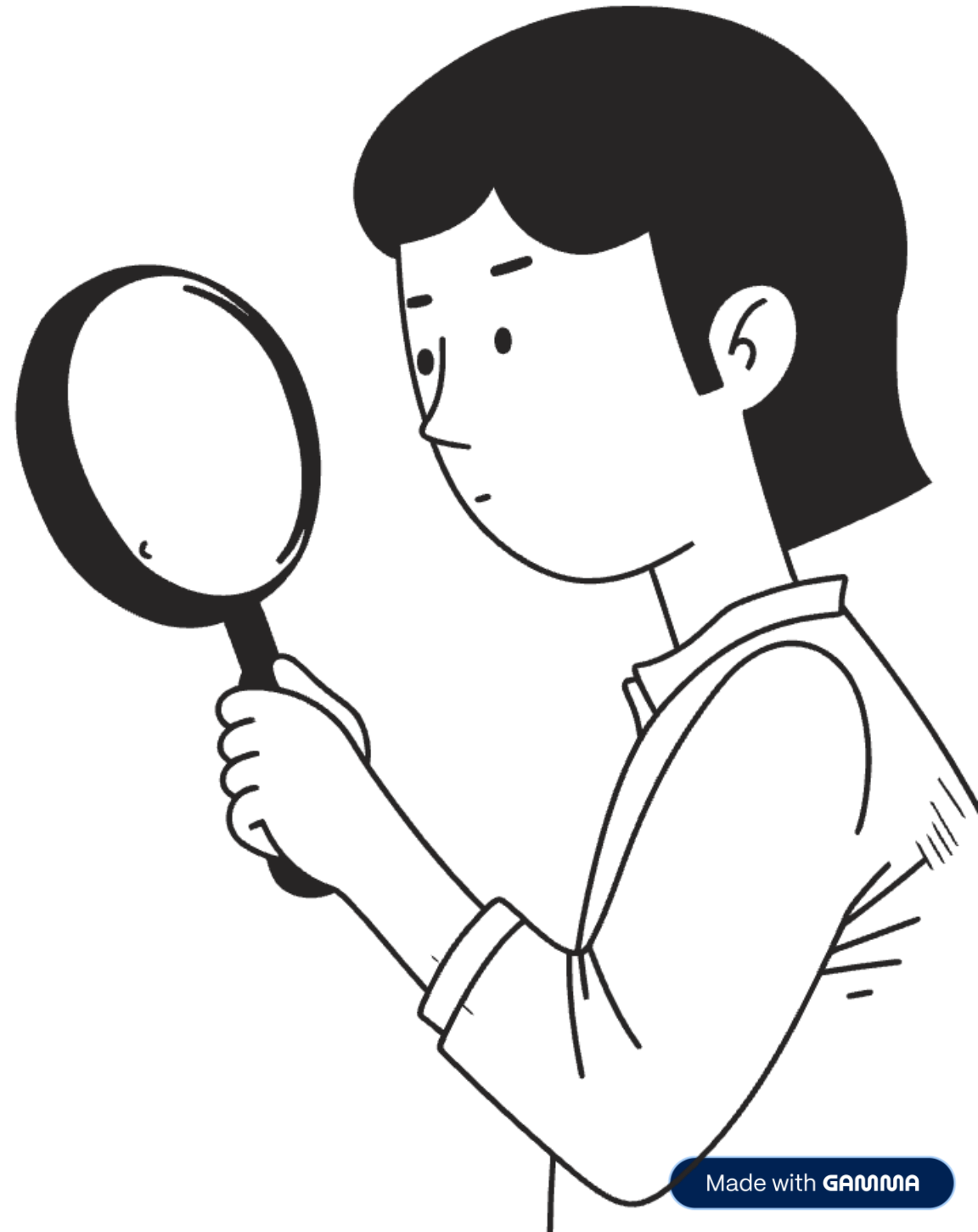


ABDOS - AI-Based Dermatological Observation System

An Advanced Platform Using Deep Learning for Early Skin Cancer Detection and Patient Management By Emeka Adimora, 4th Year Software and Electronic Engineering Student



Project Overview

Purpose

Provide accessible tools for early skin cancer detection with medical guidance.

Features

- Image-based skin lesion classification
- Risk assessment and recommendations
- User authentication and profile management
- API for frontend integration



System Architecture

Frontend

User interface built with React for uploading skin images, displaying classification results, and interacting with risk assessments and recommendations.

Backend

RESTful API developed using Node.js and Express.js, handles user authentication, profile management, and serves machine learning model inference requests securely.

Machine Learning Learning Model

Deep convolutional neural network trained on diverse skin lesion datasets to classify multiple lesion types with high accuracy and reliability.



User Authentication (Backend) (Backend)

Technologies

Node.js, Express, MongoDB, JWT for secure authentication.

Features

- User registration and login
- JWT-based secure authentication
- Password hashing and validation
- Profile retrieval and cookie sessions



Authentication API Endpoints

POST /api/auth/register	Register a new user
POST /api/auth/login	User login and token generation
POST /api/auth/logout	User logout and token invalidation
GET /api/auth/profile	Retrieve user profile information



Slide 6: Machine Learning Model

1

Model Architecture:

MobileNetV2 backbone (transfer learning)

Custom dense layers for classification

7 output classes (softmax)

2

Custom Preprocessing Layer:

Normalizes images to $[-1, 1]$ range

3

Training Data:

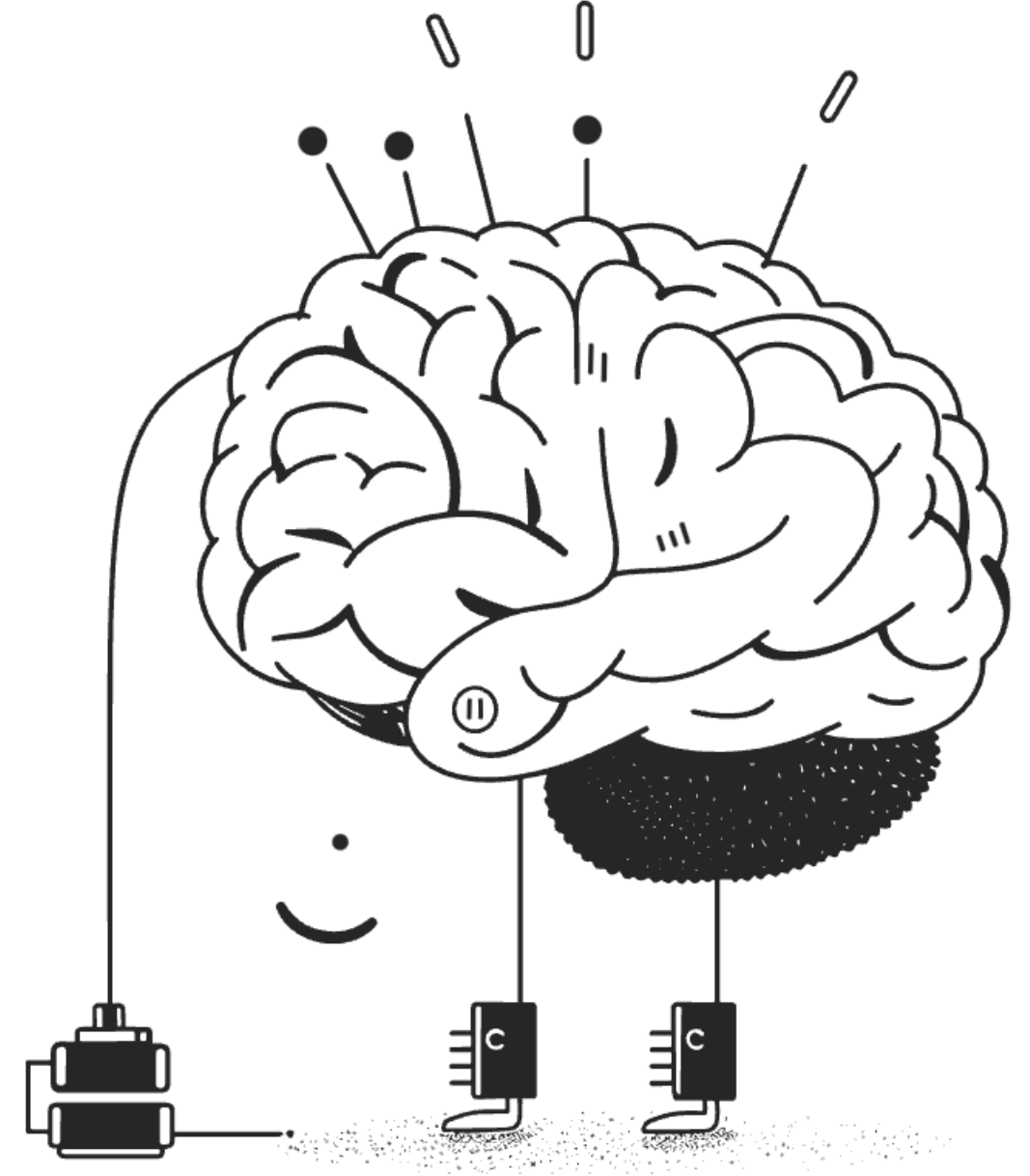
Ham10000

Data augmentation for robustness

4

Model File:

Saved as .h5 file, loaded at runtime



Skin Cancer Model Integration

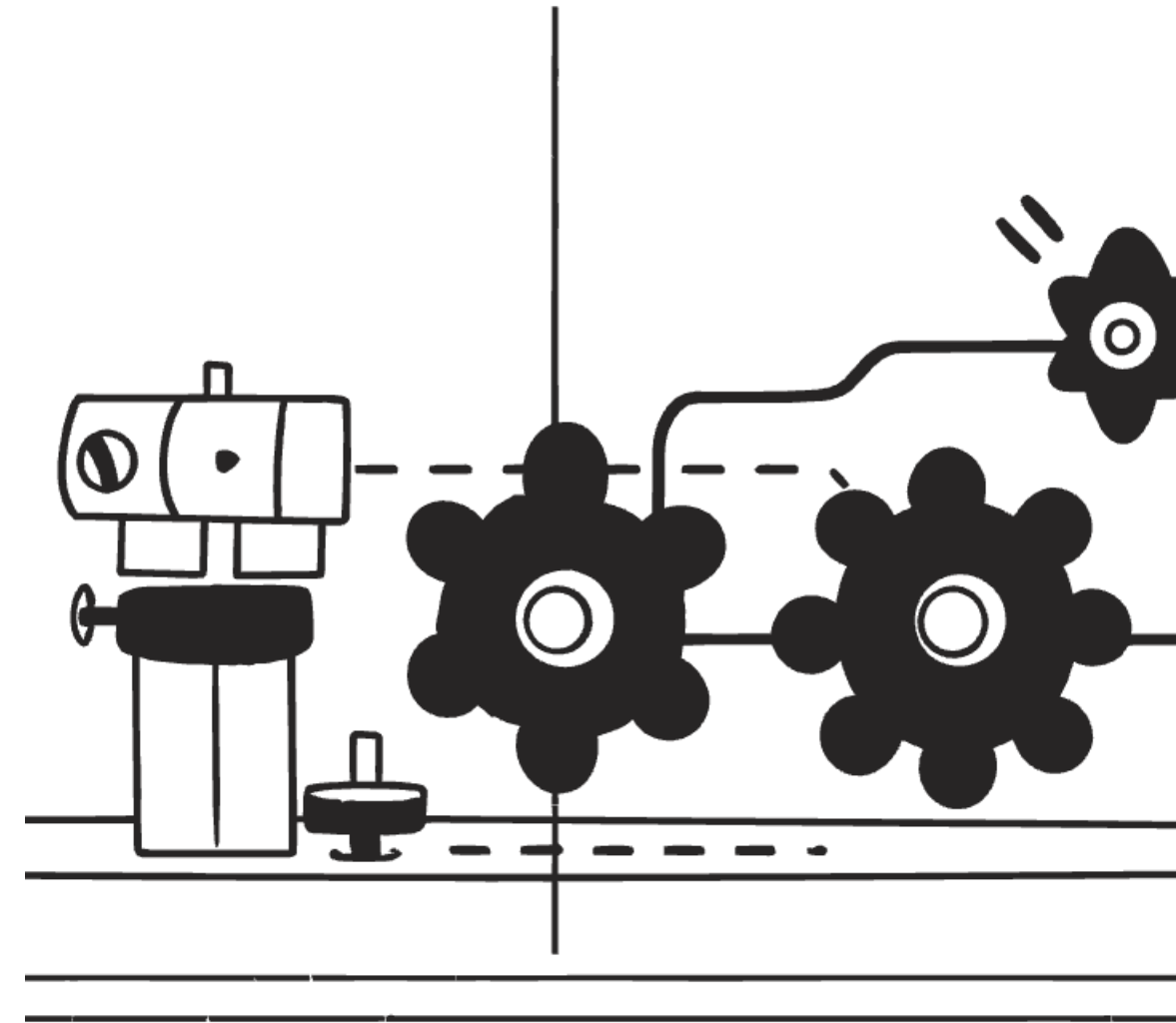
Model

Keras/TensorFlow deep learning model with MobileNetV2 backbone.

Classifies 7 types of skin lesions.

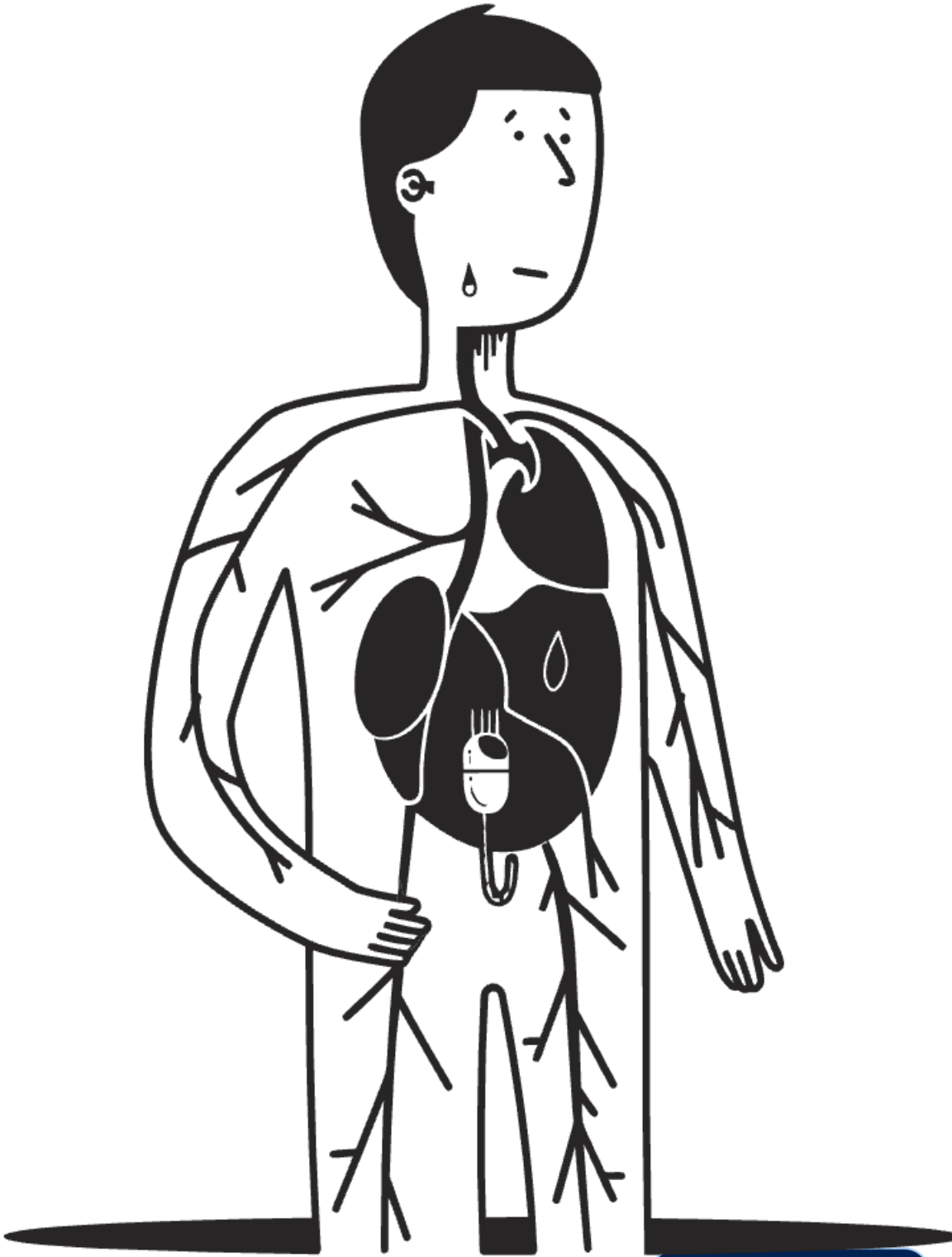
Prediction Pipeline

- Image upload and preprocessing
- Model inference
- Outputs: predicted class, confidence, risk, action



Skin Lesion Classes

Index	Code	Condition	Risk Level
0	akiec	Actinic Keratoses	Moderate
1	bcc	Basal Cell Carcinoma	High
2	bkl	Benign Keratosis	Low
3	df	Dermatofibroma	Low
4	mel	Melanoma	Very High
5	nv	Melanocytic Nevi	Low
6	vasc	Vascular Lesions	Low



Prediction Output Example

<div><div></div><div>Predicted Condition</div><div>Melanoma</div><div><p>This is a malignant tumor of melanocytes, the cells that produce pigment. Early detection is critical for effective treatment.</p></div></div>	<div><div></div><div>Confidence</div><div>92.3%</div><div><p>The model is highly confident in this prediction, reflecting strong evidence from the input image features.</p></div></div>	<div><div></div><div>Risk Level</div><div>Very High</div><div><p>Melanoma is considered the most dangerous type of skin cancer due to its tendency to spread rapidly if untreated.</p></div></div>
<div><div></div><div>Description</div><div><p>Most serious form of skin cancer.</p><p>It often appears as a new or changing mole and requires prompt diagnosis by a dermatologist.</p></div></div>	<div><div></div><div>Recommended Action</div><div><p>Urgent medical attention required.</p><p>Immediate consultation with a healthcare professional is advised to confirm diagnosis and start treatment.</p></div></div>	

Testing & Validation

Model Loading Test

Verifies model loads and predicts predicts correctly with sample input. input.

API Test

Sends images to API, checks response accuracy and latency.

Manual Testing

Uploads via frontend UI, reviews prediction results and UX.



Security & Privacy

Data Protection

User data is securely protected through JWT authentication and encrypted cookies.

Password Security

Passwords are securely hashed hashed and never stored in plain plain text.

Privacy

Patient images and prediction data are never stored without explicit user user consent.

