Dog Emotion and Breed Analyzer- Pawspective Insights

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PARAGRAPH DESCRIPTION

The main goal of this project is to develop an image classification model that can identify dog emotions and dog breeds. Predictions from this model are stored in a SQL database for further analysis. The project also includes the creation of a website hosted on a local server where users can upload images, receive real-time predictions, and explore past predictions stored in a database. This project aims to leverage cutting-edge machine learning techniques, database management, and web development to improve the understanding and assessment of dog behavior and traits. This project aims to be a valuable resource for dog lovers, researchers, and professionals alike by incorporating educational elements, encouraging community participation, and facilitating in-depth analysis. Also, implementation of user authentication to allow individuals to create profiles will allow users to track images they upload, view their dog's past emotions and breed predictions, and receive personalized insights and recommendations based on their pet's data. Allowing users to provide feedback on the accuracy of their predictions will establish a feedback loop allows you to continuously improve machine learning models over time. Users can contribute to improving the model, increasing community engagement and trust in the platform.

Similar Web apps for inspiration:

- Appointment Booking: PetDesk (https://petdesk.com/)
- ABC Triple J Hack: https://www.abc.net.au/triplej/programs/hack/happy-pets-app-uses-aito-detect-emotions-dogs-and-cats/12566482
- Siwalu Software: https://siwalusoftware.com/dog-scanner/
- Royal Canin: https://www.royalcanin.com/us/dogs/breeds

PROJECT SCOPE

Data Description and Collection:

1. Dog Images with Emotions:

- This dataset comprises dog images labeled with emotions like happy, sad, fearful, excited, etc.
- These images are essential for training the AI model to recognize and classify emotions in dogs accurately.
- Publicly available datasets from platforms like Kaggle, UCI Data Repository, and Google Data Search can provide a rich source of labeled dog images.

2. User Profiles:

- User profiles contain authentication credentials, including usernames, email, and hashed passwords.
- These profiles are necessary for implementing user authentication and authorization within the web application.
- User profiles help personalize the user experience and allow users to access and manage their data securely.

3. Dog Breed Images:

- This dataset comprises images of dog breeds and serves as training data for the breed identification feature.
- Each image is labeled with the corresponding dog breed, allowing the CNN model to learn to identify breeds accurately.
- Like the dog emotion dataset, publicly available datasets from platforms like Kaggle can provide diverse dog breed images.

Data Collection Methodology:

- Publicly Available Datasets: Utilize platforms like Kaggle, UCI Data Repository, and Google Data Search to access pre-existing datasets related to dog images, emotions, and dog breeds.
- Data Augmentation: Enhance the diversity of the dataset by applying data augmentation techniques such as rotation, flipping, resizing, and color adjustments.
- User Input: Allow users to contribute data by uploading dog images and providing emotion labels or breed information.

Core Functionality:

1. Image Upload and Prediction:
    - Users can upload images of their dogs through the web interface.
    - The uploaded photos are then processed by the Convolutional Neural Network (CNN) model trained to classify dog emotions.
    - The model predicts the dog's emotional state in the image, such as happy, sad, fearful, excited, etc.
    - The anticipated emotion is displayed to the user along with the uploaded image.
2. Data Storage and Display:
    - User data, including uploaded images and predictions, are securely stored in a database.
    - Users can view their past uploads and corresponding predictions on their profile page.
    - Admins have access to all user data for management and analysis purposes.
3. Authentication and Authorization:
    - User authentication is implemented to ensure secure access to the application.
    - Each user has an account with unique credentials (username/email and hashed password).
    - Authorization mechanisms ensure that users can only access and modify their data.

Extended Functionality:

1. Appointment Booking:

- Users can schedule appointments with pet veterinarians through the application.

- The application connects to a database of available veterinarians and their schedules.

- Users select a preferred date and time for the appointment and provide details such as the reason for the visit.

- Confirmation of the appointment is sent to the user via email or displayed on the site.

2. Breed Identification:

- A separate CNN model trained on dog breed images is integrated into the application.
- Users can upload images of dogs for breed identification.
- The model analyzes the uploaded image and predicts the breed of the dog.
- The predicted breed is displayed to the user along with the uploaded image.

3. Editable User Profiles:

- Users can edit their profiles to manage personal information and preferences.
- They can update their contact information, change passwords, or add additional details such as pet preferences or medical history.
- Changes to the profile are reflected in the database and accessible across the application.

4. Feedback Gathering Form:

- Users can fill out a feedback form to analyze the model's performance and user experience.
- Additionally, it aids in identifying any bugs within our system.
- Admin can see feedback submitted by users for better decision-making.

Project Methodology

1. Data Collection and Preprocessing:
    - Collect a diverse dataset of dog images labeled with corresponding emotions (happy, sad, fearful, excited, etc.).
    - Preprocess the images by resizing them to a uniform size, converting them to a compatible format, and normalizing pixel values.
    - Split the dataset into training, validation, and testing sets.
2. Model Development:
    - Choose a suitable Convolutional Neural Network (CNN) architecture for image classification tasks.
    - Train the CNN model using the training dataset with appropriate hyperparameters.
    - Validate the model's performance using the validation dataset and fine-tune it to improve accuracy and generalization.
3. Web Application Development with Flask:

- Set up a Flask project structure with directories for templates, static files, and Python scripts.
- Integrate the trained CNN model into the Flask application for predicting dog emotions based on uploaded images.
- Implement file upload functionality for users to upload dog images.

4. Database Integration:
   - Choose a suitable database management system (e.g., SQLite).
   - Design the database schema to store user data, uploaded images, predictions, and other relevant information.
   - Integrate the database with the Flask application
5. Authentication and Authorization:

- Implement user authentication using Flask or a separate Python SQL script.
- Set up registration and login functions for users to create accounts and authenticate.
- Admin authorization to access data related to user and feedback.

User:

1. User: Dog Owner or Enthusiast

- CRUD over base collection? Yes
- Functionality:
   a. Upload images of dogs for emotion classification.
   b. View predictions of dog emotions.
   c. Schedule appointments with pet veterinarians.
   d. Identify dog breeds from uploaded images.
   e. Edit user profile information.

2. Admin or Other Role (Manager, Business Owner, etc.):

- CRUD over base collection? Yes
- Must have a user profile (editable)
- Admin Functionality:
   a. View and manage user accounts.
   b. Access and analyze user-uploaded images and predictions.
   c. Monitor and manage appointment scheduling.
   d. Analyze feedback submitted by users.
   e. Generate reports and charts for business insights.

Additional Required functionality (all required)

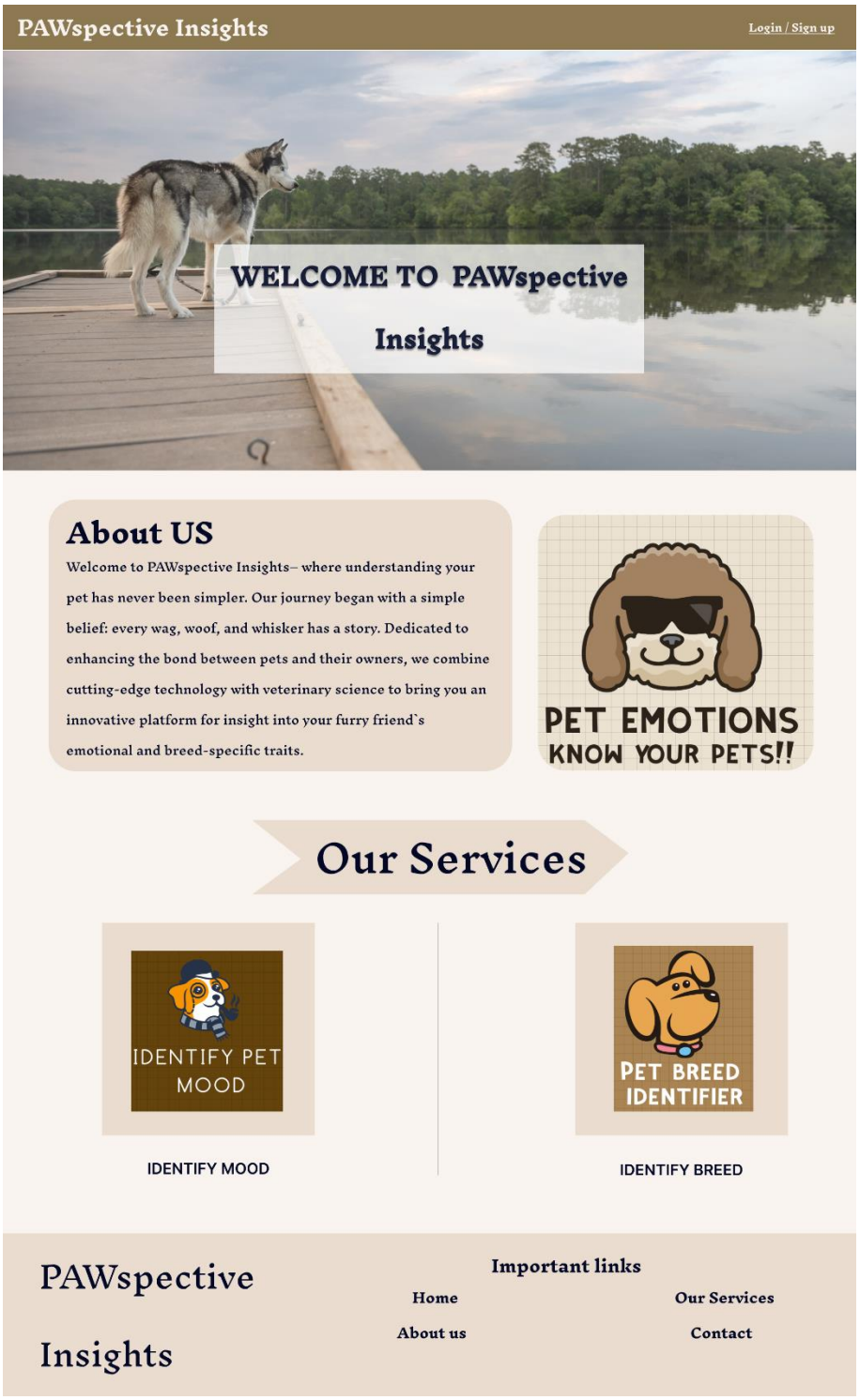
- Responsive Design: Design the platform with a responsive layout to ensure compatibility and optimal user experience across various devices and screen sizes.
- Deployment and Maintenance: Deploy the Flask application to a web server using platforms like Render or Azure.

- Integration with AI Models: Integrate AI models for emotion classification and breed identification into the platform. This ensures seamless communication between the web application and the AI models for efficient data processing and prediction generation.

Functionality Chart

Feature	User (role 1)	Admin (role 2)
Account Registration & Management	✓	✓
Image Upload and Emotion Prediction	✓	
Image Upload and Breed Identification	✓	
View Past Uploads and Predictions	✓	✓
Editable User Profiles	✓	
Submit Feedback	✓	
View and Analyze User Feedback		✓
AI Model Integration and Management		✓
Access and Analyze All User Data		✓
Manage and Schedule Vet Appointments	✓	
Add and Manage pets	✓	
Send vet appointment email reminder		✓
Edit and Manage All User Profiles		✓

Landing Page



This is the first page a user encounters. It introduces the service, highlighting key features such as "Our Services" and "Top Dog Breeds". It includes an about section and contact information.

Log In Page

Here users can log in to their existing accounts by entering their username and password. There's typically an option to recover a forgotten password, leading to the "Recover Password" page, or a user who is signing up for the first time.

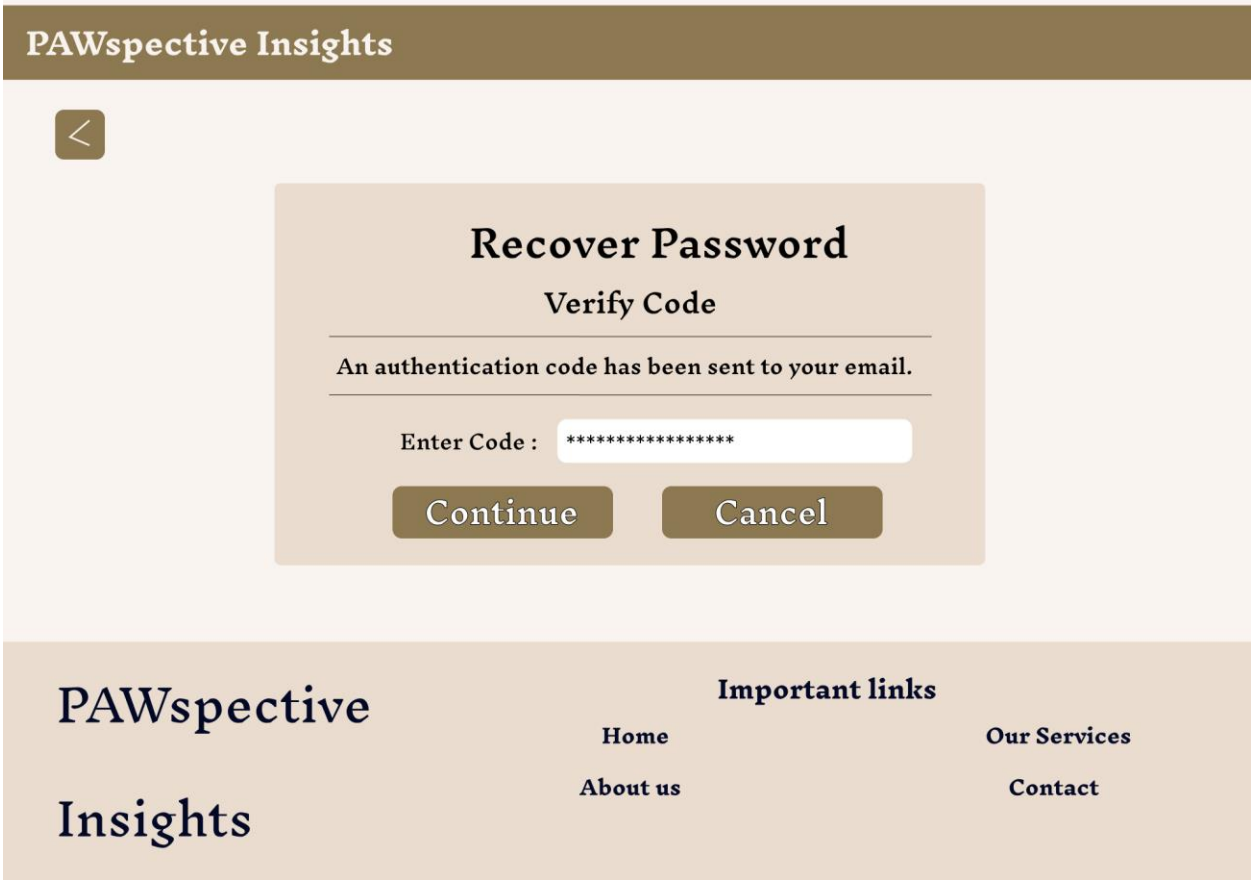
Sign Up Page

New users can create an account by filling out a form with fields for personal information like name, email, and password to gain access to the app's features. After signing up, the home page will be shown directly with the profile information according to the information given in this sign-up page.

Recover Password

Users who have forgotten their password can request a password reset, usually by entering their email to receive a recovery link. The link for recover password is given in the log in page where it is written “Forgot your password?"

Verify Password

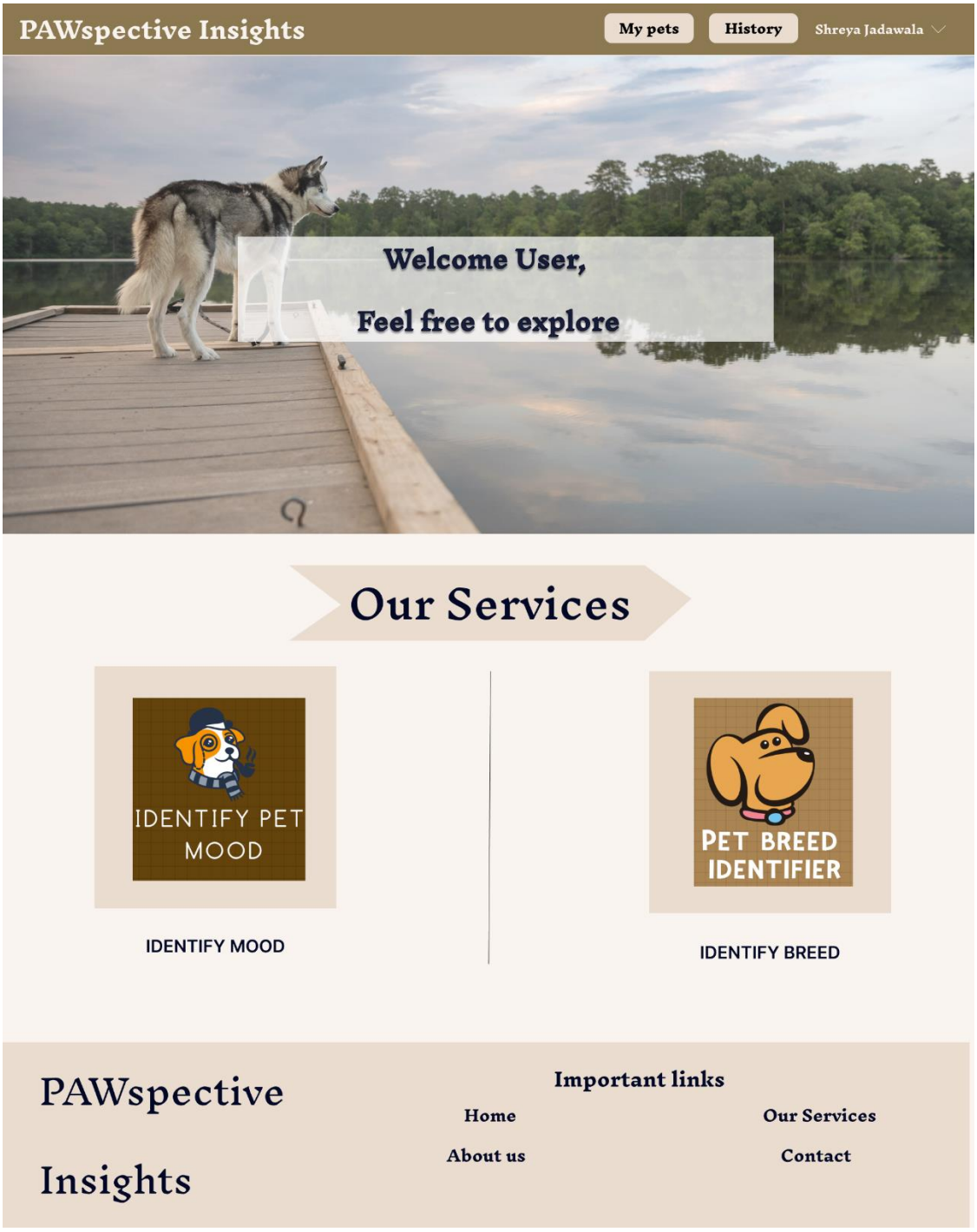


Likely a step after signing up or resetting a password where the user confirms their new password for security purposes. Here, a code will be sent to user's email address which was mentioned in sign up page/profile page. After typing the code, the user will be directed to New Password page.

New Password Page

Users are prompted to create a new password after they have verified their identity or old password. After changing password and confirming new password when user will click Reset, new password will be saved and the log in page will be shown again for verifying email and new password.

Home Page



Once logged in, this serves as a dashboard with quick access to the app's features, including "My Pets", "History", and an overview of the user's profile. On the side of user's name (here, for example, Shreya Jadawala) there is a dropdown menu where there will be a link to check profile page i.e. My profile, and link for logout. My Pets and History is shown on navigation bar will be there on each

page so that user can easily navigate to those pages, also the footer contains links for home page which will be there on each page which can direct user to home page without any difficulty.

Mood Analyser Page

This unique feature suggests the pet's current mood based on inputs or data collected, which can be useful for understanding pet behavior. When the user will select "Identify Mood" card from Home page it will direct user to this Mood Analyser Page. Here, user can choose a file on clicking "Choose file" and after hitting submit it will direct user to next Mood Analyser Page given below where the result will be shown.

Mood Analyser (part 2) Page

Breed Analyser Page

A tool for identifying a pet's breed characteristics, which might involve users uploading a picture of their pet and receiving breed information. When the user will select “Identify Breed” card from Home page it will direct user to this Breed Analyser Page. Here, user can choose a file on clicking “Choose file” and after hitting submit it will direct user to next Breed Analyser Page given below where the result will be shown.

Breed Analyser (part 2) Page

Shows the results of the breed analysis, including detailed breed information. This will be saved in the history page as well.

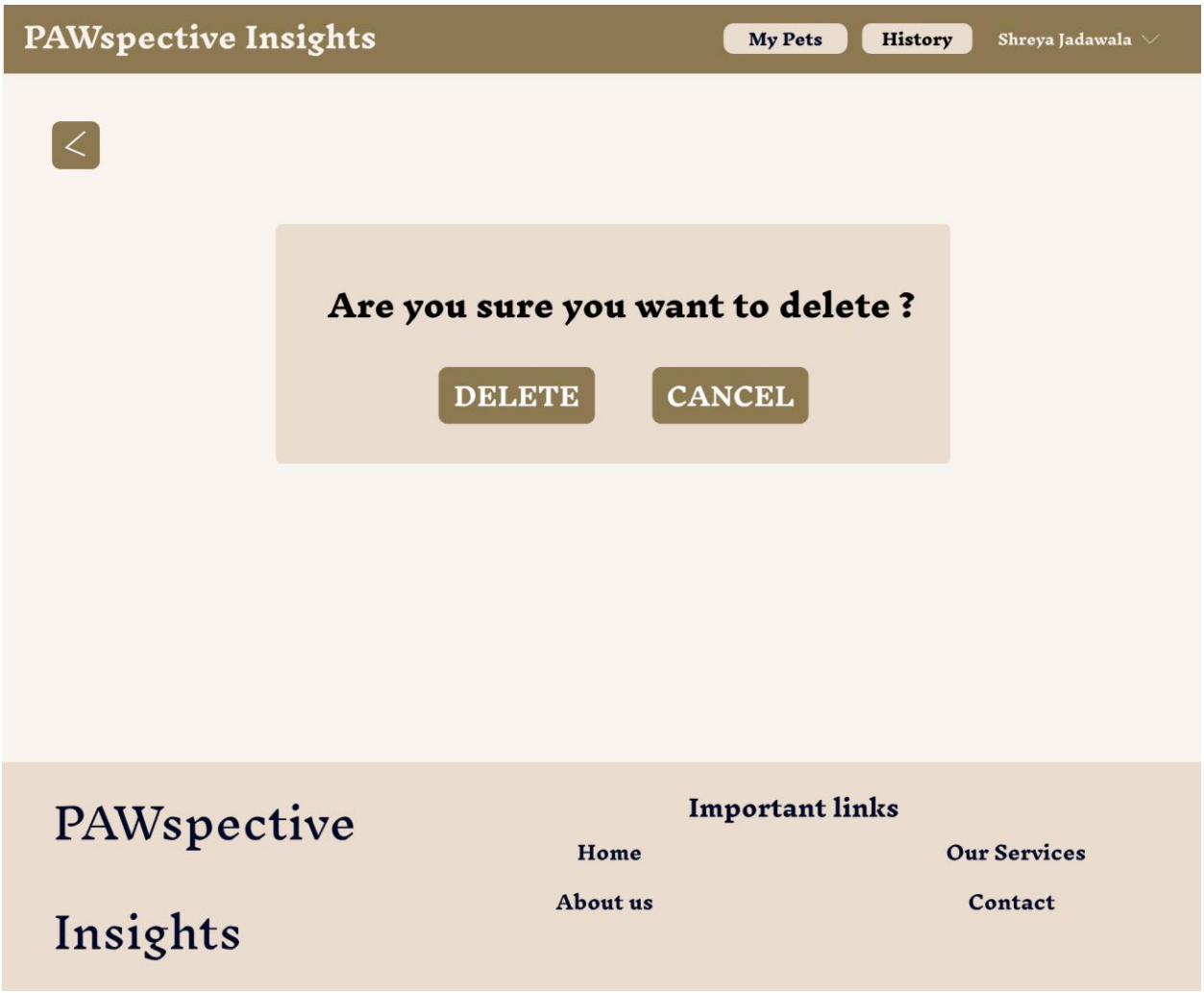
My Pets Page

A personalized section where users can view and manage their pets, likely with options to view pet profiles, medical history, and other relevant details. Also, if the user wants to edit any pet profiles or want to remove or add any pet information then the user can do after clicking on “Customize and Manage My Pets” link shown below the My Pets section and before footer.

Customize Pets Page

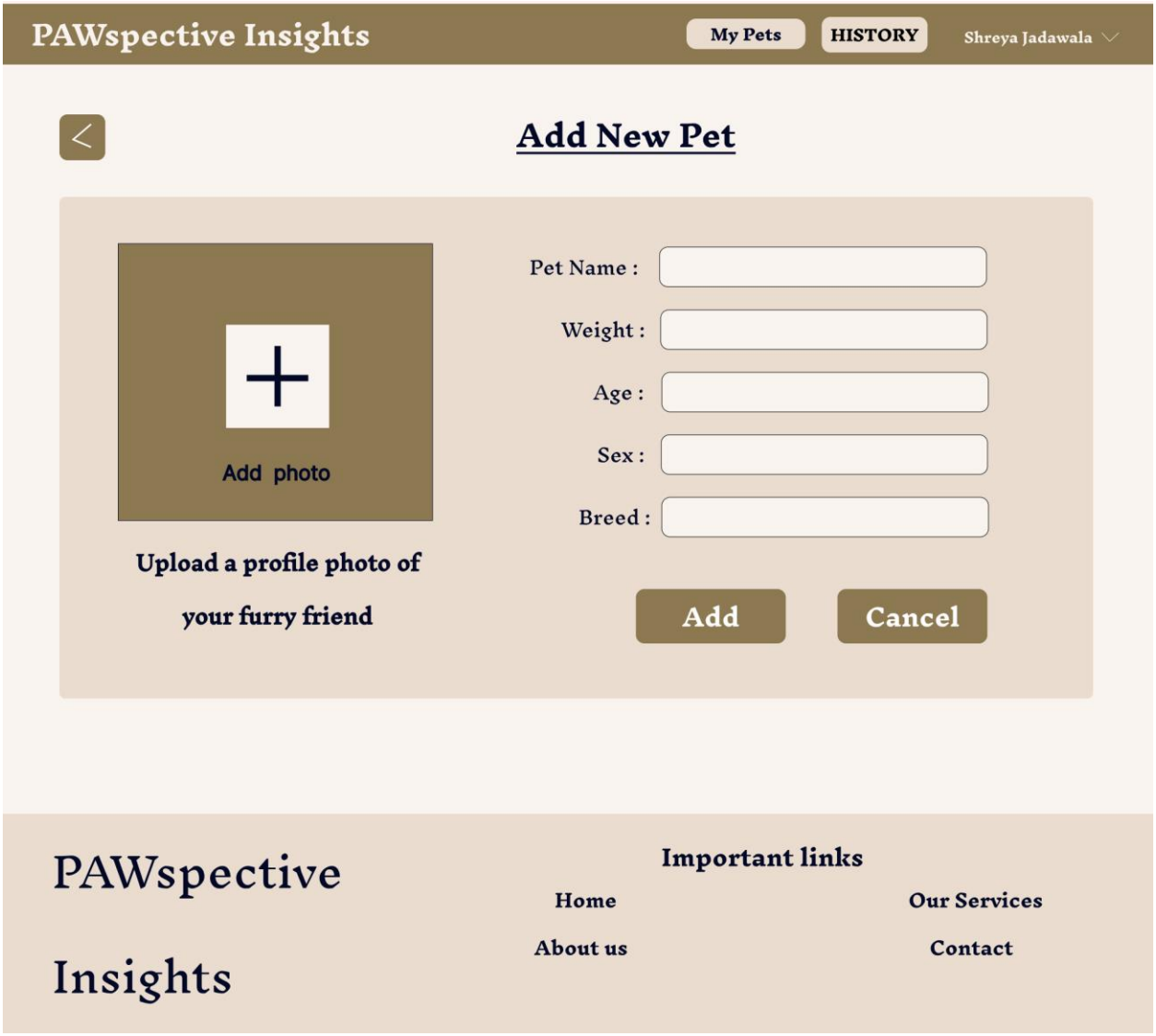
A feature for users to customize their pet profiles with photos and specific details like breed, age, and preferences. Users can remove or edit the pet details by clicking on “Remove” and “Edit” link respectively which is shown below each My Pet card. User can add a new pet using “Add a New Pet” link shown just above the footer. Also, if user is removing any pet information, then an alert message will be sent as given below “Alert Page”.

Alert Page



Here, there's a prompt asking, "Are you sure you want to delete?" This is a standard user experience practice to prevent accidental deletions. It includes two options: a "DELETE" button, which confirms the action, and a "CANCEL" button, which likely closes the dialogue box without taking any action. So, if the user by mistake clicks on remove pet, then the information won't be lost as it verifies twice before deleting pet's information.

Add New Pet Page



Here, users can expand their pet family profiles within the app. They would enter relevant details and photos, which are then reflected in the "My Pets" section. Pet's basic information like name, weight, age, sex and breed along with a profile photo of the pet is asked to make new profile of a pet. "Add a new pet" link is shown on "Customize Pets" page.

Edit Pet Page

This allows for the modification of existing pet profiles. Users can update or correct pet information as needed. If a user wants to edit any information of a pet for example weight or age of the pet, user can click on “Edit” link below the pet card shown on “Customize Pets” page which will take user to this edit pet page.

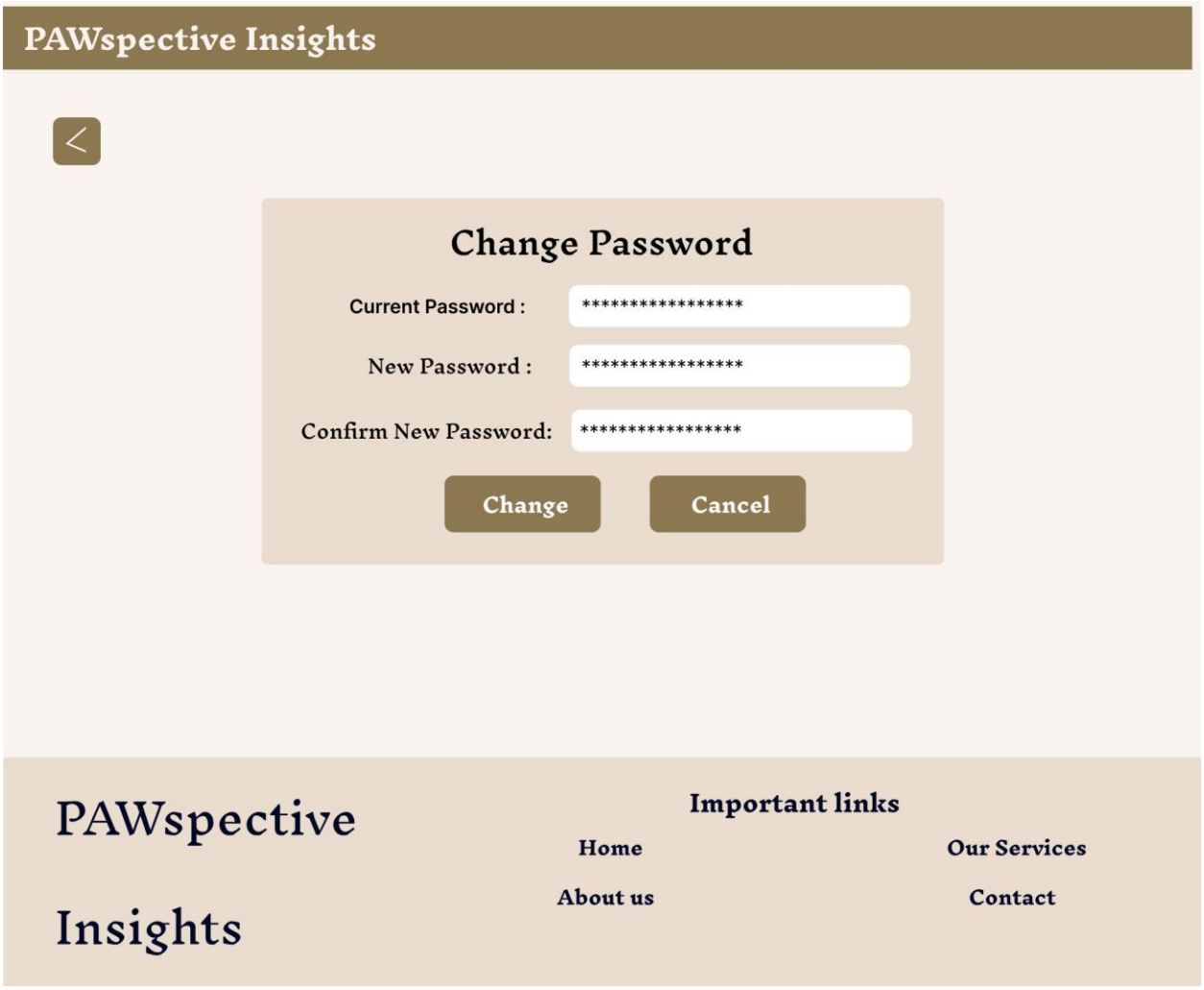
History

A log of user activity, such as previous Mood/Breed analysed by the user will be saved in this history page. Also, if the user is new then there will be no history and text will be written like “No history found, click on “+” and select Mood/Breed to analyse Mood of your Pet or analysing Breed of dogs.”. Here, if user selects Mood, then it will direct user to Mood Analyse Page and if user selects Breed, then it will direct user to Breed Analyse Page where user can detect Mood/Breed of their pet or any dogkind.

Profile Page

On this personal page, users can review and edit their profile details, including name, contact information, and password, which links to the "Change Password" screen. User can check their profile details by clicking on the dropdown button just right after user's name written on the navigation bar and clicking on My profile. User can edit their profile or can also change password from here by clicking on "Edit" or "Change Password" buttons respectively.

Change Password



This is security-centric page where users can change their existing password, ensuring account safety by requiring the current password before setting a new one. When user clicks on “Change Password” it will direct user to this Change Password Page. Here, user can change their password after clicking on change or can go back after clicking on cancel if they change their mind.

Update Profile

Users have the option here to update their personal details, ensuring their profile remains up to date with their current information. User can update their profile after clicking on “Edit” button from Profile Page.

Pet Details Page

A detailed profile page for an individual pet which includes thorough information like medical records, dietary needs, and other personal details. The user can check the details of their pet after clicking on the particular pet card which will direct user to this Pet Details Page where there is information about the upcoming appointments of that particular pet on particular time and date and also with the clinic information included. For new users, there will be no appointment information shown there, user can add new appointment by clicking on Add new appointment button given below the chart. And if user have a pet who have too many appointments then also they will be easily able to scroll and check for appointments.

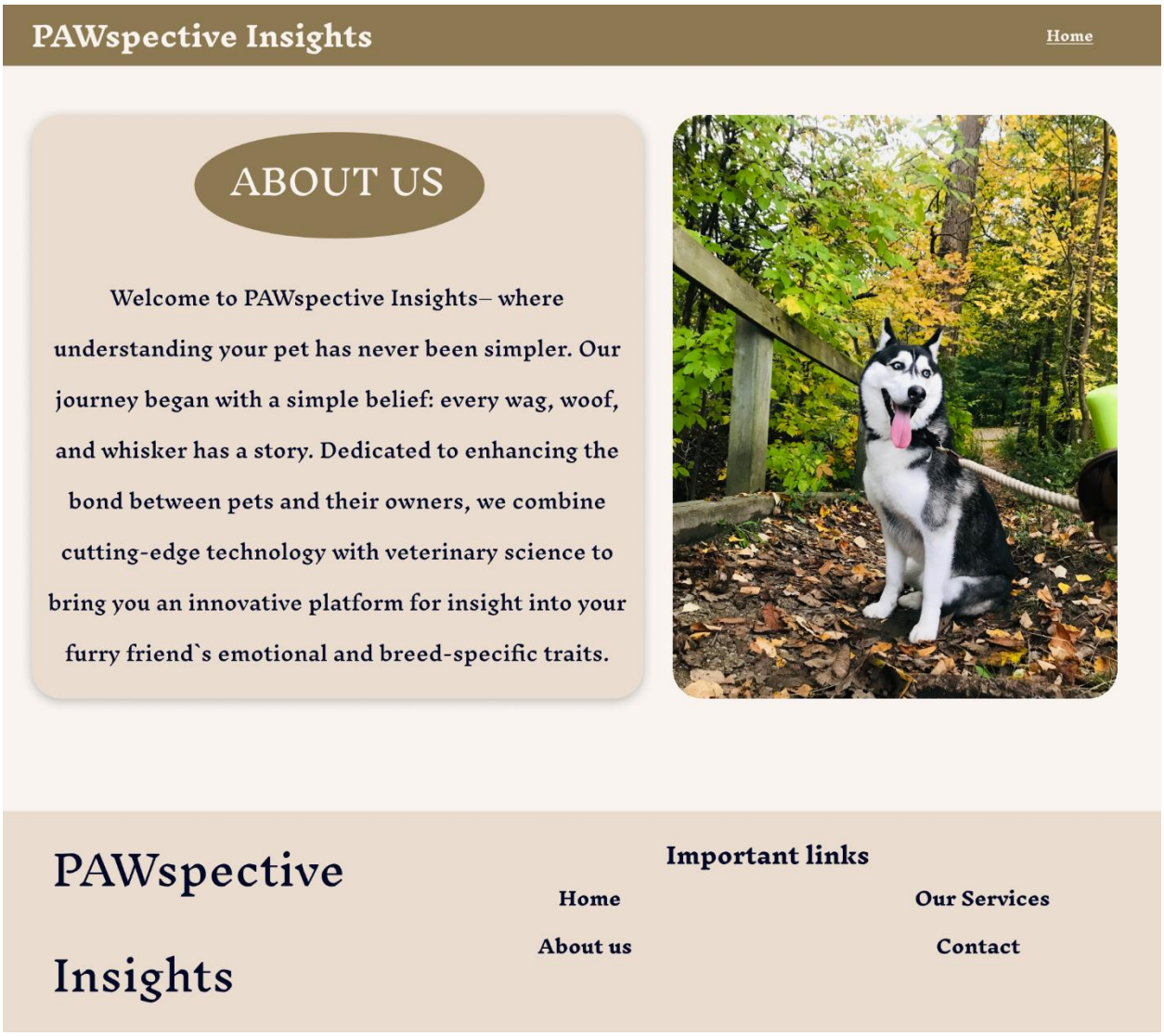
Appointment Page

A scheduling tool where users can view, set, or edit appointments for services related to their pets. This could sync with a personal calendar for reminders. After setting a new appointment for particular date and time, an email reminder/alert will be sent to the user which will remind them about the appointment time and place on that day.

Contact Information Page

This page provides detailed contact options for the website, such as email, phone number, and a physical address, inviting users to make inquiries or request support. Footer contains important links which includes Home/Landing Page, About us Page, Our Services Page and the Contact Page. Whenever user will click on Contact Page, link will direct user to this Contact Information Page.

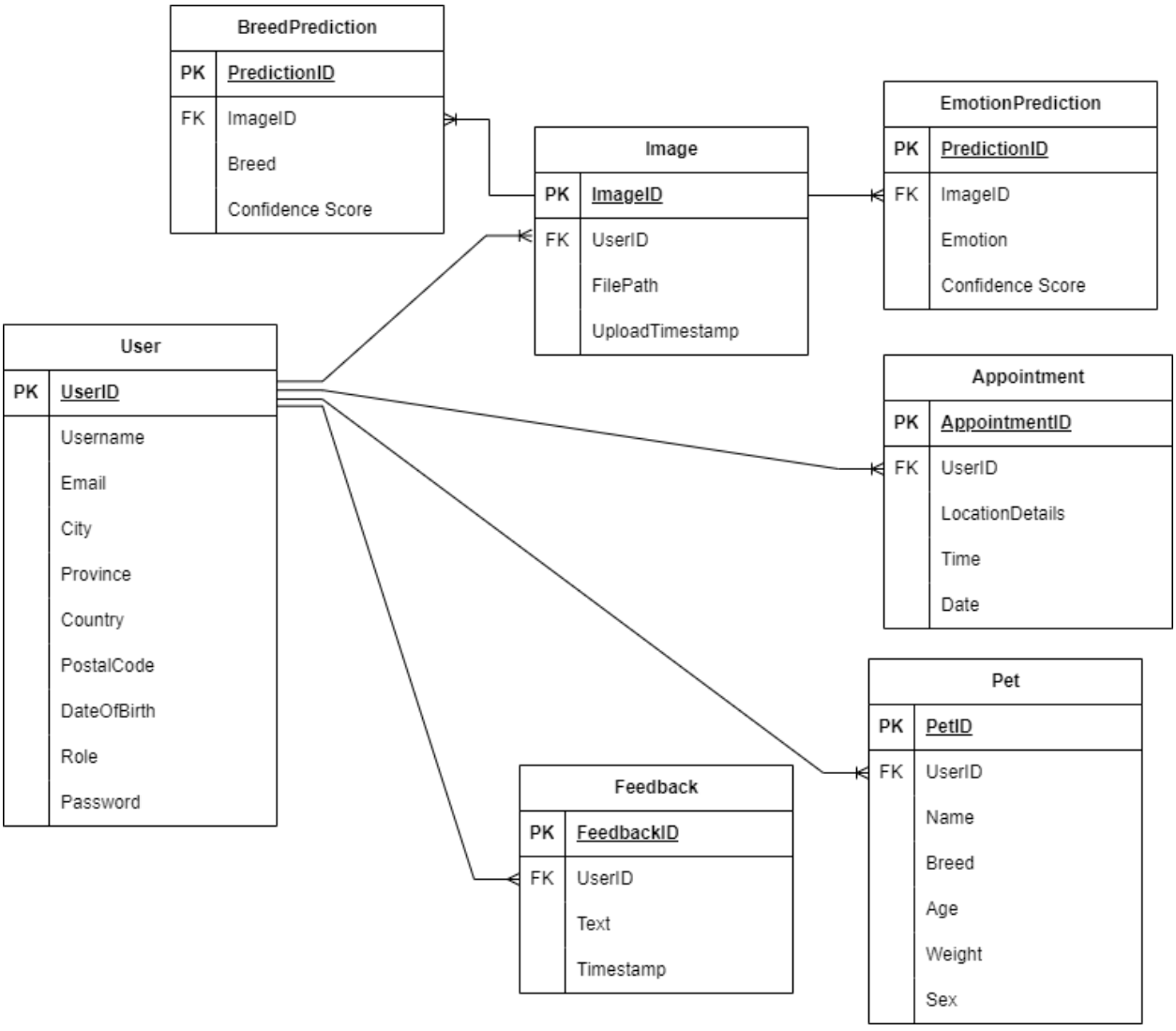
About Us Page



On this page, users can read about the app's backstory, mission, values, and the team behind it. This page is designed to build trust and provide transparency about the service.

Database Schema

The database diagram for "Pawspective Insights" visually encapsulates the relationships and flow of data within the platform. Centered around the "User" entity, it outlines how users interact with various system components. "Images" uploaded by users are subjected to analysis, resulting in "EmotionPredictions" and "BreedPredictions" that enhance the understanding of canine moods and breeds. Here, one user can upload many images as they want but under one condition i.e., each image should have only one pet. "Feedback" records user experiences for service improvement. The "Pet" entity holds information on user's pets, contributing to a comprehensive and engaging user experience. This interconnected system supports the core mission of "Pawspective Insights" to deliver a user-friendly, insightful tool for dog owners and enthusiasts.



Test Plan

In the innovative landscape of Pawspective Insights, we are committed to ensuring the highest quality and functionality of our web platform, designed to enhance the bond between dogs and their owners. This Test Plan is the roadmap for validating the performance, security, and user experience of our sophisticated image classification model and user interface. It will guide us through meticulous testing of features such as emotion and breed prediction, profile management, and appointment scheduling to deliver a product that exceeds the expectations of our users.

Test to Pass

- Test for User Profile:

- Verify that all user profile fields save correctly after editing.
- Confirm that user profile changes are immediately reflected on the user's dashboard.

-Test Image Processing for Emotion and Breed Identification:

- Validate that the image processing for emotion identification returns a result.
- Confirm that breed identification provides a breed name and that the result is displayed correctly.

-Test Prediction Accuracy:

- Check that the emotion prediction corresponds to predefined expected results for test images.
- Ensure breed prediction matches known breeds in test images.

-Test Appointment Booking and Reminder System:

- Verify that an appointment can be booked and appears in the user's list of upcoming appointments.
- Check that email reminders are sent at the correct time before an appointment.

-Test Feedback Functionality:

- Ensure that user feedback is submitted successfully.
- Test that user feedback influences the prediction models as intended.

-Test Multi-Device Responsiveness:

- Confirm that all pages render correctly on different screen sizes and devices.
- Check that interactive elements like buttons and forms work on mobile devices.

-Test Security Features:

- Attempt to access restricted user data without proper authentication to confirm security.

Test to Fail

-Test Incorrect User Input Handling:

- Attempt to upload non-image files and verify the system rejects them.
- Try to submit the feedback form with invalid inputs to check input validation.

-Test System Overload:

- Upload a large number of images simultaneously to check system stability and error handling.

-Test Inaccurate Predictions:

- Provide images with unclear emotions or mixed breeds to check the robustness of predictions.

-Test Broken Appointment Functionality:

- Set an appointment and then attempt to double-book the same time slot to ensure the system prevents it.

-Test Unauthorized Profile Access:

- Attempt to access or edit another user's profile information to verify authorization checks.

-Test Appointment Notification Failure:

- Manipulate the user's email to an invalid format and check if the system handles the failure gracefully.

-Test Downtime and Recovery:

- Simulate a server crash and verify the application's ability to recover and maintain data integrity.

-REST API Testing:

- Attempt to fetch data from an undefined REST API route and expect the server to return a 404 Not Found error.
- Send data with incorrect types (e.g., string instead of integer) to REST API endpoints and verify that the server rejects these with proper error messages.

-XSS and SQL Injection Testing:

- Inject a script tag (<script>alert('test') </script>) into fields that accept user input and verify that the script does not execute but is either rejected or sanitized by the system.
- Attempt to inject an SQL command (e.g., '1=1'--) into user input fields to manipulate database queries. Confirm that the system properly escapes inputs to avoid any database manipulation.

-Database/REST API Availability Testing:

- Simulate a database connection error and verify that the application handles this gracefully, perhaps by displaying a user-friendly message without exposing sensitive details.
- Test the scenario where the REST API is down (for example, the server is not responding) and see if the application attempts the request again or properly alerts the user about the problem.

-REST API Security:

- Try accessing secured API endpoints without credentials or with insufficient permissions to ensure the security measures are effective.
- Test for accidental exposure of sensitive data through API endpoints, ensuring that only necessary data is shared.

-Backend Connectivity Testing:

- Network Issues Simulation: Temporarily disable network connectivity to the REST API during a session to check how well the app handles network failures.

-Data Integrity and Error Handling:

- Simulate data corruption during transmission to the REST API and verify the application detects this corruption and handles it without crashing.
- Mock an API response in an unexpected format to see if the application can handle parsing errors without failing.

Deliverables:

The deliverables outlined below are carefully planned milestones set to develop and deploy a web-based platform capable of identifying dog emotions and breeds, thereby enhancing our interaction with pets. These deliverables are structured to ensure the project achieves its goals within the specified timelines, leveraging machine learning, web development, and database management.

MIlestone	Start Date	End Date	Tasks Planned
1	2024-09-09	2024-09-13	• Set up the basic Flask project structure, ensuring directories for templates, static files, and Python scripts are properly organized. • Begin the integration of the Convolutional Neural Network (CNN) model into the Flask application to enable image upload and emotion prediction functionalities.
	2024-09-16	2024-09-20	• Develop the login page and implement secure authentication processes. • Conduct initial REST API security tests to ensure the login functionality is strong and secure.
	2024-09-23	2024-09-27	• Implement user authentication within the web application, ensuring secure login and registration functionalities are operational. • Develop the database schema to store user data, uploaded images, predictions, and other relevant information.
2	2024-09-30	2024-10-04	• Add breed identification functionality using a separate CNN model. • Begin preparations for deploying the application on a live server.
	2024-10-07	2024-10-11	• Develop the appointment booking feature, integrating it with the user's profile. • Test and ensure that the breed identification feature and the appointment booking functionalities are working correctly on the live server.
	2024-10-21	2024-10-25	• I will select a reputable hosting provider based on criteria such as reliability, performance, scalability, and cost-effectiveness. Our preferred provider is AWS, known for its robust infrastructure and most importantly provides free web hosting solutions. • Complete the migration of the application to a live server environment, ensuring all functionalities work as expected. • Conduct thorough testing to confirm the application is stable and secure on the live server.

3	2024-10-28	2024-11-01	• Conduct thorough testing based on the test plan focusing on user profile management, image processing, and appointment booking functionalities. • Improve the app using the results from tests to enhance how well it works and how users interact with it.
	2024-11-04	2024-11-08	• Develop the "Add and Manage Pets" feature allowing users to input and update information about their pets. • Enhance security features and conduct additional tests to ensure data protection and safe user interactions.
	2024-11-11	2024-11-15	• Finalize the feedback feature, ensuring it's fully integrated into the application and user-friendly. • Complete all features, making sure they work together smoothly and function properly. • Get the app ready for its final launch, making sure every part is ready.
4	2024-11-18	2024-11-22	• Perform final testing across all features, concentrating on its reliability and how user-friendly it is. • Begin preparing the final project report, documenting all phases of development and testing.
	2024-11-25	2024-11-29	• Finalize the deployment of the application, ensuring all components are functioning as expected in a live environment. • Complete the final project report, ensuring it accurately reflects the project's outcomes and learnings.
	2024-12-02	2024-12-06	• Conduct any last-minute adjustments based on feedback or issues encountered during deployment. • Submit the final project report by December 06, 2024, ensuring it is comprehensive and includes all necessary details and documentation.