Data Flow Diagrams and User Stories

Project: "Transfer Learning-Based Classification of Poultry Diseases for Enhanced Health Management"
Location: Ongole, Andhra Pradesh
Date: June 2025
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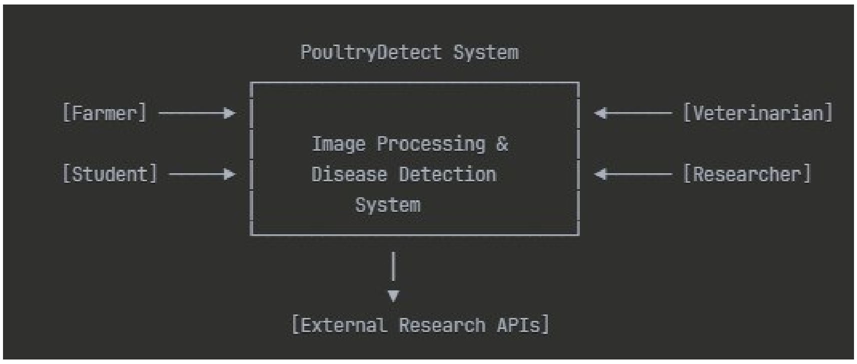
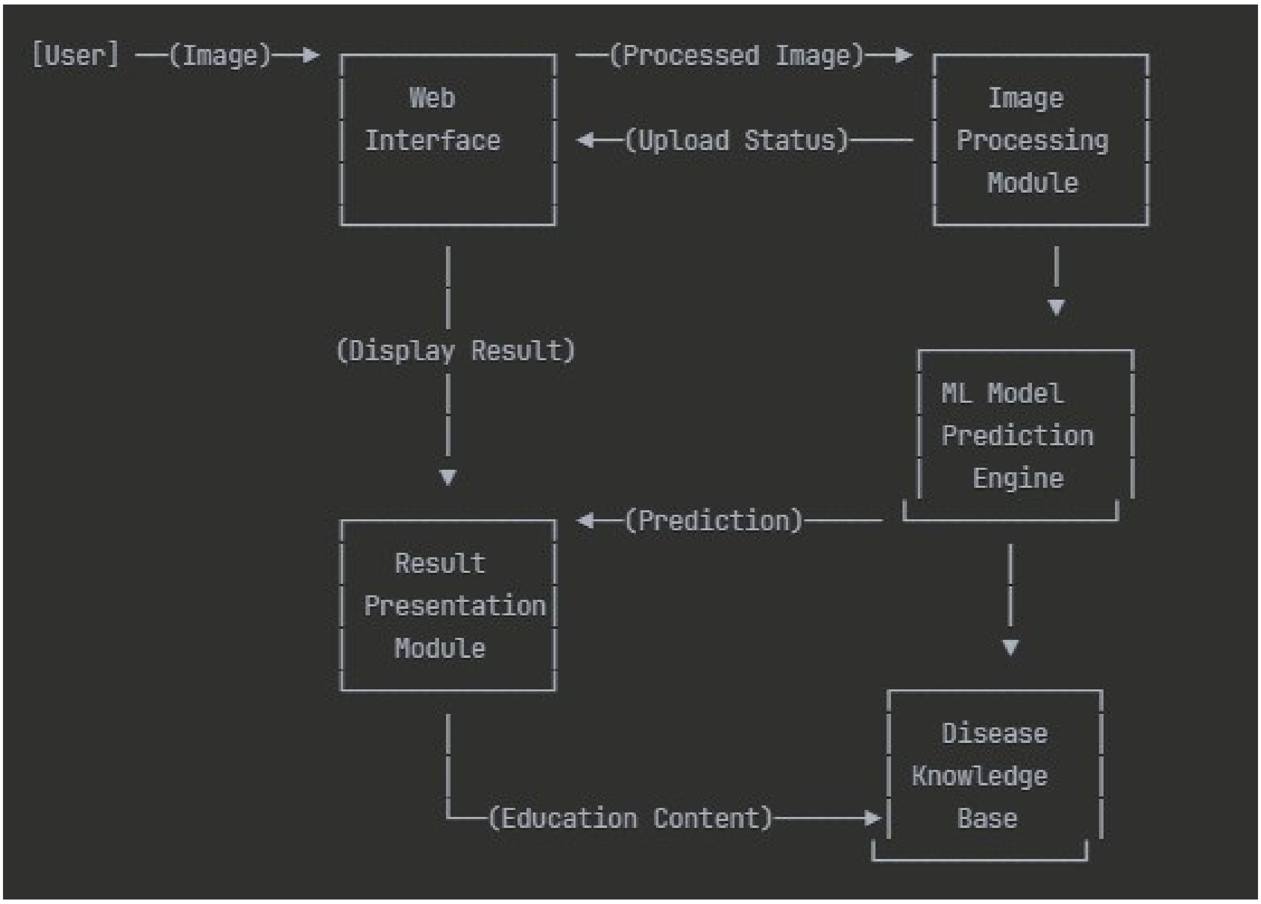
Team Members: P. Srinivasa Kalyan, M. Karthik Reddy

1. Data Flow Diagrams

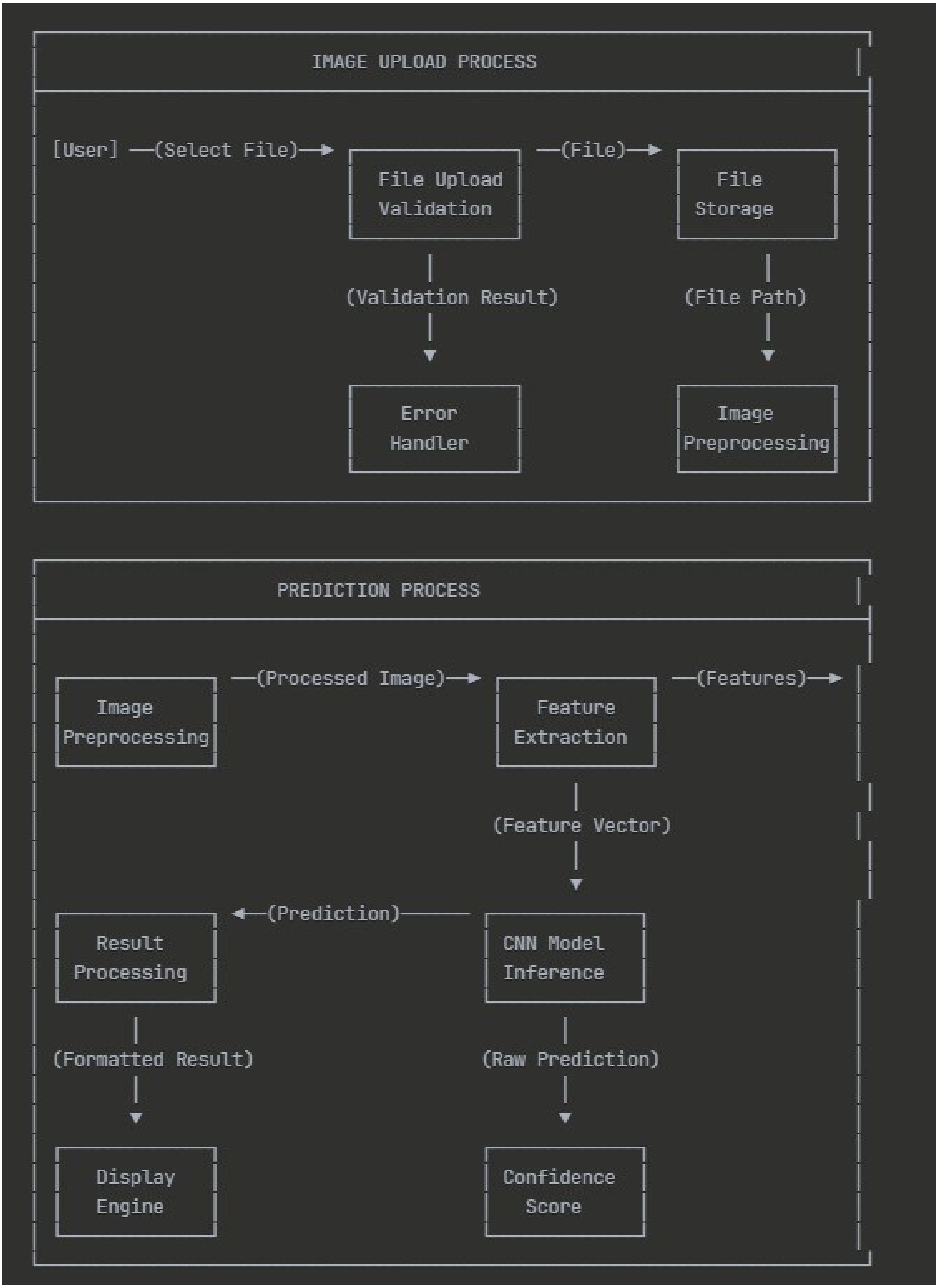
1.1 Level 0 DFD (Context Diagram)



1.2 Level 1 DFD (System Overview)



1.3 Level 2 DFD (Detailed Process Flow)



```
┌─────────────────────────────────────────────────────────────────┐
│                        IMAGE UPLOAD PROCESS                     │
├─────────────────────────────────────────────────────────────────┤
│                                                                 │
│ [User] ──(Select File)──▶ ┌─────────────┐ ──(File)──▶ ┌───────────┐ │
│                           │ File Upload │             │   File    │ │
│                           │ Validation  │             │  Storage  │ │
│                           └─────────────┘             └───────────┘ │
│                                  │                          │       │
│                        (Validation Result)             (File Path)  │
│                                  │                          │       │
│                                  ▼                          ▼       │
│                           ┌─────────────┐             ┌─────────────┐│
│                           │    Error    │             │    Image    ││
│                           │   Handler   │             │Preprocessing││
│                           └─────────────┘             └─────────────┘│
└─────────────────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────────────────┐
│                         PREDICTION PROCESS                      │
├─────────────────────────────────────────────────────────────────┤
│                                                                 │
│ ┌─────────────┐ ──(Processed Image)──▶ ┌────────────┐ ──(Features)──▶ │
│ │    Image    │                        │  Feature   │                 │
│ │Preprocessing│                        │ Extraction │                 │
│ └─────────────┘                        └────────────┘                 │
│                                              │                        │
│                                       (Feature Vector)                │
│                                              │                        │
│                                              ▼                        │
│ ┌─────────────┐ ◀──(Prediction)──────── ┌────────────┐                │
│ │   Result    │                         │ CNN Model  │                │
│ │ Processing  │                         │ Inference  │                │
│ └─────────────┘                         └────────────┘                │
│        │                                      │                       │
│ (Formatted Result)                     (Raw Prediction)               │
│        │                                      │                       │
│        ▼                                      ▼                       │
│ ┌─────────────┐                         ┌────────────┐                │
│ │   Display   │                         │ Confidence │                │
│ │   Engine    │                         │   Score    │                │
│ └─────────────┘                         └────────────┘                │
└─────────────────────────────────────────────────────────────────┘
```

1.4 Data Flow Specifications

Process 1: File Upload Validation •

Input: User selected image file

- **Processing:**
  - Check file type (JPG,
    PNG, JPEG) o
    Validate file size (<
    10MB) o Sanitize
    filename using
    secure_filename()
- **Output:** Valid file path or error message

Process 2: Image Preprocessing

- **Input:** Raw image file
- **Processing:**
  - Resize to 224x224 pixels
    o Normalize pixel
    values (0-1 range) o
    Convert to numpy
    array
- **Output:** Preprocessed image array

Process 3: ML Model Inference •

Input: Preprocessed image array

- **Processing:**
  - Load pre-trained CNN
    model o Run forward
    pass prediction
  - Extract confidence scores
- **Output:** Disease classification and confidence

Process 4: Result Presentation •

Input: Raw prediction results

- **Processing:**

- Map prediction to

  disease name ○

  Format confidence

  percentage
- Generate treatment recommendations

- **Output:** User-friendly result display

2. User Stories

2.1 Epic 1: Disease Detection

Story 1.1: Basic Image Upload

As a farmer

I want to upload a photo of my sick poultry

So that I can get a quick disease diagnosis

Acceptance Criteria:

- User can select image files from device
- System accepts common image formats (JPG, PNG)
- File size validation prevents oversized uploads
- Clear error messages for invalid files
- Upload progress indication for slow connections

Story 1.2: AI Disease Prediction

As a poultry owner

I want to receive an accurate disease prediction

So that I can take appropriate treatment action **Acceptance**

Criteria:

- Prediction completed within 10 seconds
- Result shows disease name clearly
- Confidence score displayed as percentage
- Original uploaded image shown with result
- Prediction covers 4 disease categories: Coccidiosis, Healthy, Salmonella, Newcastle Disease

Story 1.3: Treatment Guidance

As a farmer with limited veterinary access

I want to receive basic treatment suggestions So

that I can start appropriate care immediately

Acceptance Criteria:

- Treatment recommendations displayed with prediction
- Management tips provided for each disease
- Clear disclaimer about professional consultation
- Simple language avoiding medical jargon
- Links to detailed research for more information

2.2 Epic 2: Educational Resources

Story 2.1: Disease Information Learning

As a poultry farmer

I want to learn about common poultry diseases So

that I can better prevent and manage health issues

Acceptance Criteria:

- Dedicated training/research page available
- Information cards for each disease type
- Symptoms, treatment, and management tips
- Visual icons and clear formatting
- Links to scientific research sources

Story 2.2: Research Access

As a veterinary student

I want to access research papers and studies So that I

can deepen my knowledge of poultry diseases

Acceptance Criteria:

- Direct links to Google Scholar searches
- Disease-specific research queries
- Current and relevant study access
- Educational journey timeline
- Step-by-step learning process

Story 2.3: Professional Development

As a veterinarian

I want to use the tool for preliminary screening

So that I can optimize my consultation time

**Acceptance

2.3 Epic 3: User Experience

Story 3.1: Intuitive Navigation

As a first-time user

I want to easily navigate the application So

that I can use it without technical training

Acceptance Criteria:

- Clear navigation menu with 4 main sections
- Consistent design across all pages
- Mobile-responsive interface
- Visual cues and animations for guidance
- Breadcrumb navigation for complex flows

Story 3.2: Multilingual Support (Future)

As a Telugu-speaking farmer

I want to use the application in my native language

So that I can better understand the results

Acceptance Criteria:

- Language selection option
- Complete Telugu translation
- Cultural adaptation of content
- Local disease terminology
- Regional treatment preferences **Story 3.3:** Offline Capability (Future)

As a farmer in areas with poor connectivity

I want to use basic features offline So

that I can still get disease identification

Acceptance Criteria:

- Offline model caching
- Local image processing
- Sync when connection available
- Reduced feature set for offline mode
- Clear online/offline status indication

2.4 Epic 4: System Performance

Story 4.1: Fast Response Times

As a user with urgent disease concerns

I want quick prediction results So

that I can take immediate action

Acceptance Criteria:

- Image upload completes in < 5 seconds
- Prediction processing in < 10 seconds
- Page load times under 3 seconds
- Responsive interface during processing
- Progress indicators for long operations

Story 4.2: Error Handling

As a user who may make mistakes

I want clear error messages and recovery options

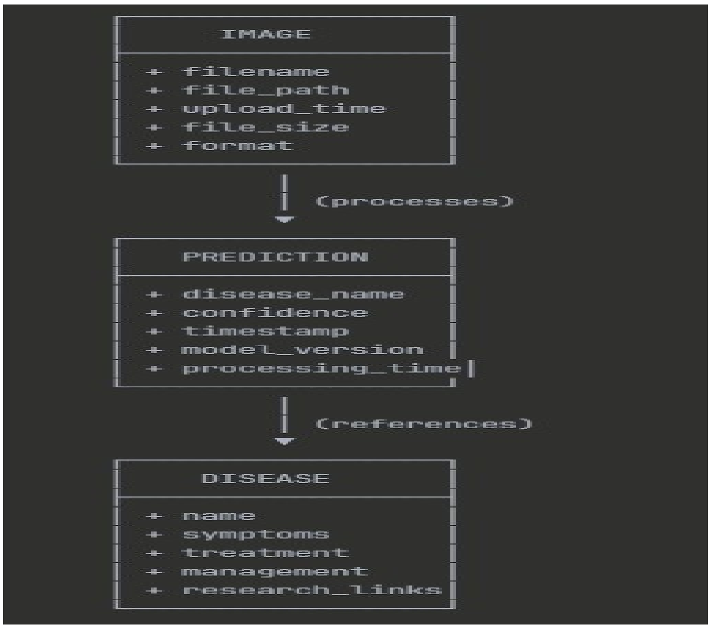
So that I can successfully complete my task **Acceptance**

Criteria:

- Graceful handling of invalid files
- Clear error messages in simple language
- Suggested corrective actions
- Fallback options for failed processes
- No system crashes from user errors

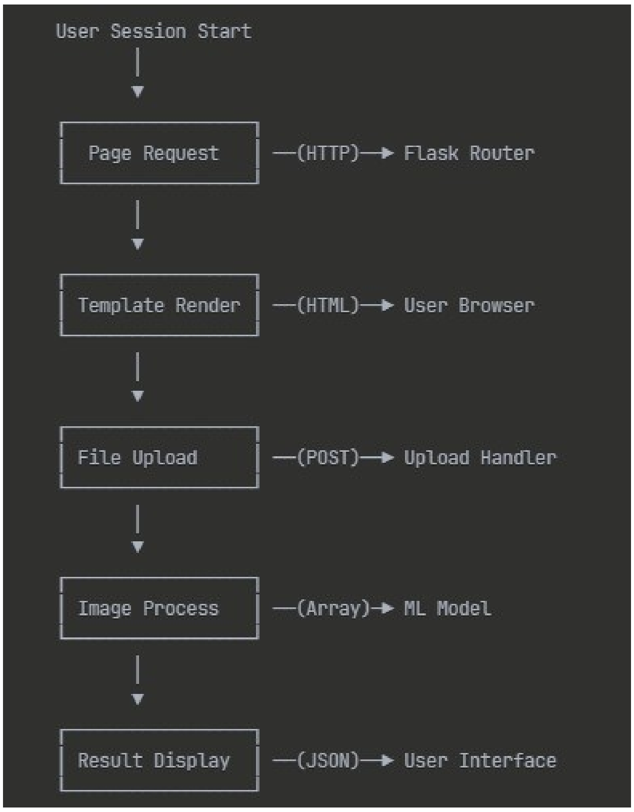
3. Data Entity Relationships

3.1 Core Data Entities



```
┌─────────────────────────────┐
│          IMAGE              │
├─────────────────────────────┤
│  + filename                 │
│  + file_path                │
│  + upload_time              │
│  + file_size                │
│  + format                   │
└─────────────────────────────┘
              │
              │ (processes)
              ▼
┌─────────────────────────────┐
│        PREDICTION           │
├─────────────────────────────┤
│  + disease_name             │
│  + confidence               │
│  + timestamp                │
│  + model_version            │
│  + processing_time│
└─────────────────────────────┘
              │
              │ (references)
              ▼
┌─────────────────────────────┐
│          DISEASE            │
├─────────────────────────────┤
│  + name                     │
│  + symptoms                 │
│  + treatment                │
│  + management               │
│  + research_links           │
└─────────────────────────────┘
```

3.2 Session Data Flow



```
User Session Start
      │
      ▼
┌──────────────┐
│ Page Request │ ──(HTTP)──► Flask Router
└──────────────┘
      │
      ▼
┌─────────────────┐
│ Template Render │ ──(HTML)──► User Browser
└─────────────────┘
      │
      ▼
┌──────────────┐
│ File Upload  │ ──(POST)──► Upload Handler
└──────────────┘
      │
      ▼
┌───────────────┐
│ Image Process │ ──(Array)──► ML Model
└───────────────┘
      │
      ▼
┌────────────────┐
│ Result Display │ ──(JSON)──► User Interface
└────────────────┘
```

4. Technical User Stories

4.1 Developer Stories

Story D1: Model Integration

As a developer

I want to easily integrate new ML models So

that I can improve prediction accuracy

Acceptance Criteria:

- Modular model loading system
- Version control for models
- A/B testing capability
- Performance monitoring
- Rollback mechanisms

Story D2: API Development

As a developer

I want to create RESTful APIs

So that mobile apps can integrate with the system

Acceptance Criteria:

- RESTful endpoint design
- JSON response format
- Authentication mechanism
- Rate limiting implementation
- API documentation

4.2 Administrator Stories

Story A1: System Monitoring

As a system administrator

I want to monitor application performance So

that I can ensure optimal user experience

Acceptance Criteria:

- Real-time performance metrics
- Error rate monitoring
- User activity tracking
- Resource utilization alerts
- Automated scaling triggers **Story A2:** Content Management

As a content administrator

I want to update disease information So

that users get current medical knowledge

Acceptance Criteria:

- Easy content editing interface
- Version control for content changes
- Review and approval workflow
- Scheduled content updates
- Multi-language content support

5. Data Security & Privacy

5.1 Privacy User Stories

Story P1: Data Protection

As a privacy-conscious user

I want my uploaded images to be handled securely

So that my farm information remains confidential

Acceptance Criteria:

- No permanent storage of uploaded images
- Automatic file deletion after processing
- No personal data collection
- Secure file transmission
- Clear privacy policy

Story P2: Anonymous Usage

As a user concerned about privacy

I want to use the system without creating accounts

So that my identity remains anonymous **Acceptance**

Criteria:

- No user registration required
- Stateless session management
- No tracking cookies
- No personal information requests
- Anonymous usage analytics only