**Introduction**

The proposed system focuses on real-time monitoring and detection of livestock health, behavior, and intrusions on farms. By integrating IoT, machine learning, and computer vision, it aims to classify threats, analyze patterns, detect diseases, and ensure animal welfare. This advanced solution supports smarter farm management and better decision-making.

**Product Goal**

1. **Early Detection of Diseases**: Monitor livestock health to identify potential diseases at an early stage.
2. **Behavioral Analysis**: Track and analyze animal behavior to detect abnormalities or distress.
3. **Intruder Classification**: Identify and distinguish between farm animals and unauthorized intruders.
4. **Real-time Alerts and Reporting**: Provide timely notifications and generate actionable reports for efficient management.

**Demography**

**Users:**

* Farmers and ranchers responsible for livestock management.
* Wildlife conservationists tracking wildlife activity.
* Veterinary professionals providing remote diagnostics and care.
* Insurance companies validating livestock-related claims.

**Location:**

* Rural and semi-rural farms.
* Wildlife reserves and areas with mixed farming zones.

**Business Processes**

1. **Monitoring**: Capture real-time data using IoT-enabled cameras and sensors.
2. **Classification**: Employ machine learning models to differentiate between farm animals, wildlife, and intruders.
3. **Behavior Analysis**: Analyze movement patterns, feeding habits, and social interactions to identify anomalies.
4. **Health Assessment**: Detect disease symptoms using visual cues and thermal imaging.
5. **Reporting**: Generate health and activity reports, including historical trends and actionable insights.
6. **Alert System**: Send automated SMS or email notifications for abnormal behaviors or potential threats.

**Features**

**5.1 Description**

1. **Real-time Video Monitoring**: Continuous surveillance to ensure livestock safety and welfare.
2. **Behavioral Analysis**: Identification of normal and abnormal activities using AI-powered models.
3. **Disease Detection**: Identification of physical symptoms and fever through thermal imaging.
4. **Intruder Detection**: Differentiates between authorized and unauthorized entities.
5. **Reporting and Analytics**: Provides detailed health summaries and historical data for better decision-making.
6. **IoT Integration**: Merges sensor data for a comprehensive understanding of farm conditions.

**5.2 User Story**

* **As a farmer, I want** to receive real-time alerts for abnormal livestock behavior **so that** I can address potential health issues immediately.
* **As a wildlife conservationist, I want** to monitor wildlife activity near farm boundaries **so that** I can prevent conflicts between livestock and predators.
* **As a veterinarian, I want** access to historical health data **so that** I can diagnose and treat animals effectively.

**Authorization Matrix**

| **Role** | **Access Level** |
| --- | --- |
| Farmer | Full access to real-time monitoring, analytics, and reporting. |
| Veterinary Professional | View historical health data and generate diagnostic insights. |
| Farm Manager | Manage access rights, monitor real-time data, and view reports. |
| Field Worker | Limited access to daily reports and alert notifications. |
| Admin/Technician | Manage system maintenance, add devices, and troubleshoot. |

**Assumptions**

1. Farms have the necessary infrastructure to support IoT devices, including internet access and reliable power supply.
2. Users can access smartphones or computers to receive alerts and view reports.
3. Animals are tagged or identifiable through computer vision for individual tracking and analysis.
4. Environmental factors such as weather and lighting conditions may impact the performance of sensors and cameras.
5. Data storage and processing comply with all relevant privacy and security regulations.