**Project Title: Crisis Pilot**

**Abstract**Crisis Pilot is an advanced AI-driven platform designed to revolutionize disaster management and humanitarian response. By leveraging satellite imagery, drone technology, and real-time weather intelligence, Crisis Pilot enhances disaster detection, victim localization, and resource allocation. The system ensures early wildfire detection, rapid flood victim identification, and strategic planning for emergency response, ultimately saving lives and minimizing damage during natural disasters.

**Objectives**

* Wildfire Detection: Utilize NOAA-20 satellite data (VIIRS) for early wildfire detection, providing timely alerts to disaster relief teams to enable faster intervention.
* Drone-Based Flood Victim Detection: Employ high-resolution drone imagery and YOLOv8 AI for accurate victim identification and tracking in flooded areas, facilitating rapid search-and-rescue operations.
* Flood Segmentation: Implement semantic segmentation techniques for real-time flood detection using satellite imagery, aiding emergency teams in efficient resource deployment.
* Integrated Location and Weather Intelligence: Merge location data with live weather updates to predict high-risk zones for animal rescue, optimizing response time and resource allocation based on correlated data.

**Key Features**

1. **Wildfire Detection:**
   * Uses NOAA-20 VIIRS satellite data to detect early signs of wildfires through infrared imaging.
   * AI-based analysis of thermal anomalies and fire hotspots for faster detection and alerting.
   * Generates geospatial alerts sent to disaster relief teams for swift deployment.
2. **Drone-Based Victim Detection:**
   * Drones equipped with high-resolution cameras capture detailed images of flood-affected regions.
   * YOLOv8 algorithm enables real-time object detection for identifying and localizing victims.
   * Integration with Geographic Information Systems (GIS) allows for live mapping and strategic rescue deployment.
3. **Flood Segmentation:**
   * AI-powered semantic segmentation is applied to satellite images to map flood-affected areas.
   * Decision-support algorithms identify priority areas for emergency responders, improving resource allocation.
4. **Location and Weather Intelligence for Animal Rescue:**
   * Integrates weather data from APIs like OpenWeatherMap with geospatial information.
   * AI-based prediction models analyze animal movement patterns in relation to weather forecasts and historical data.
   * Provides real-time monitoring of at-risk areas to enhance animal rescue operations during emergencies.

**System Architecture**

1. **Data Acquisition:**
   * Satellite Imagery: NOAA-20 VIIRS data for wildfire detection and flood monitoring.
   * Drone Imagery: Aerial footage from drones with high-resolution cameras.
   * Weather Data: Real-time updates from weather APIs like OpenWeatherMap and AccuWeather.
2. **Data Processing and Analysis:**
   * Wildfire Detection: Machine learning models analyze thermal anomalies in satellite images.
   * Flood Segmentation: CNNs and deep learning models classify flood-affected areas pixel by pixel.
   * Victim Detection: YOLOv8 object detection identifies individuals in flood zones using drone footage.
   * Weather Intelligence: AI-driven correlation between weather patterns and disaster risk predicts high-risk areas.
3. **Decision Support and Integration:**
   * GIS Integration: Real-time data visualization on GIS platforms (e.g., ArcGIS, QGIS) for situational awareness.
   * Resource Optimization: Decision-support algorithms ensure efficient allocation of rescue resources.
4. **Actionable Outputs:**
   * Wildfire Alerts: Automated location-based alerts for disaster response teams.
   * Flood Maps: Real-time high-resolution flood maps for emergency assessment and response.
   * Victim Locations: Detailed victim location data for optimized rescue operations.
   * Animal Rescue Plans: AI-generated recommendations for rescue teams, incorporating location-specific guidelines.

**Technologies and Tools**

* AI/ML Frameworks: TensorFlow, PyTorch, OpenCV for model training and inference.
* Object Detection: YOLOv8 for real-time victim localization from drone images.
* Satellite Data Processing: NOAA-20 VIIRS for wildfire detection and flood monitoring.
* Geospatial Data: QGIS, ArcGIS for visualization and mapping.
* Weather APIs: OpenWeatherMap, AccuWeather for real-time weather intelligence.
* Cloud Platforms: AWS, Google Cloud for scalable infrastructure and data processing.

**Implementation Steps**

1. **Data Collection and Preprocessing:**
   * Acquire and preprocess satellite imagery (NOAA-20 VIIRS) and drone data.
   * Clean and annotate datasets for training AI models, including YOLOv8 for victim detection.
2. **Model Development and Training:**
   * Train AI models for wildfire detection and flood segmentation.
   * Fine-tune YOLOv8 for accurate flood victim identification.
3. **System Integration:**
   * Integrate weather APIs for real-time updates.
   * Merge satellite imagery, drone data, and weather information into a unified decision-support system.
4. **Testing and Evaluation:**
   * Conduct real-world tests to validate system performance.
   * Assess the accuracy and responsiveness of wildfire alerts, flood maps, and rescue recommendations.
5. **Deployment and Monitoring:**
   * Deploy the system on cloud platforms for scalability.
   * Continuously monitor and improve model performance with new data.

**Expected Outcomes**

* Wildfire Detection: Faster identification of fire hotspots, reducing disaster response time.
* Flood Victim Localization: Immediate victim identification, improving rescue efficiency.
* Flood Segmentation: Real-time flood mapping for optimized resource allocation.
* Animal Welfare: Proactive rescue operations for animals in disaster-prone areas.

**Applications**

* Disaster Relief Operations: Enhanced preparedness and response for wildfires, floods, and other natural disasters.
* Search and Rescue Operations: Real-time victim identification for rapid intervention.
* Wildlife Protection: AI-driven monitoring of animals in disaster zones.
* Environmental Monitoring: Data-driven analysis for future disaster risk mitigation.

**Conclusion**

Crisis Pilot presents a transformative approach to disaster management, utilizing AI, drone technology, and satellite imagery for faster and more accurate responses. By integrating real-time location intelligence and weather updates, the system provides a comprehensive view of emergency situations, optimizing resource allocation and minimizing response time. Through its innovative features, Crisis Pilot empowers disaster relief teams to act swiftly and effectively, safeguarding human lives and animal welfare while mitigating the impact of natural disasters.