

# **Stream Sense - Intelligent Movie Review Platform with AI Sentiment Analysis**

## **Project Overview**

The platform features a dual-interface architecture: a user-facing movie browsing system and an administrator dashboard with comprehensive analytics. Users can explore a curated collection of popular streaming titles, write detailed reviews, and receive immediate sentiment feedback powered by state-of-the-art natural language processing. Meanwhile, administrators gain access to powerful analytics tools that visualize sentiment distributions, track trending content, and monitor user engagement patterns.

## **Technical Architecture**

The application is built using Flask as the backend framework, implementing a Model-View-Controller (MVC) architecture for clean code organization. The frontend utilizes modern HTML5, CSS3, and JavaScript with Chart.js for dynamic data visualization. Data persistence is managed through CSV files using Pandas, providing a lightweight yet effective solution for user accounts and review storage.

## **AI/ML Component**

At the core of the system lies a fine-tuned DistilBERT model (Distilled Bidirectional Encoder Representations from Transformers), a 66-million parameter neural network trained on the IMDB sentiment dataset. The model achieves an impressive 92.33% accuracy in classifying review sentiments. Built using PyTorch and the Hugging Face Transformers library, the sentiment analysis pipeline includes:

- Text preprocessing and cleaning
- DistilBERT tokenization (max 256 tokens)

- Real-time inference with CUDA GPU acceleration (when available)
- Confidence score generation for predictions
- Automatic fallback to CPU processing

## **Key Features**

### User Features:

- Secure registration and authentication system
- Netflix-style dark theme interface with intuitive navigation
- Interactive movie grid with hover effects and detailed movie pages
- Real-time review submission with instant AI sentiment analysis
- Personalized user sessions with secure password management

### Admin Features:

- Comprehensive dashboard with real-time analytics
- Interactive visualizations (pie charts, bar graphs, word clouds)
- Movie-specific sentiment filtering and statistics
- Total review tracking with positive/negative breakdowns
- Most popular movie identification based on positive sentiment
- Exportable data for further analysis

### Technology Stack

- Backend: Python 3.x, Flask 3.0.0
- Machine Learning: PyTorch 2.1.2, Transformers 4.36.2
- Data Processing: Pandas 2.1.4, NumPy 1.26.3
- Frontend: HTML5, CSS3, JavaScript (Chart.js)
- AI Model: DistilBERT (distilbert-base-uncased)
- Storage: CSV-based file system
- Styling: Custom Netflix-inspired CSS with responsive design

## **Dataset & Model Training**

The sentiment analysis model was trained on the IMDB Movie Review Dataset, containing 50,000 highly polarized movie reviews. The training process involved:

- Text preprocessing and tokenization
- Binary classification (positive/negative)
- Model fine-tuning with gradient descent optimization
- Validation accuracy monitoring
- Best model checkpoint saving (best\_bert\_sentiment\_model.pth)

## **Application Workflow**

1. User Registration/Login: Secure authentication with session management
2. Movie Browsing: Users explore 10 popular streaming titles with rich metadata
3. Review Submission: Natural language reviews are submitted through an intuitive interface
4. AI Processing: BERT model analyzes text and predicts sentiment with confidence scores
5. Data Storage: Reviews are stored with timestamps, usernames, and sentiment labels
6. Analytics Generation: Admin dashboard aggregates data for visualization
7. Insights Delivery: Interactive charts display sentiment trends and distributions

## **Real-World Applications**

This project demonstrates practical applications in:

- Content Recommendation Systems: Sentiment data can drive personalized recommendations
- Movie Production Analytics: Studios can gauge audience reception
- Marketing Intelligence: Identify trending content and viewer preferences

- Quality Monitoring: Detect negative sentiment patterns early
- Business Intelligence: Data-driven decision making for content acquisition

### **Performance Metrics**

- Model Accuracy: 92.33% on test dataset
- Inference Speed: Real-time (<1 second per review)
- Scalability: Session-based architecture supports multiple concurrent users
- Reliability: Graceful error handling and automatic CSV initialization

### **Future Enhancements**

Potential improvements include:

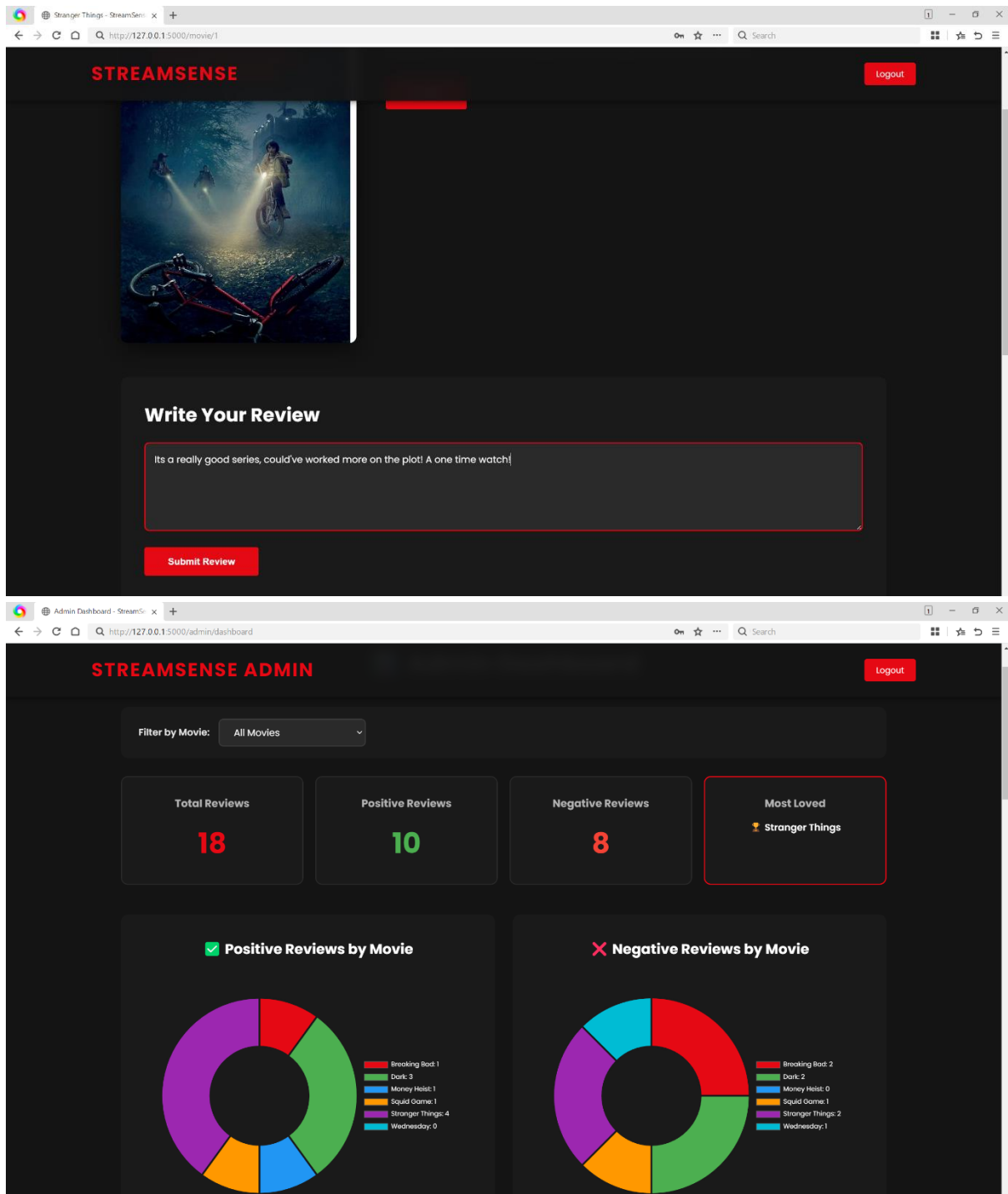
- Multi-class sentiment analysis (positive, neutral, negative, mixed)
- Aspect-based sentiment analysis (plot, acting, cinematography)
- Integration with external movie APIs (TMDB, OMDb)
- User recommendation engine based on sentiment history
- Advanced NLP features (emotion detection, sarcasm detection)
- PostgreSQL/MongoDB migration for production scalability
- RESTful API development for mobile application integration

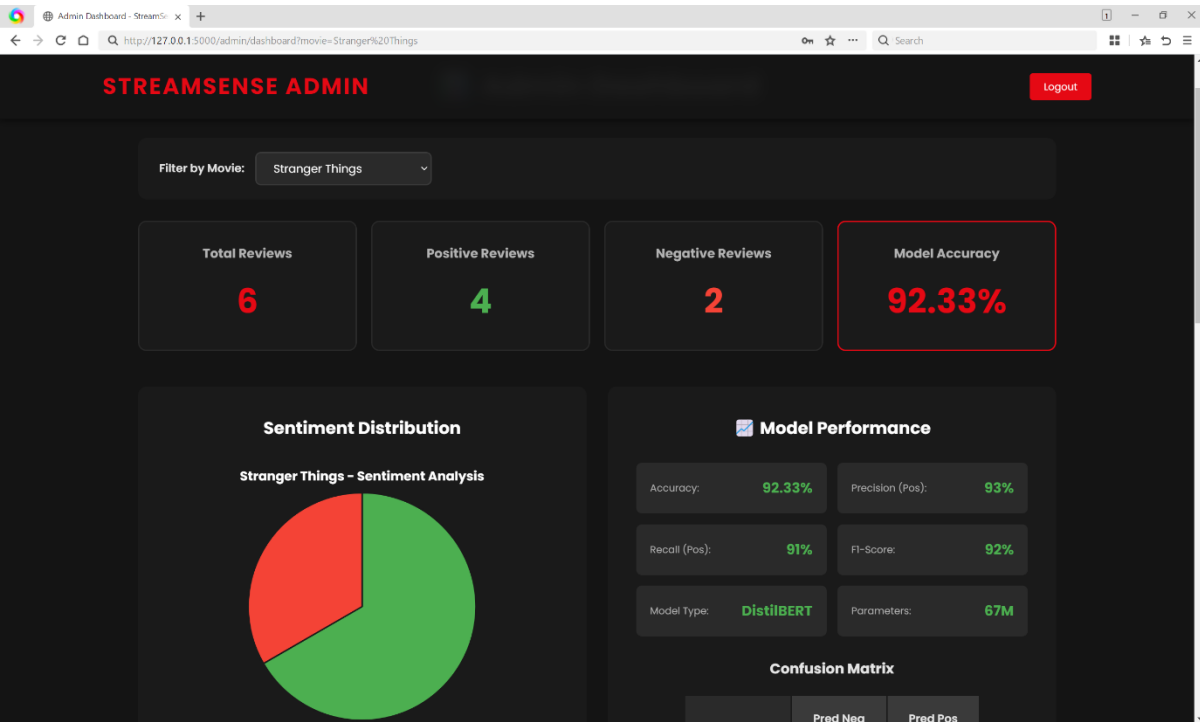
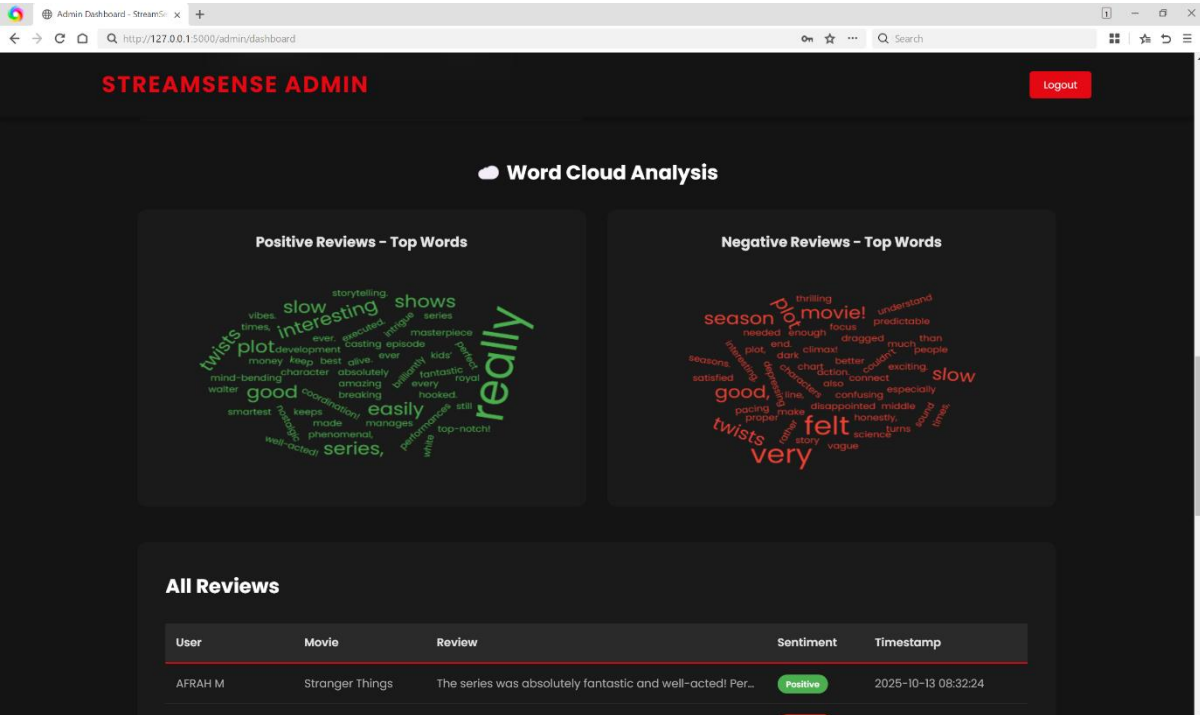
### **Educational Value**

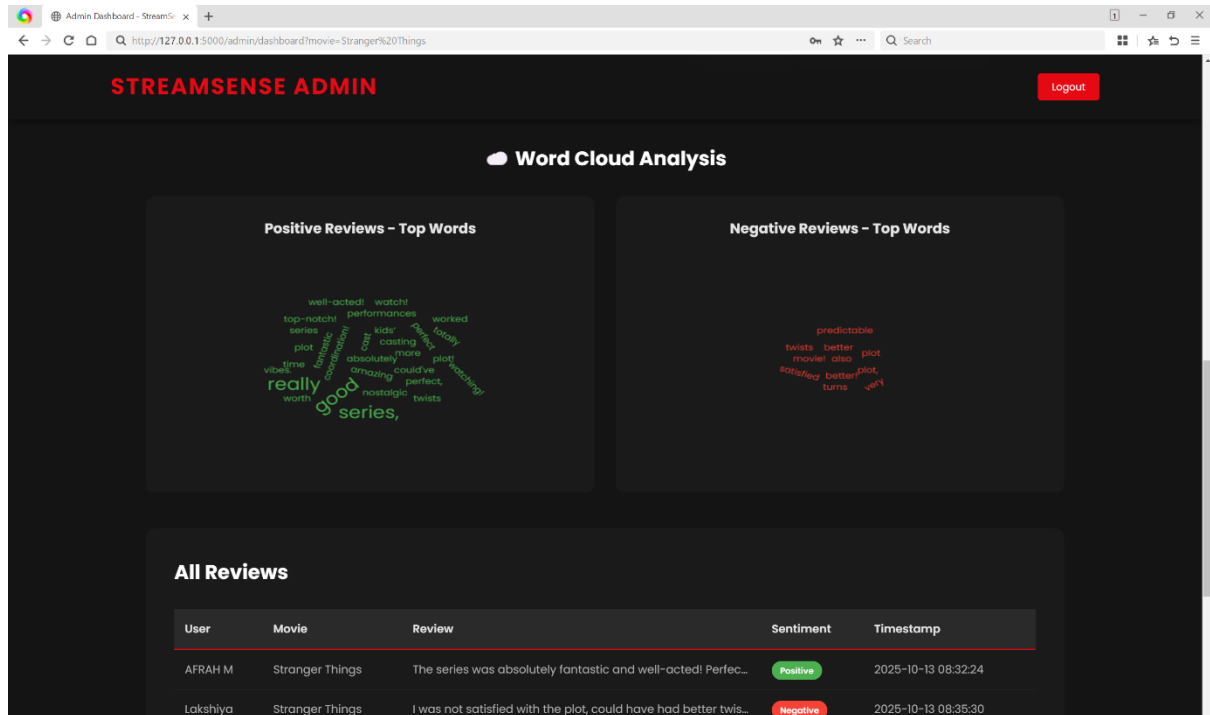
This project serves as an excellent demonstration of:

- Full-stack web development with Flask
- Deep learning model integration in production applications
- Natural language processing and sentiment analysis
- Data visualization and business intelligence
- User experience design following industry standards (Netflix UI)
- Software engineering best practices (MVC architecture, error handling)

## SAMPLE OUTPUT:







WORKING VIDEO:

