

Dashboard Plan: Fake News Detection System

Capstone Project 3

Dashboard Requirements and Design Specification

27th June 2025

1 Executive Summary

This document outlines the comprehensive plan for developing two distinct dashboards for the Fake News Detection System: an Operational Dashboard for real-time monitoring and an Analytical Dashboard for in-depth pattern analysis. The dashboards are designed to serve different user needs whilst maintaining a cohesive approach to combating misinformation through data-driven insights.

2 Dashboard Story and Purpose

2.1 The Narrative

In an era where misinformation spreads rapidly across social media platforms, there is a critical need for sophisticated monitoring and analysis tools. Our dashboard system tells the story of fake news propagation through two complementary lenses:

- **Real-time vigilance:** Immediate detection and response to emerging threats
- **Strategic understanding:** Deep analysis of patterns, behaviours, and trends

The overarching narrative demonstrates how fake news spreads through social networks, the role of verified versus unverified users, and the temporal patterns that characterise misinformation campaigns.

2.2 Problem Statement

Social media platforms face unprecedented challenges in identifying and mitigating fake news. Traditional approaches often rely on post-hoc analysis, missing the critical window for early intervention. Our dashboard system addresses this gap by providing both immediate awareness and strategic insights.

3 Dashboard Types and Specifications

3.1 Dashboard 1: Operational Dashboard

Type: Operational

Purpose: Real-time monitoring and immediate threat detection

3.1.1 Key Characteristics

- Real-time data updates with manual refresh capability
- Alert-style visualisations for immediate attention
- Quick decision-making support
- Current status indicators
- Performance monitoring metrics

3.1.2 Core Functionality

- Live article classification monitoring
- Viral content detection and tracking
- Top influencer identification
- Real-time engagement metrics
- Source credibility monitoring
- Geographic distribution analysis

3.2 Dashboard 2: Analytical Dashboard

Type: Analytical

Purpose: Strategic pattern analysis and deep insights

3.2.1 Key Characteristics

- Historical trend analysis
- Complex pattern recognition
- Comparative analysis capabilities
- Deep-dive investigation tools
- Strategic decision support

3.2.2 Core Functionality

- Temporal trend analysis with customisable time ranges
- Social network analysis and visualisation
- User behaviour pattern identification
- Source reliability tracking over time
- Category-based performance analysis
- Dynamic insight generation

4 Target Users and Demographics

4.1 Primary Users

4.1.1 Security Analysts

- **Role:** Monitor and respond to emerging threats
- **Needs:** Real-time alerts, quick threat assessment, immediate response capabilities
- **Primary Dashboard:** Operational
- **Technical Level:** High
- **Decision Speed:** Immediate to short-term

4.1.2 Research Scientists

- **Role:** Study misinformation patterns and develop countermeasures
- **Needs:** Historical data, pattern analysis, comparative studies
- **Primary Dashboard:** Analytical
- **Technical Level:** Very High
- **Decision Speed:** Long-term strategic

4.1.3 Content Moderation Teams

- **Role:** Review and moderate content based on risk assessments
- **Needs:** Source reliability, user behaviour insights, content categorisation
- **Primary Dashboard:** Both (context-dependent)
- **Technical Level:** Medium
- **Decision Speed:** Short to medium-term

4.2 Secondary Users

4.2.1 Platform Executives

- **Role:** Strategic oversight and policy development
- **Needs:** High-level trends, performance metrics, compliance reporting
- **Primary Dashboard:** Analytical
- **Technical Level:** Medium
- **Decision Speed:** Strategic

5 Key Metrics and Data Insights

5.1 Critical Performance Indicators

5.1.1 Volume Metrics

- Total articles processed per time period
- Fake vs. real news distribution ratios
- User engagement levels (tweets, retweets, favourites)
- Geographic spread patterns

5.1.2 Quality Metrics

- Source reliability scores over time
- Verified user participation rates
- Content categorisation accuracy
- Network influence measurements

5.1.3 Temporal Metrics

- Average spread time for different content types
- Peak activity periods and seasonal patterns
- Growth rates and trend directions
- Response time to emerging threats

6 Visualisation Strategy

6.1 Quantitative Techniques (4+ Required)

1. **Time Series Line Charts:** Temporal trends and growth patterns
2. **Bar Charts:** Category comparisons and user behaviour metrics
3. **Geographic Heat Maps:** Spatial distribution of content
4. **Network Graphs:** Social connection analysis using D3.js
5. **Gauge Charts:** Real-time performance indicators
6. **Scatter Plots:** Correlation analysis between variables

6.2 Qualitative Techniques (3+ Required)

1. **Colour Coding:** Semantic representation (red for fake, green for real)
2. **Interactive Tooltips:** Contextual information on hover
3. **Dynamic Text Analysis:** Automated insight generation based on data
4. **Icon-based Indicators:** Visual status representation
5. **Progressive Disclosure:** Layered information presentation

6.3 Chart Selection Rationale

6.3.1 Operational Dashboard

- **Real-time Gauges:** Immediate status comprehension
- **Geographic Maps:** Spatial threat awareness
- **Bar Charts:** Quick comparison of current metrics
- **List Views:** Actionable item identification

6.3.2 Analytical Dashboard

- **Line Charts:** Trend analysis over extended periods
- **Network Graphs:** Complex relationship visualisation
- **Grouped Bar Charts:** Multi-dimensional comparisons
- **Timeline Charts:** Historical pattern recognition

7 Technical Architecture

7.1 Technology Stack

- **Backend:** Flask (Python) with SQLAlchemy ORM
- **Database:** PostgreSQL with optimised queries
- **Frontend:** HTML5, CSS3, JavaScript (ES6+)
- **Visualisation Libraries:** Chart.js, D3.js
- **Styling:** Bootstrap 5 for responsive design

7.2 Performance Considerations

- Efficient database indexing for real-time queries
- Client-side caching for improved responsiveness
- Asynchronous data loading to prevent UI blocking
- Optimised SQL queries with appropriate aggregations

8 Interactive Features

8.1 Filtering Capabilities

- **Temporal Filters:** Date ranges, time periods
- **Category Filters:** News categories, content types
- **User Filters:** Verified status, influence levels
- **Geographic Filters:** Regional and country-based selection

8.2 Dynamic Elements

- **Real-time Updates:** Manual refresh for current data
- **Interactive Charts:** Click-through navigation and drill-down
- **Contextual Tooltips:** Detailed information on demand
- **Responsive Layout:** Adaptive design for various screen sizes

9 Success Criteria

9.1 Functional Requirements

- All visualisations display accurate, real-time data
- Filters function correctly and update charts dynamically
- Dashboard loads efficiently (< 3 seconds initial load)
- All interactive elements respond appropriately

9.2 User Experience Requirements

- Intuitive navigation requiring minimal training
- Clear visual hierarchy and information organisation
- Accessible design meeting WCAG guidelines
- Consistent behaviour across different browsers

9.3 Performance Requirements

- Support for concurrent users without degradation
- Efficient database queries executing within 500ms
- Responsive design functioning on mobile devices
- Minimal false positive/negative rates in classifications

10 Implementation Timeline

10.1 Project Schedule Overview

The implementation follows a structured approach with clearly defined phases and deliverables. The project commenced on 8th May 2025 and spans approximately 30 working days, concluding on 27th June 2025, allowing for thorough development, testing, and documentation.

10.2 Gantt Chart - Project Implementation Schedule

Project Timeline Summary:

- **Phase 1 (8-14 May):** Foundation - Database & API Development
- **Phase 2 (15-26 May):** Core Features - Statistics, Classification, Detection, Analysis
- **Phase 3 (27 May-3 June):** Analytics - Trends, Networks, User Behaviour
- **Phase 4 (13-19 June):** Dashboard Implementation - Operational & Analytical
- **Phase 5 (27 June):** Finalisation - Documentation & Delivery

Phase	Timeline Visualization
Foundation	8-14 May 2025: Database Integration (8-12 May) XXX Backend API (12-14 May) XX
Core Features	15-26 May 2025: Statistics (15-16) XX Classification (19-20) XX Detection (21-22) XX Analysis (23-26) XX
Analytics	27 May-3 June 2025: Temporal Trends (27-28 May) XX Network Analysis (29-30 May) XX User Behaviour (2-3 June) XX
Dashboards	13-19 June 2025: Operational Dashboard (13-17 June) XXXXX Analytical Dashboard (18-19 June) XX
Finalisation	27 June 2025: Documentation Report & Project Delivery X

10.3 Detailed Task Breakdown

10.3.1 Phase 1: Foundation (8-14 May 2025)

- **8-12 May: Database Integration**
 - PostgreSQL connection setup
 - SQLAlchemy ORM configuration

- Database schema validation
- Performance indexing implementation

- **12-14 May: Backend API Development**

- Flask application structure
- Blueprint architecture implementation
- Core API endpoints development
- Database query optimisation

10.3.2 Phase 2: Core Features (15-26 May 2025)

- **15-16 May: Real-time Statistics**

- Overview statistics calculation
- User verification metrics
- Performance monitoring setup

- **19-20 May: Article Classification**

- Recent articles feed implementation
- Classification filtering system
- Real-time content monitoring

- **21-22 May: Viral Content Detection**

- Engagement velocity algorithms
- Viral scoring implementation
- Alert system development

- **23-26 May: Source Analysis**

- Source reliability calculation
- Credibility scoring system
- Historical tracking implementation

10.3.3 Phase 3: Analytics Features (27 May - 3 June 2025)

- **27-28 May: Temporal Trends**

- Time series data processing
- Growth rate calculations
- Trend analysis algorithms

- **29-30 May: Network Analysis**

- Social network mapping
- Centrality calculations
- D3.js visualisation setup

- **2-3 June: User Behaviour Patterns**

- Verified vs. unverified analysis
- Engagement pattern identification
- Behaviour comparison metrics

10.3.4 Phase 4: Dashboard Implementation (13-19 June 2025)

- **13-17 June: Operational Dashboard**
 - Real-time interface development
 - Chart.js integration
 - Interactive filtering system
 - Performance optimisation
 - User testing and feedback integration
- **18-19 June: Analytical Dashboard**
 - Advanced analytics interface
 - D3.js network visualisations
 - Dynamic analysis results
 - User experience refinement

10.3.5 Phase 5: Finalisation (27 June 2025)

- **27 June: Documentation Report**
 - Development process documentation
 - Technical implementation summary
 - User guide creation
 - Final testing and validation
 - Project delivery preparation

10.4 Critical Path Analysis

The critical path for this project includes:

1. Database Integration → Backend API Development
2. Core Features Development → Analytics Features
3. Dashboard Implementation → Documentation

10.5 Risk Mitigation Timeline

- **Buffer Days:** Each phase includes half-day buffers for unexpected issues
- **Parallel Development:** Some features can be developed concurrently
- **Incremental Testing:** Testing integrated throughout development phases
- **Early Integration:** Database and API tested early to avoid late-stage issues

10.6 Deliverable Schedule

- **14 May 2025:** Backend API functional
- **26 May 2025:** Core features operational
- **3 June 2025:** Analytics features complete
- **17 June 2025:** Operational dashboard deployed
- **19 June 2025:** Analytical dashboard deployed
- **27 June 2025:** Complete documentation delivered

11 Risk Mitigation

11.1 Technical Risks

- **Database Performance:** Implement query optimisation and indexing
- **Real-time Updates:** Design efficient polling mechanisms
- **Scalability:** Plan for horizontal scaling capabilities

11.2 User Adoption Risks

- **Complexity:** Provide comprehensive user documentation
- **Training:** Develop user guides and tutorials
- **Feedback Integration:** Establish continuous improvement processes

12 Conclusion

This dashboard plan establishes a comprehensive framework for developing sophisticated fake news detection and analysis tools. By combining real-time operational capabilities with deep analytical insights, the system will provide users with the tools necessary to combat misinformation effectively. The differentiated approach ensures that both immediate response needs and strategic planning requirements are met through purpose-built interfaces optimised for their respective use cases.

The success of this implementation will be measured not only by technical performance but by the system's ability to enhance decision-making capabilities and improve the overall response to misinformation threats in digital environments.