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news recommendation system

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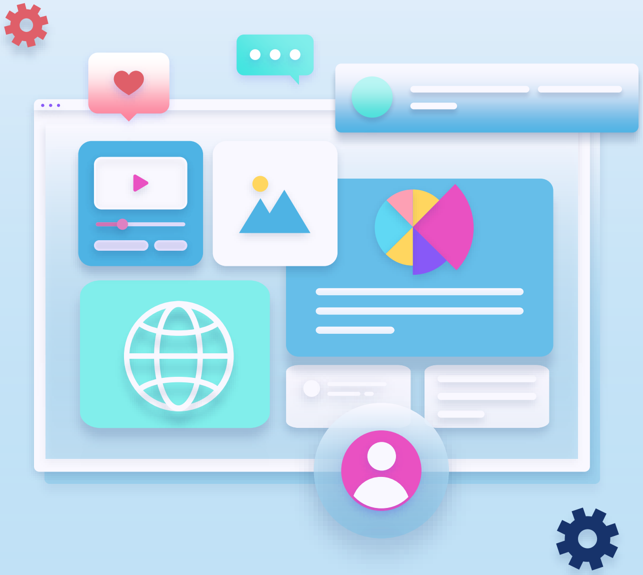

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introduction

overview

A credibility-aware news recommendation system that delivers relevant **AND** trustworthy content to readers

Unlike standard systems that prioritize relevance alone, our solution integrates credibility assessment to filter misinformation while maintaining content relevance

problem statement - stakeholders

Standard recommendation systems promote fake news as easily as verified content

- This erodes user trust and damages platform reputation
- Readers make less informed decisions due to misinformation exposure

Primary stakeholder

- The end user, specifically news readers who rely on digital platforms for information that are directly affected by exposure to misinformation

Secondary stakeholders

- News platforms and aggregators seeking to maintain credibility and retain users

dataset description

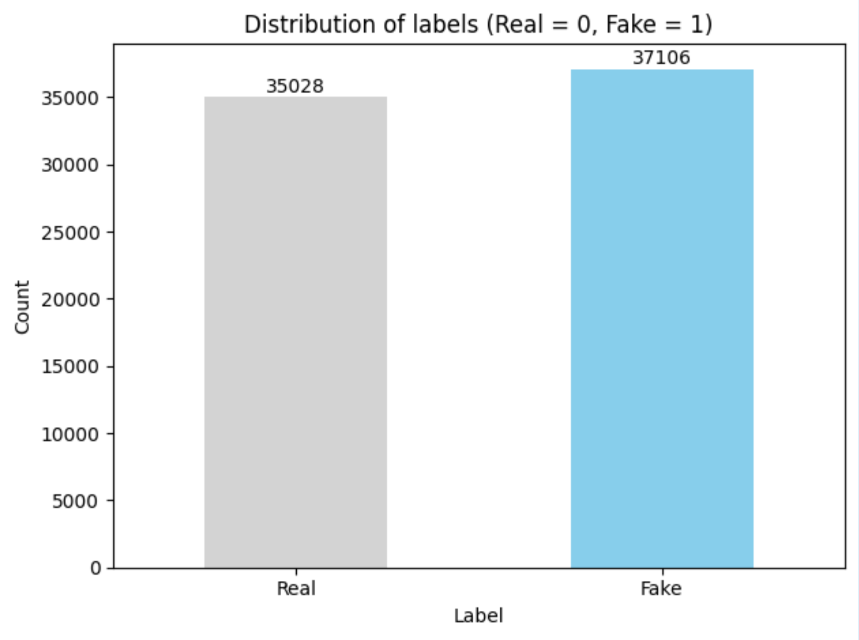
WELFake dataset: 72,134 news articles from multiple sources

- Created by merging Kaggle, McIntire, Reuters, and BuzzFeed Political datasets
- Balanced distribution: 48.6% real news, 51.4% fake news
- Final cleaned dataset: **63,121** unique articles after removing duplicates and missing values

02

data processing

label distribution



Near-perfect balance: 48.6% real news, 51.4% fake news

- No artificial data manipulation required
- Ensures unbiased credibility assessment
- Reflects real-world news ecosystem proportions

This balanced dataset enables reliable credibility scoring without overemphasizing either news type

feature engineering

Title Length: **Fake news headlines are 14 characters longer on average**

Real: 68.8 characters | Fake: 82.9 characters

Most powerful single indicator (66.2% accuracy)

Exclamation Count: Fake news uses 50x more exclamation marks

Real: 0.002 per headline | Fake: 0.107 per headline

Question Marks: Fake news uses 2.6x more questions

Real: 2.5% of headlines | Fake: 6.5% of headlines

Capitalization Ratio: Fake news uses nearly 2x more ALL-CAPS text

Real: 1.0% capitalization | Fake: 1.9% capitalization

These headline patterns serve as early warning signals that help identify misinformation before readers click through to full articles

03

credibility assessment

how we measure trustworthiness

- Uses out-of-sample prediction to prevent data leakage
- Scores represent probability that an article is real (0 = fake, 1 = real)
- Maintains original dataset balance through stratified cross-validation

what we analyze in headlines

- Punctuation patterns (exclamation marks, question marks)
- Capitalization usage
- Structural elements and length

Unlike standard systems, our credibility scores come from models that never saw the specific article during training, ensuring unbiased, reliable assessments

transparent explanations

SHAP Explainability reveals why articles receive specific credibility scores:

- Identifies exact words/phrases that influence trustworthiness
- Shows how "CDC" increases credibility or "BREAKING!!!" decreases it
- Uses game theory approach for mathematically sound explanations

Reader-friendly output

- Clear "High/Moderate/Low" credibility labels
- Specific reasons like "Reputable health authority mentioned"
- Actionable guidance: "Check sources before sharing"

This transforms opaque credibility scores into actionable insights readers can understand in seconds, not technical details

04

recommendation system

how we match content to readers

Content-based similarity

- Analyzes headlines to find topically related articles
- Uses advanced text analysis to understand what makes articles similar
- Focuses on what interests readers (not just popularity)

Why this matters

- 89% of news consumption happens on mobile devices
- Readers need relevant content in seconds, not minutes
- Standard systems often recommend similar but misleading content

Hybrid scoring algorithm combines two factors

- 50% Content Relevance: What interests you
- 50% Source Credibility: Is it trustworthy?

Smart topic-sensitive filtering

- Health topics: 45% credibility minimum
- Political topics: 40% credibility minimum
- Standard topics: 30% credibility minimum

perfect balance

Rigorous testing

- Tested multiple weight combinations (50-80% similarity)
- Measured impact on fake news reduction and relevance

The winning formula: 50/50 balance

- Achieved 91% precision@5 (91 out of 100 top recommendations are real news)
- Reduced fake news in recommendations by 38 percentage points (from 46% to 9%)
- Maintained strong relevance (0.42-0.61 topic match)

This balance delivers the best protection against misinformation while keeping content relevant to readers

real-world results

When users view fake news (0.04 credibility)

- System recommends articles with 0.63 average credibility while maintaining 0.42 topic relevance

When users view credible content (0.99 credibility)

- System maintains high standards (0.97 average credibility) with 0.61 topic relevance

real-world results

1. Dynamic Credibility Thresholds

Problem: Fixed thresholds can't adapt to evolving misinformation tactics

Solution: Automatically adjust scrutiny levels during emerging threats (e.g., health crises)

Business Value: Stay ahead of misinformation without manual intervention while maintaining the 50/50 relevance/credibility balance

04

recommendations

1. Dynamic credibility thresholds

- **Problem**: Fixed thresholds can't adapt to evolving misinformation tactics
- **Solution**: Automatically adjust scrutiny levels during emerging threats
- **Business value**: Stay ahead of misinformation without manual intervention while maintaining the 50/50 relevance/credibility balance

2. Personalized credibility settings

- **Problem**: One-size-fits-all approach ignores different user needs and contexts
- **Solution**: Simple slider for users to adjust relevance/credibility balance (70/30 to 30/70)
- **Business value**: Increase user satisfaction while maintaining system integrity: breaking news seekers prioritize relevance, health researchers prioritize credibility

3. Cross-platform credibility sharing

- **Problem**: Misinformation spreads across platforms while systems operate in isolation
- **Solution**: Privacy-preserving protocol to share anonymized credibility signals across platforms
- **Business value**: Collective defense against coordinated misinformation campaigns through shared linguistic fingerprint detection

THANKS!

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