

SentimentSift: AI-Powered Review Analysis Platform

7245 Big-Data

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1. Introduction

Background

In today's digital marketplace, online reviews significantly influence consumer decisions. However, these reviews often contain emotional biases, exaggerations, or subjective content that can skew the overall perception of businesses. While Google reviews provide valuable consumer feedback, they don't differentiate between objective assessments and emotionally charged content, creating potential blind spots for both businesses and consumers seeking reliable information.

A restaurant owner saying that those who gave the restaurant one-star negative reviews were all saying it took too long to wait, not that the food was bad. So there is an API that can capture the reviews of this store, and then throw it into AI analysis, there should be different results.

Tsuru Ton Tan - Boston
512 Commonwealth Ave, Boston, MA 02215 美國

撰寫評論

3.9 ★★★★★ 428 則評論

1 則評論 · 3 張相片

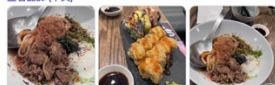
★★★★★ 7 個月前

內用 | 午餐 | US\$20-30

Really nice food!! Especially the crab sushi and the spicy chicken wudon. The waiter and waitress is good, but the only problem is the attitude of one of the girls. We aren't familiar with this restaurant, it's our first time to dine in. We are foreigners, we don't know we have to show our student ID to get discount. But the girl just angrily yelled and queried us why didn't we tell her at the first place if we want discount. But the problem is "we don't know!!" And I just asked her whether we can get the discount or not, 'cause again I Don't Know!! But she couldn't stop yelling, and asked us to wait. But it's your job to explain it to us. We were confused, But the result was being yelled in the public. I know she had a busy and harsh day for working. But it really affect our moods. I still tipped, because the other waiters are really nice.

餐點：5/5 | 服務：1/5 | 氣氛：5/5

查看翻譯 (中文)



SentimentSift addresses these challenges by not only filtering emotional content but also providing a curated list of reliable food bloggers. For each trusted blogger, the platform displays a comprehensive list of all restaurants they've previously visited and reviewed, creating a reliable recommendation network that users can trust.

Objective

SentimentSift aims to develop an intelligent review analysis platform that uses advanced natural language processing and sentiment analysis to filter emotional content from Google reviews, providing users with more objective, factual, and balanced insights about businesses, products,

and services.

2. Project Overview

Scope

- **Data Sources:** Google Reviews API for structured data, web scraping for additional unstructured review content from various platforms
- **Technologies:** Apache Airflow for ETL, FastAPI for backend services, Streamlit for frontend, LangChain/LangGraph for agent orchestration
- **Deliverables:** A fully functional web application that allows users to search for businesses, view filtered reviews, and gain objective insights through AI-powered analysis

Stakeholders

- **Primary Users:** Consumers making purchasing decisions
- **Secondary Users:** Business owners seeking accurate customer feedback
- **Tertiary Users:** Market researchers and analysts studying consumer behavior

3. Problem Statement

Current Challenges

1. **Emotional Bias:** Reviews often contain emotional language that can distort perception of actual quality
2. **Manipulation:** Some reviews may be inauthentic or manipulated to inflate or deflate ratings
3. **Inconsistency:** Review quality and helpfulness vary widely, making it difficult to extract reliable information
4. **Information Overload:** Users must read through numerous reviews to form their own assessment
5. **Reviewer Credibility:** Difficulty in identifying which reviewers consistently provide

accurate, trustworthy reviews

Opportunities

1. **Objectivity Enhancement:** Provide more balanced, fact-based assessment of businesses
2. **Time Efficiency:** Save users time by automatically filtering and summarizing review content
3. **Business Insights:** Help businesses understand genuine customer concerns separated from emotional reactions
4. **Trust Building:** Create a more trustworthy information ecosystem for consumer decision-making
5. **Reliable Food Blogger List:** Identify trustworthy food bloggers and provide access to all businesses they've reviewed

4. Methodology

Data Sources

1. **Structured Data:**
 - Google Places API: Primary source for business information and associated reviews
 - Public Review Datasets in CSV/JSON format: For initial model training and validation
 - User feedback data stored in structured database tables
2. **Unstructured Data:**
 - Web Scraping Pipeline: Reviews from various platforms (Yelp, TripAdvisor)
 - PDF documents: Business reports, academic papers on sentiment analysis
 - Social media feeds: Unstructured text data from Twitter/X, Instagram comments

Technologies and Tools

1. Data Collection & Processing:

- Apache Airflow for ETL pipeline orchestration and data preprocessing
- Python (BeautifulSoup, Scrapy) for web scraping
- AWS S3 for storing both structured and unstructured review data(from web, PDFs)
- PostgreSQL for structured business data (API responses)

2. Backend Development:

- FastAPI for multiple RESTful API endpoints
- Agent orchestration using Langgraph, CrewAI, and Autogen frameworks
- Integration with multiple LLMs (GPT-4, Claude, Llama) for sentiment analysis
- MCP server integration for distributed processing
- Docker for containerization

3. Frontend Development:

- Streamlit for user interface and dashboard
- Plotly and Altair for interactive data visualizations
- Streamlit components for enhanced UI capabilities

Data Storage Design:

1. S3 Data Architecture:

- Business metadata stored in JSON format
- Reviews stored in date-partitioned folders for versioning
- Reviewer data with reliability metrics
- Efficient object organization for scalable access

2. Reliable Blogger Classification:

- Algorithm to identify consistently accurate reviewers
- Track record analysis of previous reviews
- Cross-referencing with known expert opinions
- Reliability scoring system based on multiple factors

Data Pipeline Design

1. Data Ingestion:

- Scheduled API calls to Google Places API
- Parallel web scraping jobs for supplementary review sources
- Data validation and cleaning procedures

2. Storage Layer:

- Distributed database architecture for scalability
- Caching mechanisms for frequently accessed data

3. Processing Layer:

- Review text preprocessing (tokenization, lemmatization)
- Sentiment analysis and emotional content detection
- Fact extraction and verification

Data Processing and Transformation

1. **Sentiment Analysis:** Identify and quantify emotional content in reviews
2. **Fact Extraction:** Use NLP techniques to extract objective statements from reviews
3. **Credibility Scoring:** Develop an algorithm to score review credibility based on various factors
4. **Summary Generation:** Create concise, objective summaries of multiple reviews
5. **Blogger Reliability Analysis:** Evaluate food bloggers' consistency, accuracy, and

objectivity

5. Project Plan and Timeline

Milestones and Deliverables

1. Project Setup and Initial Development (April 5-7)

- Repository setup and project scaffolding
- Team roles assignment
- Data source API integration setup
- Initial Airflow pipeline configuration

2. Data Collection and Processing (April 8-10)

- Implementation of web scraping components
- Development of data processing pipelines
- Initial sentiment analysis model integration
- Data storage implementation

3. Backend and Agent Implementation (April 11-13)

- FastAPI endpoint development
- Agent orchestration with Langgraph/CrewAI
- LLM integration for sentiment analysis
- MCP server setup

4. Frontend and Integration (April 14-16)

- Streamlit application development
- Data visualization implementation
- API integration with frontend

- Initial system testing

5. Final Testing and Deployment (April 17-18)

- Comprehensive testing and debugging
- Documentation completion
- Cloud deployment
- Final presentation preparation

Timeline

Due to the compressed timeframe (April 5-18), the team will employ an agile sprint methodology with daily stand-ups to ensure rapid progress and address any blockers immediately. A detailed task board will be maintained in GitHub Projects with daily updates and priority adjustments.

6. Resources and Team

Personnel

- **Team Member 1 (33.3%):** Data Engineering Lead
 - Responsible for ETL pipeline development
 - API integration
 - Database management
- **Team Member 2 (33.3%):** AI/ML Specialist
 - Sentiment analysis model development
 - LLM integration
 - Agent orchestration
- **Team Member 3 (33.3%):** Full-Stack Developer
 - Frontend development

- Backend API implementation
- System integration

7. Risks and Mitigation Strategies

Identify Risks

1. **API Rate Limiting:** Google Places API has usage limits that could restrict data collection
2. **Model Accuracy:** Sentiment analysis and fact extraction models may have accuracy limitations
3. **Scalability Challenges:** Processing large volumes of reviews may create performance bottlenecks
4. **Legal/Ethical Concerns:** Web scraping and data usage may have legal implications

Mitigation Strategies

1. **Distributed Data Collection:** Implement rotating proxies and scheduled collection to avoid rate limits
2. **Model Ensemble Approach:** Use multiple models and validation techniques to improve accuracy
3. **Efficient Database Design:** Optimize storage and indexing for scalability
4. **Legal Compliance:** Ensure all data collection adheres to Terms of Service and applicable regulations

8. Expected Outcomes and Benefits

Measurable Goals and Testing Framework

1. **Accuracy Metrics:**
 - Achieve >85% accuracy in sentiment classification (measured using precision, recall, F1-score)

- Implement A/B testing to compare filtered vs. unfiltered review insights
- Use human evaluation panels to validate AI-filtered content quality

2. **Performance Testing:**

- Process and analyze >10,000 reviews per hour
- Stress testing of API endpoints with simulated traffic
- Benchmark response times across different server configurations

3. **User Experience Evaluation:**

- Achieve >80% user satisfaction in initial user testing
- Implement usability testing protocols with defined task completion metrics
- Track user engagement and retention metrics

4. **System Integration Testing:**

- End-to-end testing of the entire pipeline from data collection to visualization
- Component testing for each agent in the multi-agent system
- Cross-compatibility testing across different devices and browsers

Expected Benefits

1. **Enhanced Decision Making:** Users can make more informed decisions based on objective information
2. **Time Savings:** Reduce the time needed to research businesses by 50%
3. **Business Improvement:** Provide businesses with clear, actionable feedback separated from emotional noise
4. **Market Analysis:** Enable better understanding of market trends through objective review analysis

9. Conclusion

The SentimentSift platform addresses a critical gap in online review systems by providing tools to filter emotional bias and extract objective information. By leveraging advanced AI techniques, our project aims to transform how consumers interact with and utilize online reviews, ultimately creating a more transparent and reliable information ecosystem for both consumers and businesses.