

DES646 – Mid-Term Assessment: Project Proposal Submission

1. Project Title: **DesignSense:** AI-Powered Sentiment Analysis for Smarter Smartphone Experience Design.

2. Team Details (Ideators):

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3. Project Aim:

To leverage AI and ML to analyze smartphone feedback across platforms and languages, generating actionable insights for both buyers and suppliers to enhance user experience and guide user-centric product design.

4. Objectives:

- To collect and integrate **smartphone user feedback** from diverse sources such as Amazon, Flipkart, Myntra, Reddit and Twitter for holistic sentiment analysis.
- Apply **NLP** and **feature-level sentiment analysis** to uncover perceptions related to key smartphone features (e.g., battery, camera, heating, and UI).
- Conduct **cross-cultural** and **multilingual analysis** to explore variations in design expectations and pain points across user demographics.
- Generate dual-perspective insights:
 - **For buyers** – highlight key satisfaction trends, preferred brands, and recurring issues.
 - **For suppliers** – identify feature improvement areas and design opportunities based on sentiment clusters.

Then, to visualize comparisons (feature importance, use-case distribution, price sensitivity) and produce an **interactive demo/dashboard**.

- Translate insights into **design recommendations** that guide more empathetic, data-driven, and user-centric smartphone development.

5. Proposed Methodology / Technical Approach:

The project will employ an AI/ML-driven pipeline to analyze smartphone reviews and discussions from Reddit, Twitter/X, Flipkart, Amazon, and Myntra. Data will be ethically collected via official APIs or compliant scraping, then cleaned, normalized, and stored in MongoDB for further processing.

NLP preprocessing using transformer models (**BERT**, **DistilBERT**) will enable:

- Sentiment classification
- Aspect-Based Sentiment Analysis (ABSA)
- Topic extraction through BERTopic or Latent Dirichlet Allocation (LDA)

Supervised and unsupervised methods (e.g., Gradient Boosted Trees, SHAP) will estimate feature importance and price sensitivity. Model validation and testing will be conducted using metrics such as accuracy, **F1-score**, and **correlation** analysis, along with cross-platform and temporal evaluations to ensure robustness.

The system will be deployed with a **Next.js frontend** and a **Flask backend**, where users (buyers or suppliers) can query the trained model — for example, to identify flaws in a particular smartphone (e.g., Xiaomi 15 Pro) — and receive responses via the backend using pre-trained models and the OpenAI API. Real-time training will not be implemented to avoid challenges with continuous data ingestion and memory constraints. A **React-based dashboard** will visualize comparative insights, sentiment trends, and supplier recommendations.

Tools and technologies include **Python**, **PyTorch**, **Hugging Face Transformers**, and **Chart.js**.

6. Expected Deliverables:

- **Cleaned & Structured Dataset** – Integrated **multilingual** user feedback/product reviews on smartphones collected from Amazon, Flipkart, Myntra, Reddit and Twitter.
- **Codebase**: Data collection scripts, preprocessing, models, and scoring engine.
- **Feature-Level Sentiment Model** – An AI/ML pipeline capable of identifying sentiments for specific smartphone features (e.g., battery, camera, performance).
- **Buyer–Supplier Insight Dashboard** – A **web demo** showcasing user pain points and actionable recommendations **separately** for buyers and suppliers.
- **Design documentation & Readme**: Methodology, data schema, evaluation results, and instructions to run.

7. Intellectual Property / Research Dissemination Plan:

Our project will follow the **Publication Track**, with a research paper prepared for submission to IEEE conferences or journals in AI, data analytics, or human–computer interaction. The

paper will present the AI/ML-driven smartphone review analysis system, highlighting **Aspect-Based Sentiment Analysis**, **feature importance** modeling, and **buyer/supplier insights**. The study aims to advance AI-assisted product evaluation while ensuring all data and models comply with ethical and privacy standards.

8. Preliminary Timeline (till Final Submission):

Week	Milestone / Tasks	Short Description
Week 1	Problem Definition & Data Planning	Extract data from data sources (Amazon, Flipkart, Reddit, Twitter, Myntra), define schema, and set up API access.
Week 2	Data Collection & Storage Setup	Extract sample reviews via APIs or compliant scraping, clean duplicates, and store in MongoDB.
Week 3	NLP Preprocessing & Model Training	Perform text normalization, tokenization, and sentiment/ABSA model fine-tuning using BERT or DistilBERT.
Week 4	Feature Importance & Topic Modeling	Apply BERTopic/LDA and Gradient-Boosted Trees + SHAP for feature and theme extraction across brands.
Week 5	Dashboard & Backend Integration	Develop Flask backend and Next.js/React frontend to serve buyer–supplier insights; integrate Chart.js for visual trends.
Week 6	Evaluation & Final Documentation	Validate models (accuracy, F1-score, correlation), generate comparative reports, and finalize documentation + presentation.

9. Resources Required:

- **Compute:** GPU instance for model fine-tuning and CPU instance for data collection and indexing.
- **Storage & Database:** MongoDB or PostgreSQL; Elasticsearch for indexing and analytics.
- **APIs / Access:** Twitter/X API, Reddit API/Pushshift, Flipkart and Amazon review data.
- **Software & Frameworks:** Python 3.9+, Hugging Face Transformers, PyTorch, spaCy, scikit-learn, pandas, FastAPI/Flask, React, Chart.js.

References:

Reference 1	Reference 2	Reference 3	Reference 4	Reference 5
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