

PROBLEM BREAKDOWN

The modern marketing landscape is fragmented and inefficient. Brands struggle with:

- **Attention Economy Crisis**
- **Resource Inefficiency** in Startups and content creators
- **Lack of Personalization**
- **Channel Optimization Gap**



MARKET ANALYSIS:

The global digital marketing automation market is valued at \$8.42 billion (2024) and growing at 13.3% CAGR. However, **73% of businesses struggle with channel optimization and 68% report difficulty in content personalization.** break it into points

USER PERSONA



Name: Dev Yadav
Age: 27 years
City: Mumbai
Occupation: Startup Owner

Pain point: Insufficient budget and time for manual marketing labour and analysis



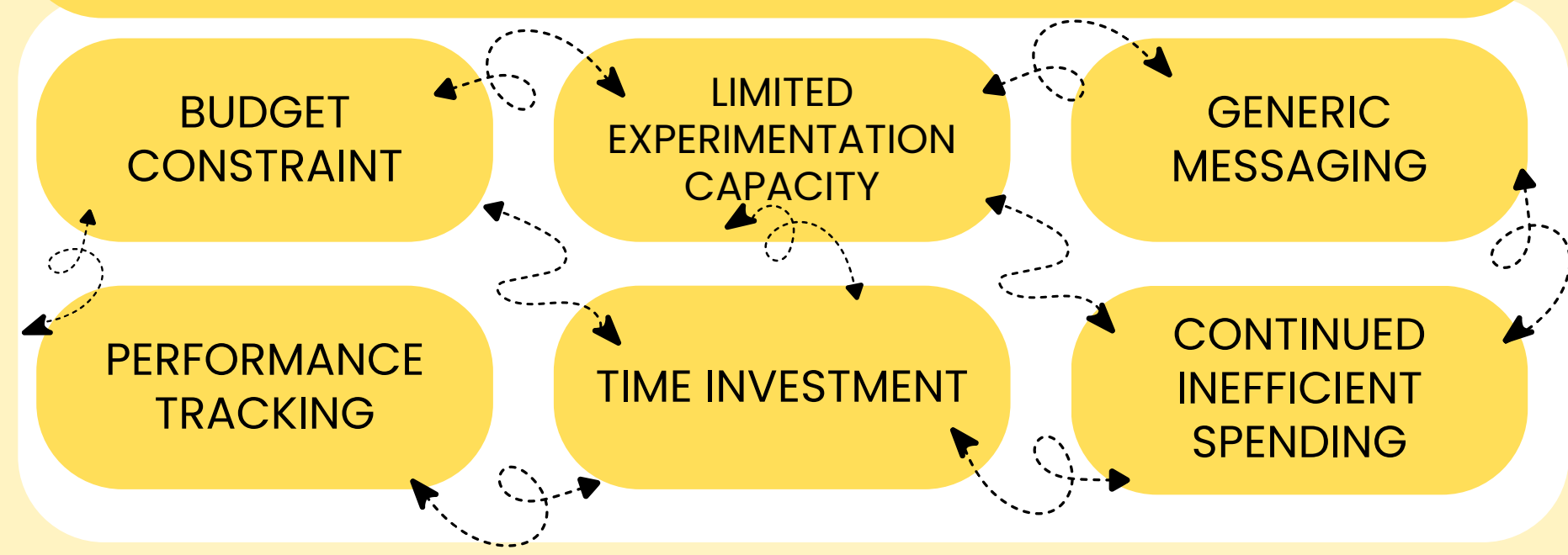
Name: Riya Pal
Age: 23 years
City: Delhi
Occupation: Influencer

Pain point: Insufficient energy and time for manual analysis of her account

OBJECTIVE

AI x Growth Challenge is to design an **AI-powered solution** that automates and optimizes marketing or growth channels such as LinkedIn, WhatsApp, Instagram, or Twitter

INTERCONNECTED PAIN POINTS



Solution Overview

A Python-based tool to:

- Scrape Instagram post data
- Analyze mood, engagement, visuals, audience
- Output insights + CSV
- Recommend improvements (timing, hashtags, visuals)

UVP(UNIQUE VALUE PROPOSITION)

"AI-powered insights that go beyond likes analyzing mood, visuals, timing, and audience to help creators grow smarter and faster."

FEATURES

Data Extraction

Via Instagram API

Data: captions, hashtags, likes, comments, views, demographics, audio, visuals

Content & Mood Analysis:

NLP (TextBlob/VADER) → Classify as: Motivation, Comedy, Brainrot, Informative

Sentiment + frequent comment words

Audio trends & thumbnail style

Engagement Metrics

Watch time, gender ratio, hook performance (first 3s)

CTR, conversion rate

Active hours/days

Visual Analysis

Dominant colors (OpenCV), fonts (OCR)

Suggest color palettes per mood

Output & Recommendations

Store everything in CSV

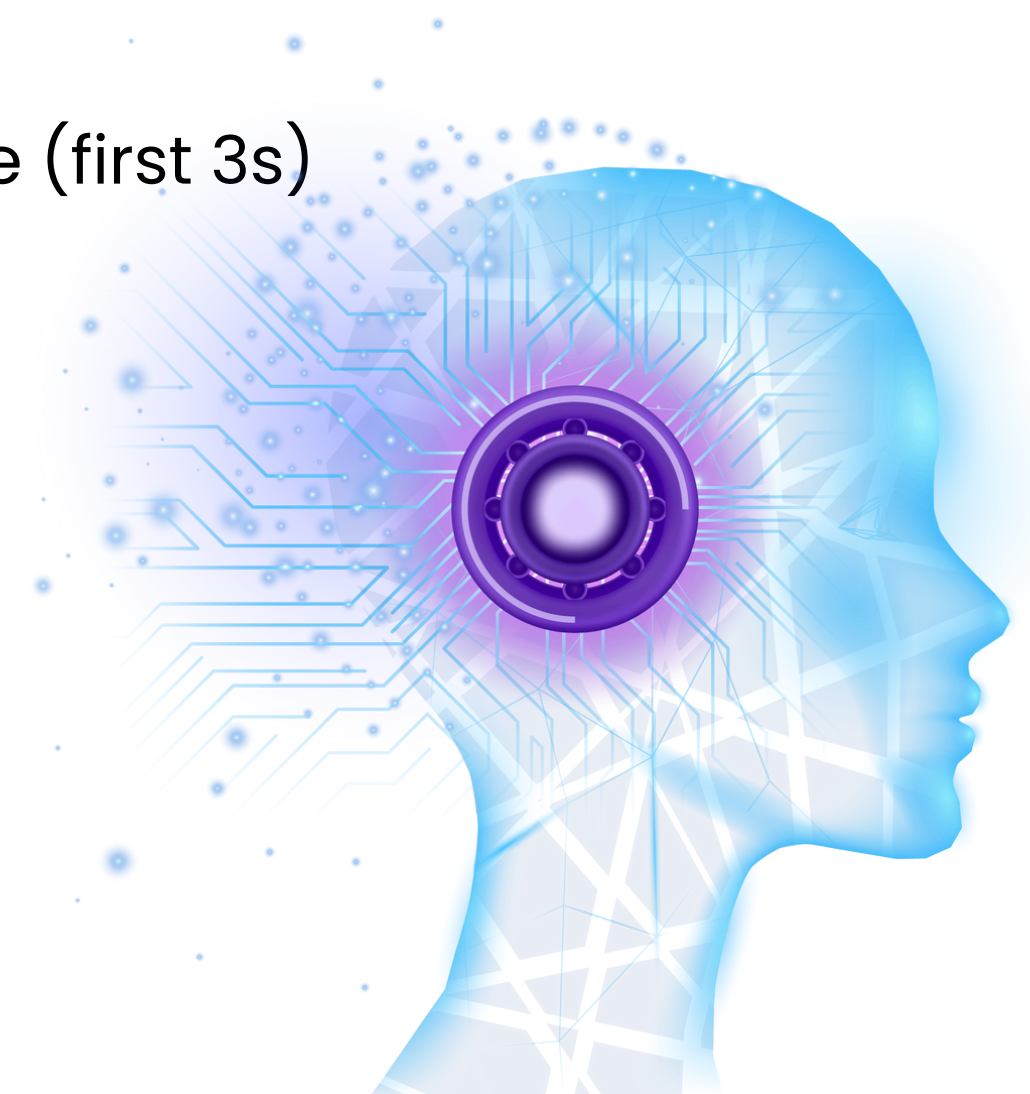
Recommend:

A/B test thumbnails

Best post times (per gender/age/location)

Hashtag refinement

Mood-based color palettes



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SOLUTION

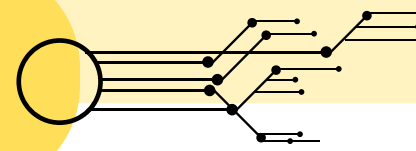
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Tech Stack Overview



Backend & API Integration

- **Python** – Core programming language for scripting and automation
- **Instagram Graph API** – Fetch media, comments, insights, and demographics
- **Requests** – HTTP requests to access Instagram data
- **dotenv** – Environment variable management for secure token handling

Data Processing & Analysis

- **Pandas** – Data manipulation and CSV export
- **NumPy** – Numerical operations (image pixel data, color clustering)
- **JSON** – Structured data storage and parsing
- **TQDM** – Progress tracking for loops
- **Collections.Counter** – Word frequency and color analysis

Media & Visual Analysis:

- **OpenCV** –
 1. Motion detection
 2. Face count
 3. Dominant color extraction (via K-means)
- **Pillow (PIL)** – Image processing (thumbnail, RGB conversion)
- **MoviePy** – Video/audio handling, duration extraction
- **FFmpeg** (indirect via MoviePy) – Audio export
- **Librosa** – Audio analysis (tempo, duration, waveform)

Web dev part:

Frontend: HTML, CSS, Javascript
Backend: NodeJs, Flask

Natural Language Processing (NLP)

- **NLTK** – Tokenization and text preprocessing
- **Hugging Face Transformers** – Sentiment analysis using pretrained models (pipeline("sentiment-analysis"))
- **Text Analysis:**
 - Sentiment tone classification (positive/negative/neutral)
 - Mood inference from captions/comments
 - Common word extraction

Storage & Export

- **CSV** – For tabular analytics export (used in tools like Excel, Power BI)
- **JSON** – For structured data storage and downstream ML usage

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AI Impact Assessment – K.A.R.O Model

K – Knowledge

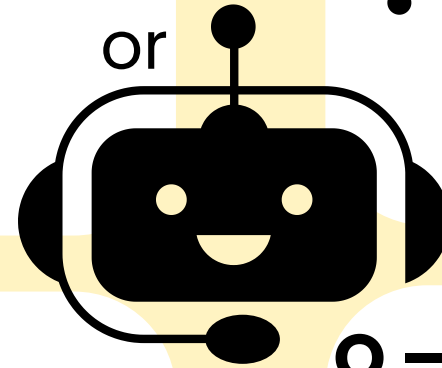
What does the AI system learn, understand, or generate?

- Data sources used (e.g., Instagram posts, comments, demographics)
- Type of insights generated (mood, engagement, timing, audience behavior)
- It enhances human decision-making or automate it.

A – Action

What actions does the AI enable or automate?

- Recommends post timings, hashtags, thumbnail styles, color palettes
- Automates mood classification, sentiment analysis, and visual analysis
- Drives decisions: What to post, when to post, and how to post



R – Reach

Who is impacted by the AI system, and how far does that impact go?

- Primary: Content creators, digital marketers
- Secondary: Followers, brands, platform engagement
- Scope: Scalable to any platform using video + audience data (YouTube, TikTok)

O – Outcome

What measurable results or value does the AI deliver?

- Higher engagement: CTR, watch time, conversions
- Data-backed creative decisions
- Time saved on manual analysis
- Personalized content strategy → better audience retention and growth

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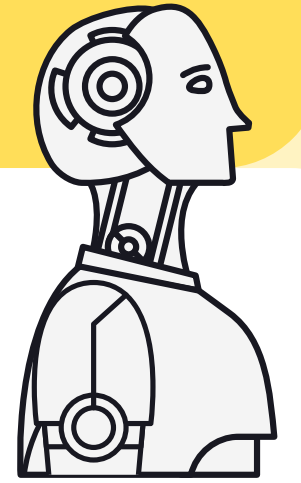
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Future Expansion:



- ✓ LinkedIn: Analyze post mood (informative, promotional) and Engagement by industry, job role, post timing
- ✓ Twitter (X): Sentiment analysis, hashtag trends, Virality patterns and timing optimization
- ✓ WhatsApp Business: Track open & click-through rates, Analyze customer sentiment and conversion flow

Bibliography Links

Personalization, User Retention, and Channel Optimization

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- <https://www.gartner.com/en/marketing/insights/articles/ai-in-marketing>
- <https://www.mckinsey.com/capabilities/growth-marketing-and-sales/our-insights/the-potential-for-ai-in-marketing>

AI Marketing & Growth Automation

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- <https://www.mckinsey.com/capabilities/growth-marketing-and-sales/our-insights/the-potential-for-ai-in-marketing>

Tech Stack & AI Tools

- <https://stackshare.io/collections/ai-marketing-automation>
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