

# Project Report on

## Automating Digital Advertisement Campaigns with LLMs (MVP)

### 1. Objective

The primary goal of this project was to develop a Minimal Viable Product (MVP) for automating the creation of digital advertisement campaigns using Large Language Models (LLMs). The system was designed to accept a structured campaign brief—including product details, goal, target audience, budget, and optionally a website or marketing material in PDF format—and generate compelling ad copy suitable for deployment on major social platforms like LinkedIn, Meta, or TikTok.

The project followed a two-day sprint. Day one focused on environment setup, Gemini API configuration, and developing the PDF parsing module. Gemini's outputs were tested with several prompt versions to ensure formatting consistency. Day two involved modularizing the codebase, adding fallback parsing logic for inconsistent outputs, and testing edge cases such as missing fields or PDFs. Mock deployment routines were also prepared to simulate actual campaign launches.

### 2. Approach & Architecture

The solution adopted a modular design with distinct components for input collection, PDF text extraction, LLM prompt generation, response parsing, and mock deployment logic. A Command-Line Interface (CLI) was chosen for this prototype to maintain simplicity and ease of use for developers. PyMuPDF was utilized for robust and accurate PDF text extraction. The backend logic was separated into three modules: `extractor.py` for document handling, `generator.py` for LLM integration and prompt engineering, and `runner.py` for overall orchestration.



### 3. Model Selection and LLM Alternatives

Several LLMs were evaluated, including open-source options like LLaMA 2, Mistral, and Falcon, alongside commercial models such as Claude and GPT-4. Gemini 1.5 Flash by Google was ultimately selected due to its fast response time, stable output formatting, and efficient handling of structured prompts. While LLaMA and Mistral offered local control, they would have required significantly more setup and fine-tuning for this MVP. Claude demonstrated strong reasoning capabilities but was less consistent in adhering to the desired output format. Gemini struck the optimal balance among structure, quality, and integration simplicity.

Table shows the comparison for the various open source large language models

LLM	Type	Strengths	Weaknesses	Reason for Rejection/Acceptance
LLaMA 2	Open-source	Local control, no API costs, customizable	Requires setup/GPU, resource-heavy	Rejected – High setup overhead for MVP
Mistral	Open-source	Lightweight, fast, good for edge deployments	Limited long context handling	Rejected – Less structured output, more dev time needed
Falcon	Open-source	Scalable, permissive license	Inconsistent output formatting	Rejected – Less predictable in structured prompts
Claude	Commercial	Excellent reasoning, safe output generation	Slower, weaker formatting adherence	Rejected – Format inconsistency in structured tasks

GPT-4	Commercial	High-quality output, great reasoning	Limited API access, costly	Rejected – Overkill for prompt + PDF tasks
Gemini 1.5 Flash	Commercial	Fast, reliable formatting, good context window	Requires API key	Accepted – Best trade-off between speed and structure

Initially, Google Gemini 1.5 Pro was used, but daily token limits were quickly reached. This led to the adoption of the lighter version, Gemini 1.5 Flash. It was noted that the model struggled with particularly long prompts, which is discussed further in the next section.

## 4. Prompt Engineering

As mentioned, PDF input was incorporated into the prompt, allowing for the inclusion of diverse content such as research papers or articles on specific advertising strategies (e.g., LinkedIn advertising). While this added valuable context, it introduced variability in token count. The prompt was carefully engineered to emulate an expert LinkedIn marketing consultant. It enforced a strict output format (TAG LINE and BODY), integrated the campaign brief details, and optionally included up to 6000 characters of parsed PDF content. This structured approach aimed to ensure the model's output was easily parsable and professionally aligned with LinkedIn advertising standards. Several prompt iterations were tested, with the final version proving most reliable across various input scenarios. The prompt was deliberately designed to avoid placeholders and maintain a professional tone suitable for the LinkedIn platform.

The initial prompt (for Gemini -1.5-pro) structure was as follows:

```

“You are a LinkedIn marketing expert tasked with creating a highly customized ad campaign for the brand "{campaign_details['product']}". Based on the campaign brief below and the PDF material if provided, write compelling ad copy, suggest a creative hook, and provide targeting parameters tailored for LinkedIn advertising.
{pdf_text[:6000]} # Only include the first 6000 characters of the PDF text
Campaign Brief:
- Product: {campaign_details['product']}
- Goal: {campaign_details['goal']}
- Target Audience: {campaign_details['audience']}

```

- Budget: {campaign\_details['budget']}
- Platform: {campaign\_details['platform']}

**\*Instructions to keep in mind:\*\***

- Use a **\*\*professional\*\*** and **\*\*engaging tone\*\*** appropriate for LinkedIn.
- Avoid placeholders like [Brand Name], [Material - e.g., recycled ocean plastic].
- Include appropriate hashtags.

Please format your response EXACTLY as follows:

TAG LINE: [Your catchy headline here]

BODY: [Your persuasive ad body text here]

- If a website is provided, include: "Visit website for more information: {campaign\_details.get('website', 'Not provided')}"

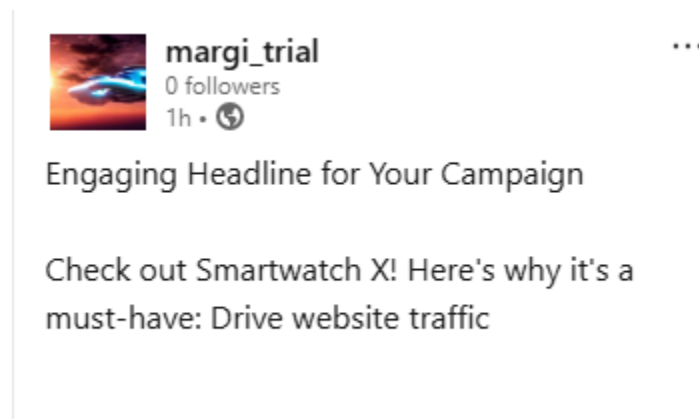


Figure shows the hallucinated output generated by Gemini-1.5-flash

This prompt proved to be too long for Gemini 1.5 Flash in some cases, leading to occasional "hallucinations" or deviations in the output format, as illustrated in the provided figure (not included in this text).

Final Prompt used:

""""

You are a LinkedIn marketing expert tasked with creating a highly customized ad campaign for the brand "{campaign\_details['product']}".

Based on the campaign brief below and the PDF material if provided, write compelling ad copy, suggest a creative hook, and provide targeting parameters tailored for LinkedIn advertising. Make sure the ad copy reflects the brand's unique value and does NOT include placeholders like [Brand Name], [Link to Website]. Include appropriate hashtags.

`{pdf_text[:6000]}` # Only include the first 6000 characters of the PDF text

Campaign Brief:

- Product: `{campaign_details['product']}`
- Goal: `{campaign_details['goal']}`
- Target Audience: `{campaign_details['audience']}`
- Budget: `{campaign_details['budget']}`
- Platform: `{campaign_details['platform']}`

Please format your response EXACTLY as follows:

HEADLINE: [Your catchy headline here]

BODY: [Your persuasive ad body text here]

Use a professional, engaging tone suitable for LinkedIn audiences. """

## 5. Tooling and Automation with Zapier

A significant challenge encountered was the restriction of the `r_liteprofile` scope by the LinkedIn API. This scope, necessary for accessing a user's URN ID required for programmatic posting, is now limited to verified companies or approved LinkedIn applications. As an individual developer with an unverified app I have access to only `w_member_social`, obtaining this permission was not possible, blocking direct posting via the API.

To circumvent this limitation, Zapier was employed. Zapier offers a no-code/low-code automation platform with pre-verified access to the LinkedIn API. By sending the generated ad content from the Flask application to a Zapier webhook, Zapier handled the LinkedIn authentication and posting process, effectively bypassing the need for direct API access with restricted scopes. This solution enabled the automation of LinkedIn posting without requiring `r_liteprofile` access or managing LinkedIn's OAuth restrictions directly.

While not fully integrated for all functionalities (e.g., image uploads), Zapier served as a viable low-code automation tool for this prototype. In a future production environment, campaign data

could be directly pushed to ad platforms using their native APIs or through Zapier's more comprehensive connectors. The decision to leverage Zapier for early automation prototyping provided a simple bridge between LLM output and deployment simulations without the need for extensive backend infrastructure development.

## 6. Output

### Example1: User Input

Product: Smartwatch X

Goal: Drive website traffic

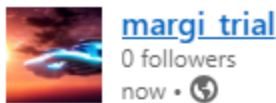
Audience: Young professionals aged 25-35 interested in fitness and productivity

Budget: \$2000

Platform: LinkedIn

Company Website: -

Upload Reference PDF (Optional): -



Conquer Your Day. Own Your Fitness. Smartwatch X.

Juggling career ambitions and a healthy lifestyle? Smartwatch X seamlessly integrates both. Track your fitness goals with precision – from daily steps and heart rate to advanced workout metrics. Maximize your productivity with smart notifications, calendar reminders, and seamless app integration. Elevate your professional image and personal well-being with a sophisticated design and intuitive interface. Smartwatch X isn't just a watch; it's your personalized performance partner. Ready to unlock your full potential? Learn more and experience the difference. [#SmartwatchX](#) [#FitnessTech](#) [#Productivity](#) [#YoungProfessionals](#) [#Wellness](#) [#Smartwatch](#) [#CareerGoals](#) [#HealthAndFitness](#) [#TimeManagement](#)

### Example 2: User Input

Product: Ecofriendly Water Bottles

Goal: Promote sustainability and eco-conscious

Audience: Students, professionals, and eco-friendly enthusiasts

Budget: \$2000

Platform: LinkedIn

Company Website: -

Upload Reference PDF (Optional): A research paper (Environmental performance of different water bottles with different compositions: A cradle to gate approach)



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Hydrate Your Hustle, Sustain Our Planet.

Making sustainable choices doesn't mean compromising on style or convenience. Our eco-friendly water bottles are crafted from recycled materials, reducing your carbon footprint with every sip. Lightweight, durable, and stylish, they're the perfect companion for your busy workday and beyond. Join the movement towards conscious consumption – choose hydration that's good for you and the planet.

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[#ConsciousConsumer](#)

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Hydrate Your Hustle: Sustainable Hydration for a Sustainable Future

Juggling work and a conscious lifestyle? Our eco-friendly water bottles are designed for the modern professional. Made with recycled materials and built to last, they reduce your environmental footprint without compromising on style or convenience. Choose reusable, choose responsible, choose a healthier planet. Reduce your reliance on single-use plastics and make a positive impact, one sip at a time.

[#SustainableLiving](#) [#EcoFriendly](#) [#ReusableWaterBottle](#) [#GreenBusiness](#)  
[#CorporateSocialResponsibility](#) [#Hydration](#) [#YoungProfessionals](#)

Without pdf

## 7. Trade-offs and Limitations

Several trade-offs were made during this project. Utilizing Gemini, a paid API, was a trade-off for output quality. A CLI interface was prioritized over a more user-friendly web UI for rapid prototyping. Ad deployment was simulated rather than fully executed due to credential and time constraints.

Current limitations include the absence of a live feedback loop for performance analysis (e.g., A/B testing), the lack of a dedicated frontend interface for marketing teams, and some inherent output variability across different runs of the LLM. In a production environment, these limitations could be addressed with retry logic, the implementation of UI frameworks like Streamlit or Flask,



and integration with image generation or retrieval models to provide accompanying visuals for campaigns.

## 8. Conclusion

This project successfully demonstrates a proof-of-concept tool that effectively leverages an LLM to generate advertising content based on structured briefs and optional PDF inputs. It establishes a solid foundation for developing scalable, automated campaign creation systems that could be expanded into a full-stack solution incorporating deployment and analytics. The codebase is cleanly modularized, reasonably documented, and could be made production-ready with further adjustments. With the appropriate APIs and infrastructure, this system has the potential to significantly reduce the manual effort involved in ad generation and enable efficient scaling of advertising efforts.