# Technical Architecture Report

**Project:** LinkedIn AI Agent

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## 1. Overview

The **LinkedIn AI Agent** automates the generation, personalization, and publishing of LinkedIn content to boost user engagement and personal branding. It integrates with LinkedIn's API for real-time posting and analytics while leveraging AI to generate high-quality, context-aware posts. Core modules include **AI content creation**, **user preference customization**, **post scheduling**, and **analytics insights**.

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## 2. System Components

| Layer | Technology | Description |
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| Frontend | React.js + Material UI | User dashboard with editor, scheduling, and analytics visualization |
| Backend API | FastAPI (Python) | RESTful service handling content generation, scheduling, posting, and analytics |
| AI Service | Google Gemini API (`google.generativeai`) | AI-powered post creation, hashtag generation, and topic suggestions |
| Data Store | PostgreSQL | Persistent storage for users, posts, preferences, and analytics |
| Social Integration | LinkedIn API (OAuth 2.0) | Secure posting, user authentication, and analytics retrieval |

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# 3. Core Workflows

## A. User Flow

- Secure sign-up/login and onboarding.
- LinkedIn connection via OAuth 2.0 (secure token storage).
- User defines preferences (industry, tone, posting frequency, brand voice).

## B. Content Generation

- AI-driven draft generation (posts, hashtags, and topics) via Gemini.
- Preview and manual editing in the dashboard.
- Posts can be saved as drafts or scheduled for auto-publishing.

## C. Automated Publishing

- Backend executes scheduled publishing to LinkedIn using stored OAuth tokens.
- Posts' status and LinkedIn IDs are tracked.

## D. Analytics Collection

- Post performance retrieved from LinkedIn (likes, comments, impressions, CTR).
- Engagement metrics stored historically for trend analysis.
- Dashboard displays charts, comparisons, and engagement rates.

## E. Topic Suggestions

- Gemini AI suggests trending topics in user's industry.
- Suggestions cached for quick retrieval.

- Personalized prompts align topics with user preferences.

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## 4. Data Structure

- **User**: ID, profile info, preferences, LinkedIn OAuth token.
- **Post**: Content, hashtags, status (draft/scheduled/published), timestamps, LinkedIn URL/ID.
- **PostAnalytics**: Post ID, metrics (likes, comments, shares, views, impressions, engagement rate), history of performance.

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## 5. AI Layer

- **Content Generation**: User + industry context fed into Gemini prompts.
- **Topic Suggestions**: Real-time trending topic generation aligned with LinkedIn categories.
- **Analytics Prediction** (future): Estimate engagement using AI-driven heuristics.

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## 6. Security & Compliance

- OAuth tokens encrypted and securely stored.
- API endpoints protected with authentication/authorization.
- GDPR-aligned handling of user data.
- Content moderation and filters ensure professional standards.

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## 7. Extensibility & Maintainability

- Modular services (e.g., `GeminiContentService`, `LinkedInService`).
- Backend designed with extensible API endpoints for new features like **A/B testing**, **sentiment analysis**, or **engagement prediction**.
- Separation of concerns: frontend ↔ backend ↔ AI services ↔ database.
- CI/CD pipeline for fast iteration and deployments.

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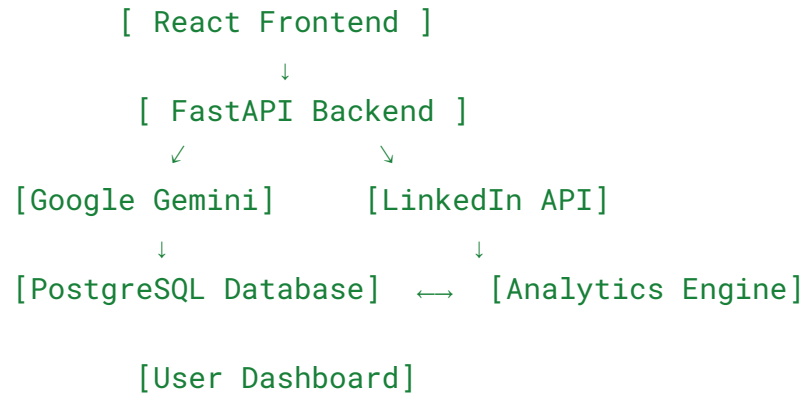
## 8. Logical Architecture Diagram (Textual)

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## 9. Summary

This architecture ensures **scalability, maintainability, and security** while delivering a seamless AI-driven experience for LinkedIn content automation. By combining **FastAPI**, **Gemini AI**, and **LinkedIn API**, the system empowers users to enhance their LinkedIn presence with minimal effort while gaining valuable insights into engagement trends.