

# Report from my industrial placement

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## **Summary**

Over twelve weeks from October 7 to December 31, 2025, I independently designed, developed and deployed Patent Gap – a comprehensive web-based platform for patent infringement detection and management. This project represents my complete work with no external involvement, combining full-stack web development, machine learning and domain-specific knowledge in patent law. The platform enables patent attorneys and clients to efficiently manage patent cases, detect similar patents through AI-powered analysis, and receive automated alerts for potential infringement scenarios.

Working extensively with patent data deepened my understanding of intellectual property law and patent analysis methodologies. I learned that patent similarity isn't merely textual overlap – it requires understanding claims, technical specifications and legal precedents. Different similarity thresholds apply depending on use case: preliminary screening requires higher sensitivity while legal proceedings demand higher specificity.

The complexity of patent documents – with their technical drawings, claims hierarchies, and citation networks – revealed why automated analysis tools are invaluable yet challenging to implement correctly. Understanding how patent attorneys work influenced design decisions, ensuring the platform supports their workflows rather than imposing artificial constraints.

Throughout development, I prioritized professional software engineering practices. The modular architecture with clear component boundaries facilitates maintenance and future enhancements. Comprehensive documentation – technical specifications, API documentation, deployment guides, and code comments – ensures knowledge transfer and sustainability. Environment-aware configuration management supports seamless deployment across development, testing and production environments. Security considerations included input validation and sanitization, secure session management, and proper error handling without information leakage. While the current authentication uses mock user data, the architecture supports future integration with production user management systems

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# **1 ROLES, GOALS AND CONTEXTS**

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## **1.1 Context**

Patent Gap is an innovative legal technology startup company specializing in patent infringement detection and intellectual property management solutions. The company addresses a critical challenge in the intellectual property landscape: the time-consuming and labor-intensive process of identifying potential patent infringements through manual analysis. With the exponential growth of patent filings globally, patent attorneys and legal professionals require sophisticated technological solutions to efficiently monitor, analyze, and manage patent portfolios.

## **1.2 Company Structure:**

The company, being fresh and focusing solely on one single product, maintains a lean organizational structure optimized for rapid development and innovation. The leadership team consists of:

- **Otto Werneskog, CEO:** Provides overall strategic direction and oversees company operations. The CEO focuses on business development, stakeholder relationships and long-term strategic planning for the company's growth trajectory.
- **Daniel A Karlsson, CFO:** Manages financial operations, funding strategies and resource allocation. The CFO ensures financial stability while supporting the technical development initiatives required for product advancement.
- **Sebastian Campo Toro, Legal Innovation & Product Lead:** Serves as the primary point of contact for product development and legal domain expertise. This role bridges the gap between legal requirements and technical implementation, ensuring that the platform meets the practical needs of patent attorneys while maintaining legal accuracy and compliance.
- **Rebecca Åkerstrand Li, Partner:** Contributes strategic guidance and legal expertise, particularly in intellectual property law and patent litigation. This role provides domain knowledge essential for validating the platform's analytical capabilities and ensuring alignment with legal professional standards
- **Punnoose Kozhupakalam Thomas, Software Engineer:** Contributes technological planning and development of the entire Patent Gap solution as a whole, while also delving into testing and deploying versions at the right times as and when required. This role provides technical expertise and a base level builder who integrates ideas and suggestions from various stakeholders into a viable product sellable in the intellectual property market.

## **1.3 Goals**

As of this moment, Patent Gap remains as a pre-funding seed company in the development process for a viable product aiming towards their first angel investor. Patent Gap focuses on a narrow band of problems specifically for patent attorneys and intellectual property holders and as such they have very little competition, especially since Patent Gap is the only firm attempting to employ the usage of large language models and artificial intelligence towards patent analysis, infringement detection and report generation on a large scale from multiple sources. Few competitors were identified who work with parts of the entire structure Patent Gap aims to address. A few of them are Clarivate, Anqua and Questel who specialize in end-to-end IP management solutions, PatSnap and IPRally who specialize in patent search and analytics with light idea management features and Wellspring, Brightide and Ideascale who specialize in capturing ideas, crowdsourcing solutions, and managing R&D projects.

Considering the nuance of this idea and the viability of this product as a selling solution, I personally see the potential of becoming a core member and the lead developer of a platform that could potentially make it big as a tool for intellectual property owners and attorneys to use on a regular basis to perform efficiently.

## 2 ACTIVITIES AND REFLECTIONS

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### **Week 1:**

Started the Patent Gap project – researched patent infringement detection, planned architecture, set up virtual environment and built initial database and wireframes.

I am excited but overwhelmed. I learned the value of domain research and planning before coding.

Understanding legal/patent domain and scalable data structures was a professional challenge for me.

Managing the uncertainty while tackling something completely new was my personal challenge at this point in time.

### **Week 2:**

Built backend structure in Flask, integrated MongoDB, authentication, CRUD endpoints, and configuration handling.

I gained respect for modular architecture. While debugging DB and sessions, I improved my backend maturity.

Connection management and error handling was a professional challenge in this phase. Developing the patience to debug foundational systems was a personal challenge here.

### **Week 3:**

Implemented document processing, embeddings (TF-IDF & OpenAI), similarity calculations, and a start to the USPTO API integration.

I learned the trade-offs between ML approaches. I became more aware of the complexity in data extraction and semantic similarity.

Handling messy PDF/XML/text formats reliably proved to be a professional challenge for me. Shifting into a user-centric mindset from a developer-centric mindset was a personal obstacle I had to overcome

### **Week 4:**

Built the initial UI (login, dashboard, case views) with responsive layouts. Started API integration and a drag-and-drop feature for document uploads.

I realized UX decisions matter as much as functionality. I learned to become more user-oriented.

JavaScript in HTML and cross-browser issues became my professional challenge while shifting to a mindset to think more like a user in terms of front end was my personal challenge.

### **Week 5:**

Built the alert/notification system, automated similarity triggers, completed the alert UI and performance handling.

I understood the real-time systems & user notification psychology. I saw the importance of scalability at an early stage.

This is the point where avoiding notification overload and ensuring accuracy became a professional challenge for me while balancing ambition with realistic time allocation became my personal challenge

### **Week 6:**

Finalized USPTO integration, caching, search/import features, and robust error handling.

I learned how fragile external integrations can be and the need for defensive programming,

API rate limits and messy real-world data shapes were a professional challenge while managing frustration when systems fall outside my control proved to be a personal challenge.

## **Week 7:**

Built agentic LLM processor architecture with multiple LLMs for summaries and reports along with prompt engineering and fallback strategies.

I saw how generative AI enhances, not replaces, traditional algorithms and learned how precise the results can be when using the right prompts.

Ensuring AI output reliability and domain accuracy was a professional challenge here and on top of it, overcoming the imposter syndrome when entering the agentic AI territory was a personal challenge for me.

## **Week 8:**

Debugging, optimization, indexing, memory fixes, security validation, and end-to-end testing was done for the initial version.

I underestimated how long hardening a system takes. Testing is a discipline, not an afterthought.

A professional challenge was to handle the performance issues with large flows. Keeping motivation high during repetitive debugging was a personal challenge for me.

## **Week 9:**

Worked on a complete UI/UX overhaul – accessibility, mobile responsiveness and onboarding flows.

I realized user experience is emotional and not just functional, that accessibility is essential and not just optional.

Designing an interface for multiple personas and interpreting feedback was a professional challenge for me. Accepting the constructive criticism gracefully was a personal challenge.

## **Week 10:**

This week was for documentation, Swagger integration, deployment scripts, and security hardening.

The documentation clarified architecture gaps and writing it down forced a deeper understanding than code alone.

Explaining the concepts to both technical and non-technical audiences in written format proved to be a professional challenge while staying disciplined with slower, meticulous tasks were a personal challenge.

## **Week 11:**

Started with the advanced features such as keyword upgrades, audit logging, monitoring and schema migrations.

I felt the shift from “school project” to enterprise-ready system and gained confidence in design maturity.

The complexity of scaling and compliance was a professional challenge for me. The knowledge fatigue and maintaining momentum through it was a personal challenge.

## **Week 12:**

Final testing, fixes, deployment preparations, presentations, security audit, and knowledge consolidations were this week’s tasks.

Completing the project proved to be harder than starting it and it came with the realization that learned software is never “done”, they are only “ready”.

Ensuring hand-off ready quality was a professional challenge for me while managing the emotional pressure at the end of the project was a personal challenge.

### **3 CONCLUSIONS**

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The Patent Gap platform represents a successful synthesis of web-development, machine learning and domain-specific knowledge into a functional product addressing real-world needs. Developed entirely independently over twelve weeks, this project demonstrates my capabilities in full-stack development, AI integration and professional software engineering practices. The technical challenges overcome and lessons learned have significantly enhanced my skills and confidence as a software engineer.

Beyond the technical achievements, this project taught valuable lessons about project planning, iterative development, and the importance of understanding user needs. The patent domain knowledge gained provides unique perspective applicable to legal technology and intellectual property management. This foundation positions me well for future work in AI powered applications, legal technology or enterprise software development.

The complete codebase, documentation and deployment artifacts represent production-ready software suitable for further development or deployment in legal practices. This project stands as evidence of my ability to independently conceive, design, implement and deliver complex technical solutions addressing specialized domain requirements.

## 4 REFERENCES

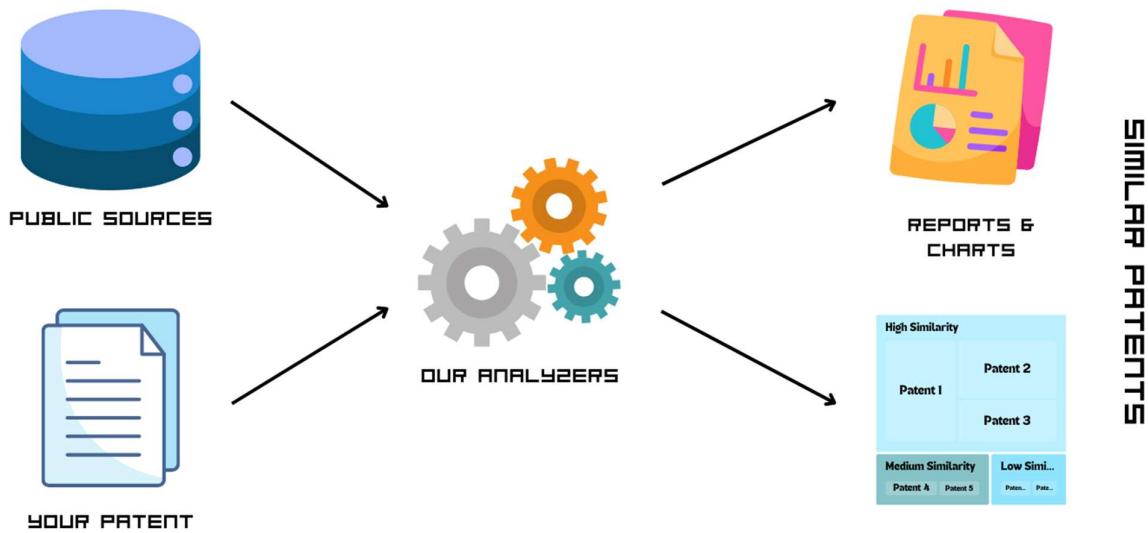
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## 5 APPENDIX

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Here are images providing proof of the work done for this firm – File Structure, Superficial Flow Chart, Functional Flow Chart, and a Diagram representing the flow of control between different pages within this project.



## Appendix

