



LanguageTeams Planning Tool

Reflection

**Bachelor's degree in
Applied Computer Science**

Rob Verbeek

Academic year 2024-2025

Campus Geel, Kleinhoefstraat 4, BE-2440 Geel

1 INTRODUCTION

This document provides a reflection on my internship at B-Robots, a company specialising in Robotic Process Automation (RPA). The internship focused on developing an automated scheduling engine for LanguageTeams, a language school that was facing operational inefficiencies due to its manual lesson planning process. The reflection is divided into two parts: a substantive reflection on the project carried out, and a personal reflection on the internship experience and the development of my professional competencies.

2 REFLECTION ON THE INTERNSHIP PROJECT

The core objective of the internship was to replace LanguageTeams' manual Excel-based scheduling system with an intelligent, automated solution. I was responsible for designing and developing the scheduling engine that generates weekly timetables for group lessons, while considering a wide range of constraints such as teacher availability, room capacity, group size, and course configurations.

To solve this problem, I implemented two separate planning engines:

- A production-ready planner based on **Genetic Algorithms**, which creates optimized schedules through evolutionary techniques.
- A research-oriented **Agentic AI prototype**, which simulates negotiation-based planning using large language models (LLMs).

Both approaches were designed to operate on structured data retrieved via API, and their results were integrated into the backend system for further use.

2.1 Results and Value to the Client

The delivered scheduling system offers the following improvements over the previous solution:

- Significant reduction in manual administrative work.
- Improved reliability and consistency in lesson planning.
- Better alignment between available resources and actual lesson schedules.

For LanguageTeams, this translates to fewer scheduling conflicts, better use of their teaching capacity, and most importantly an increase in productivity by reducing the time spent on manually creating these schedules.

The Genetic Algorithm planner is fully functional and integrated. The Agentic AI planner serves as a proof of concept for future development.

2.2 Current Status and Remaining Work

The genetic algorithm-based solution has been completed and integrated with the application backend. Some aspects that still require attention include:

- Further real-world testing with diverse data sets.
- Interface improvements for better usability by staff and teachers.
- Handling more edge cases and supporting additional business rules.

The Agentic AI planner, while not production-ready, provided valuable insights into adaptive planning strategies and the use of LLMs in scheduling contexts.

2.3 Recommendations for the Client

Looking ahead, I recommend the following steps for further development:

- Expand the validation and feedback mechanisms within the scheduling interface.
- Explore hybrid approaches if so desired, to add the flexibility of LLMs such as adding a chatbot to help the administrators make final changes to the schedules or gather input from the teachers.
- Monitor and evaluate performance and user satisfaction once the system is in regular use.

3 PERSONAL REFLECTION

The internship provided me with the opportunity to apply theoretical knowledge in a professional context. I was given the freedom to design the core of the scheduling system, which allowed me to take ownership of the technical architecture and problem-solving strategy. Working on a project with real-world implications increased my motivation and helped me develop a more pragmatic mindset.

3.1 Skills and Competencies Developed

Throughout the internship, I strengthened and expanded the following technical and soft skills:

- **Technical Skills:** Python, Django, RESTful APIs, evolutionary algorithms (DEAP), data modelling, LangChain, LangGraph, and containerized development with Docker.
- **Analytical Skills:** Deconstructing complex scheduling problems into modular, solvable components.
- **Communication Skills:** Presenting technical decisions clearly to both technical and non-technical colleagues.
- **Project Management:** Planning iterative development stages and balancing experimental and production-ready components.

3.2 Personal Growth

One of the main areas in which I developed was in independently evaluating and comparing potential solutions. I had to decide between multiple planning approaches, test their feasibility, and weigh their respective trade-offs. I also grew more confident in writing production-quality code and in integrating different layers of a software system.

3.3 Challenges Encountered

One technical challenge was balancing algorithm complexity with performance. The scheduling problem, by nature, involves a vast search space and numerous constraints. Efficiently narrowing down this space while maintaining scheduling quality required careful algorithm tuning and modular design.

Besides the performance, ensuring that all business rules are being followed by the algorithm proved to be difficult challenge as well, resulting in a lot of debugging and validation to make sure it was working as expected.

The agentic planner posed a different kind of challenge. Working with large language models involved unfamiliar tools, unpredictable output, and the need for robust validation. I addressed these issues through incremental prototyping, clear interface boundaries, and fallback logic to ensure output reliability.

Ensuring reliable and factual outputs from the agentic planner proved to be much harder than initially expected and proved itself to be a major pain-point of working with agents.

4 CONCLUSION

The internship at B-Robots allowed me to contribute to a meaningful automation project while developing both my technical and professional competencies. The project demonstrated the practical applications of algorithmic scheduling and opened the door to future exploration of adaptive, AI-driven systems. I gained valuable experience in designing and implementing scalable backend systems and learned how to apply computer science principles in a real business setting.

This experience has solidified my interest in solving complex operational problems through intelligent automation and has prepared me for the responsibilities and expectations of a professional software developer.