# Tools and Technologies

## Programming Languages

### C#

It is reliable, efficient, and well-suited for building robust backend systems or desktop applications. It integrates seamlessly with .NET libraries, offering strong type safety and excellent performance.  
It reduces runtime errors, provides scalability for large systems, and allows rapid development of stable APIs or services that power the application.

### Python

Python is widely used in machine learning and AI development because of its clean syntax, extensive libraries, and community support.  
It enables quick prototyping, easy integration with frameworks like QLoRA and TinyLlama, and fast iteration when building or refining AI components.

### React

React is rather ideal for creating web interfaces with a component-based architecture that promotes reusability.  
It also allows a smoother user experience than some alternatives, reduces development effort for the frontend, and ensures scalability as the application grows.

## Frameworks

### QLoRA

QLoRA (Quantized Low-Rank Adaptation) fine-tunes large language models efficiently by lowering memory usage without compromising accuracy.  
It also makes it affordable and practical to adapt advanced AI models to our project requirements.

### TinyLlama API

TinyLlama provides a lightweight API for large language model capabilities, focusing on speed and low resource consumption, which is great for the hardware we have access to as developers.  
faster AI responses, reduced latency, and an overall smoother experience for end-users are some of its benefits.

Additionally due to its highly curated data set it’s does a great job at data extraction and understanding without having to worry about hallucinations.

## Development Tool

### Microsoft Visual Studio Code

Why chosen: VS Code is a lightweight yet powerful code editor with broad language support, integrated debugging, Git control, and an extensive extension marketplace.  
How it helps the project: It increases developer productivity, streamlines workflows across different programming languages, and enables rapid switching between backend, AI, and frontend development.

**SQL Server Management Studio**

SSMS provides a comprehensive and user-friendly interface for managing SQL Server databases. It's a key tool for database administrators and developers, offering a visual way to design, query, and maintain databases. Its powerful features streamline tasks like performance monitoring, security management, and data backup, ensuring the database is stable, secure, and performant.

As our backend is powered by C#, we'll be using a SQL Server database for data storage. SSMS is the standard tool for working with this database. It allows us to easily **design the database schema**, **write and debug complex queries**, and **manage the database's health** and security. This is crucial for building a scalable and reliable backend that can handle our application's data needs efficiently.

## Overall Impact

- Backend stability and scalability (C# + VS Code)  
- Fast AI development and integration (Python + QLoRA + TinyLlama)  
- Modern, user-friendly frontend (React)  
- Efficient resource usage with advanced AI (QLoRA quantization, TinyLlama’s lightweight models)