

## Thesis Outline

1. Introduction and Motivation
  - Background of the project
  - Importance of backend development in modern web applications
  - Motivations: why focus on software design, databases, and caching
  - Problem statement: providing structured information about local cuisines
  - Project goals and deliverables
2. Theoretical Foundations and Literature Review
  - Backend software design and architecture principles
    - i. Overview of Monolithic vs Distributed
    - ii. Monolithic
      1. Monolithic: Head First software, chapter 5
        - A. Layered Monolithic
        - B. Modular monolithic
        - C. Microkernel Architecture
    - iii. Distributed
      1. Microservice
      2. Event-Driven Architecture
  - Databases
    - i. Types of Databases
      1. Relational Databases
      2. Non-Relational Databases
    - ii. Data Design and Evolution
      1. Normalization
      2. Migration
    - iii. Querying and Performance
      1. N+1 Query Problem
      2. Performance Related Strategies
        - A. Indexing
        - B. Sharding
        - C. Partitioning
    - iv. Transactions and Reliability
      1. Transactions
      2. ACID Properties
      3. Failure Modes
    - v. Scaling Databases
      1. Vertical Scaling
      2. Horizontal Scaling
      3. Trade-offs in Scaling
  - Caching
    - i. Server side caching
      1. Redis
    - ii. Client side caching
      1. CDN
      2. HTTP Caching
3. Implementations
  - General Design Choices Made
  - Backend Design Choices
    - i. Software design, database, caching, api etc
  - Frontend Design Choices
4. Challenges and Lessons Learned
  - What worked well
  - What did not work well
5. Conclusion and Future Work