Chapter 1

Research Methodology

1.1 Proposed Framework

This section presents the proposed framework for addressing the research problem. The overall architecture is depicted in **??**.

1.1.1 Data Collection

The research employs multiple datasets to ensure comprehensive evaluation:

- **Dataset A**: Contains 10,000 samples with 50 features...
- **Dataset B**: Comprises time-series data spanning 5 years...
- **Dataset C**: Includes multimodal data from various sources...

1.2 Algorithm Design

The proposed algorithm builds upon the foundation established by [**lee2019optimization**]. The pseudocode is presented in Algorithm 1.

1.3 Experimental Setup

All experiments were conducted on a computing cluster with the following specifications:

- CPU: Intel Xeon Gold 6248R (3.0 GHz)
- GPU: NVIDIA A100 (40GB)

Input: X, θ
Output: Best solution in P
Initialize population $\mathsf{P} \leftarrow \emptyset$;
for $\mathsf{i} \leftarrow 1$ **to** N **do**
    $\mathsf{x}_\mathsf{i} \leftarrow$ **InitializeSolution()**;
    $\mathsf{P} \leftarrow \mathsf{P} \cup \{\mathsf{x}_\mathsf{i}\}$;
end
while *not converged* **do**
    Evaluate fitness for all $\mathsf{x} \in \mathsf{P}$;
    Select parents for reproduction;
    Apply crossover and mutation;
    Update population P;
end
return best solution in P;

Algorithm 1: Proposed Optimization Algorithm

- Memory: 256 GB DDR4
- Storage: 2 TB NVMe SSD