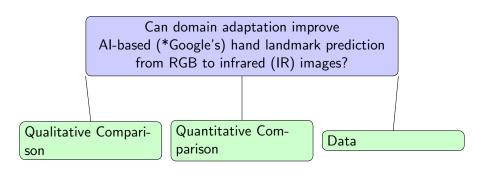
## Research Plan for CSE3000 Research Project

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## Research Questions



# Qualitative Comparison

- Availability of data
- Shallow vs Deep models
- Scalability

## Quantitative Comparison

- Comparative metrics
- Real-time inference maintenance

#### Data

- Data augmentation
- Google's model limitations

# Methodology (1/2): Setup and Core Components

```
# 1. Data Collection and Initial Setup
  DATA = Upload_and_clean_infrared_videos()
   DETECTOR = GoogleMediaPipe.HandLandmarkDetector()
4
  # 2. Domain Adaptation Methods to Explore
6
  ADAPTATION_METHODS = [
7
       "Feature Alignment", # Start with simpler approach
8
      "Adaptive Batch Norm", # Gradually increase complexity
      "DANN", # Deep adversarial learning
10
      "Correlation Alignment" # Advanced feature matching
      # And maybe more based on other methods limitations
13
14
  # 3. Core Evaluation Pipeline
  def EVALUATE(Data, Detector, Annotations):
16
      """Measures performance using:
17
      - Landmark accuracy
18
      - Inference speed
      - Resource usage"""
20
      return EvalResults
21
22
  def DATA_PREP(Data, Method):
       """Prepares data specific to each adaptation method:
      - Data augmentation
       - Feature extraction
26
       - Domain-specific preprocessing"""
      return (ProcessedData, Annotations)
```

# Methodology (2/2): Iterative Research Process

```
# 4. Iterative Experimentation Loop
  DEADLINE = datetime(2025, 1, 31)
  while datetime.now() < DEADLINE:
      # Phase 1: Setup and Data Preparation
      current method = select next method(ADAPTATION METHODS)
      prepared data = DATA PREP(DATA, current method)
6
7
      # Phase 2: Model Adaptation and Testing
      adapted_model = apply_adaptation(DETECTOR, current_method)
      results = EVALUATE(prepared_data, adapted_model)
      # Phase 3: Analysis and Improvement
13
      Reflect(results)
15 l
  def Reflect(results):
16
       """Research Documentation and Analysis:
      1. Compare with previous iterations
      2. Document time/resource costs
19
      3. Identify improvement areas
      4. Plan next adaptation strategy"""
      update_research_findings()
      optimize pipeline()
```

## Project Timeline

### **Key Milestones:**

- Nov 2024: Literature Review & Evaluation Framework
- Dec 2024: Method Implementation & Midterm Presentation
- Jan 2025: Model Optimization & Comparison Analysis & Final Documentation