Research Plan for CSE3000 Research Project

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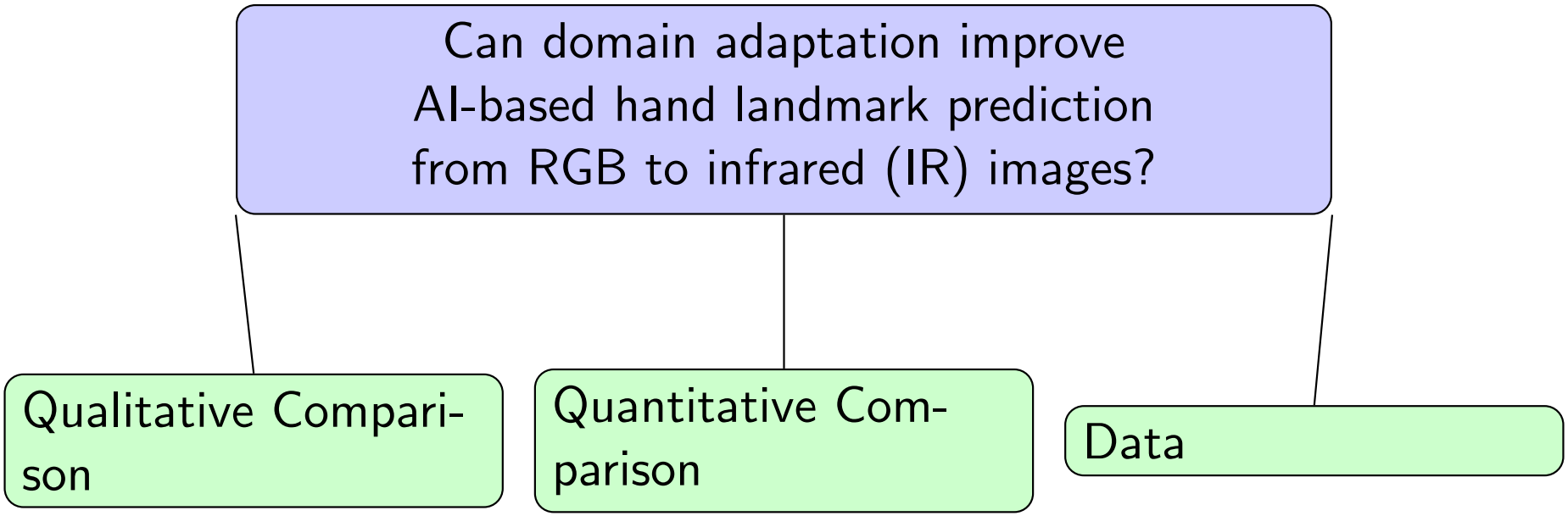
Research Questions



Qualitative Comparison

- Availability of data
- Availability of resources
- Scalability

Quantitative Comparison

- Comparative metrics
- Real-time inference maintenance

Data

- Custom annotations
- External datasets

Methodology (1/2): Setup and Core Components

```
# 1. Data Collection and Initial Setup
DATA = Upload_and_clean_infrared_videos()
DETECTOR = GoogleMediaPipe.HandLandmarkDetector()

# 2. Domain Adaptation Methods to Explore
ADAPTATION_METHODS = [
    "Feature Alignment", # Start with simpler approach
    "Adaptive Batch Norm", # Gradually increase complexity
    "DANN", # Deep adversarial learning
    "Correlation Alignment" # Advanced feature matching
]

# 3. Core Evaluation Pipeline
def EVALUATE(Data, Detector, Annotations):
    """Measures performance using:
    - Landmark accuracy
    - Inference speed
    - Resource usage"""
    return EvalResults

def DATA_PREP(Data, Method):
    """Prepares data specific to each adaptation method:
    - Data augmentation
    - Feature extraction
    - 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)

    # Phase 2: Model Adaptation and Testing
    adapted_model = apply_adaptation(DETECTOR, current_method)
    results = EVALUATE(prepared_data, adapted_model)

    # Phase 3: Analysis and Improvement
    Reflect(results)

def Reflect(results):
    """Research Documentation and Analysis:
    1. Compare with previous iterations
    2. Document time/resource costs
    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