

# CEN310 Parallel Programming

Week-15 (Final Project Review)

Spring Semester, 2024-2025

# Project Review Day Schedule

## Morning Session (09:00-12:00)

- Project presentations (Group 1-4)
- Performance analysis discussions
- Q&A sessions

## Lunch Break (12:00-13:00)

## Afternoon Session (13:00-17:00)

- Project presentations (Group 5-8)
- Technical demonstrations
- Final feedback

## 1. Project Documentation

- Comprehensive project report
- Source code documentation
- Performance analysis results
- Implementation details
- Future work proposals

## 2. Technical Implementation

- Working parallel application
- Multiple parallel programming models
- Advanced optimization techniques
- Error handling and robustness
- Code quality and organization

# Content

## 1. Project Overview

- Problem statement
- Solution approach
- Technical challenges

## 2. Implementation Details

- Architecture design
- Parallel strategies
- Optimization techniques

## 3. Results and Analysis

- Performance measurements
- Scalability tests

# Performance Analysis Requirements

## Metrics to Cover

- Execution time
- Speedup
- Efficiency
- Resource utilization
- Scalability

## Analysis Tools

```
# Performance measurement examples  
$ nvprof ./cuda_program  
$ mpirun -np 4 ./mpi_program  
$ perf stat ./openmp_program
```

# Project Structure Example

```
project/
├── src/
│   ├── main.cpp
│   ├── cuda/
│   │   ├── kernel.cu
│   │   └── gpu_utils.cuh
│   ├── mpi/
│   │   ├── communicator.cpp
│   │   └── data_transfer.h
│   └── openmp/
│       ├── parallel_loops.cpp
│       └── thread_utils.h
├── include/
│   ├── common.h
│   └── config.h
├── test/
│   ├── unit_tests.cpp
│   └── performance_tests.cpp
├── docs/
│   ├── report.pdf
│   └── presentation.pptx
├── data/
│   ├── input/
│   └── output/
├── scripts/
│   ├── build.sh
│   └── run_tests.sh
├── CMakeLists.txt
└── README.md
```

## Technical Aspects (50%)

- Implementation quality (15%)
- Performance optimization (15%)
- Code organization (10%)
- Error handling (10%)

## Documentation (25%)

- Project report (10%)
- Code documentation (10%)
- Presentation quality (5%)

## Results & Analysis (25%)

- Performance results (10%)
- Comparative analysis (10%)

- Fluid dynamics
- Monte Carlo methods
- Matrix computations

## 2. Data Processing

- Image/video processing
- Signal processing
- Data mining
- Pattern recognition

## 3. Machine Learning

- Neural network training
- Parallel model inference
- Data preprocessing
- Feature extraction

## 4. Graph Processing



# Resources & References

## Documentation

- CUDA Programming Guide
- OpenMP API Specification
- MPI Standard Documentation
- Performance Optimization Guides

## Tools

- Visual Studio
- NVIDIA NSight
- Intel VTune
- Performance Profilers

- Scope

## 2. Design

- System architecture
- Component design
- Parallel strategies

## 3. Implementation

- Development environment
- Technical details
- Optimization techniques

## 4. Results

- Performance measurements
- Analysis

## Contact Information

For project-related queries:

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- **Office Hours:** By appointment
- **Location:** Engineering Faculty

# Questions & Discussion

