

## CS267 Class Project Suggestions

Spring 2015

### Class project suggestions

- Many kinds of projects
  - Reflects broad scope of field and of students, from many departments
- Need to do one or more of design / program / measure some parallel application / kernel / software tool / hardware
- Can work alone or in teams
  - HW0 posted to help identify possible teammates based on interest
- What you need to do
  - Project proposal (< 1 page) ideally during spring break
    - Many old project posters/videos posted on class web page
  - Feedback from instructor (ongoing conversations)
  - Poster presentations (+ recording short video presentation) on Thursday morning May 7 (during RRR week), in Woz
  - Final report writeups due Monday May 11 at midnight (11:59pm)

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### How to Organize A Project Proposal (1/2)

- Parallelizing/comparing implementations of an Application
- Parallelizing/comparing implementations of a Kernel
- Building /evaluating a parallel software tool
- Evaluating parallel hardware

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### How to Organize A Project Proposal (2/2)

- What is the list of tasks you will try?
  - Sorted from low-hanging fruit to harder
- What existing tools you will use, compare to?
  - Don't reinvent wheels, or compare to existing wheels to evaluate pros and cons
  - For applications, consider using frameworks like Chombo or PETSC
  - For applications, identify computational and structural patterns you plan to use
- What are your success metrics
  - Get application X up on Edison, solve problem Y
  - Get motif Z to run W times faster on GPU
  - Collect data V to evaluate/compare approaches

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## A few sample CS267 Class Projects

all posters and video presentations on class web page

- Content based image recognition
  - “Find me other pictures of the person in this picture”
- Faster molecular dynamics, applied to Alzheimer’s Disease
- Better speech recognition through a faster “inference engine”
- Faster algorithms to tolerate errors in new genome sequencers
- Faster simulation of marine zooplankton population
- Sharing cell-phone bandwidth for faster transfers

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## More Prior Projects

1. [High-Throughput, Accurate Image Contour Detection](#)
2. [CUDA-based rendering of 3D Minkowski Sums](#)
3. [Parallel Particle Filters](#)
4. [Scaling Content Based Image Retrieval Systems](#)
5. [Towards a parallel implementation of the Growing String Method](#)
6. [Optimization of the Poisson Operator in CHOMBO](#)
7. [Sparse-Matrix-Vector-Multiplication on GPUs](#)
8. [Parallel RI-MP2](#)

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## More Prior Projects

1. [Parallel FFTs in 3D: Testing different implementation schemes](#)
2. [Replica Exchange Molecular Dynamics \(REMD\) for Amber's Particle-Mesh Ewald MD \(PMEMD\)](#)
3. [Creating a Scalable HMM based Inference Engine for Large Vocabulary Continuous Speech Recognition](#)
4. [Using exponential integrators to solve large stiff problem](#)
5. [Clustering overlapping reads without using a reference genome](#)
6. [An AggreGATE Network Abstraction for Mobile Devices](#)
7. [Parallel implementation of multipole-based Poisson-Boltzmann solver](#)
8. [Finite Element Simulation of Nonlinear Elastic Dynamics using CUDA](#)

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## Still more prior projects

1. [Parallel Groebner Basis Computation using GASNet](#)
2. [Accelerating Mesoscale Molecular Simulation using CUDA and MPI](#)
3. [Modeling and simulation of red blood cell light scattering](#)
4. [NURBS Evaluation and Rendering](#)
5. [Performance Variability in Hadoop's Map Reduce](#)
6. [Utilizing Multiple Virtual Machines in Legacy Desktop Applications](#)
7. [How Useful are Performance Counters, Really? Profiling Chombo Finite Methods Solver and Parsec Fluids Codes on Nehalem and SiCortex](#)
8. [Energy Efficiency of MapReduce](#)
9. [Symmetric Eigenvalue Problem: Reduction to Tridiagonal](#)
10. [Parallel POPCycle Implementation](#)

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