TERM PROJECT

VERSION 1.0

DUE DATES:
[TP-D0] Friday, September 20th 2019, @5:00 pm [Team composition]
[TP-D1] Friday, October 18th 2019, @ 5:00 pm [2-page Term Project Proposal & Presentation Slides]
[TP-D2] Wednesday December 4th, 2019 @ 5:00 pm [Software Submission]
[TP-D3] Friday, December 6th, 2019 @ 5:00 pm [Report]
[TP-D4] Friday, December 6th, 2019 @ 5:00 pm [PowerPoint Presentation]

OBJECTIVE
The objective of this assignment is for you to apply concepts that you have learned in class to an original problem that you have devised. You are required to demonstrate that you are solving an important problem and there are restrictions on the types of projects that you can choose.

This assignment may be modified to clarify any questions (and the version number incremented), but the crux of the assignment and the distribution of points will not change.

Grading: This assignment will account for 35 points towards your cumulative course grade. There are several components to this assignment, and the points-breakdown is listed in the remainder of the text. This assignment is to be done individually. The scoring process will involve a one-to-one interview session where you will demonstrate the functionality of your project. You are required to make two presentations and reports as part of this effort. The slots for these interview sessions and presentations will be posted a few days prior to the submission deadline.

TEAM COMPOSITION: The term project is a team effort. Each team is restricted to 2-3 students. Furthermore, each team must have at least one on-campus and distance/online student.
1 Requirements

As part of your term project you are required to design a system that solves a problem. The requirements are the following:

1. Your project should be a distributed systems problem. It should build on concepts that you have learned in class. **Examples of unacceptable projects include**: designing a new cryptographic encryption/decryption algorithm.

2. Your system or application should execute on a minimum of 25 machines. The problem should be data-intensive or compute-intensive.
   a. **Examples of unacceptable projects include**: Using MPI, Fortran, or shared-memory based systems to solve the problem.

3. Either the problem or the solution you propose has to be original. **Examples of unacceptable projects include**:
   a. Assignments from Distributed Systems (x55 series at CSU) or Big Data (x35 series at CSU) courses at CSU, MOOCS or other universities.
   b. Implementation of existing systems: You cannot, for example, say you will be implementing Pastry, BitTorrent, etc.
   c. Term projects from previous courses that you have taken (or are currently taking). The submission has to be an original submission that you have done specifically for CS555.
   d. Submitting projects that you are working on as part of your Graduate Research Assistantships or your day job. This is to ensure a level playing field for your peers.

2 Third-party libraries and restrictions:

You are allowed to use 3rd party libraries ONLY AFTER you have received approval from the Professor. You are allowed to use libraries from the Hadoop, Storm, and Spark ecosystem. Once you have chosen the libraries that you will use, you are responsible for coping with issues that you encounter with them i.e. there is no assistance for debugging why your Storm cluster is not working the way it should. You can discuss your proposed project with your peers at the architectural level, but the project implementation is an individual effort.

3 Deliverables

**TP-DO: DELIVERABLE ZERO [0 points]**

This deliverable requires submission of the composition of your group. One of the team members should submit this information via CANVAS by Friday, September 20th @ 5:00 pm MT. The composition of the group must include at least one on-campus or distance students. Any problems that you are having with your non-performing or non-responsive teammate should be reported 2-3 weeks after Deliverable Zero. Timely intervention will allow us to resolve problems before they fester.

**TP-D1: TERM PROJECT PROPOSAL & PRESENTATION [5 points]**: In class presentation (and submission of a 2-page report) of your proposed term project.

Due: Friday, October 18th, @ 5:00 pm [2-page Term Project Proposal and Presentation Slides]
The **PRESENTATION** is restricted to be for 10-12 minutes. You should have 5 slides for your presentation and the content of these slides is tightly regulated to ensure that you are not wandering off on tangents during presentation.

1. Slide 1: Project Title
2. Slide 2: Problem characterization
   a. This is a technical description of the problem. Your audience is your peers so express it in a way that they can appreciate.
3. Slide 3: Why the problem is important
4. Slide 4: Proposed solution and implementation strategy
   a. Methodology summary and the libraries that you are planning to use
5. Slide 5: Evaluating the effectiveness of your solution
   a. What are numbers that will use to assess how good your solution is? Examples of these include: accuracy, turn around times, throughputs, number of false positive or false negatives, mean squared errors, etc.

You are also required to submit a **2-PAGE PROPOSAL** that is single-spaced with 1’ margins, 10 point Times New Roman with no paddings. The proposal should include all the sections that were required in your presentation. References or citations are not included in this page limit. Proposals that are not good enough will be subject to further refinements and a one-on-one discussion with the Professor/GTA. Please do not send e-mails about your topic till then. A recursive cycle of e-mails on acceptable topics is counterproductive.

In summary, the project proposal includes the following information.
- Title of the Project
- Full names of the team members
- Problem characterization
- Why the problem is important
- Proposed solution and implementation strategy
- Evaluating the effectiveness of your solution
- Citations [Not included in the 2-page limit]

**TP-D2: CODE SUBMISSION: [15 points]**
Due: Wednesday December 4th, 2019 @ 5:00 pm [Software]

The software must be ready for demonstration of project functionality. This will also include a one-on-one interview session. The interview schedule will be posted once we get closer to the submission deadline.

**TP-D3: FINAL REPORT FOR TERM PROJECT [10 points].** Please see the next section on the required elements in the Term Project report.
Due: Friday, December 6th, 2019 @ 5:00 pm [Report].

**TP-D4: IN-CLASS PRESENTATION [5 points]:** The regulated content and number of slides in your presentation has been posted on the course schedule page. PowerPoint Slides are Due: Friday, December 6th, 2019 @ 5:00 pm [PowerPoint Presentation]
4 Anatomy of the Term Project Report

The term project report must include several elements, each of which will be a separate section. These include:

- Introduction
- Problem characterization
- Dominant approaches to the problem
- Methodology
- Experimental Benchmarks
- Insights Gleaned
- How the problem space will look like in the future
- Conclusions
- Bibliography

There are several pitfalls that you must avoid when you are writing technical articles. Avoid cringe-inducing marketing lingo and hearsay e.g., “My teammate Tony Stark thinks ...”. Quoting Professors and researchers in the University is not allowed. You are allowed to speculate, but these should be based on reasoned arguments. Avoid using words that are not part of your normal vocabulary – it is easy to know if someone had the thesaurus handy. Technical writing is meant to be clear while being accessible to those in the area.

| Word Counts: | The word counts set aside for each element of your term paper are specified below. Please do not try to skew the word limits for these sections so that you can reach the requisite word counts. Such skews are easy to spot and will be penalized. You are also not allowed to quote from cited papers just to pad the word counts. |

4.1 Introduction

This section describes why the problem is important, where this research is being used, how this technology plays a role in our daily lives, etc. The introduction section is also a concise summary of your paper that outlines the rationale, organization, and key contributions of the term paper. It should be possible for a reader to know all the key aspects of your term paper just by reading your Introduction and Conclusions section.

You can also briefly inform this section with your past experience. Describe how you think your chosen area would be applicable to a project that you are working on or have worked on in the past.

Word count: 500 words

4.2 Problem characterization

This is a technical description of the problem. Your audience is your peers so express it in a way that they can understand and appreciate.

This section should describe the theoretical, physical, social, and/or engineering aspects that make the problem particularly challenging. A clear discussion of the challenge also makes the reader look forward to reading the remainder of the paper.

Word count: 500 words
4.3 Dominant approaches to the problem
The section must contrast and identify possible approaches and also identify inefficiencies in each of these schemes. For each work that you cite you need to describe the advantages, disadvantages, and the scope of the work. Your objective is not to defend any work, rather you should let the facts speak for themselves. Finally, in your write-up you need to describe each reference in the context of the overall narrative.

If you compare features across two systems and say that one system outperforms the other include a citation for this. List what the comparison point is. This could be latency, throughput, scaling, efficiency, accuracy, price, etc.

Citations have a specific purpose. They: (1) relate to work that you are surveying, (2) substantiate your claims, and (3) could be used by readers to delve deeper. Remember to number your references and list them in your bibliography in the order that you referenced it. If an article is in your bibliography it must cited in the main text. Citing at the right location indicates what your source is for a particular piece of information, and also demonstrates that you have read the article. Make sure that you cite all your references including Wikipedia and online lecture notes that you may have perused. References that are not cited should not be in your bibliography.

Word count: 300 words

4.4 Your Methodology
Describe your methodology. This includes the tasks you have performed, the approach that you have taken, and the justification for your methodology. For example if your approach involves fitting models to the data, describe the rationale for your choice of the model fitting algorithm.

Word count: 1000 words

4.5 Experimental Benchmarks
Include a description of the benchmarks that you performed. Your performance metrics must be amenable to quantitatively assessing the quality of your solution. Examples of these include: accuracy, turnaround times, throughputs, number of false positive or false negatives, mean squared errors, Area under the curve for the receiver operating characteristic, etc.

Word count: 500 words

4.6 Insights Gleaned
These are things that you did not know before you started this project. The best solutions are the ones that you may have not thought of, but seem incredibly obvious once you have come up with them.

Word count: 400 words
4.7 How will the problem space transform in the future

This is a thought experiment. You will be looking ahead and visualizing a future where there could be proliferation of certain types of devices, new types of services, changes in usage patterns, etc. You must describe the forces that you think will drive this change. Once you have these forces in place, identifying how the problem space will evolve in the future should be easier. Ultimately, you are describing what technology advancements and the way we interact with services will affect the problem space of your research area.

Word count: 400 words

4.8 Conclusions

A conclusion is not a summary. You must make a set of assertions about your work.

Word count: 400 words

4.9 Bibliography

The final term paper must have at least 8-10 references. All references must be cited in the paper. Citations must be numbered and sorted in the order that they appear. The Bibliography is NOT included in your word count.

4.10 Overall Word Count

Excluding the bibliography, the total word count for your term project report is 4000 words. Please do not exceed, or be under, the total word count limit by more than 200 words.

5 Submission deadline:

Please submit all deliverables by 5:00 pm on the due date using CANVAS. We will rely on the honor system: please do not make any modifications after the submission deadline has elapsed. There will be steep deductions for making modifications after you have submitted. You may resubmit within the 2 day late-submission window – this will result in the usual penalty

Nota Bene: Please do not e-mail the source codes to the Professor or the GTA – there will be a 3 point deduction for doing this.

6 Change History

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<th>Version</th>
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<tr>
<td>1.0</td>
<td>8/28/2019</td>
<td>First public release of the document describing the term project.</td>
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