The University of Texas at Austin
School of Information

CAPSTONE PROJECT PROPOSAL FORM

Student information
Name: Michael Chen
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UT EID: mc73525 **Graduation Date: Fall 2024**
Capstone Course Instructor: Dr. John Neumann
Brief Proposal Title: Visualization of Heating/Cooling Demands

Capstone Project Information
Type of Project: ☐ **Research Project** ☒ **Applied project**
Supervisor Name: Dr. James Howison
Email: jhowison@ischool.utexas.edu **Phone number:**
Name of Organization/Unit/Department: University of Texas School of Information
Address:
Website:

PROPOSAL SECTIONS

The student's capstone project proposal form must include the following sections:

1. **Project Objective:** Clearly state project's objective and describe the Informatics-related work to be performed.

The objective of this project is to create a visualization system for a more intuitive understanding of Manual J heating and cooling calculations for homeowners and members of the home construction economy. Developing a visualization of HVAC loads on a time-series level throughout a particular year can help inform better decisions when deciding on HVAC equipment sizing from both a homeowner and contractor perspective, particularly in avoiding oversized systems. This project will work to create a prototype generalizable time-series visualization system based on inputs including home schematics, local weather and climate conditions, and real and simulated loads.

2. **Project Activities and Methods:** List the work activities or tasks you will complete on the way to the final deliverable, including methods as appropriate.

I will undertake the following tasks:

- Perform background research on current energy simulation programs and visualizations (ManualJ, ResStock, NEEP Visualizations, etc.)
- Find and aggregate data of load calculations, real heat loads, and potentially simulated load data over time.
- Test and evaluate visualizations using Python on how they communicate loads and sensible temperatures over time and on design temperature days.
- Communicate visualization system in a final report and to any potential stakeholders.

3. **Project Deliverables:** List the expected culminating products of your work.

I will produce the following deliverables:

- Documented database of collected relevant data, including NREL ResStock modeling data tested and historical and modeled heat loads.
- Visualizations of expected heating demands for a system relative to the capacity of a potential system over time, with the goal to intuitively communicate how a properly sized system will be able to meet comfort standards for a large majority of days.
- A report on the iterative process taken in data collection and development of visualizations, as well as conclusions and recommendations for further research or potential stakeholders.

4. **Preliminary Schedule:** Outline your schedule with tasks and dates of completion.

Although unforeseen events may alter my plans, I propose this preliminary schedule.

- 2/9: Capstone proposal form and letter of agreement due, work officially starts.
- 2/16: Background research conducted on current simulation systems, mock ResStock simulation set up.
- 3/1: Complete data collection of historical ResStock load calculations and open-source heat loads. Prep sketches/low-fidelity visualizations for class presentations/mid-semester evaluation.
- 3/15: If running large scale simulations seems possible, complete data collection of simulated loads and corresponding sensible temperatures.
- 4/12: Time-series and any additional intuitive visualizations completed. Evaluate whether visualization system can be generalized on a higher level.
- 4/23: Communicate results in a final report.

5. **Work Expectations:** List your work expectations (e.g., on-site attendance, meeting attendance, dress, availability, or social media protocol).

My expectation is that I'll be able to complete at least a prototype visualization system in a timely manner, with a widely generalizable tool being the end goal to work towards and communicate. I will mainly work in a remote manner, meeting in person when necessary with consistent communication.

6. **Communication Plan:** List method by which you will communicate with your supervisor.

We will communicate through zoom or in person if necessary, on a biweekly or weekly basis, depending on how much trouble I may be having or if I need any additional resources. I'll be sure to schedule any meetings accordingly. Any communication outside of live meetings can be conducted through email.

7. **Monitoring & Evaluating Student Progress:** Describe how progress will be monitored (e.g., weekly meetings with your supervisor, routine presentations, or regular emails).

Our weekly meetings will include quick updates on student progress and a quick evaluation on how the schedule and deliverables are being completed.

8. **Specific Learning Objectives:** Outline a set of learning objectives that specify what you will gain from the project (as in skills you will hone or knowledge you will gain).

This project will enable me to exercise and gain a variety of skills:

- Data manipulation and database management with large volumes of data.
- Data collection and general Python coding skills through running simulations.
- Data visualization and visualization design through an iterative visualization process.
- Intuitive communication of results through visualization design and reporting.

9. **Fit with My Education:** Explain how the project fits into your education (with courses specified).

This project fits well with the core informatics values and data science curriculum in several manners, including general Python coding skills (I304, I320D Introduction ML), database management and engineering (I320D Data Engineering), and data visualization and visualization design (I320D Open Source, I320D Introduction ML). As such, I believe that this capstone will work well as a culmination of my education in the iSchool and will continue to serve me well in my future career plans.