CMPSC 580
Junior Seminar
Spring 2021

Assignment 3:
Exploration of Research Types

Objectives

To determine some of the aspects of a research project by studying the work of others. To investigate the feasibility of the senior thesis work under consideration.

Figure 1: Your bright idea!

Research in Computer Science

A bright idea, as indicated by the lightbulb in Figure 1, may be hard to conceive, and a challenge to develop. However, with hard work and patience, you will be able to find a topic about which you are passionate, and your senior this project can become brilliant! In this assignment, we spend some time to determine what kind of research might be a good fit for your research direction and then we will examine the idea in terms of its *feasibility*, or its viability for completion.

What Types of Research Are Out There?

Types of research in computer science and informatics typically involve multi-disciplinary efforts. Researchers may need to investigate which tools, techniques, and processes to use when developing a research project. In addition, there are other considerations to consider such as the social and cognitive processes surrounding the project, how the project's software would be developed, or how teams and organizations manage their efforts and interact collaboratively.

To complete their research goals, investigators employ different types of methods in their computational studies to answer some of the challenges of the work. Below , some of the common approaches to research are listed and described in general terms.

- **Modeling**: a study of a certain problem through an abstraction (how can we understand/-explain phenomena).

- **Simulation**: a study of the circumstances of phenomena (what happens if ...).
- **Case Study**: investigation of a contemporary phenomenon within its real-life context.
- **Literature Survey**: characteristics of a broad subfield, methodology, etc. (what is known? what questions are still open?)
- **Comparative Study**: comparison of two or more techniques.
- **Theoretical Study**: conceptualization, modeling, mathematical analysis, proof-based (proving properties of abstract artifacts).
- **Tool or data**: Some projects are designed to develop a tool of analysis or a data set that others can use in their own research or investigation.

Formulating Research Idea

(Taken partially from Zobel J. (2014) Hypotheses, Questions, and Evidence. In: Writing for Computer Science. Springer, London)

The first step of a research project development involves exploration of interesting topics or problems, and then identification of particular issues to investigate. It is assumed now that you have found your area of interest and you are now expected to begin to focus on a specific idea (i.e., research goals) for your senior thesis project.

The research is typically given direction by development of specific **research questions** that the project aims to answer. They can be based on an informal model, for example understanding of how something works, interacts, or behaves. They can be **exploratory** (what is X like? does X exist? How X is different from Y? How often does X occur? How does X work? etc.) or **explanatory** (how X and Y related? what causes/affects X? Is X better than Y and /or Z? How can X be improved? etc.) Research questions often clarify what is to be studied and establish a framework for the study. This framework can be characterized as a statement of belief about how the object of the study behaves – a **hypothesis**.

To continue to narrow your research scope, you should continue to read research and popular press articles to expand your knowledge of the field. As you read articles in your interest area, keep a log of the **title** and the **author**(s) and make a note of the **research question(s)** and/or **hypotheses** and **resources** that were used by the authors (the "investigators") to achieve some important task in their project and identify what type of study has been conducted in each article. Perhaps the resources they have used or their contributions in the form of libraries, open-source software, data, etc.) would be helpful to your own research? Therefore, you should also begin to investigate resources you might need for your project, including existing open-source projects, data sources, etc.

Part 1, This Class: What To Do

In this assignment, you are invited to complete the following reading and writing tasks. The objectives of this task are the following.

1. **Related Literature**: To report on at least **two** additional research articles that are relevant to your area of interest and proposal idea. This time, you are to generate or expand a sample research idea from the article that you have read. This does not need to be the idea you choose to pursue, here it is to be done as a helpful exercise.
2. **Relevant Resources**: To investigate the research itself of each found article. Here we study the deliverable of the research to determine its importance to your own work.
3. **Your Proposal Idea**: To develop a tentative research question(s) and a hypothesis (if relevant) for your senior thesis idea, and to report on the feasibility of your project idea.

In the Google form (link: `https://forms.gle/y94mni8i6U4aDxLQ7`), you are invited to address some questions concerning the articles found, in addition to responding to questions concerning your own research direction.

Part 2, Next Class: What To Do

During our following class session, you will participate in the peer reviewing process, where a class colleague will guide you through the questions related to your proposal idea, its grounding in relevant literature/work, and its feasibility. During this process, a reviewer will ask some leading questions (listed below) to help you in your consideration of the idea and will assess and provide feedback based on the project idea assessment rubric via a Google Form. In this portion of the assignment, you are to describe a tentative idea that you found important to your area of interest (in some meaningful way), identify possible research questions and/or hypothesis for your project, and to comment on the feasibility of your idea while thinking about resources (i.e., time, data, money, etc.) For instance, the goal of this Part is to consider the availability of the resources that will be necessary for the project.

In the Google form (`https://forms.gle/7gSEP4TVjSGFqomj9`), each reviewer will ask questions concerning the inspiration and motivation of a senior thesis project. The review will then comment on the perceived feasibility of the work.

Summary of deliverables

- **For THIS class** : Complete the survey form for a check-mark grade about your own research idea and its literature review. (link: `https://forms.gle/y94mni8i6U4aDxLQ7`)
- **For NEXT class**: Interview a member of your class and complete the reviewer survey form for a check-mark grade. (link: `https://forms.gle/7gSEP4TVjSGFqomj9`)

Grading

The two check-mark grades are given for this assignment (i.e., Part 1 and Part 2). These check-marks will be given only for the completion of the forms.

Help?

Please let the instructor know of any questions that you may have. Please use email or make office-hour appointment slots if you would like to discuss an issue.

HANDED OUT: 11^{th} MARCH 2021