Research in Computer Science

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, or what social and cognitive processes surround them, or how an individual software engineer develop software, or how teams and organizations coordinate their efforts and interact. Some of the methods employed by investigators in their computational study involve:

- 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).
- etc.

Formulating Research Idea


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 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, 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.
Due: 4th February

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.

Writing Task

In this assignment that spans over two weeks, you are invited to complete the following reading and writing tasks, each with a separate Google form link.

1. To report on at least two additional research articles that are relevant to your area of interest and proposal idea. This time, you should 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. To identify, to experiment and to report on at least two resources that are relevant and useful to your area of interest and proposal idea, which can include a software tool, a programming language, API (for getting data, for example), etc.

3. 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 (https://forms.gle/WjVW7PJxtKVAd4BBA), you will be invited to answer the following questions.

1. In general terms, describe your area of interest.

2. First Article:
   
   (a) What is your inspired idea that you found in this article?
   (b) What was the article (citation) that you read to find this idea?
   (c) How do you think that this idea will help you in your own research work?
   (d) Describe the types of resources that the investigators of the article required to apply the idea.
   (e) When you adapt the first idea to your own work, what kinds of resources will you require? What kinds of challenges will you face here?

3. Second Article:
   
   (a) What is your inspired idea that you found in this article?
   (b) What was the article (citation) that you read to find this idea?
(c) How do you think that this idea will help you in your own research work?

(d) Describe the types of resources that the investigators of the article required to apply the idea.

(e) When you adapt the second idea to your own work, what kinds of resources will you require? What kinds of challenges will you face here?

4. **First Resource:**

   (a) What is your first resource that could be useful for your idea?

   (b) What is the link or a citation to this resource?

   (c) Is the documentation for this resource sufficient? Were you able to follow instructions and utilize the resource appropriately?

   (d) Describe how this resource could be used in your senior project study?

5. **Second Resource:**

   (a) What is your second resource that could be useful for your idea?

   (b) What is the link or a citation to this resource?

   (c) Is the documentation for this resource sufficient? Were you able to follow instructions and utilize the resource appropriately?

   (d) Describe how this resource could be used in your senior project study?

6. **Your Proposal Idea:**

   (a) What is your research question(s) and/or hypothesis?

   (b) Identify three indicators of your project’s feasibility (what makes you think that this project is feasible)?

**Part 2: Peer Review Task**

During our class session on Thursday (January 30th), 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 example, do you have all the required resources available to execute the study.

In the Google form (https://forms.gle/4KY5w5ptqhGprgwV8), each reviewer will ask the following questions and then evaluate the answers based on the provided rubric.

1. Describe your area of interest.
2. Describe your proposal idea.

3. What are research question(s) and/or hypothesis that can be formed for this research idea?

4. Describe the relevant literature that motivates this idea. Include a discussion of at least two research projects that are relevant and useful for the proposed study.

5. What are the top two resources that can be used for this study?

6. How feasible is this idea for your work? What resources do you have and not have to implement this idea? How could you change the idea to be able to reach a resource that may not have immediately available to you?

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.