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Course : COMP6575 – Research Topics in Computer Science

Effective Period : December 2019

Research Topics

Session 02

Learning Outcomes

At the end of this session, students will be able to:

- LO 1: Describe the basics of writing research paper and the research lifecycle
- LO 2: Select the research topic, literature and writing strategies used in the project

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Outline

1. Arguments presented in a proposal
2. Approaches to research (Qualitative, Quantitative, Mixed)
3. Research topics
4. Guideline
5. Discussion

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Starts with a Research Proposal

Arguments Presented in a Proposal

- List of the core arguments that need to be advanced in any proposal:
  1. What do readers need to better understand your topic?
  2. What do readers need to know about your topic?
  3. What do you propose to study?
  4. What is the setting, and who are the people you will study?
  5. What methods do you plan to use to collect data?
  6. How will you analyze the data?
  7. How will you validate your findings?
  8. What ethical issues will your study present?
  9. What do preliminary results show about the practicability and value of the proposed study?

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3 Approaches to Research

Qualitative

- Is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem.
- Research Design :
  - ***Narrative Research :*** is a design of inquiry from the humanities in which the researcher studies the lives of individuals and asks one or more individuals to provide stories about their lives.
  - ***Phenomenological Research :*** a design of inquiry from philosophy and psychology in which the researcher describes the lived experiences of individuals about a phenomenon as described by the participants.
  - ***Grounded Theory :*** is a design of inquiry from sociology in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in

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Qualitative

- ***Ethnographies :*** is a design of inquiry coming from anthropology and sociology in which the researcher studies the shared patterns of behaviors, language, and action of an intact cultural group in a natural setting over a prolongs period of time.
- ***Case Study :*** are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process, or one or more individuals.

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Qualitative

Let's look at an example of qualitative research from start to finish. Imagine you work at a bowling alley and you have a little form at each lane that asked "how was your experience today?" Let's assume there are 100 responses, including comments like "great, the staff was so courteous" and "terrible, I've never bowled so poorly in my life." When the boss asks, "how is the feedback so far?" you scratch your head because you are not quite sure how to summarize the data.

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Qualitative

- Example :

Sumber : https://bcomposes.com/category/scala/

A creative way to visualize qualitative data

Quantitative

- Is an approach for testing objective theories by examining the relationship among variables.

- Research Design :
  - ***Survey Research***

    provides a quantitative or numeric description of trends, attitudes or opinions of a population by studying a sample of that population.
  - ***Experimental Research***

    seeks to determine if a specific treatment influences an outcome.

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Quantitative

- Example :

Let's say you wanted to know the average height of all professional basketball players in the NBA. To conduct that research, you could do a survey and call up each player on the phone and ask them for their height. You could physically find them and measure them. Both would be examples of primary research, but I'd opt for secondary research and simply compile the data from nba.com. As you can see, quantitative research can come in many forms, including surveys, observation, experimentation, and secondary research. All of these techniques will help you obtain numerical ("quantitative") data.

Mixed Methods

- Is an approach to inquiry involving collecting both quantitative and qualitative data

- Research Design :
  - ***Convergent parallel :*** is a form of mixed methods design in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem.
  - ***Explanatory sequential :*** is one in which the researcher first conducts quantitative research, analyzes the results and then builds on the results to explain then in more details with qualitative research.
  - ***Exploratory sequential :*** is the reverse sequence from the explanatory sequential design

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The table of differences

Quantitative Methods	Mixed Methods	Qualitative Methods
Pre-determined	Both predetermined and emerging methods	Emerging methods
Instrument based questions	Both open and closed ended questions	Open-ended questions
Performance data, attitude data, observational data, and census data	Multiple forms of data drawing on all possibilities	Interview data, observation data, document data, and audiovisual data
Statistical analysis	Statistical and text analysis	Text and image analysis
Statistical interpretation	Across databases interpretation	Themes, patterns interpretation

Topics

As mentioned in the last session about the topics in Computer Science, have you found yours?

Research Topics in Computer Science

- Currently there are huge numbers of promising topics that vary in difficulties.
- The starting point of your research should be starts from your interest (might be depends on you streaming)

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Research Topics in Computer Science

- IEEE Computer Society Predicts the Future of Tech : Top 10 Technology Trends for 2019:
  1. Deep learning accelerators
  2. Assisted transportation
  3. The Internet of Bodies
  4. Social Credit Algorithms
  5. Advance (smart) materials and devices
  6. Active security protection
  7. Virtual reality (VR) and Augmented Reality (AR)
  8. Chatbots
  9. Automated voice spam (robocall) prevention
  10. Technology for humanity (Specifically machine learning)

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Research Topics in Computer Science

- Bernard Marr in Forbes.com announce the 7 Biggest technology trends in 2020 everyone must get ready for now:
  1. AI as a service
  2. 5G data networks
  3. Autonomous driving
  4. Personalized and predictive medicine
  5. Computer Vision
  6. Extended Reality (XR)
  7. Blockchain Technology

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Research Topics in Computer Science

- Mendeley announced Top 5 Trending Computer Science papers in January 2019:
  1. A survey on sentiment analysis challenges
  2. Opportunities and challenges in developing deep learning models using electronic health records data: A systematic review
  3. Big Data in Smart Farming - A review
  4. Scientific development of smart farming technologies and their application in Brazil
  5. Hierarchical Attention Networks for Document Classification

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Guideline to select your topic

- What is the problem you are trying to solve?
- How do you solve it?
- What are the benefits?
- How is the scope?

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- https://www.prnewswire.com/news-releases/ieee-computer-society-predicts-the-future-of-tech-top-10-technology-trends-for-2019-300767876.html
- https://www.forbes.com/sites/bernardmarr/2019/09/30/the-7-biggest-technology-trends-in-2020-everyone-must-get-ready-for-now/#74a2183a2261
- https://blog.mendeley.com/2019/02/27/top-5-trending-computer-science-papers-in-january-2019/

In Class Assignment

- Discuss about your topics to your lecture!

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Thank you