

# Research Methods in computer science

Spring 2024

Lecture 9

Omprakash Gnawali

February 14, 2024

# Agenda

CS Experiments

HW4

# Experiments

What experiments are useful?

Critical for the main arguments of the paper

What experiments are not useful?

Pointless experiments that generate pointless numbers, graphs, and tables

# Types of Experiments

From the “context” perspective

Controlled

Uncontrolled

There are other perspectives to be covered in future lectures

# Group Activity

Experiment Design

Metric Selection

# Group 1

A new algorithm that translates English text to Spanish.

# Group 2

A new wireless networking technology.

# Group 3

Impact of doing court proceedings in metaverse.

<https://www.reuters.com/world/americas/colombia-court-moves-metaverse-host-hearing-2023-02-24/>



# Anatomy of a Science Paper

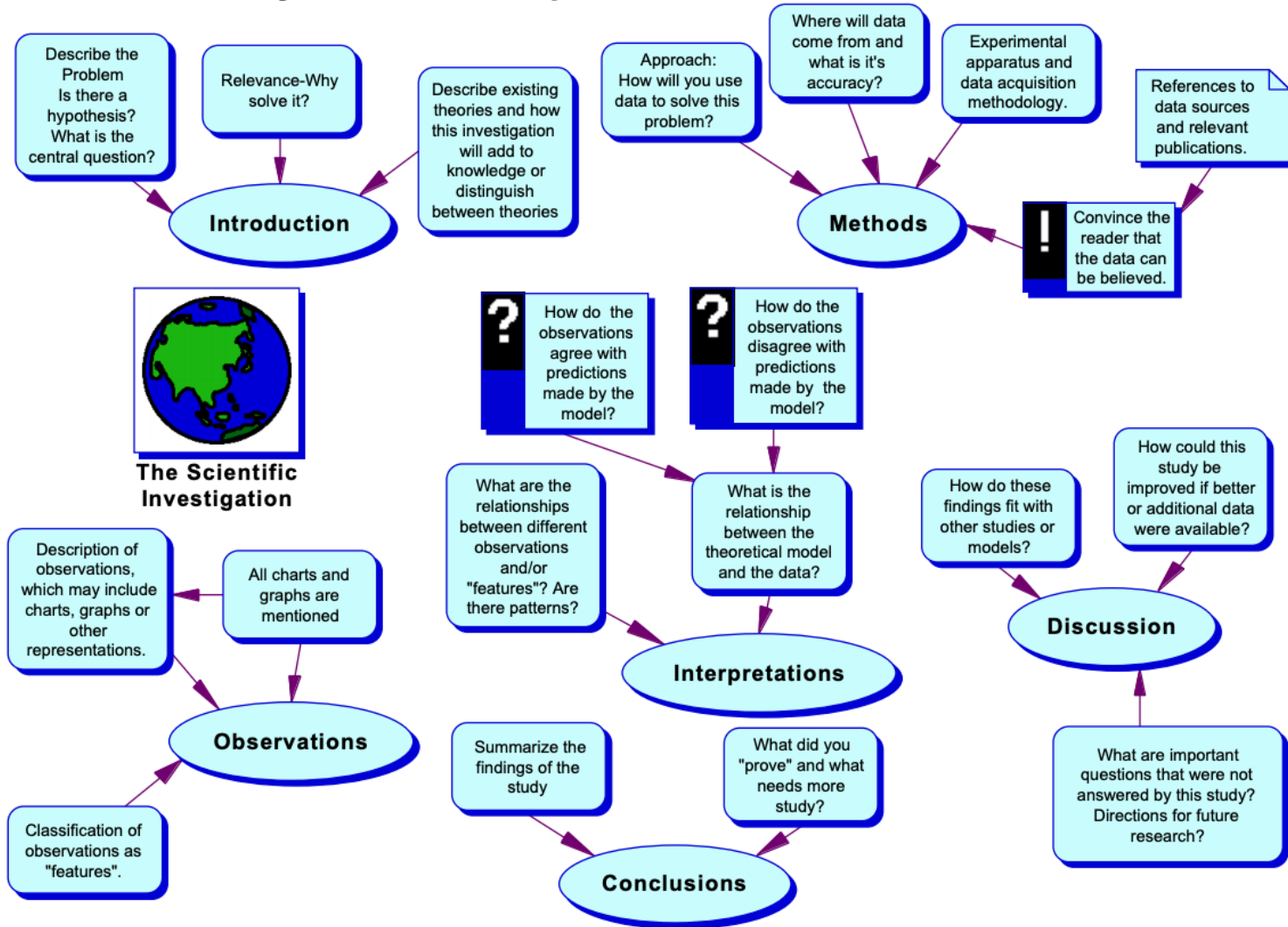


Figure 3.1. This diagram shows the headings that must be used for this science paper. Please pay careful attention to the boxes with arrows pointing at each elliptical heading box. These boxes are reminders of the content that belongs with each heading.

# Types of Papers (mechanical)

Technical Reports

- Project description

- Research paper

Conference

Journal

Magazine

Find out what type your group  
and community writes.

# Which papers are more important?

Conference

Journal

Magazine

Impact factor

CORE ranking

What makes a paper more important than others?

# Types of Papers (purpose)

Research Paper

Survey Paper

Tutorial

Technical Report

- E.g., NIST, Other Orgs

White Paper

Vision Paper

Challenge Paper

# Publications – Looking Ahead

Blogs?

Facebook?

Twitter?

LinkedIn?

GitHub?

YouTube?

arXiv?

.....

# Citation and References

Clean! Clean! Clean!

(esp. for websites, links, datasheets)

Consistency! Consistency! Consistency!

# Examples

^ both

- ALIZAL, M. H., WIRTZ, H., KIRCHEN, B., VAEGS, T., GNAWALI, O., AND WEHRLE, K. 2011. TinyWifi: Making Network Protocol Evaluation Portable Across Multiple Phy-Link Layers. In *WINTECH '11: Proceedings of the Sixth ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization*.
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# References

Can take a long time to format references.

Is it worth it?



# Citations – Google Scholar

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## Language independent analysis and classification of discussion threads in Coursera MOOC forums

[LA Rossi, O Gnawali](#) - ... [Reuse and Integration \(IRI\), 2014 IEEE ...](#), [2014 - ieeexplore.ieee.org](#)

... Aside from students and instructors, other categories of **Coursera forum** users: are Course Staff (teach-655 Page 3 ... 4.1. Different usages of posts and comments As we mentioned in Sec. a discussion thread on a **Coursera forum** is composed of posts and possibly comments ...

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Cite

- MLA Rossi, Lorenzo A., and Omprakash Gnawali. "Language independent analysis and classification of discussion threads in Coursera MOOC forums." *Information Reuse and Integration (IRI), 2014 IEEE 15th International Conference on*. IEEE, 2014.
- APA Rossi, L. A., & Gnawali, O. (2014, August). Language independent analysis and classification of discussion threads in Coursera MOOC forums. In *Information Reuse and Integration (IRI), 2014 IEEE 15th International Conference on* (pp. 654-661). IEEE.
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- Harvard Rossi, L.A. and Gnawali, O., 2014, August. Language independent analysis and classification of discussion threads in Coursera MOOC forums. In *Information Reuse and Integration (IRI), 2014 IEEE 15th International Conference on* (pp. 654-661). IEEE.
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# Citations – ACM DL

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## Room occupancy estimation through wifi, UWB, and light sensors mounted on doorways

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Authors: [Hessam Mohammadmoradi](#) [University of Houston](#)  
[Shengrong Yin](#) [University of Houston](#)  
[Omprakash Gnawali](#) [University of Houston](#)



2017 Article

Published in:



· Proceeding  
[ICSDSDE '17](#) Proceedings of the 2017 International Conference on Smart Digital Environment  
Pages 27-34

Rabat, Morocco — July 21 - 23, 2017  
ACM New York, NY, USA ©2017  
[table of contents](#) ISBN: 978-1-4503-5281-9  
doi>[10.1145/3128128.3128133](https://doi.org/10.1145/3128128.3128133)

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```
@inproceedings{Mohammadmoradi:2017:ROE:3128128.3128133,  
author = {Mohammadmoradi, Hessam and Yin, Shengrong and Gnawali, Omprakash},  
title = {Room Occupancy Estimation Through Wifi, UWB, and Light Sensors Mounted on Doorways},  
booktitle = {Proceedings of the 2017 International Conference on Smart Digital Environment},  
series = {ICSDSDE '17},  
year = {2017},  
isbn = {978-1-4503-5281-9},  
location = {Rabat, Morocco},  
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url = {http://doi.acm.org/10.1145/3128128.3128133},  
doi = {10.1145/3128128.3128133},  
acmid = {3128133},  
publisher = {ACM},  
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# Citations - IEEE

## Towards Embedded Visible Light Communication Robust to Dynamic Ambient Light

2 Author(s) Shengrong Yin ; Omprakash Gnawali [View All Authors](#)

1 Paper Citation

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### Abstract

#### Document Sections

- I. Introduction
- II. Related Work
- III. System Overview
- IV. Evaluation
- V. Conclusions

#### Authors

#### Figures

#### References

#### Citations

#### Keywords

### Abstract:

The presence of ambient light is a key challenge for reliable and robust low cost embedded visible light communication system. The photodetector used by these systems can perform poorly when subjected to bright ambient light or fluctuating ambient light. To solve this problem, we present an ambient light cancellation mechanism for low cost embedded LED to photodiode communication systems that utilizes a digital potentiometer to adaptively nullify the ambient light to provide an always ZERO output no matter what the ambient light intensity is. The proposed technique allows the receiver to correctly receive the light transmitted by the transmitter without any interference from the ambient light. We provide a detailed description of the modulation and demodulation schemes as well as ambient light cancellation mechanism, and their evaluations. The results show our proposed system can provide a reliable and robust visible light communication with extremely low symbol error rate (almost 0) and an acceptable data rate up to 3kbps given an operating distance of 50 centimeters.

Published in: [2016 IEEE Global Communications Conference \(GLOBECOM\)](#)

Date of Conference: 4-8 Dec. 2016

Date Added to IEEE Xplore: 06 February 2017

► ISBN Information:

INSPEC Accession Number: 16655135

DOI: [10.1109/GLOCOM.2016.7842344](#)

Publisher: IEEE

Conference Location: Washington, DC, USA

```
@INPROCEEDINGS{7842344,
  author={S. Yin and O. Gnawali},
  booktitle={2016 IEEE Global Communications Conference (GLOBECOM)},
  title={Towards Embedded Visible Light Communication Robust to Dynamic Ambient Light},
  year={2016},
  volume={},
  number={},
  pages={1-6},
  keywords={demodulation;free-space optical communication;interference suppression;light emitting diodes;optical modulation;photodetectors;photodiodes;dynamic ambient light fluctuation;robust low-cost embedded visible light communication system reliability;photodetector;photodiode communication system;low-cost embedded LED;digital potentiometer;modulation scheme;demodulation scheme;ambient light cancellation mechanism;distance 50 cm;Receivers;Photodiodes;Robustness;Modulation;Prototypes},
  doi={10.1109/GLOCOM.2016.7842344},
  ISSN={},
  month={Dec},}
```

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# Citations

- Systems and artifacts
  - Generally immediately after the names  
AnguLoc [5] is better than SideLoc[6].
- Narrative
  - Generally at the end of the sentence

Researchers have made a lot of progress in this field in the last five years [6]

This solution is scalable as the number of transmitting anchors can be small and can be scheduled in different time slots. With the usage of inter-anchor concurrency, solutions like AnguLoc [1] managed to make it more efficient. However, this architecture is not cost-effective as described earlier.

In addition to that, new light-emitting technologies, such as LEDs, become more popular and accessible, enabling new perspectives for optical wireless communication [7], [8]. Finally, the increasing interest and exploration of the

Bad form:

[1] presents a new technique.

# Citation Format

Number: [n]

Author / year: [Gnawali et al. 2020]

In text without [] or (), e.g., Gnawali et al. proposed a new technique.

Consult the instruction for your conference or journal. Number [n] format common in our fields.



# HW4

## Introduction

Your writeup should answer all the questions we discussed in the stated sequence.