Research Methods in computer science

Spring 2019

Lecture 5

Omprakash Gnawali

January 30, 2019

Agenda

HW1 Live Grading

Research Paper Anatomy and Types

Citations

Assignment

Anatomy of a Research Paper

Abstract

Introduction

Related Work

Design and Implementation

Evaluation

Conclusion

Some of the contents in the next few slides from Jennifer Widom's notes on Writing Technical Papers.

Abstract

Summary of motivation, state of the art, your algorithm or system, and results each in 1-3 sentences.

Abstract MadLibs!!

This paper presents a _____ method for _____
(synonym for *new*) (sciencey verb)
the _____. Using _____, the
(noun few people have heard of) (something you didn't invent)
_____ was measured to be _____ +/- _____
(property) (number) (number)
_____. Results show _____ agreement with
(units) (sexy adjective)
theoretical predictions and significant improvement over
previous efforts by _____, et al. The work presented
(Loser)
here has profound implications for future studies of
_____ and may one day help solve the problem of
(buzzword)
_____.
(supreme sociological concern)

Keywords: _____, _____, _____
(buzzword) (buzzword) (buzzword)

Introduction

What is the problem?

Why is it interesting and important?

Why is it hard? (E.g., why do naive approaches fail?)

Why hasn't it been solved before? (Or, what's wrong with previous proposed solutions? How does mine differ?)

What are the key components of my approach and results? Also include any specific limitations.

Summary of results and contributions.

Related Work

You want to give a sense of the old and new work in this area.

Where to look for these?

Organized is better than not organized

The Body of the paper

Depending on the area of work may describe the proposed algorithm, proofs, systems, implementations

Evaluation

Description of experiments and metrics

Results of experiments

Implications of those results

More applicable to the applied areas of computer science.

Conclusions

Not the same as abstract

Short summary of what you did in the project and the implications of the results

Can include lessons learnt and future directions

How do the answers map to these questions to the different parts of a paper?

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

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

Citation Format

There is no standard citation format

- Different communities
  - APA, Chicago, ……
- Different conferences/journals
  - ACM, IEEE, ……

Learn how to use tools

- BibTex
- Online Services (e.g., Mendeley)
  - Demo: Google Scholar, IEEE, ACM
- Word

Citation

Clean! Clean! Clean!

(esp. for websites, links, datasheets)

Consistency! Consistency! Consistency!

Examples

ALIZAI, 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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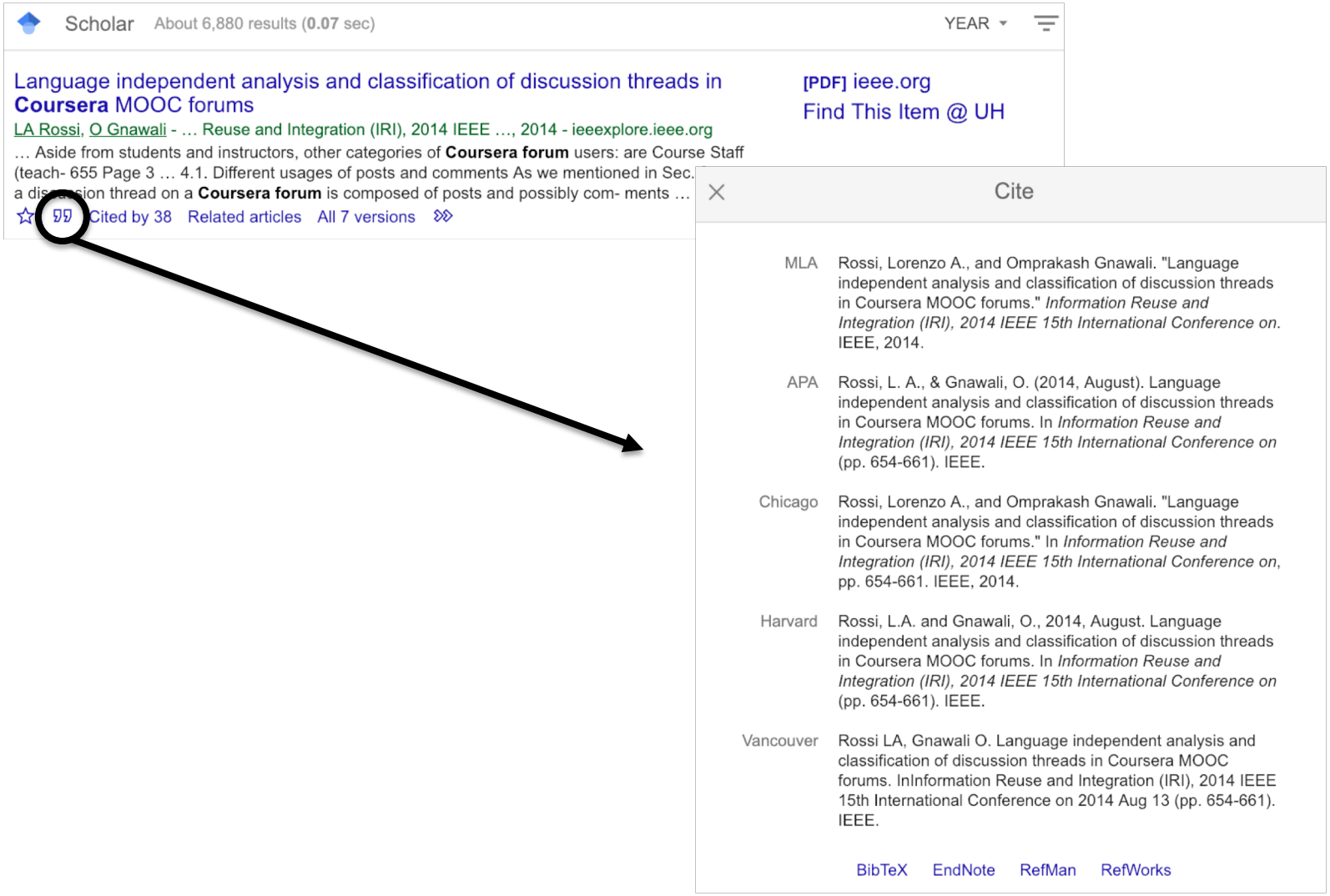
Citations

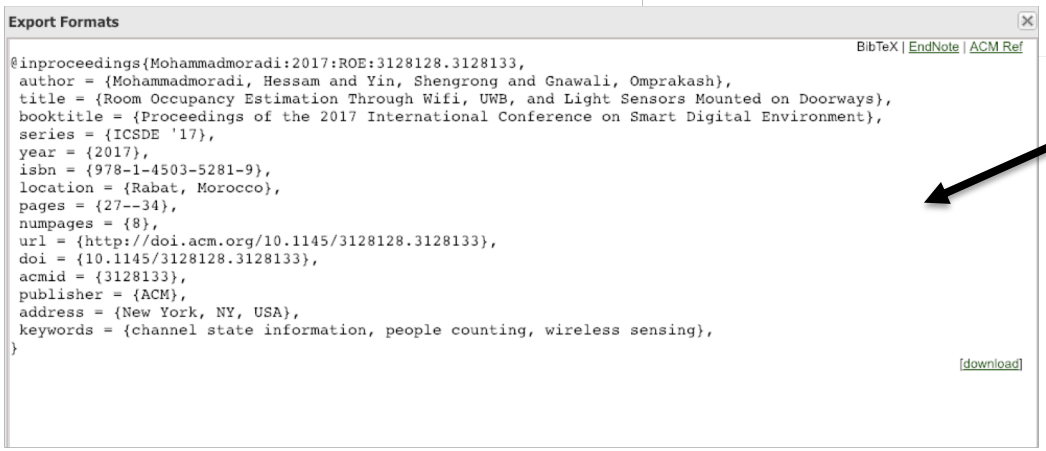
Can take a long time to format citations.

Is it worth it?

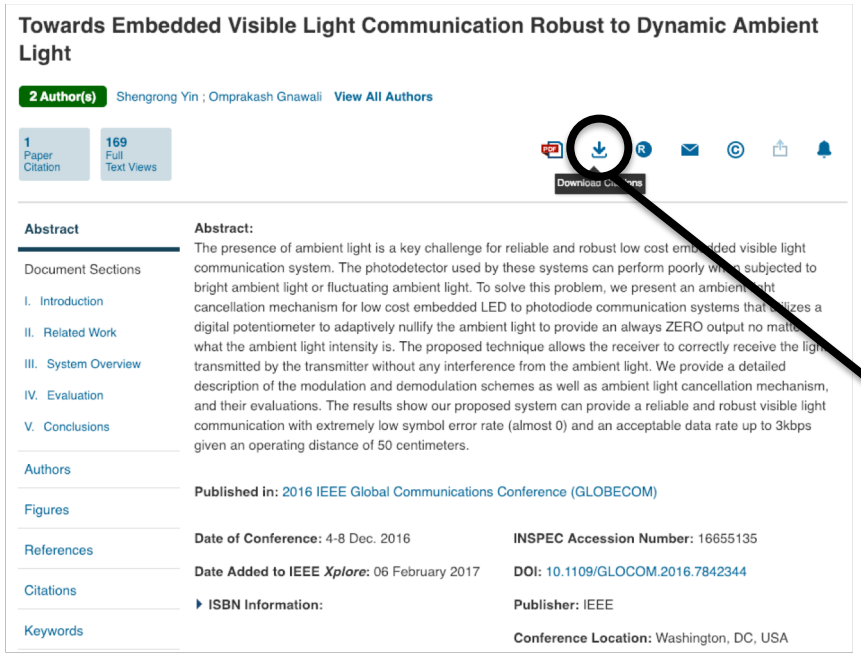
Citations – Google Scholar



Citations – ACM DL



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

169 Full Text Views

Download Citations

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

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@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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HW2 - Research Formulation

What are you trying to do? Articulate your objectives using absolutely no jargon.

How is it done today, and what are the limits of current practice?

What's new in your approach and why do you think it will be successful?

Who cares?

Heilmeier

HW2 - Research Formulation

If you're successful, what difference will it make?

What are the risks and the payoffs?

How much will it cost?

How long will it take?

What are the midterm and final "exams" to check for success?

Heilmeier