

# How to do Research

This is as much discussion as presentation so please  
interrupt!

# Roadmap

Choosing and Refining Ideas

Finding/Reading Academic Papers


Project Scale and Prior Work

Collaboration

Please don't make us go to court

Meet with staff next week

# Choosing Project Ideas

- What do you  ?
  - Hobbies? Your favorite class?
  - Security is ***everywhere***

# Choosing Project Ideas

- What do you ❤️ ?
  - Hobbies? Your favorite class?
  - Security is *everywhere*
- What do you use?
  - Do you understand how the devices around you work?
    - How does your computer know what time it is?
    - Caller ID???
    - The unlock button on a car remote?

# Choosing Project Ideas

- What do you ❤️ ?
  - Hobbies? Your favorite class?
  - Security is *everywhere*
- What do you use?
  - Do you understand how the devices around you work?
    - How does your computer know what time it is?
    - Caller ID???
    - The unlock button on a car remote?
- What is exciting?
  - If you aren't excited about your project, no one else will be either

# Choosing Project Ideas

- What do you ❤️ ?
  - Hobbies? Your favorite class?
  - Security is **everywhere**
- What do you use?
  - Do you understand how the devices around you work?
    - How does your computer know what time it is?
    - Caller ID???
    - The unlock button on a car remote?
- What is exciting?
  - If you aren't excited about your project, no one else will be either
- Do you **enjoy** the type of work you're about to sign up for?
  - When you consider a topic, think about how you'll reach your result, not just about the result itself! Programming? Reverse engineering?

# Refining your Topic

What problem are you solving?

Why is this an important problem?

What other work exists in the area?

What are the limitations of your approach?

# How to Find Papers

[scholar.google.com](https://scholar.google.com)



# How to Find Papers

Google Scholar

anonymous communication



Articles  Case law

# How to Find Papers

Cited by

- Generally corresponds to “influence”
- Look at works citing a paper to find similar followup works!



Any time

Since 2022

Since 2021

Since 2018

Custom range...

Sort by relevance

Sort by date

Any type

Review articles

include patents

include citations

Create alert

**An anonymous communication technique using dummies for location-based services**

[PDF] psu.edu

H Kido, Y Yanagisawa, T Satoh - ICPS'05. Proceedings ..., 2005 - [ieeexplore.ieee.org](http://ieeexplore.ieee.org)

... We propose a new **anonymous communication** technique to protect the location privacy of people using LBSs. In our proposed technique, a user sends true position data ... To apply our **anonymous communication** technique in LBSs, we discuss the following two important issues: ...

☆ Save Cite **Cited by 963** Related articles All 8 versions

[PDF] **A protocol for anonymous communication over the internet**

[PDF] acm.org

C Shields, BN Levine - Proceedings of the 7th ACM Conference on ..., 2000 - [dl.acm.org](http://dl.acm.org)

... In this paper, we present a new protocol for providing **anonymous communication** on the In... Hordes achieves these reductions by making use of multicast **communication**, and is the first ... method of comparing the anonymity provided by **anonymous** protocols. In Section 4, we ...

☆ Save Cite Cited by 345 Related articles All 13 versions

[PDF] **A survey of anonymous communication channels**

[PDF] freehaven.net

G Danezis, C Diaz - 2008 - [hostmaster.freehaven.net](http://hostmaster.freehaven.net)

... **anonymous communication** systems. In this survey we look at the definition of **anonymous** communications and the major **anonymous communication** ... Data **communication** networks use addresses to perform routing which are, as a rule, visible to anyone observing the network. ...

☆ Save Cite Cited by 185 Related articles All 20 versions

**P5: A protocol for scalable anonymous communication**

[PDF] mtu.edu

R Sherwood, B Bhattacharjee... - Journal of Computer ..., 2005 - [content.iospress.com](http://content.iospress.com)

... We present a protocol for **anonymous communication** over the Internet. Our protocol, called P5 (... **communication** efficiency, and hence can be used to scalably implement large **anonymous** groups. We present a description of P5, an analysis of its anonymity and **communication** ...

☆ Save Cite Cited by 371 Related articles All 14 versions Web of Science: 19

Any time

Since 2022

Since 2021

Since 2018

Custom range...

Sort by relevance

Sort by date

Create alert

## A protocol for anonymous communication over the internet

Search within citing articles

### [PDF] Anonymous usage of location-based services through spatial and temporal cloaking

[M Gruteser](#), [D Grunwald](#) - ... of the 1st international conference on Mobile ..., 2003 - [dl.acm.org](#)

Advances in sensing and tracking technology enable location-based applications but they also create significant privacy risks. Anonymity can provide a high degree of privacy, save service users from dealing with service providers' privacy policies, and reduce the service ...

☆ Save [🔗 Cite](#) Cited by 3016 [Related articles](#) [All 16 versions](#)

[PDF] [acm.org](#)

### [PDF] Peer-to-peer computing

[DS Milojicic](#), [V Kalogeraki](#), [R Lukose](#), [K Nagaraja](#)... - 2002 - [cs.kau.se](#)

The term "peer-to-peer"(P2P) refers to a class of systems and applications that employ distributed resources to perform a function in a decentralized manner. With the pervasive deployment of computers, P2P is increasingly receiving attention in research, product ...

☆ Save [🔗 Cite](#) Cited by 1415 [Related articles](#) [All 42 versions](#) [🔗](#)

[PDF] [kau.se](#)

### ANODR: Anonymous on demand routing with untraceable routes for mobile ad-hoc networks

[J Kong](#), [X Hong](#) - Proceedings of the 4th ACM international symposium ..., 2003 - [dl.acm.org](#)

In hostile environments, the enemy can launch traffic analysis against interceptable routing information embedded in routing messages and data packets. Allowing adversaries to trace network routes and infer the motion pattern of nodes at the end of those routes may pose a ...

☆ Save [🔗 Cite](#) Cited by 686 [Related articles](#) [All 18 versions](#)

[PDF] [acm.org](#)

### Statistical identification of encrypted web browsing traffic

[Q Sun](#), [DR Simon](#), [YM Wang](#), [W Russell](#)... - ... IEEE Symposium on ..., 2002 - [ieeexplore.ieee.org](#)

Encryption is often proposed as a tool for protecting the privacy of World Wide Web browsing. However, encryption-particularly as typically implemented in, or in concert with popular Web browsers-does not hide all information about the encrypted plaintext ...

☆ Save [🔗 Cite](#) Cited by 485 [Related articles](#) [All 25 versions](#)

[PDF] [ieee.org](#)

# How to Find Papers

## Year

- Old  $\neq$  bad, but newer papers will give a better view of the *current* state of the area
- It can be helpful to start with new and work back



- Any time
- Since 2022
- Since 2021
- Since 2018
- Custom range...

Sort by relevance

Sort by date

Any type

Review articles

- include patents
- include citations

Create alert

**Privacy-aware secure anonymous communication protocol in CPSS cloud computing**

F Li, C Cui, D Wang, Z Liu, N Elmrabit, Y Wang... - IEEE ..., 2020 - ieeexplore.ieee.org

... mechanism, we achieve a novel **anonymous communication** protocol to protect the identity ... an **anonymous communication** link establishment method and an **anonymous communication** ... to **anonymous communication** packet encapsulation format and **anonymous communication** ...

☆ Save Cite Cited by 10 Related articles All 9 versions Web of Science: 2

[PDF] ieee.org

**[HTML] Anonymous communication via anonymous identity-based encryption and its application in IoT**

L Jiang, T Li, X Li, M Atiquzzaman, H Ahmad... - ... and Mobile Computing, 2018 - hindawi.com

... To solve this problem, we propose an **anonymous communication** system based on **anonymous** IBE. Our scheme has significant advantage in efficiency compared with previous work and can also offer strong anonymity. In the future, we will consider the user ...

☆ Save Cite Cited by 20 Related articles All 7 versions Web of Science: 12

[HTML] hindawi.com  
Full View

**[PDF] On privacy notions in anonymous communication**

C Kuhn, M Beck, S Schiffner, E Jorswieck... - Proceedings on Privacy ..., 2019 - sciendo.com

... On Privacy Notions in **Anonymous Communication** Abstract: Many **anonymous communication** networks (ACNs) with different privacy goals ... To protect metadata from state and industrial surveillance, a broad variety of **anonymous communication** networks (ACNs) has emerged; ...

☆ Save Cite Cited by 19 Related articles All 10 versions

[PDF] sciendo.com

# How to Find Papers

## Conference tier

- Top tier conferences are pickier about what they accept
  - USENIX, S&P, CCS, NDSS, RWC
  - Crypto, TCC, EUROCRYPT
  - OSDI, SOSP, NSDI



Any time

Since 2022

Since 2021

Since 2018

Custom range...

Sort by relevance

Sort by date

Any type

Review articles

include patents

include citations

Create alert

**An anonymous communication technique using dummies for location-based services**

[PDF] psu.edu

H Kido, Y Yanagisawa, T Satoh - ICPS'05. Proceedings ..., 2005 - [ieeexplore.ieee.org](http://ieeexplore.ieee.org)

... We propose a new **anonymous communication** technique to protect the location privacy of people using LBSs. In our proposed technique, a user sends true position data ... To apply our **anonymous communication** technique in LBSs, we discuss the following two important issues: ...

☆ Save ↻ Cite Cited by 963 Related articles All 8 versions

[PDF] A protocol for **anonymous communication** over the internet

[PDF] acm.org

C Shields, BN Levine - Proceedings of the 7th ACM Conference on ..., 2000 - [dl.acm.org](http://dl.acm.org)

... In this paper, we present a new protocol for providing **anonymous communication** on the In... Hordes achieves these reductions by making use of multicast **communication**, and is the first ... method of comparing the anonymity provided by **anonymous** protocols. In Section 4, we ...

☆ Save ↻ Cite Cited by 345 Related articles All 13 versions

[PDF] A survey of **anonymous communication** channels

[PDF] freehaven.net

G Danezis, C Diaz - 2008 - [hostmaster.freehaven.net](http://hostmaster.freehaven.net)

... **anonymous communication** systems. In this survey we look at the definition of **anonymous** communications and the major **anonymous communication** ... Data **communication** networks use addresses to perform routing which are, as a rule, visible to anyone observing the network. ...

☆ Save ↻ Cite Cited by 185 Related articles All 20 versions ⇨

P5: A protocol for scalable **anonymous communication**

[PDF] mtu.edu

R Sherwood, B Bhattacharjee... - Journal of Computer ..., 2005 - [content.iospress.com](http://content.iospress.com)

... We present a protocol for **anonymous communication** over the Internet. Our protocol, called P5 (... **communication** efficiency, and hence can be used to scalably implement large **anonymous** groups. We present a description of P5, an analysis of its anonymity and **communication** ...

☆ Save ↻ Cite Cited by 371 Related articles All 14 versions Web of Science: 19



# How to Find Papers

## Terminology

- Google Scholar is very picky about your word choices
  - (this is a feature not a bug)
  - You need to try many different search queries when searching for papers

# How to Find Papers

## Terminology

- Google Scholar is very picky about your word choices
  - (this is a feature not a bug)
  - You need to try many different search queries when searching for papers

Where was Tor is my anonymous communication searches? (not there)



## Any time

Since 2022

Since 2021

Since 2018

Custom range...

## Sort by relevance

Sort by date

## Any type

Review articles

 include patents include citations Create alert

### Usability of **anonymous web browsing**: an examination of tor interfaces and deployability

[\[PDF\] acm.org](#)[J Clark](#), [PC Van Oorschot](#), [C Adams](#) - ... of the 3rd symposium on Usable ..., 2007 - dl.acm.org

... Tor is an important privacy tool that provides **anonymous web-browsing** capabilities by sending users' traffic through a network of specialized ... In Section 2, we review the preliminaries of **anonymous** communication and onion routing, and examine the relevant threat models. ...

☆ Save 🔄 Cite Cited by 92 Related articles All 22 versions

### How to make personalized web **browsing** simple, secure, and **anonymous**

[\[PDF\] psu.edu](#)[E Gabber](#), [PB Gibbons](#), [Y Matias](#), A Mayer - International Conference on ..., 1997 - Springer

... The work closest in spirit to our goal of **anonymous** personalized web **browsing** is the visionary paper of Chaum [C85] on digital pseudonyms. Chaum presented a general framework in which users maintain distinct pseudonyms for different organizations, such that pseudonyms ...

☆ Save 🔄 Cite Cited by 257 Related articles All 15 versions

### Predicted packet padding for **anonymous web browsing** against traffic analysis attacks

[\[PDF\] ieee.org](#)[S Yu](#), [G Zhao](#), [W Dou](#), [S James](#) - IEEE Transactions on ..., 2012 - ieeexplore.ieee.org

... In this paper, we focused on reducing the delay and bandwidth waste of **anonymous web browsing** systems in order to make **anonymous web browsing** applicable for web viewers. We proposed the predicted packet padding strategy to achieve this goal. A simple mathematical ...

☆ Save 🔄 Cite Cited by 251 Related articles All 5 versions Web of Science: 18

### **Anonymous** connections and onion routing

[\[PDF\] ieee.org](#)[PF Syveron](#), DM Goldschlag... - Proceedings. 1997 IEEE ..., 1997 - ieeexplore.ieee.org

... In this paper, we will focus on the HTTP proxy for Web **browsing**. In the basic configuration where a firewall lives between a trusted and untrusted network, the onion router and its proxies live on the firewall. There are two classes of proxies: one that bridges connections from ...

☆ Save 🔄 Cite Cited by 796 Related articles All 27 versions



Any time

Since 2023

Since 2022

Since 2019

Custom range...

Sort by relevance

Sort by date

Any type

Review articles

include patents

include citations

Create alert

**Tor: The second-generation onion router**

[R Dingledine](#), [N Mathewson](#), [P Syverson](#) - 2004 - apps.dtic.mil

... chronous, loosely federated **onion routers** that provides the following improvements over the old **Onion** Routing design: Perfect forward secrecy: In the original **Onion** Routing design, a ...

☆ Save Cite Cited by 5484 Related articles All 107 versions

[PDF] dtic.mil

[PDF] **Onion routing**

[D Goldschlag](#), [M Reed](#), [P Syverson](#) - Communications of the ACM, 1999 - dl.acm.org

... All cells arriving at an **onion router** within a fixed time interval ... **onion routers** can be padded and bandwidth-limited to foil external observers. An **onion** looks different to each **onion router** ...

☆ Save Cite Cited by 1273 Related articles All 21 versions

[PDF] acm.org

[HTML] **Tor: The secondgeneration onion router**

[P Syverson](#), [R Dingledine](#), [N Mathewson](#) - Usenix Security, 2004 - usenix.org

... chronous, loosely federated **onion routers** that provides the following improvements over the old **Onion** Routing design: Perfect forward secrecy: In the original **Onion** Routing design, a ...

☆ Save Cite Cited by 173 Related articles All 2 versions

[HTML] usenix.org

**The onion router: Understanding a privacy enhancing technology community**

[HY Huang](#), [M Bashir](#) - ... of the Association for Information Science ..., 2016 - Wiley Online Library

... One of the most well-known PETs is the **Onion Router** (Tor) network, which provides users with online anonymity. The Tor network is supported by a group of volunteers who contribute ...

☆ Save Cite Cited by 25 Related articles All 3 versions

[PDF] wiley.com

Full View

# How to Read Papers

Don't read the whole thing top to bottom as soon as you find it!!!

1. Read the abstract
  - a. Does it still seem relevant?

# How to Read Papers

Don't read the whole thing top to bottom as soon as you find it!!!

1. Read the abstract
  - a. Does it still seem relevant?
2. Read the introduction
  - a. This will be a summary of the paper's contributions along with its motivation
  - b. Does the paper still seem relevant?

# How to Read Papers

Don't read the whole thing top to bottom as soon as you find it!!!

1. Read the abstract
  - a. Does it still seem relevant?
2. Read the introduction
  - a. This will be a summary of the paper's contributions along with its motivation
  - b. Does the paper still seem relevant?
3. Read the related works
  - a. This is where you find other papers in the area (and why this paper thinks they didn't solve the problem)
  - b. Find papers that cite this paper in *their* related works to see what might have been missed

# How to Read Papers

Don't read the whole thing top to bottom as soon as you find it!!!

1. Read the abstract
  - a. Does it still seem relevant?
2. Read the introduction
  - a. This will be a summary of the paper's contributions along with its motivation
  - b. Does the paper still seem relevant?
3. Read the related works
  - a. This is where you find other papers in the area (and why this paper thinks they didn't solve the problem)
  - b. Find papers that cite this paper in *their* related works to see what might have been missed
4. Read the rest of the paper (optional)
  - a. You should be reading full papers for works closely related to yours



# Refining your Topic

What problem are you solving?

*Anonymous communication is pretty slow*

# Refining your Topic

What problem are you solving?

*Anonymous communication is pretty slow*

Why is this an important problem?

*People won't use it if it's slow*

# Refining your Topic

What problem are you solving?

*Anonymous communication is pretty slow*

Why is this an important problem?

*People won't use it if it's slow*

What other work exists in the area?

*Tor: more usable than academic works, but not as strong anonymity*

# Refining your Topic

What problem are you solving?

*Anonymous communication is pretty slow*

Why is this an important problem?

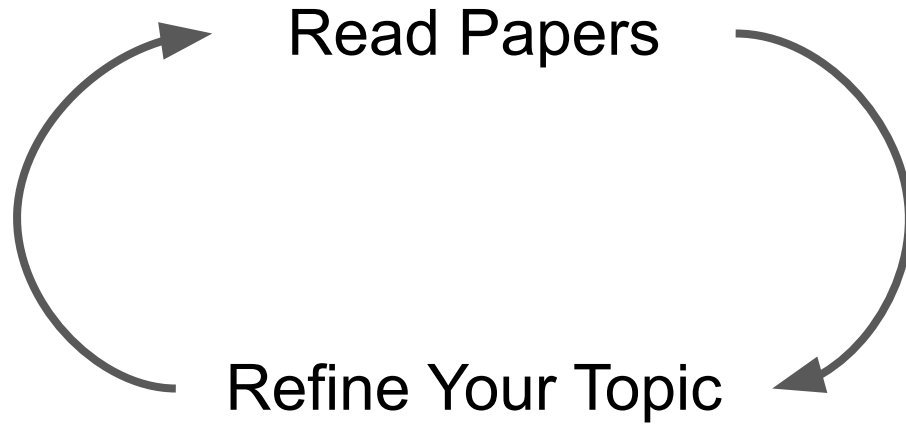
*People won't use it if it's slow*

What other work exists in the area?

*Tor: more usable than academic works, but not as strong anonymity*

What are the limitations of your approach?

*Better performance often means worse security*



# Roadblocks

Novelty: So you found a paper that looks like it already solved your problem

- Are there missing pieces to their solution?
  - See related work or, if present, “limitations”
- Is there a related problem that seems open?

# Roadblocks

Novelty: So you found a paper that looks like it already solved your problem

- Are there missing pieces to their solution?
  - See related work or, if present, “limitations”
- Is there a related problem that seems open?

Scope: Your project is out of scope for a course project

- Any bite sized pieces you can break off?

# Roadblocks

Novelty: So you found a paper that looks like it already solved your problem

- Are there missing pieces to their solution?
  - See related work or, if present, “limitations”
- Is there a related problem that seems open?

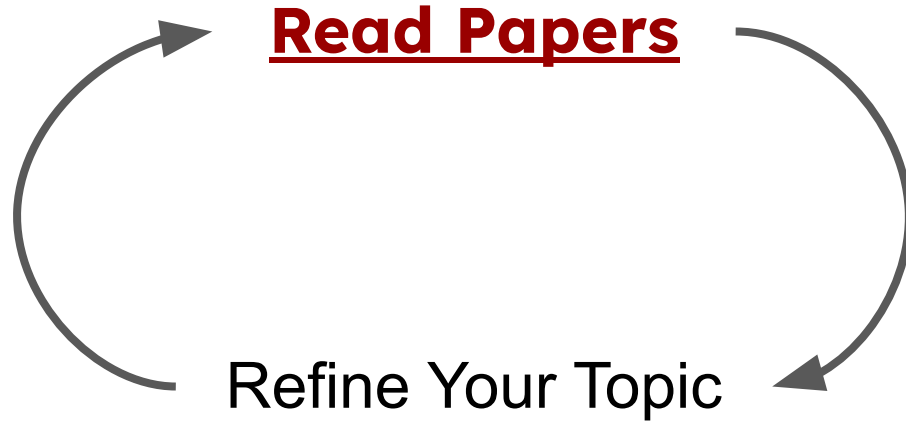
Scope: Your project is out of scope for a course project

- Any bite sized pieces you can break off?

Binary Projects: Your problem is either “solved” or “unsolved” with no middle ground

- You want steps along the way
  - Checkpoints along the way should be meaningful in their own right
  - Move the goalposts
  - See: Papers with titles of the format “Towards....”





# Finding papers (redux)

Cite related work!

- Important for your own understanding of the topic
- Credit where credit is due

It's okay if you miss some papers initially

- Or even over time. (course staff can help here)
- Very important to *do your best*
- Repeat your searches as your understanding grows

# Collaboration

Research is best with friends

This is how you will refine your ideas and find bugs

It's easy to get into the weeds and lose sight of the big picture.

A fresh brain will catch things you missed.

Can I help?



Your classmates >> a rubber duck

# Ethics

- This guy (Andy Sellars) is part of the CyberLaw Clinic
  - Go to the BU Cyberlaw Clinic with legal questions!
- Absolutely no breaking of things without permission
  - Don't even look at things without permission
- Law is confusing - do not make assumptions
  - Ask for help if ever unsure



# Ethics

- This guy (Andy Sellars) is part of the CyberLaw Clinic
  - Go to the BU Cyberlaw Clinic with legal questions!
- Absolutely no breaking of things without permission
  - Don't even look at things without permission
- Law is confusing - do not make assumptions
  - Ask for help if ever unsure

Bug bounties: some companies have a policy about security research involving them.

Responsible disclosure: if you find a problem you **MUST** let the organization know **BEFORE** you make it public



## Next week: come talk to us!

- Kelsey M10-11 32-G9
- Andrea M2:30-3:30 32-G9
- Henry M3-4 32-G970
- Kyle W10-11 32-G9
- Simon W3-4 32-G9
- Alex Th4-5 32-G9
- Yael (by appointment)

## TYPES OF CYBERSECURITY PAPERS



Write up your results into a snazzy paper!

## TYPES OF PRIVACY PAPER

