

COP5570 Term Group Project Spring 2023

Number of students in a group

You can have up to three students in a team

Project objective: To apply the concepts and techniques learned in COP5570 to some research and/or practical problems.

Type of projects: A potential project should be a combination of both software development and research. More details are provided in the later part of this project description.

Grading: Grading will be based on 4 elements (where it is applicable): project proposal and status report, project presentation, project software and demo, and project final report.

Project proposal and status report: 10% (text or pdf, up to 2 pages)

Project presentation: 20%

Project software and demo: 20%

Project final report: 50% (pdf up to 9 pages)

The relative weight for research and development components will be determined based on the nature of the project.

Research components:

1. The significance of the application or problem (presentation + report)
2. The survey of the state of the art (presentation + report)
3. The novelty of the proposed techniques (presentation + report)
4. The completeness of the implementation and evaluation (presentation + report)

Development components:

1. Software usefulness and correctness (demo + software)
2. Software scope (demo + software)
3. The challenges/novelty of software implementation techniques (demo + software + presentation + report).
4. The completeness of the evaluation (presentation + report)

Project proposal and status report: up to 2 pages. In this short report, you need to report the team members, type of the project, the topic of the project, and the detailed objectives of the project (precisely what you want to achieve in the project) and the planned steps to achieve the objectives. In addition, you should also report the current status of the project (what your group has done). A column in the grade book will be added later for you to submit the project proposal and status report, which must be in either plain text or pdf format.

Project presentation: graded based on

1. clarity
2. organization
3. novelty
4. evaluation

5. overall research quality of the project
6. overall development quality of the project

Final project report: Up to nine pages. Graded based on

1. clarity
2. organization
3. novelty
4. evaluation
5. overall writing
6. overall research quality of the project
7. overall development quality of the project

Details on project types

A term group project should have both components of software development and research. You can have different weights on the two components, depending on the nature of the project. A project can be more software development oriented with minimum amount of research effort, more research oriented with minimum amount of software development effort, or anything in between. However, a project with only software development or a project with only research component (for example, a pure theory project) is not acceptable for this term group project.

For a software-development oriented project, you can either develop a new application or system, or you can extend an existing application or system. In the type of developing a new application or system, you will select and develop a software project. You can either identify a new application, or you can re-develop an existing software application from scratch. In the type of extending an existing software application or system, you will select an existing open-source software project, analyze the components and structure of the software project, and then make some meaningful extension of the project. In any case, you need to have a research component, in addition to the software development. The research component can be in various forms, for example, performance evaluation or comparison with existing software packages.

For a research-oriented project, you need to identify a research problem and work on it. It does not necessarily have to be a new research problem or a new solution to the problem. You can extend an existing research paper, or you can repeat the work in a research paper. However, it should also include a software development component, for example, writing code to evaluate the developed solution of the research problem.

- To be fair to all the students in the class, you cannot use a research project that you are working on with your academic advisor for this course. It must be a research project without input from your academic advisor.

You have great flexibility in choosing a specific topic for the group project; however, it must be related to the topics that we study in this course, namely, it must be related to concurrent, parallel, and networking systems and applications (or research related to them). A term project will be evaluated based on the usefulness, difficulty, and completeness of the project.

Projects that are NOT accepted for this term assignment:

- Projects applying machine learning, deep learning, or in general artificial intelligence to collected data traces are not accepted. If you are interested in ML/DL etc, we have other courses in the department on such topics.
- You may not want to develop a simple text-based messenger/chat like networking application. We will have an individual programming project on this topic. Of course, you can develop a messenger term project beyond the simple text-based chat, for example, adding voice communications etc. We did have groups in the past working on this type of projects.
- Please do not use a project that you have developed or you are developing for another course as the term project for this course. It violates the FSU Honor code.
- Again, please do not use a project you are working on with your academic advisor for this term project. It is unfair.
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Potential term project topics

As discussed above, you have great flexibility in choosing a topic or problem to work on for this term project. However, it must be within the scope of this course, that is, it has to be related to concurrent, parallel, and distributed programming. Put in another way, it should be related to systems programming, process and thread programming, or computer networks. In the following we provide some more information where you may look for a potential topic.

Some relevant international conferences where you can look for topics:

- ACM SIGCOMM
- USENIX NSDI
- IEEE INFOCOM
- USENIX Security
- ACM WWW (The Web Conference)
- ACM Internet Measurement conference (IMC)
- ACM CCS
- IEEE Security and Privacy

Some potential papers/pointers that you may explore:

You can search a paper when the corresponding link to download the paper is not given. Please note that, for some of those papers, you need to access from the FSU campus network, or log into the FSU library website and search there.

- Your Home is Insecure: Practical Attacks on Wireless Home Alarm Systems
- D. Jin, Z. Yu, P. Jiao, S. Pan, D. He, J. Wu, P. Yu, and W. Zhang, "A survey of community detection approaches: From statistical modeling to deep learning," IEEE Transactions on Knowledge and Data Engineering, 2021.
- V. A. Traag, L. Waltman, and N. J. Van Eck, "From Louvain to Leiden: guaranteeing well-connected communities," Scientific reports, vol. 9,no. 1, pp. 1–12, 2019.
- Detecting Attacks Against Robotic Vehicles: A Control Invariant Approach
- SAVIOR: Securing Autonomous Vehicles with Robust Physical Invariants

- A Friendly and Low-Cost Technique for Capturing Non-Cooperative Civilian Unmanned Aerial Vehicles
- [Techniques for detecting compromised IoT devices](#)
- [An Analytics Framework to Detect Compromised IoT Devices using Mobility Behavior](#)
- [Secure the Internet, one home at a time](#)
- Rethinking Home Network Security
- Privacy-Preserving Detection of IoT Devices Connected Behind a NAT in a Smart Home Setup
- IP-based IoT device detection
- Demystifying IoT security: an exhaustive survey on IoT vulnerabilities and a first empirical look on internet-scale IoT exploitations
- IoT security: Review, blockchain solutions, and open challenges
- Statistical detection of downloaders in Freenet
- Police plants own computers in Freenet, log IPs, makes arrest
- A Forensically Sound Method of Identifying Downloaders and Uploaders in Freenet
- BGP churn evolution: A perspective from the core, IEEE/ACM Transactions on Networking (Volume: 20, Issue: 2, April 2012)
- Towards a Rigorous Methodology for Measuring Adoption of RPKI Route Validation and Filtering
- A survey among network operators on BGP prefix hijacking
- Practical Experience: Methodologies for Measuring Route Origin Validation
- Are We There Yet? On RPKI's Deployment and Security.
- Detecting and Characterizing Lateral Phishing at Scale, 2019 Usenix security conference
- A comprehensive survey on internet outages
- Scanning the IPv6 internet: towards a comprehensive hitlist
- Measuring the variability of CAIDA internet traffic traces
- Understanding Evolution and Adoption of Top Level Domains and DNSSEC, 2019 IEEE International Symposium on Measurements & Networking (M&N)
- Inferring carrier-grade NAT deployment in the wild
- A Flow-Based Entropy Characterization of a NATed Network and Its Application on Intrusion Detection
- [A Practical Approach to Portscan Detection in Very High-Speed Links, 2011](#)
- [A Multi-resolution Port Scan Detection Technique for High-speed Networks.](#)
- Leveraging Internet background radiation for opportunistic network analysis, PhD dissertation, UC San Diego, 2016
- [DDoS Attacks in Cloud Computing: Issues, Taxonomy, and Future Directions](#)
- [DDoS attack protection in the era of cloud computing and software-defined networking](#)
- [Amplification Hell: Revisiting Network Protocols for DDoS Abuse.](#)
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Various helpful network pointers:

- Routeview: <http://www.routeviews.org/>
- RIPE Data Repository: <https://labs.ripe.net/datarepository>
- Anti-phishing working group: <https://apwg.org/>

- PhishTank: <https://www.phishtank.com/>
- CAIDA (center for applied Internet data analysis): <http://www.caida.org/home/>
- [DARPA Intrusion Detection Data Sets - MIT Lincoln Laboratory](#)
- [Where can I get the latest dataset for a network intrusion detection system?](#)
- [The ADFA Intrusion Detection Datasets](#)
- Quagga Routing Suite: <https://www.nongnu.org/quagga/>
- Snort: <http://www.snort.org/>
- Bro: <http://bro-ids.org/>
- Metasploit: <https://www.metasploit.com/>
- Wireshark: <https://www.wireshark.org/>
- Java SOCKS server: <http://jsocks.sourceforge.net/>
- OpenSSH: <http://www.openssh.org/>
- ClamAV: <http://www.clamav.net/lang/en/>
- ROS (robot operating system)
- Gazebo (robot simulation made easy)
- Contiki
- Ubuntu Core
- Android (not an IoT OS per se; but we allow it in this project)
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More information on extending an existing open-source project

In this type of projects, you need to select an existing open-source software system and analyze its components and structure so that others can better understand how a software system is implemented, to a degree that they can extend the system, and then you need to make meaningful extension of the project, for example, adding some additional functionalities. A good example is the Manual of the NS-3 network simulator, which explains the basic structure, the components, and how they are pieced together (the manual can be accessed at the following link: <http://www.nsnam.org/ns-3-14/documentation/>). If the system you choose is very large, you can focus on certain functionalities of the system. Some example open-source projects are listed below:

- Bladegps: [GitHub - osqzss/bladeGPS: Real-time GPS signal simulator for bladeRF](#)
- GNSS SDR: [GitHub - gnss-sdr/gnss-sdr: GNSS-SDR, an open-source software-defined GNSS receiver](#)
- GPS sdr sim: [GitHub - osqzss/gps-sdr-sim: Software-Defined GPS Signal Simulator](#)
- Ardupilot: <https://ardupilot.org/>
- Freenet: <https://freenetproject.org/index.html>
- Tor project: <https://www.torproject.org/>

Some example projects carried out by students in previous semesters

- Extending Tor
- Extending Snort
- Games using Unreal Engine
- Multiple party online games with GUI
- Network intrusion detection systems using machine learning

- Voice over IP (voice chat)
- Version control system (allowing multiple users to edit a file or calendar)
- Studies and analyses of social network data such as Facebook and Twitter to investigate a specific problem, such as US presidential election.
- A comparison of server-side programming models for web development, for example, Node.js vs PHP
- An investigation of (concurrent/parallel) programming models of Android
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