COMP 5900K for Winter 2022
Software Ecosystems

Carleton University

Course information

Instructor: Dr. Rabe Abdalkareem

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Lectures: Monday 8:30 – 11:30 AM (see the Zoom link in Brightspace)

Office hour: Tuesday 9:30 – 11:30 AM (see the Zoom link in Brightspace).
- Please drop me a brief email ahead to schedule an appointment.
- If the office hour does not work for you, send me an email to schedule another appointment.
- Please mention the course number in the email subject line.

Course website: Available through Brightspace.

Brightspace for University of Ottawa students: Please, fill out this form or contact grad studies.

Course description and objective:

The development of software systems has changed dramatically over time. Nowadays, software developers create entire systems by reusing existing source code, which is glued together with additional custom code to suit their specific needs. These platforms that contain a massive number of reusable source code components are referred to as software ecosystems. A good example of a software ecosystem is the node package manager platform (npm) that contains over a million reusable packages. Researchers have found that code reuse provides developers with rapid and easy-to-use code that results in reduced development time and cost, along with increased productivity. However, reusing code from software ecosystems brings with it many challenges such as quality issues, maintenance issues, and even legal and security issues.

The main objective of this seminar course is to introduce students to the field of software ecosystems, including extensive mining of software ecosystems' data, software reuse, the evolution of software ecosystems, and software dependencies management. At the end of the course, students will have acquired the ability to extract data from software ecosystems' repositories and perform quantitative and qualitative analyses. In addition, students are expected to study, present, discuss, and critique research papers in the current literature. Finally, students are expected to complete a research project.

Topics:

A tentative list of the topics covered in this course is given below.

- Evolution and maintenance of software ecosystems
- Software reuse
- Dependencies management
- Software ecosystem bugs

- Human aspects of software ecosystems
- Non-traditional ecosystems

Please notice that a tentative week-to-week schedule is available through Brightspace. Students should check this tentative schedule and follow the class plan for any changes.

Prerequisites:

There are no official prerequisites. However, students should have a background in software engineering and have good programming experience in one or more of the commonly used programming languages (e.g., Python, Java, or JavaScript).

Recommended readings

No textbook is needed. Reading references (e.g., papers and journals) will be provided. The course reading references include a selection of research papers from software ecosystems literature. Students may need to log into the university library to access these papers. More information on how to login to the university library can be found here.

Course evaluation:

1.	**Participation in in-class discussions.**	**15%**
2.	**Paper critiques**	**15%**
3.	**Paper presentations**	**15%**
4.	**Research proposal and project**	**55%**

1. Participation in in-class discussions (15%)

Students are expected to attend all classes. In every class, students will have discussions based on the presented papers. Students are expected to: 1) read all the papers covered each week; and 2) participate and make meaningful contributions to these discussions. As a discussant, the student should try to point out the weaknesses and limitations of the presented paper.

2. Paper critiques (15%)

Starting week 2, each paper from the list of papers selected for this course offering will be assigned to 8 - 9 students, depending on the number of students. First, one student will present the paper (see Paper Presentations below). Then, in the week that the paper is presented, the other students in that group will submit a critique for that paper by Sunday (before Monday) at 5 PM. The critique should include a summary of the paper, at least three strong points of the paper, and at least three weaknesses of the paper (i.e., the critique will be marked based on these requirements). It is important to note that those students who critiqued the paper will lead the discussion of the paper and highlight some controversial points in the paper (e.g., limitations in its methodology and evaluation). Note that the number of paper critiques that the students need to submit in the entire course depends on the number of registered students.

3. Paper presentations (15%)

During the course, each student will **present 1-2 papers**, depending on the number of students. Each paper will be assigned to one student who will present it. The presentation will last 25-30 minutes, and the discussion will last 25-30 minutes. The student should upload the slides to Brightspace by Sunday (before Monday) at 8:00 PM. The student who will present the paper should not simply repeat the paper's content. Instead, the student should first briefly explain the data and the analysis technique used in the paper. Second, the student should first point out the main essential findings of the work. Third, the student should highlight any novel contributions, surprises, and other possible implications of the proposed techniques. Forth, the student should place the work relative to other papers covered in that week. Finally, the student should state at least three strengths of the paper and at least three weaknesses to spark the discussion. More information on the presentation content will be provided in the first class.

It is important to note that some students will need to present an additional paper. Those students will be graded on all the presentations, where only the best grades will count towards the final grade calculation.

4. Research proposal and project (55%)

A large portion of the course deliverables is a course research project. Students are expected to work on a course project that will be done individually or in a group of two students. For this project, students are expected to write a research paper by the end of the semester. The topic is to be determined with the instructor. Examples include a new contribution on a specific related topic, a survey paper of a related topic (typically involves surveying 50 – 60 papers), or a replication of one of the papers covered in the course or similar papers. The 55% project grade breaks down as follows:

- **5% project proposal** explaining your project goals and plans (max 2 pages plus one page for references). The proposal should provide a brief motivation of the problem, the research questions, a detailed discussion of the data that will be used, a timeline of project milestones, and the expected outcome. The project proposal should be submitted by the end of week 4.

- **5% proposal presentation.** Each project proposal will be presented and discussed in class in week 6.

- **5% project progress**. A project progress presentation will be held in week 11. In addition, students are required to submit an updated version of the project proposal that contains a related work section. The related work section should include summaries of at least ten scholarly articles related to the project topic.

- **10% project presentation.** Each project will be presented and discussed in class around weeks 13 - 14. The slides should be submitted with the report; the instructor will mark them.

- **3% originality** to be assessed by the instructor to reward students who deliver interesting projects.

- **25% project report** describing the project data, methods and discussing the results and the limitation of the project (~10 pages). The final submission is expected to be of publishable quality. The project report will argue for the importance of the project, situate the project with respect to the related work, describe the design and results of the analysis, and discuss the broader implications of the results.

- **2% code and data** to be submitted with the report; the instructor will inspect these files. The final project report and code should be submitted by the end of week 14.

All project-related documents (i.e., project proposal and project report) should use the IEEE conference publication format. If the paper is deemed publishable, the instructor will work with the students to make appropriate changes to the final report and submit the paper for publication.

Important Considerations

- There is no a priori fixed relationship between your total percentage scored and the final letter grade assigned.
- No late submissions are accepted for critiques, paper presentations, or project deliverables.
- Students are not permitted to post, share, or upload course materials without explicit permission from the instructor.
- In the event of extraordinary circumstances beyond the University's control, the content, delivery plan (i.e., blended), and evaluation scheme in this course are subject to change.

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see Carleton's Academic Calendar.

Pregnancy Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit Equity Services.

Religious Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit Equity Services.

Academic Accommodations for Students with Disabilities If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton Centre website.

Survivors of Sexual Violence. As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence

Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities. Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the policy.

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of *F* in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found here.

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science. Standard penalty guidelines can be found here.

Unauthorized Co-operation or Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.