Term Project

Objective

The goal of this project is to expose you to some of the applications of supply chain management in literature and practice. You will select a journal paper of interest to your group, explain the approach, and replicate the experiment on your own. You will be required to conduct a robust and comprehensive analysis and communicate your findings and insights using a written report and an oral presentation.

Process

Choosing a team: Choose a team to work on (2-4 people), ideally select members who share in a common area of interest in supply chain management. This could include members from your capstone design project. Topics can be found in the course outline calendar and/or in your course notes.

Choosing a model: There are many academic journals which publish peer-reviewed papers on optimization with applications in supply chain management. You are free to explore any journal and find a model to work with. In particular, the journal Interfaces is a publication by INFORMS, and is generally dedicated to application of OR in different fields (as opposed to more theoretical articles which usually appear in the journals *Operations Research*, *Manufacturing and Service Operations Management (MSOM)*, etc.).

Some journals that may be applicable include (but are not limited to):

- International Journal of Production Economics
- European Journal of Operational Research
- Omega
- Computers & Operations Research
- Transportation Research Part D

To access Interfaces, you need to be on the campus network. Go to https://pubsonline.informs.org/journal/inte and explore the current and previous issues.

Alternatively, you can use Web of Science database through the library website. Go to http://www.lib.uwaterloo.ca/ and click on Find and Use Resources > Research and Journal Databases. Then, search for Web of Science. In the new window, use the terms you like to search for, and limit the search to the journal Interfaces.

If you need help finding a paper, please contact our assigned librarian Rachel Figueiredo (http://subjectguides.uwaterloo.ca/mansci?hs=a).

Applications can range from location, inventory, routing, or any combinations of them. You can pick any industry or field. There will be papers that discuss statistical or other quantitative approaches. We are **only interested in optimization models** (of the form: Max/Min – subject to).

If it is applicable, you may consult your design project supervisor and agree on a paper that is related to your project.

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Here are some suggestions when choosing a paper:

- The paper includes concepts that are academically within reach of the team members.
- Does not include too many new mathematical concepts (e.g. stick to linear formulations).
- Uses processes/formulations you and your team feel could be easily executed in a months' time.
- Includes test data (real or author created). This may be in the form of how the author randomly generated model parameters.

Note: Papers that fit this list will likely be a case study, applying a simpler model to a real or "realistic" test case.

Claim your paper: Once you have selected your paper, post your group and the paper's citation on LEARN in the Project Discussion forum. Use the following format:

Group members: Member Aye, Member Bee, Member Cee Paper: Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Journal, volume number* (issue number), pages. https://doi.org/xx.xxx/yyyy

This will secure your groups rights to use this paper.

Write and submit a proposal: A proposal will be submitted explaining which paper has been chosen for study and why the paper was chosen. If the paper includes more than one mathematical formulation, be clear in your proposal which formulation your team will implement. In your proposal, be sure to include the following:

- What are the outcomes of this paper?
- What will you be learning?
- What do you need to learn for effective implementation? Where will you find this information?
- What languages and solvers will be used to implement and solve the model?
- How will the model parameters be generated?

Execute project and write a report: Summarize the selected model and use examples, figures, diagrams, etc. to explain its assumptions and limitations. Then, apply the model using a programming language (e.g., Python) and an optimization software (e.g., Gurobi). Use information given in the paper to access the datasets used in the original application (if available), or to generate random instances based on the assumptions made in the paper.

For many optimization models, finding an initial basic solution can be challenging. Solvers generally progress by finding an initial solution, and updating it until optimality is reached, if any. Therefore, commercial optimization solvers take 'initial solution' as input from the user with the hope it will reduce the time needed to find optimality. Provide a method to generate an initial basic solution and feed it to the model. Compare the solution time with that found without initial solutions.

Finally, suggest and implement a small extension to the model (you don't need to check if it was implemented in later papers or not). Explain how the extended model is different than the original and compare the solution times of both models.

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Prepare presentation: Each presentation will include a PowerPoint (PDF) presentation and will be 5 minutes in length, followed by 2-3 minutes of questions by your instructor, teaching assistants, and classmates. You will be expected to stay and observe presentations by classmates made during the class period your presentation is assigned. In the presentation you will need to effectively provide an overview of your project, such that a person unfamiliar with your report can understand your findings. Any number of team members can present the work; however, all members will be expected to be able to answer any question about the report. The entire team will receive the same mark for the presentation regardless of who is presenting.

Deliverables

1. Team formation: Due Friday, June 14, 2019 at 11:59 PM. Sign up for your team on LEARN. Use the team number from LEARN in all future correspondence and submission. Claim paper on LEARN as soon as you have selected it.
    - Note: if you do not select a team by the deadline above, you will be randomly assigned to a team.
2. Proposal: Due Wednesday, June 19, 2019 at 11:59 PM. Submit your project proposal **and chosen journal paper** in PDF format on Crowdmark. Only one member of the team is required to submit (same as assignments). *Submission:* 1-2 pages – follow formatting guidelines below.
    - Note: if you do not select a paper by the deadline above, you will be randomly assigned to paper.
3. Written report: Due Monday, 22nd-July-2018 at 12:00PM (noon). Submit your project report in PDF format on Crowdmark. Submit any relevant code to LEARN. Only one member of the team is required to submit (same as assignments). *Submission:* 25 pages maximum (including appendices, etc.) – follow formatting guidelines below.
4. Presentation: Due Monday, 22nd-July-2018 at 12:00PM (noon). Submit your presentation in PDF format on LEARN. Only one member of the team is required to submit. See below for more details.
5. Delivering presentation: July 25, 2019, July 30, 2019, and, possibly, July 29, 2019 in class. Presentation dates will be assigned no later than July 10, 2019.

To receive full marks, each deliverable will be expected to illustrate clear explanations of the chosen topic and paper. Information taken from sources should illustrate comprehensive analysis and viewpoints of the authors are to be questioned thoughtfully. All assumptions made by you or the author should be explained fully to support the presented position(s) including the rational behind them. Mathematical equations and nomenclature should be fully explained making use of visual aids when necessary. If background information (e.g. from supporting literature) is necessary to clearly communicate a concept, be sure to include it. Calculations made are clear to the reader and presented well and concisely. Conclusions made should reflect your informed evaluation of the work and should provide evidence to support your perspective. Be sure to present how the selected paper relates to real applications to further support your findings. Any visual aids should be included only to clarity and support statements made.

Grading distribution

The total weight for the entire project is 30% of the total grade of this course. The marks will be broken down as follows:

Proposal	5%
Written Report	
• Understanding and analyzing the problem	5%
• Choice of tools, models, and methods	5%
• Depth and breadth of analysis. Validity and comprehensiveness of conclusions	5%
• Formatting, references/citations, and language	5%
Presentation	5%
Total (of final grade in course)	30%

Additional Information

Attendance at Presentations

On the presentation date assigned to your team, you are expected to attend the entire time slot. You are to be an active participant and are encouraged to ask questions.

Formatting

All written deliverables will be submitted as tightly written, professional reports, 12-point font, double-spaced, one-inch margins all around. Your submissions should look and feel professional, with clear language and efficient use of visual tools.

Plagiarism will be approached with a ZERO TOLERANCE policy. If you do not use in-line citations when necessary, you will be penalized accordingly.

The Writing Centre at the University of Waterloo provides a host of resources to help you in your writing process. The workshops, online resources, and one-to-one meetings are designed to improve your writing skills and enhance your final product. Visit https://uwaterloo.ca/writing-and-communication-centre/.

Submission

Submission will be on Crowdmark (written documents) and LEARN. No late submission is allowed. The proposal, report, and the presentation should be submitted in PDF format. Other files (Excel sheets, code files, etc.) can be submitted on LEARN as well. When submitting Excel sheets, code files, etc., make sure the files are annotated and comments are added to make them easier to read and follow. Explicitly state your assumptions and logic. Explain your work such that a person with no familiarity with the problem can follow and reproduce your work. **This is important should you wish to receive full marks.**

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Use the following naming scheme for all files submitted on Learn. Use the team number assigned to you. The following examples are for Team 3:

Proposal:	MSCI434_S19_Team3_Proposal.pdf
Report:	MSCI434_S19_Team3_Report.pdf
Presentation:	MSCI434_S19_Team3_Presentation.pdf
Python Code:	MSCI434_S19_Team3_SupplyChainNetworkDesign.py
… etc.	

Responsible TA

Aliaa (aliaa.alnaggar@uwaterloo.ca) will be responsible for this project. Please contact her first for any questions and concerns regarding the project.