CSCI 6514: Strategies for Search and Optimization
Course Syllabus

Instructor Information

Instructor: Dr. Dirk Arnold
Office: CS 314
E-mail: dirk@cs.dal.ca
Office Hours: Thursdays, 13:00-14:00
Class Meeting Time: Wednesdays and Fridays, 13:05-14:25
Room: LSC C234
Course Homepage: https://web.cs.dal.ca/~dirk/6514

Important Dates

1. Reading week (no classes): November 6–10
2. In-class test: either November 29 or December 1
3. Last day to withdraw without a “W”: October 2
4. Last day to withdraw with a “W”: October 31
5. Assignment deadlines: TBA

Course Description

This class provides a broad overview of strategies for tackling difficult optimization problems that occur in computer science, in the engineering sciences, and beyond. It covers “classical” approaches such as conjugate gradient strategies and branch-and-bound as well as more recent, nature-inspired strategies including evolutionary algorithms and simulated annealing.

Learning Outcomes

- Acquire a broad overview of strategies for search and optimization.
- Understand difficulties encountered in optimization.
- Implement algorithms for unconstrained and constrained numerical optimization.
- Benchmark and compare optimization algorithms.
- Understand the basics of convergence analysis of stochastic direct search algorithms applied to simple problems.
- Gather experience in report writing, interpreting data, and Matlab programming.

Class Format and Course Communication

- Content will be delivered using lectures.
- Course announcements will be posted on Brightspace. It is the student’s responsibility to check Brightspace on a daily basis.
Evaluation Criteria

1. Assignments (75%)
   - Three assignments, each worth 25%
   - Late assignments will not be accepted.
   - Assignments may require programming in Matlab and writing reports in \LaTeX.
   - No collaboration is permitted on the assignments.

2. Test (25%)
   - To be held during class.
   - Will cover all material in the course.

Notes

- All grades will be given on a scale from 0.0 to 4.3.
- The grade for the course will be the weighted average of the grades for the assignments and test, with the weights as determined above, rounded to the closest grade point value corresponding a letter grade as specified in Section 7.6.2 of the Graduate Calendar. Exception: a weighted average below 2.5 rounds down to 0.0.

Tentative List of Topics

- background and terminology
- linear programming
- integer linear programming
- deterministic direct search
- stochastic direct search: algorithms and analysis
- constrained optimization
- information-geometric optimization
- Bayesian optimization

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (http://its.dal.ca/policies/) and the Faculty of Computer Science Responsible Computing Policy. (https://www.cs.dal.ca/downloads/fcs_policy_local.pdf)

Culture of Respect

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.
What we all need to do:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like “Why did you say that?” or “How did you develop that belief?”

2. **Identify the Behaviour:** Use reflective listening and avoid labelling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, “The comment you just made sounded racist, is that what you intended?” is a better approach than “You’re a racist if you make comments like that.”

3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, “I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that.”

4. **Set Limits:** You cannot control another person’s actions, but you can control what happens in your space. Do not be afraid to ask someone “Please do not tell racist jokes in my presence anymore” or state “This classroom is not a place where I allow homophobia to occur.” After you have set that expectation, make sure you consistently maintain it.

5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.

6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate. [Link](https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=70)

**Academic Integrity**

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. [Link](http://www.dal.ca/dept/university_secretariat/academic-integrity.html)

**Accessibility**

The Advising and Access Services Centre is Dalhousie’s centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD). [Link](http://www.dal.ca/campus_life/student_services/accessibility.html)

**Student Code of Conduct**

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don’t follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner perhaps through a restorative justice process. If an informal resolution can’t be reached, or would be inappropriate, procedures exist for formal dispute resolution. [Link](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html)

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1Source: Speak Up! ©2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full “Speak Up” document found at [Link](http://www.dal.ca/dept/dalrespect.html) Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University 902.494.4140 lyndsay.anderson@dal.ca www.dal.ca/think.
Diversity and Inclusion — Culture of Respect
Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory
Dalhousie University would like to acknowledge that the University is on Traditional Mi’kmaw Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

Learning and Support Resources
Dalhousie University Library http://libraries.dal.ca