

# ECE 524 Data Exploration and Evolutionary Computing

The University policy about course outlines can be found in Section 23.4(2) of the University Calendar (<http://www.registrar.ualberta.ca/calendar/Regulations-and-Information/Academic-Regulation/23.4.html>).

About the instructor	
Name:	Petr Musilek
Office location:	ECERF W6-033 (6 <sup>th</sup> floor access: 8:30-12:00, 13:00-16:30)
Office hours:	M 13:00-14:00, or individual consultation scheduled by e-mail
Email:	<a href="mailto:Petr.Musilek@ualberta.ca">Petr.Musilek@ualberta.ca</a> (please put ECE524 in the subject line)
Website:	Linked from <a href="http://www.ece.ualberta.ca/~musilek">http://www.ece.ualberta.ca/~musilek</a> (more details provided below)

Course days, times, and locations	
Lectures:	ECE 720 LEC B2, TH 14:00-15:20, ECE W6-087 (reg. code 68325)
Last lecture:	TBD
Midterm exam:	TBD
Final exam:	TBD
No classes:	TBD

## Calendar Description

Learning, adaptation, self-organization and evolution. Data preprocessing, feature selection and generation. Exploratory data analysis. Optimization methods, genetic algorithms, evolutionary programming, evolution strategies, genetic programming. Alternative paradigms, artificial immune systems, swarm intelligence. Applications

## Textbook and references

TBD

## Topics Covered in this Course

1. Introduction (1 week approx.) Learning and Adaptation, Self-organization and Evolution, Pattern Recognition, Design Cycle
2. Feature Selection (1 week approx.) Preprocessing, Testing statistical hypotheses, Class separability measures, Feature subset selection, Optimal feature generation
3. Feature Generation (2 weeks approx.) Principal and Independent Component Analysis, Transforms, Regional Futures, Shape and Size Characterization, Time Sequences, Spatial Data
4. Exploratory Data Analysis (1 week approx.) Topographic Mapping, Clustering, Data Visualization
5. Optimization (1 week approx.) Optimization and Minimum-seeking Algorithms, Natural Optimization Methods
6. Genetic Algorithms (2 weeks approx.) History and Overview of Evolutionary Computation, Genetic Algorithms, Operations, Population models, Selection Strategies, Advanced Techniques
7. Other Evolutionary Algorithms (2 weeks approx.) Evolutionary Programming, Evolution Strategies, Genetic Programming, Selecting Parameters for Evolutionary Computing Algorithms
8. Alternative Paradigms (1 week approx.) Learning Classifier Systems, Differential and Cultural Evolution, Coevolution, Artificial Immune Systems, Swarm Intelligence
9. Applications of Evolutionary Computing (1 week approx.) Basic Applications, Multiple Objective Optimization, Permutation Problems, Planning, Design

## Relationship to Other Courses

TBD

## Course Website

Website for ECE524 is provided by the University of Alberta moodle site.

This live website contains plan of lectures as well as important course material (handouts, assignments, extras) that will be updated as the term progresses. Marks obtained for individual assignments and exams will be also posted at the website. In addition, the website should serve as a forum for students to discuss course related topics and to ask question. The site will be monitored daily during week days.

## Evaluation Scheme:

TBD

## Grading

As of September 2003, the University of Alberta uses a (4-point) letter-grading scheme. Grades are assigned under this system and are guided by the Faculty of Engineering's suggested distribution, which is subject to modification from time to time. The Faculty's suggested GPA range for 500-level courses is 3.2 with a median grade of B+.

## Plagiarism

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour at

[http://www.uofaweb.ualberta.ca/GFCPOLICYMANUAL/content.cfm?ID\\_page=37633](http://www.uofaweb.ualberta.ca/GFCPOLICYMANUAL/content.cfm?ID_page=37633)

and avoid any behaviour, which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

## Lecture Recording

Recording is permitted only with the prior written consent of the professor or if recording is part of an approved accommodation plan.