SYDE 372 - Introduction to Pattern Recognition - University of Waterloo
Course Outline (Winter 2019)

COURSE OVERVIEW

The course emphasizes pattern recognition as a process of data analysis and focuses on topics of pattern features as components in a random vector representation, classification techniques: distance measures in feature space, probabilistic (Bayesian) decision theory, linear discriminants, clustering and feature extraction, and deep learning.

INTENDED LEARNING OUTCOMES
Upon completion of this course, students should be able to:
1) Understand the principles of fundamental pattern recognition concepts such as classification, feature extraction and selection, deep learning, etc.
2) Apply learnt algorithms in practical laboratory exercises using Matlab.
3) Understand the usefulness of the learnt concepts in applications of pattern recognition such as optical character recognition, speech recognition, industrial robot vision, medical diagnosis, remote sensing and satellite image analysis, fault detection and diagnosis in complex systems such as nuclear reactors.

CEAB GRADUATE ATTRIBUTES
Successfully completing this course will contribute to students' developing the following:

Graduate Attribute	Learning Outcome	Assessment
1. Knowledge Base	1,3	Exams
2. Problem Analysis	2,3	Labs 1-4, Exams
3. Investigation		
4. Design		
5. Engineering Tools	2,	Labs 1-4
6. Individual & Teamwork		
7. Communication		
8. Professionalism		
9. Engineering Society and Environment		
10. Ethics & Equity		
11. Economics & Project Management		
12. Life-Long Learning		

COURSE TOPICS

1. Introduction, Pattern Recognition Problem Definition
2. Overview of Statistics and Random Vectors
3. Parametric and Nonparametric Distance-Based Classification
4. Probabilistic Methods for Classification
5. Parametric and Nonparametric Density Estimation
6. Discriminant Functions
7. Parametric and Nonparametric Clustering
8. Feature Extraction, Feature Selection
9. Deep Learning

MEETING TIMES & INSTRUCTIONAL METHODS

Lectures:
Tuesday   11:30 am – 1:20 pm – **E5 6006**
Friday   11:30 am – 12:20 pm – **E5 6006**

Tutorial (Lab/Tutorial):
Friday   12:30 pm - 1:20 pm – **E5 6006**

REQUIRED MATERIALS

M. Jernigan and P. Fieguth, Pattern Recognition in a Nutshell, Available in SCH bookstore.

Course and Supplemental Materials will be posted on course website
http://www.eng.uwaterloo.ca/~a28wong/syde372.html

INSTRUCTIONAL STAFF
Instructors:
Prof. Alexander Wong, PhD, PEng
Associate Professor, Biomedical Engineering Program, Systems Design Engineering

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Feel free to speak with us before/after class or during breaks. We will be available for more in-depth questions and discussions during our office hours. Always feel free to approach us or the TAs and seek out extra help, that's what we're here for.

Teaching Assistants:
Mingzhe Jiang– m63jiang@uwaterloo.ca
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Overall Grading Breakdown*:
25%   Computer labs
25%   Midterm Exam
50%   Final Exam

* Some assessment components will be summative and some will be formative. More details regarding the type of grading used will be provided with each assignment.
* Components may be eliminated and additional assessment components may be added at the instructor's discretion (i.e. this is not necessarily the final/complete list of deliverables).

Homework Problems
Homework problems will be assigned from time to time but will not be graded. Solutions to homework problems will be presented during tutorials.

Computer Labs
Three short computer labs will be assigned during the term.   The emphasis of these labs will be to provide insights into pattern recognition algorithms, complementing the more analytical material discussed in class. The labs will be undertaken in groups of two or three students.   25% of the course grade will be based upon the submitted lab report. Labs will be submitted via e-mail to the TAs by midnight of the due date. Late labs will have 25% of the lab mark deducted for each day or part of a day that the lab is late.

Midterm Exam
The Midterm Exam will be worth 25% of your final grade in the course. More details to follow.

Final Exam
The Final Exam will be worth 50% of your final grade in the course. The Final Exam will be held during the official University of Waterloo exam period. More details to follow.

FACULTY OF ENGINEERING – MORE FINE PRINT

https://uwaterloo.ca/engineering/current-undergraduate-students/academic-support

Academic Integrity:

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.

Check www.uwaterloo.ca/academicintegrity/ for more information.

Discipline:
A student is expected to know what constitutes academic integrity (see link above) to avoid committing an academic offence, and to take responsibility for their actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g. plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline: www.adm.uwaterloo.ca/infosec/Policies/policy71.htm .

For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Grievance:
A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy70, Student Petitions and Grievances, Section 4:

www.adm.uwaterloo.ca/infosec/Policies/policy70.htm.

When in doubt please be certain to contact the department's administration who will provide further assistance.

Appeals:
A decision made or penalty imposed under Policy 70 (Student Petitions and Grievance (other than a petition)) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72 (Student Appeals): www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities:
AccessAbility Services, located in Needles Hall Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require accommodation to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.