QUEEN'S UNIVERSITY
ELEC 823 Signal Processing (Winter'21)

Instructor: Geoffrey Chan, chan@queensu.ca.

Lecture: Fri 1:00-4:00 p.m., attendance in person (no streaming) in WLH 210 every Friday for 11 weeks from Jan 29 to Apr 9 (no break). Project presentations will be held on April 23. Enrolment cannot exceed the room capacity limit for Covid-19; first priority is given to non-auditors. Auditors must have the instructor's permission to register in the course and attend classes. Attendees must wear masks and maintain physical distancing at all times.

Prerequisites: Proficiency in the materials of Probability and Random Processes (comparable to ELEC 326 or ELEC 861) and Digital Signal Processing (comparable to ELEC 421) is assumed.

Grading: Homework (30%), project (40%), exam (30%).

Course Outline: This course covers selected topics in statistical signal processing and machine learning. The methods studied have numerous areas of applications, e.g., analysis, enhancement, and understanding of information bearing signals such as speech, biomedical, and communications signals. The lectures are roughly divided into two parts, with the first covering spectral modeling and adaptive filtering, and the second covering machine learning.

At its core, DSP is about designing algorithms which can be mapped to software and/or hardware for implementation. The course project enables you to practice algorithm design. A list of suggested projects will be distributed mid-term. The project work has three components: computer simulation, oral presentation, and a written report. Programming is done using a language of your choice.

Lecture Topics (may be adjusted)	**Weeks**
Random processes & spectral modeling; linear prediction	2
Wiener & LMS adaptive filters	2
Bayesian inference & decision theory	2
Linear models & support vector machines	2
Neural networks	1
Hidden Markov models	2
Project presentations	1

References

1. Proakis & Manolakis, "Digital Signal Processing," 4th ed., Prentice Hall, 2007.
2. Haykin, "Adaptive Filter Theory," 4th ed., Prentice Hall, 2002.
3. Bishop, "Pattern Recognition and Machine Learning," Springer, 2006.
4. Goodfellow, Bengio, & Courville, "Deep Learning," MIT Press, 2016.
5. Hastie, Tibshirani, & Friedman, "The Elements of Statistical Learning," 2nd ed., 2009. [FREE]
6. Rasmussen & Williams, "Gaussian Processes for Machine Larning," 2006. [FREE]
7. Duda, Hart, & Stork, "Pattern Classification," 2nd ed., Wiley, 2001.
8. Huang, Acero, & Hon, "Spoken Language Processing," Prentice Hall, 2001.
9. Rabiner & Juang, "Fundamentals of Speech Recognition," Prentice Hall, 1993.
10. Gray & Davisson, "An Introduction to Statistical Signal Processing," 2004. [FREE]
11. Stark & Woods, "Probability and Random Processes with Applications to Signal Processing," 3rd ed., Prentice Hall, 2001.