EEE 6504 MACHINE LEARNING FOR TIME SERIES
SPRING 2020

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TextBook: *Knowledge Discovery from Data Streams, Joao Gama, CRC Press, 2010, ISBN 978-1-4398-2611-9*

References:

Adaptive Signal Processing, Widrow and Stearns, Prentice Hall,
Fundamentals of Adaptive Filtering, Ali Sayed, Wiley, 2003
Kernel Adaptive Filtering, Liu, Principe and Haykin, Wiley 2010
Information Theoretic Learning, Principe, Springer 2010

Course Goals:

The goal is to present the theory of on-line learning and cover several engineering applications in filtering and classification under stationary / nonstationary conditions including concept drift. The major topics will be the concept of on-line adaptation, change detection, novelty detection, and how to include them both in time series models and also clustering and classification. Both the LMS and RLS will be covered in detail for model building as well as decision trees. These concepts will be extended to functional spaces, specifically, reproducing kernel Hilbert Spaces (RKHS). Information theoretic measures will also be covered.

Topics with Approximate Schedule:

Week 1: Review of stochastic processes and adaptation as function approximation.
Week 2: The linear model in functional spaces: Wiener theory
Week 3: Least Squares and iterative algorithms **HMW 1**
Week 4: LMS and RLS Algorithms and quantification of the solution
Week 5: ARMA model adaption **HMW 2**
Week 6: Hilbert Spaces and RKHS
Week 7: Algorithms for Linear Functional models **Project 1**
Week 8: Kernel ARMA **HMW 3**
Week 9: Information Theoretic Loss Functions
Week 10: Correntropy
Week 11: Entropy and Divergences **HMW 4**
Week 12: Change Detection in streaming data
Week 13: Clustering for data streams
Week 14: Decision trees for Data Streams **Project 2**
Week 15: Concept Drift **HMW 5**
Week 16: Novelty Detection

Grading:		
	Homework	33.3%
	Project I	33.3%
	Project II	33.3%

Computer Projects: Students will have the opportunity to apply the algorithms to real world data using Matlab/Python.