Online Mode, A-Slot   Aug-Nov 2021

EE 6110: Adaptive Signal Processing

Text Book: "*Adaptive Filter Theory*" S. Haykin, 4th Ed. (Pearson Education Low Price Edition, New Delhi, 2002.) Reference book list (and additional material) will be available on www.ee.iitm.ac.in/~giri/teaching

Part-1: Review of Estimation Theory and Stochastic Models
Chapter 0 -- Background and Preview pp.1 to 25: (self-study)
Chapter 1 –Elements of Estimation Theory*** + Stochastic Models
Chapter 3 – Auto-correlation, Linear Prediction, and Levinson-Durbin (pp. 136 to 180)

Part-2: Gradient Descent Techniques
Chapter 4 – Method of Steepest Descent
Chapter 5 – LMS Adaptive Filters
Chapter 6 – Normalised LMS Algorithm + other variants
EMSE (stationary case) of LMS and NLMS*
Tracking EMSE analysis of LMS and RLS algorithms*

Part-3: Least Squares and Kalman Filtering
Chapter 8 – Method of Least Squares
Chapter 9 – RLS Adaptive Filters, EMSE (Stationary case) of RLS*
Chapter 10 – Kalman Filter (recursive predictor form), and
Predictor-corrector form **

Part-4: Select Topics in Adaptive Filtering

(a) Topics on stabilization of RLS and KF filters (from Ch-11 and Ch-12)
(b) Topics from Ch-14 on Tracking of Time-varying systems
(c) Weighted Least Squares and IRLS Algorithms*
(d) Robust Estimation and Filtering*

* the topics carrying the asterik are from Ali Sayed's book
** the topics with double asterisk are from J.M.Mendel's book
*** this is from the book by Orfanides

Assessment Method:

End Sem for 40 marks will be open-book; 30 marks will be awarded based on several tutorial and computer assignments which are graded; 30 marks mini-project with oral presentation.

K. Giridhar: August 19, 2021