EN 520.665 Homework 2 Fall 2021

1. Consider a first order Gaussian Markov random field with a single coefficient. Derive the constraint on the coefficient so that the Markov random field is stable. Calculate the eigenvalues and eigenvector of the covariance matrix of the data obeying this MRF model assuming doubly-periodic boundary conditions.
2. Compare the computational complexity of Gibbs and Metropolis sampling algorithm for synthesizing an NxN texture image.
3. Calculate the number of parameters in AlexNet, VGGnet, ResNet and InceptionNet.
4. Show that if the transfer function of the hidden units is linear, a three-layer network is equivalent to a two-layer one. Explain why, therefore, that a three-layer network with linear hidden units cannot solve a non-linearly separable problem such as XOR or *n*-bit parity.
5. What problem(s) will result from using a learning rate that is too high? How would you detect these problems? What problem(s) will result from using a learning rate that is too low? How would you detect these problems?

Due 10/11/2021