West Virginia University

Lane Department of Computer Science and Electrical Engineering

CS 677 Pattern Recognition

Spring 2025

Assignment 1

Attempt all questions and show your steps and codes.

Question 1

Rework example 4 in Chapter 3 (Duda et al), and show all the detailed steps, and diagrams. Add comments to the steps to show your work.

Question 2

Consider the use of hidden Markov models for classifying sequences of four visible states, A-D. Train two hidden Markov models, each consisting of three hidden states (plus a null initial state and a null final state), fully connected, with the following data. Assume that each sequence starts with a null symbol and ends with an end null symbol (not listed).

Sample	ω_1	ω_2
1	AABBCCDD	DDCCBBAA
2	ABBCBBDD	DDABCBA
3	ACBCBCD	CDCDCBABA
4	AD	DDBBA
5	ACBCBABCDD	DADACBBAA
6	BABAADDD	CDDCCBA
7	BABCDCC	BDDBCAAAA
8	ABDBBCCDD	BBABBDDDCD
9	ABAAACDCCD	DDADDBCAA
10	ABD	DDCAAA

(a) Print out the full transition matrices for each of the models.
(b) Assume equal prior probabilities for the two models and classify each of the following sequences: ABBBCDDD, DADBCBAA, CDCBABA, and ADBBBCD.