UNIVERSITY OF TEXAS AT AUSTIN

Homework Assignment 7

Regression trees.

Please, provide your **complete solutions** to the following problems. Final answers only, even if correct will earn zero points for those problems.

Problem 7.1. (10 points) Solve Problem **8.4.1** from page 361 from the textbook.

Problem 7.2. (5 points) Draw an example of a partition in the plane that **cannot possibly** correspond to recursive binary splitting.

Problem 7.3. (10 points) Solve Problem **8.4.4** from page 362 from the textbook.

Problem 7.4. (10 points) *Source: An old SRM manual.*
Consider the following observations of (X, Y) with X being the predictor and Y being the response:

$$(0, 8), \quad (1, 5), \quad (3, 8), \quad (6, 6).$$

After one iteration of recursive binary splitting, there are two groups of observations. Find the members of the two groups.

Problem 7.5. (15 points) *Source: Sample MAS-II.*
A data set contains six observations for two predictor variables, X_1 and X_2, and a response variable Y. Here is the table of observations:

X_1	X_2	Y
1	0	1.2
2	1	2.1
3	2	1.5
4	1	3.0
2	2	2.0
1	1	1.6

The following five splits are analyzed:

I. $R_1(1,1) = \{X \mid X_1 < 1\}$ and $R_2(1,1) = \{X \mid X_1 \geq 1\}$
II. $R_1(1,4) = \{X \mid X_1 < 4\}$ and $R_2(1,4) = \{X \mid X_1 \geq 4\}$
III. $R_1(2,0) = \{X \mid X_2 < 0\}$ and $R_2(2,0) = \{X \mid X_2 \geq 0\}$
IV. $R_1(2,1) = \{X \mid X_2 < 1\}$ and $R_2(2,1) = \{X \mid X_2 \geq 1\}$
V. $R_1(2,2) = \{X \mid X_2 < 2\}$ and $R_2(2,1) = \{X \mid X_2 \geq 2\}$

Determine which split is chosen first.