ISOM3360 Assignment: ROC Curve

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Inst#	Class	Score	Inst#	Class	Score
1	**p**	.9	11	**p**	.4
2	**p**	.8	12	**n**	.39
3	**n**	.7	13	**p**	.38
4	**p**	.6	14	**n**	.37
5	**p**	.55	15	**n**	.36
6	**p**	.54	16	**n**	.35
7	**n**	.53	17	**p**	.34
8	**n**	.52	18	**n**	.33
9	**p**	.51	19	**p**	.30
10	**n**	.505	20	**n**	.1

1 Answer

By changing the decision threshold t, we can get different pairs of TPR/FPR.

$t \in (0.9, 1]$

		Predicted	
		p	n
Actual	p	0	10
	n	0	10

$$TPR = \frac{0}{0+10} = 0.0$$
$$FPR = \frac{0}{0+10} = 0.0$$

$t \in (0.8, 0.9]$

		Predicted p	Predicted n
Actual	p	1	9
	n	0	10

$$TPR = \frac{1}{1+9} = 0.1$$
$$FPR = \frac{0}{0+10} = 0.0$$

$t \in (0.7, 0.8]$

		Predicted p	Predicted n
Actual	p	2	8
	n	0	10

$$TPR = \frac{2}{2+8} = 0.2$$
$$FPR = \frac{0}{0+10} = 0.0$$

$t \in (0.6, 0.7]$

		Predicted p	Predicted n
Actual	p	2	8
	n	1	9

$$TPR = \frac{2}{2+8} = 0.2$$
$$FPR = \frac{1}{1+9} = 0.1$$

$t \in (0.55, 0.6]$

		Predicted p	Predicted n
Actual	p	3	7
	n	1	9

$$TPR = \frac{3}{3+7} = 0.3$$
$$FPR = \frac{1}{1+9} = 0.1$$

$t \in (0.54, 0.55]$

		Predicted p	Predicted n
Actual	p	4	6
	n	1	9

$$TPR = \frac{4}{4+6} = 0.4$$
$$FPR = \frac{1}{1+9} = 0.1$$

$t \in (0.53, 0.54]$

		Predicted p	Predicted n
Actual	p	5	5
	n	1	9

$$TPR = \frac{5}{5+5} = 0.5$$
$$FPR = \frac{1}{1+9} = 0.1$$

$t \in (0.52, 0.53]$

		Predicted p	Predicted n
Actual	p	5	5
	n	2	8

$$TPR = \frac{5}{5+5} = 0.5$$
$$FPR = \frac{2}{2+8} = 0.2$$

$t \in (0.51, 0.52]$

		Predicted p	Predicted n
Actual	p	5	5
	n	3	7

$$TPR = \frac{5}{5+5} = 0.5$$
$$FPR = \frac{3}{3+7} = 0.3$$

$t \in (0.505, 0.51]$

		Predicted p	Predicted n
Actual	p	6	4
	n	3	7

$$TPR = \frac{6}{6+4} = 0.6$$
$$FPR = \frac{3}{3+7} = 0.3$$

$t \in (0.4, 0.505]$

		Predicted p	Predicted n
Actual	p	6	4
	n	4	6

$$TPR = \frac{6}{6+4} = 0.6$$
$$FPR = \frac{4}{4+6} = 0.4$$

$t \in (0.39, 0.4]$

		Predicted p	Predicted n
Actual	p	7	3
	n	4	6

$$TPR = \frac{7}{7+3} = 0.7$$
$$FPR = \frac{4}{4+6} = 0.4$$

$t \in (0.38, 0.39]$

		Predicted p	Predicted n
Actual	p	7	3
	n	5	5

$$TPR = \frac{7}{7+3} = 0.7$$
$$FPR = \frac{5}{5+5} = 0.5$$

$t \in (0.37, 0.38]$

		Predicted p	Predicted n
Actual	p	8	2
	n	5	5

$$TPR = \frac{8}{8+2} = 0.8$$
$$FPR = \frac{5}{5+5} = 0.5$$

$t \in (0.36, 0.37]$

		Predicted p	Predicted n
Actual	p	8	2
	n	6	4

$$TPR = \frac{8}{8+2} = 0.8$$
$$FPR = \frac{6}{6+4} = 0.6$$

$t \in (0.35, 0.36]$

		Predicted p	Predicted n
Actual	p	8	2
	n	7	3

$$TPR = \frac{8}{8+2} = 0.8$$
$$FPR = \frac{7}{7+3} = 0.7$$

$t \in (0.34, 0.35]$

		Predicted p	Predicted n
Actual	p	8	2
	n	8	2

$$TPR = \frac{8}{8+2} = 0.8$$
$$FPR = \frac{8}{8+2} = 0.8$$

$t \in (0.33, 0.34]$

		Predicted p	Predicted n
Actual	p	9	1
	n	8	2

$$TPR = \frac{9}{9+1} = 0.9$$
$$FPR = \frac{8}{8+2} = 0.8$$

$t \in (0.30, 0.33]$

		Predicted p	Predicted n
Actual	p	9	1
	n	9	1

$$TPR = \frac{9}{9+1} = 0.9$$
$$FPR = \frac{9}{9+1} = 0.9$$

$t \in (0.1, 0.30]$

		Predicted	
		p	n
Actual	p	10	0
	n	9	1

$$TPR = \frac{10}{10+0} = 1.0$$
$$FPR = \frac{9}{9+1} = 0.9$$

$t \in [0.0, 0.1]$

		Predicted	
		p	n
Actual	p	10	0
	n	10	0

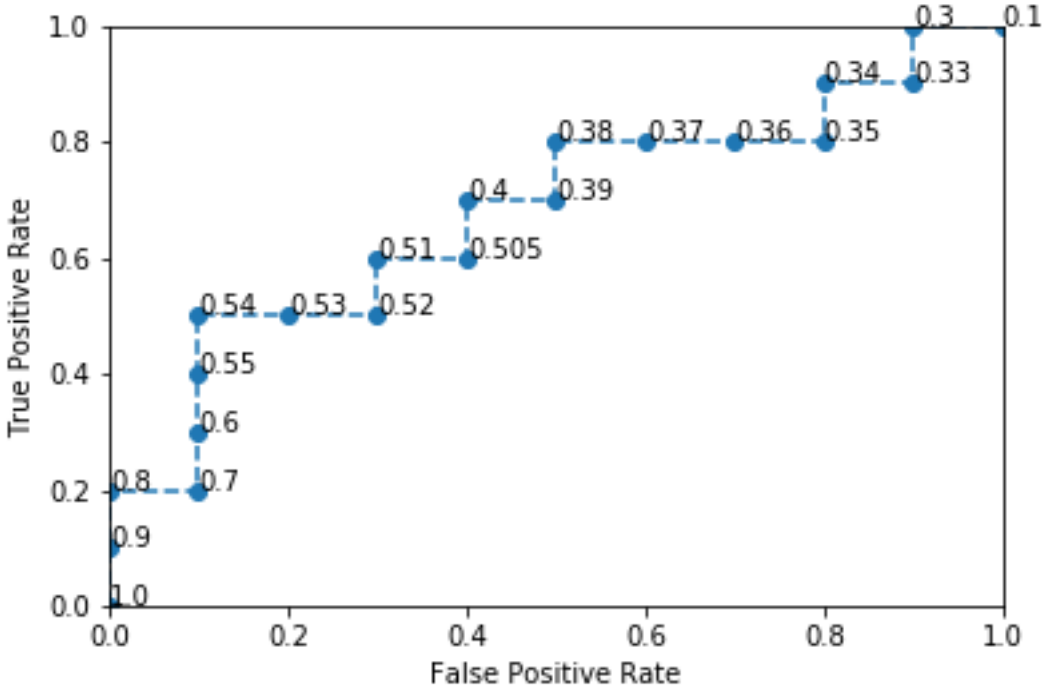
$$TPR = \frac{10}{10+0} = 1.0$$
$$FPR = \frac{10}{10+0} = 1.0$$

Therefore, we get the list of the all TPR/FPR pairs:

TPR	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.5	0.6
FPR	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.3

TPR	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0
FPR	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.8	0.9	0.9	1.0

Draw the ROC curve:


True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
0.3
0.1
0.34
0.33
0.38
0.37
0.36
0.35
0.4
0.39
0.51
0.505
0.54
0.53
0.52
0.55
0.6
0.8
0.7
0.9
1.0