1 Numerical Result

Table 1: Test for variable selection

Method	CFR (%)	CFR2 (%)	OFR (%)	AN	CFR (%)	CFR2 (%)	OFR (%)	AN
		Case A				**Case B**		
PAWLS-AIC	0	0	80	87.6	0	0	100	97.2
PAWLS-BIC	60	100	40	10.4	100	100	0	10
APAWLS-AIC	80	100	20	10.2	80	80	0	8.2
APAWLS-BIC	80	100	20	10.2	80	80	0	8.2
		Case C				**Case D**		
PAWLS-AIC	0	0	60	79	0	0	80	86
PAWLS-BIC	80	80	0	10	60	60	20	10.6
APAWLS-AIC	100	100	0	10	100	100	0	10
APAWLS-BIC	100	100	0	10	100	100	0	10
		Case E						
PAWLS-AIC	0	0	40	76.4				
PAWLS-BIC	20	40	20	13.8				
APAWLS-AIC	20	20	0	7.4				
APAWLS-BIC	20	20	0	8				

Table 2: Test for outlier detection

		AIC			BIC		
	Model	M (%)	S (%)	JD(%)	M (%)	S (%)	JD(%)
PAWLS	Case A	0	0.1	1	0	0	1
	Case B	0	0	1	0	0.01	1
	Case C	0.08	0.1	0.6	0	0	1
	Case D	0.1	0.03	0.4	0.16	0	0.8
	Case E	0.46	0.18	0	0.44	0.01	0
APAWLS	Case A	0	0	1	0	0	1
	Case B	0	0.15	1	0	0.15	1
	Case C	0	0.01	1	0	0	1
	Case D	0	0.01	1	0	0	1
	Case E	0.24	0.11	0	0.3	0.02	0

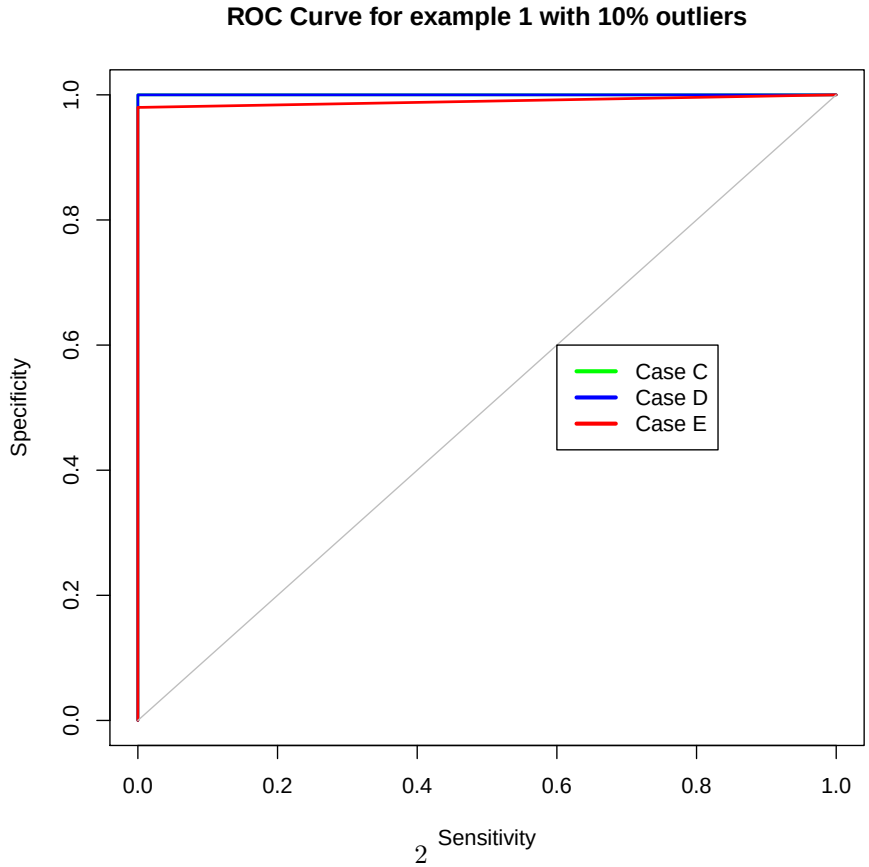


Table 3: Variable Selection Results for Example 1 ($\beta = (3, 2, 1.5, 0, 0, 0, 0, 0)'$ with 10% outliers)

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case A				**Case B**		
ALasso	74	23	3.29	0.9	63	25	3.25	0.97
sLTS	10	89	4.89	4.3	24	76	4.21	4.1
MMNNG	68	25	3.25	691.33	88	12	3.13	682.07
SROS	19	78	4.34	49.36	30	70	4.12	53.2
PAWLS	100	0	3	1.66	100	0	3	1.48
APAWLS	40	0	2.3	3.12	40	0	2.3	3.04
		Case C				**Case D**		
ALasso	3	2	1.94	0.85	0	19	2.52	1.19
sLTS	7	93	5.06	4.09	11	89	4.98	4.38
MMNNG	72	12	2.95	673.93	63	16	3.25	682.47
SROS	50	42	3.57	49.32	3	84	4.9	49.3
PAWLS	90	0	2.9	1.63	80	0	2.8	1.71
APAWLS	40	0	2.4	3.29	70	0	2.7	3.44
		Case E						
ALasso	0	17	4.05	0.98				
sLTS	5	95	5.07	4.2				
MMNNG	79	12	3.08	484.67				
PAWLS	90	0	2.8	1.61				
APAWLS	70	0	2.6	3.26				

Table 4: Variable Selection Results for Example 1 ($\beta = (3, 2, 1.5, 0, 0, 0, 0, 0)'$ with 20% outliers)

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case C				**Case D**		
ALasso	1	2	1.22	1.03	1	4	1.68	1.57
sLTS	1	99	5.49	4.31	4	95	5.35	4.3
MMNNG	65	5	2.76	470.24	31	33	3.96	473.42
PAWLS	43	56	3.9	0.68	66	32	4.13	1.25
PAWLS	73	7	2.67	2.78	88	1	2.87	3.67
		Case E						
ALasso	0	12	2.73	0.98				
sLTS	5	94	5.2	4.27				
MMNNG	56	6	2.72	457.01				
PAWLS	44	39	3.54	1.24				
APAWLS	49	3	2.2	2.5				

Table 5: Variable Selection Results for Example 1 ($\beta = (3, 2, 1.5, 0, 0, 0, 0, 0)'$ with 30% outliers)

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case C				**Case D**		
ALasso	2	0	0.68	1	0	3	0.96	1.75
sLTS	2	97	5.58	4.42	5	91	5.61	4.43
MMNNG	38	1	2.3	465.41	5	41	4.29	477.06
PAWLS	50	47	3.77	0.8	36	63	5.43	1.42
APAWLS	76	7	2.86	2.87	89	0	2.87	3.99
		Case E						
ALasso	1	8	2.25	0.97				
sLTS	8	91	5.11	4.2				
MMNNG	26	8	2.43	459.79				
PAWLS	28	38	3.48	1.56				
PAWLS	32	3	2.07	2.74				

Table 6: Variable Selection Results for Example 2 ($\beta = (\mathbf{2}'_{10}, \mathbf{0}'_{p-10})'$ with 10% outliers

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case A				**Case B**		
ALasso	97	0	9.96	3.4	84	1	9.75	3.41
sLTS	0	78	31.9	1702.93	1	86	24.93	1630.7
PAWLS	2	98	30.83	38.38	12	88	18.12	36.85
APAWLS	92	0	9.84	113.76	96	0	9.96	109.8
		Case C				**Case D**		
ALasso	0	0	6.25	4.07	0	1	6.89	4.07
sLTS	0	91	32.11	1942.99	0	92	31.98	1870.57
PAWLS	6	86	19.79	76.68	9	77	30.06	78.49
APAWLS	90	0	9.9	119.84	90	0	9.9	123.03
		Case E						
ALasso	0	0	12.18	4.06				
sLTS	0	92	30.96	1830.16				
PAWLS	0	79	76.74	122.89				
APAWLS	16	0	10.32	143.43				

Table 7: Variable Selection Results for Example 2 ($\beta = (\mathbf{2}'_{10}, \mathbf{0}'_{p-10})'$ with 20% outliers

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case C				**Case D**		
ALasso	0	0	5.7	6.45	0	0	6.15	6.89
sLTS	0	98	32.24	3138.03	0	98	32.21	2997.23
PAWLS	7	52	46.41	155.78	8	56	51.72	138.95
APAWLS	60	6	7.56	257.45	53	8	7.29	267.92
		Case E						
ALasso	0	0	17.41	6.3				
sLTS	0	76	34	2852.83				
PAWLS	0	39	87.43	132.7				
APAWLS	3	4	5.57	287.92				

Table 8: Variable Selection Results for Example 2 ($\beta = (\mathbf{2}'_{10}, \mathbf{0}'_{p-10})'$ with 30% outliers

Method	CFR (%)	OFR (%)	AN	TIME	CFR (%)	OFR (%)	AN	TIME
		Case C				**Case D**		
ALasso	0	0	6.26	7.26	0	0	7.03	7.28
sLTS	0	2	56.47	3177.43	0	69	40.49	3135
PAWLS	0	8	89.68	210.68	0	29	80.26	196.42
APAWLS	23	3	5.28	290.77	21	14	6.65	301.11
		Case E						
ALasso	0	0	17.89	6.67				
sLTS	0	17	42.75	2960.74				
PAWLS	0	12	89.01	155.62				
APAWLS	0	0	3.33	291.39				

Table 9: Outlier Detection Evaluation in Example 1 and 2 with 10% outliers

		sLTS			PAWLS		
	Model	M (%)	S (%)	JD(%)	M (%)	S (%)	JD(%)
Example 1	Case A	0	0.05	1	0	0	1
	Case B	0	0.08	1	0	0.05	1
	Case C	0	0	1	0	0.01	1
	Case D	0	0	1	0	0.02	1
	Case E	0.03	0	0.87	0.02	0.01	0.9
Example 2	Case A	0	0.21	1	0	0.01	1
	Case B	0	0.16	1	0	0.01	1
	Case C	0	0.13	0.99	0	0	1
	Case D	0	0.14	0.99	0	0	1
	Case E	0.08	0.12	0.42	0.54	0	0

Table 10: Outlier Detection Evaluation in Example 1 and 2 with 20% outliers

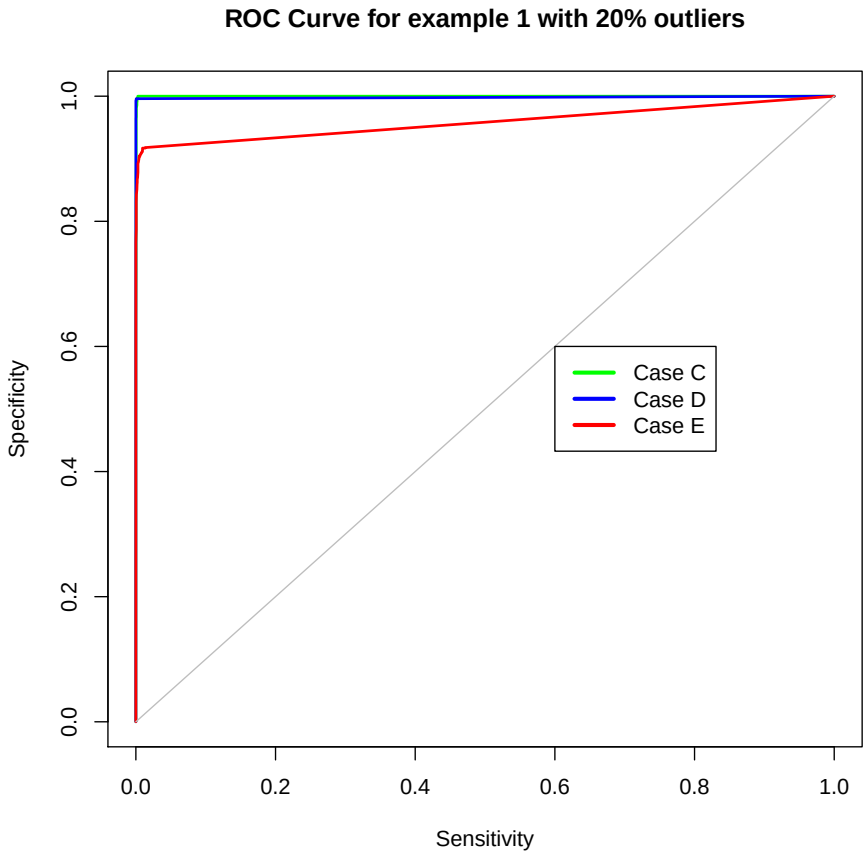
		sLTS			PAWLS		
	Model	M (%)	S (%)	JD(%)	M (%)	S (%)	JD(%)
Example 1	Case C	0	5×10^{-4}	1	0	0.01	1
	Case D	0.02	0	0.95	0	7.5×10^{-4}	0.99
	Case E	0.02	0	0.81	0.08	0.02	0.45
Example 2	Case C	0	0.05	1	0.04	0.07	0.67
	Case D	0	0.05	0.99	0.07	0.08	0.57
	Case E	0.18	0.07	0	0.35	0.12	0

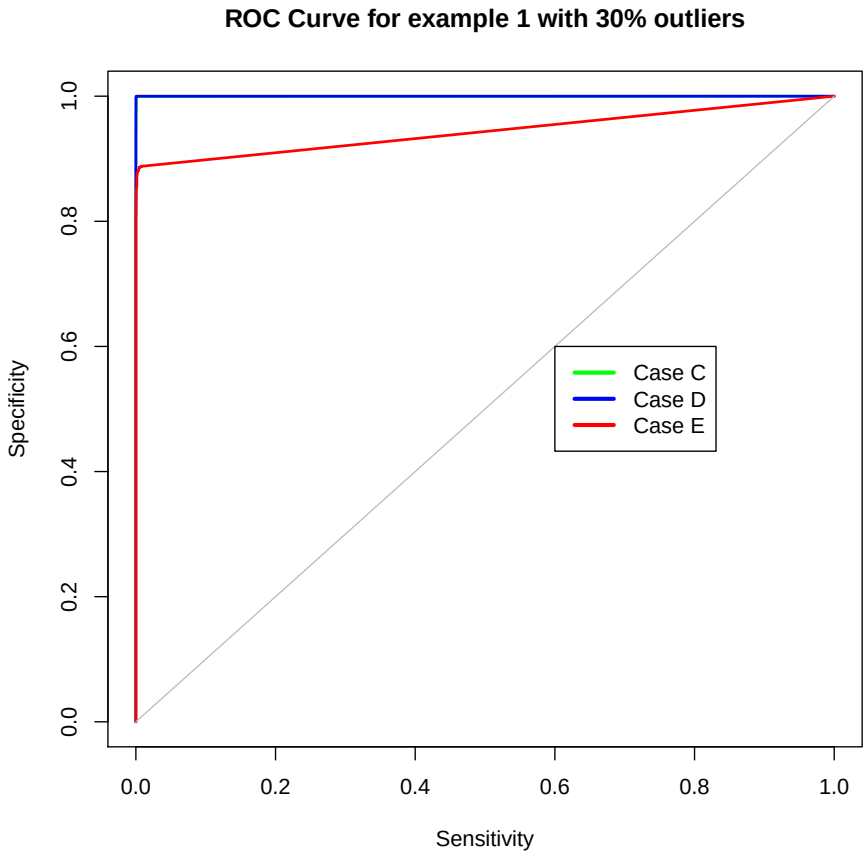
Table 11: Outlier Detection Evaluation in Example 1 and 2 with 30% outliers

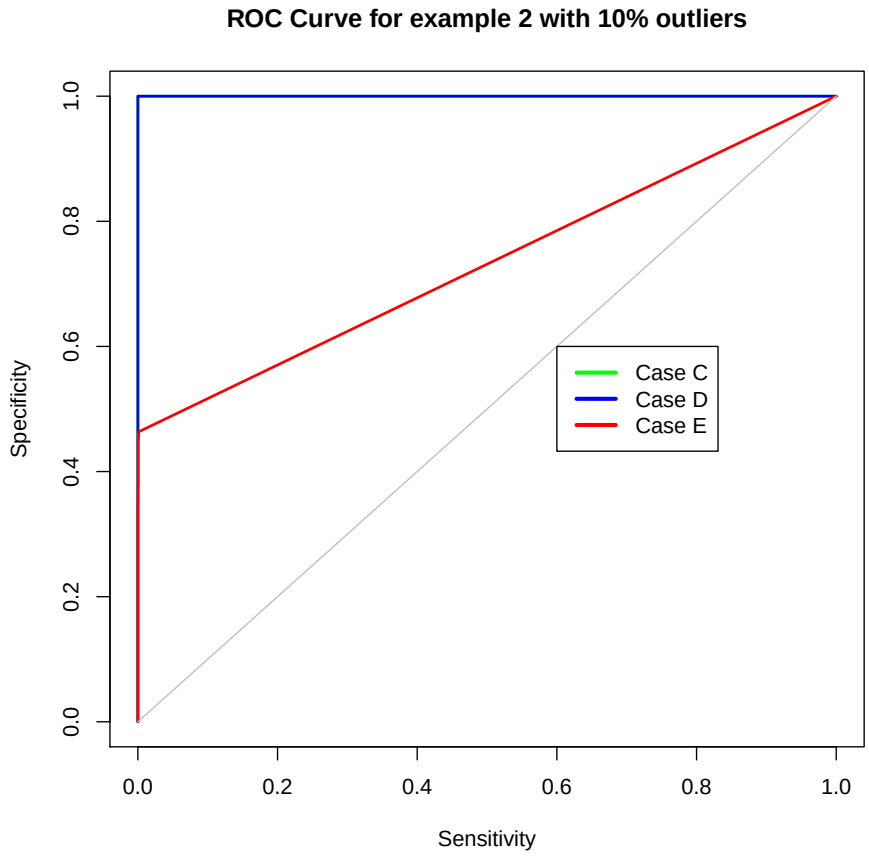
		sLTS			PAWLS		
	Model	M (%)	S (%)	JD(%)	M (%)	S (%)	JD(%)
Example 1	Case C	0	0	1	6.67×10^{-4}	0	0.99
	Case D	0.07	0.01	0.81	0	5.71×10^{-4}	1
	Case E	0.04	2.86×10^{-4}	0.63	0.11	0.01	0.31
Example 2	Case C	0.25	0.04	0	0.09	0.1	0.36
	Case D	0.32	0.06	0	0.15	0.08	0.33
	Case E	0.35	0.06	0	0.32	0.14	0

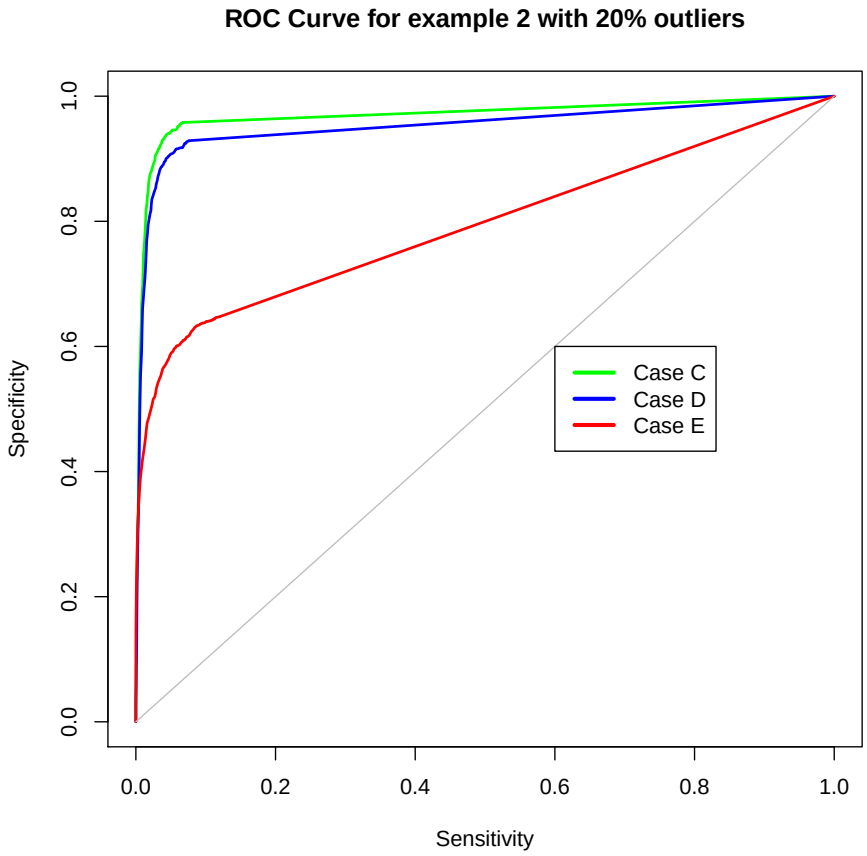
Table 12: Outlier Detection Evaluation in Example 1

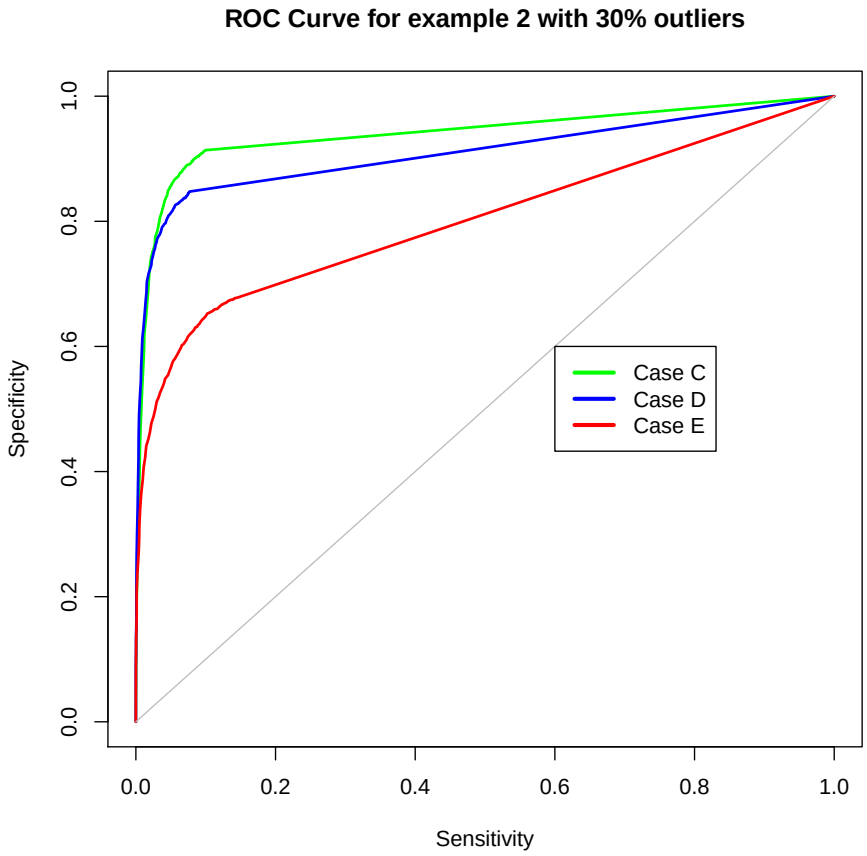
		IPOD			PAWLS		
	Model	M (%)	S (%)	JD(%)	M (%)	S (%)	JD(%)
Example 1	Case A	0	0	1	0	0	1
	Case B	0	0.1	1	0	0.05	1
	Case C	0	0.08	1	0	0.01	1
	Case D	0.49	0.02	0.07	0	0.02	1
	Case E	0.22	0.05	0.31	0.02	0.01	0.9


ROC Curve for example 1 with 20% outliers
Specificity
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Case C
Case D
Case E


ROC Curve for example 1 with 30% outliers
Specificity
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Case C
Case D
Case E


ROC Curve for example 2 with 10% outliers
Specificity
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Case C
Case D
Case E


ROC Curve for example 2 with 20% outliers
Specificity
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Case C
Case D
Case E


ROC Curve for example 2 with 30% outliers
Specificity
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Case C
Case D
Case E