SEng 474 A1

1. **Weka classifier output:**

```
=== Run information ===

Scheme:       weka.classifiers.trees.J48 -C 0.25 -M 2
Relation:     titanic2_1.txt
Instances:    2201
Attributes:   4
              pclass
              age
              sex
              survived
Test mode:    10-fold cross-validation

=== Classifier model (full training set) ===

J48 pruned tree
------------------

sex = male
|   pclass = 1st
|   |   age = adult: no (175.0/57.0)
|   |   age = child: yes (5.0)
|   pclass = 2nd
|   |   age = adult: no (168.0/14.0)
|   |   age = child: yes (11.0)
|   pclass = 3rd: no (510.0/88.0)
|   pclass = crew: no (862.0/192.0)
sex = female
|   pclass = 1st: yes (145.0/4.0)
|   pclass = 2nd: yes (106.0/13.0)
|   pclass = 3rd: no (196.0/90.0)
|   pclass = crew: yes (23.0/3.0)

Number of Leaves  :    10

Size of the tree :          15


Time taken to build model: 0.04 seconds
```

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances	1737	78.9187 %
Incorrectly Classified Instances	464	21.0813 %
Kappa statistic	0.429	
Mean absolute error	0.312	
Root mean squared error	0.3959	
Relative absolute error	71.3177 %	
Root relative squared error	84.6545 %	
Total Number of Instances	2201	

=== Detailed Accuracy By Class ===

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
	0.376	0.013	0.930	0.376	0.535	0.503	0.746	0.680	yes
	0.987	0.624	0.768	0.987	0.864	0.503	0.746	0.822	no
Weighted Avg.	0.789	0.427	0.820	0.789	0.758	0.503	0.746	0.777	

=== Confusion Matrix ===

a	b	<-- classified as
267	444	a = yes
20	1470	b = no

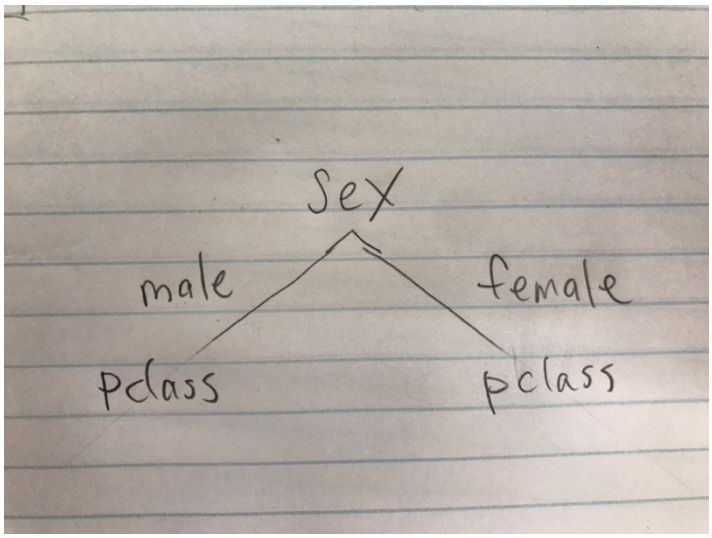
Entropy Calculation:

Count of pclass	Column Labels							
Pclass	no	yes	(blank)	Grand Total		Entropies	Frequency		
1st	37.54%	62.46%	0.00%	100.00%		95.47%	0.1475931	0.14090964	
2nd	58.60%	41.40%	0.00%	100.00%		97.86%	0.12942779	0.12665425	
3rd	74.79%	25.21%	0.00%	100.00%		81.46%	0.32061762	0.26118418	
crew	76.05%	23.95%	0.00%	100.00%		79.43%	0.40190736	0.31923013	
(blank)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				0.8479782	Total Entropy
Grand Total	67.70%	32.30%	0.00%	100.00%					

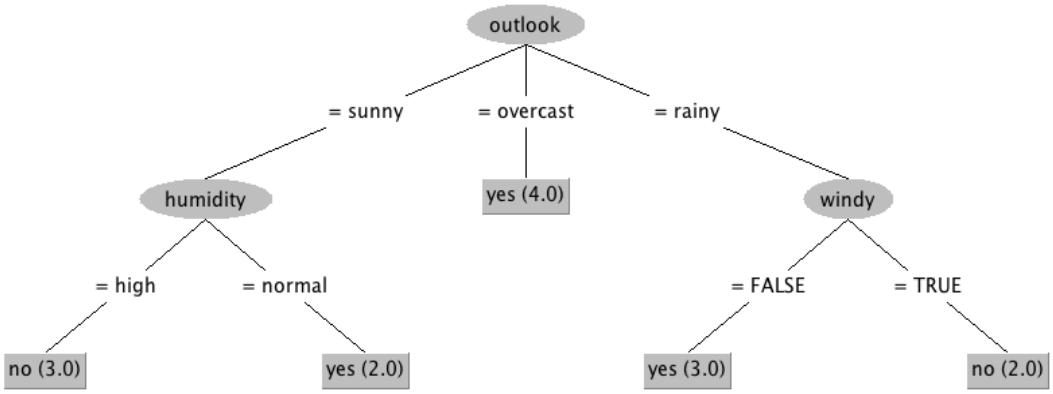
Count of age	**Column Labels**							
Row Labels	**no**	**yes**	**(blank)**	**Grand Total**				
adult	68.74%	31.26%	0.00%	100.00%		89.617411952253600%	0.95004541	0.85140611	
child	47.71%	52.29%	0.00%	100.00%		99.848160779777900%	0.04950045	0.04942529	
(blank)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				0.9008314	
Grand Total	**67.70%**	**32.30%**	**0.00%**	**100.00%**					

Count of sex	**Column Labels**							
Row Labels	**no**	**yes**	**(blank)**	**Grand Total**				
female	26.81%	73.19%	0.00%	100.00%		83.870344448306100%	0.21344233	0.17901481	
male	78.80%	21.20%	0.00%	100.00%		74.531895218441400%	0.78610354	0.58589787	
(blank)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!				0.76491268	
Grand Total	**67.70%**	**32.30%**	**0.00%**	**100.00%**					

First level decision tree:



2. **Decision tree built on weather.nominal.csv**



Based on the tree we can follow the pseudo code for PRISM algorithm and obtain the following two:

R1: (outlook = sunny) ∧ (humidity = high) = no
R2: (outlook = rainy) ∧ (windy = false) = yes

Weka verifications:

=== Classifier model (full training set) ===

Prism rules

If outlook = sunny
  and humidity = high then no
If outlook = rainy
  and windy = TRUE then no
If outlook = overcast then yes
If humidity = normal
  and windy = FALSE then yes
If temperature = mild
  and humidity = normal then yes
If outlook = rainy
  and windy = FALSE then yes

3.

a. **(2nd, child, male)**

P(survived=yes|E)

=P(Pclass=2nd|survived=yes)*P(age=child|survived=yes)*P(sex=male|survived=yes)*P(survived=yes) / P(E)
= 118/711 * 57/711 * 367/711 * 711/2201 / P(E) = 0.002218 / P(E)

P(survived=no|E)
=P(Pclass=2nd|survived=no)*P(age=child|survived=no)*P(sex=male|survived=no)*P(survived=yes) / P(E)
= 167/1490 * 52/1490 * 1364/1490 * 1490/2201 / P(E) = 0.002424 / P(E)

P(survived=yes|E) = 0.002218 / (0.002218+0.002424) = 0.4778112882 = 47.78%
P(survived=no|E) = 0.002424 / (0.002218+0.002424) = 0.522188712 = 52.22%

b. (2nd, adult, female)

P(survived=yes|E)
=P(Pclass=2nd|survived=yes)*P(age=adult|survived=yes)*P(sex=female|survived=yes)*P(survived=yes) / P(E)
= 118/711 * 654/711 * 344/711 * 711/2201 / P(E) = 0.02386 / P(E)

P(survived=no|E)
=P(Pclass=2nd|survived= no)*P(age=adult|survived= no)*P(sex=female|survived= no)*P(survived= no) / P(E)
= 167/1490 * 1438/1490 * 126/1490 * 1490/2207 = 0.006175 / P(E)

P(survived=yes|E) = 0.02386 / (0.02386+0.006175) = 79.44%
P(survived=no|E) = 0.006175 / (0.02386+0.006175) = 20.56%

Weka verification:

=== Predictions on test set ===

inst#	actual	predicted	error	prediction
1	1:?	2:no		0.523
2	1:?	1:yes		0.793