School of Computing and Information Systems

The University of Melbourne

COMP90049 Introduction to Machine Learning (Semester 1, 2023)

Week 5

1. How is **holdout** evaluation different to **cross-validation** evaluation? What are some reasons we would prefer one strategy over the other?

2. A **confusion matrix** is a summary of the performance of a (supervised) classifier over a set of development ("test") data, by counting the various instances:

		Actual			
		a	*b*	*c*	*d*
Classified	*a*	10	2	3	1
	b	2	5	3	1
	c	1	3	7	1
	d	3	0	3	5

   (i). Calculate the classification **accuracy** of the system. Find the **error rate** for the system.

   (ii). Calculate the **precision**, **recall** and **F-score** (where $\beta = 1$) for class *d*.

   (iii). Why can't we do this for the whole system? How can we consider the whole system?

3. Given the following dataset, build a Naïve Bayes model for the given training instances.

ID	*Outl*	*Temp*	*Humi*	*Wind*	PLAY
A	s	h	n	F	N
B	s	h	h	T	N
C	o	h	h	F	Y
D	r	m	h	F	Y
E	r	c	n	F	Y
F	r	c	n	T	N
G	o	m	n	T	?
H	?	h	?	F	?

4. Using the Naïve Bayes model that you developed in question 2, classify the given test instances.

   (i). No smoothing.

   (ii). Using the "epsilon" smoothing method.

   (iii). Using "Laplace" smoothing ($\alpha = 1$)

5. [OPTIONAL] Given the following dataset,

   (i). Build a Naïve Bayes model for the given training instances (1-4, above the line).

   (ii). Estimate the probability of the test instance (5, below the line)

$X_1(Headache)$	$X_1(Sore)$	$X_1(Temp)$	*Y(Diagnosis)*
0.8	0.4	39.5	Flu
0	0.8	37.8	Cold
0.4	0.4	37.8	Flu
0.4	0	37.8	Cold
0.8	0.8	37.8	? (Flu)