

School of Computing and Information Systems
The University of Melbourne
COMP90049 Knowledge Technologies (Semester 1, 2017)
Workshop exercises: Week 8

1. In the **PageRank** algorithm:

- (a) What is the mechanism for the “random walk”?
- (b) In terms of user behaviour, what is the significance of “teleporting”?
- (c) The lecture example of the PageRank algorithm was given as follows:

t	$\pi(d_{(1,t)})$	$\pi(d_{(2,t)})$
0	0.5	0.5
1	$0.5 \times 0.2 \times 0.5 + 0.5 \times 0.5 = 0.3$	$0.5 \times 0.2 \times 0.5 + 0.5 \times 0.8 + 0.5 \times 0.5 = 0.7$
2	$0.3 \times 0.2 \times 0.5 + 0.7 \times 0.5 = 0.38$	$0.3 \times 0.2 \times 0.5 + 0.3 \times 0.8 + 0.7 \times 0.5 = 0.62$
3	$0.38 \times 0.2 \times 0.5 + 0.62 \times 0.5 = 0.348$	$0.38 \times 0.2 \times 0.5 + 0.38 \times 0.8 + 0.62 \times 0.5 = 0.652$

- i. Which terms represent “following a link” and which represent “teleporting”?
 - ii. What is the value of α in the above example? Re-do the above with $\alpha = 0.5$
- 2. What is **Machine Learning** (or **Data Mining**) and why is it a **Knowledge Technology**? Why has this field become important? Contrast the use of data/information/knowledge/wisdom with the way we have used them previously in this subject.
- 3. An urn initially contains 10 red balls and 6 black balls. At each trial, a ball is selected from the urn, its colour is noted, and then it is returned to the urn with 2 more balls of the same colour.
 - (a) Compute the probability of obtaining a red ball with both the first and second trials
 - (b) Show that the events “red ball on the first trial” and “red ball on the second trial” are **not** independent