

## Assignment 6– Review

**Assignment overview.** This assignment is aimed at reviewing some concepts of the deep learning and reinforcement learning and to provide practice questions for the final exam.

**Submission.** Please provide your answers to the written question (1-8) as a pdf file, and the last question (9) as Jupyter file through Brightspace.

**Submission deadline.** Thursday, April 5, 2:00 pm.

**Late submission policy.** No late submission can be accepted.

**Academic Integrity.** Dalhousie academic integrity policy applies to all submissions in this course. You are expected to submit your own work. Please refer to and understand the academic integrity policy, available at <https://www.dal.ca/academicintegrity>

**If you have a question:** Teaching Assistants (TAs) will be present during the labs to help you with any questions you may have. If you still have questions, feel free to email me at [tt@cs.dal.ca](mailto:tt@cs.dal.ca).

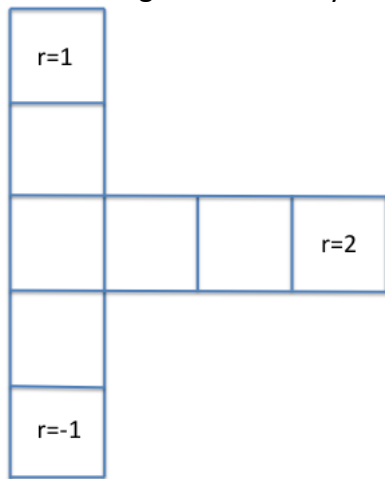
### Questions:

1. **[4 Marks] What** is the *vanishing gradient problem* in deep learning and how can it be mediated?
2. **[5 Marks] What** is the result when convolving the array A with the filter B without padding?




A= array([[0, 0, 0, 2],	B= array([[2, 0, 1],
[2, 1, 0, 0],	[0, 0, 0],
[2, 1, 0, 2],	[2, 0, 1]])
[2, 2, 2, 1]])	

3. **[3 Marks] What** is a pooling operation in convolutional neural networks and why is this operation important?
4. **[4 Marks] What** is a gated recurrent network? Name an example of such a neural network.
5. **[4 Marks] In** reinforcement learning, what is a policy?
6. **[3 Marks] Explain** the difference between the SARSA and Q-Learning algorithm.
7. **[2 Marks] Briefly** explain 'dropout' and why it is used in deep networks.

8. **[5 marks]** What are the optimal Q values for the T-maze below, assuming that we value diminishing returns with  $\gamma=0.5$ ?



9. **[20 Marks]** Implement a neural network version of an RL to solve the linear maze example and submit your program as jupyter notebook.

					
State x:	0	1	2	3	4
$\rho(x)$ :	1	0	0	0	2
$Q^*(x,u)$ :	$\begin{matrix} s & s \\ 0 & 0 \end{matrix}$	$\begin{matrix} l & r \\ 1 & 0.5 \end{matrix}$	$\begin{matrix} l & r \\ 0.5 & 1 \end{matrix}$	$\begin{matrix} l & r \\ 0.5 & 2 \end{matrix}$	$\begin{matrix} s & s \\ 0 & 0 \end{matrix}$
$\pi(x)$ :	