Resource Allocation for Disaster Relief Using Reinforcement Learning
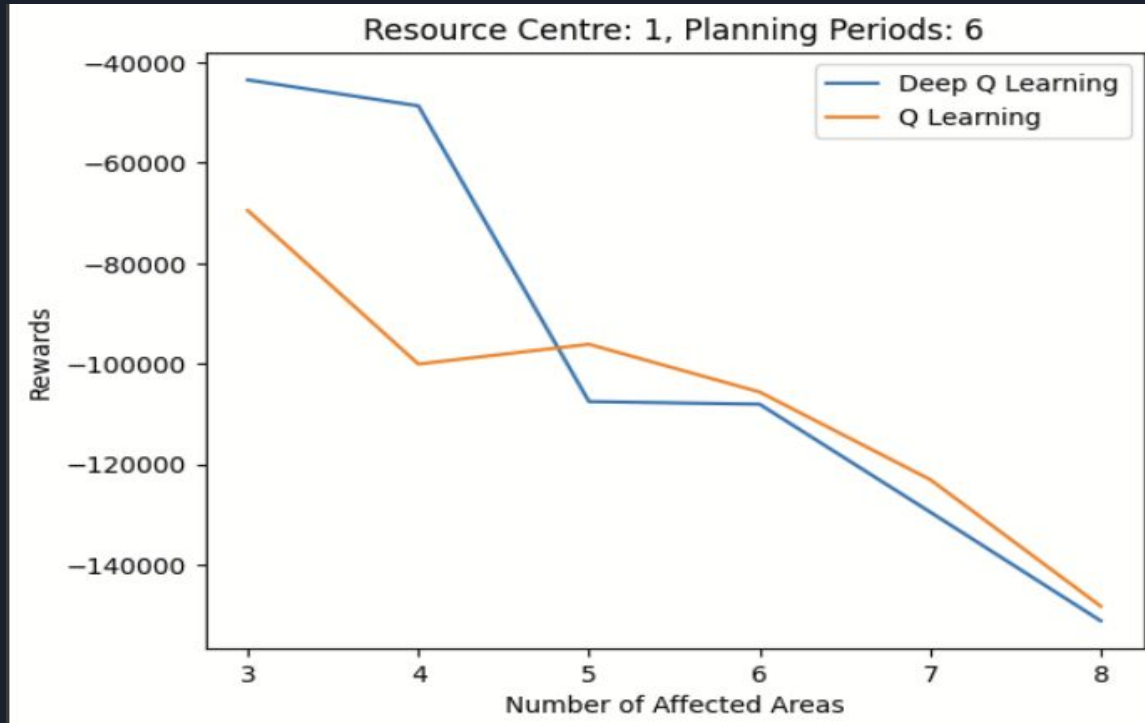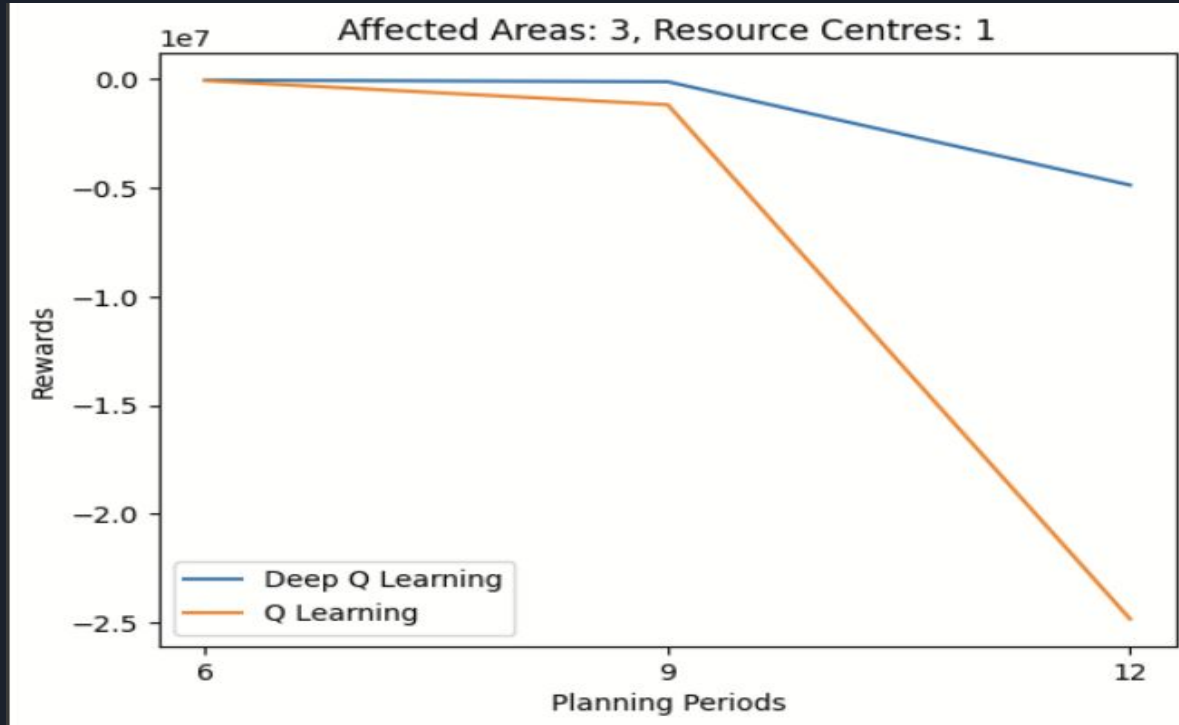
By Isha Goyal (2020CSB1089)
Jyoti Dhiman (2020CSB1092)
Akash Garg (2020MEB1262)

Comparison of Rewards vs Affected Areas for Q learning and Deep Q learning, keeping resource centres and planning periods constant

Comparison of Rewards vs Planning Periods for Q Learning and Deep Q Learning keeping resource centres and affected areas constant

Affected Areas: 3, Resource Centres: 1

Single resource center (Q-Learning)

Instances	Reward	Time taken (sec)
{3,1,6}	-69504.04591	0.1982712746
{3,1,9}	-1177305.996	0.8895583153
{3,1,12}	-24830246.14	1.748139381
{4,1,6}	-100059.7638	0.45119524
{4,1,9}	-2566730.477	5.49846983
{4,1,12}	-72240452.75	39.08319831
{5,1,6}	-96122.14328	0.9261720181
{5,1,9}	-4193914.709	33.40808201
{5,1,12}	-113325670.3	425.129205
{6,1,6}	-105612.0866	9.339951277
{6,1,9}	-4792238.603	149.5093424
{6,1,12}	-133680396.2	3052.574582
{7,1,6}	-123031.0538	14.56297708
{7,1,9}	-5640074.526	722.9411025
{8,1,6}	-148236.5248	28.82158494
{8,1,9}	-5511994.616	3231.289172
When the demand per time period from each area: 2 instead of 1		
{3,2,1,6}	-85682301.23	0.7616100311
{4,2,1,6}	-196746723.7	0.7042460442
{5,2,1,6}	-211028061.8	1.521782637

Multiple resource centers (Q-learning)

Instances {|N|,R,D,C,T}, with |N| affected areas, R resource centers, D demand per time period from each area, C capacities, and T planning periods

Instances	Multiple resource centers			
	Reward	Time taken (sec)	Training Time	Result Calculation Time
{3,2,1,1,6}	-1728.584252	0.6352272034	0.5616629124	0.0001165866852
{3,2,1,1,9}	-22127.89198	5.127473593	4.797831297	0.0001509189606
{4,2,1,1,6}	-6343.493557	10.67837667	8.309608459	0.000111579895
{4,2,1,1,9}	-62193.31037	197.2530768	167.6223428	0.0001935958862
{4,3,1,1,6}	-67423.56321	173.2441552	66.96901298	0.0001683235168

Single resource center(Deep q-learning)

Instances	Reward	Time taken (sec)	Training time
{3,1,6}	-43526.204	85.3225	27.66099
{3,1,9}	-121097.745	118.33148	53.2589
{3,1,12}	-48743935.38	166.8999	99.96716
{4,1,6}	-48690.0128	68.95153	29.4412653
{4,1,9}	-2173279.43	87.757591	46.447499
{4,1,12}	-73115752.85	126.20569	89.3435
{5,1,6}	-107526.0277	89.24062	26.49785
{5,1,9}	-2397883	167.6678	48.042
{6,1,6}	-108041.8209	54.99288	30.44688
{7,1,6}	-129497.026	58.120869	28.92245
{8,1,6}	-151152.232	72.47702	29.563