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PROJECT ASSIGNMENT

Following reference paper [ref2], assigned for presentation at seminars 2 and 3, enhance the network slicing model by considering that tenants share their subscribers' resources (whenever idle) as fog nodes with the infrastructure provider (InP) to augment its infrastructure. The fog nodes are equipped with communication, computing, and storage capabilities. The InP will slice the augmented infrastructure that contains its own resources and fog resources to serve service requests from multiple tenants. Using this enhanced network slicing model, answer the following questions:

[ref2] N. Van Huynh, D. Thai Hoang, D. N. Nguyen and E. Dutkiewicz, "Optimal and Fast Real-Time Resource Slicing With Deep Dueling Neural Networks," *IEEE Journal on Selected Areas in Communications*, vol. 37, no. 6, pp. 1455-1470, June 2019.

1. Assume the network provider aims to maximize the immediate reward defined in [equation (16), ref2]. Formulate the network provider's resource allocation problem as a centralized optimization problem. This problem includes the allocation of radio, computing and storage resources to network slices (by the network provider) to meet the slice requests from tenants.

2. Solve the optimization problem and represent the number of requests versus the optimum reward for different numbers of available fog nodes. *You can use Matlab and the simulation parameters described in [ref2].*

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3. Implement the Q-learning algorithm described in [Section IV, ref2] for the enhanced network slicing model. *You can use Matlab or Tensorflow and the simulation parameters described in [ref2].* Compare the performance with the optimum solution obtained in question 2.

4. Implement the Double Deep Q-learning algorithm described in [Section V.A, ref2] for the enhanced network slicing model. *You can use Matlab or Tensorflow and the simulation parameters described in [ref2].* Compare the performance with the optimum solution obtained in question 2 and Q-learning in question 3.

5. Illustrate the convergence of the Q-learning and Double Deep Q-learning algorithms developed in questions 3 and 4, respectively.

Instructions: work in groups of 2 to 3 students. Submit one report per group and the code in Moodle.