ECE 597AA – Project Assignment

Question 1.

The immediate reward after action $a_{\mathbf{s}}$ is executed at state $\mathbf{s} \in \mathcal{S}$ is defined as follows:

$$r(\mathbf{s}, a_{\mathbf{s}}) = \begin{cases} r_c, & \text{if } e_c = 1, \quad a_{\mathbf{s}} = 1, \text{ and } \mathbf{s}' \in \mathcal{S}, \\ 0, & \text{otherwise.} \end{cases} \tag{16}$$

*At state **s** , if an arrival slice is accepted, i.e., $a_s = 1$, the system will move to next state s' and the network provider receives an immediate reward r_c . In contrast, the immediate reward is equal to 0 if an arrival slice is rejected or there is no slice request arriving at the system. The value of r_c represents the amount of money paid by the tenant based on resources and additional services required.*

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.

- In state s,
  - If arrival slice is accepted i.e., $a_s = 1$
    - The system will move to next state s'
      - Network provider receives immediate reward r_c
        - The value of r_c represents the amount of money paid by the tenant based on resources and additional services required
  - If arrival slice is rejected or no slice request arriving at the system
    - Immediate reward is 0

Definition A.2 *A centralized optimization problem is defined by:*

$$\{x_i\}, i \in [1..(n_x)], \quad x_i \in D_i \tag{A.5}$$

$$\{p_i\}, i \in [1..(n_p)], \quad p_i : D_{i_1^p} \times D_{i_2^p} \times ... \times D_{i_{a^i}^p} \rightarrow boolean \tag{A.6}$$

$$f, \quad f : D_{f_1} \times D_{f_2} \times ... \times D_{f_b} \rightarrow D^f \tag{A.7}$$

https://cs.fit.edu/~msilaghi/teza/chapter22.pdf