Imitation Learning for Combined Coverage and Resource Allocation in UAV-Aided RAN-Slicing

I. Overview:

Imitation learning is a machine learning approach that enables an agent to learn how to perform a task by imitating the behavior of an expert. In this approach, the agent observes the expert performing the task and uses this information to learn a policy that can achieve similar performance. Imitation learning has been widely used in a variety of fields, including robotics, gaming, and natural language processing, to name a few. One of the key benefits of imitation learning is that it can enable an agent to learn a complex task more efficiently than through trial and error or reinforcement learning. Additionally, imitation learning can transfer knowledge from an expert to a novice, which can be particularly useful in scenarios where training an expert agent is expensive or time-consuming. However, imitation learning also has its limitations, including the need for high-quality expert demonstrations and the potential for the agent to only learn a limited range of behaviors. Overall, imitation learning is a powerful technique that has the potential to revolutionize many fields. Still, its success depends on the quality of the expert demonstrations and the complexity of the task at hand.

II. Project Description:

We propose to overcome the intrinsic limitation of needing a human expert by substituting it with an optimization model. One particular advantage of using optimization models as experts for imitation learning is their ability to provide optimal solutions to complex problems. By using an optimization model as an expert, the agent can learn to mimic the optimal behavior of the model, potentially achieving better performance than a human expert. Additionally, optimization models can be easily modified and adapted to different scenarios, allowing the agent to learn from a variety of situations.

We want to apply the mentioned methodology to identify a joint placement and resource allocation for a fleet of aerial drones used to provide additional wireless coverage in an area.

III. Requirments:

- Good knowledge of machine learning and deep learning.
- Knowledge of Mathematical programming is considered a plus

- Excellent programming skills (Python is mandatory. Keras, TensorFlow and PyTorch are a plus).

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