Experience-driven Networking: A Deep Reinforcement Learning based Approach

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4 May 2020

This paper gives a brief overview of an experience-driven approach in communication networking to counter a predicament of traffic engineering. The approach is self-sufficient to manage a fully modern communication network with a higher level of complexities and dynamicity. This approach outcasts all the other currently used methods in terms of efficiency.

1 Introduction

- Enhancing the efficiency of modern communication network.

- Development of DRL-TE Approach.

- Benefits of DRL-TE Approach.

- Drawbacks of DRL-TE Approach.

2 Problem Statement

- Describing Traffic Engineering (TE) Problem.

- Objective to maximize the utility function.

3 Network Utility Maximization (NUM)

- A solution to an optimization problem [3]

- Drawbacks associated with NUM.

- Algorithm combined with SDN (Software Defined Networking).

4 DEEP REINFORCEMENT LEARNING (DRL)

- Brief Overview about DRL[1].

- Key concepts of Deep Q-Network.

- Actor-critic method - Deep Deterministic Policy Gradient[4]

5 Proposed DRL Based Framework

- Design of State space, Action space and reward.

- Extending DDPG approach.

- Key points like Temporal Difference and Q gradients were defined.

- Prioritized experience replay[2]

- The working of DRL-TE algorithm is discussed in brief.

6 Algorithm DRL-TE

- 2-layer fully connected feed forward neural network configuration for actor and critical network

- Inclusion of Leaky Rectifier.

- Utilization of Softmax.

6.1 Implementation of Algorithm DRL-TE

- Initialization of all weights of actor and critic network.

- Computation of various key elements - gradients, priority, weight change etc.

- Updating Network Parameters.

- Implementation of the algorithm using ns-3 for packet level simulation

7 PERFORMANCE EVALUATION

- Simulation on NSFNET and ARPANET topologies

- Results were compared with other methods.

- Performance DDPG and DRL-TE was evaluated for each network topologies.

7.1 Factors for comparisons

- End to end delay
- End to end throughput.
- Total Utility.

8 Discussion

(with references 1/2 page)

- An experience driven approach.

- DRL-TE compared with NUM and DDPG

9 Conclusion

In the end , authors provided an experience-driven DRL-TE with actor and critic networks approach to counter TE problem. The performance of this approach when evaluated using NSFNET, APRANET topologies and a random topologies outperforms all the current baselines methods.

References

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[4] M.-C. van Leuwen. *A Handbook for Scholars*. Oxford University Press, 1900.