Maximizing energy efficiency in 5G using deep reinforcement algorithm and IOT

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Overview

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Introduction

- 5th Generation Internet
  - High Speed
  - Low Latency
  - High Capacity

Problems

Problem 1

- The increase in the number of base stations and the need for new infrastructure leads to high consumption of 5G

Problem 2

- Simultaneous management of diverse network resources to maintain Quality of Service (QoS)

Questions

Question 1

What algorithms contribute to energy efficiency in 5G networks?

Question 2

What architectures enable lower energy consumption and are more cost-effective and easier to implement?

Hypotheses

1. The use of smart algorithms in RRHs will contribute to energy efficiency .
2. IoT-based architectures will reduce energy consumption.
3. The integration of smart algorithm within IoT-based architectures will maximize energy efficiency.

Methodology

- **Methods based on Smart Algorithms**

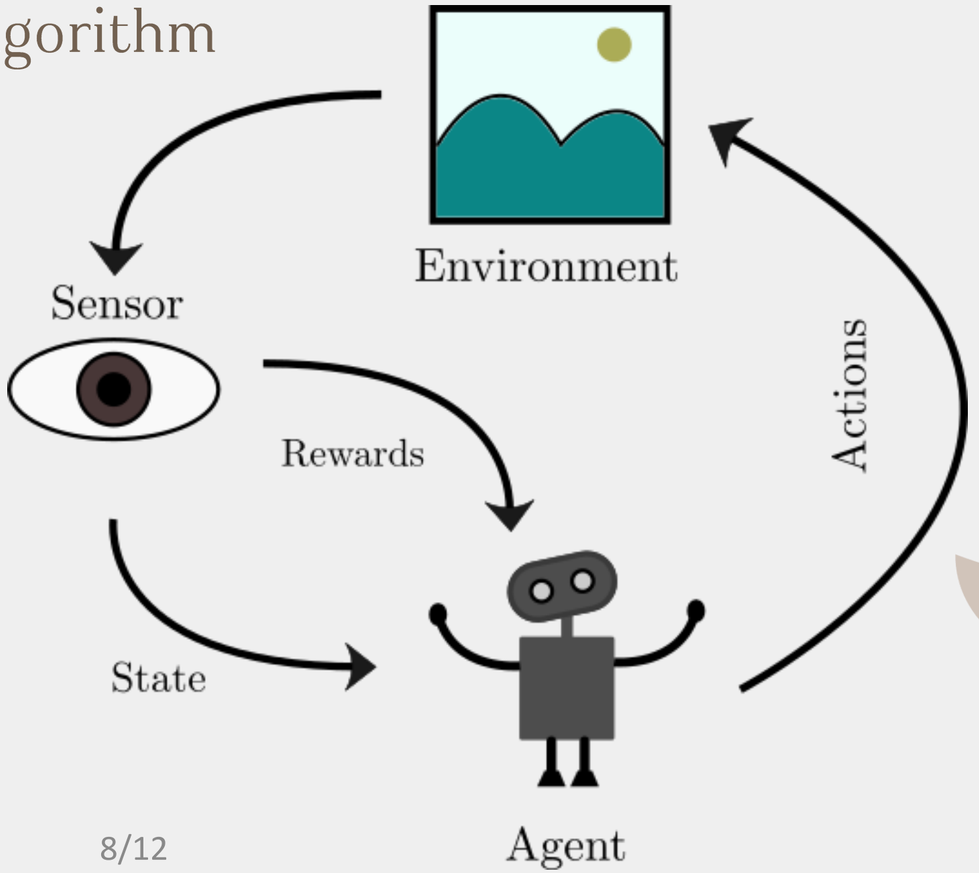
  Deep Reinforcement Learning (DRL)

- **Methods based on IoT**

  Cloud Radio Access Network (C-RAN)

Smart Algorithm

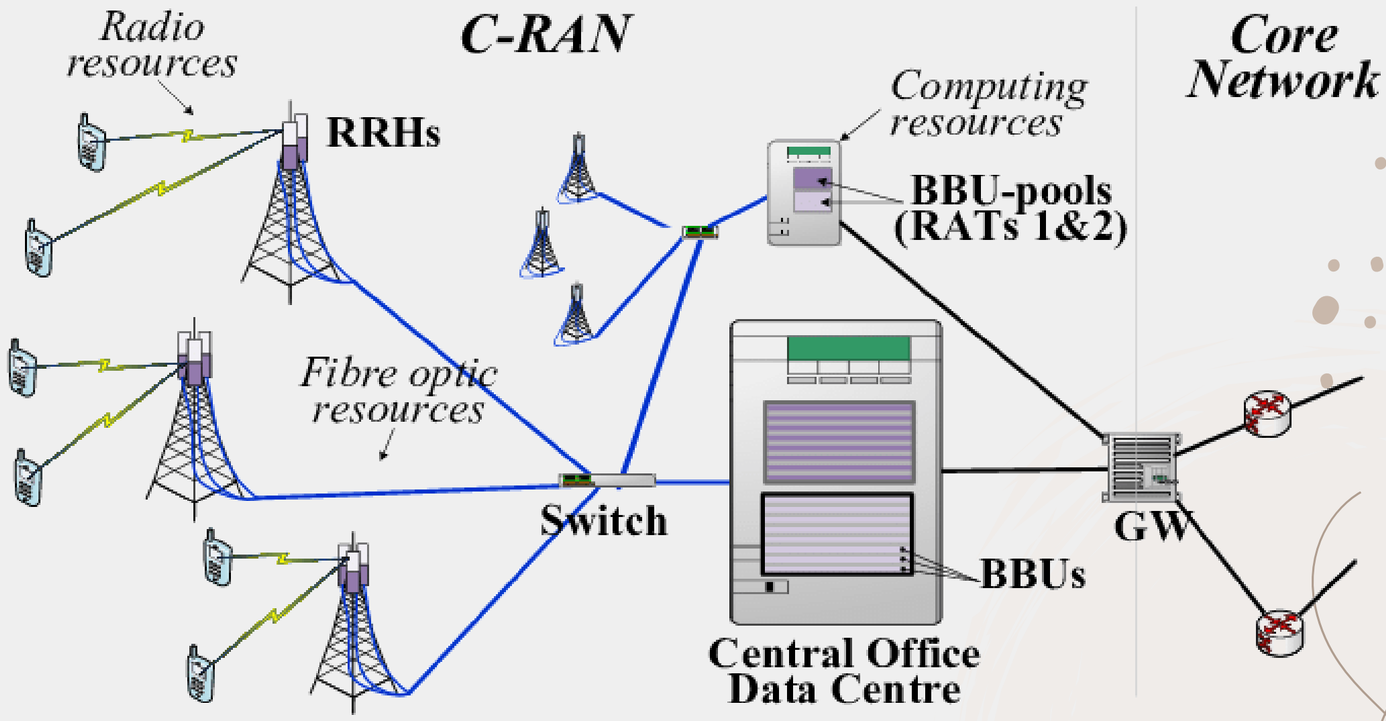
- Deep Reinforcement Learning
- Main components of the algorithm
  - Agent
  - Environment
  - State
  - Action
  - Reward
  - Policy
- Achievements



IoT-Based optimization

- Cloud Radio Access Network (C-RAN)
  - Remote Radio Head (RRH)
  - Base Band Unit (BBU)
  - Fiber Optic Network

- Achievements
  - Cost and energy reduction
  - System flexibility enhancement



Conclusion

- The combination of the Internet of Things (IoT) and deep Reinforcement (DRL) algorithms can significantly reduce energy consumption in 5G networks.
- This synergy optimizes resource utilization while maintaining Quality of Service (QoS), leading to substantial energy efficiency.
- Advanced architectures such as Cloud Radio Access Network (C-RAN) play a crucial role in achieving these objectives.

References

- Abdallah, Noor Aboueleneen et al. "Deep Reinforcement Learning for Internet of Drones Networks."
- Al-Tam, Faroq et al. "Learn to Schedule (Leasch): A Deep Reinforcement Learning Approach."
- Hajisami, Abolfazl et al. "Elastic-Net: Boosting Energy Efficiency and Resource Utilization in 5G C-RANs.“
- Zuo, Jun et al. "Energy Efficient User Association for Cloud Radio Access Networks."

Thank You So Much

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