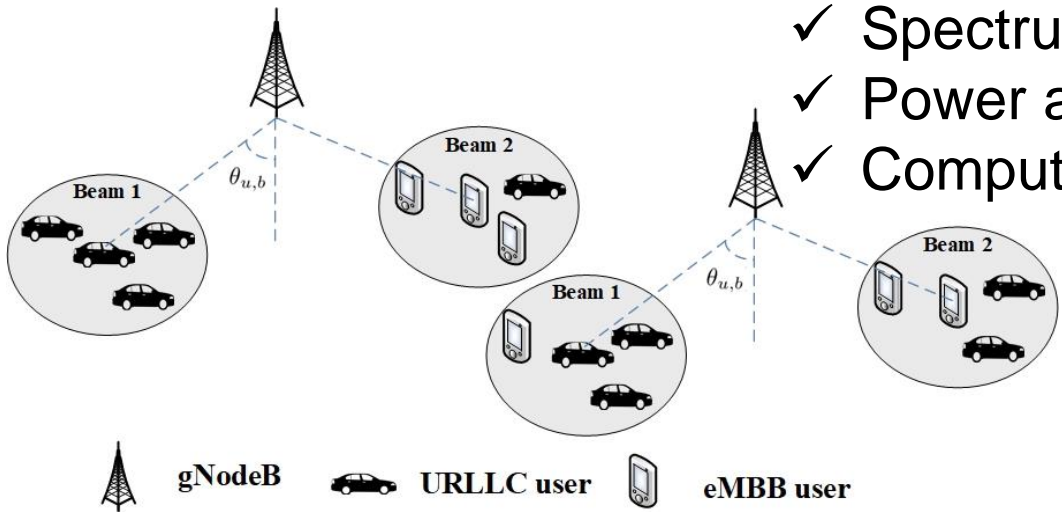


**Melike (Mel) Erol-Kantarci, PhD**  
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Associate Professor



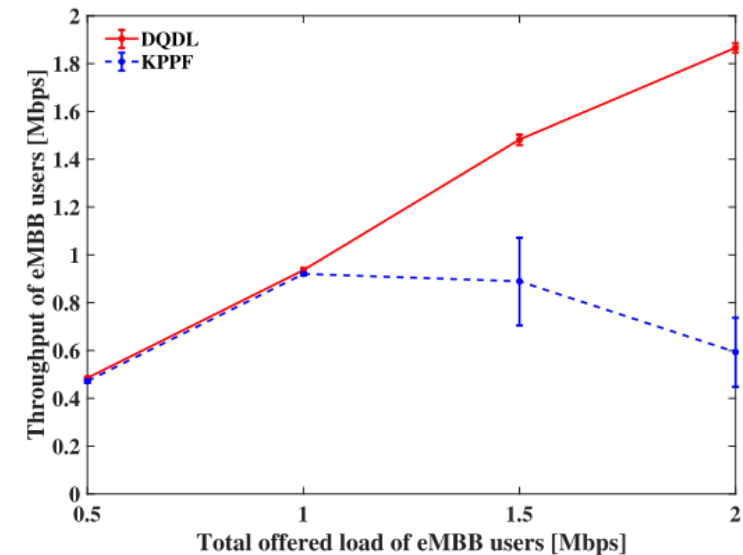
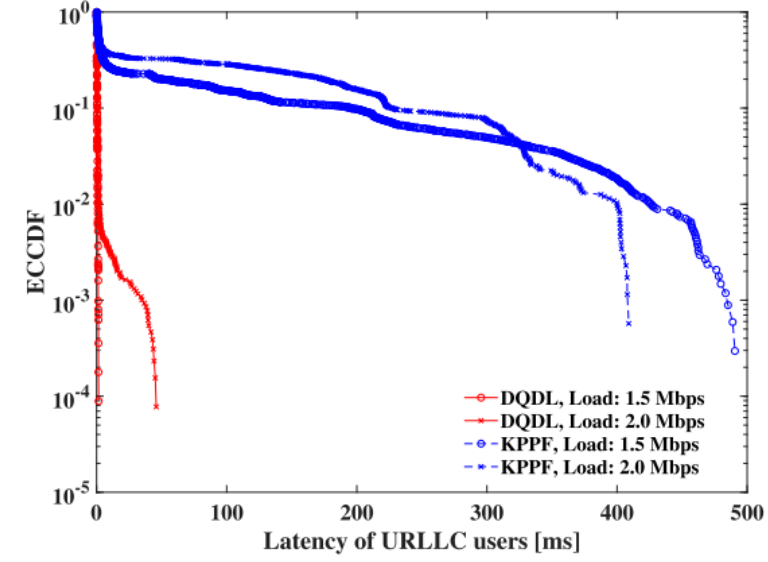
**Open 5G Forum - Fall 2021**  
**O-RAN: A Great Playground for AI – Let's Play**

# Resource Allocation and Beam Management in 5G



- ✓ User-cell (beam) association
- ✓ Spectrum allocation
- ✓ Power allocation
- ✓ Computational resource allocation

- ✓ DBSCAN for user clustering and beam association
- ✓ DRL for resource allocation

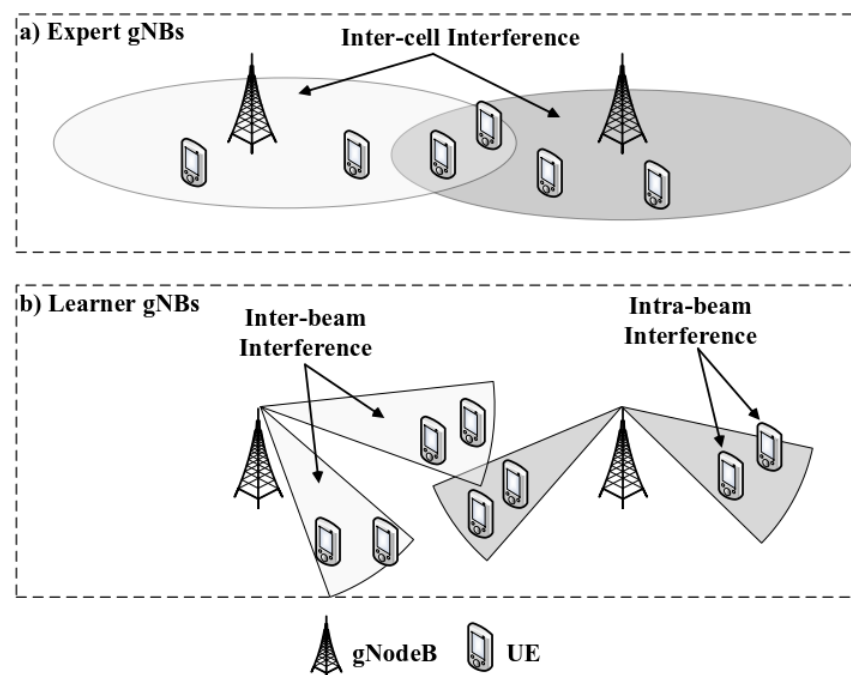


M. Elsayed, M. Erol-Kantarci, "Radio Resource and Beam Management in 5G mmWave Using Clustering and Deep Reinforcement Learning," IEEE Globecom, 2020.



# Transfer Reinforcement Learning for Faster Convergence

- ✓ Improving the converge of ML algorithms to speed up their adoption in the field

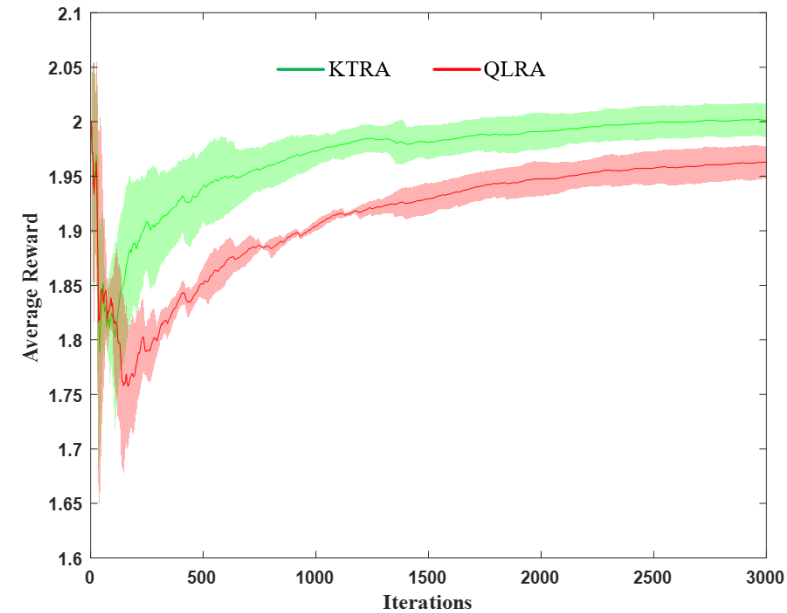
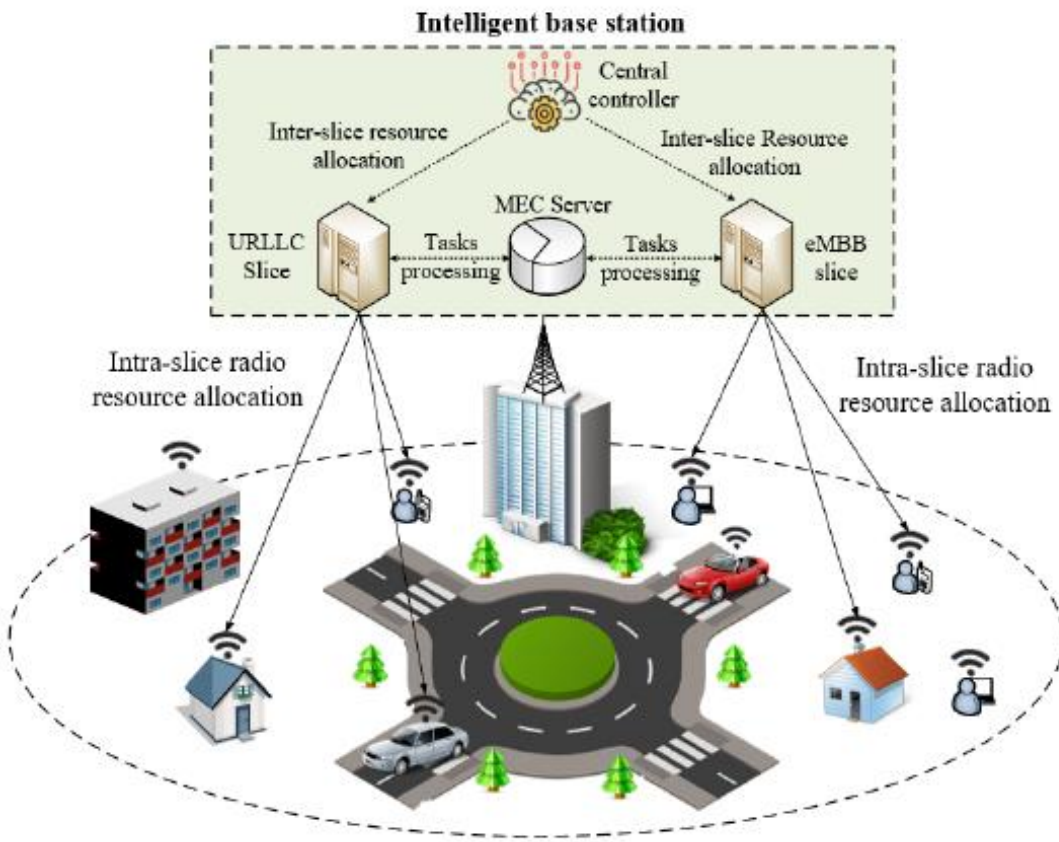


Transfer reinforcement learning for transferring offline expert knowledge to online (field) gNbs

M. Elsayed, M. Erol-Kantarci, H. Yanikomeroglu, "Transfer Reinforcement Learning for 5G-NR mm-Wave Networks," IEEE Transactions on Wireless Communications, May 2021.

# RAN Slicing with Transfer Reinforcement Learning

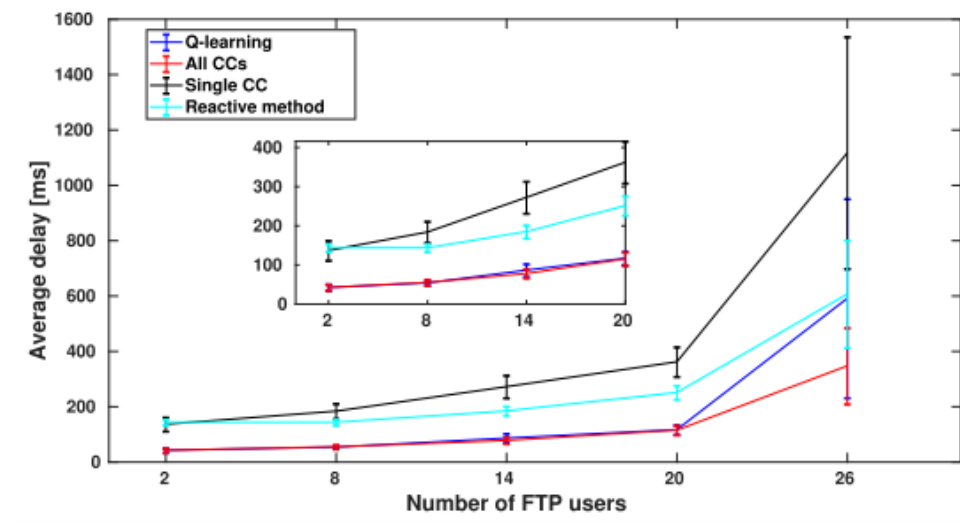
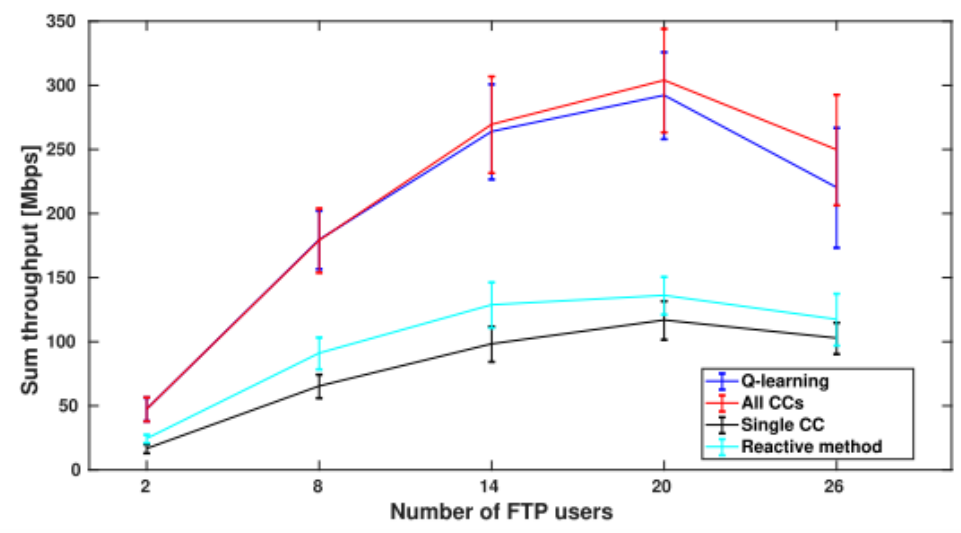
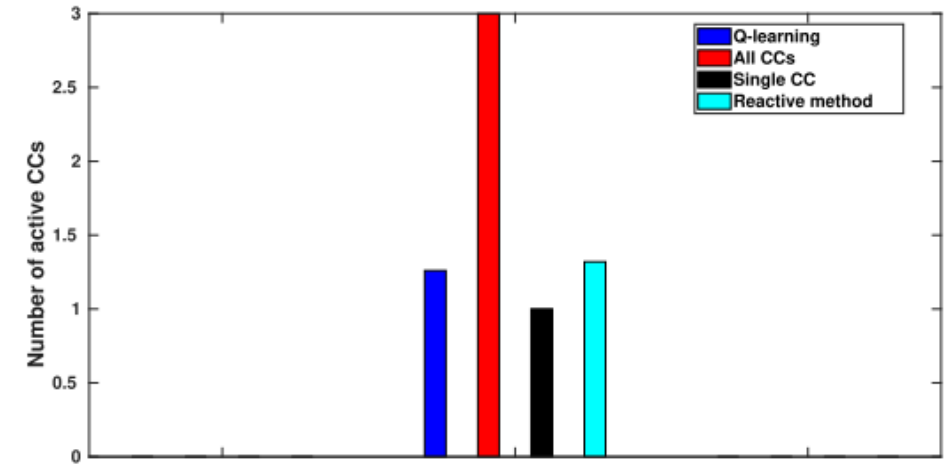
- ✓ Enhanced RAN slicing with transfer reinforcement learning from multiple trainers



H. Zhou, M. Erol-Kantarci, "Knowledge Transfer based Radio and Computation Resource Allocation for 5G RAN Slicing," IEEE CCNC, January 2022.

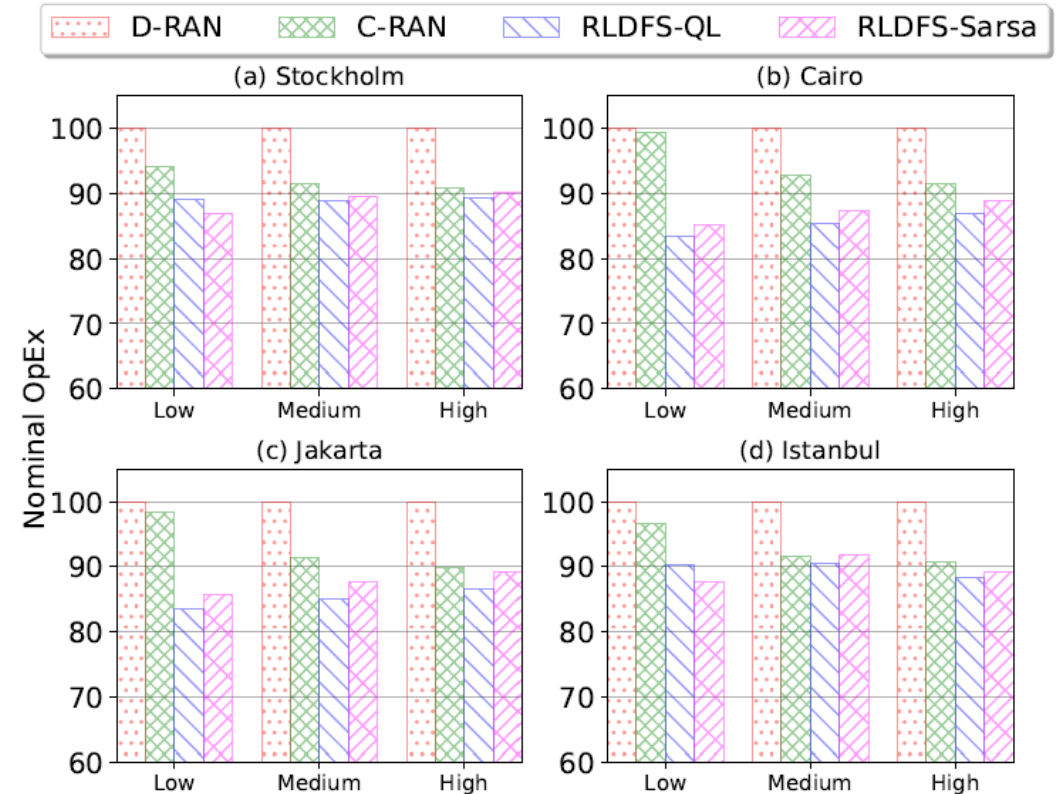
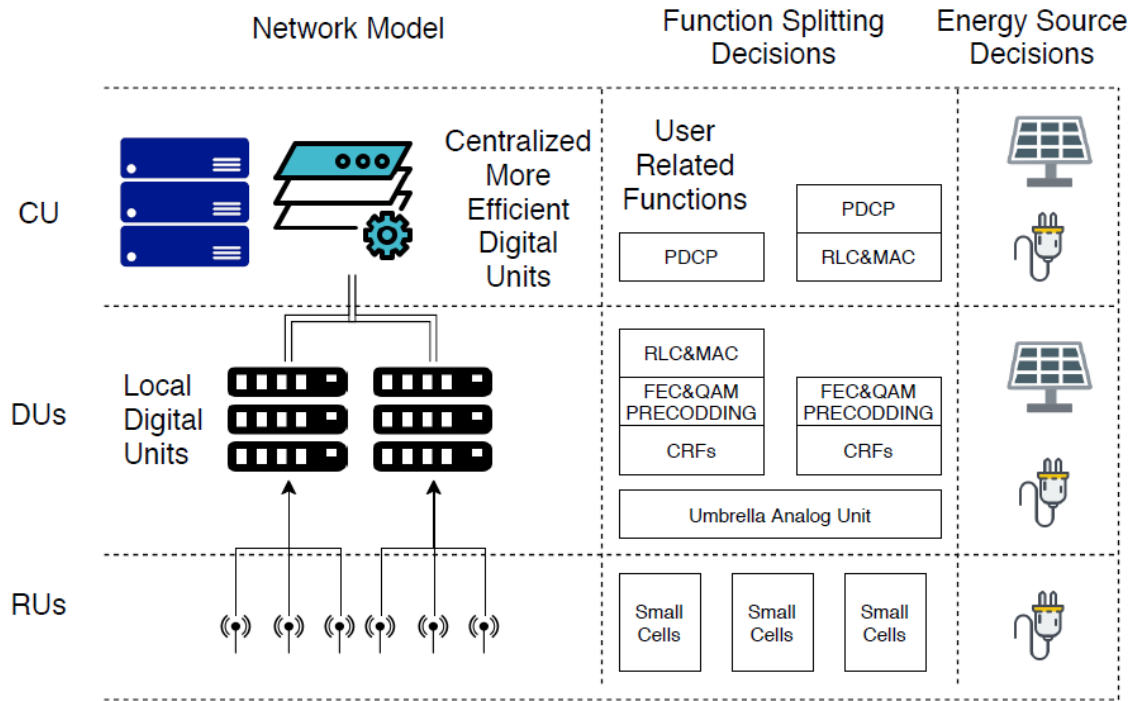
# Carrier Aggregation with Deep Q-Learning

- ✓ Comparable throughput and latency with less energy and control overhead



M. Elsayed, R. Joda, H. Abou-zeid, R. Atawia, A. Bin Sediq, G. Boudreau, M. Erol-Kantarci, "Reinforcement Learning Based Energy-Efficient Component Carrier Activation-Deactivation in 5G," IEEE Globecom, 2021.

# RL-based Dynamic Function Splitting in Green O-RAN

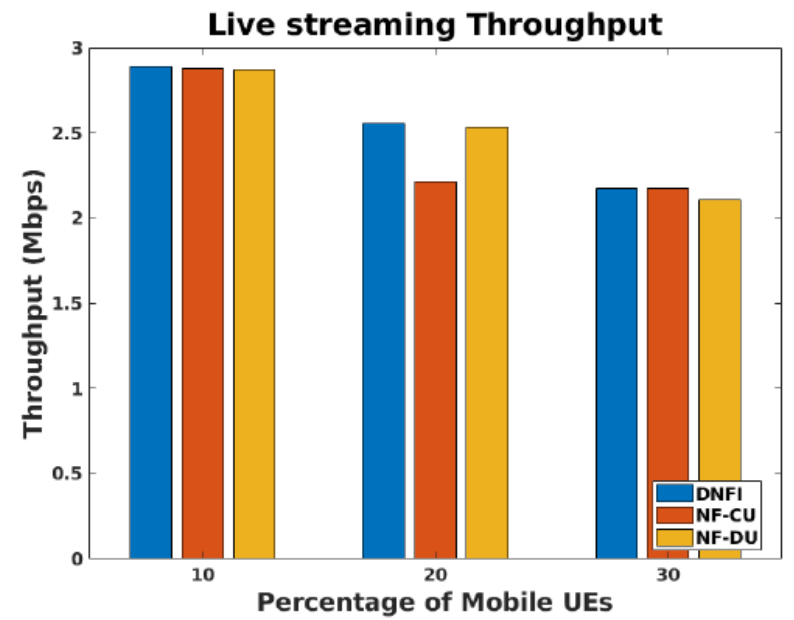
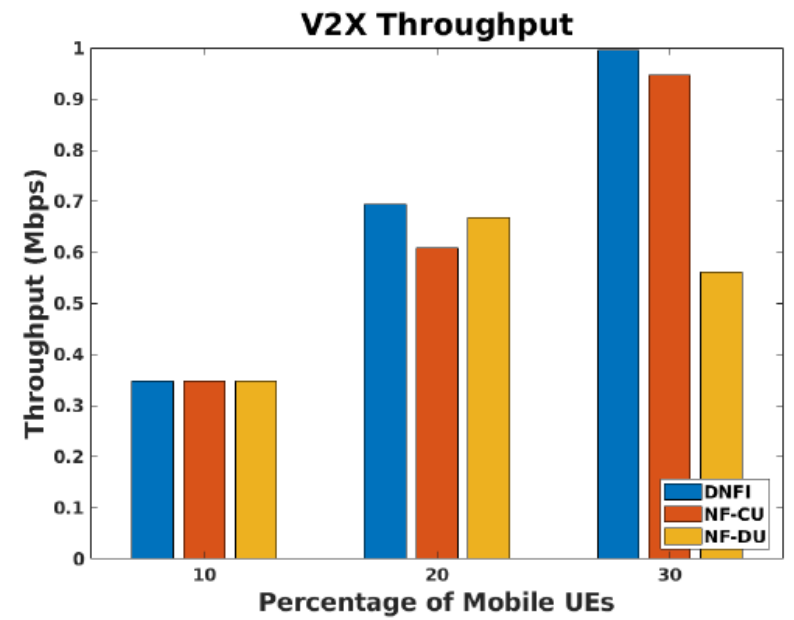


✓ Comparison of RL methods with centralized RAN and distributed RAN approaches for solar radiation in different cities and traffic rates.

T. Pamuklu, M. Erol-Kantarci, C. Ersoy, "Reinforcement Learning Based Dynamic Function Splitting in Disaggregated Green Open RANs, IEEE ICC 2021.

# Dynamic CU-DU Selection for in O-RAN w/ Actor-Critic Learning

- ✓ Two-level actor-critic learning
- ✓ One for resource allocation NF
- ✓ One for CU-DU selection for the NF



S. Mollahasani, M. Erol-Kantarci, R. Wilson, "Dynamic CU-DU Selection for Resource Allocation in O-RAN Using Actor-Critic Learning," IEEE Globecom, 2021.



Thank you!

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