1> imports

Workers.

2> Configuration
with physical unit
scaling (Defining param)

RL Agents & Training

PBFT simulation core
a> Pre-prepare b> prepare c> commit.

Metrics:- a> latency b> Transmission & collision.
c> Energy. d> PER e> Throughput.
f> Margin calcln. g> Eval MAEs.

Reward calculation
a> T_mbps b> L_ms c> E_uj

State Discretization for Q learning:
dc, meanD, PER, N, IF_prob, load.

Q learning Agent

QR-DQN network

Training functions
a> Train QRDQN / Q-learning.

Policy Evaluation
1> Scenario params 2> CSMA / TDMA params.
config Agent

Data structures
(Latency, Energy,
Throughputs)

Scenario and
MAC parameters
(N, Area, v_mean
v_std, IF_prob
bg load, name
CSMA / TDMA params

Defn & Plan

utility functions
a> Path loss (conv.)
b> Packet Error Rate

Kinematics and
Mobility
1> initial_posit.
2> initial_vel.
3> update_posn.

MAC protocol
functions
a> CSMA backoff Delay b> next_tdma_start
c> sync_jitter d> link Delay (and parameters)

PBFT MAC
CORE

Energy and
Throughput calcn
functions
a> count_transmissions, b> calculate Energy
c> calculate Throughput

Context Extraction
Extracting 6D features from current state.

Exports
a> Detailed history.
b> Generate Summary Table.
c> Generate Decision Summary.

Visualization
a> plot Training curves/CDF comparison.
Energy latency Trade-off / Throughput
comparison, / Regime Map, / Action Distb.

~~multi scenario~~ comp.

Statistics & Reporting

Main pipeline.

Main pipeline