**Pure Nash equilibrium**

Evaluate Nash Equilibrium for Signaling Game in WSN

1. Require:
2. Attack cost y, Succes benefit x, Cost of lying as low energy α, Cost of lying as high energy 𝛽, Prior belief of high energy type q
3. Ensure:

 Nash equilibrium strategy profiles for Defender (Sensor Node) and Attacker, Equilibrium payoffs for both players

1. Initialize Game Parameters
2. Set costs and benefits: *y*, *x*, *α*, *β*
3. Set initial belief *q*, the probability that the node is high energy
4. Define Utility Functions
5. Define Defender’s Utility:
6. For high energy type: utility based on signal ("H" or "L")
7. For low energy type: utility based on signal and Attacker’s action (Attack or Not Attack)
8. Define Attacker’s Utility:
9. Utility depends on received signal (H or L) and belief *qq* about Defender’s type
10. Compute Expected Utilities
11. For Defender (Sensor Node):
12. Calculate expected utility for sending "H" signal
13. Calculate expected utility for sending "L" signal
14. For Attacker:
15. Calculate expected utility for actions Attack and Not Attack based on signal and belief *q*
16. Determine Best Response Functions
17. For Defender:
18. Identify the signal ("H" or "L") that maximizes Defender’s utility for each type
19. For Attacker:
20. Choose action (Attack or Not Attack) that maximizes Attacker’s utility based on received signal
21. Check Nash Equilibrium Conditions
22. Update Attacker’s beliefs using Bayes’ rule where possible
23. Ensure sequential rationality:
24. Both players’ chosen strategies maximize their expected utility given the opponent’s strategy
25. Repeat steps 10–21 until no player can increase utility by changing strategy
26. Output Nash Equilibrium
27. Return equilibrium strategy profiles for Defender and Attacker
28. Output equilibrium payoffs for both players