Slide 1: Game Setup - Stag Hunt in Mountain Rescue

> ***Scenario:*** *Two explorer drones discover a critically injured person trapped under heavy debris at 2,000m elevation. The debris requires coordinated lifting for safe extraction.*

Agents:

Explorer Drone 1 Explorer Drone 2

Actions:

- **Coordinate (C):** Commit to synchronised heavy debris lifting
- **Solo (S):** Search for other victims independently

Key Constraint: Heavy debris requires **both drones working together** - solo attempts will fail

Slide 2: Payoffs and Expected Strategies

	Drone 2: Coordinate	Drone 2: Solo
Drone 1: Coordinate	**(8, 8)**	(0, 3)
Drone 1: Solo	(3, 0)	**(3, 3)**

Payoff Interpretation:

- **(8, 8):** Successful coordinated rescue - highest value outcome
- **(3, 3):** Both search independently - moderate success finding others
- **(0, 3):** Coordination failure - one drone wastes time and battery

Slide 3: Nash Equilibrium Analysis

Pure Strategy Nash Equilibria:

- **(Coordinate, Coordinate):** Neither drone benefits from unilateral deviation
- **(Solo, Solo):** Safe strategy preventing coordination failure

Mixed Strategy Equilibrium:

Let p = probability of coordination

Equilibrium condition: 8p = 3

Therefore: **p* = 3/8 = 0.375**

Each drone coordinates 37.5% of the time

Slide 4: Practical Application to Rescue Missions

Strengths of the Stag Hunt Model:

- Captures real coordination risks in time-critical rescue operations
- Reflects trust requirements for high-stakes collaborative tasks
- Models payoff asymmetry between coordinated and solo actions

Practical Solutions:

- **Pre-commitment protocols:** Drones signal coordination intent before approaching
- **Reputation systems:** Track coordination success across missions
- **Communication channels:** Real-time status updates reduce uncertainty

Limitations:

- Assumes perfect information about payoffs
- Ignores dynamic environmental factors (weather, battery levels)

Slide 5: References

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