Technical Appendix
It Is Among Us: Identifying Adversaries in Ad-hoc Domains Using Q-valued Bayesian Estimations

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1 LEVEL-BASED FORAGING BENCHMARK SCENARIOS FURTHER DETAILS

(LBF.a). The first scenario defined to run our experiments. We refer to this in the paper as the "small scenario". Figure 1a illustrates its initial spatial configuration. LBF.a has the following features:

- **Dimensions:** 5×5;
- **Number of Tasks:** 1;
- **Number of Agents:** 3;

Each agent has a type and parameters associated with it, which follows the information presented in Table 1.

Each task is also associated with a weight, which follows the information presented in Table 2.

Table 1: Agents' details in the small scenario (LBF.a).

Agent Index (color)	True Type	Parameters [Radius, Angle,Level]
A (red)	ϕ	[1.0, 1.0, 1.0]
1 (grey)	$l1$	[1.0, 1.0, 1.0]
X (blue)	ψ	[1.0, 1.0, 1.0]

Table 2: Task' details in the small scenario (LBF.a).

Task Position	$(5, 5)$
Weight	1.0

(LBF.b). The second scenario defined to run our experiments. We refer to this in the paper as the "medium scenario". Figure 1b illustrates its initial spatial configuration. LBF.b has the following features:

- **Dimensions:** 9×9;
- **Number of Tasks:** 5;
- **Number of Agents:** 3;

Each agent has a type and parameters associated with it, which follows the information presented in Table 3.

Each task is also associated with a weight, which follows the information presented in Table 4.

Table 3: Agents' details in the medium scenario (LBF.b).

Agent Index (color)	True Type	Parameters [Radius, Angle,Level]
A (red)	ϕ	[1.0, 1.0, 1.0]
1 (grey)	$l1$	[1.0, 1.0, 1.0]
X (blue)	ψ	[1.0, 1.0, 1.0]

Table 4: Tasks' details in the medium scenario (LBF.b).

Task Position	$(3, 3)$	$(7, 7)$	$(7, 3)$	$(3, 7)$	$(5, 5)$
Weight	0.5	0.5	0.5	0.5	0.5

(LBF.c). The third scenario defined to run our experiments. We refer to this in the paper as the "big scenario". Figure 1c illustrates its initial spatial configuration. LBF.c has the following features:

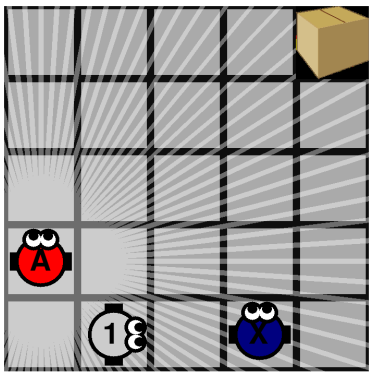
- **Dimensions:** 9×9;
- **Number of Tasks:** 5;
- **Number of Agents:** 5;

Each agent has a type and parameters associated with it, which follows the information presented in Table 5.

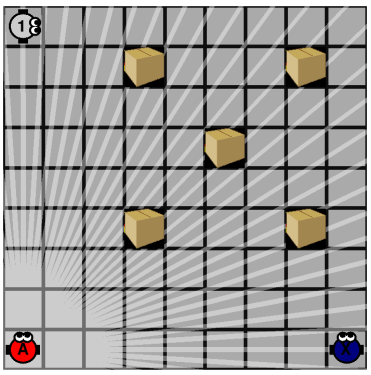
Each task is also associated with a weight, which follows the information presented in Table 6.

(LBF.d). The last scenario defined to run our experiments. We refer to this in the paper as the "cooperative scenario". Figure 1c illustrates its initial configuration. LBF.d has the following features:

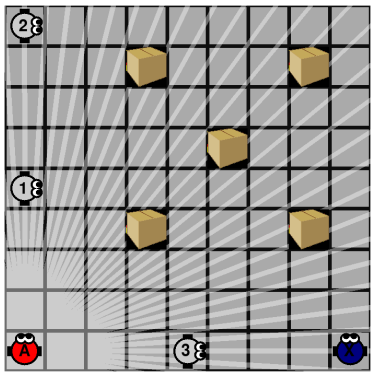
- **Dimensions:** 9×9;
- **Number of Tasks:** 5;
- **Number of Agents:** 5;



(a) Small scenario spatial configuration (LBF.a).



(b) Medium scenario spatial configuration (LBF.b).



(c) Spatial configuration for the big scenario (LBF.c) and the cooperative scenario (LBF.d).

Table 5: Agents' details in the big scenario (LBF.c).

Agent Index (color)	True Type	Parameters [Radius, Angle,Level]
A (red)	ϕ	[1.0, 1.0, 1.0]
1 (grey)	$l1$	[1.0, 1.0, 1.0]
2 (grey)	$l2$	[1.0, 1.0, 1.0]
3 (grey)	$l3$	[1.0, 1.0, 1.0]
X (blue)	ψ	[1.0, 1.0, 1.0]

Each agent has a type and parameters associated with it, which follows the information presented in Table 7.

Each task is also associated with a weight, which follows the information presented in Table 8.

Table 6: Tasks' details in the big scenario (LBF.c).

Task Position	(3, 3)	(7, 7)	(7, 3)	(3, 7)	(5, 5)
Weight	0.5	0.5	0.5	0.5	0.5

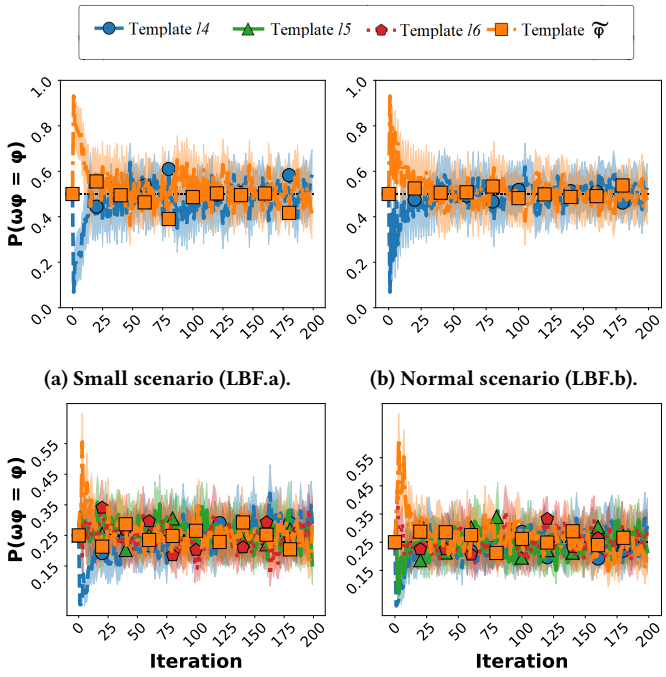
Table 7: Agents' details in the cooperative scenario (LBF.d).

Agent Index (color)	True Type	Parameters [Radius, Angle,Level]
A (red)	ϕ	[1.0, 1.0, 0.1]
1 (grey)	$l1$	[1.0, 1.0, 0.3]
2 (grey)	$l2$	[1.0, 1.0, 0.4]
3 (grey)	$l3$	[1.0, 1.0, 0.5]
X (blue)	ψ	[1.0, 1.0, 0.6]

Table 8: Tasks' details in the cooperative scenario (LBF.d).

Task Position	(3, 3)	(7, 7)	(7, 3)	(3, 7)	(5, 5)
Weight	0.5	0.5	0.5	0.5	0.5

2 ADDITIONAL PLOTS FOR RESULTS VISUALISATION



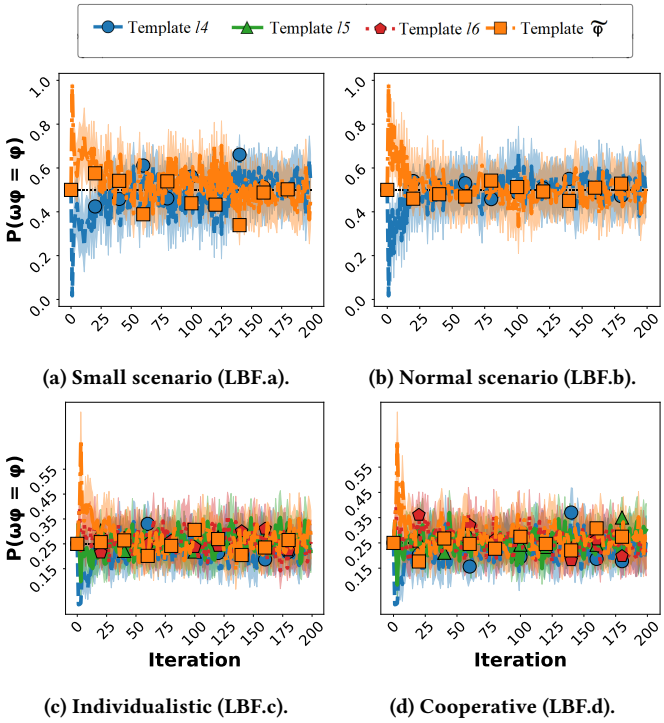
(a) Small scenario (LBF.a).

(b) Normal scenario (LBF.b).

(c) Individualistic (LBF.c).

(d) Cooperative (LBF.d).

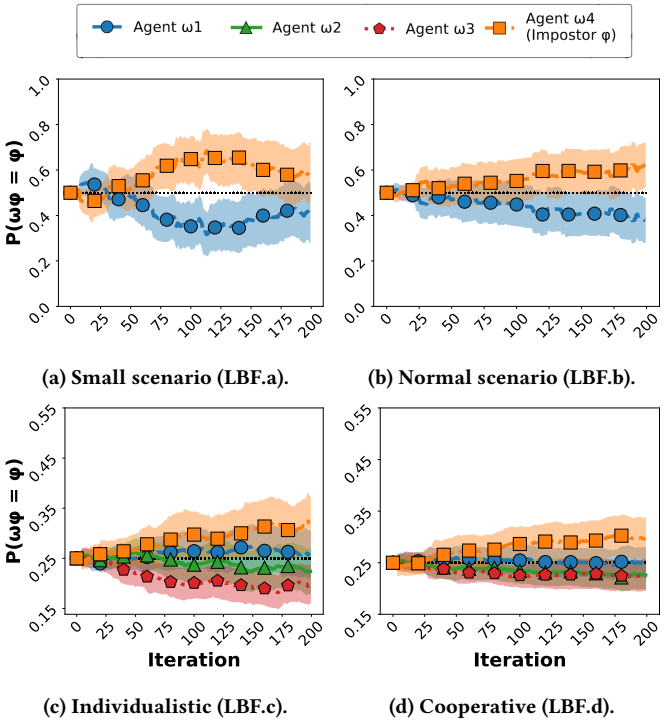
Figure 2: AGA's impostor probability across iteration per template type for each defined scenario in the LBF environment.



(a) Small scenario (LBF.a). (b) Normal scenario (LBF.b).

(c) Individualistic (LBF.c). (d) Cooperative (LBF.d).

Figure 3: ABU's impostor probability across iteration per template type for each defined scenario in the LBF environment.



(a) Small scenario (LBF.a). (b) Normal scenario (LBF.b).

(c) Individualistic (LBF.c). (d) Cooperative (LBF.d).

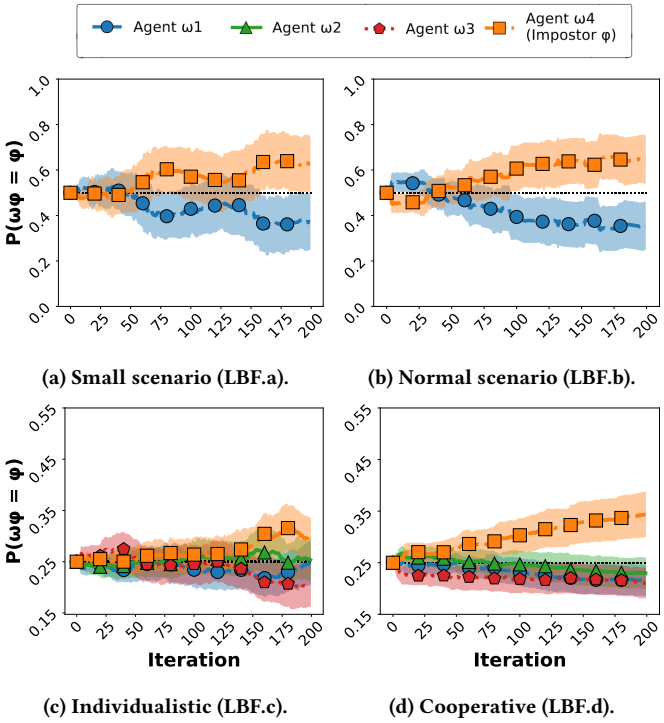
Figure 4: AGA-BAE's impostor probability across iteration per agent for each defined scenario in the LBF environment.

3 ADDITIONAL INFORMATION

Hyper-parameters. Considering the MCTS-based algorithms, the hyper-parameters used in the paper follow:

- Discount factor for future rewards $\gamma = 0.95$;
- Maximum depth for the tree is 25;
- Maximum number of simulations equals to 250 per search.

Hardware and System information. Each experiment run was performed in a single node of a high-performance cluster, containing 16 Intel Ivy Bridge cores with 64GB of RAM.



(a) Small scenario (LBF.a). (b) Normal scenario (LBF.b).

(c) Individualistic (LBF.c). (d) Cooperative (LBF.d).

Figure 5: ABU-BAE's impostor probability across iteration per agent for each defined scenario in the LBF environment.