Table 1: Comparison of Φ-regret minimizing algorithms for extensive-form games. †: Only applies to single-step Bayesian games, not general extensive-form games. ‡: Theorems 3.1 and 3.2 are the special cases of Theorem 3.4 when $d = 1$.

Citation	**Deviation set** (Φ)	**Number of rounds**
Zinkevich et al. [2007]	External (Constant)	N^2/ϵ^2
Farina et al. [2022b]	External (Constant)	N/ϵ^2
Farina et al. [2022a]	Trigger	N^2/ϵ^2
Fujii [2023] †	Linear	N/ϵ^2
Ours (Theorems 3.1‡, 3.4)	k-mediator deviations	$N^{O(k)}/\epsilon^2$
Ours (Theorems 3.2‡, 3.4)	Degree-k polynomials	$N^{O(kd)^3}/\epsilon^2$
Farina and Pipis [2023], Zhang et al. [2024]	Linear	N^4/ϵ^2
Peng and Rubinstein [2024], Dagan et al. [2024]	Swap	$N^{\tilde{O}(1/\epsilon)}$

Table 2: Time complexity for computing ϵ-correlated equilibria in n-player normal-form games with A actions per player. The second column suppresses absolute constants and polylogarithmic factors. For simplicity, issues related to bit complexity have been ignored.

Reference	**Time complexity**
Ours (Corollary 4.1)	$\frac{A}{\epsilon^2}\left(\mathsf{EO}(n, A) + n\frac{A^2}{\epsilon}\right)$
[Anagnostides et al., 2022, Daskalakis et al., 2021]	$\frac{A}{\epsilon}\left(\mathsf{EO}(n, A) + nA^\omega\right)$
[Dagan et al., 2024, Peng and Rubinstein, 2024]	$nA\log^{1/\epsilon}(nA)$
[Papadimitriou and Roughgarden, 2008]	$(nA)^c\mathsf{EO}(n, A)$ for $c \gg 1$
[Huang and Pan, 2023]	$\frac{A^2}{\epsilon^2}(nA^\omega)$

References

Ioannis Anagnostides, Constantinos Daskalakis, Gabriele Farina, Maxwell Fishelson, Noah Golowich, and Tuomas Sandholm. Near-optimal no-regret learning for correlated equilibria in multi-player general-sum games. In *STOC '22: 54th Annual ACM SIGACT Symposium on Theory of Computing, 2022*, pages 736–749. ACM, 2022.

Yuval Dagan, Constantinos Daskalakis, Maxwell Fishelson, and Noah Golowich. From external to swap regret 2.0: An efficient reduction and oblivious adversary for large action spaces. *Proceedings of the Annual Symposium on Theory of Computing (STOC)*, 2024.

Constantinos Daskalakis, Maxwell Fishelson, and Noah Golowich. Near-optimal no-regret learning in general games. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NeurIPS)*, pages 27604–27616, 2021.

Gabriele Farina and Charilaos Pipis. Polynomial-time linear-swap regret minimization in imperfect-information sequential games. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2023.

Gabriele Farina, Andrea Celli, Alberto Marchesi, and Nicola Gatti. Simple uncoupled no-regret learning dynamics for extensive-form correlated equilibrium. *Journal of the ACM*, 69(6), 2022a.

Gabriele Farina, Chung-Wei Lee, Haipeng Luo, and Christian Kroer. Kernelized multiplicative weights for 0/1-polyhedral games: Bridging the gap between learning in extensive-form and normal-form games. In *International Conference on Machine Learning (ICML)*, pages 6337–6357. PMLR, 2022b.

Kaito Fujii. Bayes correlated equilibria and no-regret dynamics. *CoRR*, abs/2304.05005, 2023.

Zhiming Huang and Jianping Pan. A near-optimal high-probability swap-regret upper bound for multi-agent bandits in unknown general-sum games. In *Proceedings of the Conference on Uncertainty in Artificial Intelligence (UAI)*, 2023.

Christos H. Papadimitriou and Tim Roughgarden. Computing correlated equilibria in multi-player games. *Journal of the ACM*, 55(3): 14:1–14:29, 2008.

Binghui Peng and Aviad Rubinstein. Fast swap regret minimization and applications to approximate correlated equilibria. *Proceedings of the Annual Symposium on Theory of Computing (STOC)*, 2024.

Brian Hu Zhang, Gabriele Farina, and Tuomas Sandholm. Mediator interpretation and faster learning algorithms for linear correlated equilibria in general extensive-form games. In *International Conference on Learning Representations (ICLR)*, 2024.

Martin Zinkevich, Michael Bowling, Michael Johanson, and Carmelo Piccione. Regret minimization in games with incomplete information. In *Proceedings of the Annual Conference on Neural Information Processing Systems (NIPS)*, 2007.