We thank reviewers (R1,R2,R3,R5) for their insightful comments. All reviewers agree that the main quantity proposed in the paper, *policy-change density*, is novel and the proposed decomposition of policy change over active information set, can be potentially impactful for research in incomplete information games (IIG), in which unlike perfect information game, policies at different information sets can influence each others in involved ways. Most reviewers agree that experiments on simple games and Bridge bidding are interesting.

We thank R5 for pointing out that the "decomposition challenges" in IIG are critical for equilibrium construction where the problem is "even worse than described, with behaviour at an information set being entangled across the game tree, not just due to downstream reachability." Therefore, our paper could have stronger implications than we expect. We will make connections to CFR-D, continual resolving, etc, which are for subgame solving in zero-sum 2-player games. We disagree with R2 that the tabular form of JPS indeed has theoretical guarantees, as appreciated by other reviewers.

Generality. Our framework can be extended to general-sum games, by replacing the scalar value v^σ with vector values $\mathbf{v}^\sigma \in \mathbb{R}^C$, where C is the number of players. The i-th component of $\mathbf{v}^\sigma$ is the utility of player i. Other terms (e.g., $c^{\sigma,\sigma'}$ and $\rho^{\sigma,\sigma'}$) are based on v^σ and can be similarly vectorized. In this paper we dig deep in pure collaborative settings and apply JSP for competitive Bridge bidding to improve the collaboration within the team, under the self-play framework.

Comparison with WBridge5 R2,R5. We are aware of the potential unfairness of comparing with WBridge5 only at Bridge bidding phase (line 251-253), including **(1)** WBridge5 conforms to human convention but JPS can be creative, **(2)** WBridge5 optimizes for the results of real Bridge playing rather than double-dummy scores (DDS) that assumes full information during playing. While we will *tune down the claim* as suggested by R2,R5, fully addressing these problems requires substantial future work, as R2 points out. For now, to verify our bot, we choose to evaluate against WBridge5, which is an independent baseline tested extensively with both AI and human players. Full game AI is a future work.

Connection to CFR. R5 makes a great point that similarity exists between our policy-change density (Eqn. 6 in our paper) and regret notation (Eqn. 7 in[1]). The key difference here is that we use the total reachability $\pi^{\sigma'}$ evaluated on the *new* policy σ', while CFR uses the except-player-i reachability π^σ_{-i} evaluated on the *old* policy σ.

This change leads to very different (and novel) theoretical insights. It leads to policy-change decomposition in Thm. 1, and enables the proposed search algorithm (Alg. 1) with guarantees. Furthermore, our decomposition formula *exactly* captures the value difference before and after policy changes, while in CFR, summation of the regret notion is *an upper bound* of the Nash exploitability. Our advantage comes with a price: the regret in CFR only depends on the old policy σ and can be computed independently at each infoset, while computing our policy-change density requires a re-computation of the altered reachability due to new policy σ' on the upstream infosets. From the derivation, we could also see that CFR requires the condition of *perfect recall* to ensure that no double counting exists so that the upper bound can hold (Eqn. 15 in[1]), while our formula does not require that. We will add comparisons in the next version.

Concern in correctness of Lemma 2. R5 expresses "biggest concerns" that in Eqn. 15, the quantity $c(z)$ is defined differently than its original definition (Eqn. 3, line 136). Due to an editing error, the last equality "$= \sum_{z\in Z} c(z)$" in Eqn. 15 is unnecessary and shouldn't appear. As suggested by R3, there is a typo in Eqn. 14: it should be "$v^{\sigma'}(h_0) = \sum_{z\in Z} \pi^{\sigma'}(z|h_0)v(z)$". The remaining part of Lemma 2 is consistent. We apologize for editing errors. Experiments show that the game value difference $\bar{v}^{\sigma'} - \bar{v}^\sigma$ from Thm. 1 always coincides with naive computation, with much faster speed. [R1] E.g., for each iteration in SimpleBidding (Def. 2), for $N = 8$ JPS takes $\sim$ 1s while brute-force takes $\sim$ 4s; for $N = 16$ and $d = 3$ JPS takes $\sim$ 20s while brute-force takes $\sim$ 260s.

Bidding conventions. As said by R2 and R5, by Law 40 of Contract Bridge[2], before the game starts both team needs to fully disclose the meaning of their bids and answer questions accordingly. In Computer Bridge Tournament, conventions needs to be disclosed 1 month beforehand for other bots to adapt[3]. For WBridge5, its convention is fixed[4] and it seems that a manual change of its internal logic is needed, which is not possible without the code.

JPS on other policies [R1]. Except for Comm (Def. 1) that JPS always gets 1.0, uniform random+JPS converges to local minima that CFR is immune to, and underperforms CFR1k+JPS. Compared to CFR1k+JPS, BAD+JPS is worse (10.47 vs 10.56 for $N = 16$) in Simple Bidding but *better* ($1.12/1.71/2.77$ vs $1.07/1.71/2.74$ for $N = 3/4/5$) in 2-Suited-Bridge. We leave these interesting interplays between methods for future study. Except for brute-force and JPS, we are not aware of other methods with the same non-worsening guarantee for policy update in cooperative IIGs.

Other issues. [R1] *"Percentage of Search"*: in non-tabular version of JPS, estimation of v^σ runs in parallel with Alg. 1. The percentage determines the ratio of threads running estimation to those running Alg. 1. Direct comparison with [18] is not possible due to unpublished code. [R5] In performance like "$\mu \pm \sigma_\mu$", σ_μ is the standard deviation of the estimated mean μ. $\sigma_\mu \sim 1/\sqrt{N}$ for N samples. In Table 1, all σ_μ are small ($\sim 10^{-2}$) and omitted. Superscript $*$ = one of the trials gets the best solution. *"Reachability"*: π^σ includes chance and all agents playing under σ. We will fix all typos, add more citations and discussions and release the code with detailed instructions in the next revision.

[1] https://poker.cs.ualberta.ca/publications/NIPS07-cfr.pdf
[2] https://www.acbl.org/conduct-and-ethics/active-ethics/#Disclosure
[3] https://www.allevybridge.com/allevy/computerbridge/icgaj.html
[4] https://github.com/jdh8/wbridge5.book