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Supplementary Material - Scalable Job Recommendation with Lower Congestion using Optimal Transport

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I. BASELINE COMPARISON

Here we compare the methods in terms of the desirability measures and congestion-related measures. Figures 1-24 show the performance of all methods, where they all compare a desirability measure (NDCG, Recall, or Hit Rate) and a congestion-related measure (Congestion, Coverage, or Gini Index). We can observe that for some selections of hyper-parameters, `ReCon` usually finds a good trade-off between both measures.

II. PERFORMANCE OF A SINGLE VARIATION OF RECON

In this section, we provide parallel coordinates plots for tracking the performance of `ReCon` with each value of λ across multiple evaluation measures. Figures 25-32 show the performance of a single variation of `ReCon` with a specific λ for each dataset and each method (CNE or NN). The performance of the base model is indicated by $\lambda = 0$.

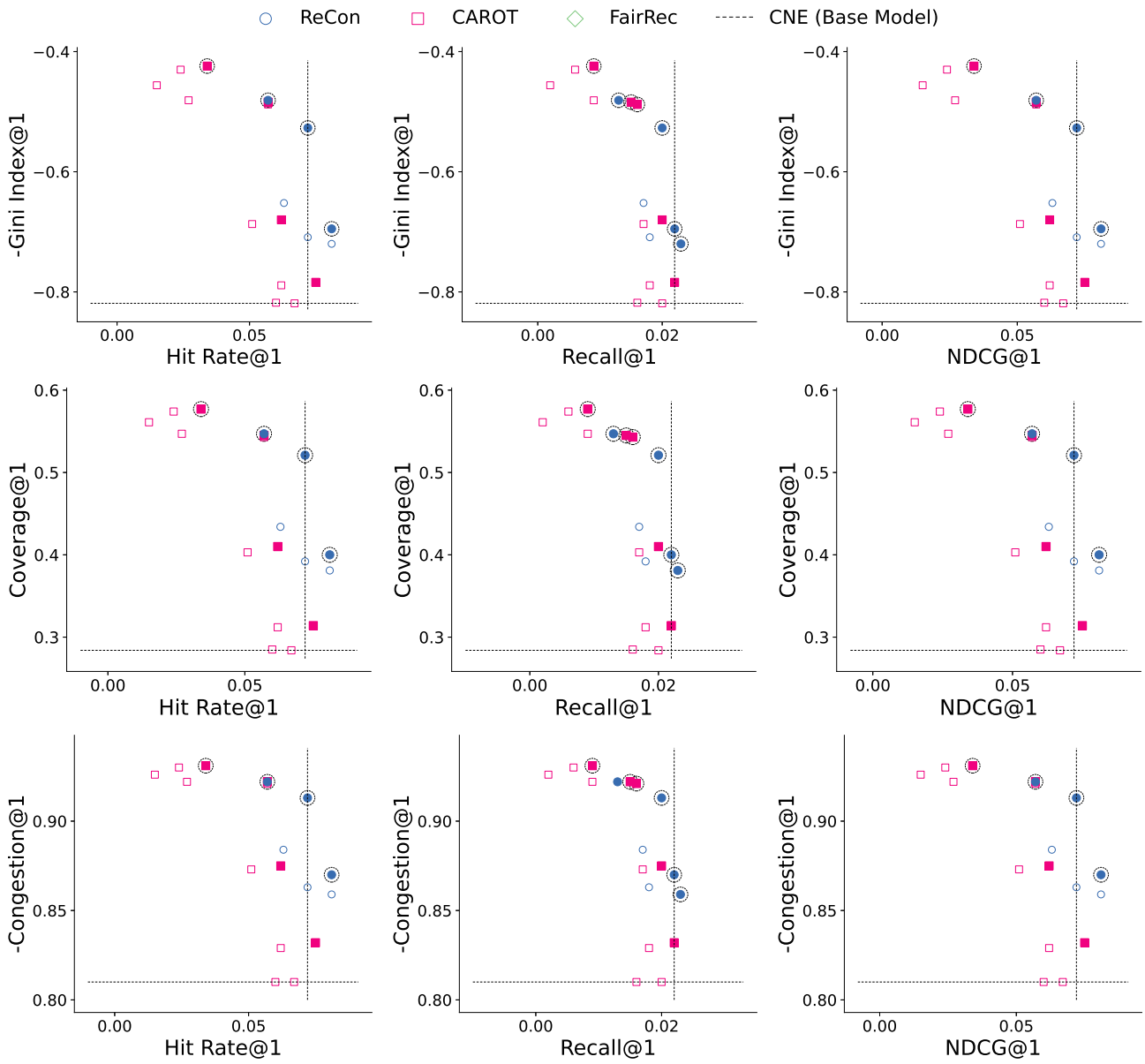


FIGURE 1: Desirability versus congestion-related measures in VDAB-S dataset with CNE for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

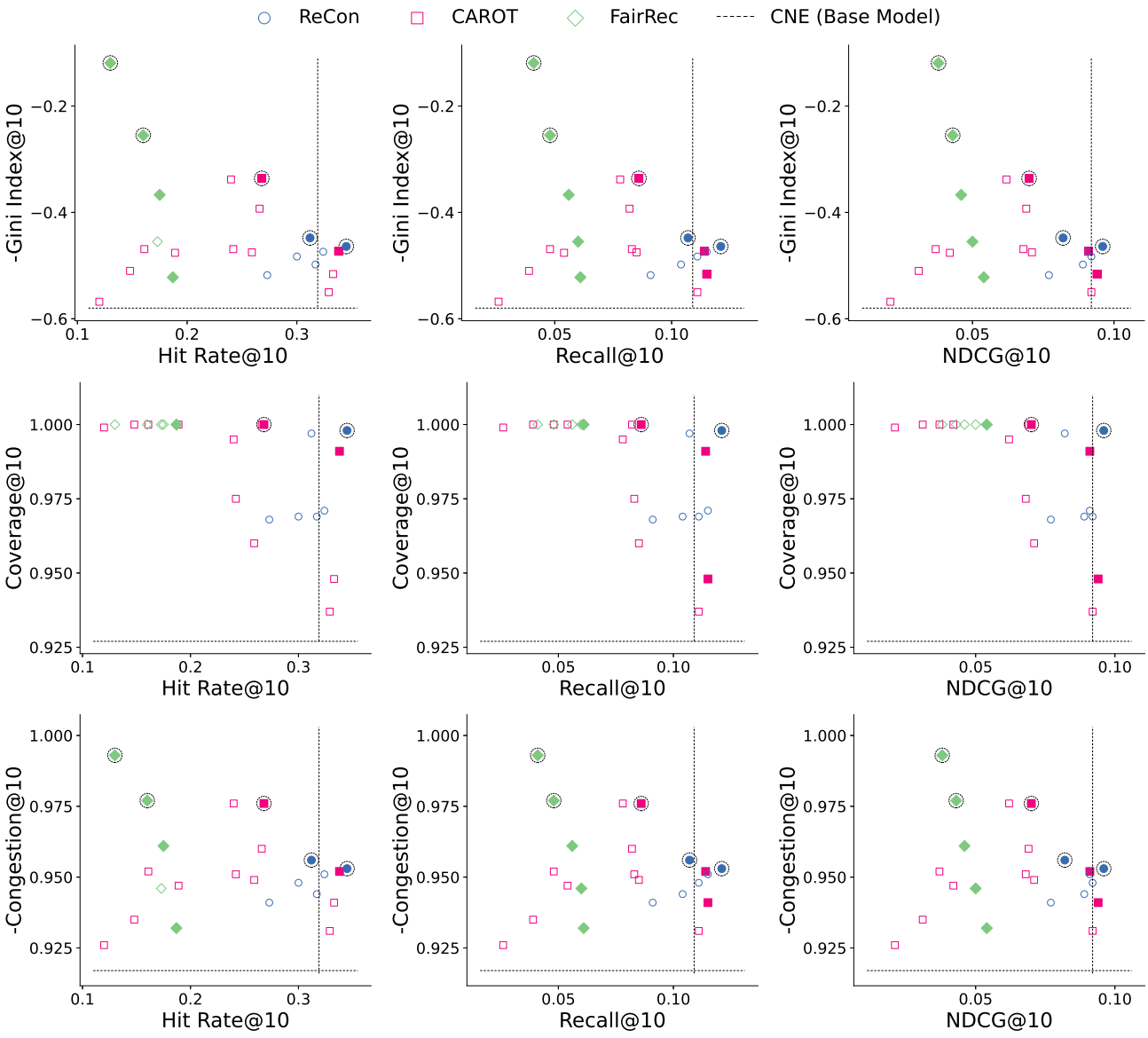


FIGURE 2: Desirability versus congestion-related measures in VDAB-S dataset with CNE for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

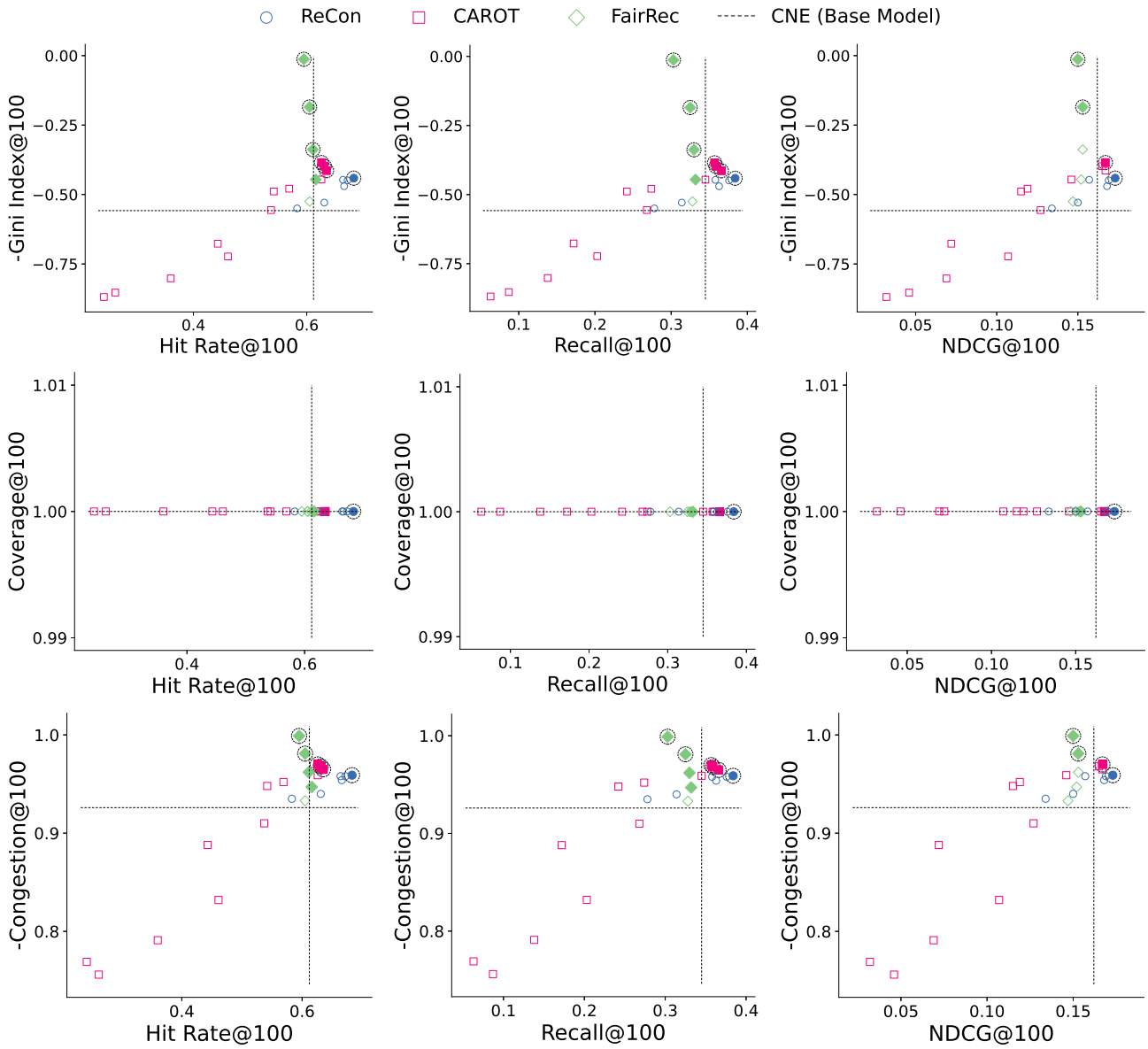


FIGURE 3: Desirability versus congestion-related measures in VDAB-S dataset with CNE for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

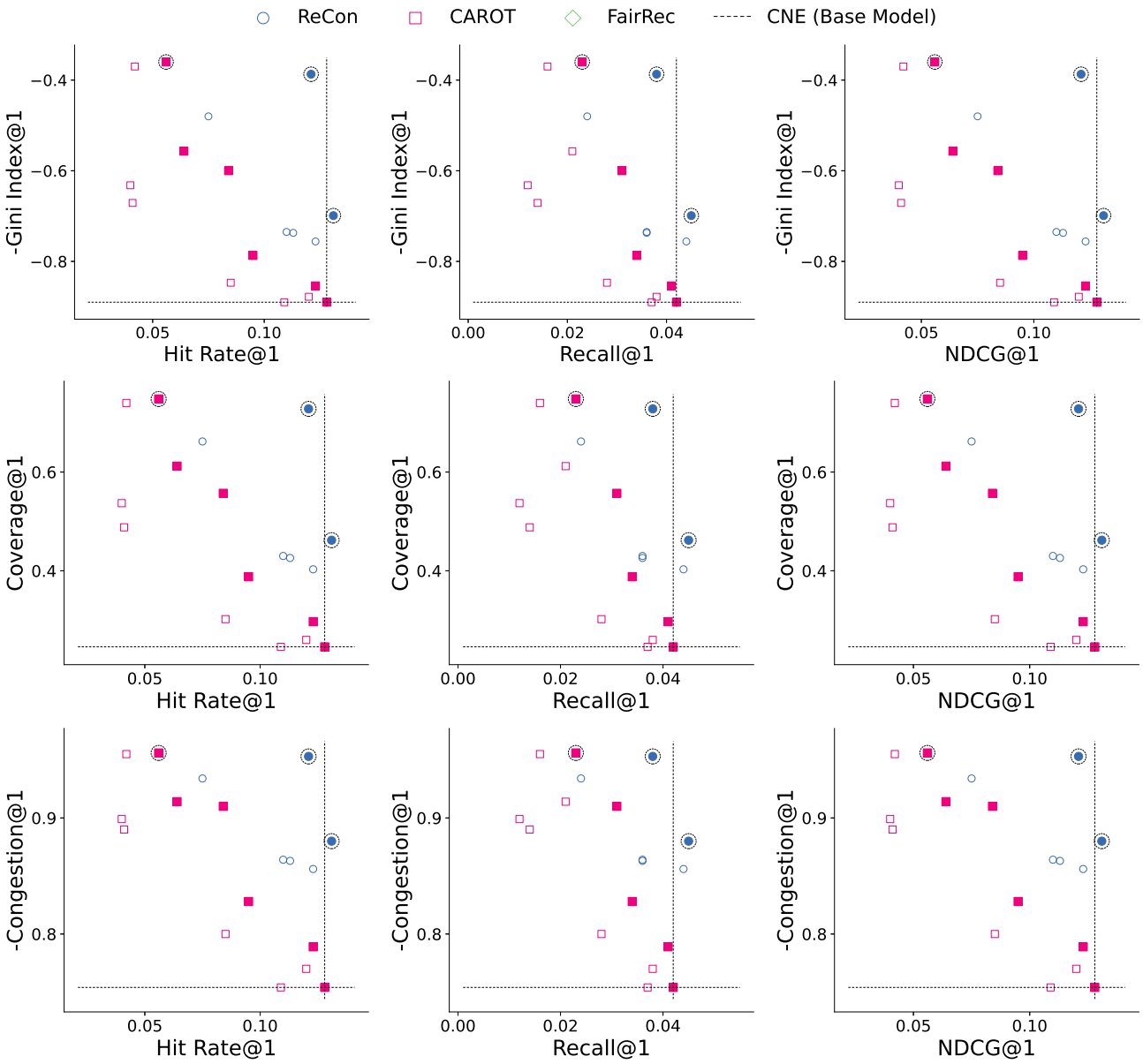


FIGURE 4: Desirability versus congestion-related measures in CareerBuilder-S dataset with CNE for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

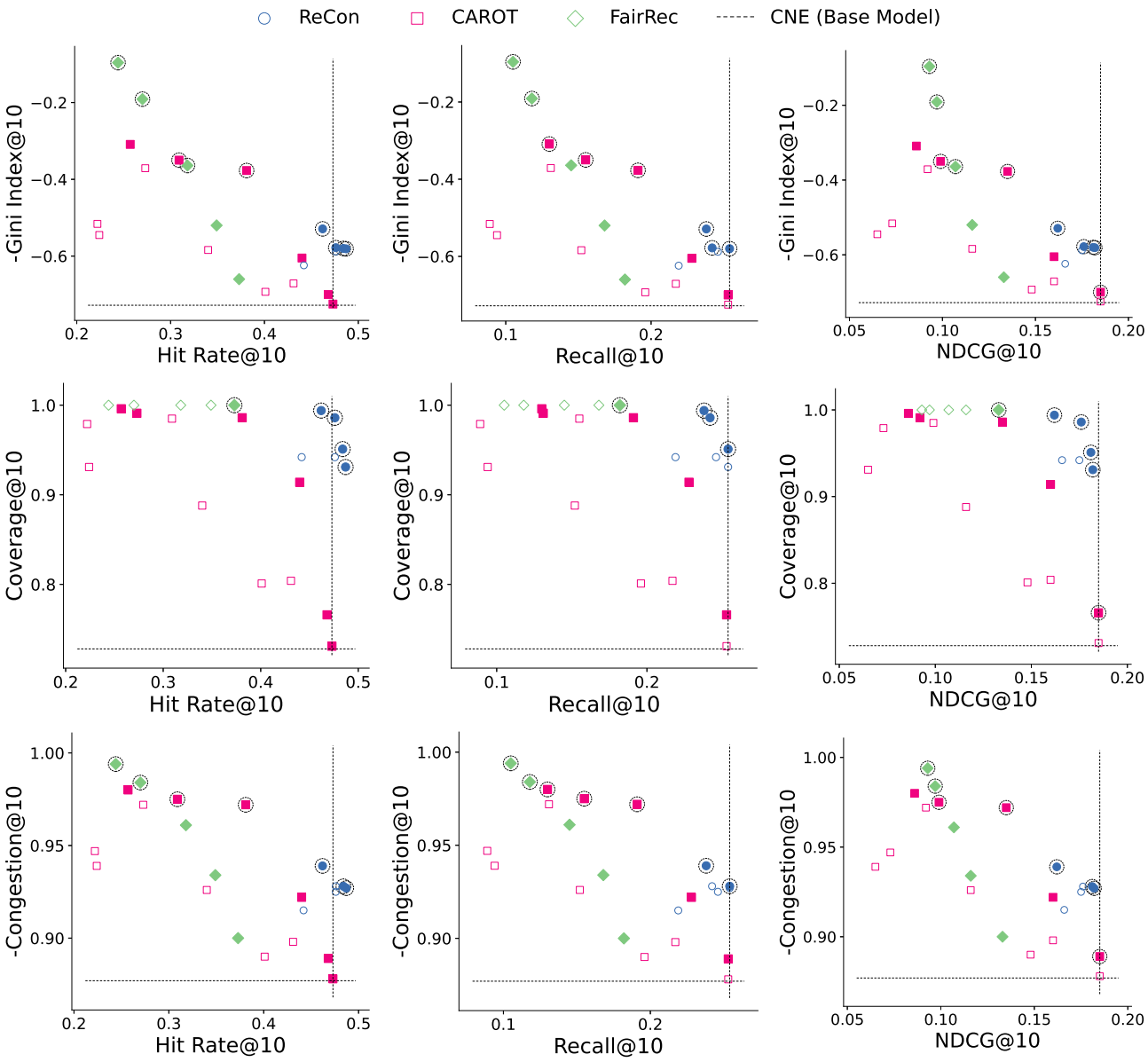


FIGURE 5: Desirability versus congestion-related measures in CareerBuilder-S dataset with CNE for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

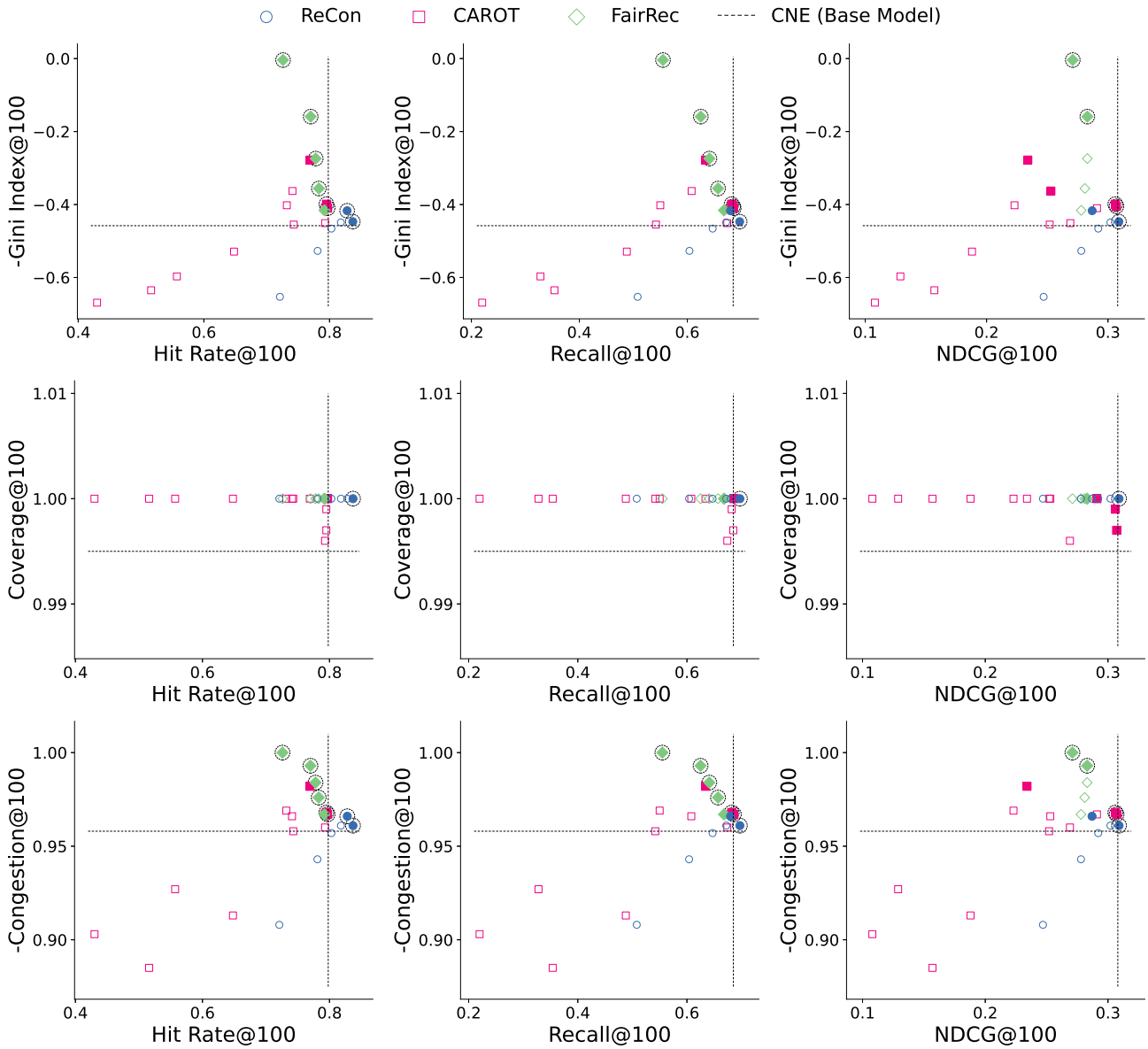


FIGURE 6: Desirability versus congestion-related measures in CareerBuilder-S dataset with CNE for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

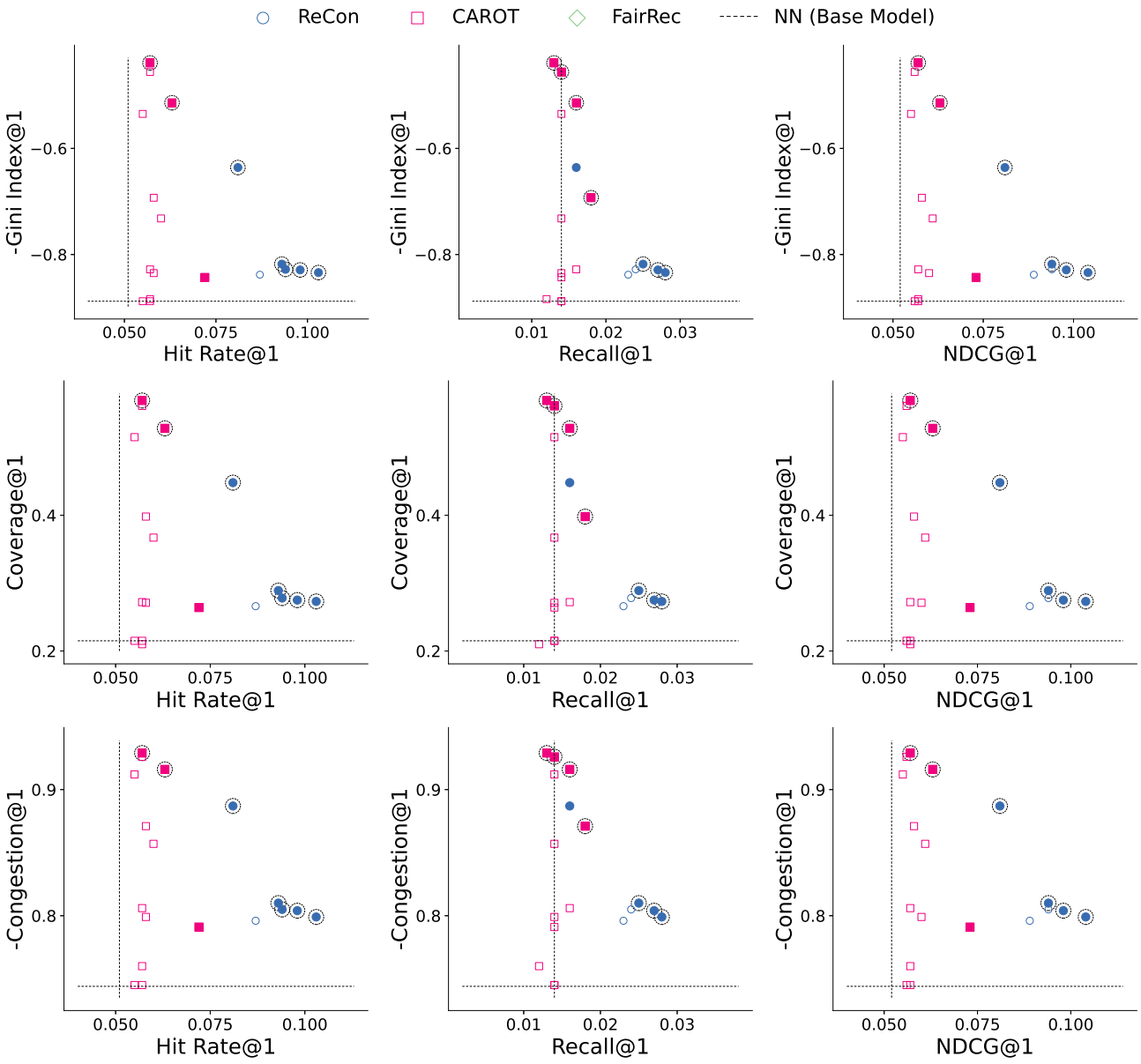


FIGURE 7: Desirability versus congestion-related measures in VDAB-S dataset with NN for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

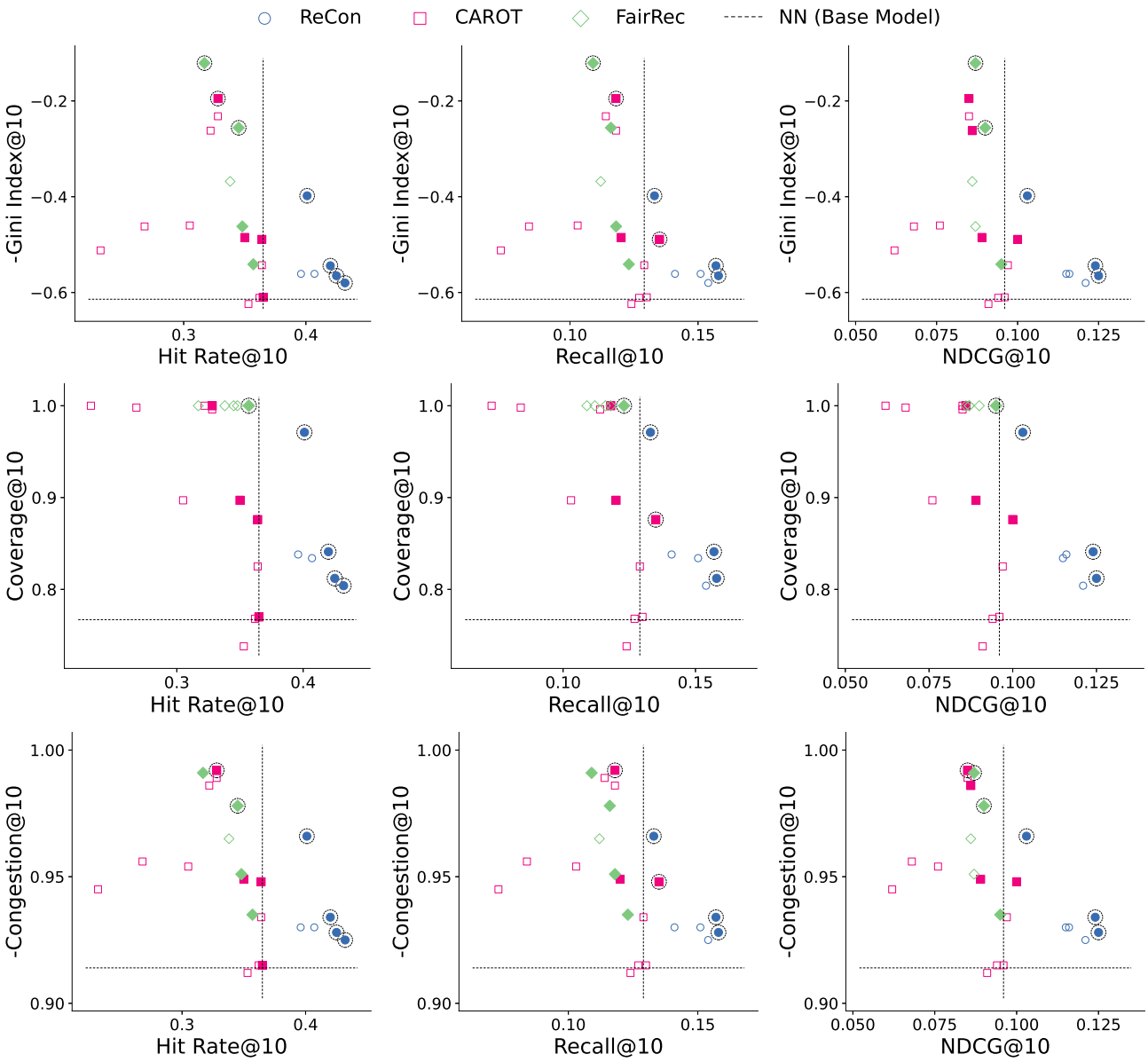


FIGURE 8: Desirability versus congestion-related measures in VDAB-S dataset with NN for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

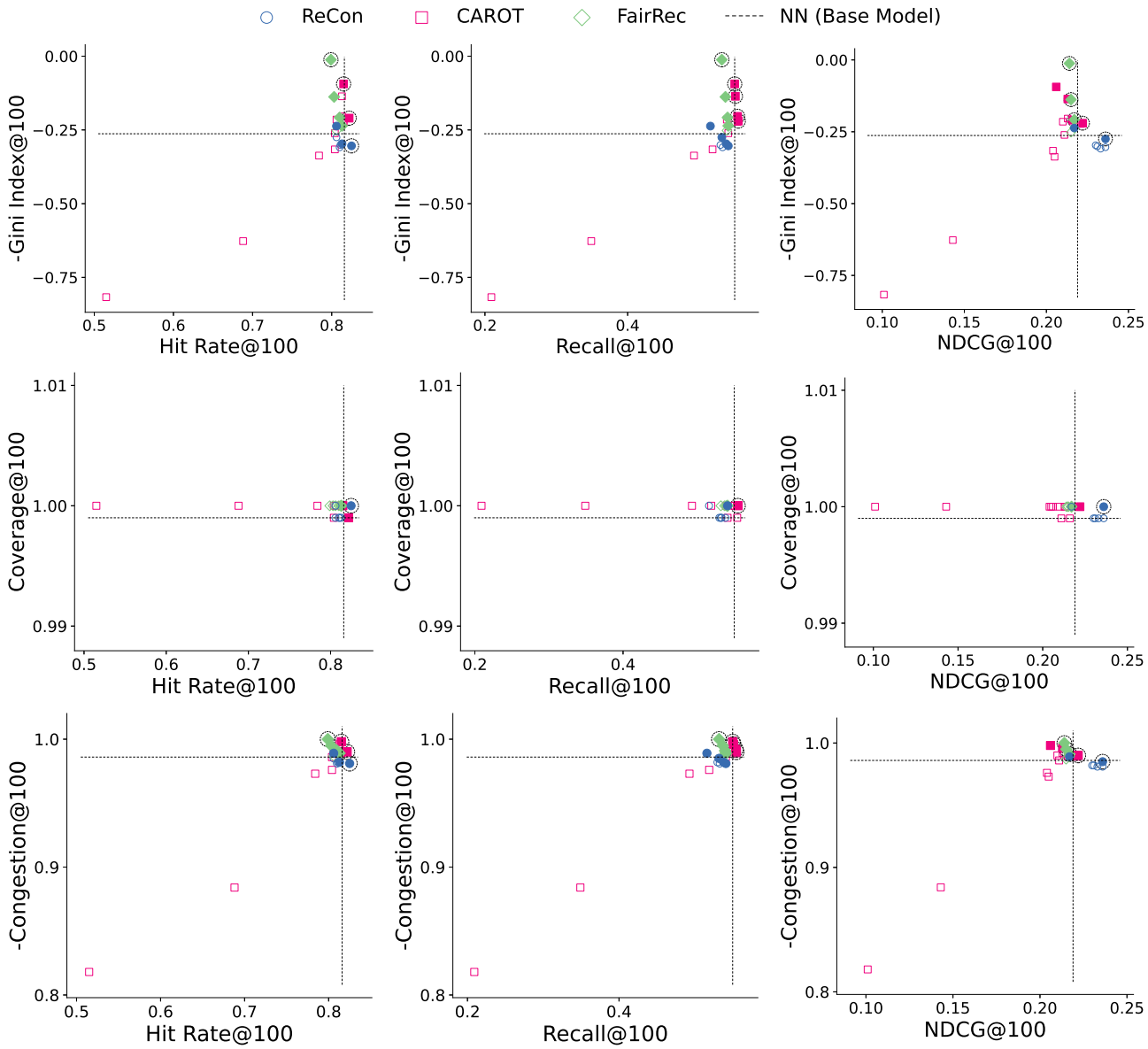


FIGURE 9: Desirability versus congestion-related measures in VDAB-S dataset with NN for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

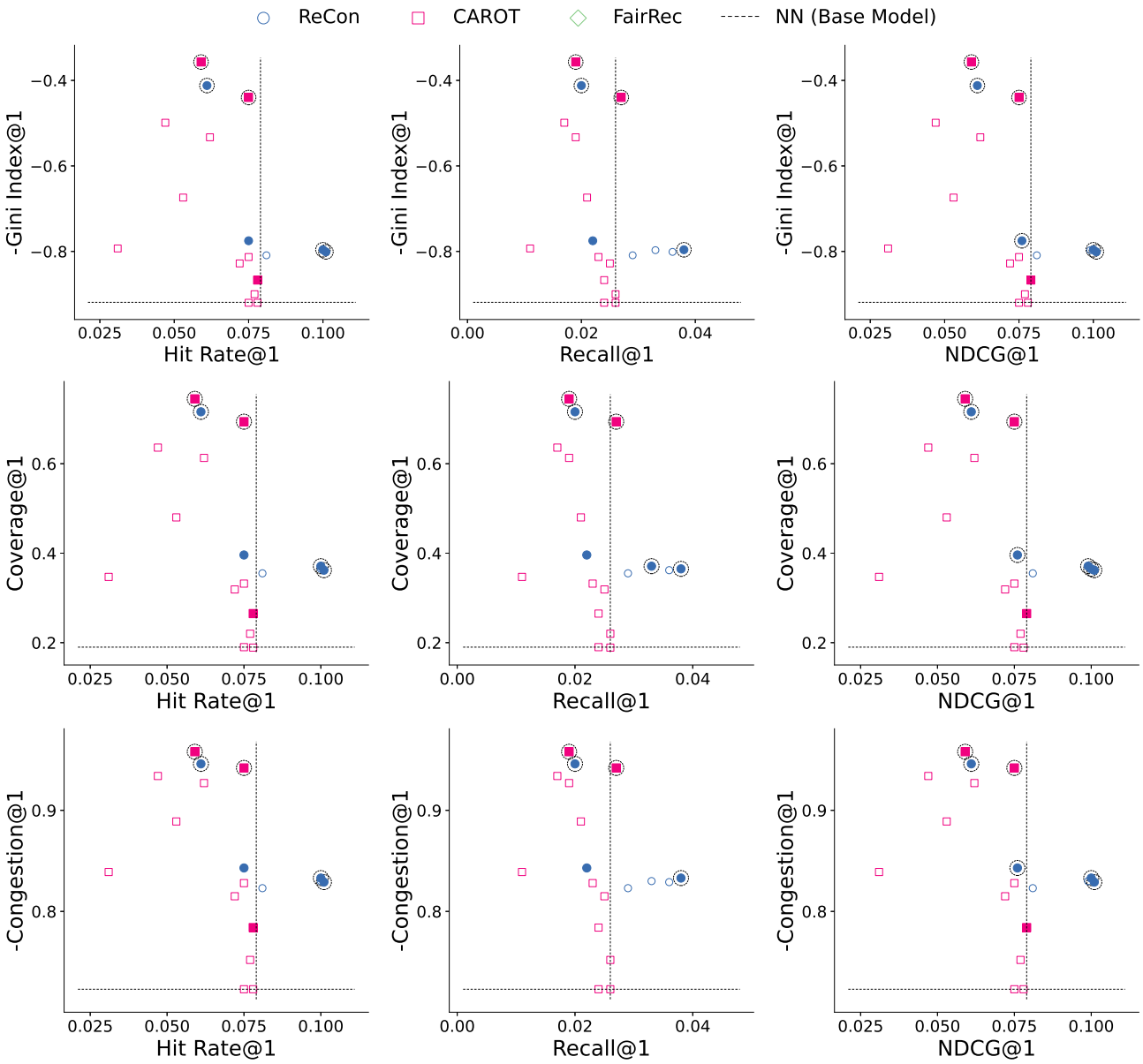


FIGURE 10: Desirability versus congestion-related measures in CareerBuilder-S dataset with NN for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

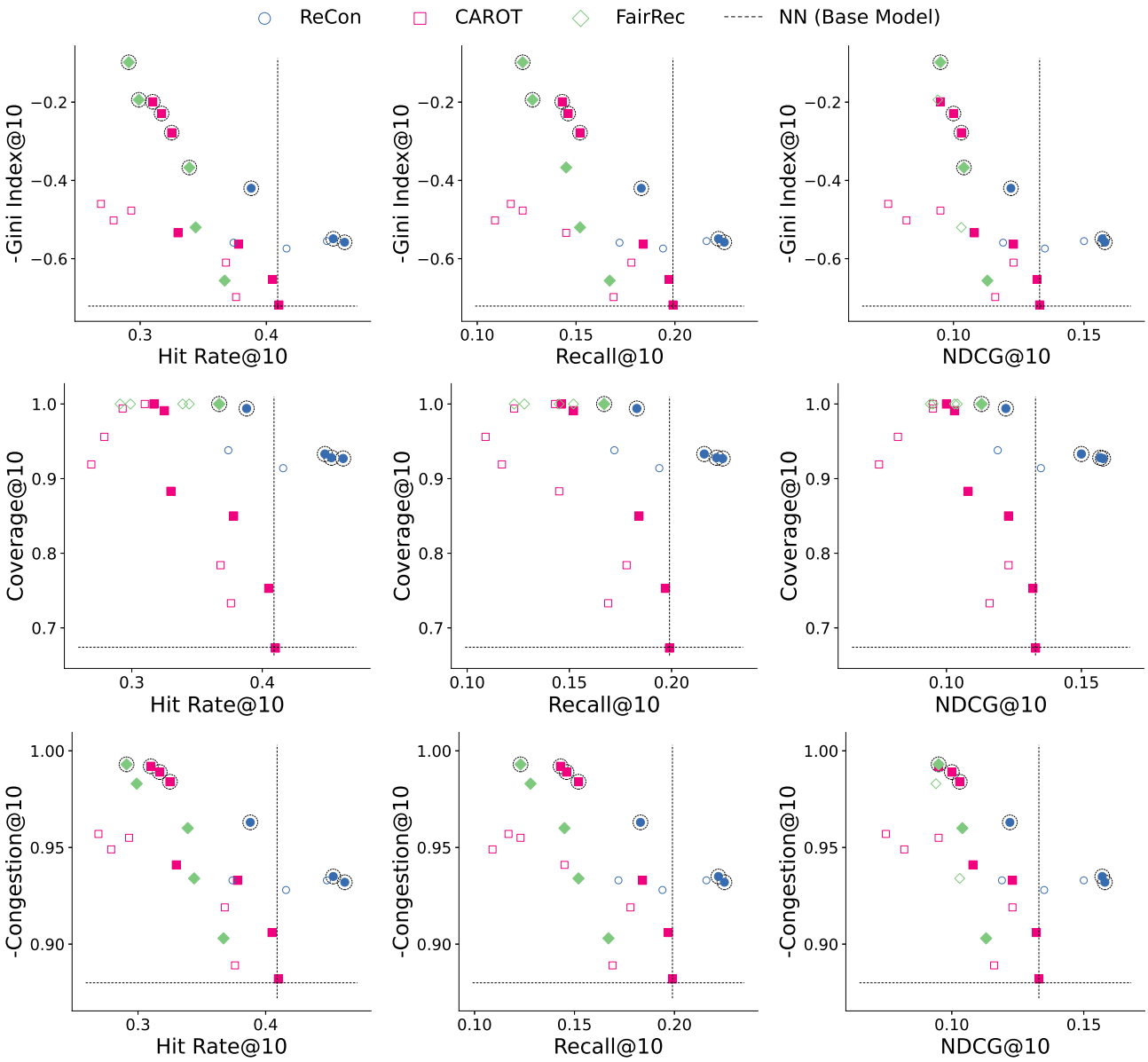


FIGURE 11: Desirability versus congestion-related measures in CareerBuilder-S dataset with NN for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

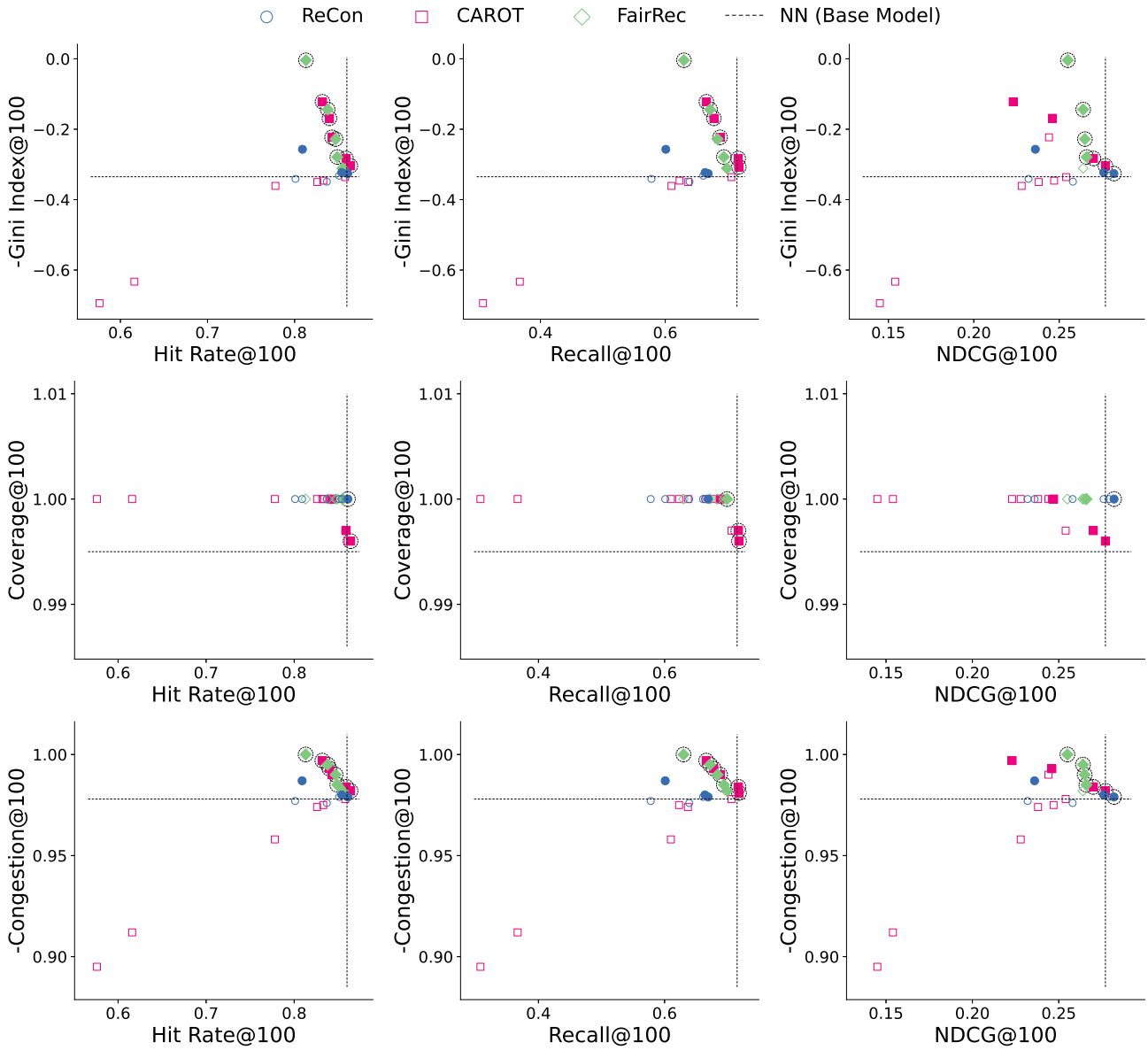


FIGURE 12: Desirability versus congestion-related measures in CareerBuilder-S dataset with NN for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

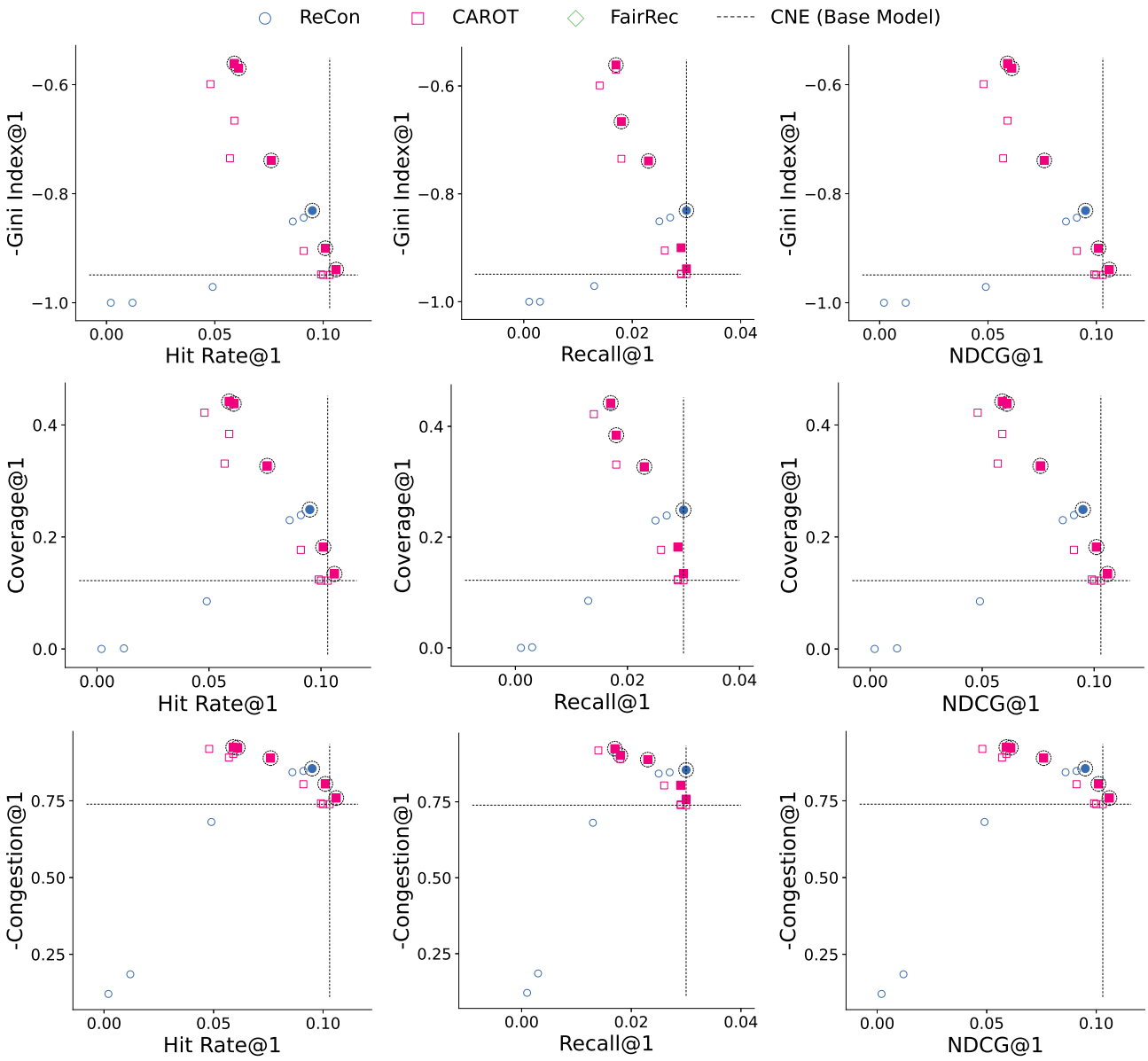


FIGURE 13: Desirability versus congestion-related measures in VDAB-L dataset with CNE for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

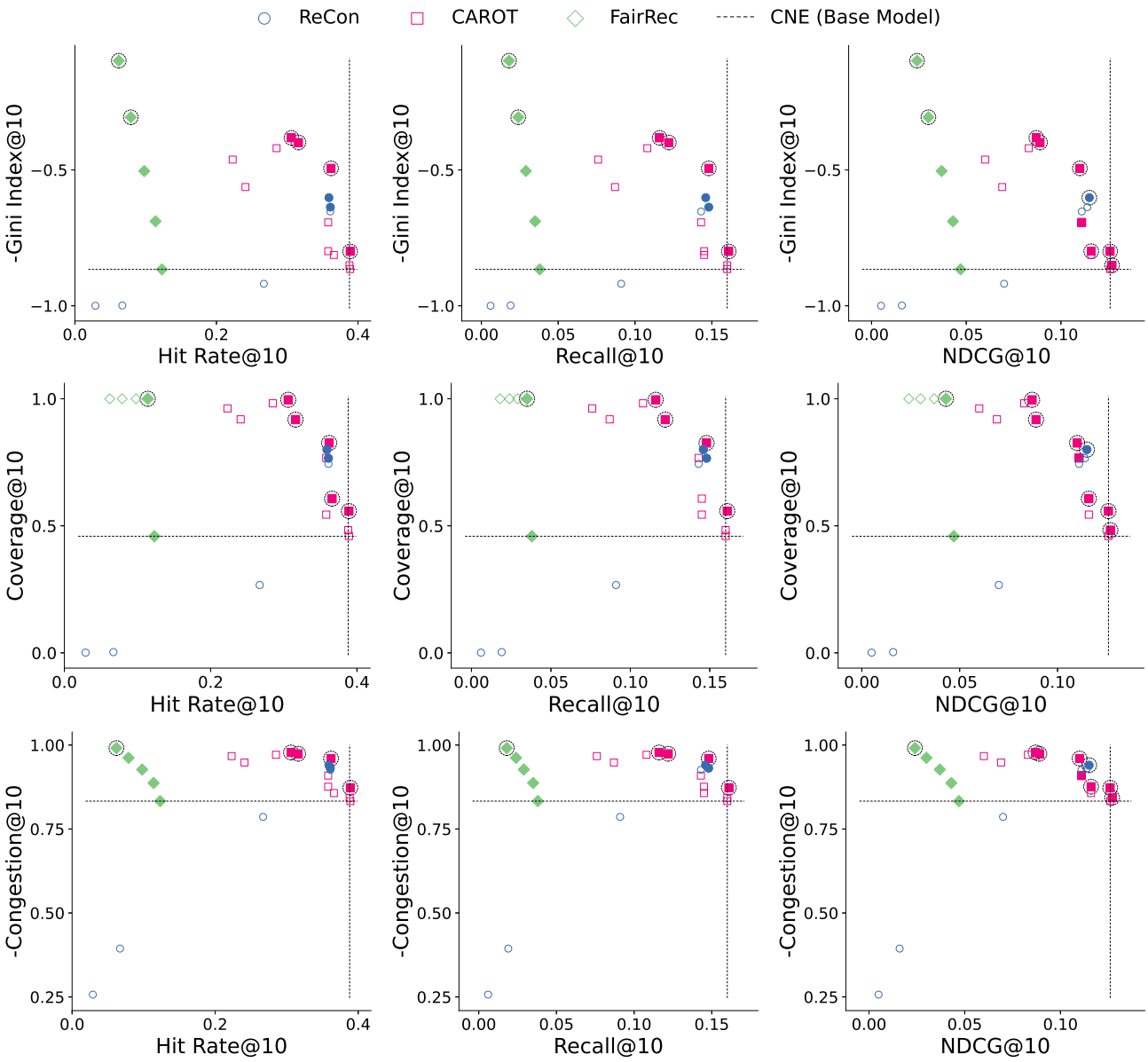


FIGURE 14: Desirability versus congestion-related measures in VDAB-L dataset with CNE for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

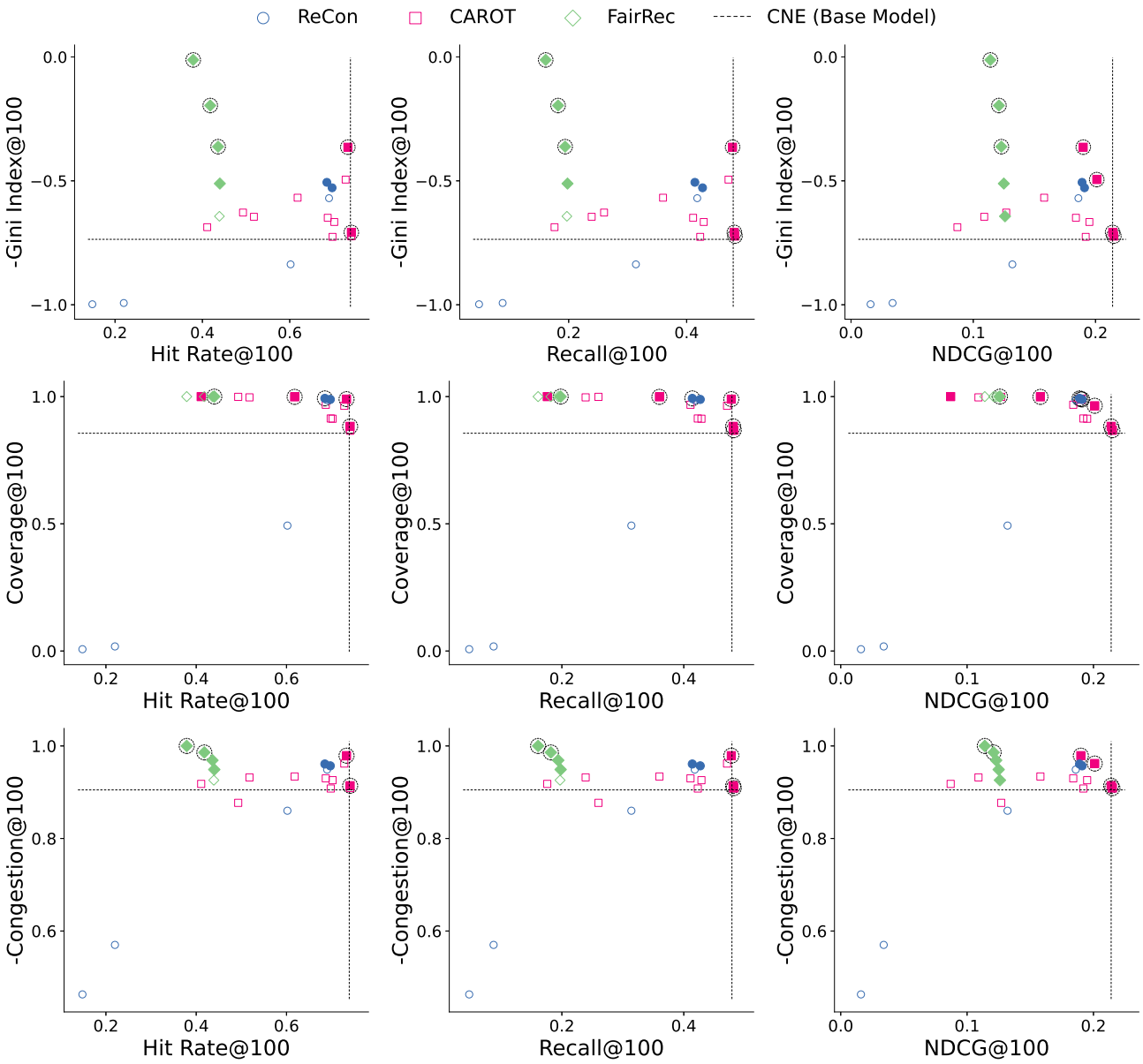


FIGURE 15: Desirability versus congestion-related measures in VDAB-L dataset with CNE for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

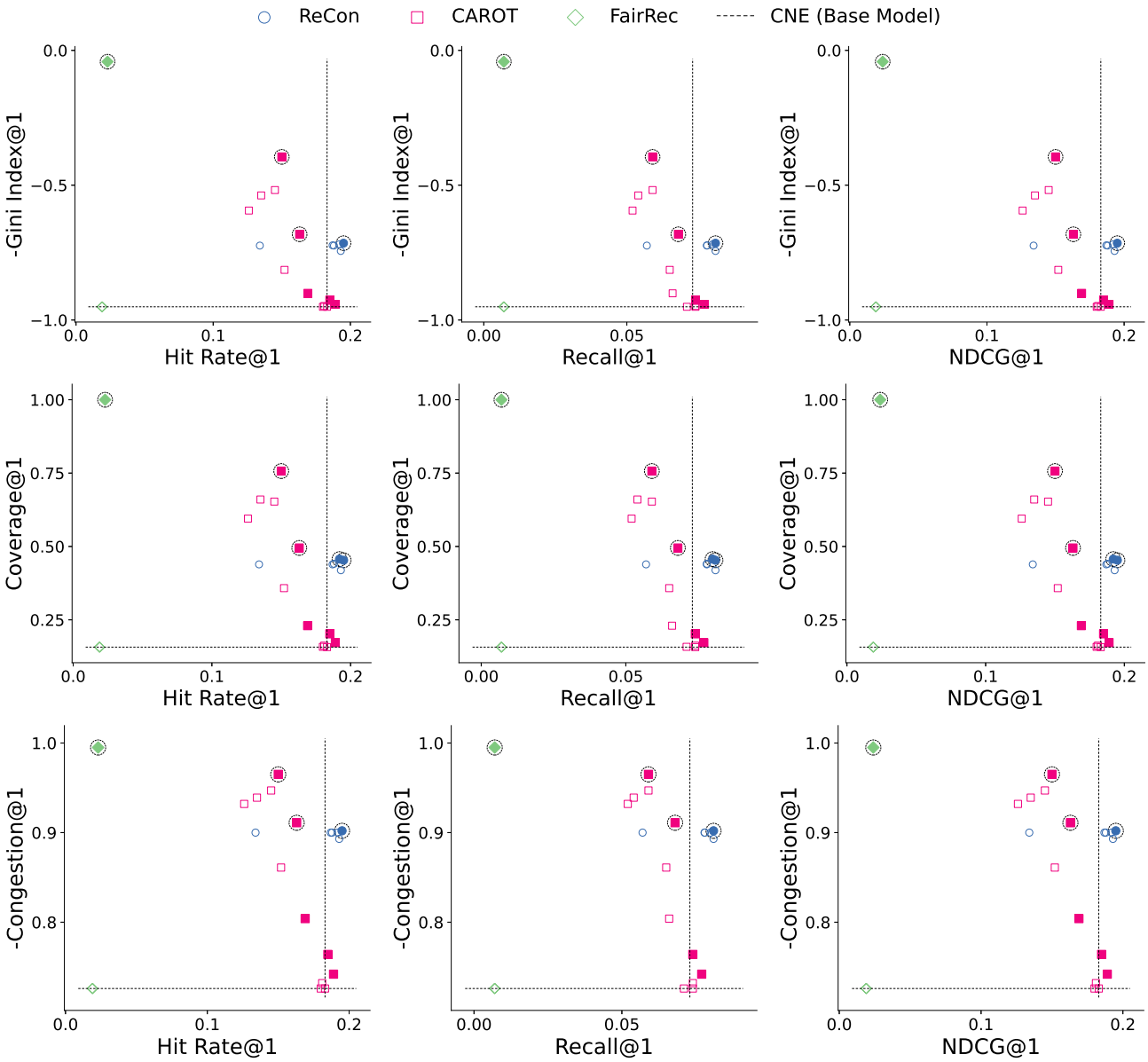


FIGURE 16: Desirability versus congestion-related measures in CareerBuilder-L dataset with CNE for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

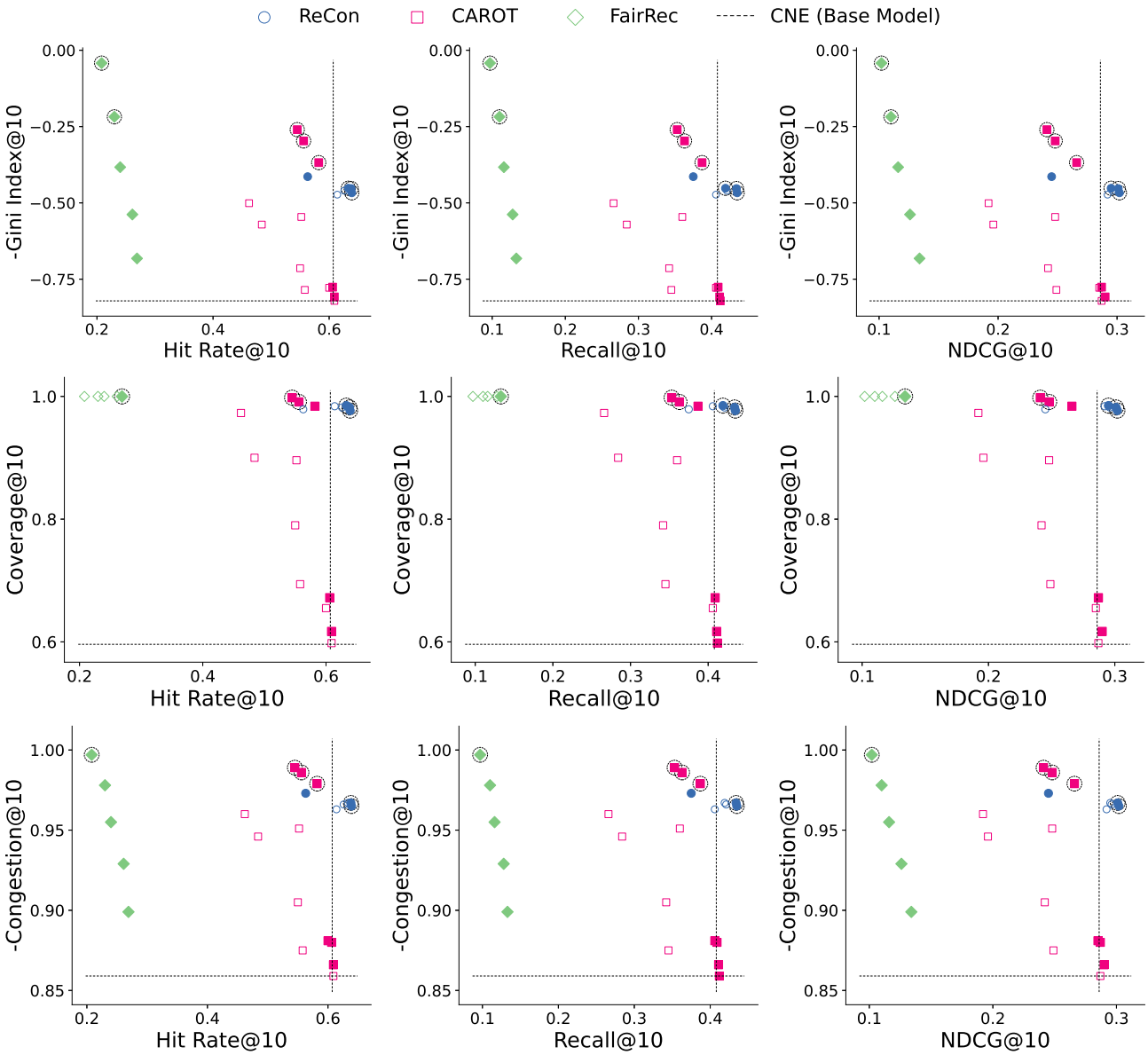


FIGURE 17: Desirability versus congestion-related measures in CareerBuilder-L dataset with CNE for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

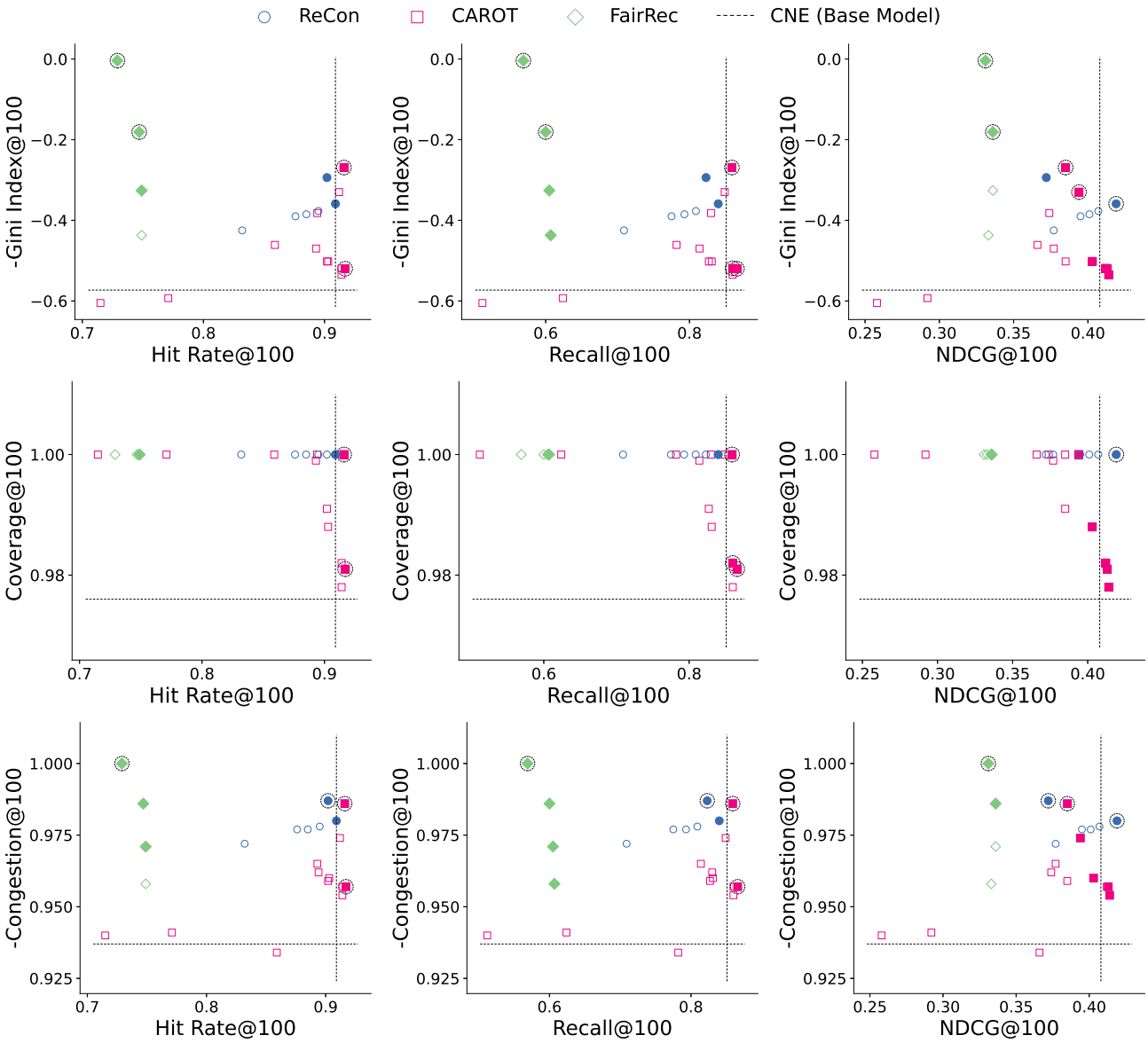


FIGURE 18: Desirability versus congestion-related measures in CareerBuilder-L dataset with CNE for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

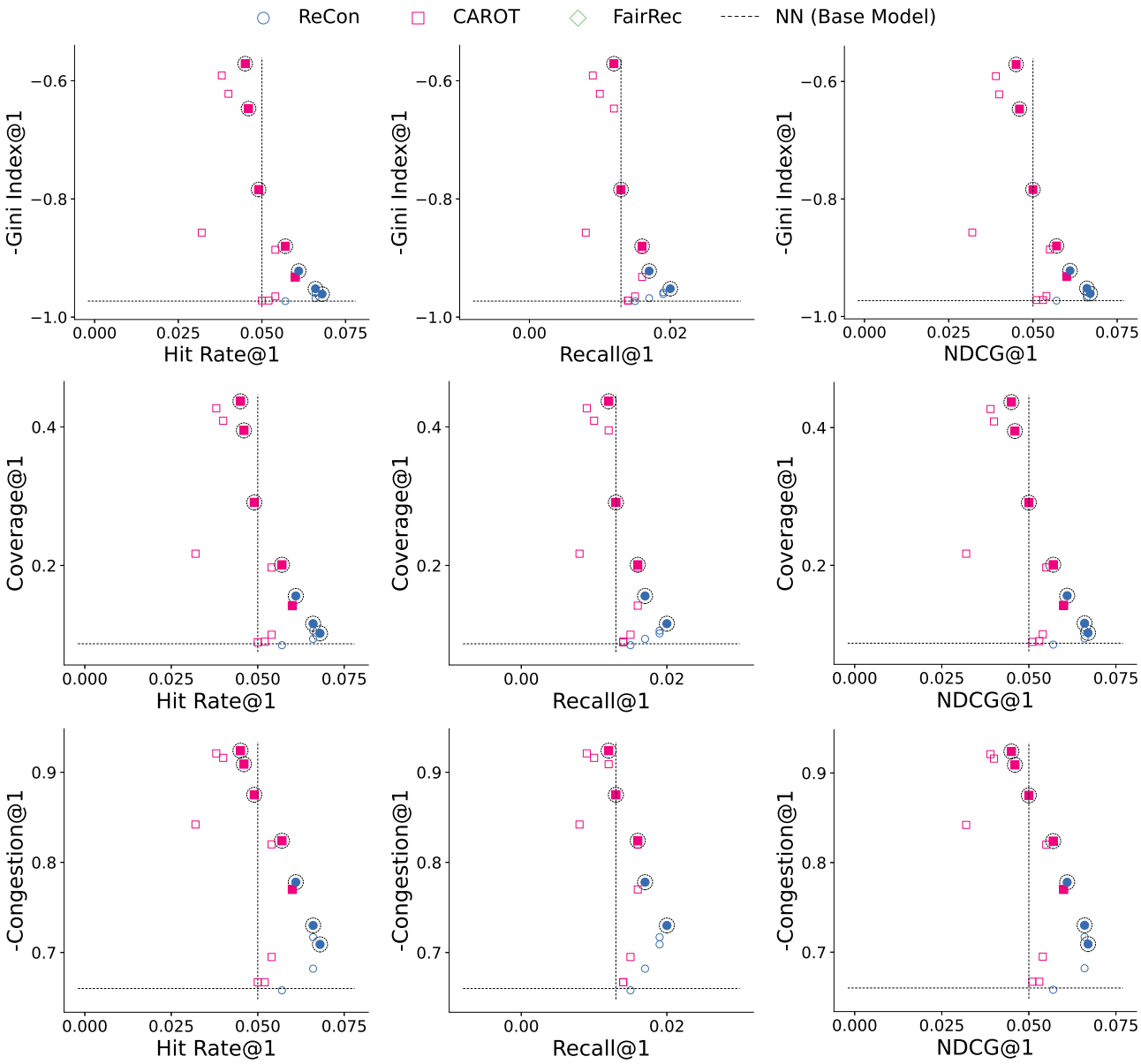


FIGURE 19: Desirability versus congestion-related measures in VDAB-L dataset with NN for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

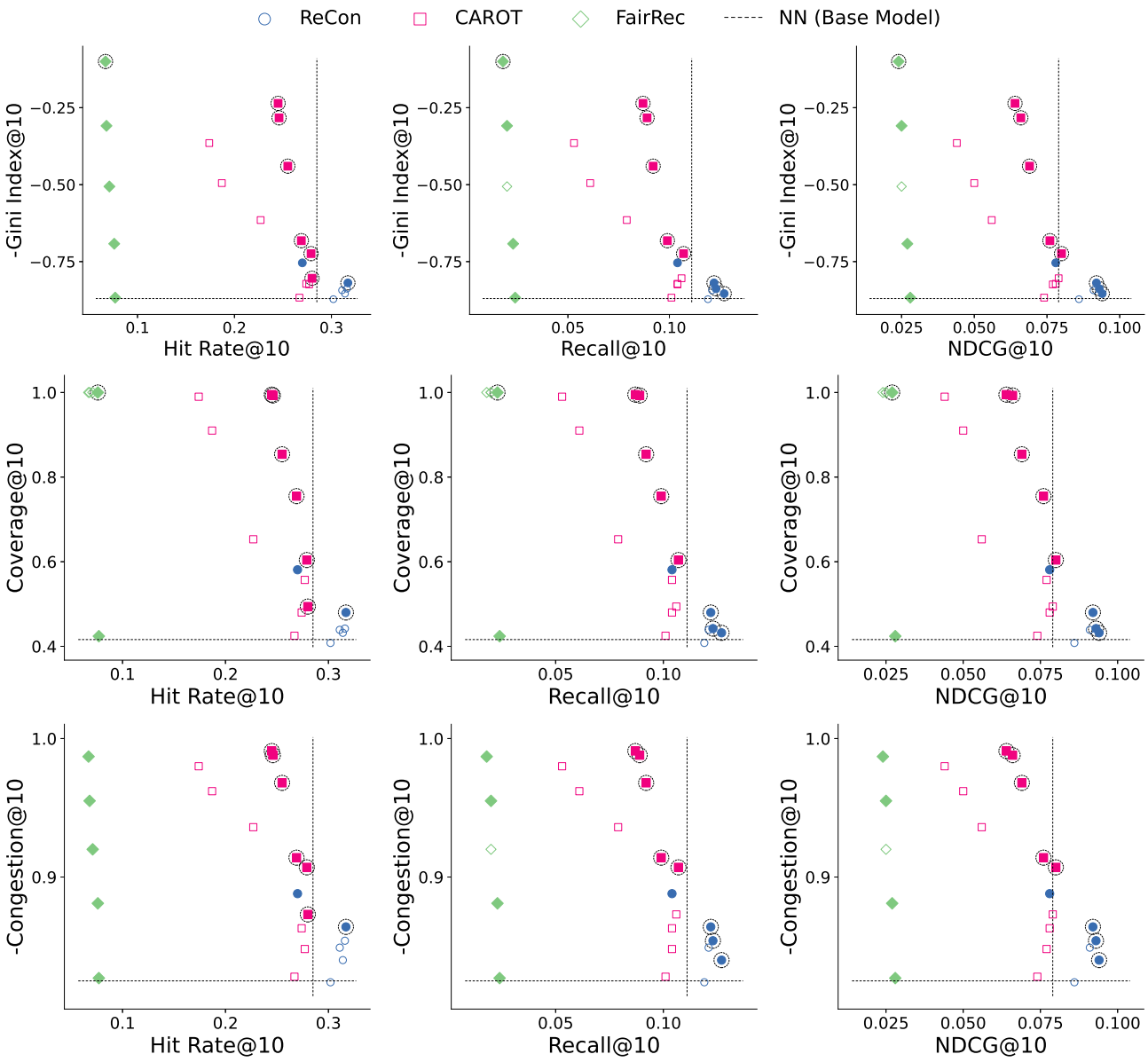


FIGURE 20: Desirability versus congestion-related measures in VDAB-L dataset with NN for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

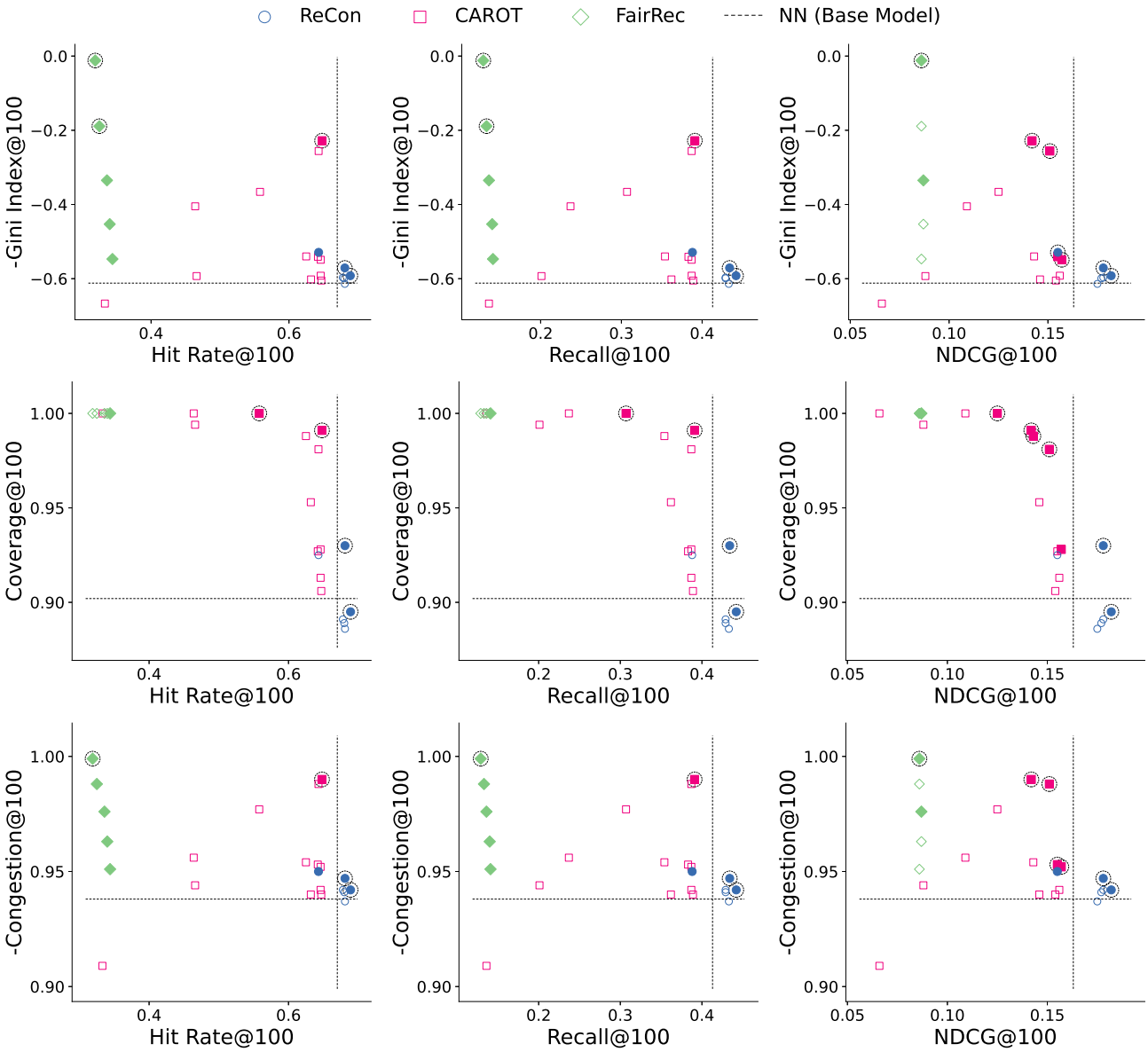


FIGURE 21: Desirability versus congestion-related measures in VDAB-L dataset with NN for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

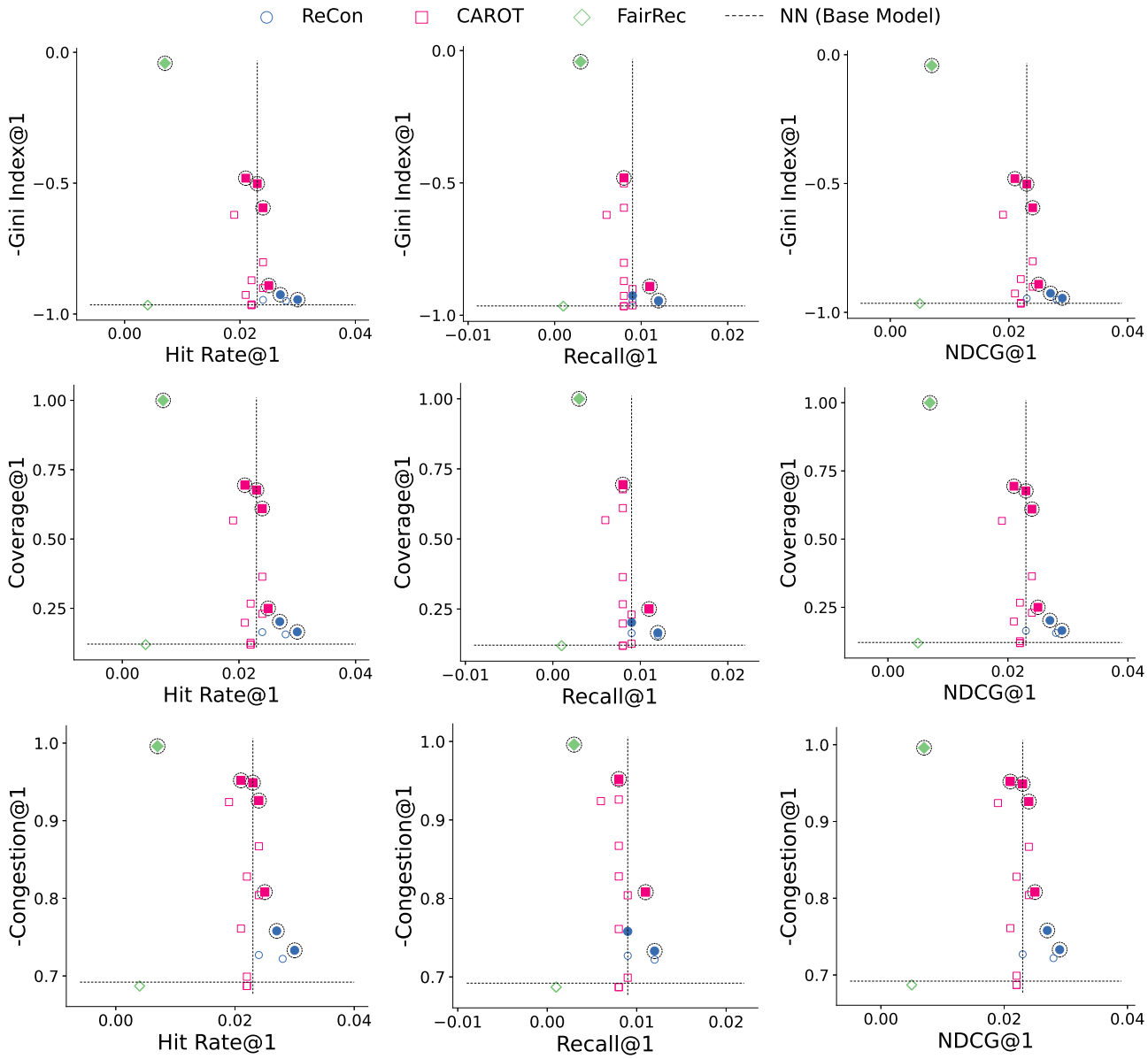


FIGURE 22: Desirability versus congestion-related measures in CareerBuilder-L dataset with NN for top-1 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

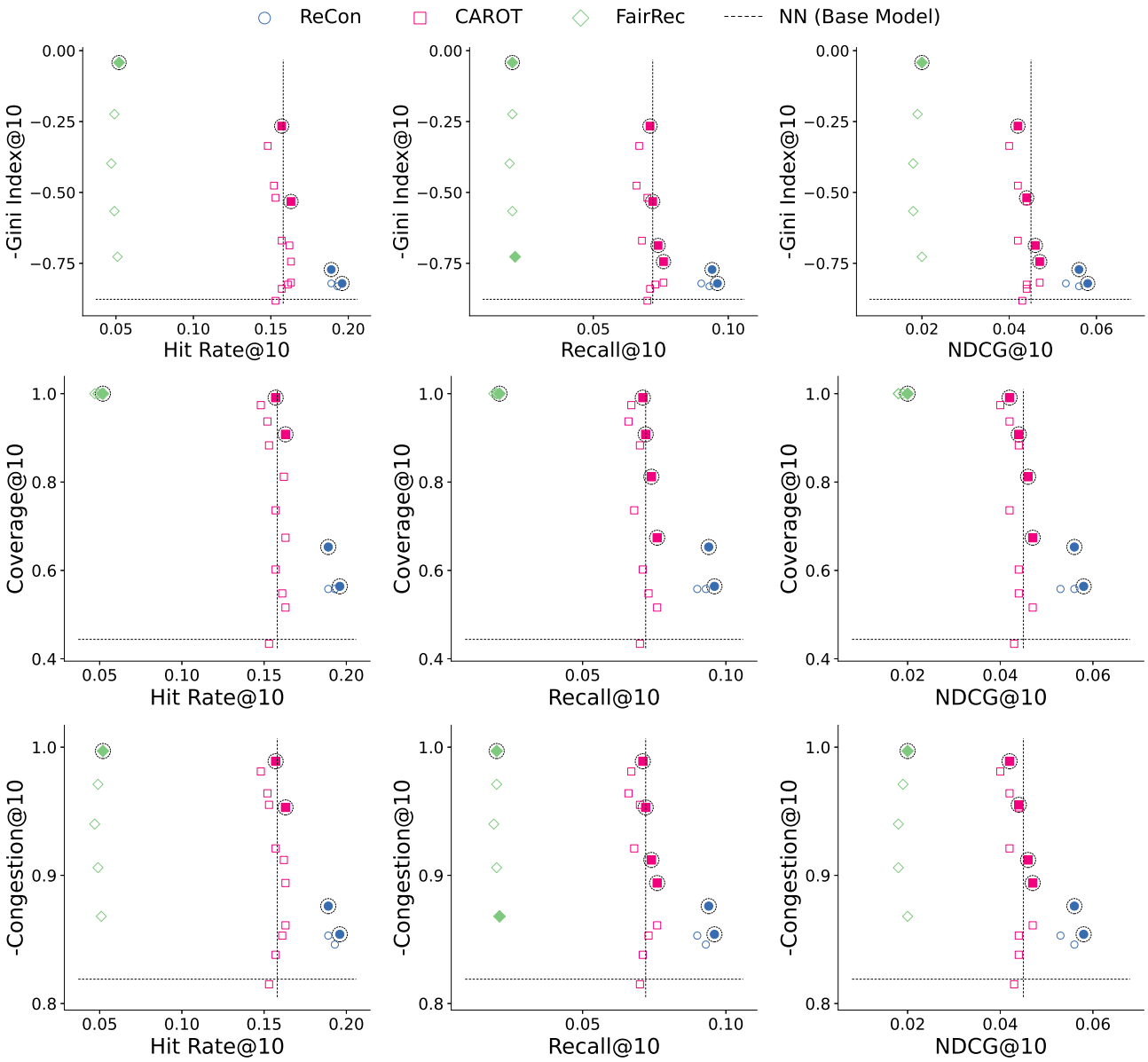


FIGURE 23: Desirability versus congestion-related measures in CareerBuilder-L dataset with NN for top-10 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.

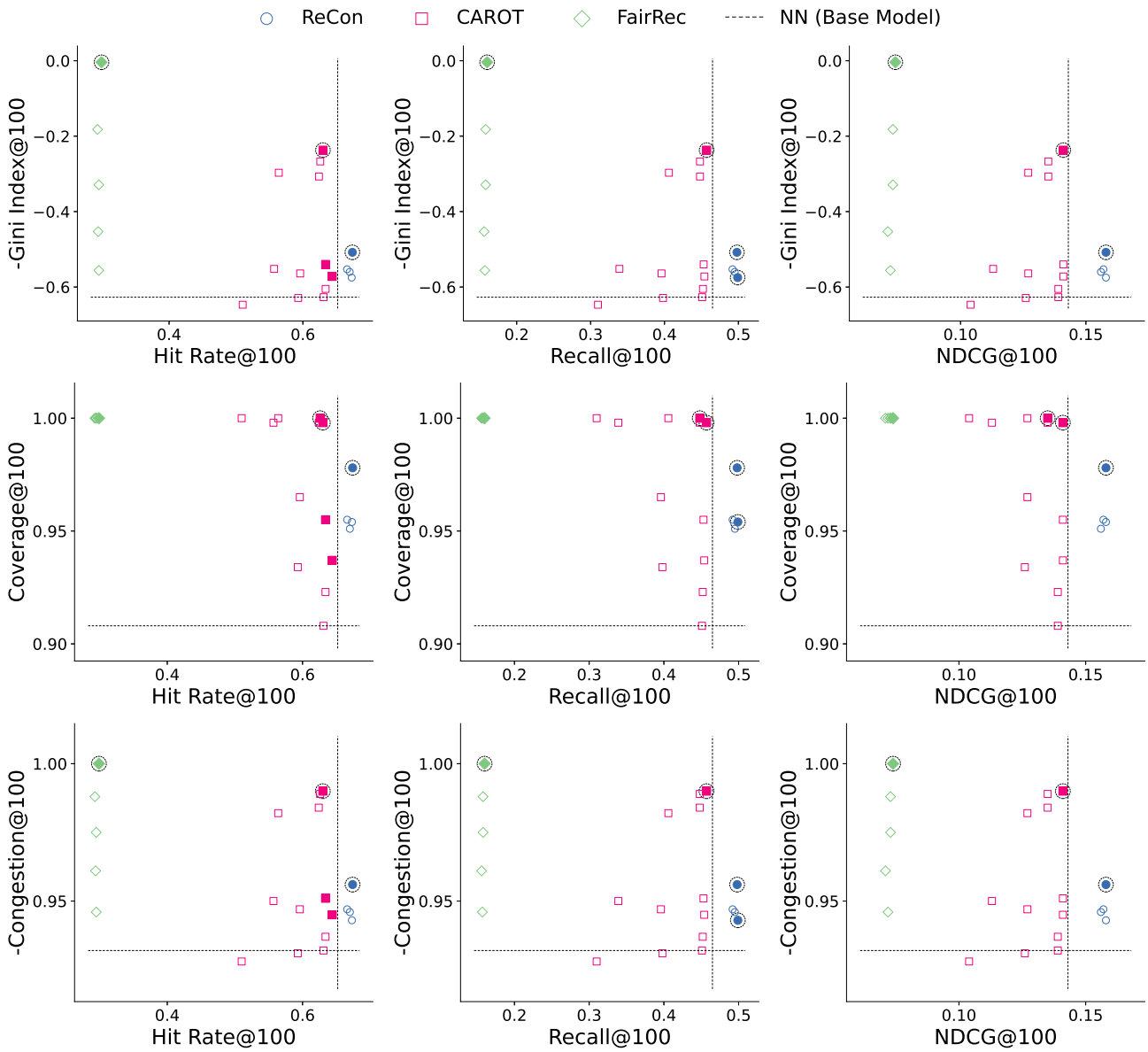
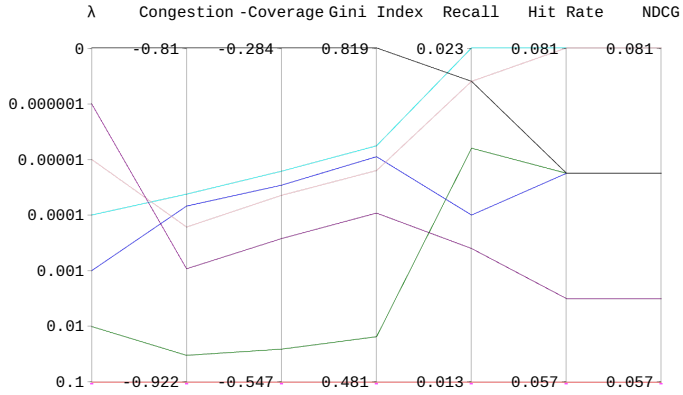
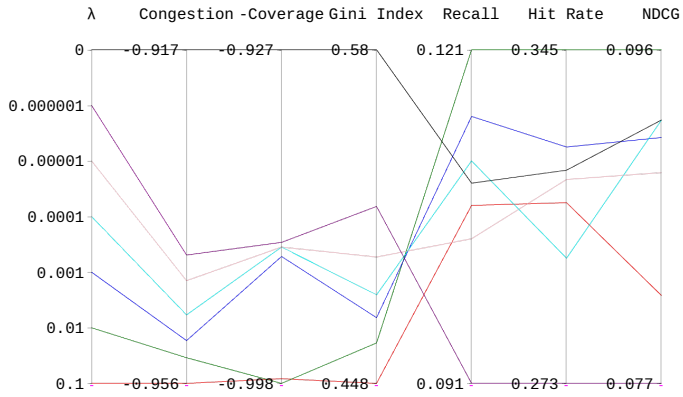


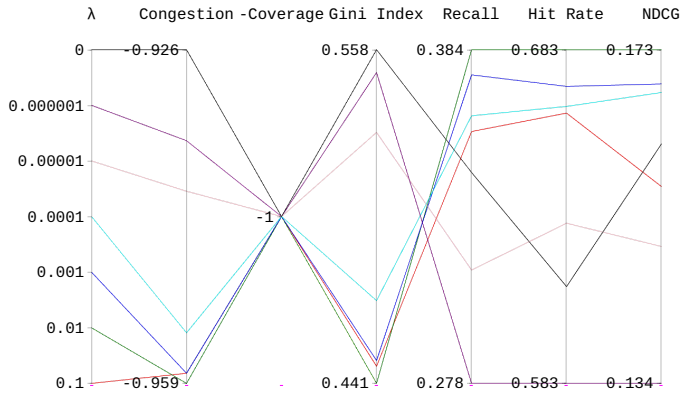
FIGURE 24: Desirability versus congestion-related measures in CareerBuilder-L dataset with NN for top-100 recommendation (higher values are better). Points represent different hyper-parameter combinations. Pareto optimal points per method are filled. Pareto optimal points across methods have a circle around.



(a) top-1

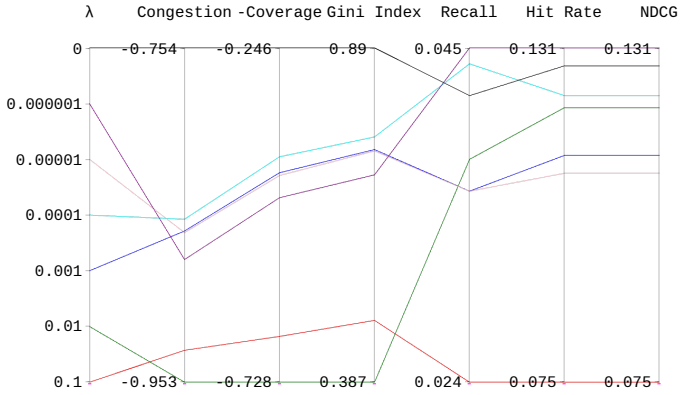


(b) top-10

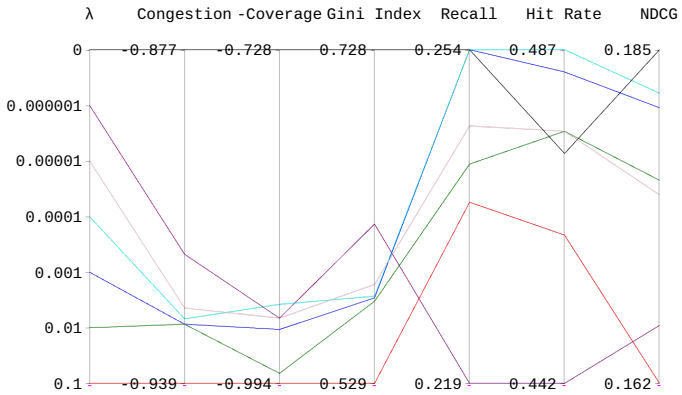


(c) top-100

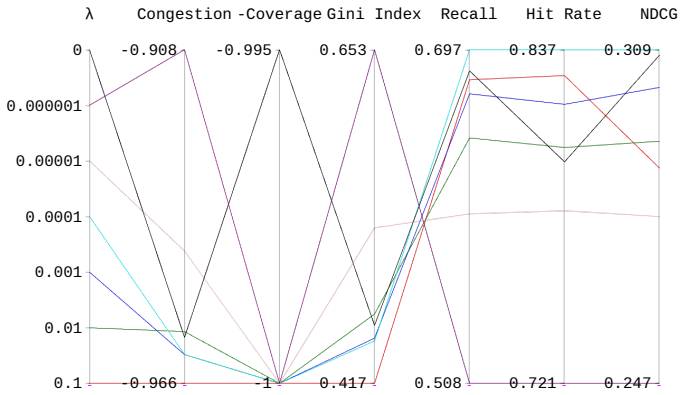
FIGURE 25: Performance of `ReCon` for each value of λ in VDAB-S dataset with CNE (higher values are better for desirability measures and lower values are better for congestion-related measures).



(a) top-1

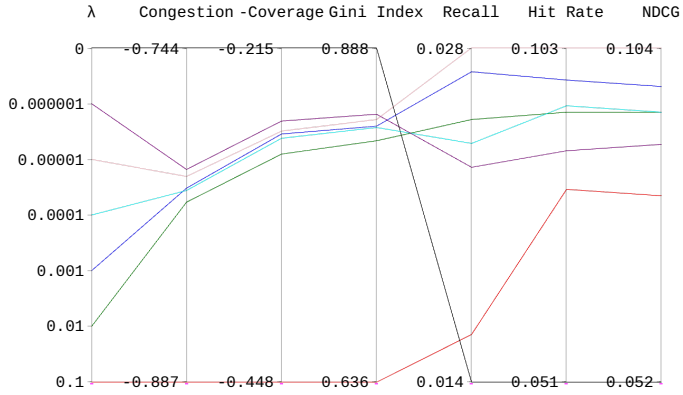


(b) top-10

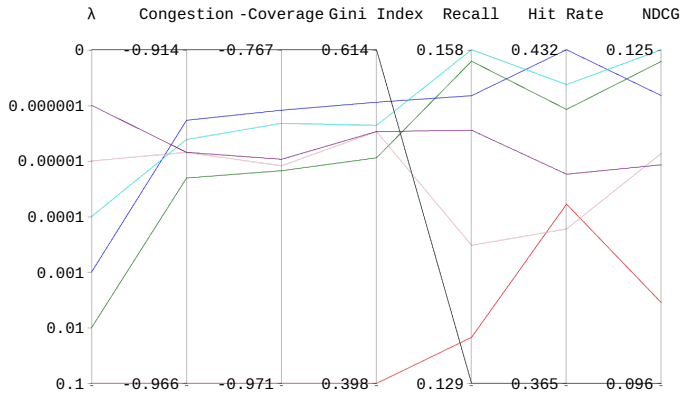


(c) top-100

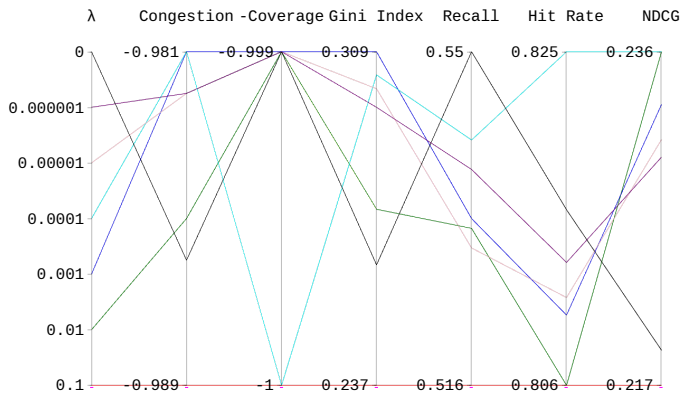
FIGURE 26: Performance of `ReCon` for each value of λ in CareerBuilder-S dataset with CNE (higher values are better for desirability measures and lower values are better for congestion-related measures).



(a) top-1

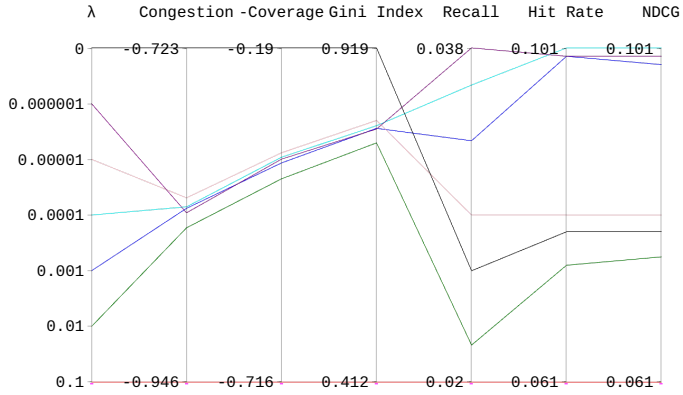


(b) top-10

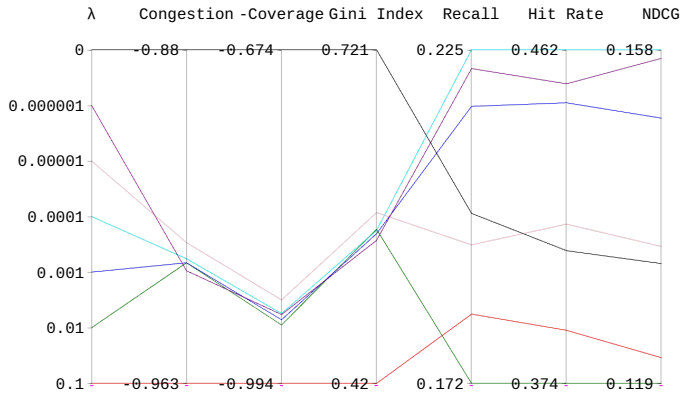


(c) top-100

FIGURE 27: Performance of `ReCon` for each value of λ in VDAB-S dataset with NN (higher values are better for desirability measures and lower values are better for congestion-related measures).



(a) top-1



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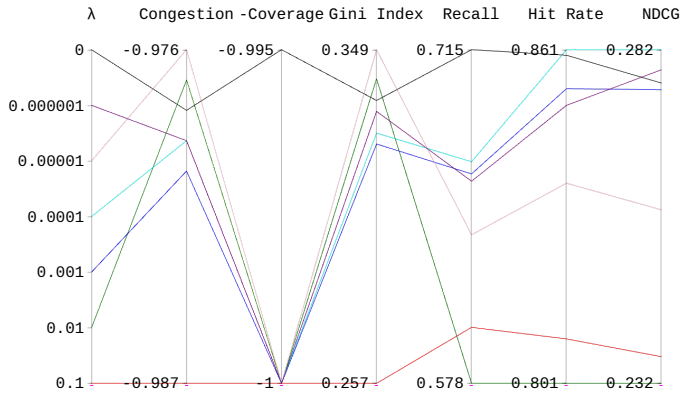
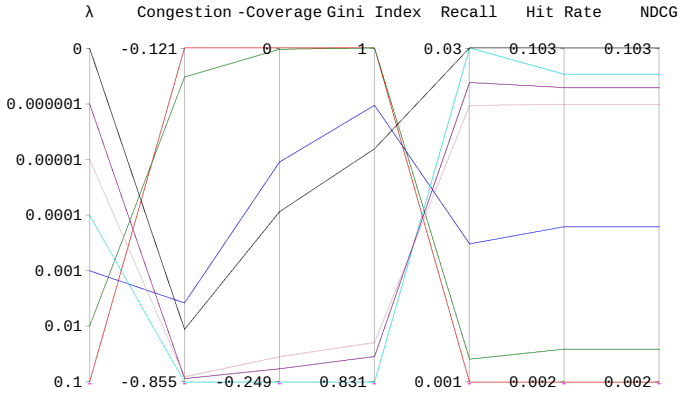


(c) top-100

FIGURE 28: Performance of `ReCon` for each value of λ in CareerBuilder-S dataset with NN (higher values are better for desirability measures and lower values are better for congestion-related measures).



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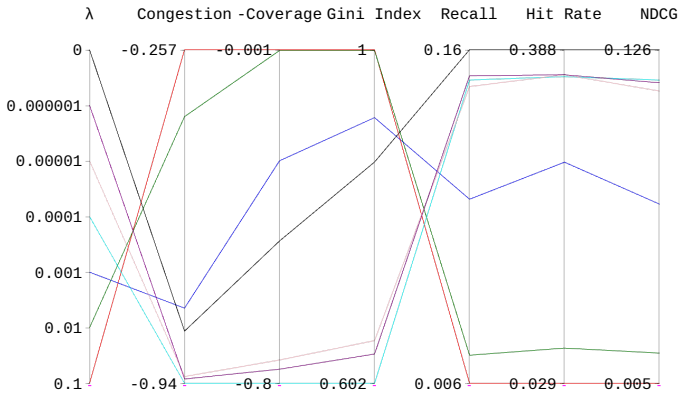

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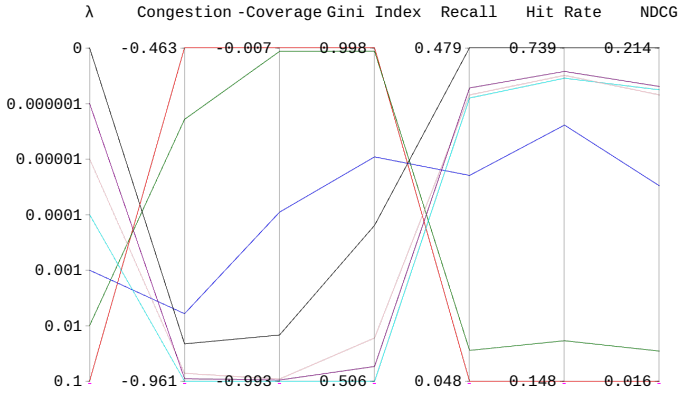
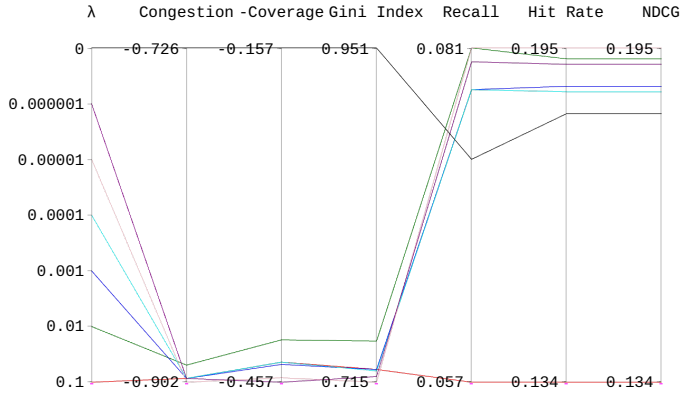


(c) top-100

FIGURE 29: Performance of `ReCon` for each value of λ in VDAB-L dataset with CNE (higher values are better for desirability measures and lower values are better for congestion-related measures).



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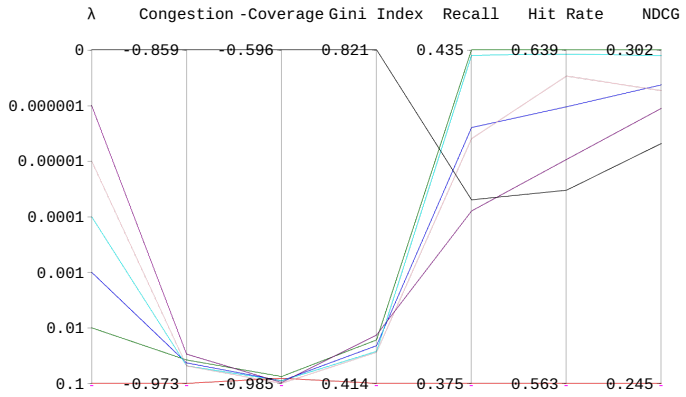
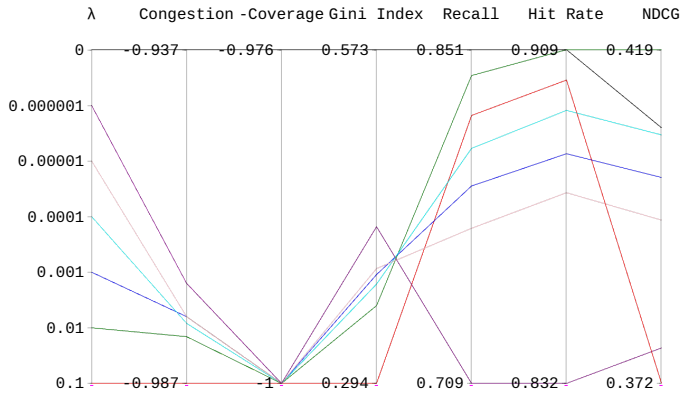
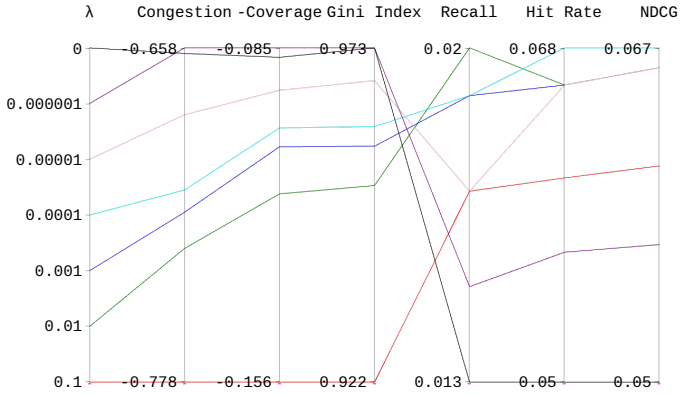


(b) top-10

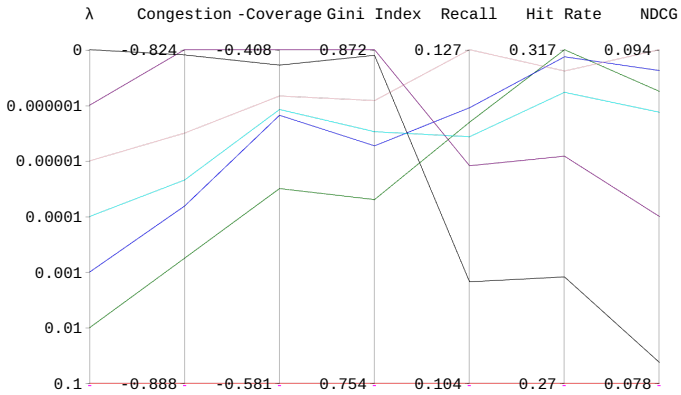


(c) top-100

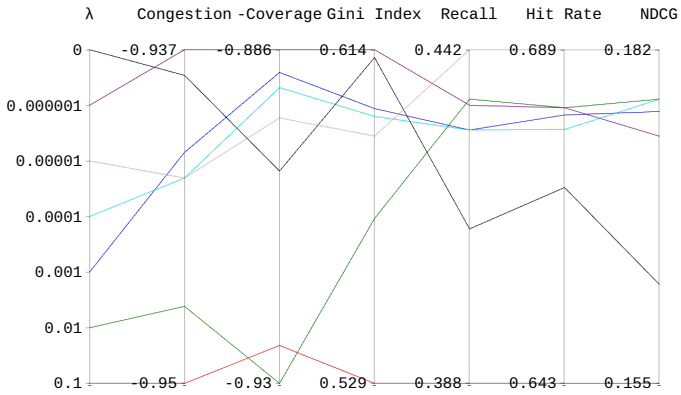
FIGURE 30: Performance of `ReCon` for each value of λ in CareerBuilder-L dataset with CNE (higher values are better for desirability measures and lower values are better for congestion-related measures).



(a) top-1

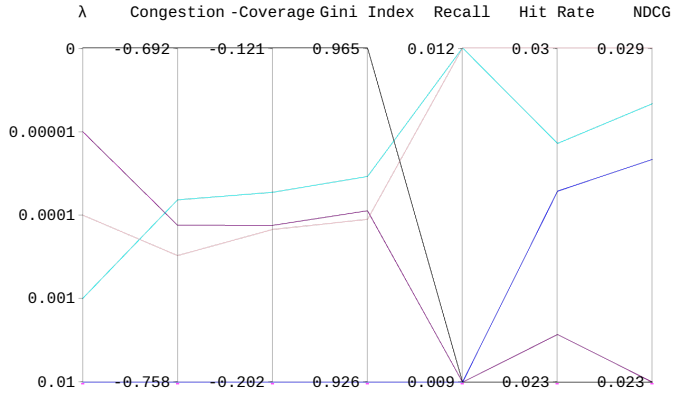


(b) top-10

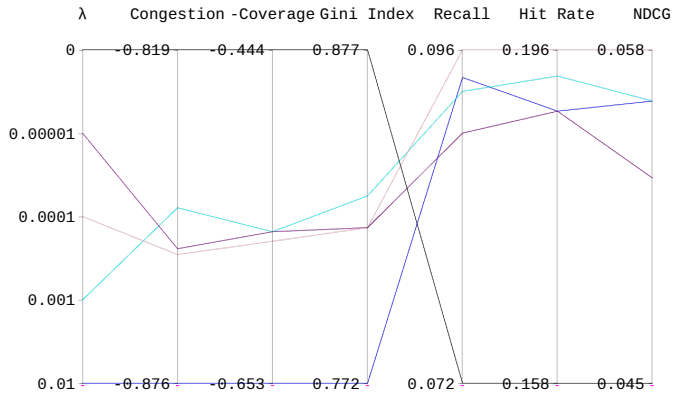


(c) top-100

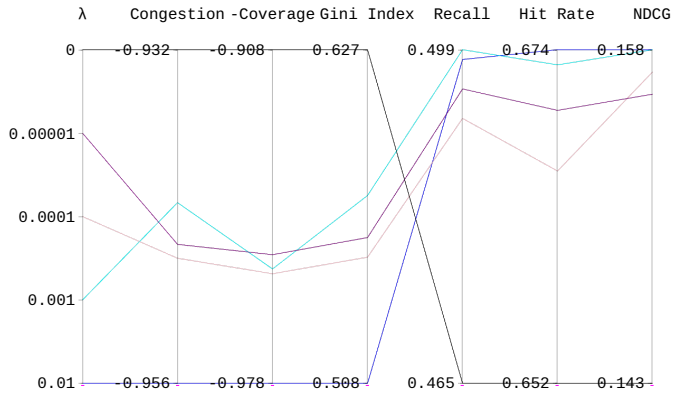
FIGURE 31: Performance of `ReCon` for each value of λ in VDAB-L dataset with NN (higher values are better for desirability measures and lower values are better for congestion-related measures).



(a) top-1



(b) top-10



(c) top-100

FIGURE 32: Performance of `ReCon` for each value of λ in CareerBuilder-L dataset with NN (higher values are better for desirability measures and lower values are better for congestion-related measures).