Supplementary report for the paper *A Distance-based Ranking Model Estimation of Distribution Algorithm for Flowshop Scheduling Problem* submitted to the journal *IEEE Transactions on Evolutionary Computation*.

Supplementary Report: Results of GM-EDA and HGM-EDA for Taillard's PFSP instances with Makespan criterion

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Abstract

In this report we extend the experimental results presented in the paper *A Distance-based Ranking Model Estimation of Distribution Algorithm for Flowshop Scheduling Problem* submitted to the journal *IEEE Transactions on Evolutionary Computation*, by introducing the results of the GMEDA and HGMEDA over Taillard's PFSP instances with the makespan criterion. Experimentation parameters, maximum number of evaluations and the final results of the experimentation are extensively introduced.

1 Parameters

In this section, we introduce the θ_{upper} parameters used for each configuration type in the GM-EDA and HGM-EDA (see table 1), and the maximum number of evaluations performed by the algorithms when optimizing (see table 2).

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Table 1: Upper θ values for Taillard's PFSP instances. Note the first instance of each set was selected for the experimentation. The θ that provided the best fitness average of 10 repetitions was selected.

Instance	θ range	θ_{upper}
20×05	1.0 - 3.0	1.5
20×10	1.0 - 3.0	1.4
20×20	1.0 - 3.0	1.4
50×05	2.5 - 5.5	3.7
50×10	2.5 - 5.5	2.8
50×20	2.5 - 5.5	3.0
100×05	3.5 - 6.0	4.9
100×10	3.5 - 6.0	3.7
100×20	3.5 - 6.0	4.7
200×10	4.0 - 6.0	5.3
200×20	4.0 - 6.0	5.5
500×20	4.0 - 7.0	4.4

Table 2: Maximum number of evaluations for Taillard's PFSP instances. Note that the first instance of each set was selected for the experimentation. The evaluation numbers reported are the average of 20 repetitions of the evaluations performed by AGA algorithm running n×m×0.4 seconds.

Instance	Evaluations
20×05	182224100
20×10	224784800
20×20	256896400
50×05	220712150
50×10	256208100
50×20	275954150
100×05	235879800
100×10	266211000
100×20	283040000
200×10	272515500
200×20	287728850
500×20	260316750

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2 Results

In Table 3 we introduce the results obtained by GM-EDA and HGM-EDA for Taillard's PFSP instances with makespan criterion.

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Table 3: Best and average results for Taillard's PFSP instances with the makespan criterion. 10 repetitions of each algorithm-instance pair were carried out.

Instance	ID	GM-EDA		HGM-EDA		Instance	ID	GM-EDA		HGM-EDA	
		Best	Avg	Best	Avg			Best	Avg	Best	Avg
20×5	1	1278	1278	1278	1278	100×5	1	5493	5495	5493	5493
	2	1359	1360	1359	1359		2	5280	5285	5268	5268
	3	1081	1085	1081	1081		3	5175	5188	5175	5175
	4	1293	1295	1293	1293		4	5018	5026	5014	5014
	5	1235	1236	1235	1235		5	5255	5255	5250	5250
	6	1195	1208	1195	1195		6	5137	5145	5135	5135
	7	1251	1251	1234	1237		7	5246	5258	5246	5246
	8	1206	1208	1206	1206		8	5098	5105	5094	5094
	9	1230	1237	1230	1230		9	5472	5473	5448	5448
	10	1108	1108	1108	1108		10	5334	5338	5322	5322
20×10	1	1585	1590	1582	1582	100×10	1	5800	5815	5770	5770
	2	1660	1670	1659	1659		2	5377	5387	5349	5352
	3	1496	1513	1496	1496		3	5679	5680	5676	5678
	4	1385	1391	1377	1377		4	5820	5848	5781	5795
	5	1419	1426	1419	1419		5	5498	5509	5467	5483
	6	1397	1404	1397	1397		6	5308	5325	5308	5308
	7	1484	1488	1484	1484		7	5622	5640	5596	5598
	8	1544	1552	1538	1539		8	5651	5675	5623	5636
	9	1594	1611	1593	1593		9	5922	5926	5875	5875
	10	1598	1607	1591	1591		10	5881	5892	5848	5848
20×20	1	2298	2314	2297	2297	100×20	1	6379	6401	6268	6281
	2	2105	2123	2099	2099		2	6280	6324	6231	6251
	3	2329	2342	2326	2326		3	6391	6421	6316	6331
	4	2233	2241	2223	2223		4	6369	6388	6291	6321
	5	2302	2308	2291	2292		5	6465	6497	6364	6385
	6	2226	2238	2226	2226		6	6487	6525	6437	6454
	7	2277	2291	2273	2273		7	6369	6407	6318	6332
	8	2204	2214	2200	2200		8	6545	6585	6469	6485
	9	2242	2253	2237	2237		9	6383	6424	6314	6343
	10	2184	2196	2178	2178		10	6542	6582	6478	6499
50×5	1	2724	2732	2724	2724	200×10	1	10878	10908	10872	10872
	2	2838	2846	2834	2834		2	10531	10540	10493	10496
	3	2621	2628	2621	2621		3	10973	11010	10922	10922
	4	2753	2768	2751	2751		4	10893	10917	10889	10890
	5	2864	2864	2863	2863		5	10535	10537	10527	10527
	6	2832	2833	2829	2829		6	10372	10383	10330	10331
	7	2725	2736	2725	2725		7	10900	10913	10857	10857
	8	2694	2702	2683	2683		8	10789	10797	10731	10733
	9	2554	2561	2552	2552		9	10465	10477	10438	10441
	10	2782	2782	2782	2782		10	10727	10732	10676	10678
50×10	1	3041	3062	3025	3025	200×20	1	11378	11407	11270	11306
	2	2913	2929	2877	2890		2	11424	11448	11296	11314
	3	2871	2896	2852	2864		3	11491	11547	11412	11431
	4	3071	3089	3063	3063		4	11471	11496	11350	11380
	5	3011	3025	2979	2996		5	11419	11448	11302	11325
	6	3026	3058	3006	3007		6	11359	11395	11260	11298
	7	3140	3162	3098	3106		7	11536	11556	11436	11450
	8	3046	3062	3038	3041		8	11478	11528	11412	11435
	9	2910	2933	2902	2902		9	11380	11422	11294	11320
	10	3091	3121	3078	3083		10	11420	11474	11353	11379
50×20	1	3939	3953	3870	3889	500×20	1	26875	27066	26200	26241
	2	3798	3829	3715	3721		2	27151	27456	26735	26764
	3	3734	3769	3667	3678		3	27333	27478	26506	26577
	4	3793	3817	3744	3755		4	27094	27408	26561	26602
	5	3675	3695	3625	3639		5	26776	26987	26412	26452
	6	3765	3792	3698	3710		6	27042	27377	26584	26613
	7	3772	3803	3720	3731		7	27065	27261	26474	26542
	8	3778	3803	3720	3728		8	27112	27349	26691	26733
	9	3812	3837	3754	3773		9	26630	26928	26164	26196
	10	3833	3868	3768	3783		10	27020	27384	26570	26608