

# Results for Scheduling Benchmark Classes

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Table 1: Results for Taillard OpenShop (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai10 10 0.json	10	10	Optimal	0.45	637	637.00	0.00
tai10 10 1.json	10	10	Optimal	0.06	588	588.00	0.00
tai10 10 2.json	10	10	Optimal	0.27	598	598.00	0.00
tai10 10 3.json	10	10	Optimal	0.05	577	577.00	0.00
tai10 10 4.json	10	10	Optimal	0.05	640	640.00	0.00
tai10 10 5.json	10	10	Optimal	0.04	538	538.00	0.00
tai10 10 6.json	10	10	Optimal	0.06	616	616.00	0.00
tai10 10 7.json	10	10	Optimal	0.11	595	595.00	0.00
tai10 10 8.json	10	10	Optimal	0.05	595	595.00	0.00
tai10 10 9.json	10	10	Optimal	0.08	596	596.00	0.00
tai15 15 0.json	15	15	Optimal	0.11	937	937.00	0.00
tai15 15 1.json	15	15	Optimal	0.11	918	918.00	0.00
tai15 15 2.json	15	15	Optimal	0.08	871	871.00	0.00
tai15 15 3.json	15	15	Optimal	0.13	934	934.00	0.00
tai15 15 4.json	15	15	Optimal	0.09	946	946.00	0.00
tai15 15 5.json	15	15	Optimal	0.08	933	933.00	0.00
tai15 15 6.json	15	15	Optimal	0.16	891	891.00	0.00
tai15 15 7.json	15	15	Optimal	0.13	893	893.00	0.00
tai15 15 8.json	15	15	Optimal	0.28	899	899.00	0.00
tai15 15 9.json	15	15	Optimal	0.17	902	902.00	0.00
tai20 20 0.json	20	20	Optimal	0.35	1155	1155.00	0.00
tai20 20 1.json	20	20	Optimal	1.00	1241	1241.00	0.00
tai20 20 2.json	20	20	Optimal	0.56	1257	1257.00	0.00
tai20 20 3.json	20	20	Optimal	0.25	1248	1248.00	0.00
tai20 20 4.json	20	20	Optimal	0.19	1256	1256.00	0.00
tai20 20 5.json	20	20	Optimal	0.16	1204	1204.00	0.00
tai20 20 6.json	20	20	Optimal	0.66	1294	1294.00	0.00
tai20 20 7.json	20	20	Optimal	1.18	1169	1169.00	0.00
tai20 20 8.json	20	20	Optimal	0.17	1289	1289.00	0.00
tai20 20 9.json	20	20	Optimal	0.17	1241	1241.00	0.00
tai4 4 0.json	4	4	Optimal	0.13	193	193.00	0.00
tai4 4 1.json	4	4	Optimal	0.11	236	236.00	0.00
tai4 4 2.json	4	4	Optimal	0.08	271	271.00	0.00

Table 1: Results for Taillard OpenShop (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai4 4 3.json	4	4	Optimal	0.15	250	250.00	0.00
tai4 4 4.json	4	4	Optimal	0.17	295	295.00	0.00
tai4 4 5.json	4	4	Optimal	0.05	189	189.00	0.00
tai4 4 6.json	4	4	Optimal	0.10	201	201.00	0.00
tai4 4 7.json	4	4	Optimal	0.05	217	217.00	0.00
tai4 4 8.json	4	4	Optimal	0.13	261	261.00	0.00
tai4 4 9.json	4	4	Optimal	0.12	217	217.00	0.00
tai5 5 0.json	5	5	Optimal	0.18	300	300.00	0.00
tai5 5 1.json	5	5	Optimal	0.16	262	262.00	0.00
tai5 5 2.json	5	5	Optimal	0.20	323	323.00	0.00
tai5 5 3.json	5	5	Optimal	0.17	310	310.00	0.00
tai5 5 4.json	5	5	Optimal	0.27	326	326.00	0.00
tai5 5 5.json	5	5	Optimal	0.16	312	312.00	0.00
tai5 5 6.json	5	5	Optimal	0.21	303	303.00	0.00
tai5 5 7.json	5	5	Optimal	0.25	300	300.00	0.00
tai5 5 8.json	5	5	Optimal	0.17	353	353.00	0.00
tai5 5 9.json	5	5	Optimal	0.25	326	326.00	0.00
tai7 7 0.json	7	7	Optimal	0.03	435	435.00	0.00
tai7 7 1.json	7	7	Optimal	0.12	443	443.00	0.00
tai7 7 2.json	7	7	Optimal	0.31	468	468.00	0.00
tai7 7 3.json	7	7	Optimal	0.03	463	463.00	0.00
tai7 7 4.json	7	7	Optimal	0.03	416	416.00	0.00
tai7 7 5.json	7	7	Optimal	0.80	451	451.00	0.00
tai7 7 6.json	7	7	Optimal	1.10	422	422.00	0.00
tai7 7 7.json	7	7	Optimal	0.05	424	424.00	0.00
tai7 7 8.json	7	7	Optimal	0.09	458	458.00	0.00
tai7 7 9.json	7	7	Optimal	0.06	398	398.00	0.00

Table 2: Results for Taillard JobShop (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 20 0.json	100	20	Optimal	266.17	5464	5464.00	0.00
tai100 20 1.json	100	20	Optimal	31.20	5181	5181.00	0.00
tai100 20 2.json	100	20	Optimal	38.67	5568	5568.00	0.00
tai100 20 3.json	100	20	Optimal	177.17	5339	5339.00	0.00
tai100 20 4.json	100	20	Solution	300.04	5412	5392.00	0.37
tai100 20 5.json	100	20	Optimal	172.70	5342	5342.00	0.00
tai100 20 6.json	100	20	Optimal	298.02	5436	5436.00	0.00
tai100 20 7.json	100	20	Optimal	111.51	5394	5394.00	0.00
tai100 20 8.json	100	20	Optimal	86.84	5358	5358.00	0.00
tai100 20 9.json	100	20	Optimal	188.94	5183	5183.00	0.00
tai15 15 0.json	15	15	Optimal	12.44	1231	1231.00	0.00

Table 2: Results for Taillard JobShop (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai15 15 1.json	15	15	Optimal	35.14	1244	1244.00	0.00
tai15 15 2.json	15	15	Optimal	17.26	1218	1218.00	0.00
tai15 15 3.json	15	15	Optimal	30.94	1175	1175.00	0.00
tai15 15 4.json	15	15	Optimal	134.85	1224	1224.00	0.00
tai15 15 5.json	15	15	Solution	300.02	1243	1183.00	4.83
tai15 15 6.json	15	15	Optimal	104.11	1227	1227.00	0.00
tai15 15 7.json	15	15	Optimal	102.79	1217	1217.00	0.00
tai15 15 8.json	15	15	Optimal	133.01	1274	1274.00	0.00
tai15 15 9.json	15	15	Optimal	32.78	1241	1241.00	0.00
tai20 15 0.json	20	15	Solution	300.02	1424	1274.00	10.53
tai20 15 1.json	20	15	Solution	300.01	1378	1328.00	3.63
tai20 15 2.json	20	15	Solution	300.02	1398	1243.00	11.09
tai20 15 3.json	20	15	Optimal	17.73	1345	1345.00	0.00
tai20 15 4.json	20	15	Solution	300.02	1374	1270.00	7.57
tai20 15 5.json	20	15	Solution	300.02	1389	1268.00	8.71
tai20 15 6.json	20	15	Optimal	76.19	1462	1462.00	0.00
tai20 15 7.json	20	15	Solution	300.02	1427	1358.00	4.84
tai20 15 8.json	20	15	Solution	300.02	1369	1258.00	8.11
tai20 15 9.json	20	15	Solution	300.02	1406	1289.00	8.32
tai20 20 0.json	20	20	Solution	300.02	1688	1514.00	10.31
tai20 20 1.json	20	20	Solution	300.02	1640	1454.00	11.34
tai20 20 2.json	20	20	Solution	300.02	1585	1456.00	8.14
tai20 20 3.json	20	20	Solution	300.01	1656	1583.00	4.41
tai20 20 4.json	20	20	Solution	300.02	1642	1474.00	10.23
tai20 20 5.json	20	20	Solution	300.02	1663	1490.00	10.40
tai20 20 6.json	20	20	Solution	300.02	1724	1605.00	6.90
tai20 20 7.json	20	20	Solution	300.02	1629	1564.00	3.99
tai20 20 8.json	20	20	Solution	300.02	1675	1466.00	12.48
tai20 20 9.json	20	20	Solution	300.01	1627	1424.00	12.48
tai30 15 0.json	30	15	Solution	300.03	1766	1764.00	0.11
tai30 15 1.json	30	15	Solution	300.03	1860	1774.00	4.62
tai30 15 2.json	30	15	Solution	300.03	1828	1778.00	2.74
tai30 15 3.json	30	15	Solution	300.03	1885	1828.00	3.02
tai30 15 4.json	30	15	Optimal	15.87	2007	2007.00	0.00
tai30 15 5.json	30	15	Solution	300.02	1852	1819.00	1.78
tai30 15 6.json	30	15	Solution	300.03	1804	1771.00	1.83
tai30 15 7.json	30	15	Solution	300.03	1701	1673.00	1.65
tai30 15 8.json	30	15	Solution	300.02	1821	1795.00	1.43
tai30 15 9.json	30	15	Solution	300.02	1706	1631.00	4.40
tai30 20 0.json	30	20	Solution	300.03	2071	1857.00	10.33
tai30 20 1.json	30	20	Solution	300.03	2006	1867.00	6.93
tai30 20 2.json	30	20	Solution	300.04	1912	1809.00	5.39
tai30 20 3.json	30	20	Solution	300.04	2086	1923.00	7.81
tai30 20 4.json	30	20	Solution	300.03	2014	1997.00	0.84
tai30 20 5.json	30	20	Solution	300.03	2070	1940.00	6.28

Table 2: Results for Taillard JobShop (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai30 20 6.json	30	20	Solution	300.02	1942	1783.00	8.19
tai30 20 7.json	30	20	Solution	300.03	2027	1905.00	6.02
tai30 20 8.json	30	20	Solution	300.03	2026	1903.00	6.07
tai30 20 9.json	30	20	Solution	300.03	2006	1806.00	9.97
tai50 15 0.json	50	15	Optimal	90.61	2760	2760.00	0.00
tai50 15 1.json	50	15	Optimal	52.92	2756	2756.00	0.00
tai50 15 2.json	50	15	Optimal	16.80	2717	2717.00	0.00
tai50 15 3.json	50	15	Optimal	10.28	2839	2839.00	0.00
tai50 15 4.json	50	15	Optimal	35.27	2679	2679.00	0.00
tai50 15 5.json	50	15	Optimal	66.12	2781	2781.00	0.00
tai50 15 6.json	50	15	Optimal	15.50	2943	2943.00	0.00
tai50 15 7.json	50	15	Optimal	30.88	2885	2885.00	0.00
tai50 15 8.json	50	15	Optimal	35.67	2655	2655.00	0.00
tai50 15 9.json	50	15	Optimal	37.75	2723	2723.00	0.00
tai50 20 0.json	50	20	Optimal	165.80	2868	2868.00	0.00
tai50 20 1.json	50	20	Solution	300.11	2907	2869.00	1.31
tai50 20 2.json	50	20	Solution	300.10	2784	2755.00	1.04
tai50 20 3.json	50	20	Solution	300.10	2708	2702.00	0.22
tai50 20 4.json	50	20	Solution	300.11	2738	2725.00	0.47
tai50 20 5.json	50	20	Optimal	199.89	2845	2845.00	0.00
tai50 20 6.json	50	20	Solution	300.12	2826	2825.00	0.04
tai50 20 7.json	50	20	Optimal	144.63	2784	2784.00	0.00
tai50 20 8.json	50	20	Optimal	87.12	3071	3071.00	0.00
tai50 20 9.json	50	20	Solution	300.12	3036	2995.00	1.35

Table 3: Results for Taillard Flowshop (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 10 0.json	100	10	Solution	60.04	6146	5759.00	6.30
tai100 10 1.json	100	10	Solution	60.03	5631	5345.00	5.08
tai100 10 2.json	100	10	Solution	60.04	5827	5646.00	3.11
tai100 10 3.json	100	10	Solution	60.04	6258	5737.00	8.33
tai100 10 4.json	100	10	Solution	60.04	5952	5431.00	8.75
tai100 10 5.json	100	10	Solution	60.03	5696	5274.00	7.41
tai100 10 6.json	100	10	Solution	60.04	5806	5553.00	4.36
tai100 10 7.json	100	10	Solution	60.04	5936	5575.00	6.08
tai100 10 8.json	100	10	Solution	60.04	6170	5838.00	5.38
tai100 10 9.json	100	10	Solution	60.05	6107	5835.00	4.45
tai100 20 0.json	100	20	Solution	60.05	7109	5914.00	16.81
tai100 20 1.json	100	20	Solution	60.05	7058	6115.00	13.36
tai100 20 2.json	100	20	Solution	60.06	7088	6139.00	13.39
tai100 20 3.json	100	20	Solution	60.06	7043	6117.00	13.15

Table 3: Results for Taillard Flowshop (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 20 4.json	100	20	Solution	60.06	7246	6148.00	15.15
tai100 20 5.json	100	20	Solution	60.07	7521	6192.00	17.67
tai100 20 6.json	100	20	Solution	60.06	7219	6045.00	16.26
tai100 20 7.json	100	20	Solution	60.04	7306	6113.00	16.33
tai100 20 8.json	100	20	Solution	60.03	7111	6014.00	15.43
tai100 20 9.json	100	20	Solution	60.07	7281	6359.00	12.66
tai100 5 0.json	100	5	Solution	60.12	5493	5488.00	0.09
tai100 5 1.json	100	5	Solution	60.13	5301	5232.00	1.30
tai100 5 2.json	100	5	Solution	60.12	5221	5170.00	0.98
tai100 5 3.json	100	5	Solution	60.13	5018	4993.00	0.50
tai100 5 4.json	100	5	Solution	60.11	5263	5225.00	0.72
tai100 5 5.json	100	5	Solution	60.13	5139	5131.00	0.16
tai100 5 6.json	100	5	Solution	60.13	5236	5222.00	0.27
tai100 5 7.json	100	5	Solution	60.14	5162	5077.00	1.65
tai100 5 8.json	100	5	Solution	60.12	5479	5438.00	0.75
tai100 5 9.json	100	5	Solution	60.12	5333	5305.00	0.53
tai200 10 0.json	200	10	Solution	60.07	11394	10842.00	4.84
tai200 10 1.json	200	10	Solution	60.08	11508	10429.00	9.38
tai200 10 2.json	200	10	Solution	60.12	11498	10915.00	5.07
tai200 10 3.json	200	10	Solution	60.06	11677	10826.00	7.29
tai200 10 4.json	200	10	Solution	60.07	11313	10474.00	7.42
tai200 10 5.json	200	10	Solution	60.09	11084	10311.00	6.97
tai200 10 6.json	200	10	Solution	60.05	11420	10825.00	5.21
tai200 10 7.json	200	10	Solution	60.06	11429	10709.00	6.30
tai200 10 8.json	200	10	Solution	60.05	11101	10419.00	6.14
tai200 10 9.json	200	10	Solution	60.05	11353	10664.00	6.07
tai200 20 0.json	200	20	Solution	60.07	12701	11010.00	13.31
tai200 20 1.json	200	20	Solution	60.18	12943	10976.00	15.20
tai200 20 2.json	200	20	Solution	60.12	12672	11168.00	11.87
tai200 20 3.json	200	20	Solution	60.09	12848	11131.00	13.36
tai200 20 4.json	200	20	Solution	60.07	12918	11160.00	13.61
tai200 20 5.json	200	20	Solution	60.14	12899	11114.00	13.84
tai200 20 6.json	200	20	Solution	60.09	13156	11249.00	14.50
tai200 20 7.json	200	20	Solution	60.11	12937	11149.00	13.82
tai200 20 8.json	200	20	Solution	60.09	12719	11013.00	13.41
tai200 20 9.json	200	20	Solution	60.23	13084	11167.00	14.65
tai20 10 0.json	20	10	Solution	60.02	1577	1494.00	5.26
tai20 10 1.json	20	10	Solution	60.03	1677	1531.00	8.71
tai20 10 2.json	20	10	Solution	60.03	1501	1424.00	5.13
tai20 10 3.json	20	10	Solution	60.03	1382	1343.00	2.82
tai20 10 4.json	20	10	Solution	60.02	1430	1353.00	5.38
tai20 10 5.json	20	10	Solution	60.03	1397	1334.00	4.51
tai20 10 6.json	20	10	Solution	60.01	1450	1388.00	4.28
tai20 10 7.json	20	10	Solution	60.02	1561	1414.00	9.42
tai20 10 8.json	20	10	Solution	60.00	1591	1553.00	2.39

Table 3: Results for Taillard Flowshop (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 10 9.json	20	10	Solution	60.02	1579	1479.00	6.33
tai20 20 0.json	20	20	Solution	60.04	2281	1968.00	13.72
tai20 20 1.json	20	20	Solution	60.02	2158	1758.00	18.54
tai20 20 2.json	20	20	Solution	60.03	2336	1931.00	17.34
tai20 20 3.json	20	20	Solution	60.03	2318	1892.00	18.38
tai20 20 4.json	20	20	Solution	60.05	2327	1992.00	14.40
tai20 20 5.json	20	20	Solution	60.04	2248	1925.00	14.37
tai20 20 6.json	20	20	Solution	60.06	2325	1962.00	15.61
tai20 20 7.json	20	20	Solution	60.04	2235	1913.00	14.41
tai20 20 8.json	20	20	Solution	60.06	2256	1884.00	16.49
tai20 20 9.json	20	20	Solution	60.04	2207	1928.00	12.64
tai20 5 0.json	20	5	Optimal	2.35	1278	1278.00	0.00
tai20 5 1.json	20	5	Optimal	1.63	1358	1358.00	0.00
tai20 5 2.json	20	5	Optimal	3.34	1073	1073.00	0.00
tai20 5 3.json	20	5	Optimal	4.08	1292	1292.00	0.00
tai20 5 4.json	20	5	Optimal	10.38	1231	1231.00	0.00
tai20 5 5.json	20	5	Optimal	2.42	1193	1193.00	0.00
tai20 5 6.json	20	5	Optimal	3.02	1234	1234.00	0.00
tai20 5 7.json	20	5	Optimal	2.17	1199	1199.00	0.00
tai20 5 8.json	20	5	Optimal	1.05	1210	1210.00	0.00
tai20 5 9.json	20	5	Optimal	1.85	1103	1103.00	0.00
tai500 20 0.json	500	20	Solution	300.37	28702	25931.00	9.65
tai500 20 1.json	500	20	Solution	300.29	29115	26390.00	9.36
tai500 20 2.json	500	20	Solution	300.18	28737	26330.00	8.38
tai500 20 3.json	500	20	Solution	300.29	28987	26456.00	8.73
tai500 20 4.json	500	20	Solution	300.15	28863	26205.00	9.21
tai500 20 5.json	500	20	Solution	300.20	29077	26436.00	9.08
tai500 20 6.json	500	20	Solution	300.20	28800	26329.00	8.58
tai500 20 7.json	500	20	Solution	300.18	28953	26451.00	8.64
tai500 20 8.json	500	20	Solution	300.24	28144	25929.00	7.87
tai500 20 9.json	500	20	Solution	300.17	28694	26355.00	8.15
tai50 10 0.json	50	10	Solution	60.09	3219	2963.00	7.95
tai50 10 1.json	50	10	Solution	60.09	3041	2828.00	7.00
tai50 10 2.json	50	10	Solution	60.07	2976	2824.00	5.11
tai50 10 3.json	50	10	Solution	60.06	3243	3023.00	6.78
tai50 10 4.json	50	10	Solution	60.11	3200	2917.00	8.84
tai50 10 5.json	50	10	Solution	60.07	3118	2963.00	4.97
tai50 10 6.json	50	10	Solution	60.08	3178	3063.00	3.62
tai50 10 7.json	50	10	Solution	60.10	3141	3000.00	4.49
tai50 10 8.json	50	10	Solution	60.11	2961	2832.00	4.36
tai50 10 9.json	50	10	Solution	60.09	3205	3046.00	4.96
tai50 20 0.json	50	20	Solution	60.19	4152	3551.00	14.47
tai50 20 1.json	50	20	Solution	60.18	4100	3533.00	13.83
tai50 20 2.json	50	20	Solution	60.24	4007	3412.00	14.85
tai50 20 3.json	50	20	Solution	60.19	4013	3382.00	15.72

Table 3: Results for Taillard Flowshop (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 20 4.json	50	20	Solution	60.17	3980	3371.00	15.30
tai50 20 5.json	50	20	Solution	60.21	3967	3499.00	11.80
tai50 20 6.json	50	20	Solution	60.24	4075	3453.00	15.26
tai50 20 7.json	50	20	Solution	60.25	4056	3411.00	15.90
tai50 20 8.json	50	20	Solution	60.17	4115	3468.00	15.72
tai50 20 9.json	50	20	Solution	60.19	3986	3474.00	12.84
tai50 5 0.json	50	5	Optimal	17.70	2724	2724.00	0.00
tai50 5 1.json	50	5	Optimal	57.29	2834	2834.00	0.00
tai50 5 2.json	50	5	Optimal	47.53	2612	2612.00	0.00
tai50 5 3.json	50	5	Optimal	11.58	2751	2751.00	0.00
tai50 5 4.json	50	5	Optimal	23.50	2853	2853.00	0.00
tai50 5 5.json	50	5	Optimal	28.67	2825	2825.00	0.00
tai50 5 6.json	50	5	Optimal	42.14	2716	2716.00	0.00
tai50 5 7.json	50	5	Optimal	19.26	2683	2683.00	0.00
tai50 5 8.json	50	5	Optimal	56.32	2545	2545.00	0.00
tai50 5 9.json	50	5	Optimal	5.82	2776	2776.00	0.00