**Algorithmus 1**

Duales Problem: Surrogate Subgradientenverfahren

Unterprobleme: Variable Nachbarschaftssuche

Feasibility Repair: List Scheduling

**Konfiguration**

problem.setmTimeSlots(200);

(SubproblemSolverType.*VariableNeighbourhoodSearch*, 50, 5, 3, 50, 50, 1);

SurrogateSubgradientSearch(problem, **true**, -1, 0.2, 15, 0.1, 20, 5, config);

sg.solve(500);

**Lösung**

Job 0: (4,0,5) (13,9,4) (20,15,8) (22,29,3) (24,32,5) (19,48,6)

Job 1: (19,0,6) (27,13,6) (18,26,5) (13,31,4) (22,46,3) (1,53,3)

Job 2: (14,0,5) (25,5,4) (20,23,8) (18,33,5) (4,41,5) (21,51,4)

Job 3: (13,5,4) (18,9,5) (4,17,5) (19,25,6) (24,42,5) (21,47,4)

Job 4: (18,0,5) (4,8,5) (25,19,4) (14,23,5) (20,35,8) (22,49,3)

Job 5: (11,0,3) (24,3,6) (26,13,3) (0,21,2) (2,33,6) (6,40,7) (14,58,4)

Job 6: (0,0,2) (11,6,3) (24,9,6) (26,19,3) (2,27,6) (6,33,7) (14,51,4)

Job 7: (14,5,4) (2,20,6) (0,26,2) (26,33,3) (11,40,3) (27,49,4) (8,53,6)

Job 8: (13,0,5) (3,12,7) (5,19,3) (27,22,4) (11,32,3) (26,39,3) (6,47,7)

Job 9: (26,0,3) (25,9,5) (11,18,3) (5,27,3) (3,30,7) (8,37,6) (13,50,5)

Job 10: (9,0,8) (9,53,9) (10,62,9) (7,79,4) (20,90,8)

Job 11: (18,14,5) (10,36,9) (9,45,8) (10,53,8) (7,69,4)

Job 12: (20,0,8) (7,15,4) (9,27,10) (9,37,8) (10,45,8)

Job 13: (10,0,9) (9,9,8) (9,17,9) (7,34,4) (20,45,8)

Job 14: (7,0,4) (10,12,7) (10,19,8) (10,27,9) (18,48,5)

Lower Bound: 537.5430918680164, Upper Bound: 541.0

Hinweis:

* ein Tripel (a,b,c) in der Lösung hat folgende Bedeutung: (Maschine, Startzeit, Prozesszeit),
* jedes Tripel entspricht einer Operation,
* Für jeden Job sind die Operationen in der Reihenfolge ihrer Durchführung angegeben.

**Algorithmus 2**

Duales Problem: Surrogate Subgradientenverfahren

Unterprobleme: Dynamische Programmierung

Feasibility Repair: List Scheduling

**Konfiguration**

problem.setmTimeSlots(200);

SubproblemSolver\_config(SubproblemSolverType.*DynamicProgramming*);

SurrogateSubgradientSearch(problem, **true**, -1, 0.2, 15, 0.1, 20, 5, config);

sg.solve(500);

**Lösung**

Job 0: (4,0,5) (13,9,4) (18,14,5) (22,30,3) (24,33,5) (19,49,6)

Job 1: (18,0,5) (27,12,6) (18,25,5) (13,30,4) (21,45,4) (1,53,3)

Job 2: (14,0,5) (25,5,4) (20,16,8) (18,30,5) (4,38,5) (21,49,4)

Job 3: (13,5,4) (18,9,5) (4,17,5) (19,25,6) (24,42,5) (22,47,3)

Job 4: (19,0,6) (4,9,5) (25,20,4) (14,24,5) (20,36,8) (22,50,3)

Job 5: (11,0,3) (24,3,6) (26,13,3) (0,21,2) (2,33,6) (6,40,7) (14,58,4)

Job 6: (0,0,2) (11,6,3) (24,9,6) (26,19,3) (2,27,6) (6,33,7) (14,51,4)

Job 7: (14,5,4) (2,20,6) (0,26,2) (26,33,3) (11,40,3) (27,49,4) (8,53,6)

Job 8: (13,0,5) (3,12,7) (5,19,3) (27,22,4) (11,32,3) (26,39,3) (6,47,7)

Job 9: (26,0,3) (25,9,5) (11,18,3) (5,27,3) (3,30,7) (8,37,6) (13,50,5)

Job 10: (9,0,8) (9,53,9) (10,62,9) (7,79,4) (20,90,8)

Job 11: (18,19,5) (10,36,9) (9,45,8) (10,53,8) (7,69,4)

Job 12: (20,0,8) (7,15,4) (9,27,10) (9,37,8) (10,45,8)

Job 14: (7,0,4) (10,12,7) (10,19,8) (10,27,9) (18,48,5)

LB: 537.7104102024659, UB: 541.0