Dynamic Programming for Routing and Scheduling

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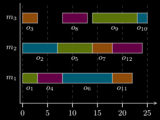
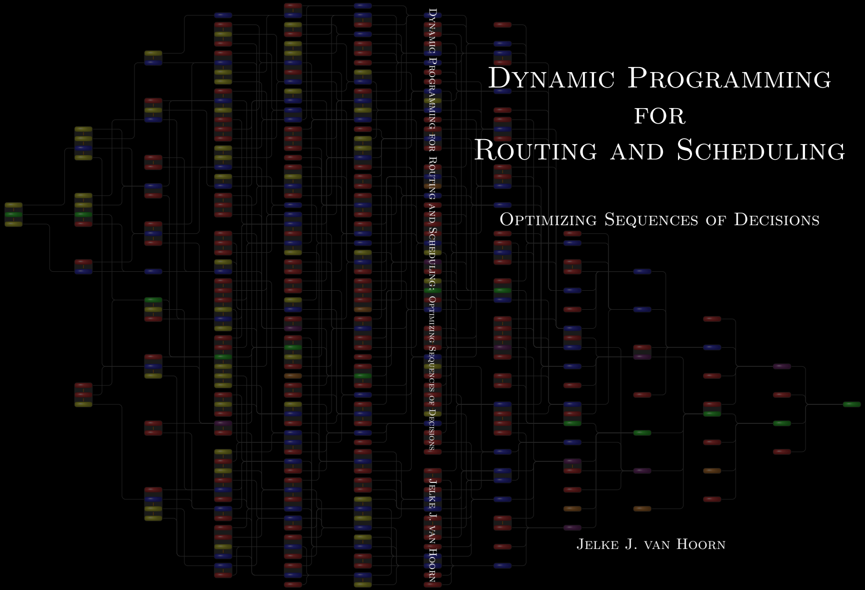




- feasible
- optimal
- infeasible
- dominated
- bounded/feasible
- bounded/infeasible

Dynamic Programming for Routing and Scheduling: Optimizing Sequences of Decisions   Jelke J. van Hoorn

Dynamic Programming for Routing and Scheduling

Optimizing Sequences of Decisions

Jelke J. van Hoorn

Job 1

	$m(o)$	$p(o)$
o_1	1	3
o_5	2	7
o_9	3	9

Job 2

	$m(o)$	$p(o)$
o_2	2	7
o_6	1	10
o_{10}	3	2

Job 3

	$m(o)$	$p(o)$
o_3	3	3
o_7	2	4
o_{11}	1	4

Job 4

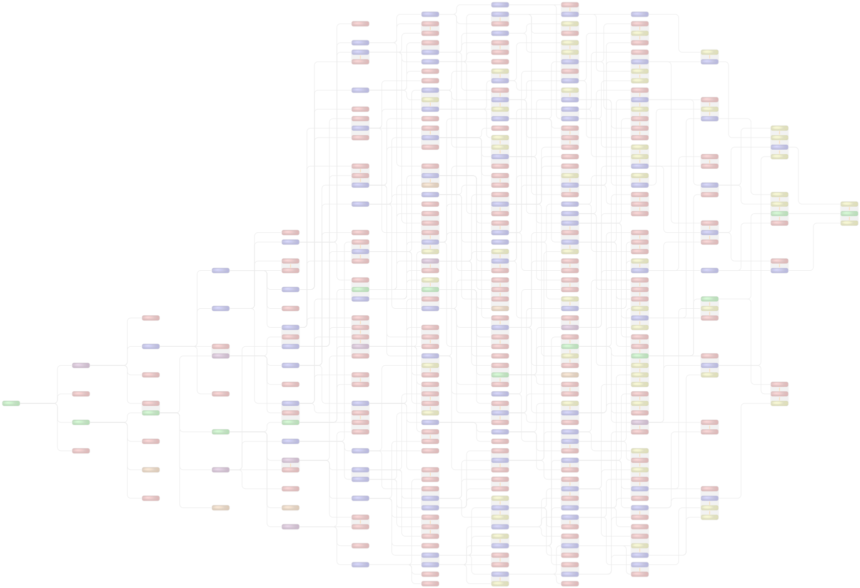
	$m(o)$	$p(o)$
o_4	1	5
o_8	3	5
o_{12}	2	6

JSSP

C_o	**Finish time of operation o**
j	**Job**
m	**Machine**
$C_{\max}$	**Makespan**
$p_{\max}$	**Maximum operation time**
o	**Operation**
$\pi_j(i)$	**i-th machine job j has to visit**
p_o	**Processing time of operation o**
ψ	**Schedule**
$\alpha(\varsigma, o)$	**Aptitude**
$j(o)$	**Job for operation o**
$m(o)$	**Machine for operation o**
$\lambda(S)$	**Last operation in S for each job**
$\varepsilon(S)$	**Next operation per job not in S**
$p(o)$	**Processing time for operation o**
$\eta(\varsigma)$	**Possible expansions of ς**
$\Lambda(\varsigma)$	**Last operation in the sequence ς**
N	**Number of jobs**
M	**Number of machines**
$\mathcal{J}$	**Set of jobs**
$\mathcal{M}$	**Set of machines**
$\mathcal{O}$	**Set of operations**
$\vec{\alpha}$	**Array of aptitude values**
$\vec{\eta}$	**Array of possible expansions**

JSSP Bounding

o^*	**Current operation**
$h^{\max}$	**First start of next maintenance**
$h^{\min}$	**First end of prev maintenance**
r_o	**Head of operation o**
$\tilde{r}_o$	**temporary head of operation o**
p_o^+	**Remaining processing time**
q_o	**Tail of operation o**
K^*	**Maximal set creating a block**
t	**Current time**
$t^{\mathbf{req}}$	**Next relevant time**
$\mathcal{A}$	**Set of available operations**
$\mathcal{D}$	**Set of delayed operations**
$\mathcal{U}$	**Set of unavailable operations**
$\mathcal{M}^+$	**Machines with operations left**
$\bar{I}$	**Set of all operations**
I	**Set of job operations**
$\breve{I}$	**Set of maintenance operations**



DP

β	**Bookkeeping variables**
E	**Number of expansions per solution**
H	**Number of expanded solutions**
$\doteq$	**Domination: equal**
$\geqq$	**Domination: dominates**
$\not\doteq$	**Domination: not comparable**
⟐⟹	**Expands solution with node**
γ	**Comparable variables**
ϕ	**Fixed variables**
$\prec$	**Precedence relation between nodes**
Ω	**Set identifiers of optimal solutions**
ς	**A Solution**
$\mathring{\varsigma}$	**An optimal solution**
≀	**Splits ϕ and γ in a state definition**
≀	**Splits γ and β in a state definition**
ξ	**State**
$\check{\xi}$	**Optimal solution**
$\hat{\xi}$	**Non-dominated solutions**

TSP

n	**Number of nodes of a TSP problem**
s	**Start node of a TSP used in DP**

VRP

d	**Destination of a vehicle**
o	**Origin of a vehicle**
r	**Request**
v	**Vehicle**
n	**Number of customer requests**
m	**Number of vehicles**
D	**Set of destinations**
O	**Set of origins**
R	**Set of requests**
V	**Set of vehicles**

JSSPM

D	**Downtime**
$\vec{u}$	**Array of left uptime**
u	**Left uptime**
R	**Maintenance**
U	**Uptime**
$\mathcal{N}$	**Number of maintenances**
$\mathcal{R}$	**Set of maintenances**