

# Literature Survey

Helmut Simonis

## Constraint Based Production Scheduling



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## Key Points



- We are working on a survey of the existing CP & Scheduling literature
- Considers over 1200 papers
- Current version of survey available at  
<https://hsimonis.github.io/pthg24>

# A Survey of the Existing Literature



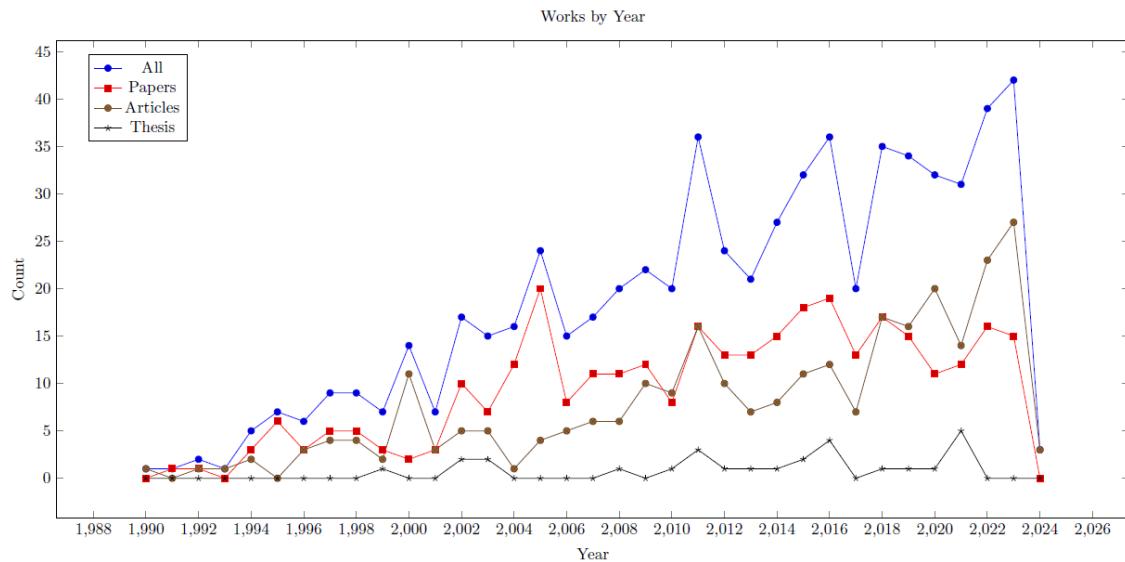
- Joint work with Cemallettin Ozturk, MTU
- What is out there
- Where to start
- Where to publish
- I'm interested in some specific topic, what is relevant

## Methodology



- Manually curated list of works, somewhat inclusive
- Starting with bibtex files
- Citation links through OpenCitations (open access)
- Content analysis on local copies of pdf files
- Closure of domain by analyzing missing cited and citing works
- Limited manual analysis of works (datasets, code)
- Results presented as LaTeX documents
- Open source analysis on git:  
<https://hsimonis.github.io/pthg24/>

## Overall Analysis (Based on 671 Works)

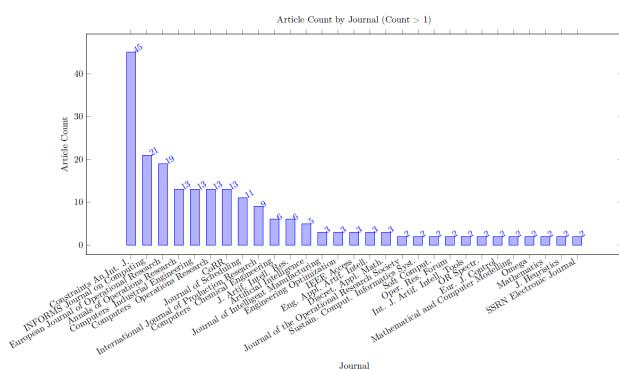
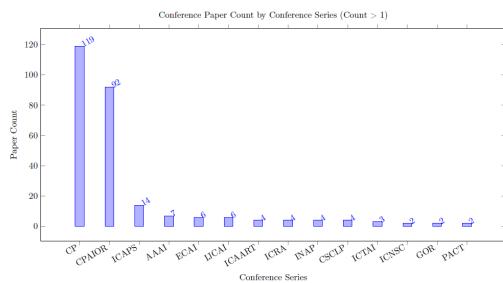


ENTIRE EDIH

## Production Scheduling

Slide 8

## Origin of Papers/Articles



ENTIRE EDIH

## Production Scheduling

Slide 9

# Most Recent Articles



Table 5: Works from bibtex (Total 274)

Key	Authors	Title	LC	Cite	Year	Conference /Journal	Pages	Nr Cites	Nr Refs	b	c
ForbesHJST24 ForbesHJST24	M. Forbes [M. Harris [H. Jansen [F.A. van der Schoot [T. Tsaiure	Combining optimisation and simulation using logic-based Benders decomposition	Yes	[217]	2024	European Journal of Operational Research	15	0	26	1314	1490
PrataAN23 PrataAN23	Bruno A. Prata [Levi R. Abreu [Marcelo S. Nagano	Applications of constraint programming in job-scheduling problems: A descriptive bibliometric analysis	Yes	[509]	2024	Results in Control and Optimization	17	0	0	1427	1497
abs-2402-00459 abs-2402-00459	S. Nguyen [Dhananjay R. Thiruvady [Y. Sun [M. Zhang	Genetic-based Constraint Programming for Resource Constrained Job Scheduling	Yes	[469]	2024	CoRR	21	0	0	1495	1498
AbreuNP23 AbreuNP23	Levi Ribeiro de Abreu [Marcelo Scido Nagano [Bruno A. Prata	A new two-stage constraint programming approach for a short scheduling problem with machine blocking	Yes	[168]	2023	International Journal of Production Research	20	1	47	1243	1499
AbreuPNF23 AbreuPNF23	Levi R. Abreu [Bruno A. Prata [Marcelo S. Nagano [Jose M. Framinan	A constraint programming-based iterated greedy algorithm for the open shop with sequence-dependent processing times and makespan minimization	Yes	[9]	2023	Computers & Operations Research	12	0	46	1244	1500
Adelgren2023 Adelgren2023	N. Adelgren [Christos T. Maravalias	On the utility of prediction scheduling formulations for job shop keeping variables	Yes	[7]	2023	Computers & Industrial Engineering	12	0	43	1245	1501
AlsariVP23 AlsariVP23	S. Alsari [Camino R. Vela [Juan José Palacios [Luis González-Rodríguez	Mathematical models and benchmarking for the fuzzy job shop scheduling problem	Yes	[8]	2023	Computers & Industrial Engineering	14	0	50	1246	1502
AkramNHSA23 AkramNHSA23	Bilal Omar Akrami [Nor Kamariah Noordin [F. Hashimi [Moh. Fadlee A. Rasid [Mustafa Ismail [Salman [Abdulrahman M. Abdullaheen	Joint Scheduling and Routing Optimization for Deterministic Hybrid Traffic in Time-Sensitive Networks Using Constraint Programming	Yes	[13]	2023	IEEE Access	16	0	0	1248	1503
AlfieriGPS23 AlfieriGPS23	A. Alfieri [M. Garratia [E. Pastore [F. Salassa	Permutation flowshop problems minimizing core waiting time and core idle time	Yes	[15]	2023	Computers & Industrial Engineering	13	0	37	1249	1504
AlfieriGPS23 AlfieriGPS23	Jordi Coll Caballero	Scheduling through logic-based tools	Yes	[127]	2023	Constraints An. Int.	1	0	0	1287	1505
CzerniachowskaW223 CzerniachowskaW223	K. Czerniachowska [R. Wichniarek [K. Zywicki	Constraint Programming for Flexible Flow Shop Scheduling Problem with Repeated Jobs and Repeated Operations	Yes	[159]	2023	Advances in Science and Technology Research Journal	14	0	0	1297	1506
FahimiQ23 FahimiQ23	H. Fahimi [C. Quimper	Overload-Checking and Edge-Finding for Robust Cumulative Scheduling	No	[207]	2023	INFORMS Journal on Computing	null	0	16	No	1507
Fatemi-AnarakiTFV23 Fatemi-AnarakiTFV23	S. Fatemi-Anaraki [B. Torokhtei-Moghaddam [M. Foumani [S. Vahedi-Nouri	Scheduling of Multi-Robotic Job Shop Systems in Dynamic Environments: Mixed-Integer Linear Programming and Constraint Programming Approaches	Yes	[212]	2023	Omega	15	7	60	1312	1508
GhasemiMH23 GhasemiMH23	S. Ghasemi [R. Tavakkoli-Moghaddam [M. Hamdi	Operating room scheduling by emphasizing human factors and dynamic decision-making styles: a constraint programming method	No	[242]	2023	International Journal of Systems Sciences: Operations Logistics	null	0	104	No	1509
GuoZ23 GuoZ23	P. Guo [J. Zhu	Capacity reservation for humanitarian relief: A logic-based Benders decomposition method with subgradient cut	Yes	[269]	2023	European Journal of Operational Research	29	0	112	1325	1510
GurPAE23 GurPAE23	S. Gur [M. Pinarbasi [Haci Mehmet Alakas [T. Eren	Operating room scheduling with surgical team: a new approach with constraint programming and goal programming	Yes	[270]	2023	Central Eur. J. Oper. Res.	25	1	40	1327	1511
IstikYA23 IstikYA23	Eyüp Ensar İstik [Seyda Topaloglu Yıldız [Özge Sattır Akpinar	Constraint programming models for the hybrid flow shop scheduling problem and its extensions	Yes	[321]	2023	Soft Comput.	28	0	127	1350	1512
JuvinalHL23a JuvinalHL23a	C. Juvinal [L. Housain [P. Lopez	Logic-based Benders decomposition for the preemptive flexible job-shop scheduling problem	Yes	[331]	2023	Computers & Operations Research	17	0	40	1355	1513
LacknerMMWW23 LacknerMMWW23	M. Lackner [C. Mrkvicka [N. Musliu [D. Walkiewicz [F. Winter	Exact methods for the Oven Scheduling Problem	Yes	[374]	2023	Constraints An. Int.	42	0	32	1371	1514

## Automatically Extracted Article Features



Table 6: Automatically Extracted ARTICLE Properties (Requires Local Copy)

Work	Pages	Concepts	Classification	Constraints	Prog Languages	CP Systems	Areas	Industries	Benchmarks	Algorithm	a	c
LaborieO3 [369]	38	task, precedence, order, emax, machine, job, activity, re-scheduling, setup-time, release-date, inventory, preempt, job-shop, resource, scheduling, make-span		cycle, table constraint, cumulative, disjunctive	C++	Ilog Scheduler			benchmark	edge-finding, not-last, energetic reasoning, not-first, time-tabling	1201	1731
LaborieRSV18 [372]	41	release-date, job-shop, resource, activity, precedence, sequence dependent setup, earliness, scheduling, machine, memory, transportation, manpower, due-time, setup-time, batch process, order, tardiness, flow-shop, job, make-span, re-scheduling, task, distributed	psplib, parallel machine, RCPSP	alternative constraint, cumulative, noOverlap, disjunctive, span constraint, cycle, alwaysIn, endBeforeStart	C , Python, Gecode, C++, Java	CHIP, Ilog Solver, CPLEX, Ilog Scheduler, OPL, Choco Solver, CPO, Gurobi	semiconductor, railway, container terminal, satellite, robot, pipeline, aircraft, shipping line	chemical industry, petro-chemical industry	real-world, CSPlib, benchmark	edge-finding	1080	1610
LacknerMMWW23 [374]	42	release-date, batch process, setup-time, job, order, due-date, tardiness, scheduling, make-span, machine, task, lateness, job-shop, earliness	parallel machine, OSP, single machine	alternative constraint, disjunctive, bin-packing, noOverlap, cumulative, endBeforeStart	C++, OPL, CPLEX, OR-Tools, MiniZinc, Gurobi	Cplex, OPL, CHIP, ECLIPSe, OPL, CHIP	semiconductor oven scheduling	electronics industry, steel industry, manufacturing industry	random instances, industrial partner, benchmark, instance generator, real-life real-life	time-tabling	984	1514
LammaMM97 [377]	15	job-shop, resource, scheduling, precedence, order, task, job, distributed, job		disjunctive, circuit, disjunctive	C++, Prolog	ECLIPSe, OPL, CHIP	railway		generated instances, Roadef, benchmark, random instance	time-tabling	1230	1760
LetortCB15 [385]	52	machine, make-span, job, precedence, resource, scheduling, task, order	psplib	cumulative, cycle, bin-packing	Java, Prolog	Choco Solver, CHIP, SICStus Prolog, Ilog Solver, OZ, CPLEX, ECLIPSe, OPL, CHIP			energetic reasoning, sweep, edge-finding	time-tabling	1110	1640
LiW08 [386]	18	precedence, activity, resource, completion-time, setup-times, make-span, scheduling, machine, preempt, job, job-shop, no preempt, job, re-scheduling, open-shop, due-date, task, order	RCPSP	disjunctive, cycle, bin-packing					real-world	time-tabling	1178	1708
LiessM08 [388]	12	precedence, scheduling, machine, job, activity, precedence, job-shop, task, make-span, order, emax	RCPSP, psplib	disjunctive, cumulative	C++	OZ			benchmark	edge-finding	1179	1709
LimtanyakulS12 [393]	32	release-date, scheduling, order, completion-time, job, resource, activity, tardiness, machine, due-date, precedence		table constraint, disjunctive, bin-packing, cumulative		OZ, Ilog Scheduler, Cplex	robot, automotive	automotive industry	random instance, real-life, generated instance, industrial partner, benchmark	not-last, energetic reasoning, not-first, edge-finding	1133	1663
LombardiM10a [402]	30	due-date, distributed, order, job, make-span, release-date, re-scheduling, task, completion-time, resource, activity, precedence, preempt, scheduling, machine	TCSP	cycle, span constraint, cumulative, disjunctive, table constraint	C	Cplex			real-world, benchmark, real-life	sweep	1160	1690

# Manually Extracted Article Features



Table 4: Manually Defined PAPER Properties

Key	Title (Local Copy)	CP System	Bench	Links	Data Avail	Sol Avail	Code Avail	Related To	Classification	Constraints	a	b
AalianPG23	Optimization of Short-Term Underground Mine Planning Using Constraint Programming	CP Opt	real-world	1	n	n	n	-	?	-	1	325
AalianPG23 [1]	Enhancing Hybrid CP-SAT Search for Disjunctive Scheduling	ARIES	real-world	1	y	y	-	JSSP OSSP	-	-	2	371
Bit-Monnot23	Predicting the Optimal Period for Cyclic Hoist Scheduling Problems	CP Opt OR-Tools	github, bench-mark	3	n	n	-	CHSP	-	-	3	415
EfthymiouY23	An Efficient Constraint Programming Approach to Preemptive Job Shop Scheduling	CP Opt	benchmark, random instance, generated instance, real-life, industrial instance	6	ref	y	PJSSP	endBeforeStart span noOverlap	-	-	4	476
JuvinHHL23	Constraint Programming for the Robust Two-Machine Flow-Shop Scheduling Problem with Budgeted Uncertainty	CP Opt Cplex	real-world	0	ref	n	-	Perm FSSP	endBeforeStart noOverlap sameSequence cumulative	-	5	477
KamegneFND23	Horizontally Elastic Edge Finder Rule for Constraint Constraint Based on Slack and Density	?	benchmark	5	BL PSPlib	n	-	RCPSPs	-	-	6	480
KimCMLLP23	Iterated Greedy Constraint Programming for Scheduling Steelmaking Continuous Casting	Gurobi OR-Tools	real-world, benchmark, zenodo	0	y	n	-	SCC	alternative noOverlap	-	7	485
Mehdizadeh-Somarin23	A Constraint Programming Model for a Reconfigurable Job Shop Scheduling Problem with Multiple Resources	CP Opt	random instance	0	n	n	-	JSSP RMS	alternative endBeforeStart noOverlap	-	8	529
PerezGSL23	A Constraint Programming Model for Scheduling the Unloading of Trains in Ports	custom	real-world, generated instance	0	n	n	-	SUTP	noOverlap	-	9	553
PovedaAA23	Partially Preemptive Multi Skill/Mode Resource-Constrained Project Scheduling with Generalized Precedence Relations and Calendars	CP Opt MiniZinc Chuffed	real-world, github, benchmark, industrial instance, real-life	4	y	y	PP-MS-MMRCPSp/max-cal	-	-	10	557	
SquillaciPR23	Scheduling Complex Observation Requests for a Constellation of Satellites: Large Neighborhood Search Approaches	Cplex Studio	github, benchmark	2	y	n	-	EOSP	?	-	11	584
TardivoDFMP23	Constraint Propagation on GPU: A Case Study for the Cumulative Constraint	MiniCPP MiniZinc	bitbucket, github, benchmark, real-world	9	PSPLib BL Pack	y	-	RCPSp	cumulative	-	12	590
TasselGS23	An End-to-End Reinforcement Learning Approach for Job-Shop Scheduling Problems Based on Constraint Programming	custom Choco	industrial instance, real-world, supplementary material, github, benchmark	0	ref	y	-	JSSP	noOverlap	-	13	591
WangB23	Dynamic All-Different and Maximal Cliques Constraints for Fixed Job Scheduling	FaCILe	real-world, random instances	0	(y)	n	[628]	FJS	-	-	14	620
WangB23 [629]	A competitive constraint programming approach for the group shop scheduling problem	CP Opt	github, benchmark	0	ref	n	-	GSSP	noOverlap endBeforeStart	-	15	633

## Extracted Features: Application Areas



Table 16: Works for Concepts of Type ApplicationAreas

Type	Keyword	High	Medium	Low
ApplicationAreas	COVID	[GuZ23] [260]	GeilingerKKMMW21 [234]	[Fatemi-AnarakiTFV23] [212], [Mehdizadeh-Somarin23] [430], [GurPAE23] [270], [JuvinHHL23a] [331], [OujanaAYB22] [487], [Lemos21] [381]
ApplicationAreas	HVAC	[LimHTB16] [390], [LimBTBB15] [391], [GrimesOS14] [260]	-	-
ApplicationAreas	agriculture	-	-	[AkramNHRSA23] [13], [BenderWS21] [84], [HamPK21] [275], [Astrand21] [53], [QinWLSLS21] [511], [AstrandDF21] [36], [Mejia20] [431]
ApplicationAreas	aircraft	[PolIAK22] [562], [WangB20] [528], [TranDHTWVOV17] [390], [Fahim116] [205], [BajestaniB13] [42], [LombardiM12] [493], [BajestaniB11] [41], [FrankK05] [210], [ArtionchimeB05] [34], [SimoniS99] [558]	[WangB23] [629], [GombolayWS18] [253], [Ham15] [273], [SimoniS07] [559], [SakkoutWoo] [329], [SimoniS56] [556]	[PrataA23] [509], [PovedaAA23] [501], [Adelgren2023] [7], [KwonAmesDuanGNMS22] [202], [ElieOH22] [196], [ZarandIASC20] [654], [HauserBRPA20] [283], [abs-1902-09244] [282], [Hoover19] [312], [LaborieRSV18] [372], [HooverH17] [314], [TranAB16] [594], [Lombardi10] [308], [Laborie09] [370], [KoraceB03] [355], [KrogstLPHJ07] [668], [MartinPY01] [427], [SimonisK09] [569], [GruianK08] [264], [Darby-DowlingM21] [163], [Wallace09] [624], [SimoniS95] [557], [SimpsonC08] [561], [PovedaAA23] [509], [NaderiRR23] [460], [CzerniakowskaWZ23] [159], [NaderiBZ22] [457], [NaderiBZ22] [457], [AntuoriHHEN21] [22], [HubnerGSV21] [318], [AbreuAPNM21] [166], [KochierBFPHPS21] [348], [VlkHT21] [623], [BarzegaranP20] [61], [GebingerMM19] [236], [abs-1911-04766] [235], [BonattiZLM19] [113], [Stalat15] [652], [SchmitHT13] [333], [AkhavinBC14] [181], [Hanjumok83MBC14] [279], [BennifBGM06] [881], [KovacsC06] [360], [Wallace09] [624]
ApplicationAreas	automotive	-	[GuoZ23] [269], [YuraszeckMPV22] [650], [EmdeZD22] [169], [Grotaek21] [261], [LimtanyakuS12] [303], [SunYL10] [567], [Lombardi110] [398], [BarlaitCG08] [52], [SchildW00] [532]	[BeldiceanuC94] [78], [abs-2312-13682] [497], [PerezGSL23] [499], [TouatBT22] [592], [CauwelaertDS22] [14], [Wallace20] [627], [ZarandIASC20] [654], [abs-2307-07001] [201], [CauwelaertDMS16] [140], [Denecker91] [172], [DeneckerCS15] [173], [Novash12] [476], [CorrealLR07] [158], [LimRG07] [158], [NaderiR23] [460], [WangB23] [629], [Adelgren2023] [7], [EtmianieshtahnGNMS22] [202], [NaderiBZ22a] [456], [NaderiBZ22] [457], [HeinzNVH22] [295], [ElieOH22] [195], [Lemos21] [381], [MokhtarzadehINP20] [443], [TangLWSR18] [574], [HooverH17] [314], [DombribIRP16] [190], [LipovetzkyBPS14] [394], [HachmiC07] [122], [MilanoW09] [441], [WanB09] [623], [MilanoW08] [440], [BeldiceanuC02] [74], [JanG01] [523], [SimonisK09] [569]
ApplicationAreas	cable tree	[KochierBFPHPS21] [348]	-	[BeldiceanuC94] [78], [abs-2312-13682] [497], [PerezGSL23] [499], [TouatBT22] [592], [CauwelaertDS22] [14], [Wallace20] [627], [ZarandIASC20] [654], [abs-2307-07001] [201], [CauwelaertDMS16] [140], [Denecker91] [172], [DeneckerCS15] [173], [Novash12] [476], [CorrealLR07] [158], [LimRG07] [158], [NaderiR23] [460], [WangB23] [629], [Adelgren2023] [7], [EtmianieshtahnGNMS22] [202], [NaderiBZ22a] [456], [NaderiBZ22] [457], [HeinzNVH22] [295], [ElieOH22] [195], [Lemos21] [381], [MokhtarzadehINP20] [443], [TangLWSR18] [574], [HooverH17] [314], [DombribIRP16] [190], [LipovetzkyBPS14] [394], [HachmiC07] [122], [MilanoW09] [441], [WanB09] [623], [MilanoW08] [440], [BeldiceanuC02] [74], [JanG01] [523], [SimonisK09] [569]
ApplicationAreas	car manufacturing	[QinDCS20] [512], [SacramentoSP20] [526]	[AntuoriHHEN21] [22], [LaborieRSV18] [372]	-
ApplicationAreas	container terminal	-	-	[Bartak02] [54], [Bartak02a] [53], [Grotaek21] [261], [Zalout21] [652], [GalleguillosKS19] [225], [Madri-WambalOBM17] [418], [Letort13] [382], [IfrimOS12] [320], [LetortBC12] [383]
ApplicationAreas	crew-scheduling	[ZarandIASC20] [654], [PourDERB18] [505]	[BourreauGG17] [22], [Zalout21] [652], [GombolayWS18] [253], [Mason01] [420], [Touralvane95] [593]	[HebrandALLCMR22] [285], [GuoZ23] [269], [JuvinHHL23a] [331], [Adelgren2023] [7], [ShalikhK23] [547], [EndeZD22] [199], [AstrandDF21] [35], [AstrandDF21] [36], [AntuoriHHEN21] [22], [ZarandIASC20] [654], [Ham18] [274]
ApplicationAreas	dairies	-	-	-
ApplicationAreas	dairy	[EscobetPQPR19] [201]	[PrataAN23] [509], [HarjunkoskiMBC14] [279]	-
ApplicationAreas	datacenter	[HermenierDL11] [390]	-	-
ApplicationAreas	datacentre	-	[HurleyOS16] [319]	-
ApplicationAreas	datacentre	-	-	-
ApplicationAreas	day-ahead market	-	-	-
ApplicationAreas	deep space	[MontemannID23a] [446], [MontemannID23] [447], [Ham8] [273]	-	-
ApplicationAreas	drone	-	-	-

# Prolific Authors



Table 8: Co-Authors of Articles/Papers

# Limitations



- Limited coverage by OpenCitations
  - Difficult to have local access to some publication types (book, incollection)
  - Heavily biased towards publications in English
  - More powerful NLP analysis of works possible?

# Problem: Count for Most Cited Papers



Table 9: Works from bibtex (Total 30)

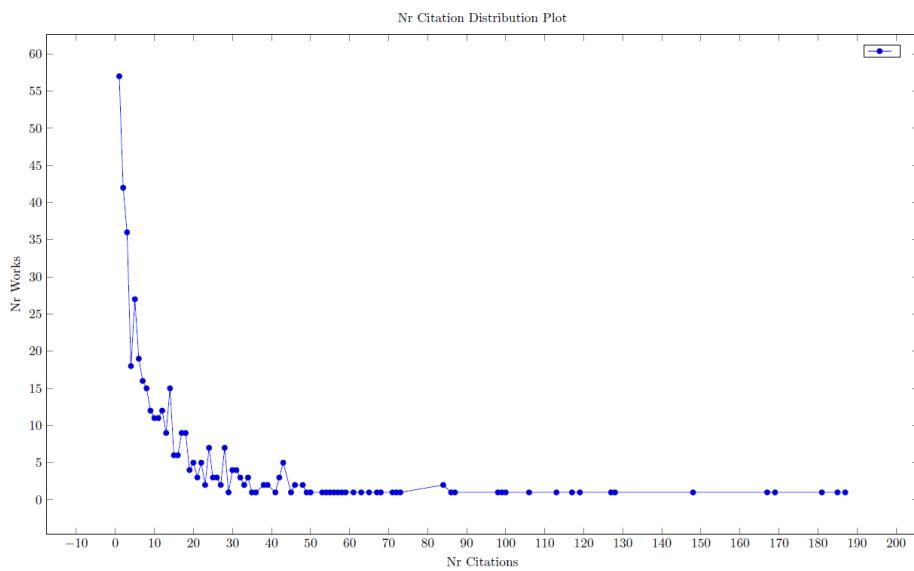
Key	Authors	Title	LC	Cite	Year	Conference /Journal	Pages	Nr Cites	Nr Refs	b	c
JainM99 [JainM99]	A. Jain, S. Meeran	Deterministic job-shop scheduling: Past, present and future	Yes	322	1999	European Journal of Operational Research	45	490	150	1352	1753
HarjunkoskiMBC14 [HarjunkoskiMBC14]	I. Harjunkoski, Christos T. Maravelias, P. Bongers, Pedro M. Castro, S. Engel, Ignacio E. Grossmann, John N. Hooker, C. Méndez, G. Sand, J. Wassick	Scope for industrial applications of production scheduling models and solution methods	Yes	279	2014	Computers Chemical Engineering	33	381	176	1335	1649
BlazewiczDP96 [BlazewiczDP96]	J. Blazewicz, W. Domschke, E. Pesch	The job shop scheduling problem: Conventional and new solution techniques	Yes	125	1996	European Journal of Operational Research	33	344	127	1278	1762
HookerO03 [HookerO03]	John N. Hooker, G. Ottosson	Logic-based Benders decomposition	Yes	313	2003	Mathematical Programming	28	317	0	1347	1720
BaptistePN01 [BaptistePN01]	P. Baptiste, Claude Le Pape, W. Nuijten	Constraint-Based Scheduling	No	50	2001	Book	null	296	0	No	n/a
JainG01 [JainG01]	V. Jain, Ignacio E. Grossmann	Algorithms for Hybrid MILP/CP Models for a Class of Optimization Problems: Extending CHIP in order to solve complex scheduling and placement problems	Yes	323	2001	INFORMS Journal on Computing	19	279	23	1351	1738
AggounB93 [AggounB93]	A. Aggoun, N. Beldiceanu	Logic Based Methods for Optimization: Combining Optimization and Constraint Satisfaction	No	304	2000	Mathematical and Computer Modelling Book	null	185	0	No	n/a
Hooker00 [Hooker00]	John N. Hooker	Planning and Scheduling by Logic-Based Benders Decomposition	Yes	309	2007	Operations Research	29	181	19	1345	1715
Hooker07 [Hooker07]	John N. Hooker	Decomposition techniques for multistage scheduling problems using mixed-integer and constraint programming methods	Yes	278	2002	Computers Chemical Engineering	20	169	11	1334	1733
HarjunkoskiG02 [HarjunkoskiG02]	I. Harjunkoski, Ignacio E. Grossmann	Introducing Global Constraints in CHIP	Yes	78	1994	Mathematical and Computer Modelling	27	167	8	1271	1765
BeldiceanuC94 [BeldiceanuC94]	N. Beldiceanu, E. Contejean	IBM ILOG CP optimizer for scheduling - 20+ years of scheduling with constraints at IBM/ILOG	Yes	372	2018	Constraints An Int. J.	41	148	35	1370	1610
LaborieRSV18 [LaborieRSV18]	P. Laborie, J. Rogerie, P. Shaw, P. Vilim	Algorithms for propagating resource constraints in AI planning and scheduling: Existing approaches and new results	Yes	369	2003	Artificial Intelligence	38	128	10	1369	1731
KuB16 [KuB16]	W. Ku, J. Christopher Beck	Propagation via lazy clause generation	Yes	483	2009	Constraints An Int. J.	35	127	15	1417	1702
OhrimenkoSC09 [OhrimenkoSC09]	O. Ohrimenko, Peter J. Stuckey, M. Codish	Mixed Integer Programming models for job shop scheduling: A computational analysis	Yes	365	2016	Computers Operations Research	9	119	17	1367	1630
Rodriguez07 [Rodriguez07]	J. Rodriguez	A constraint programming model for real-time train scheduling at junctions	Yes	520	2007	Transportation Research Part B: Methodological	15	117	6	1430	1716
LiW08 [LiW08]	H. Li, K. Werner	Scheduling projects with multi-skilled personnel by a hybrid MILP/CP approach: A decomposition algorithm	Yes	456	2008	Journal of Scheduling	18	113	31	1374	1708
CorreaLR07 [CorreaLR07]	Ayoub Insa Corréa, A. Langevin, L. Rousseau	Scheduling and routing of automated guided vehicles: A hybrid approach	Yes	158	2007	Computers Operations Research	20	106	20	1296	1714
MengZRLZ20 [MengZRLZ20]	L. Meng, C. Zhang, Y. Ren, B. Zhang, C. Lv	Mixed-integer linear programming and constraint programming formulations for solving distributed flexible job shop scheduling problem	Yes	435	2020	Computers Industrial Engineering	13	100	62	1393	1574
BensanaLV99 [BensanaLV99]	E. Bensana, M. Lemaitre, G. Verfaillie	Earth Observation Satellite Management	Yes	91	1999	Constraints An Int. J.	7	99	0	1276	1752

## OpenCitation Count Compared to Google Scholar



Key	Type	Google	OC	Ratio
JainM99	article	1116	490	2.28
HarjunkoskiMBC14	article	588	381	1.54
BlazewiczDP96	article	796	344	2.31
BaptistePN01	book	1039	296	3.51
AggounB93	article	502	187	2.68
LaborieRSV18	article	309	148	2.09
BensanaLV99	article	251	99	2.54
DincbasSH90	article	271	86	3.15
Thorsteinsson01	paper	205	67	3.06
DincbasSH88	paper	287	0	:(

# Problem: Citation Count Distribution



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## Summary



- Use the survey to find
  - Most important works on Constraint Based Scheduling
  - Specialized papers on the constraint reasoning for scheduling
  - Works in specific application domains or specific industries

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