

Serial batching problems

- **maximal polynomially solvable:**

$1 prec; s - batch L_{max}$	Ng et al. (2002) [12]
$1 prec; p_i = p; s - batch \sum C_i$	Albers & Brucker (1993) [1]
$1 s - batch \sum C_i$	Coffman et al. (1990) [5]
$1 p_i = p; s - batch; r_i \sum w_i C_i$	Baptiste (2000A) [2]
$1 s - batch \sum U_i$	Brucker & Kovalyov (1996) [4]
$1 p_i = p; s - batch; r_i \sum w_i U_i$	Baptiste (2000A) [2]
$1 p_i = p; s - batch; r_i \sum T_i$	Baptiste (2000A) [2]

- **maximal pseudopolynomially solvable:**

$1 s - batch \sum w_i U_i$	Brucker & Kovalyov (1996) [4], Karp (1972) [7]
$1 s - batch \sum T_i$	Du & Leung (1990) [6], Baptiste & Jouglet (2001) [3]

- **minimal NP-hard:**

* $1 s - batch; r_i L_{max}$	Lenstra et al. (1977) [11]
$1 chains; s - batch \sum C_i$	Albers & Brucker (1993) [1]
* $1 prec; s - batch \sum C_i$	Lawler (1978) [8], Lenstra & Rinnooy Kan (1978) [9]
* $1 s - batch; r_i \sum C_i$	Lenstra et al. (1977) [11]
* $1 chains; p_i = 1; s - batch \sum w_i C_i$	Albers & Brucker (1993) [1]
* $1 s - batch \sum w_i C_i$	Albers & Brucker (1993) [1]
* $1 chains; p_i = 1; s - batch \sum U_i$	Lenstra & Rinnooy Kan (1980) [10]
$1 s - batch \sum w_i U_i$	Brucker & Kovalyov (1996) [4], Karp (1972) [7]
$1 s - batch \sum T_i$	Du & Leung (1990) [6], Baptiste & Jouglet (2001) [3]
* $1 chains; p_i = 1; s - batch \sum T_i$	Leung & Young (1990) [6]

- **minimal open:**

$1 chains; p_i = 1; s - batch; r_i L_{max}$
$1 chains; p_i = 1; s - batch; r_i \sum C_i$
$1 p_i = 1; s - batch \sum w_i T_i$

- **maximal open:**

$1 prec; p_i = p; s - batch; r_i L_{max}$
$1 prec; p_i = p; s - batch; r_i \sum C_i$
$1 p_i = p; s - batch; r_i \sum w_i T_i$

References

- [1] S. Albers and P. Brucker. The complexity of one-machine batching problems. *Discrete Appl. Math.*, 47(2):87–107, 1993.
- [2] P. Baptiste. Batching identical jobs. *Math. Methods Oper. Res.*, 52(3):355–367, 2000.
- [3] P. Baptiste and A. Jouglet. On minimizing total tardiness in a serial batching problem. *RAIRO Oper. Res.*, 35(1):107–115, 2001.
- [4] P. Brucker and M.Y. Kovalyov. Single machine batch scheduling to minimize the weighted number of late jobs. *Math. Methods Oper. Res.*, 43(1):1–8, 1996.
- [5] E.G. Coffman, Jr., M. Yannakakis, M.J. Magazine, and C. Santos. Batch sizing and job sequencing on a single machine. *Ann. Oper. Res.*, 26(1-4):135–147, 1990.
- [6] J. Du and J.Y.-T. Leung. Minimizing total tardiness on one machine is NP-hard. *Math. Oper. Res.*, 15(3):483–495, 1990.
- [7] R.M. Karp. Reducibility among combinatorial problems. In *Complexity of computer computations (Proc. Sympos., IBM Thomas J. Watson Res. Center, Yorktown Heights, N.Y., 1972)*, pages 85–103. Plenum, New York, 1972.
- [8] E.L. Lawler. Sequencing jobs to minimize total weighted completion time subject to precedence constraints. *Ann. Discrete Math.*, 2:75–90, 1978.
- [9] J.K. Lenstra and A.H.G. Rinnooy Kan. Complexity of scheduling under precedence constraints. *Oper. Res.*, 26(1):22–35, 1978.
- [10] J.K. Lenstra and A.H.G. Rinnooy Kan. Complexity results for scheduling chains on a single machine. *European J. Oper. Res.*, 4(4):270–275, 1980.
- [11] J.K. Lenstra, A.H.G. Rinnooy Kan, and P. Brucker. Complexity of machine scheduling problems. *Ann. of Discrete Math.*, 1:343–362, 1977.
- [12] C.T. Ng, T.C.E. Cheng, and J.J. Yuan. A note on the single machine serial batching scheduling problem to minimize maximum lateness with precedence constraints. *Oper. Res. Lett.*, 30:66–68, 2002.