



# Single Machine Scheduling Problem with Sequence-Dependent Setup Times

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# Opis problema

- Skup  $N$  nezavisnih poslova  $\{J_1, J_2, \dots, J_N\}$  koji se trebaju izvršiti na nekom stroju bez prekida
- Za svaki posao  $J_i$  zadani su nam:
  - *Processing time*  $p_i$
  - *Due date*  $d_i$
  - *Setup times*  $s_{ij}$
- Pronaći raspored  $Q = \{Q(0), Q(1), \dots, Q(N)\}$  za poslove  $\{J_1, J_2, \dots, J_N\}$  takav da je ukupno zakašnjenje ( *total tardiness*  $TT_{Q(i)}$  ) poslova minimalno

- $1 \mid s_{ij} \mid \sum T_i$
- Zakašnjenje  $T_{Q(i)} = \max\{0, C_{Q(i)} - d_i\}$
- $C_{Q(i)}$  vrijeme završetka posla  $J_i$

$$\sum_{x=1}^i s_{Q(x-1)Q(x)} + p_{Q(x)}$$

- 1990. Du J, Leung JY  
 $1 \mid \sum T_i$  je NP-težak problem

# Motivacija

- Problem rasporeda
- Široka primjena u svakodnevici kod printanja te u raznim industrijama (tekstilnoj, kemijskoj...)



# Kako su drugi riješili?

- 1989. Ragatz GL - **branch and bound**
- 1995. Rubin PA, Ragatz GL - **genetski algoritam**
- 1997. Tan KC, Narasimhan R - **simulirano kaljenje**
- 2002. Gagne C, Price WL, Gravel M – **mravlji algoritam**
- 2005. Gagne C, Gravel M, Price WL – **hibrid tabu search / vns**
- 2007. Liao C-J, Juan H-C – **mravlji algoritam**
- 2008. Lin S-W, Ying K-C – **hibrid simulirano kaljenje / tabu search**

# Kako ćemo mi riješiti?

- Pčelinji algoritmi
- Testni podaci
  - $N = 15, 25, 35, 45$   
1995. Rubin PA, Ragatz GL
  - $N = 55, 65, 75, 85$   
2002. Gagne C

# Literatura

- [1] Lin, S.-W., and K.-C. Ying. “A Hybrid Approach for Single-Machine Tardiness Problems with Sequence-Dependent Setup Times.” The Journal of the Operational Research Society, vol. 59, no. 8, 2008, pp. 1109–1119. JSTOR, JSTOR, [www.jstor.org/stable/20202174](http://www.jstor.org/stable/20202174).
- [2] Gagné, C., et al. “Comparing an ACO Algorithm with Other Heuristics for the Single Machine Scheduling Problem with Sequence-Dependent Setup Times.” The Journal of the Operational Research Society, vol. 53, no. 8, 2002, pp. 895–906. JSTOR, JSTOR, [www.jstor.org/stable/822917](http://www.jstor.org/stable/822917).