

# Bachelor's / Master's Thesis

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## Systematic development of a genetic algorithm for dual row facility layout problems

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### Background

Facility layouts (FLs) are a determinant of efficient production having a significant impact on material handling costs (MHC). MHCs are estimated to account for 20% to 50% of the total operating expenses within manufacturing (Tompkins (1996)). FL problems are generally not efficiently solvable (Pérez-Gosende et al. (2021), Hosseini-Nasab et al. (2018)); therefore, multiple layout types and metaheuristics have been investigated in the literature. The dual row FL (DRFL) is an extension of the single row facility layout and arranges facilities along both sides of a central aisle (Chung and Tanchoco (2010)). Rising revenues in the semiconductor market (Statista (2025)), combined with the applicability of DRFLs in the semiconductor industry (Wang et al. (2015)), highlight the growing significance of DRFLs.

### Objective

The aim of the thesis is to establish a conceptual framework for the development of a genetic algorithm, as they are widely adopted in the literature. Following this framework, the genetic algorithm is tested on a DRFL model previously selected from the literature. Finally, the genetic algorithm is compared to another solution method from the literature.

### Extension for a master's thesis

Master's students are expected to develop a new DRFL model. In contrast to previous DRFL models, it should enable aisles with orthogonal turns.

### Starting Literature

Chung, Jaewoo; Tanchoco, J.M.A. (2010): The double row layout problem. In *International Journal of Production Research* 48 (3), pp. 709–727. DOI: 10.1080/00207540802192126.

Hosseini-Nasab, Hasan; Fereidouni, Sepideh; Fatemi Ghomi, Seyyed Mohammad Taghi; Fakhrzad, Mohammad Bagher (2018): Classification of facility layout problems: a review study. In *Int J Adv Manuf Technol* 94 (1-4), pp. 957–977. DOI: 10.1007/s00170-017-0895-8.

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Pérez-Gosende, Pablo; Mula, Josefa; Díaz-Madroñero, Manuel (2021): Facility layout planning. An extended literature review. In *International Journal of Production Research* 59 (12), pp. 3777–3816. DOI: 10.1080/00207543.2021.1897176.

Wang, Shengli; Zuo, Xingquan; Liu, Xueqing; Zhao, Xinchao; Li, Jianqiang (2015): Solving dynamic double row layout problem via combining simulated annealing and mathematical programming. In *Applied Soft Computing* 37, pp. 303–310. DOI: 10.1016/j.asoc.2015.08.023.

### Supervisor

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### Language

German or English

### *Additional literature cited in the text*

*Tompkins, J. A. (1996). Facilities Planning (2. ed.). Wiley.*

*World Semiconductor Trade Statistics, SIA. (2025). Semiconductor market revenue world-wide from 1987 to 2026 (in billion U.S. dollars). Statista. Statista Inc.. Accessed: January 30, 2026.*  
<https://www.statista.com/statistics/266973/global-semiconductor-sales-since-1988/>