

# Master's Thesis

---

## Human-robot collaboration in logistics: A systematic literature review and natural language-based analysis

---

### Background

Human-robot collaboration (HRC) is rapidly transforming logistics operations. In warehouses, for example, collaborative robots (cobots), automated guided vehicles (AGVs), and more recently the humanoids, are increasingly work side-by-side with human operators (de Koster, 2023). In the meantime, advances in artificial intelligence (AI), particularly in computer vision, reinforcement learning, and natural language processing, are enhancing the adaptability and interaction capabilities of robots (Leng et al., 2022). Unlike traditional industrial robots that operate in dedicated fenced-off areas, more recent robotic systems are designed for shared workspaces, enabling flexible task allocation (Koreis et al., 2023). However, integrating robots into logistics processes introduces challenges related to safety, trust, and acceptance (Panagou et al., 2024). The growing body of HRC research is fragmented across technical, organizational, and social perspectives. Questions about how human roles, safety, ergonomics, trust, and skills are addressed when robots become co-workers remain open. A systematic, data-driven review is therefore needed to map how HRC in logistics is conceptualized.

### Objective

The aim of the thesis is to systematically review and analyse the literature on HRC in logistics context. To achieve this goal, the student will first conduct a systematic literature review and then leverage natural language processing (NLP) methods (e.g., topic modelling, sentiment analysis) to uncover hidden patterns, emerging themes, and sentiment on how HRC is conceptualized. The results are expected to provide a structured and data-driven understanding of the state of knowledge on HRC in logistics, identifying gaps for future research and highlighting opportunities for human-centered logistics of the future. Basic programming and text analysis skills (e.g., Python, R, NLP libraries) are recommended but can also be acquired during the thesis work.

### References

Koreis, J., Loske, D. and Klumpp, M. (2023), "Together, we travel: empirical insights on human-robot collaborative order picking for retail warehousing", *The International Journal of Logistics Management*, Emerald Publishing, doi: 10.1108/IJLM-03-2023-0127.

---

De Koster, R. (2023), “Warehousing 2030”, Global Logistics and Supply Chain Strategies for the 2020s, Springer International Publishing, Cham, pp. 243–260, doi: 10.1007/978-3-030-95764-3\_14.

Leng, J., Sha, W., Wang, B., Zheng, P., Zhuang, C., Liu, Q., Wuest, T., Mourtzis, D. and Wang, L., 2022. “Industry 5.0: Prospect and retrospect”, Journal of Manufacturing Systems, pp.279-295, doi: 10.1016/j.jmsy.2022.09.017

Panagou, S., Neumann, W.P. and Fruggiero, F. (2024), “A scoping review of human robot interaction research towards Industry 5.0 human-centric workplaces”, International Journal of Production Research, Taylor and Francis Ltd., doi: 10.1080/00207543.2023.2172473.

**Supervisor:**

Dr. Ting Zheng ([zheng@pscm.tu-darmstadt.de](mailto:zheng@pscm.tu-darmstadt.de)), Prof. Dr. Christoph Glock)

**Language:**

English