

Course Title: Research Methodology in Computer Science

Course Code: AI800

Weighting: 30 %

Lecturer: Dr. Mohammed Anbar

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Enhancing human-robot collaboration (HRC) for industrial efficiency and service applications

Problem statement:

(HRC) has become a better solution for industrial area. Technologies such as no-code programming, virtual assistants, and intelligent sensors drive these innovations, enabling more efficiency human-robot interactions.

For the Industrial field robots often require complex programming, limiting flexibility and accessibility and in case of any issues related to programming it will need to experts to evaluate it which in usual take long time specially when there are no developers in the field .

HRC can improve productivity, reduce physical and cognitive workloads, and enrich human-robot interactions. no-code robotics can make the learning step much easier and also for any future failures much easier to fix and with merging virtual assistants make more easier for anyone to improve the machine even with zero programming knowledge. Addressing these challenges can lead to groundbreaking changes across sectors, improving both efficiency and user experiences.

No-code robotics simplifies robot programming using technologies like image and voice recognition if we adapt it with virtual assistant's by provide user-friendly interfaces which will lead to next generation of no code robotics only will need the support from the virtual assistant which will assist the human for teaching the industrial robotics.

The current solutions address specific HRC challenges, their limitations in scalability, multilingual support, and adaptability hinder their broader application. Research into innovative integrations—such as combining no-code robotics with advanced AI can lead to versatile, efficient, and inclusive HRC systems for diverse industrial and service settings.

Research objectives

- To develop and evaluate adaptable HRC systems that improve collaboration, efficiency, and user experiences across various industries.
- Design a scalable no-code robotic system that allows non-technical users to program tasks using voice and gesture recognition.
- Propose a multilingual framework for virtual assistants and chatbots to address diverse industrial requirements.
- Evaluate the integration of HRC technologies in real-world, focusing on adaptability, scalability, and user satisfaction.
- Investigate cost-effective, lightweight approaches for deploying HRC systems in different environments.

References:

- [1] Halim J, Eichler P, Krusche S, Bdiwi M, Ihlenfeldt S. No-code robotic programming for agile production: A new markerless-approach for multimodal natural interaction in a human-robot collaboration context. *Front Robot AI* 2022;9:1001955. <https://doi.org/10.3389/frobt.2022.1001955>.
- [2] Parvez MO, Öztüren A, Cobanoglu C, Arasli H, Eluwole KK. Employees' perception of robots and robot-induced unemployment in hospitality industry under COVID-19 pandemic. *International Journal of Hospitality Management* 2022;107:103336. <https://doi.org/10.1016/j.ijhm.2022.103336>.
- [3] Vassilakopoulou P, Haug A, Salvesen LM, Pappas IO. Developing human/AI interactions for chat-based customer services: lessons learned from the Norwegian government. *European Journal of Information Systems* 2023;32:10–22. <https://doi.org/10.1080/0960085X.2022.2096490>.
- [4] Li C, Chrysostomou D, Pinto D, Hansen AK, Bøgh S, Madsen O. Hey Max, Can You Help Me? An Intuitive Virtual Assistant for Industrial Robots. *Applied Sciences* 2022;13:205. <https://doi.org/10.3390/app13010205>.
- [5] Hellou M, Lim J, Gasteiger N, Jang M, Ahn HS. Technical Methods for Social Robots in Museum Settings: An Overview of the Literature. *Int J of Soc Robotics* 2022;14:1767–86. <https://doi.org/10.1007/s12369-022-00904-y>.
- [6] Andrade, I.M.D. and Tumelero, C. (2022), "Increasing customer service efficiency through artificial intelligence chatbot", *Revista de Gestão*, Vol. 29 No. 3, pp. 238-251. <https://doi.org/10.1108/REGE-07-2021-0120>