



**TAL  
TECH**

**AUTOMATING CLASSROOM PROCESSES:  
ASSESSING THE EFFICIENCY AND EFFECTIVENESS  
OF ROBOT ASSISTANTS IN HIGHER EDUCATION  
MANAGEMENT TASKS**

Authors: **Fuad Budagov**, Janika Leoste, Mohammad Tariq Meeran, Tarmo Robal  
IT College | School of Information Technologies, Tallinn University of Technology

AmiEs-2024, Tallinn, Estonia

12.09.2024

# PRESENTATION AGENDA

- Background
- Research Question
- Methodology
- Results
- Limitation and Future Direction
- Conclusion

# DEFINITIONS

- **Robot Assistant**
  - A robot designed to assist humans in various tasks, improving efficiency and effectiveness in both professional and personal contexts.
- **Semi-autonomous Robot Assistant**
  - A robot that operates with some degree of autonomy but still requires human intervention for complex tasks or decisions.



# BACKGROUND

HE challenges due to changing educational needs and expectations:

- **Inefficiencies** in addressing diverse student **needs** and teacher **workloads**.
- **Teacher shortages** and demand for personalized instruction strain institutions.
- **Administrative tasks** overwhelm educators, reducing the focus on impactful teaching.
- **Limited**, quick, personalized **help** for students.

**Aim:** to assess the **efficiency** of robot assistants in **reducing administrative workload**.

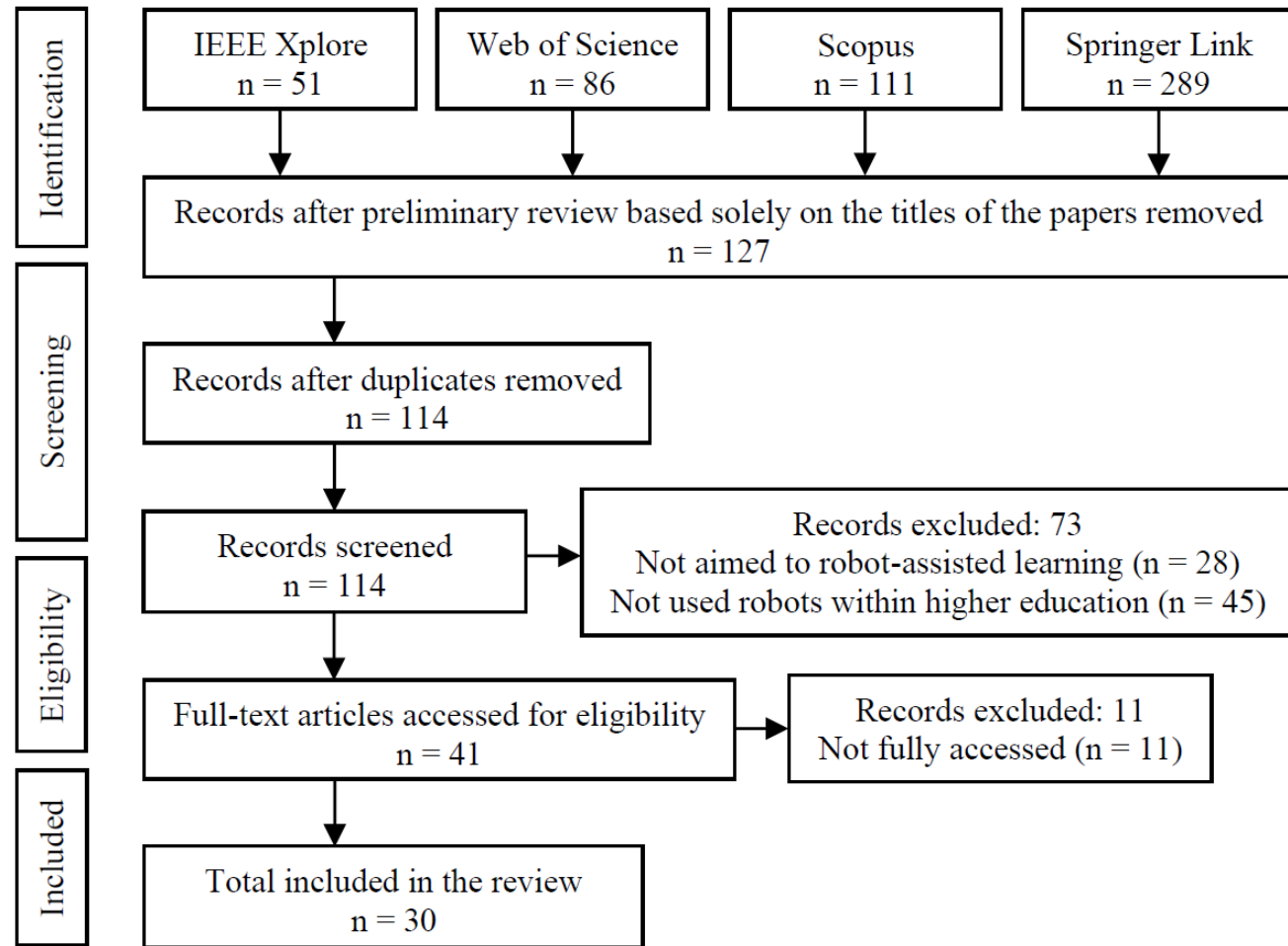
# RESEARCH QUESTION

1. How **effective** are robot assistants in **automating administrative** tasks like **attendance monitoring** in higher education?

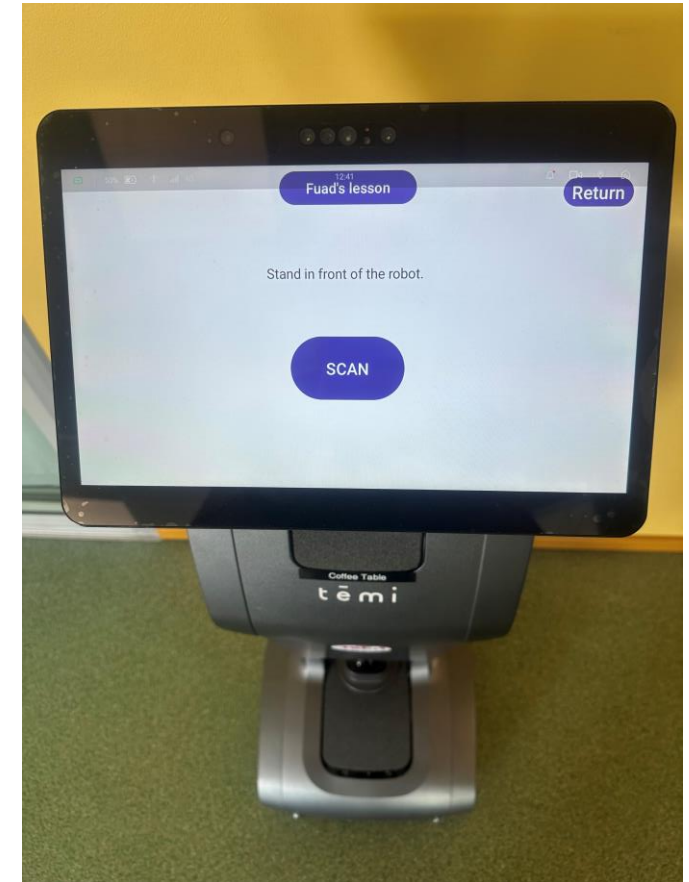
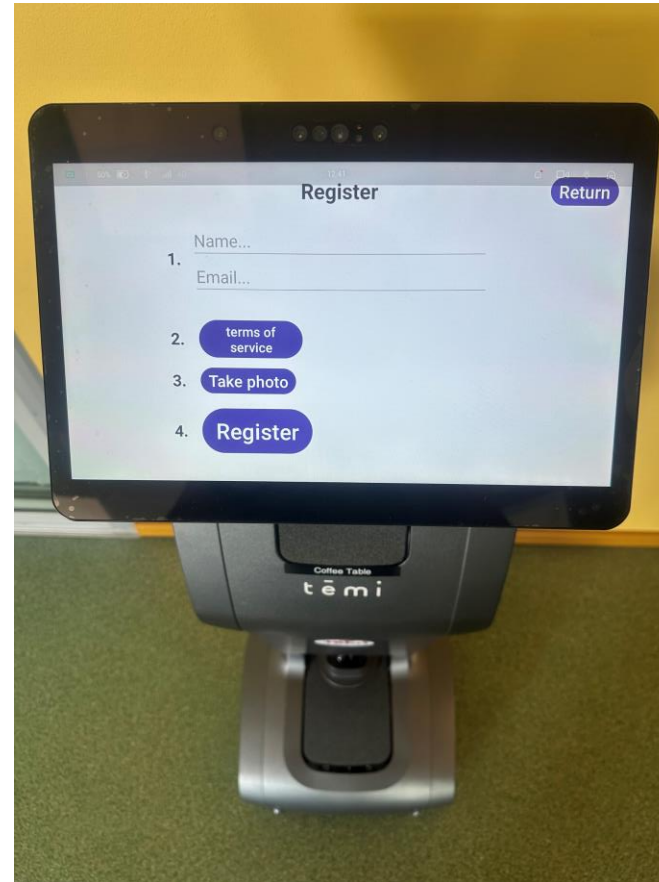
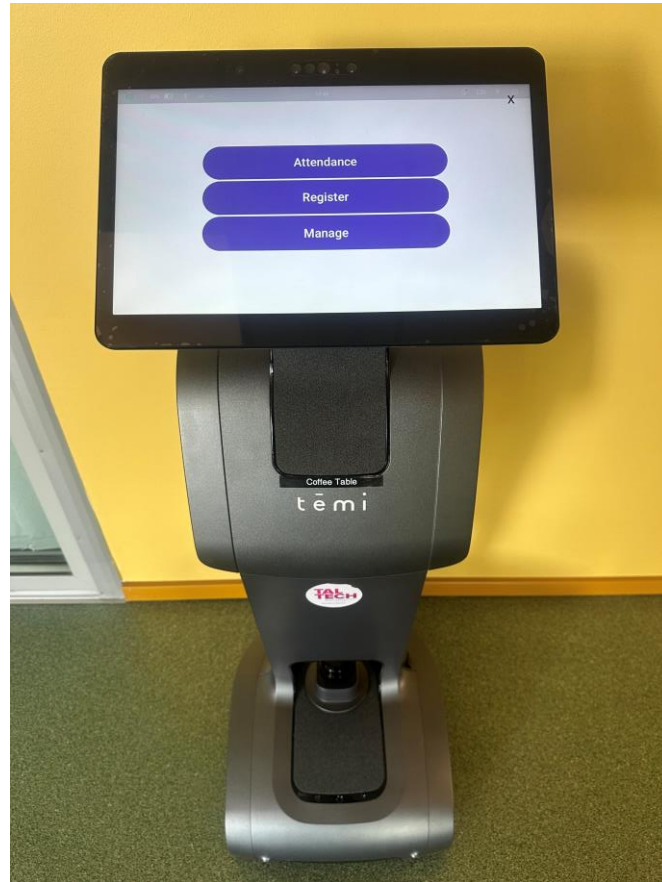
# METHODOLOGY

<b>Electronic databases</b>	IEEE Xplore Web of Science Scopus SpringerLink
<b>Type of searched literature</b>	Journal and Conference Papers
<b>Search string</b>	("robot assistants" OR "robotic assistant" OR "educational robots" OR "robot-assisted learning" OR "robotic teaching assistants" OR "ai-based robots" OR "social robots" OR "humanoid robots" OR "telepresence robots" OR "robot teaching roles") AND "higher education"
<b>Language of the study</b>	English
<b>Publication period</b>	From January 2019 to February 2024

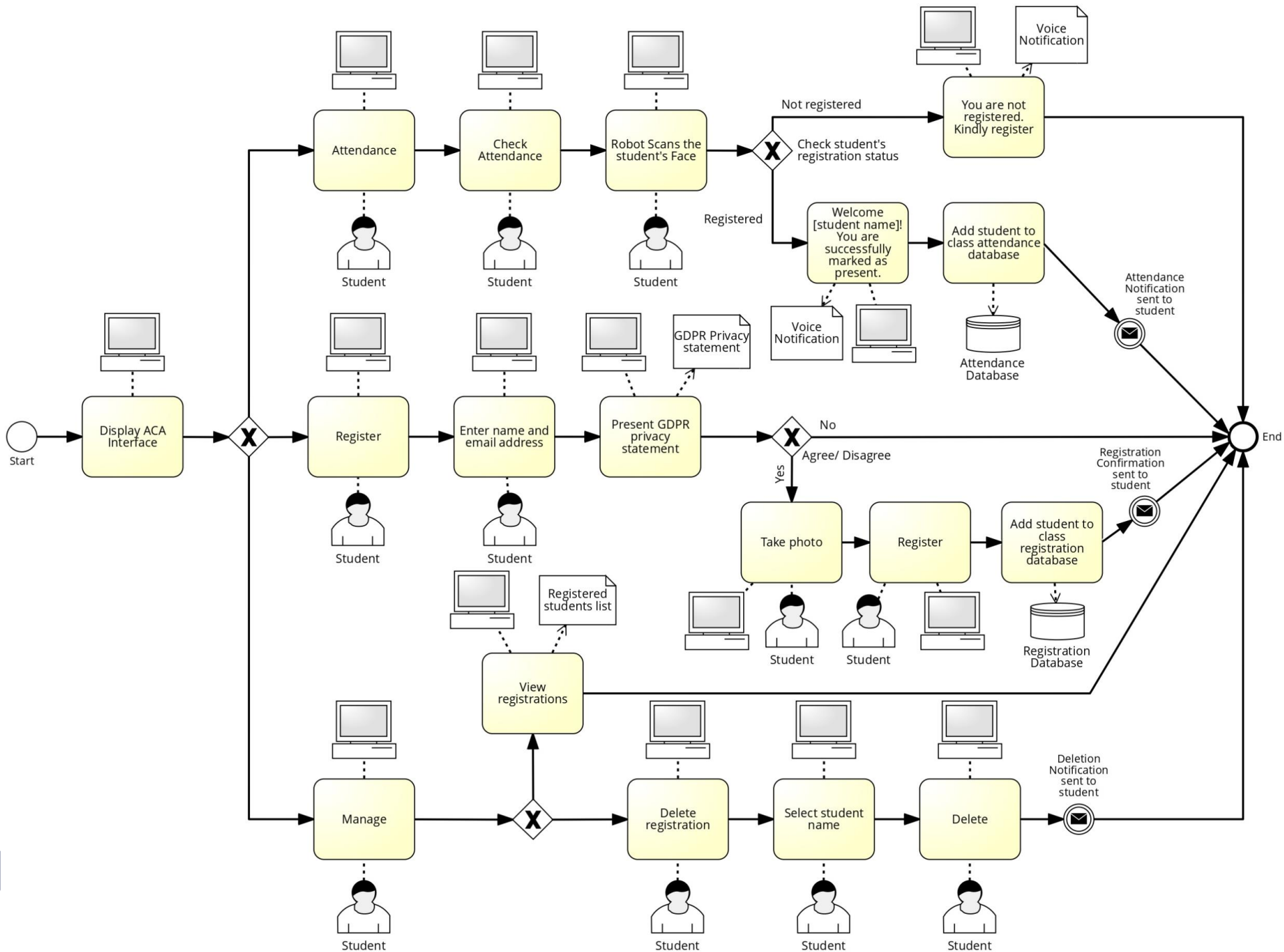
# METHODOLOGY



# ATTENDANCE CHECK APPLICATION (ACA) IN TEMI ROBOT







# METHODOLOGY

- Combined **qualitative** and **quantitative** approaches.
- **Collected** numerical data from **67 student questionnaires** for statistical analysis.
- Included **free-form comments** and **observations** for in-depth feedback.
- **Mixed-methods** approach ensured **comprehensive** and **detailed assessment**.

# SAMPLE SIZE

Table 1. Demographic information

<b>Age Group</b>	<b>Male</b>	<b>Female</b>	<b>Prefer not to say</b>	<b>Total</b>
Under 18	0	0	0	0
18-24	32	7	1	40
25-34	14	4	0	18
35-44	6	2	0	8
45+	1	0	0	1
<b>Total</b>	<b>53</b>	<b>13</b>	<b>1</b>	<b>67</b>

# DESCRIPTION OF THE QUESTIONNAIRE

- Administered via **Microsoft Forms** with **11** questions.
- **Eight** questions used a **five-point Likert scale** to assess **usability** and **comfort**.
- Included one **free-form comment** section for detailed feedback.
- **Two** questions collected **age** and **gender** information.

# RESULTS

Category	Aim of robot assistant
For the teaching process	Allows students and teachers to attend classes remotely
	Attendance monitoring through facial/fingerprint recognition
	Providing real-time feedback
	Enhancing engagement with gamification and robotics
	Automating administrative tasks
For the lecturer	Robot as examiner
	Exam supervision
	Plagiarism detection
	Tutoring and assessment support via LMS
	Improve psychological and social communication during oral assessment
For the student	Provides support for learning difficulties and disabilities
	Exam preparation
	Transcribing faculty lectures
	Emotion detection of students to provide motivation
	Enhance group collaboration

# RESULTS

*How **effective** are robot assistants in **automating administrative** tasks like **attendance monitoring** in higher education?*

- **Ease of Use:** **100%** of students found ACA very easy or somewhat easy to use (n = **67**).
- **Speed:** **90%** of students reported ACA sped up the attendance process (n = **60**).
- **Interaction:** **90%** found ACA pleasant to interact with (n = **60**).
- **Simplicity:** **93%** found ACA use straightforward (n = **62**).
- **Comfort:** **81%** felt comfortable using ACA (n = **54**).
- **Privacy Concerns:** **55%** had concerns or no clear opinion on privacy issues (n = **37**).
- **Future Use:** **73%** willing to use ACA in the future (n = **49**).
- **Benefit:** **78%** considered ACA beneficial for managing attendance (n = **52**).

# DISCUSSION

- **Effectiveness:** Positive feedback on using the TEMI robot with ACA for automating attendance in higher education.
- **Student Willingness:** 73% of participants (n = 49) are willing to use the technology for class registration.
- **Expanded Functionalities Needed:** Positive feedback suggests the need for additional features like managing assignments and scheduling.
- **Enhanced Interaction:** The robot's ability to greet students by name creates a personalized, welcoming atmosphere, impractical for lecturers in large classes.

# LIMITATIONS AND FUTURE DIRECTIONS

- Conducted over a **single week**, limiting the **acceptability** of findings.
- **Focused** only on **student** feedback, **excluding lecturers'** perspectives.
- **Short** duration **prevented** assessment of **long-term effectiveness**.
- **Extend** study to a **full 16-week semester** for more **extensive** data.
- Include **feedback** from both **lecturers** and **students**.
- Implement **initial** registration in the **first week**, followed by quick **face scans** for attendance.
- Provide **QR codes** as an **alternative** for those **not using facial recognition**.
- Enhance **automation** with **automatic face recognition** to **eliminate** need for **physical interaction**.



# CONCLUSION

- **Enhancing Educational Practices:** Utilizing robot assistants for attendance checks shows promise for improving educational methods.
- **Positive Feedback:** Initial findings indicate strong support for robot assistants, highlighting their potential in HE.
- **Need for Further Exploration:** Ongoing research is crucial to address technical challenges and ensure successful adoption.
- **Expanding Functionalities:** Future developments should include broader administrative tasks and personalized learning experiences to maximize benefits in HE.

# PAPERS

#	Paper Title	Contribution	Status	Date/ Location	Journal/Conference	Category	Period
1	Using telepresence robots for remote participation in technical subjects in higher education	Co-author	Published	June 2023 <i>Tallinn, Estonia</i>	8th <b>Conference</b> on Smart Learning Ecosystems and Regional Development	3.1	Pre-PhD studies
2	<b>Enhancing Inclusivity in Higher Education: The Case of TEMI Semi-Autonomous Robot for Special Needs Students in Technical Courses</b>	<b>First author</b>	Published	September 2023 <i>Crete, Greece</i>	International <b>Symposium</b> on Ambient Intelligence and Embedded Systems	5.2	<b>First year of PhD</b>
3	The Opinions of Basic School Students Regarding the Use of Telepresence Robots for Teaching and Learning	Co-author	Presented	April 2024 <i>Koblenz, Germany</i>	15th International <b>Conference</b> on Robotics in Education - RiE 2024	3.1	<b>First year of PhD</b>
4	The Potential of Using Social Service Robots in the Healthcare Environment	Co-author	Accepted	June 2024 <i>Valencia, Spain</i>	10th International <b>Conference</b> on Higher Education Advances (HEAd'24)	3.1	<b>First year of PhD</b>
5	<b>A Systematic Literature Review on Applicability of Robot Assistants in Higher Education</b>	<b>First author</b>	Accepted	June 2024 <i>Salamanca, Spain</i>	14th International <b>Conference</b> on Methodologies and Intelligent Systems for Technology Enhanced Learning	3.1	<b>First year of PhD</b>
6	<b>Attendance Check of Students via Robot Assistant in Higher Education Classes</b>	<b>First author</b>	Submitted	September 2024 <i>Tallinn, Estonia</i>	27th International <b>Conference</b> on Interactive Collaborative Learning	3.1	<b>First year of PhD</b>



**TAL  
TECH**

**THANK YOU!**

[taltech.ee/en](https://taltech.ee/en)