MACIEJ WOZNIAK

Robotics Perception Researcher

@ maciejw@kth.se · in **mawoz** · **maxiuw** · 🎓 **Publications**

EXPERIENCE

Ph.D. Researcher
KTH Royal Institute of Technology

📅 Jan 2022 - Present   📍 Stockholm, Sweden

- Working on deep learning models for spatial robot perception in a challenging environment
- Developing AR/VR applications for HRI
- Supervising multiple master students on self-driving related project

Research Engineer
Miami University

📅 Aug 2020 - Dec 2021   📍 Ohio, USA

- Developing machine learning applications for cognitive science, psychology, and simulation
- In charge of multiple Python-based projects (FCMpy, or detection of simulation errors)
- Teaching computer science undergraduate courses

Mechanical Engineer
Kubor

📅 Dec 2018 - Dec 2019   📍 Aveiro, Portugal

- Constructing machines for autonomous parts inspection
- Designing and fabricating different machine components

SELECTED PROJECTS

🚗 **Robust Sensor Fusion For Multimodal 3D Object Detection**
We developed **novel fusion step** to make multimodal 3D object detection more robust. Our method performed much better than the other SOTA and its performance decreases less when sensors are misaligned or data is partially missing.

🤖 **VR framework for correcting robot errors**
We developed a VR framework for improving human-robot collaboration, allowing the user to correct robots perceptual and planning errors in VR before deploying its actions to the real-world.

🎯 **Unsupervised Adversarial Domain Adaptation**
We proposed **UADA3D**: Unsupervised Adversarial Domain Adaptation method for LiDAR-based 3D Object Detection. The method's primary goal is to train domain-invariant object detectors, that achieve high performance on unlabeled sparse LiDAR data.

HOBBIES

🔺 **Rock Climbing, Hiking**

〜 **Surfing, Sailing, Kitesurfing**

RESEARCH

Robot perception fails and it's our task to develop the tools that account for that!
I am working on developing deep learning models and AR/VR applications for robotics, that account for real-world imperfections, such as missing data, sensor failure, novel domains, and challenging environments.

EDUCATION

Doctorate in Robotics
KTH Royal Institute of Science

📅 2022.01 – present   📍 Sweden

Master in Computer Science
Miami University

📅 2020.08 – 2021.12   📍 USA

Master in Mechanical Engineering
University of Aveiro

📅 2017.08 – 2019.11   📍 Portugal

PROGRAMMING

Python
ROS
C#,C/C++
CAD

STRENGTHS

Deep Learning · Robot Vision · VR/AR
Research · Project Management

LANGUAGES

English
Polish
Portuguese
Spanish
Swedish

REFERENCE

- Patric Jensfelt, patric@kth.se
- Philippe Giabbanelli, giabbapj@miamioh.edu
- Nuno Abrantes, n.abrantes@kubor.pt

PUBLICATION LIST

Perception

1. **Wozniak**, et al. "UADA3D: Unsupervised Adversarial Domain Adaptation on 3D Object Detection with Sparse LiDAR and Large Domain Gaps." In-submission CVPR 2024.
2. Nguyen,(...),**Wozniak** et al. "MCD: Diverse Large-Scale Multi-Campus Dataset for Robot Perception." In-submission CVPR 2024.
3. **Wozniak**, et al. "Towards a Robust Sensor Fusion Step for 3D Object Detection on Corrupted Data." IEEE Robotics and Automation Letters 2023.
4. **Wozniak**, et al. "Applying 3D Object Detection from Self-Driving Cars to Mobile Robots: A Survey and Experiments." IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC) 2023.
5. Khoche, **Wozniak** et al. "Semantic 3D Grid Maps for Autonomous Driving." IEEE International Conference on Intelligent Transportation Systems (ITSC) 2022.

Human-Robot Interaction

1. **Wozniak**, et al. "Happily Error After: Framework Development and User Study for Correcting Robot Perception Errors in Virtual Reality." IEEE International Conference on Robot and Human Interactive Communication (RO-MAN) 2023.
2. **Wozniak**, et al. "What you see is (not) what you get: A vr framework for correcting robot errors." ACM/IEEE International Conference on Human-Robot Interaction (HRI) 2023.
3. Moletta, **Wozniak**, et al. "A Virtual Reality Framework for Human-Robot Collaboration in Cloth Folding." IEEE-RAS Humanoids 2023.

Others

1. Mkhitaryan, Giabbanelli, **Wozniak**, et al. "How to use machine learning and fuzzy cognitive maps to test hypothetical scenarios in health behavior change interventions: a case study on fruit intake." BMC Public Health 23.1 2023.
2. Mkhitaryan, Giabbanelli, **Wozniak** et al. "FCMpy: a python module for constructing and analyzing fuzzy cognitive maps." PeerJ Computer Science 8, 2022.
3. **Wozniak**, Mkhitaryan, and Giabbanelli. "Automatic generation of individual fuzzy cognitive maps from longitudinal data." International Conference on Computational Science. Springer International Publishing 2022.
4. **Wozniak**, et al. "A New Application of Machine Learning: Detecting Errors in Network Simulations." IEEE Winter Simulation Conference (WSC) 2022.
5. **Wozniak** and Giabbanelli. "Comparing implementations of cellular automata as images: A novel approach to verification by combining image processing and machine learning." ACM SIGSIM Conference on Principles of Advanced Discrete Simulation 2021.

INVITED TALKS

1. "How to deal with robots perception failures?" WARA Media and Language, Are (Sweden), 11.2023
2. "Robot Perception: Failures and Novel Environments", CMU Robotics Institute, Pittsburgh (USA), 09.2023
3. "Challenges in 3D object detection on mobile robotics platforms", Department of Control Systems and Mechatronics, Wroclaw (Poland), 05.2023
4. "AR and VR for improving human-robot interaction", GAIPS Lab, Lisbon (Portugal), 04.2023
5. "AR and VR for improving human-robot interaction", Interactive Technologies Institute, Lisbon (Portugal), 04.2023

ORGANIZED EVENTS

1. International Workshop on Virtual, Augmented, and Mixed-Reality for Human-Robot Interactions at ACM/IEEE HRI 2023 and 2024
   `https://vam-hri.github.io`
2. Robotics, Perception, and Learning (RPL) Summer School 2022 and 2024
   `https://summer-school.rpl.eecs.kth.se/`

SUPERVISION

Master Thesis

1. Viktor Karefjard (2022-2023): *Robust Multi-Modal Fusion for 3D Object Detection: Using multiple sensors of different types to robustly detect, classify, and position objects in three dimensions.*, now at Volvo Group
2. Mattias Hansson (2022-2023): *Unsupervised Domain Adaptation for 3D Object Detection Using Adversarial Adaptation: Learning Transferable LiDAR Features for a Delivery Robot,* now at Husqvarna Group

3. Isak Sneltvedt (2023): *Online Panoptic Mapping of Indoor Environments*, now at Element Logic
4. Zhongyue Wu (2023-2024): *Haptic Feedback in Virtual and Augmented Reality Frameworks for Human Robot Interaction*

Research Projects

1. Viktor Karefjard and Mattias Hansson (2022): *Dynamic 3D Object Detection and Tracking on the Mobile Platform*
2. Jule Schmidt and Magnus Tibbe (2023-2024): *Multimodal Amodal Segmentation for Autonomous Driving*

TEACHING

KTH Royal Institute of Technology (2022-...)

Hosting labs and lectures, preparing course materials (assignments and lectures), grading, hosting office hours

1. Engineering project in Robotics, Perception and Learning with Patric Jensflet (DD2414)
2. Introduction to Robotics with Christian Smith (DD2410)
3. Machine Learning with Atsuto Maki (DD2421)
4. Project Course in Robotics and Autonomous Systems with Patric Jensfelt (DD2419)

Miami University (2020-2021)

Hosting labs, preparing course materials (assignments), grading, hosting office hours

1. Data Structures with Jim Kiper
2. Fundamentals of Programming and Problem Solving with Meisam Amjad
3. Machine Learning with Philippe Giabbanelli
4. Mobile Application Design and Implementation with Michael Zmuda
5. Data Structures with Michael Zmuda
6. Robotics with Jim Leonard

AWARDS

1. 2024 - Human Robot Interaction Pioneer, ACM/IEEE HRI
2. 2023 - Research Visit/Trip Scholarship - KTH Royal Institute of Technology
3. 2021 – Summer research scholarship – Miami University 1500
4. 2020 – One out of three the best Graduate researcher at the Miami University
5. 2017 – 6 months research scholarship (Erasmus – Mundus) – Wroclaw University of Science and Technology and National University of Science and Technology Moscow
6. 2013-2015 – Scholarship for 10% of the best student in the department (Wroclaw University of Science and Technology)

SERVICE

Reviewer

1. IEEE Robotics and Automation Letters (RAL)
2. IEEE International Conference on Robotics and Automation (ICRA)
3. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
4. ACM/IEEE International Conference on Human-Robot Interaction (HRI)
5. IEEE International Workshop on Robot and Human Communication (ROMAN)
6. BMC Medical Informatics and Decision Making
7. ACM International Conference on Principles of Advanced Discrete Simulation (SIGSIM-PADS)

Volunteer

1. Homework Help, Samordnare Roda Korset, Stockholm, Sweden
2. IT services in Retirement Home, Oxford, OH, USA
3. Erasmus Student Network, Events and Buddy program, Poland/Portugal