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Professional Profile

- Robotics Researcher doing my PhD in Robotics control and human-robot interaction at University of Birmingham. I have spent my undergraduate and postgraduate years working on projects in the field of mechanical design, electronics, control, automation and robotics. Constantly appointed in technical hardware design and different manufacturing processes. Experienced in developing software programs that serve operational tasks. Acknowledged for showing persistence and teamwork towards assigned roles.

Education

- Current: PhD researcher at Extreme Robotics Lab (ERL) at University of Birmingham.
- Postgraduate Master degree from Innopolis University in Computer Science, Robotics and Computer Vision track. Graduated August 2022.
- Graduated, with High Honors, from Nile University, Egypt in July 2020 with a bachelor's degree in Mechanical engineering, Mechatronics major.
- Bachelor's Courses studied: Analytical Geometry, Calculus I, Integration, differential equations, Physics I, Physics II (including Labs), Introduction to Engineering Disciplines, Engineering Design, Chemical Principles, Engineering Economy, Safety Engineering, Introduction to Programming, Engineering Mechanics (statics & dynamics), Natural Science, Numerical Methods, Introduction to Finite Elements techniques, Fluid Mechanics I, Solid Modelling, Manufacturing Technology, Rigid Body Dynamics, Metallurgy, Kinematics & Dynamics of Mechanical systems, Electronics & Power Circuits, Machine Design, Fundamentals of Mechatronics, Automatic Control, Modelling and Simulation, Mechanical Vibrations, Robotics, Pneumatics and Hydraulics of control systems, Digital & Industrial Control, Advanced Mechatronics, Microcontrollers, Signal processing.
- Bachelor's CGPA: 3.73/4.0
- Master's Courses studied: Dynamics of Non-Linear Robotics systems, Object Oriented Programming, Sensing-perception and Actuators, Machine Learning, Fundamentals of Robotics control, Advanced Robotics, Computer Vision, Optimization and Computational Intelligence, Behavioral and Cognitive Robotics.
- Master's CGPA: 4.4/5.0

Professional Experience

- [July 2019 – November 2019] Embedded systems Diploma. Skills acquired:
    - C Programming and Data structures Algorithms
    - Embedded Systems Concepts
    - Embedded C for Microcontrollers
    - Embedded Systems Software Design Using UML
    - HW/SW Co-Design
    - Real Time Operating Systems and Scheduling
    - Software Engineering for Embedded Systems
    - Verification and Testing of Embedded Systems

- [September 2017 – March 2020] FESTO professional Diploma in Industrial Automation & Mechatronics. Courses studied:
    - Fluidics (Pneumatics ~ Electro-Pneumatics ~ Hydraulics)
    - CNC (Milling, lathing)
    - Electrical Drives (DC & AC Drives)
    - Automation (Introduction & Advanced PLC programming)
    - Robotics (Kinematics & Robotics ~ Robotic Programming)

- [August 2018 –July 2019] Participation in the Erasmus +KA2 VET-ENG project and achievement of Joint Project (NU – GBAUTO) program.
    - Design a 3D model of a 3D-printer using SOLIDWORKS software.
    - Designing the control box layout for the 3D-printer hardware.
    - Manufacturing and assembling of the 3D-printer parts.
    - Integrating the mechanical design and the electrical board.
    - Testing and developing for higher output accuracy.

- [June 2018 - August 2019] Product designer and manufacturer, Engineering Op. Company:
    - Participated in manufacturing a Remotely Operated Vehicle (ROV) for a graduation project.
    - Involved in operating several manufacturing techniques and processes: Milling, Drilling, lathing, and different CNC operations.

- [Feb 2017 – May 2017] Teaching Assistant (TA) for an undergraduate course 'Mechanics and Dynamics' at Nile University, Mechatronics department.

- "IEEE Global Conference of Internet of Things and Artificial Intelligence 2020" attendee. I was invited to present my bachelor's thesis project idea and discuss with the committee the scalability and applicability of the project in the industry.

- Machine Learning Winter School 2020 attendee. I had the chance to attend lectures from top world class professors and researchers from the field of my interest, Robotics and Machine Learning. Topics covered: Behavioral and Cognitive perception, Reinforcement Learning, and Deep Learning in Roboitcs.

- Participating in the international Robocon competition for the 2018 year as the Team leader of the mechanical team. Managed to design a manual robot with a forklift mechanism in addition to an automatic robot with a throwing mechanism.

- IEEE NUSB volunteer for 3 years. Helped in organizing a programing event called "Programabitious" hosted by IEEE NUSB that was of a great success.

Projects	

- **My PhD** is focusing on developing a learning-from-demonstration framework for motion planning of serial manipulators in the application of Battery Disassembly of Electric Vehicles.

- **My Master's Thesis** is dedicated to controlling robots where the human is being part of the control loop i.e., human-robot interaction. Through an established bilateral communication, a haptic device is used to tele-operate a collaborative robot to do manipulation tasks in both joint and cartesian spaces. *please refer to the [Video demo from here]().

  With such a teleoperation system, I conducted a study on performing a Peg-In-Hole task in different scenarios: 1) fully automated 2) fully teleoperated 3) shared

(autonomous-teleoperated) 4) learned from demonstration. The main objective with my thesis is to show how human-robot interaction in precise tasks can improve overall task achievement in terms of completion time, repeatability, scalability, and effort exerted (from the robot and the user).

- **My Bachelor's Thesis title "**Teleoperation of an AI model-based custom 7 DOF serial arm manipulator via VR in hazardous environments**"**
  *please refer to the [project description from here](#)
- Tele-operation of a Cable-driven robot via Touch haptic device.
  *please refer to the [project description from here](#)
- Object detection of a peg using YOLOv5 and hole detection using HoughCircles for a PegInHole task performed by KUKA LBR Iiwa 14.
  *please refer to the [project description from here](#)
- Applying PD, Feedback linearization, and robust control techniques on a simulated PRR serial robot configuration using python and MATLAB.
- Participated in a Machine learning competition held on CodaLab as a part of a course. I built a deep neural network model for classifying 9 classes of various types of animals and vehicles using CNNs and FC networks. I took 4th place out of 43 participants.
- Designing and making a vertical XY plotter and applying image processing technique using MATLAB and Arduino for controlling.
- Implementing and controlling of a 6-DOF serial robotic arm using MATLAB and ARDUINO software.
- Simulation of a 4-DOF delta parallel robot via MSC Adams software and study analysis of its motions.
- Measuring the speed of fluid(air) using a pressure differential sensor connected with a pitot tube kit and displaying the data on a LED screen using Arduino.
- Simulating the heat distribution on Earth and Mars' cores using COMSOL software.
- Solving ODEs and PDEs using Numerical Solutions; Finite Element techniques.
- Mathematical modeling of a mechanical based Seismograph using MATLAB.
- Designing an apparatus for illustrating Magnetism using AutoCAD.
- Memory Game using Python coding language.

Publications

- J. Hathaway, A. Shaarawy, C. Akdeniz, A. Aflakian, R. Stolkin, A. Rastegarpanah, "Towards reuse and recycling of lithium-ion batteries: Tele-robotics for disassembly of electric vehicle batteries", in *Frontiers in Robotics and AI, 2023, Volume 10.* doi: https://doi.org/10.3389/frobt.2023.1179296

- K. Almaghout, R. A. Boby, M. Othman, A. Shaarawy, and A. Klimchik, "Robotic Pick and Assembly Using Deep Learning and Hybrid Vision/Force Control," in *2021 International Conference "Nonlinearity, Information and Robotics" (NIR)*, Aug. 2021, pp. 1–6. doi: [10.1109/NIR52917.2021.9666138](10.1109/NIR52917.2021.9666138).

- H. A. Elkholy, A. S. Shahin, A. W. Shaarawy, H. Marzouk, and M. Elsamanty, "Solving Inverse Kinematics of a 7-DOF Manipulator Using Convolutional Neural Network," in *Proceedings of the International Conference on Artificial Intelligence and Computer Vision (AICV2020)*, Springer Cham, 2020, pp. 343–352. doi: [10.1007/978-3-030-44289-7_32](10.1007/978-3-030-44289-7_32).

Achievements	• Awarded the 5th place in the DELL EMC Technologies annual challenge for graduation projects from senior undergraduate students, year 2020. Please refer to the project's video for more details: https://www.youtube.com/watch?v=oxwMDySRGDk

Achievements

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  https://www.youtube.com/watch?v=oxwMDySRGDk
- Awarded the 1st place in graduation projects category at Egypt IOT & AI challenge competition 2020. Subsequently, our team got invited to attend and participate with presenting the project's idea in the IEEE GCAIoT 2020 Online Conference.
- Awarded the 2nd place in the annual Research Forum in Nile University for the project entitled "Solving ODEs and PDEs using numerical solutions through finite element techniques"

Technical Skills

- Robot Operating System (ROS) [5 years, Expert level]
- MATLAB Tools [4 years, very good level]
- C++ coding language [1 year, Excellent level]
- Python coding language [3 year, Professional level]
- Unity3D engine [moderate level]
- Golang programming language [good level]
- C coding language [5 months embedded systems diploma]
- Arduino [3 years]
- SolidWorks: 3D CAD Design Software [3 years]
- Proteus Design Suite [1 year]

Linguistic Skills

- Arabic is my native language
- English: Academic IELTS Overall score (7.5/9); level (C1)
- I love learning new languages

Hobbies

- I love practicing all kinds of sports and outdoor activities.
- I have been practicing Parkour & Freerunning for 14 years.
- I am a parkour and fitness coach.
- Co-founder at Team Tracto, Parkour & Freerunning team based in Egypt.