

# Zeyad Manaa

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## Research Interests

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Data-driven modeling and control of dynamical systems– Control theory, and optimization – Model reduction, and feedback control of dynamical systems

## Education

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2023 – present	<b>King Fahd University for Petroleum &amp; Minerals (KFUPM)</b> <i>M.Sc. in Aerospace Engineering</i> <i>Thesis: “Data-driven Approaches for Modeling and Control – On Linear and Nonlinear Techniques” (Tentative Title)</i> <i>Committee: Ayman Abdallah (advisor), Mohammad Abido, Sayed Saad Ali Azhar.</i> <i>Note: This work is conducted with the Interdisciplinary Research Center for Aviation &amp; Space Exploration under research grant INAE 2401. For the project outcomes see e.g. [C1], and [C2].</i>	Dhahran, Saudi Arabia
2022	<b>University of Science and Technology at Zewail City (UST-ZC)</b> <i>B.Sc. in Aerospace Engineering</i> <i>Thesis: “Development of the software package for the attitude determination and control algorithm of a cube satellite”</i> <i>Advisor: Mustafa Abdalla</i>	Giza, Egypt

## Selected Refereed Scholarly Publications and Patents

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### Conference Proceedings

- [C2] **Manaa, Z.M.**, Abdallah, A.M., Abido, M.A. and Ali, S.S.A., 2024. Koopman-LQR for Quadrotor UAVs from Data. Submitted to IEEE International Conference on Smart Mobility
- [C1] **Manaa, Z.M.**, Elbalshy, M.R. and Abdallah, A.M., 2024. Data-driven Discovery of The Quadrotor Equations of Motion Via Sparse Identification of Nonlinear Dynamics. In AIAA SCITECH 2024 Forum (p. 1308).

### Journal Papers

- [J1] **Manaa, Z.M.** and Qassem, N., 2024. Optimal Airfoil for Improved Supersonic performance via Convex Optimization Framework. Under Review in the International Journal of Numerical Methods for Heat and Fluid Flow.

### Patents

- [P1] Qassem, N. and **Manaa, Z.M.**, 2024. Efficient Airfoil for Improved Supersonic Performance for Fighters. Filed patent. USA.

## Research Experience

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Jan 2023 – present	<b>KFUPM</b> <i>Research Assistant - Flight Dynamics &amp; Control and UAV Lab.</i> <i>Advisor: Ayman Abdallah</i> <ul style="list-style-type: none"><li>Researching Koopman operator to globally linearize nonlinear dynamics while integrating with data-driven event-triggered Control.</li><li>Exploring novel techniques for adaptive model reference control and model predictive control using new data-driven techniques.</li><li>Papers have been either published or submitted to refereed conferences; see e.g. [C1], and [C2].</li></ul>	Dhahran, Saudi Arabia
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- Jun 2022 – **National University of Science and Technology (NUST)** Islamabad, Pakistan  
 Aug 2022 *Research Intern - Aerial Robotics Lab*  
*Advisors: Muhammad Jawad Khan and Muhammad Aleem Siddiqui*
- Utilized hand gestures to control drones via built-in/web camera using YOLOvX detection models.
  - Developed an autonomous control system for a quadrotor UAV using Tello and COEX clover devices with ROS.
- Aug 2021 – **Egyptian Space Agency** Cairo, Egypt  
 Jul 2022 *Research Intern – Attitude Determination and Control Subsystem Lab.*
- Conducted the **bachelor's thesis research** under co-supervision of the Egyptian Space Agency and University of Science and Technology at Zewail City on spacecraft attitude determination and control subsystem.
  - Developed the software of the **attitude determination and control algorithm** of a cube satellite which decreased the detumbling time of the cube satellite.
  - Studied and implemented the space environment as a means of Earth's Magnetic Field (IGRF Model), Earth's gravitational field (using Spherical Harmonics) as well as modeling the space disturbances.

## Teaching

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### Courses Taught

- AE 426 Undergrad. Course: Introduction to Flight Mechanics. (Fall 2023)  
 AE 315 Undergrad. Lab: Systems and Control. (Fall 2023)  
*Overall Evaluation: 9.56/10.0*

### Teaching Assistantships

- AE 540 Graduate Course: Flight Dynamics and Control I. (Spring 2024)

### Teaching-related Activities

- AE 350 – Supervised undergrad. students' cooperative work in Aerospace Engineering and Control and  
 CIE 350 Instrumentation Engineering Departments (Summer 2023)  
 AE 399 – Supervised undergrad. students' summer internships workflow in Aerospace Engineering and  
 CIE 399 Control and Instrumentation Engineering Departments (Summer 2023)

### Presentations & Talks

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- Mar 2024 **KIKX Seminar:** Data-driven techniques for modeling and control in aerospace applications. KFUPM.  
 Jan 2024 **Talk:** Data-driven Discovery of The Quadrotor Equations of Motion Via Sparse Identification of Nonlinear Dynamics. AIAA. Florida, USA. Presented on behalf of the authors.  
 May 2023 **Presentation:** On proper orthogonal decomposition and dynamic mode decomposition for aerodynamic application. KFUPM.  
 Mar 2023 **Presentation:** Convex optimization for supersonic airfoil design using linear flow theory. KFUPM.

### Fellowships & Awards

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- 2023 **Mohammad Al-Aqeel Grant for Graduate Students:** Excellence Award for academic and research excellence, granted to attend AIAA 2023 SCITECH conference, Orlando, USA to present [C1]; awarded by Deanship of Research, KFUPM.  
 2023 **Graduate International Research Assistance Scholarship:** Fully funded scholarship for a 2.5-year M.Sc. in Aerospace Engineering at KFUPM, Saudi Arabia.  
 2022 **Research intern scholarship:** Awarded to distinguished international students to get a research internship at NUST.  
 2022 **Future Work is Digital Scholarship:** Awarded for Egyptian students to study data science from the Ministry of Communications and Information Technology, Egypt.

- 2019 **Smart City Hackathon:** 1<sup>st</sup> Place Award in global finals. Awarded by Digital Arabia Network, and Global Project, Germany.
- 2017 **Full Undergraduate Scholarship:** Merit-based scholarship given to high school students to join the University of Science and Technology at Zewail City to cover five years of study in engineering and science programs to promote the scientific research.

## Skills

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- Programming Python, MATLAB, C++, and basic working flow with Julia
- Frameworks Pytorch, OpenCV, Sci-Kit, CVX
- Other skills GIT, SolidWorks, ANSYS, Mathematica, bash-scripting, Jupyter Notebook, L<sup>A</sup>T<sub>E</sub>X, and LabVIEW
- Languages Arabic (Mother Tongue), English (C1 user, IELTS: 7)

## Archival Papers and Works in Progress

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Note: (\*) denotes equal contributions.

- Anafi, S., Najam T., Pampori A., **Manaa, Z.M.** and Abdallah, A.M. 2025. Enhanced Stability and Aerodynamic Performance of Skywalker X8 UAV via V-Tail Integration: A Comprehensive Modeling and Analysis Using OpenVSP Software. Submitted to AIAA SCITECH 2025 Forum.
- Elshaar, M., Elkhodary, P., Badr, M., Sayegh M., **Manaa, Z.M.** and Abdallah, A.M. 2025. Optimum Configuration for Hovering N-Quadrotors Carrying a Slung Payload. Submitted to *AIAA SCITECH 2025 Forum*.
- Mulla, Z., Tambal, A., Ahmed, A., Hassan, M., Qassem, N., **Manaa, Z.M.** and Abdallah, A.M. 2025. Parametric Study for V-Shaped Flight Formation for Swarm Drones. Submitted to *AIAA SCITECH 2025 Forum*
- Manaa, Z.M.**, Abdallah A.M. and Elferik, S. 2024. Koopman Inspired Event-Triggered Control for Discrete-Time Nonlinear Systems from Data. – In progress
- Elshaar, M.\*, **Manaa, Z.M.\***, Elbalshy, M.R.\* and Siddiqui, A. 2025. Drone or Not? Quadrotor UAV CNN-based Detection and Tracking. – In progress

## Professional Service

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### Reviewing

#### Conferences

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| IEEE, SMILE   | 2024        |
| IEEE, eSmarTA | 2024        |
| AIAA, SCITECH | 2023 - 2024 |

#### Journals

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| International Journal of Numerical Methods for Heat and Fluid Flow. | 2024 |
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### Leadership

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| 2020 | <b>Euroavia, Zewail City. Egypt.</b><br>Managed a team of 10 people as the Media committee head for the Euroavia Egypt, student branch                          |
| 2019 | <b>Science Festival, Zewail City. Egypt.</b><br>Managed a team of 15 people as the Media committee head for the Zewail City Science Festival mega event, Egypt. |

## References

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Available upon request.