Owais Khan

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ResearchGate, Google Scholar, ASU Profile

SUMMARY

Dedicated and results-driven Ph.D. in Control Systems with 3+ years of postdoctoral experience and a strong foundation in dynamic system modeling, state estimation, classical/modern control algorithms, and optimization. For my teaching experience, I have taught various undergraduate courses/modules across multiple institutions and supervised undergraduate and graduate students, with my commitment to teaching excellence recognized by the UK Professional Standards Framework (Associate Fellow). Seeking a faculty position where I can contribute my expertise and promote academic excellence and student success through teaching and research experiences. A permanent US resident and does not need sponsorship.

TECHNICAL SKILLS

Estimation & Control: *Kalman Filter, Luenberger Observer, Model Predictive Control, Robust and Adaptive Control, Optimal Control, Data-Driven Control, Fault Diagnosis and Tolerance, LMI-based control*
Real-Time Systems Testing & Optimization: *Hardware-in-the-loop(HIL), Sofware-in-the-loop(SIL), Model-in-the-loop(MIL) testing, Nonlinear/Linear/Quadratic/Mixed-Integer Programming, Semidefinite Programming, Convex Optimization*
Modeling and Simulation: *Dynamic Modeling, State-Space Modeling, System Identification, Linear/Nonlinear Systems, Hybrid Systems, Process Design and First-Principles-Based Models*
Languages and Tools: *MATLAB/Simulink, Python (NumPy. SciPy, Pandas, Matplotlib), ModelSim, GitHub*
Optimization Solvers: *CPLEX, Gurobi, CVX, Sedumi, Sdpt3*
Soft Skills: *Good communication, leadership, and interpersonal Skills, Project management, Problem solving skills, Simplification.*

WORK EXPERIENCE

Arizona State University, SEMTE ***Tempe, AZ/US***
*Postdoctoral Research Scholar [**Link**]* *10/2023- Present*
Projects: *Healthy Mom Zone 2.0, SleepWell24, YourMove (continued work)*

- *Continuing collaboration with **multidisciplinary teams** on digital health projects, including physical activity intervention (YourMove), prenatal weight gain (Healthy Mom Zone 2.0), and CPAP adherence (SleepWell24).*
- *Designing and deploying real-time adaptive control algorithms using three-degrees-of-freedom Kalman filter-based **Hybrid Model Predictive Control (3DoF-KF HMPC)** framework for highly dynamic complex systems.*
- *Lead full-cycle development of real-time algorithms, resulting in improved adherence and outcome metrics for YourMove (198+ participants) and HMZ 2.0 (70+ participants).*
- *Lead theoretical development, software implementation, and experimental validation, resulting in 5 peer-reviewed journal publications and 8+ conference presentations. Prepared technical reports and manuscripts using professional typesetting tools such as LaTeX.*
- *Supervise and mentor graduate students, and helping advisor fulfill project objectives, resulting in joint publications from NIH-funded projects and a 30% increase in research output of CSEL Lab.*

Southern University of Science and Technology, DMEE [Link] ***Shenzhen, China***
Postdoctoral Fellow *06/2023- 09/2023*

- *Conceptualized the development of inverse optimal control methods for finite-horizon linear quadratic regulators using system identification, enabling data-driven tuning of cost functions for real-world applications.*

Arizona State University, SEMTE ***Tempe, AZ/US***
*Postdoctoral Research Scholar [**Link**],* ***Project:*** *Yourmove* *10/2021- 10/2022*

- *Collaborated with **cross-functional team** on physical activity intervention involving 198+ participants, applying computational modeling and system identification approaches to develop **control-oriented models**.*

- *Designed and deployed a **3DoF-KF HMPC** algorithm for highly dynamic MIMO systems, including supply chain management and behavioral interventions (JustWalk, Yourmove).*
- *Conducted real-time closed-loop testing with **MATLAB/Simulink**, Python, and **Gurobi/CPLEX** solvers, perform stability and robustness analysis through MIL/HIL/SIL simulations.*
- *Achieved **100%** automation in adaptive intervention delivery through integration of multi-sensor fusion, online optimization, and model-based control workflows.*

IQRA University (Formerly Known as Grafton College), DEE [Link] ***Islamabad, Pakistan***
Lecturer *09/2018 - 03/2021*

- *Taught modules including Control Systems Design, Optimization for Engineers, Circuit Analysis, Advanced Control System, Model Predictive Control, Differential Equations, using interactive and student-centered methods.*
- *Conducted assigned lab experiments and maintained the course folders and lab folders.*
- *Assessment of students according to outcome-based education (OBE) system.*
- *Supervised final year students in their FYP projects. Development of new modules.*
- *Employed hands-on activities and MATLAB simulations in Control Systems and Differential Equations courses to enhance student engagement and understanding.*

Pakistan Institute of Engineering and Applied Sciences, DEE [Link] ***Islamabad, Pakistan***
Lab Instructor *09/2017 - 06/2018*

- *Conducted different lab experiments of electrical engineering degree program and maintained the lab folders.*
- *Conducted Lab Test and Viva and maintained the lab attendance record.*
- *Assessment of students according to outcome-based education (OBE) system.*

Pakistan Institute of Engineering and Applied Sciences, DEE [Link] ***Islamabad, Pakistan***
Doctoral Researcher/Research Associate *09/2016 - 12-2020*

- *Designed an observer-based min-max robust MPC algorithm for non-uniformly sampled systems, tackling time-varying control intervals in embedded networks and enhancing real-time stability, performance, and cutting computation time by 60%.*
- *Developed a **fault-tolerant robust MPC** scheme for actuator-fault-prone systems, achieving over 70% fault compensation under time delays, ensuring **stability and performance**.*

Swabi Institute of Technology Swabi ***Swabi, Pakistan***
Senior Instructor (Electrical Technology) *10/2011 - 01-2014*

- *Taught diploma courses related to Electrical Engineering Technology in a vocational training program*

PROJECTS

SleepWell24: Precision Medicine Approach to Optimizing Long-Term CPAP Adherence and Quality of Life [Link]
Funding Agency: American Academy of Sleep Medicine Foundation. ***Grant:*** *2022 Strategic Research Grant*

- Developed a personalized control-oriented model with dynamic modeling and system identification, implemented a 3DoF-KF HMPC framework that improves CPAP adherence by **25%** in **50+ OSA patients**.
- Configured adaptive mHealth interventions with symptoms-aware goal setting, reducing reported side effects by 30% and improving patient engagement and compliance with therapy.

Healthy Mom Zone 2.0: Prenatal Weight Gain Intervention Using Control Systems Methodology [Link-1], [Link-2]
Collaborators: Penn State University, Arizona State University
Funding Agency: U.S. National Institutes of Health (NIH), ***Grant***: *R01DK134863, ClinicalTrials.gov ID: NCT05807594*

- Engineered control-oriented models for a prenatal intervention. Applied a genetic algorithm-based greybox approach, ensuring accurate GWG predictions despite **10% missing data**.
- Developed and deployed a 3DoF-KF HMPC framework, accomplishing a **21% reduction** in GWG during early trials; delivered customized dosage adjustments to **70+** participants across **5 adaptive intervention stages**.
- Validated GWG controller performance against Institute of Medicine targets, attaining **88-98% device compliance** (Fitbit, Aria scale) through a 28-day pilot study and $>$50 simulation scenarios.
- Directed full-cycle development, from data collection to real-time closed-loop execution, enabling **100%** automated dosage adjustments and ensuring reliable, scalable weight regulation under clinical variability.

YourMove: Optimizing Individualized and Adaptive mHealth Interventions via Control Systems [Link-1], [Link-2]
Collaborators: UCSD San Diego, Arizona State University
Funding Agency: National Cancer Institute, NIH, ***Grant***: *R01CA244777, ClinicalTrials.gov ID: NCT05598996*

- Integrated control theory in behavioral medicine to execute a personalized *mHealth* intervention for sedentary individuals, attaining $>$1,000 steps/day increase during closed-loop stage compared to baseline.
- Utilized the Control Optimization Trial (COT) framework to devise customized control strategies based on estimated models, facilitating participants to exceed CDC activity recommendations **($>$10,000 steps/day)**.
- Implemented a 3DoF-KF HMPC algorithm with computational dynamic models, achieving **$>$85% goal attainment** for individualized activity targets. Reduced computation time from **7 hours to 8 minutes**, enabling real-time personalization for **198+ participants**.
- Demonstrated algorithmic robustness through Monte Carlo simulations, achieving a stable closed-loop response within $\pm$10% of the target step count, without instability despite model mismatch.

EDUCATION

- ***PhD in Electrical Engineering (Control Systems (2016-2020)**, PIEAS, Islamabad, Pakistan [Link]*
  Developed a novel fault-tolerant robust model predictive control algorithm for industrial processes subjected to different fault scenarios and uncertainties.
- ***Masters in Electrical Engineering (2014-2016)**, COMSATS University, Islamabad, Pakistan [Link]*
  Dynamic Modeling and Robust Control Design for Single-Link Flexible Joint Robots.

SELECTED JOURNAL PUBLICATIONS (LIST AVAILABLE ON GOOGLE SCHOLAR [LINK])

1. P. Otálora, et al., "Enhancing pH control in microalgae raceway photobioreactors using 3DoF-KF Model-on-Demand model predictive control," *Control Engineering Practice*, 2025 (**Under Review**) [**Link**]
2. S. Banerjee, et al., "Data-Driven System Identification and 3DoF-KF Model Predictive Control For Integrating Processes: Application to a Microalgae Raceway Reactor," *Automatica*, 2025 (**Under Review**)
3. S. Banerjee, **O.Khan**, et al., "A Robust Data-Driven Nonlinear Predictive Control Framework using 3DoF-KF DWO MPC," 2025 (**Pending**)
4. **O. Khan**, G. Mustafa, et al., "Robust Model Predictive Control of Sampled-Data Lipschitz Nonlinear Systems: Application to Flexible Joint Robots," *European Journal of Control*, 81, January 2025 [**Link**]
5. **O. Khan**, et al., "3DoF-KF HMPC: A Kalman filter-based Hybrid Model Predictive Control Algorithm for Mixed Logical Dynamical Systems," *Control Engineering Practice*, 154, January 2025 [**Link**]
6. S. Banerjee, **O. Khan**, et al., "Data-Driven Control of Nonlinear Process Systems using a Three-Degree-of-Freedom Model-on-Demand Model Predictive Control Framework," *I & ECR*, 2025 [**Link**]
7. D.S. Downs, et al., "Healthy Mom Zone Adaptive Intervention with Novel Control System and Digital Platform: Study Design and Protocol for a Randomized Control Trial to Manage Gestational Weight Gain in Pregnant Women with Overweight," *JMIR Research Protocols*, 14, 2025 [**Link-1**], [**Link-2**]
8. M. Kim, et al., "Optimizing and Testing an Individualized and Adaptive Physical Activity Digital Health Intervention: Protocol of Control Optimization Trial embedded within a Randomized Controlled Trial," *JMIR Research Protocols*, 2025 **(In-Press)** [**Link**]
9. M. El. Mistiri, **O. Khan**, et al., "Data-Driven Mobile Health: System Identification and Hybrid Model Predictive Control to Deliver Personalized Physical Activity Interventions," *IEEE OJCS*, 2025 [**Link**]
10. M. A. Shoaib, et al., "A Framework for Observer-Based Robust Fault Detection in Nonlinear Systems With Application to Synchronous Generators in Power Systems," *IEEE Trans. Power Syst.*, 37(2), 2022 [**Link**]
11. ur Rehman, A, et al., "A Disturbance Observer Based Sliding Mode Control for Variable Speed Wind Turbine," *IETE Journal of Research*, 68.3, 2022 [**Link**]
12. **O. Khan**, G. Mustafa, et al., "Fault-tolerant robust model predictive control of uncertain time-delay systems subject to disturbances," *IEEE Transactions on Industrial Electronics*, 68(11), 2021 [**Link**]
13. **O. Khan**, G. Mustafa, A. Q. Khan, M. Abid, "Robust observer-based model predictive control of non-uniformly sampled systems," *ISA Transactions*, 98, pp. 37-46, March 2020 [**Link**]

SELECTED CONFERENCE PUBLICATIONS (FULL LIST ON GOOGLE SCHOLAR [LINK])

1. **O. Khan**, D. E. Rivera, et al., "Optimizing CPAP Adherence and Quality of Life in Obstructive Sleep Apnea Patients Using 3DoF-KF Hybrid Model Predictive Control," in *IEEE Conference on Control Technology and Applications*, San Diego, CA, August 25-27, 2025 (**Accepted**).
2. **O. Khan**, et al., "An Optimized Behavioral Intervention for Managing Gestational Weight Gain Using Semi-Physical Modeling and Hybrid Model Predictive Control," in *American Control Conference (ACC)*, Denver, CO, USA, July 8-10, 2025, pp. 3317-3322 (**In-Press**)
3. M. El. Mistiri, J. Park, **O. Khan**, S. Banerjee, E. Hekler, and D. E. Rivera, "YourMove: A System Identification and Hybrid Model Predictive Control Personalized mHealth Intervention for Physical Activity," in *American Control Conference (ACC)*, Denver, CO, USA, July 8-10, 2025, pp. 3974-3980 (**In-Press**)
4. S. Banerjee, M. El. Mistiri, **O. Khan**, et al., "A Data-Driven Hybrid Model Predictive Control Framework for Managing Epidemics Using 3DoF-KF HMPC," *American Control Conference*, Denver, CO, USA, 2025, pp. 2023-2028 (**In-Press**)
5. S. Banerjee, **O. Khan**, et al., "Data-Driven control of highly interactive systems using 3-DoF Model-On-Demand MPC: Application to MIMO CSTR," *IFAC-PapersOnLine*, 58(15), 2024, pp. 420-425 [**Link**]
6. S. Banerjee, P. Otálora, M. El. Mistiri, **O. Khan**, et al., "Control-Relevant Input Signal Design For Integrating Processes: Application to a Microalgae Raceway Reactor," *IFAC-PapersOnLine*, 58(15), 2024, pp. 360-365 [**Link**]
7. M. El. Mistiri, **O. Khan**, et al., "System Identification and Hybrid Model Predictive Control in Personalized mHealth Interventions for Physical Activity," *American Control Conference*, San Diego, CA, USA, 2023, pp. 2240-2245 [**Link**]
8. **O. Khan**, M. El. Mistiri, D. E. Rivera, C. A. Martin, and E. Hekler, "A Kalman filter-based Hybrid Model Predictive Control Algorithm for Mixed Logical Dynamical Systems: Application to Optimized Interventions for Physical Activity," in *61st IEEE Conference on Decision and Control*, Cancun, Mexico, 2022, pp. 2586-2593 [**Link-1**], [**Link-2**]
9. M. El. Mistiri, D. E. Rivera, **O. Khan**, E. Hekler, and C. A. Martin, "An Integrated System Identification and Hybrid Model Predictive Control Strategy for Optimized Interventions for Physical Activity," in *AIChE Annual Meeting*, Phoenix, USA, November 16, 2022 [**Link**]
10. **O. Khan**, et al., "Beyond linear control approaches-sliding mode control of flexible robotic manipulator," in *International Conference on Frontiers of Information Technology*, Islamabad, Pakistan, Dec 19-21, 2016, pp. 1-6 [**Link**]

LEADERSHIP/MENTORING EXPERIENCE

Supervision ***PIEAS, IQRA***

* *Co-supervised master's and junior PhD students during my PhD at PIEAS, resulting in joint publications.*
* *Supervised undergraduate projects at IQRA University, fostering research skills and collaborative learning.*

AWARDS, HONORS, & MEMBERSHIPS

IT and Telecom Endowment Fund Scholarship: To support my PhD studies at PIEAS, Islamabad, Pakistan [**Link**]
Teaching Fellowship: Associate Fellow for Teaching and Learning support in Higher Education according to UK Professional Standards Framework. [**Link**]
IEEE Memberships: Member of the IEEE and IEEE Control System Society.
IAENG Membership: Member of International Association of Engineers Hong Kong. [**Link**]

CERTIFICATIONS AND TRAININGS

- **GCP - Social and Behavioral Research Best Practices for Clinical Research** *Nov 2, 2023*
  CITI Program (Training) [Link]
- **RCR Workshop - Data Management** *Nov 9, 2021*
  ASU, AZ (Training)
- **RCR - Social and Behavioral Responsible Conduct of Research** *Oct 28, 2021*
  CITI Program (Training) [Link] CITI Program (Training) [Link]
- **IRB - Social & Behavioral Research (Group 2)** *Oct 28, 2021*
  CITI Program (Training) [Link]
- **Model Predictive Control** *30 Jan - 01 Feb 2020*
  SEECS-NUST, Islamabad, Pakistan (Workshop)
- **Nonlinear Control Systems by Prof. Dr. Hassan Khalil** *6-8 March 2017*
  SEECS-NUST, Islamabad, Pakistan (Workshop)