

## SYED ASEEM UL ISLAM

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### Experience

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**University of Michigan, Ann Arbor, MI**

**May 2021 – present**

#### Research Fellow

- Conducting research on real-time implementable, data-driven, nonlinear model predictive control
- Developed a nonlinear, model-predictive guidance algorithm for minimum-time missile guidance

**University of Michigan, Ann Arbor, MI**

**Aug 2017 – April 2021**

#### Graduate Student Research Assistant

- Developed a data-driven extension of retrospective cost adaptive control – improved generalizability of the original algorithm – applied to several challenging flight control examples
- Codeveloped a data-driven, output-feedback, model predictive control algorithm – an observer-free, data-driven algorithm, which has shown promising results
- Codeveloped digital, adaptive, PID controller for systems with sensor and actuator nonlinearities – simulation-based guarantees for a first-order systems with deadtime
- Applied digital adaptive control to decentralized control of an electrical grid under PV generation – utilized decentralized, MIMO, fixed-structure controllers to simplify MIMO controller structure
- Investigated timing subtleties of real-time implementation of digital Kalman filters and predictors and recursive least squares
- Instructional Assistant: graduate linear systems theory, undergraduate aerospace controls

**Fuel Motion Inc., Karachi, Pakistan**

**Jan – May 2015**

#### Embedded Systems Engineer

- Developed and implemented a modular battery management system for a prototype electric vehicle – state of charge and state of health estimation using particle filters

**Pakistan Aeronautical Complex, Kamra, Pakistan**

**July – Aug 2013**

#### Internee

- Worked in the Aircraft Rebuild Factory of PAC Kamra, focusing mainly on overhauling of F-7P, F-7PG and K-8 aircraft

### Education

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**UNIVERSITY OF MICHIGAN, Ann Arbor, MI**

**April 2021**

**Doctor of Philosophy, Data-Driven Retrospective Cost Adaptive Control**

- GPA: 3.85

**UNIVERSITY OF MICHIGAN, Ann Arbor, MI**

**May 2017**

**Masters of Science in Engineering, Flight Dynamics and Control**

- GPA: 3.84

**INSTITUTE OF SPACE TECHNOLOGY, Islamabad, Pakistan**

**Aug 2014**

**Bachelor of Science in Aerospace Engineering**

- GPA: 3.87; graduated magna cum laude

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### Proficiency

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- MATLAB/Simulink
- Digital Control
- Adaptive Control
- LQG/LQR
- Data-driven systems
- Python
- Model Predictive Control
- PID Control
- System Identification
- Real-time implementation of digital algorithms
- C/C++

### Graduate Courses

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- Linear Algebra
- Nonlinear Systems & Control
- System Identification
- Adaptive Control
- Flight Trajectory Optimization
- Dynamics
- Robotics
- Machine Learning
- Guidance and Navigation

### Awards

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#### Fulbright Master's

Sept 2015 – May 2017

Completed Master's degree at University of Michigan under a fully funded US DoS grant.

#### President of Pakistan Gold Medal

Aug 2014

Graduated top of the class of 2014 at the Institute of Space Technology, Islamabad, Pakistan.

### Key Publications

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- S. A. U. Islam, T. W. Nguyen, I. Kolmanovsky, and D. S. Bernstein, "Data-Driven Retrospective Cost Adaptive Control for Flight Control Applications," *AIAA J. Guid. Contr. Dyn.*, Vol. 44, No. 10, pp. 1732-1758, 2021.
- T. W. Nguyen, S. A. U. Islam, D. S. Bernstein, and I. Kolmanovsky, "Predictive Cost Adaptive Control - A Numerical Investigation of Persistency, Consistency, and Exigency," *IEEE Contr. Sys. Mag.*, Vol. 41, pp. 64-96, December 2021.
- A. Goel, J. Paredes, H. Dadhaniya, S. A. U. Islam, A. M. Salim, S. Ravela, and D. S. Bernstein, "Experimental Implementation of an Adaptive Digital Autopilot," *Amer. Contr. Conf.* 2021.
- S.A.U. Islam, A. Goel, and D.S. Bernstein, "Real-Time Implementation of the Optimal Predictor and Optimal Filter: Accuracy Versus Latency," *IEEE Contr. Sys. Mag.*, Vol. 40, pp. 84–91, April 2020.
- S.A.U. Islam, A. L. Bruce, T. W. Nguyen, I. Kolmanovsky, and D. S. Bernstein, "Adaptive Flight Control with Unknown Time-Varying Unstable Zero Dynamics," *AIAA Scitech 2020 Forum*, Orlando, FL, Jan 2020.
- M. Kamaldar, S.A.U. Islam, S. Sanjeevini, A. Goel, J.B. Hoagg, and D.S. Bernstein, "Adaptive Digital PID Control of First Order-Lag-Plus-Dead-Time Dynamics with Sensor, Actuator, and Feedback Nonlinearities," *Adv. Contr. Applications*, Vol. 0, October 2019.
- S.A.U. Islam and D.S. Bernstein, "Recursive Least Squares for Real-Time Implementation," *IEEE Contr. Sys. Mag.*, Vol. 39, pp. 82–85, June 2019.