Dr. Nazim Kemal Ure

Contact Info

Assistant Professor
Istanbul Technical University,
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Research Interests

Machine Learning and Data Driven Optimization: Deep Learning, Data-driven Decision Making Systems, Large-scale Optimization, Applications of Machine Learning to Aviation, Markov Decision Processes, Approximate Dynamic Programming and Reinforcement Learning, Decentralized Decision Making and Learning, Non-parametric Bayesian Models.

Autonomous Multi-agent Systems: Unmanned Aerial Vehicles (UAVs), Multi-UAV Coordination and Trajectory Planning Algorithms, Swarm Applications, Persistent Search and Track applications, Forest Firefighting and Crop Monitoring Applications, Outdoor and Indoor Autonomous Flight Tests.

High Accuracy Guidance, Navigation and Control: Control System Design and Maneuver Planning for Agile Fighter Aircraft, Guidance and Control of Ballistic and Interceptor Missiles, Spacecraft Attitude Determination and Control, Distributed Filtering and Sensor Fusion, Inertial Navigation Systems, Nonlinear and Adaptive control.

Experience

Assistant Professor, Istanbul Technical University — August 2015 - Present
Faculty of Aeronautics and Astronautics: Department of Aeronautical Engineering
- Affiliated with Aerospace Research Center (ARC)

Research Specialist, Istanbul Technical University Technology Transfer Office — February 2015 - August 2015

Research Assistant, Massachusetts Institute of Technology — September 2010 - January 2015
Department of Aeronautics and Astronautics
Affiliated with
- Aerospace Controls Lab (ACL)
- Laboratory Of Decision and Information Systems LIDS

Education

Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

Ph.D., Department of Aeronautics and Astronautics, — September 2010 - January 2015
- Thesis Title: *Multiagent Planning and Learning with Randomized Decompositions and Adaptive Representations*
- Advisor: Prof. Jonathan P. How
- Field: Autonomous Systems and Machine Learning
- Ph.D. Minor: Mathematics

Istanbul Technical University, Ayazağa, Istanbul, Turkey

M.Sc., Defense Technologies, — September 2010 - June 2012
- Thesis Title: *Design of a Multimodal Planning and Control Framework for Agile Maneuvering Unmanned Combat Aerial Vehicles*

B.Sc., Faculty of Aeronautics and Astronautics: Department of Astronautical Engineering, — September 2004 - June 2008
- Thesis Title: *Development of Robust and Nonlinear Control Laws for Satellite Attitude Control*

B.Sc., Faculty of Aeronautics and Astronautics: Department of Aeronautical Engineering, — September 2004 - June 2008
- Thesis Title: *Design of Full Flight Envelope Nonlinear Control Laws for Agile Maneuvering Aircraft*

Projects

- Decision Making Under Uncertainty and Deep Learning for Self-Driving Cars, AVL, Principal Investigator, 2018-2019.
- Structural Health Monitoring and Failure Prediction with Deep Learning, GE Power, Principal Investigator, 2018.
- Deep Learning UAV Networks for Autonomous Forest Firefighting, EU Marie Curie Individual Fellowships Reintegration Project, Principal Investigator, 2017-2019.
- Fault Tolerant Control System Design for Fighter Aircraft with Probabilistic Sensor and Actuator Failure Models, Turkish Aerospace Industries (TAI), Principal Investigator, 2017-2019.
- Multi-UAV Search and Rescue with Signal Monitoring, Turkish Air Force, Principal Investigator, 2016-2017.
- Multi-UAV Persistent Surveillance and Convoy Security, ASELSAN, Lead Researcher, 2017-2019.
- Autonomous Agile Maneuvering Control and Planning Systems for Unmanned Aerial Vehicles, TUBITAK 1003 Project, Principal Investigator, 2016-2018.
- Combination of Probabilistic Trajectories (COPTRA), EU HORIZON 2020 Project, Researcher, 2016-2018.
- Threat Modeling for Missile Defense Systems, ASELSAN, Researcher and Technical Manager, 2015-2017
- ITUDrone: UAV Design for Campus Security, ITU, Principal Investigator, 2015-2016.
- IHATAR: UAV Design for Crop Monitoring, ITU, Principal Investigator, 2015-2016.
- Multiagent Planning and Learning Under Uncertainty with Applications to Forest Fire Modeling, NASA-STTR Project, Researcher, 2013-2015.
- Health-adaptive Multi-Vehicle Systems, Boeing Research and Technology, Researcher, 2010-2015.
- High Accuracy Platform Development for Nano Satellites with Attitude Control, TUBITAK 1001 Project, Researcher, 2009-2010.

Book Chapters

[1] Ure, N. K., Chowdhary, G., How, J. P., Vian, J., Multi-Agent Planning for Persistent Surveillance, in the book Decision Making Under Uncertainty, Edited by Mykel J. Kochenderfer. MIT Press 2015.

Journal Papers

[2] Akcal, M. U., Ure, N. K., Predictive Missile Guidance with Online Trajectory Learning, Defence Science Journal, 2017

[3] Ure, N. K., Computationally Efficient Assessment of Fighter Aircraft Mission Survivability with Probabilistic Graphical Models,Journal of Aeronautics and Space Technologies, 2017

[4] Omidshafiei S., Agha-mohammad A., Chen Y. F., Ure N. K. , How J. P., Vian J., Surati R., , "Measurable Augmented Reality for Prototyping Cyberphysical Systems: A Robotics Platform to Aid the Hardware Prototyping and Performance Testing of Algorithms," in IEEE Control Systems, vol. 36, no. 6, pp. 65-87, Dec. 2016.

[5] Yuksek, B., Ure, N. K. Caliskan, F., Inalhan G., “Fault Tolerant Heading Control System Design for Turac Unmanned Aerial Vehicle”, Transactions of the Institute of Measurements and Control (TIMC), 2016.

[6] Yuksek, B., Ure, N. K. " Optimization of Allocation and Launch Conditions of Multiple Missiles for Three Dimensional Collaborative Interception of Ballistic Targets", International Journal of Aerospace Engineering, Special Issue on Recent Advances on Aerospace Controls, 2016.

[7] Pasaoglu, C., Baspinar, B., Ure, N. K., Inalhan, G., Hybrid Systems Modelling and Automated Air Traffic Control for Three Dimensional Separation Assurance, Journal of Aerospace Engineering, 2015

[8] Ure, N. K., Chowdhary, G., How, J. P., Vian, J. Health Aware Planning Under Uncertainty for Collaborating Heterogeneous Teams of Mobile Agents. Unmanned Systems, 2015.

[9] Ure, N. K., Chowdhary, G., Chen, S., How, J. P., Vian, J., Distributed Learning for Planning Under Uncertainty Problems with Heterogeneous Teams, Journal of Intelligent & Robotic Systems, 2014.

[10] Ure, N. K., Chowdhary, G., Toksoz, T., How, J. P., Vavrina, M., Vian, J. Automated Battery Management System for Enabling Multi-UAV Persistent Missions. IEEE Transacation on Mechatronics, 2013.

[11] Ure, N. K., Inalhan G., Autonomous Control of Unmanned Combat Air Vehicles: Design of a Multimodal Control and Flight Planning Framework for Agile Maneuvering, IEEE Control Systems Magazine, 32(5) 74-95. 2012.

[12] Koyuncu, E., Ure, N. K., Inalhan G., Integration of path/maneuver planning in complex environments for agile maneuvering UCAVs, Journal of Intelligent & Robotic Systems, 57(1) 143-170. 2010.

Conference Publications

[13] Eroglu, B., Sahin, C. M., Ure, N. K., Inalhan, G., Deep Recurrent and Convolutional Networks for Accelerated Fault Tolerant Adaptive Flight Control Under Severe Failures, American Control Conference, 2018.

[14] Yildiz, A., Ure, N. K., Inalhan, G., Online Algorithm for Optimizing Invariant Conditions for Procedural Nonlinear Constrained Hybrid Systems, American Control Conference, 2018.

[15] Moghadam, M., Ure, N. K., Inalhan, G., Autonomous Execution of Aircraft Supermaneuvers with Switching Nonlinear Backstepping Control, AIAA Science and Technology Forum and Exposition, 2018.

[16] Yildiz, A., Akcal, U. M., Hostas, B., Ure, N. K., Inalhan, G., Finite State Automata Based Approach to Autonomous Stall and Upset Recovery for Agile Aircraft , AIAA Guidance Navigation and Control Conference, AIAA Science and Technology Forum and Exposition, 2018.

[17] Yuksek, B., Ure, N. K., Inalhan, G., Cooperative Interception of a Highly Manoeuvrable Aerial Target, AIAA Guidance Navigation and Control Conference, AIAA Science and Technology Forum and Exposition, 2018.

[18] Akcal, U. M., Hostas, B., Ure, N. K., Inalhan, G., Recoverability Envelope Analysis of Nonlinear Control Laws for Agile Maneuvering Aircraft, AIAA Guidance Navigation and Control Conference, AIAA Science and Technology Forum and Exposition, 2018.

[19] Hasanzade, M., Herekoglu O., Ure, N. K., Koyuncu, E., Yeniceri, R. and Inalhan, G., Localization and Tracking of RF Emitting Targets with Multiple Unmanned Aerial Vehicles in Large Scale Environments with Uncertain Transmitter Power, 2017 International Conference on Unmanned Aircraft Systems (ICUAS), June 13-16, 2017, Miami, FL, USA

[20] Akcal, U. M., Yuksek. B., Ure, N. K., Modeling and Simulation of Aerobee-150A Sounding Rocket, AIAA Modeling and Simulation Technologies Conference, AIAA Science and Technology Forum and Exposition, 2017.

[21] Baspinar, B., Ure, N. K., Koyuncu, E., Inalhan, G., Analysis of delay characteristics of European air traffic through a data-driven airport-centric queuing network model. IFAC-PapersOnLine, 49(3), 359-364, 2016.

[22] Ure, N. K., Inalhan G., Predictive Missile Guidance for Agile Targets with Stochastic Hybrid Dynamics, IEEE Aerospace Conference, Big Sky MT, 2016.

[23] Baspinar, B., Pasaoglu, C., Ure, N. K., Inalhan, G., , Infrastructure Development for Ground-Based Separation Assurance with Optional Automation, ATACCS, 2015.

[24] Ure N. K., Omidshafiei S., Lopez B., Agha-mohammad A., How J. P., Vian J., Online Heterogeneous Multiagent Learning Under Limited Communication with Applications to Forest Fire Management, IROS, Hamburg, Germany, 2015.

[25] Ure N. K., How J. P., Vian J., Randomized Coordination Discovery for Scalable Multiagent Planning, AAMAS, 2015.

[26] Omidshafiei S., Agha-mohammad A., Chen Y. F., Ure N. K. , How J. P., Vian J., Surati R., Window into Belief Space: A Projection-based Platform for Real-time Visualization and Testing of Planning and Learning Algorithms, AIAA Infotech, 2015.

[27] Agha-mohammadi A., Ure N. K., How. J. P., Vian J., Health Aware Stochastic Planning For Persistent Package Delivery Missions using Quadrotors, IROS, Chicago IL, 2014.

[28] Chen Y. F., Ure N. K., Chowdhary G., How. J. P., Vian J., Planning for Large-Scale Multiagent Problems via Hierarchical Decomposition with Applications to UAV Health Management, In: American Control Conference, Portland OR, 2014.

[29] Amato C., Chowdhary G., Geramifard A., Ure N. K., "Decentralized Control of Partially Observable Markov Decision Processes", The 52nd IEEE Conference on Decision and Control (CDC), 2013.

[30] Ure, N. K., Chowdhary, G., Chen, S., How, J. P., Vian, J., Decentralized Learning based Planning Multiagent Missions in Presence of Actuator Failures In: International Conferences on Unmanned Aircraft Systems, Atlanta GA 2013.

[31] Ure, N. K., Chowdhary, G., How, J. P., Vavrina, M., Vian, J. Health Aware Planning Under Uncertainty for UAV Missions with Heterogeneous Teams In: European Control Conference. 2013.

[32] Ure, N. K., Chowdhary, G., Chen, S., How, J. P., Vian, J., Health-Aware Decentralized Planning and Learning for Large-scale Multiagent Missions In: Conference on Guidance Navigation and Control, Boston MA 2013.

[33] Ure, N. K., Geramifard, A., Chowdhary, G., How, J. P., Adaptive Planning for Markov Decision Processes with Uncertain Transition Models via Incremental Feature Dependency Discovery In: European Conference on Machine Learning, Bristol UK 2012.

[34] Chowdhary, G., Ure, N. K., How, J. P., Kingravi H., Model Reference Adaptive Control using Nonparametric Adaptive Elements In: Conference on Guidance Navigation and Control, Minneapolis MN 2012.

[35] Chowdhary, G., Muhlegg, M., Ure, N. K., Johnson, E., How, J. P., Experimental Results of Concurrent Learning Adaptive Controller In: Conference on Guidance Navigation and Control, Minneapolis MN 2012.

[36] Ure, N. K., Toksoz, T., Chowdhary, G., Redding, J., How, J. P., Vavrina, M., Vian, J., Experimental Demonstration of Multi-Agent Learning and Planning under Uncertainty for Persistent Missions with Automated Battery Management In: Conference on Guidance Navigation and Control, Minneapolis MN 2012. (Best Paper Award)

[37] Redding, J., Ure, N. K., How, J. P., Vavrina, M., Vian, J., Scalable, MDP-based Planning for Multiple, Cooperating Agents In: American Control Conference, Montreal Canada 2012.

[38] Cutler, M., Ure, N. K., Michini, B., How, J. P., Comparison of Fixed and Variable Pitch Actuators for Agile Quadrotors In: Conference on Guidance Navigation and Control, Portland OR 2011.

[39] Redding, J., Toksoz, T., Ure, N. K., How, J. P., Vavrina, M., Vian, J., Persistent Distributed Multi-Agent Missions with Automated Battery Management In: Conference on Guidance Navigation and Control, Portland OR 2011.

[40] Michini, B., Redding, J., Ure, N. K., Cutler, M., How, J. P., , Design and Flight Testing of an Autonomous Variable-Pitch Quadrotor In: International Conference on Robotics and Automation, Shanghai China 2011.

[41] Ure, N. K., Kaya, Y. B., Inalhan G., The development of a Software and Hardware in- the-Loop Test System for ITU-PSAT II nano satellite ADCS In : Aerospace Conference, Big Sky MT 2011.

[42] Ure, N. K., Koyuncu, E., Kurtulus, C., Inalhan G., ITU PSAT II: Attitute Controlled Nano Satellite Platform Developing Project, In : National Conference on Aeronautics and Astronautics, Eskisehir Turkey 2010.

[43] Koyuncu, E., Ure, N. K., Inalhan G., Integration of path/maneuver planning in complex environments for agile maneuvering UCAVs In: Int. Symposium on Unmanned Aerial Vehicles, Reno, Nevada 2009.

[44] Ure, N. K., Inalhan G., Design of a Multi Modal Control Framework for Agile Maneuvering UCAVs In : Aerospace Conference, Big Sky MT 2009.

[45] Ure, N. K., Inalhan G., Feasible Agile Maneuver Identification and Generation Algorithms on Multi Modal Control Framework In : Conference on Guidance Navigation and Control, Chicago IL 2009.

[46] Ure, N. K., Inalhan G., 'Design of Higher Order Sliding Mode Control Laws for Multi Modal Agile Maneuvering UCAVs In : Int. Symposium on Systems and Controls in Aerospace, Shenzen China 2008.

[47] Koyuncu, E., Ure, N. K., Inalhan G., A Probabilistic Algorithm for Mode Based Motion Planning of Agile Air Vehicles in Complex Environments In: Int. Federation of Automatic Control World Congress 2008.

Referee Service

- *AIAA Journal of Guidance, Dynamics and Control*
- *AIAA Journal of Aerospace Information Systems*
- *IEEE Transactions on Aerospace and Electronic Systems*
- *Chinese Journal of Aeronautics*
- *Transportation Research Part C*
- *AIAA Conference on Guidance Navigation and Control*
- *American Control Conference*
- *Conference on Decision and Control*
- *International Conference on Robotics and Automation*

Memberships

Institute for Electrical and Electronics Engineers (IEEE), Member, 2009– Present
- IEEE Control Systems Society (2009–Present)

American Institute of Aeronautics and Astronautics (AIAA), Member, 2007– Present

Software

Coding
- C, C++, Java, Python, Julia

Numerical Analysis
- Matlab, R, Mathematica

Other
- MS Office, Eclipse, Latex

Fundings and Awards

European Commission
- Marie Curie Individual Fellowship Reintegration Grant, 2017-2019.

Boeing Research and Technology
- Faculty fellowship, 2015
- Graduate Research Fellowship, September 2010 - January 2015,

The Scientific and Technological Research Council of Turkey (TUBITAK)
- Graduate Research Fellowship, May 2009- June 2010

AIAA Guidance Navigation and Control Conference
- Best Paper Award, 2012

Istanbul Technical University
- Undergraduate Research Opportunity Program (UROP) Fellowship, August 2006 - June 2008
- Honored by ITU for completing Double Major in 4 years - June 2008
- Aeronautical Engineering Second Best Student Award - June 2008
- Astronautical Engineering Best Student Award - June 2008