Stevens Institute of Technology
School of Systems and Enterprises
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Hoboken, NJ 07030
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A. Emrah Bayrak

Curriculum Vitae

Education

2013–2015 **PhD, Mechanical Engineering**, University of Michigan
Ann Arbor MI.
Dissertation: Topology Considerations in Hybrid Electric Powertrain Architecture Design
(Chair: Panos Papalambros)

2011–2013 **MSE, Mechanical Engineering**, University of Michigan
Ann Arbor MI.

2006–2011 **BS, Mechatronics Engineering, Minor: Mathematics**, Sabanci University
Istanbul TR.

Employment

2019– **Assistant Professor**, Stevens Institute of Technology
School of Systems and Enterprises
Hoboken, NJ.

2018–2019 **Research Scientist**, Carnegie Mellon University
Mechanical Engineering
Pittsburgh, PA.

2015–2018 **Postdoctoral Research Fellow/Adjunct Lecturer**, University of Michigan
Mechanical Engineering
Ann Arbor, MI.

2010 **Summer Internship**, Toshiba Corp.
Corporate Manufacturing Engineering Center
Yokohama, JP.

Teaching Experience

Instructor

2021–2023 **EM357–Elements of Operations Research**,
Stevens Institute of Technology, Hoboken, NJ.

2020–2022 **ENGR355–Engineering Economics**,
Stevens Institute of Technology, Hoboken, NJ.

2019–2022 **SYS501–Probability and Statistics for Systems Engineering**,
Stevens Institute of Technology, Hoboken, NJ.

2020 **SYS625–Fundamentals of Systems Engineering**,
Stevens Institute of Technology, Hoboken, NJ.

2017 **ME455/DESCI501–Analytical Product Design**,
University of Michigan, Ann Arbor, MI.

2015–2016 **ME555–Design Optimization**,
University of Michigan, Ann Arbor, MI.

Guest Instructor

2017 **ISD599-2–Systems Requirement Development & Verification**,
University of Michigan, Ann Arbor, MI.

2017 **ISD599-4–Systems Architecting, Concept Development & Embodiment Design**,
University of Michigan, Ann Arbor, MI.

Research Funding

External Funding

EF3 **R15 REAP: The Patient Journey for Children with Medical Complexity during Pandemic Era and Its Implications**,
Source: National Institutes of Health, Funding: $489,163 Role: Co-I.
Period: Sep 2022 – Sep 2024

EF2 **A multi-sensor wearable system with a personalized AI and multimodal biofeedback to improve balance of older adults at home**,
Source: US National Academy of Medicine, Funding: $50,000 Role: PI.
Period: Oct 2021 – Oct 2022 *(Acceptance Rate: 5%, 25 funded out of 500 submissions)*

EF1 **Hybrid Computer Platform to Design, Guide, and Partner with Humans in the Team Problem-Solving Process**,
Source: DARPA/Carnegie Mellon University, Funding: $93,893 Role: PI of Subaward.
Period: Jan 2019 – Sep 2021

Systems Engineering Research Center (SERC) Funding

SF1 **WRT-1073: Defense Acquisition University (DAU) Credential Development and Workforce Development in AI and Data Analytics**,
Source: DAU / SERC, Funding: $334,575 Role: PI.
Period: Sep 2022 – Sep 2023

Internal Funding

IF1 **Developing Decision Support Systems for Smart Healthcare with Optimal Trust Characteristics**,
Source: SSE Dean Research Incentive Award, Funding: $9,590 Role: PI.
Period: Apr 2022 – Jul 2022

Publications

Journal Articles (Stevens Affiliated)

J19 **Systems Thinking Assessment: A Method Through Computer Simulation**,
Journal of Computing and Information Science in Engineering, 2022 (under review) (ASME).
Arnold R. D., Wade J. P., Bayrak, A. E.

J18 **Static and Dynamic Analysis of Optimal Reliance on Decision Support Systems**,
Journal of Computing and Information Science in Engineering, 2022 (under review) (ASME).
Saremi M. L., Bayrak A. E.

J17 **Empirical Evidence and Computational Assessment on Design Knowledge Transferability**, *Design Science*, 2022 (under review) (Design Society).
Rahman, M. H., Bayrak A. E., Sha Z.

J16 **Evaluating Emergent Coordination in Multi-Agent Task Allocation through Causal Influence and Sub-Team Identification**, *Robotics and Automation Letters*, 8(2): 728-735, 2023 (IEEE).
Wu H., Ghadami A., Bayrak A. E., Smereka J. M., Epureanu B.
https://doi.org/10.1109/LRA.2022.3231497

J15 **Impact of Heterogeneity and Risk Aversion on Task Allocation in Multi-Agent Teams**, *Robotics and Automation Letters*, 6(4): 7065-7072, 2021 (IEEE).
Wu H., Ghadami A., Bayrak A. E., Smereka J. M., Epureanu B.
https://doi.org/10.1109/LRA.2021.3097259

J14 **A Strategic Decision-making Architecture Toward Hybrid Teams for Dynamic Competitive Problems**, *Decision Support Systems*, 144: 113490, 2021 (Elsevier).
Bayrak A. E., McComb C., Cagan J., and Kotovsky K.
https://doi.org/10.1016/j.dss.2020.113490

J13 **Integrating Sequence Learning and Game Theory to Predict Design Decisions under Competition**, *Journal of Mechanical Design*, 143(5): 051401, 2021 (ASME).
Bayrak A. E., Sha Z.
https://doi.org/10.1115/1.4048222

J12 **Future of Autonomous High-Mobility Military Systems**, *Journal of Connected and Automated Vehicles*, 3(3): 205-215, 2020 (SAE).
Bayrak A. E., Gorsich D., Epureanu B.
https://doi.org/10.4271/12-03-03-0016

J11 **Artificial Intelligence and Human Trust in Healthcare: Focus on Clinicians**, *Journal of Medical Internet Research*, 22(6): e15154, 2020 (JMIR Pub).
Asan O., Bayrak A. E., Choudhury A.
https://doi.org/10.2196/15154

J10 **Adaptability of modular vehicle fleets to changing supply route characteristics**, *Journal of Defense Modeling and Simulation*, 17(4): 327-338, 2020 (SAGE).
Egilmez M. M., Park J. M., Bayrak A. E., Epureanu B., Papalambros P. Y.
https://doi.org/10.1177/1548512919874127

Journal Articles (Before Stevens)

J9 **Robustness and Real Options for Vehicle Design and Investment Decisions under Gas Price and Regulatory Uncertainties**, *Journal of Mechanical Design*, 140(10): 101404, 2018 (ASME).
Kang N., Bayrak A. E., Papalambros P. Y.
https://doi.org/10.1115/1.4040629

J8 **Real-time Teaming of Multiple Reconfigurable Manufacturing Systems**, *CIRP Annals – Manufacturing Technology*, 67(1): 437-440, 2018 (Elsevier).
Li X., Bayrak A. E., Epureanu B., Koren Y.
https://doi.org/10.1016/j.cirp.2018.04.051

J7 **A System-of-Systems Approach to the Strategic Feasibility of Modular Vehicle Fleets**, *Transactions on Systems Man and Cybernetics: Systems*, 50(7): 2716-2728, 2020 (IEEE).
Bayrak A. E., Egilmez M. M., Kuang H., Li X., Park J. M., Umpfenbach E., Anderson E., Gorsich D., Hu J., Papalambros P. Y., Epureanu B.
https://doi.org/10.1109/TSMC.2018.2827387

J6 **Multiobjective Optimization of Modular Design Concepts for a Collection of Interacting Systems**, *Structural and Multidisciplinary Optimization*, 57(1): 83-94, 2018 (Springer).
Bayrak A. E., Collopy A. X., Papalambros P. Y., Epureanu B.
https://doi.org/10.1007/s00158-017-1872-4

J5 **An Integrated Design Approach for Evaluating the Effectiveness and Cost of a Fleet**, *Journal of Defense Modeling and Simulation*, 13(4): 381-397, 2016 (SAGE).
D'Souza K., Bayrak A. E., Kang N., Wang H., Altin B., Barton K., Hu J., Papalambros P. Y., Epureanu B., and Gerth R.
https://doi.org/10.1177/1548512916651939

J4 **Topology Generation for Hybrid Electric Vehicle Architecture Design**, *Journal of Mechanical Design*, 138(8): 081401, 2016 (ASME).
Bayrak A. E., Ren Y., and Papalambros P. Y.
https://doi.org/10.1115/1.4033656

J3 **Decomposition-Based Design Optimization of Hybrid Electric Powertrain Architectures: Simultaneous Configuration and Sizing Design**, *Journal of Mechanical Design*, 138(7): 071405, 2016 (ASME).
Bayrak A. E., Kang N., and Papalambros P. Y.
https://doi.org/10.1115/1.4033655

J2 **EcoRacer: Game-based Optimal Electric Vehicle Design and Driver Control Using Human Players**, *Journal of Mechanical Design*, 138(6): 061407, 2016 (ASME).
Ren Y., Bayrak A. E., and Papalambros P. Y.
https://doi.org/10.1115/1.4033426

J1 **Electric Vehicle Design Optimization: Integration of a High-fidelity Interior Permanent-Magnet Motor Model**, *Transactions on Vehicular Technology*, 64(9): 3870-3877, 2015 (IEEE).
Ahn, K., Bayrak A. E., and Papalambros, P. Y.
https://doi.org/10.1109/TVT.2014.2363144

Book Chapters

Trust Considerations in the Coordination of Computational Design Teams, *In: Lee JH. (eds) A New Perspective of Cultural DNA*, KAIST Research Series. Springer, Singapore. 2021.
Bayrak A. E.
https://doi.org/10.1007/978-981-15-7707-9_2

Partially contributed to Chapters 3 and 8, *In Principles of Optimal Design: Modeling and Computation*, 3rd Edition by P. Y. Papalambros and D. J. Wilde Cambridge University Press, 2016.

Conference Proceedings (Stevens Affiliated)

C20 **Human-Autonomy Teaming in Immersive Environments**, *2022 Interservice /Industry Training, Simulation and Education Conference (I/ITSEC)*, Orlando, FL, November 28 - December 1, 2022.
Wu H., Folks C., Bayrak A. E., Smereka J. M., Epureanu B.
https://www.xcdsystem.com/iitsec/proceedings/index.cfm?Year=2022&AbID=112511&CID=944

C19 **Agent-based Simulation of Optimal Trust in a Decision Support System in One-on-One Collaboration**, *ASME 2022 International Design Engineering Technical Conferences*, St. Louis, MO, August 14-17, 2022.
Saremi M. L., Bayrak A. E.
https://doi.org/10.1115/DETC2022-90770

C18 **A Reinforcement Learning Approach to Predicting Human Design Actions Using a Data-driven Reward Formulation**, *17th International Design Conference*, Virtual, May 23-26, 2022.
Rahman M. H., Bayrak A. E., Sha Z.
https://doi.org/10.1017/pds.2022.173

C17 **Task Allocation with Load Management in Multi-Agent Teams**, *IEEE 2022 International Conference on Robotics and Automation (ICRA)*, Philadelphia, PA, May 23-27, 2022.
Wu H., Ghadami A., Bayrak A. E., Smereka J. M., Epureanu B.
https://doi.org/10.1109/ICRA46639.2022.9811374

C16-J15 **Impact of Heterogeneity and Risk Aversion on Task Allocation in Multi-Agent Teams**, *IEEE 2021 International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, September 27-October 1, 2021.
Wu H., Ghadami A., Bayrak A. E., Smereka J. M., Epureanu B.
https://doi.org/10.1109/LRA.2021.3097259

C15 **Systems Thinking Assessment: A Method Through Computer Simulation**, *ASME 2021 International Design Engineering Technical Conferences*, Virtual, August 17-20, 2021.
Arnold R. D., Wade J. P., Bayrak, A. E.
https://doi.org/10.1115/DETC2021-68180

C14 **A Survey of Important Factors in Human - Artificial Intelligence Trust for Engineering System Design**, *ASME 2021 International Design Engineering Technical Conferences*, Virtual, August 17-20, 2021.
Saremi M. L., Bayrak A. E.
https://doi.org/10.1115/DETC2021-70550

C13-J14 **A Differential Game Approach to Dynamic Competitive Decisions Toward Human-Computer Collaboration**, *ASME 2019 International Design Engineering Technical Conferences*, Anaheim, CA, August 18-21, 2019.
Bayrak A. E., McComb C., Cagan J., and Kotovsky K.
https://doi.org/10.1115/DETC2019-97619

Conference Proceedings (Before Stevens)

C12 **Operational and Strategic Decisions in Engineering Design Games**, *ASME 2018 International Design Engineering Technical Conferences*, Quebec City, CN, August 26-27, 2018.
Grogan P., and Bayrak A. E.
https://doi.org/10.1115/DETC2018-85317

C11 **A Sensitivity Based Heuristic for Optimal Blade Arrangement in a Linear Mistuned Rotor**, *ASME 2018 Turbo Expo*, Oslo, Norway, June 11-15 2018.
Mitra M., Bayrak A. E., Zucca S., and Epureanu B.
https://doi.org/10.1115/GT2018-75542

C10 **Integrated System Design of a Modular, Autonomous, Aerial and Ground Vehicle Fleet for Disaster Relief Missions - A Case Study**, *15th International Design Conference*, Dubrovnik, Croatia, May 21-24 2018.
Gärtner, A. C., Ferriero, D., Bayrak, A. E., and Papalambros, P. Y.
https://doi.org/10.21278/idc.2018.0477

C9 **Framing the Concept of Autonomy in System Design**, *15th International Design Conference*, Dubrovnik, Croatia, May 21-24 2018.
Beernaert, T. F., Bayrak, A. E., Etman, L. F. P., and Papalambros, P. Y.
https://doi.org/10.21278/idc.2018.0281

C8-J6 **An Optimal Modular Design Concept Generation Method for Interacting Systems**, *12th World Congress of Structural and Multidisciplinary Optimization*, Braunschweig, Germany, June 5-9, 2017.
Bayrak A. E., Collopy A. X., Epureanu B., and Papalambros P. Y.

C7 **Effects of Supply Route Characteristics on Modular Military Fleet Operations**, *2016 International Conference on Production Research Regional Conference Africa, Europe and the Middle East and 4th International Conference on Quality and Innovation in Engineering and Management*, Cluj-Napoca Romania, July 25-30, 2016.
Egilmez M. M., Park J. M., Bayrak A. E., Epureanu B., and Papalambros P. Y.

C6-J9 **A Real Options Approach to Hybrid Electric Vehicle Architecture Design for Flexibility**, *ASME 2016 International Design Engineering Technical Conferences*, Charlotte, NC, August 21-24, 2016.
Kang, N., Bayrak, A. E., and Papalambros, P. Y.
https://doi.org/10.1115/DETC2016-60247

C5 **A Computational Concept Generation Method for a Modular Vehicle Fleet Design**, *2016 IEEE International Systems Conference*, Orlando, FL, April 18-21, 2016.
Bayrak, A. E., Collopy, A. X., Epureanu B., and Papalambros, P. Y.
https://doi.org/10.1109/SYSCON.2016.7490619

C4-J3 **Decomposition Based Design Optimization of Hybrid Electric Powertrain Architectures: Simultaneous Configuration and Sizing Design**, *ASME 2015 International Design Engineering Technical Conferences*, Boston, MA, August 2-5, 2015.
Bayrak, A. E., Kang, N., and Papalambros, P. Y.
https://doi.org/10.1115/DETC2015-46861

C3-J2 **EcoRacer: Optimal Design and Control of Electric Vehicles Using Human Game Players**, *ASME 2015 International Design Engineering Technical Conferences*, Boston, MA, August 2-5, 2015. **Received Ford best paper award by the Design Automation Committee**.
Ren Y., Bayrak A. E., and Papalambros, P. Y.
https://doi.org/10.1115/DETC2015-46836

C2 **Optimal Dual-Mode Hybrid Electric Vehicle Powertrain Architecture Design for a Variety of Loading Scenarios**, *ASME 2014 International Design Engineering Technical Conferences*, Buffalo, NY, August 17-20, 2014.
Bayrak, A. E., Ren, Y. and Papalambros, P. Y.
https://doi.org/10.1115/DETC2014-34897

C1-J4 **Design of Hybrid-Electric Vehicle Architectures Using Auto-Generation of Feasible Driving Modes**, *ASME 2013 International Design Engineering Technical Conferences*, Portland, OR, August 4-7, 2013.
Bayrak, A. E., Ren, Y. and Papalambros, P. Y.
https://doi.org/10.1115/DETC2013-13043

Invited Talks and Panels

T6 **User-Centered Design & Older Adults as Drivers of Innovation: A Discussion with Catalyst Award Winners**, *Healthy Longevity Global Innovators Summit (**Panel**)*, Virtual, Sep 26, 2022.
National Academy of Medicine

T5 **New Directions in Human-Technology Frontier: Past, Present and Future of Human-AI Collaboration**, *AIAA Seminar Series*, Virtual, Dec 15, 2021.
AIAA North England Chapter

T4 **Exploring the Boundaries of Human-AI Collaboration: A Case Study on Starcraft 2**, *Mesmer Research Group: Guest Speaker Series*, Virtual, Oct 14, 2021.
University of Alabama at Huntsville

T3 **The Future of Human-AI Collaboration for Engineering Design**, *DAC Signature Event (**Panel**)*, Virtual, Aug 18, 2021.
ASME International Design Engineering Technical Conferences

T2 **The role of trust in the coordination of computational design teams**, *Cultural DNA Workshop*, Daejeon, South Korea, Jun 24, 2019.
Korean Advanced Institute of Science and Technology

T1 **Exploring the boundaries of human-computer partnering**, *NIST Seminar Series*, Gaithersburg, MD, Feb 26, 2019.
National Institute of Science and Technology

Select Presentations

P6 **Case Study: Finding the Marvel in the Haystack**, *Presented at 23rd University of Michigan Automotive Research Center Annual Program Review*, Ann Arbor, MI, 2017.
Bayrak A. E., Egilmez M.M., Li X., Koutsellis T., Collopy A.X., Papalambros P.Y., Epureanu B., Zissimos M., Seifeldin R., and Gerth R.

P5 **Analytical Target Cascading for Coordination of Large-Scale Systems Engineering Problems**, *Presented at INCOSE Michigan Chapter Seminar Series*, Southfield, MI, 2017.
Bayrak A. E, Burnap A.

P4 **MARVEL: A Modular Vehicle Fleet Simulation Tool**, *Presented at 8th Ground Vehicle Systems Engineering and Technology Symposium (GVSETS)*, Novi, MI, 2015.
Bayrak A. E., Egilmez M.M., Kuang H., Li X., Park J.M., Hu J., Papalambros P.Y., Epureanu B., Umpfenbach E., Anderson E., and Gorsich D.

P3 **Beyond Modular Vehicles: A Modeling Framework for Assessing Adaptability and Costs of a Modular Vehicle Fleet**, *Presented at 20th University of Michigan Automotive Research Center Annual Program Review*, Ann Arbor, MI, 2014.
D'Souza, K., Yang, S., Ren, Y., Kang, N., Bayrak, A. E., Lim, I., Pratt, W., Barton, K., Hu, J., Epureanu, B., Papalambros P.Y.

P2 **HEV Powertrain Architecture Exploration Using Bond Graphs**, *Presented at LMS Americas Vehicle Conference*, Detroit, MI, 2012.
Bayrak, A. E., Ren, Y., Papalambros, P.Y.

P1 **Topology optimization of a patch antenna using the level-set method**, *Presented at IEEE International Symposium on Antennas and Propagation and UCNS/URSI*, Toronto, ON, Canada, 2010.
Bayrak, A. E., Sendur G.K.

Thesis Advising

PhD Students

PhD3 **Elia Rezaeian**, *(Expected Graduation: 05/26)*.

PhD2 **Mostaan Lotfalian Saremi**, *(Expected Graduation: 05/24)*.

PhD1 **Ross Arnold**, *05/21*
Diss: "Systems Thinking: Definition, Skills, Simulation and Assessment".
Now a Chief Computer Scientist at Armament Graduate School, Picatinny Arsenal NJ.

Master's Students

MS1 **Shivramkrishen Maharajh**, *Expected Graduation: 05/23*.

Awards

2022 **Distinguished Teaching Award**, *by the School of Systems and Enterprises at Stevens Institute of Technology*.

2021 **Healthy Longevity Global Competition Round 2 Catalyst Award**, *by the US National Academy of Medicine*.

2015 **Ford Best Paper Award**, *by the ASME Design Automation Committee for the paper [C3-J2].*

2011 **1st ranking in Mechatronics Engineering program**, *at Sabanci University with Certificate of High Honor for all semesters.*

2011 **Winner of 20th Japanese Speech Contest (Category A)**, *by the Consulate-General of Japan in Istanbul.*

2009 **2nd ranking in the Nationwide Istanbul Technical University (ITU) Robot Olympics**, *in the fire fighter robot category.*

2006 **Sabanci University Excellence Merit Scholarship**, *for 5 years of undergraduate education covering full tuition, housing and stipend, awarded for 156th ranking out of approximately 1.5 million test takers in the 2006 Nationwide University Entrance Examination.*

Skills

Language **English (Fluent), Turkish (Native), Japanese (Pre-Intermediate)**.

Programming **Python, MATLAB, C++, C#, C18, JavaScript, Java, Visual Basic, Assembly**.

Software **Simulink, AMESim, COMSOL, Solidworks**.

Professional Membership & Academic Service

Membership

American Society of Mechanical Engineers (ASME), *Member.*

Design Society, *Member.*

Conference/Workshop Organization

Organizer **DAC Session on Human-Artificial Intelligence Collaboration in Engineering System Design**, *at the International Design Engineering Technical Conferences, St. Louis, MO, August 2022.*

Review Coordinator **DAC Session on Design of Complex Systems**, *at the International Design Engineering Technical Conferences, Virtual, August 2021.*

Review Coordinator **DAC Session on Design of Complex Systems**, *at the International Design Engineering Technical Conferences, Anaheim, CA, August 2019.*

Organizer **Call of Workshop Duty: Advancing Games Research Workshop**, *at the Conference on Systems Engineering Research, Washington, DC, April 2019.*

Review Coordinator **DAC Session on Design of Complex Systems**, *at the International Design Engineering Technical Conferences, Quebec City, CN, August 2018.*

Organizer **DAC Special Session on Gaming Methods for Engineering Systems Design Research**, *at the International Design Engineering Technical Conferences, Quebec City, CN, August 2018.*

Organizer **Games for Design Research and Education Workshop**, *at Design Computing and Cognition Conference, Evanston, IL, June 2016.*

Reviewer

ASME Journal of Mechanical Design.

Design Science Journal.

Design Studies.

IEEE Robotics and Automation Letters.

Structural and Multidisciplinary Optimization.

IEEE Transactions on Vehicular Technology.
IEEE Systems Journal.
ASME Journal of Computational and Nonlinear Dynamics.
AIAA Journal.
SAGE Advances in Mechanical Engineering.
International Journal of Production Economics.