Egemen Kolemen

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Current Position

Princeton University, Princeton, NJ — Jul 2025 – present
Professor of Mechanical & Aerospace Engineering
Jointly appointed with the Andlinger Center for Energy and the Environment
and the Princeton Plasma Physics Laboratory (PPPL)
Associated Faculty of the Program in Plasma Physics (Depart. of Astrophysical Sciences)

Education

Princeton University, Princeton, NJ — Sep 2002 – Aug 2008
Ph.D. Mechanical & Aerospace Engineering

Boğaziçi (Bosphorus) University, Istanbul, Turkey — Sep 1998 – Jun 2002
B.S. Mechanical Engineering

Honors & Awards

American Nuclear Society's Technical Accomplishment Award — Jul 2024
Given every two years to recognize an "exemplary individual technical accomplishment requiring professional excellence and leadership of a high caliber in the fusion science and engineering area"

David J. Rose Excellence in Fusion Engineering Award — Aug 2020
Given by Fusion Power Associates for technical accomplishment and potential to become an exceptionally influential leader in the fusion field

ITER Scientist Fellow in Plasma Control — Jan 2019 – present
Selected among group of 6 control scientists from across the world to solve challenging research issues and ensure the success of ITER's mission

1st Place in Princeton Annual Innovation Forum — Mar 2018
$15K prize for non-contact, calibration-free, rotating Lorentz force flowmeter design by Kolemen group

DOE Early Career Award — May 2016
For work at DIII-D National Fusion Facility on "Physics-Based Real-time Analysis and Control to Achieve Transients-Free Operations for the ITER Era"

Torkil Jensen Award — Dec 2015
National award to conduct a full day of experiments "with the potential for transformational new results" (with Luis F. Delgado-Aparicio), given by DIII-D

R&D 100 Award — Jun 2012
R&D Magazine's prestigious award for contribution to "snowflake power divertor" (with V. Soukhanovskii, J. Menard, J-W. Ahn, D. Ryutov)

Porter Ogden Jacobus Honorific Fellowship Sep 2006 – Sep 2007
Highest honorific fellowship awarded by Princeton's Graduate School reserved for two to four students university-wide

Britt and Eli Harari Fellowship Sep 2005 – Sep 2006
Awarded for academic excellence and research potential at MAE Department

Guggenheim Foundation Fellowship Sep 2003 – Sep 2004
Awarded in recognition of excellence in research and coursework at MAE Department

Ranked 1st in Class of 2002 Jun 2002
Mechanical Engineering graduating class, Bogazici University

Merit Scholarship, Bogazici University Sep 1998 – May 2002

Ranked 1st in OSSY Jun 1997
Turkish Nationwide University Entrance Exam, among ~1.5 million candidates

Research Funding

Current:

Title: Stellarator optimization software suite for commercial reactor design
Sponsor: ACEE, Princeton University
Award Number: -
Period: 9/2024-9/2027
Funding structure: Sole PI
Amount: **$398,806** (without 64% overhead of external grants)

Title: Unleash the Machine Learning Control Theoretical Development on DIII-D
Sponsor: DOE
Award Number: DE-SC0024527
Period: 9/2023-8/2026
Funding structure: Lead PI
Amount: **$1,572,173** (funds for PU)

Title: Physics Basis, Optimization, and Control for Integrated 3D Edge Long-Pulse Tokamak Scenarios
Sponsor: DOE
Sponsor Award Number: DE-SC0020372
Period: 9/1/2019 - 8/31/2025
Funding structure: Institutional PI for Princeton University (Lead PI Dr. Joe Snipes)
Amount: **$2,095,232** (funds for PU)

Title: Liquid Metal Plasma Facing Component Development Program
Sponsor: DOE
Award Number: DE-SC0024626
Period: 8/2023-5/2026
Funding structure: Institutional PI (Led by Rajesh Maingi at PPPL)
Amount: **$600,000** (funds for PU)

Title: High-fidelity Digital Models for Fusion Pilot Plant Design
Sponsor: DOE
Period: 10/2023-9/2026
Funding structure: Co-PI (Led by M. Churchill at PPPL)

Amount: **$540,000** (funds for Prof. Kolemen)

Title: Divertor Design for Low-Recycling Regime Tokamak
Sponsor: PPPL Laboratory Directed Research & Development (indirectly funded)
Sponsor Award Number: LDRD Project No. PPPL-128
Period: 10/1/2021 - 9/31/2024
Funding structure: Sole PI
Amount: **$900,000**

Title: Real-time Electron Temperature and Density Profile Measurements for NSTX-U
Sponsor: DOE
Sponsor Award Number: DE-SC0015480
Period: 5/15/2016 - 8/31/2024
Funding structure: Sole PI
Amount: **$1,431,969**

Title: Hidden Symmetries and Fusion Energy
Award Number: 560651
Sponsor: Simons Foundation
Funding structure: Collaborator w/PI Amitava Bhattacharjee
Period: 9/2023-8/2025
Amount: **$378,000** (funds for Prof. Kolemen)

Title: Development and implementation of advanced simulation tools for design and optimization of an innovative stellarator system
Sponsor: NT-Tao
Sponsor Award Number: RESEARCH AGREEMENT DTD 8-2-23
Period: 3/2023-2/2025
Funding structure: Sole PI
Amount: **$100,000**

Title: Divertor Design
Sponsor: Commonwealth Fusion Systems
Sponsor Award Number: RA5-10-2021
Period: 5/2021-4/2025
Funding structure: Sole PI
Amount: **$60,000**

Title: Flexible Equilibrium and Bifurcation Calculations to Enhance Stellarators Physics Understanding
Sponsor: DOE
Sponsor Award Number: DE- SC0022005
Period: 8/1/2021 - 7/31/2024
Funding structure: Sole PI
Amount: **$390,000**

Field Work Proposal No. 1100 (NSTX-U) supports some of E. Kolemen's time.

Field Work Proposal No. 1050 (DIII-D) supports some of E. Kolemen's time.

Concluded:

Title: Machine Learning for Real-time Fusion Plasma Behavior Prediction and Manipulation
Sponsor: DOE

Sponsor Award Number: DE-SC0021275
Period: 9/1/2020 - 8/31/2023
Funding structure: Lead PI (Institutional PIs: J. Schneider at Carnegie Mellon University, M. Boyer at PPPL, R. Coffee at SLAC, D. Smith at University of Wisconsin-Madison)
Amount: **$690,871** for Kolemen Group at Princeton University and $1,047,000 for PPPL (total grant is **$4,800,000)**

Title: Fusion as Part of the Future Energy Sector
Sponsor: DOE
Sponsor Award Number: National Fusion Communications Plan (under DE-AC02-09CH11466)
Period: 8/1/2020 - 1/9/2023
Funding structure: Lead PI E. Kolemen and co-PI J. Jenkins
Amount: Direct funding of postdoc, Jacob Schwartz (equivalent to **~$400,000** with overhead)

Title: Domestic Liquid Metal Plasma Facing Component Development
Sponsor: DOE
Sponsor Award Number: Field Work Proposal No. 1019
Period: 10/1/2019 - 9/30/2022 (being extended)
Funding structure: Collaborator (Lead PI R. Maingi)
Amount: **$400,000** for Kolemen Group (total grant is $975,000)

Title: Accelerating Fusion through Data-Driven Stellarator Optimization (DATASOPT)
Sponsor: DOE
Sponsor Award Number: Field Work Proposal No. 1019
Period: 10/1/2021 - 9/30/2022
Funding structure: Collaborator (Lead PI Prof. Amitava Bhattacharjee)
Amount: ~**$100,000** for Kolemen Group (total grant is $675,000)

Title: Control and Extension of High Performance Scenarios to Long Pulse
Sponsor: DOE
Sponsor Award Number: Field Work Proposal No. 9982
Period: 10/1/2019 - 9/30/2022 (renewal)
Funding structure: Collaborator (Lead PI F. Poli)
Amount: **$130,000** for Kolemen Group (total grant is $1,077,000)

Title: Physics-Based Real-time Analysis and Control to Achieve Transient-Free Operations for the ITER Era
Sponsor: DOE
Sponsor Award Number: DE-SC0015878
Period: 7/15/2016 - 7/14/2021 (Renewable afterwards as a standard DOE grant on DIII-D)
Funding structure: Sole PI
Amount: **$848,599**

Title: Controlled Plasma-Catalytic Reactor for Conversion of Methane and CO2 to Methanol Using Vibrational Excitation
Sponsor: ExxonMobil Research and Engineering Co.
Sponsor Award Number: EM09125.A1.TO2
Period: 9/01/2016 - 8/31/2021
Funding structure: Lead PI (Co-PI Prof. Yiguang Ju)
Amount: **$461,000**

Title: AI Deep Learning for Plasma Behavior Prediction and Manipulation in KSTAR
Sponsor: DOE

Sponsor Award Number: Field Work Proposal No. 1903
Period: 10/1/2019 - 9/30/2020 (carry over for one year to 2021)
Funding structure: Sole PI
Amount: **$388,000** ($145,000 of which is subcontracted to CMU)

Title: Divertor Design for Low-Recycling Regime Tokamak
Sponsor: PPPL Laboratory Directed Research & Development (indirectly funded)
Sponsor Award Number: LDRD Project No. PPPL-117
Period: 9/1/2020 - 8/31/2021
Funding structure: Sole PI
Amount: **$100,000**

Title: A Portable Ion-energy Diagnostic for Transformative ARPA
Sponsor: DOE ARPA-E
Sponsor Award Number: DE-AR0001166
Period: 11/1/2019 - 10/31/2021
Funding structure: Collaborator (Lead PI Dr. Sam Cohen)
Amount for my group: **$50,000**

Title: Flowing LIquid Metal Torus (FLIT)
Sponsor: PPPL Laboratory Directed Research & Development (indirectly funded)
Sponsor Award Number: Laboratory Directed Research and Development (LDRD) No. PPPL-072
Period: 3/1/2017 - 3/1/2020
Funding structure: Sole PI
Amount: **$450,000**

Title: Study and Control of Fast Flowing Liquid Metal Divertor
Sponsor: PPPL Laboratory Directed Research & Development (indirectly funded)
Sponsor Award Number: LDRD Project No. PPPL-062
Period: 11/1/2015 - 1/31/2017
Funding structure: Sole PI
Amount: **$210,000**

Title: Simulation, Deployment and Analysis of the NSTX-U Advanced Divertor Control
Sponsor: DOE
Sponsor Award Number: DE-AC02-09CH11466
Period: 3/30/1017 - 9/30/2017
Funding structure: Sole PI
Amount: **$58,309**

Title: Advanced Scenario Development and Control at NSTX-U and EAST
Sponsor: DOE
Sponsor Award Number: DE-AC02-09CH11466
Period: 3/4/2016 - 9/30/2016
Funding structure: Sole PI
Amount: **$109,571**

Title: Plasma Control Research on the DIII-D tokamak
Sponsor: DOE
Sponsor Award Number: DE-AC02-09CH11466
Period: 3/11/2015 - 7/31/2016
Funding structure: Sole PI
Amount: **$60,768**

Advanced Projects at PPPL, sponsored real-time Thomson hardware for Large Helical Device (LHD), Toki, Japan for **~$60,000** in 2018/2019.

Field Work Proposal No. 1100 (NSTX-U) sponsored graduate student Josiah Wai's thesis work on NSTX-U control with E. Kolemen for three years (equivalent to **~$100,000/year** with overhead).

Field Work Proposal No. 1100 (NSTX-U) sponsored graduate student Patrick Vail's thesis work on NSTX-U control with E. Kolemen for two years (equivalent to **~$100,000/year** with overhead).

Experience

I. Research

Tokamaks and Stellarators:

Machine Learning (ML) / Artificial Intelligence (AI) for Fusion Control, Princeton, NJ
- Lead PI for AI-Deep Learning for fusion plasma behavior prediction and manipulation in collaboration with Carnegie Mellon University, SLAC, UW-M.
- Developing machine learning algorithms to assess the measured time signatures, IEDFs, and thresholds to assess the ion heating mechanisms as part of "A portable ion-energy diagnostic for transformative ARPA-E fusion energy R&D."

Stellarator Reactor Optimization, Princeton, NJ
- Designing flexible stellarator machines that can make multiple stellarator configurations in one machine
- Developing DESC: fastest stellarator equilibrium and optimization code. Automatic differentiation based pseudo-spectral code that is hardware agnostic (CPU, GPU, TPU), that allows coupled optimization.
- Dynamical theory to understand the phases-space of possible stellarators.

Fusion as Part of the Future Energy Sector, Princeton, NJ
Started a new program that focuses on the techno-economic evaluation of several likely designs for commercial fusion power plants and an assessment of the integration of successful fusion reactors with the rest of the energy sector. Co-PI is Jesse Jenkins.

DIII-D, General Atomics, San Diego, CA
- DOE Early Career Award, 5-year award for "Physics-Based Real-Time Analysis and Control to Achieve Transients-Free Operations for the ITER Era." The aim was to develop a real-time stability control system to avoid instability and disruptions for DIII-D and project the solutions to ITER.
- Developing combined pedestal and Scrap-of-Layer models for physics understanding and control
- Detachment and Radiation Control
- Fast numerical methods (STRIDE) to calculate plasma stability for real-time applications

NSTX-U, PPPL, Princeton, NJ
- Developing real-time Thomson diagnostics to monitor the plasma core and edge, which will be used for control and development of advanced scenarios with the DOE grant "Development of Real-time Electron Temperature and Density Profile Measurements for NSTX-U."
- Simulation, Deployment, and Analysis of the NSTX-U Advanced Divertor Control. This work includes snowflake divertor, X-divertor and startup control development.

- Development of pedestal and ELM control
- Simulation of Lithium Granule Injection effect on pedestal using M3DC-1 (concluded).

KSTAR, Daejeon, South Korea
Implementing new system identification and control algorithms to develop ELM-free long-pulse operations, predict/avoid plasma instabilities and study the pedestal physics. In the past, implemented new system identification and control algorithms to allow the first 10-second H-mode plasma operation with a double null divertor with elongation of 2.1. I am the Princeton University PI for a DOE International Grant for KSTAR.

ASDEX Upgrade, Garching, Germany
Developing machine learning techniques that combine information in the discharge database and transport physics (with ASTRA code) to predict behavior of plasma and control it. Applying our group's code (STRIDE) to better understand plasma stability. Started in 2020.

ITER, Cadarache, France
Regular collaborator since 2011, helping to solve challenging control issues in order to prepare for successful operation of ITER. I am an ITER Scientist Fellow. Serving on the ITER control system review panel.

Large Helical Device (LHD), Toki, Japan
Developed, installed, and tested a real-time Thomson diagnostics system that monitors the electron density and temperature profiles; started in 2018. Preparing to run experiments to control the Electron Cyclotron Heating (ECH) system to adjust the plasma profile for performance during the up-to-an-hour-long discharge.

EAST, Hefei, China
Snowflake divertor and ELM control development, 2016-2022.

Liquid Metal:

Lithium Experimental Application Platform (LEAP), PPPL, Princeton, NJ
The Lithium Experimental Application Platform (LEAP) integrates a large, pre-fabricated glovebox system capable of handling up to 50lb of liquid lithium. The platform will facilitate the transition from NSTX-U's existing capabilities towards the advanced research objectives of NSTX-U enabling comprehensive testing of full sectors of fast-flowing lithium systems under conditions anticipated in LMCE, including applying heat sources and magnetic fields to evaluate component performance.

Liquid Metal Experimental Research, PPPL, Princeton, NJ
Flowing liquid metal wall development for nuclear fusion reactors as part of the "National Liquid Metal Plasma Facing Component Development Program". Developing and testing novel liquid lithium flow ("divertorlets") and tritium separation methods. Operating Liquid Metal eXperiment (LMX) and designing a new experiment named Flowing LIquid metal Torus (FLIT) for more realistic liquid metal tests in 1 Tesla magnetic field and fully toroidal geometry. Also running collaborative experiments at Oroshhi-2 (Japan) on MHD control of liquid metals under high magnetic field (3 Tesla) and preliminary experiments at the University of Illinois Urbana-Champaign on tritium separation.

FreeMHD, Liquid Metal Simulation Software, PPPL, Princeton, NJ
FreeMHD is an open source magnetohydrodynamics (MHD) solver, recently developed for free-surface liquid metal flows under strong magnetic fields. The code uses OpeanFOAM and calculates 3D transient MHD flows where the surface shape is changing in time.

Low Temperature Plasma:

Plasma Enhanced Chemistry eXperiment (PECX), Princeton University, Princeton, NJ
Low temperature plasma development and control for catalytic conversion of chemicals project titled "Controlled Plasma-Catalytic Reactor for Conversion of Methane and CO2 to Methanol Using Vibrational Excitation". Co-PI of this project was Yiguang Ju. Building Thomson scattering, electric field, and cavity ring-down spectroscopy diagnostics in-house for low temperature discharges with ns resolution.

Climate Engineering (Geoengineering):

Studying the ethics, policy and science of engineering the climate against global warming. Considering the policy implications of counter-geoengineering and ethical issues with global-scale climate intervention. Part of this work is conducted in my capacity as the co-chair of Climate Futures Initiative (CFI) and part of it with undergraduate interns.

II. Teaching and Advising

Courses:

ENE/MAE/GEO-308, "Engineering the Climate: Technical and Policy Challenges"
Seminar developed with an award from the Curriculum Innovation Fund. This interdepartmental course focuses on the engineering technologies that can reduce the effects of global warming and aims to prepare Princeton students to develop such technologies while considering scientific, policy, and ethical challenges. Guest speakers to class also delivered public lectures to the campus community. (Spring 2016, Spring 2018, Spring 2020, Spring 2024)

MAE-434, "Modern Control"
Taught the introduction to modern state-space methods for robust control system design and analysis. Covered stability, controllability and observability, state feedback control, observers and output feedback control, linear matrix inequalities, and optimal and robust control design methods. (Spring 2019, Spring 2021)

MAE-206, "Introduction to Engineering Dynamics"
Taught the introduction to dynamics systems with simulations, mathematical analysis, and in-class demonstrations. This is a course with over 50 students. (Spring 2017, Spring 2023)

Current Advisees (8 undergraduates, 13 graduate students, 10 postdoctoral fellows):

Undergraduate: Kaya Unalmis (ELE), Felipe De Bolle (Economics), Aly Rashid (Economics), Luc Harbers (MAE), William Roberts (PHY), Alicia Lin (MAE)

Graduate students: Sina Atalay, Jalal-ud-din Butt, Nathaniel Chen, Yigit Gunsur Elmacioglu, Minseok Kim, Logan Klingler, Dario Panici, Andy Rothstein, Francisco Saenz, and Brian Wynne (MAE); Joshua Josephy-Zack, Hiro Farre, (Princeton Program in Plasma Physics or PPPP), Mirjam Arendsen (Eindhoven University of Technology, NL, Starting summer 2024),

Postdoctoral fellows: Max Curie, Cheol-Sik Byun, Yufan Fu, Rahul Gaur, Alvin Garcia, Peter Steiner, Mikhail Khodak (half time), Arthur Obst (co-advising with CFI co-chairs), Matthew Harvey (co-advising with CFI co-chairs)

Research Scholar: Azarakhsh Jalalvand

Visiting graduate student: Min Ki Jung (Seoul National University), Rin Choi (Seoul National University)

Visiting undergraduate student: -

Former Advisees (1 high school student, 47 undergraduates, 1 post-baccalaureate student, 24 graduate students, 14 postdoctoral fellows):

High school student: Steven Odotong (Summer Undergraduate Program for Plasma Physics (SULI), 2018)

Undergraduates: Nicolas Luzarraga (MAE) and Ryan McDonnell (MAE) (senior theses, 2015-2016); Neil Slighton (MAE, 2016-2017); Yashodhar Govil (COS), Nicolas Ng (MAE), and Jinjin Zhao (COS) (2018); Mario Liu (MAE), Curtis Merrill (MAE), Nadir Noordin (MAE), Joseph Puryear III (MAE), Serg Zhelezniak (MAE) and Jinjin Zhao (COS) (senior theses, 2018-2019); Alexander Liu (COS) (2019); Matt Helm (MAE), Bora Kiyan (MAE), and Alexis Rysewyk (MAE) (senior theses, 2019-2020); Azmaine Iqtidar (MAE) (senior thesis, 2020-2021); Aaron Wu (MAT, 2020-2023), Yuno Iwasaki (PHY), Laura Fang (ORFE) (2021), Ayomikun Gbadamosi (MAE) (senior thesis, 2022-2023), Patrick Kim (University of Maryland), Jackson Crocker (MAE 2023), Laura Fang (ORFE, 2022-2023), Daniel Vergara Orozco (ECE, 2023), Kayla Xu (COS, 2023), Tal Shpigel (PHY, 2023), David Wang (MAE 2024), Andrea Hernandez (SULI, University of Puerto, 2024), Autria Aidun (SULI, Villanova University, 2024), Greta Hibbard (SULI, Ohio University, 2024)

Visiting undergraduates: Leonard Lupin (SULI, 2016); Nathaniel Barbour, Gerrit Bruhaug, Dhruval Patel, and Dhruvit Patel (SULI, 2017) ("*Outstanding Student Poster Awards*" for both Nathaniel Barbour and Gerrit Bruhaug independently at APS-DPP); Jalal-ud-din Butt (SULI, 2018); Milan Wolff (SULI 2020); Samantha O'Sullivan (Harvard, SULI 2021), Shayaan Subzwari (Yale, SULI, 2021), Nigel Mesta (UC Berkeley, SULI, 2021), Patrick Kim (Univ. Maryland, SULI, 2022), Jinsu Kim (Seoul National University, South Korea, 2023), Minsoo Cha (Seoul National University, South Korea, 2023), Taegeun Jeong, Jun Young Jang, Sea Hyun Jo (Seoul National University 2024)

Post-baccalaureate student: Jesus Hinojosa (AST, 2015, admitted at University of Michigan-Ann Arbor)

Graduate students: Yichen Fu (PPPP, 2018-2019, hired at Livermore); Alexander Glasser (PPPP, 2015-2019, PPPL); Patrick Vail (MAE, 2015-2019, Ursa Technologies); Timothy Chen (co-advising with Prof. Yiguang Ju - 2016-2021, Sandia Lab in California); Adam Fischer (MAE, 2015-2020, hired at General Dynamics); Oak Nelson (PPPP, 2016-2021, Columbia University), Susan Redmond (co-advising with Prof. William C. Jones, MAE 2018-2023, Caltech), Ricardo Shousha (MAE 2018-2023, PPPL), Josiah Wai (MAE 2018-2023, Commonwealth Fusion), Joe Abbate (MAE 2019-2024, KLA), William Conlin (MAE 2019-2024, UMD), Daniel Dudt (MAE 2018-2024, THEA, Stellarator Startup), Jinsu Kim, Kian Orr (MAE 2023-2024)

Visiting graduate students: Kornee Kleijwegt, Joost Lammers, and Shoki Nakamura (2017); Koji Kusumi and Matthijs Roelofs (2016-2018), Jabir Al-Salami (2021-2022), Alvin Garcia (2022), Sara Dubbioso (Università degli Studi di Napoli Federico II and the Università degli Studi di Padova, 2023), João Biu (Superior Técnico, Portugal, 2023), Liangjun Shao (Tsinghua University 2023-2024)

Postdoctoral fellows: David Eldon (hired at DIII-D, General Atomics), Alexandre Fil (University of York), Ben Goldberg (20%, Sandia Lab), Qiming Hu (short-term, PPPL), Michael Hvasta (private sector, battery production), Olivier Izacard (private sector, data science), Florian Laggner (Professor at North Carolina State University), Leonel M. Palacios (PPPL), Anthony Xing (DIII-D, General Atomics), SangKyeun Kim (PPPL), Jacob Schwartz (PPPL), Zhen Sun (PPPL), and Jaemin Seo (Professor at Chung-Ang University)

Visiting postdoctoral fellow: Mikhail Modestov (hired at IAC)

III. Service

Departmental (MAE/ACEE/PPPL):

Director, Minor in Sustainable Energy May 2024 – present
Director, Program in Sustainable Energy certificate Jun 2022 – May 2024
Acting Director, Program in Sustainable Energy certificate Feb – Jun 2021
Executive Committee Member, Program in Sustainable Energy Jul 2015 – present
Steering member for the program, which is designed for Princeton undergraduate students who are interested in pursuing careers or graduate education in the area of Sustainable Energy Science and Technology.

Member, MAE Seminar Committee Feb 2024 – present
Member of committee for choosing and arranging the visits and presentation for MAE seminar

Leader, ACEE Highlight Seminar Series Jan 2020 – Jun 2021
Co-Leader, ACEE Highlight Seminar Series Jan 2018 – Jan 2020
Identifying speakers such as ITER Director-General Dr. Bigot (>600 attendees) and making arrangements for the seminar series.

Organizer, monthly "Grad–Postdoc Energy Lunch Meeting" Feb 2016 – Jun 2023
Graduate students and post-doctoral fellows from different disciplines present their research on energy and discuss implications with students in other fields.

British Petroleum (BP) PPPL Collaborator Jun 2019 – Jul 2020
Working with BP on potential inclusion of fusion energy in the BP Energy Outlook, a detailed report on the global energy future.

Member, PPPL Associate Laboratory Director Search Committee Jun 2019 – Mar 2020
Member of search committee for new associate director who will enhance breadth of research at PPPL.

Lead Author, Advancing Fusion with Machine Learning May 2019 – Oct 2019
Organizer of control panel and lead author of control section of final report, as a PPPL representative, at the request of the DOE's Fusion Energy Science and Advanced Scientific Computing Research programs.

Expert, APS-DPP Community Planning Workshop Jul 2019
As a PPPL representative, gave a talk on liquid metal technology and physics at the Fusion Materials & Technology Community Planning Workshop in order to help plan the future of fusion research.

Member, Fusion Energy Systems Studies (FESS) Jan 2017 – Jun 2019
"Liquid Metal Plasma Facing Components Systems Study"
As a PPPL representative, participated in expert group to examine the liquid metal plasma facing components in the context of an integrated facility and distilled the highest priority R&D activities into a report for DOE.

Member, MAE Seminar Committee Jun 2016 – Jun 2019
Organized the weekly Friday seminars of the department. Met with colleagues in applied physics and dynamics and control to decide on our invitation list, and jointly invited and hosted the speakers.

Reviewer, Andlinger Center's E-ffiliates Partnership Oct 2015 & Oct 2017
Reviewed Princeton E-filliates Partnership funding proposals.

DOE Fusion Energy Science (FES) Expert May 2015 – Nov 2015
Contributor (7 pages), as a PPPL representative, to the report "*On Transients in Tokamak Plasmas*" at the request of FES, which discussed the research needed in the next decade to achieve sustained, stable, and reliable tokamak operation.

Organizer, "Future Power" Panel on Fusion Feb 2015
Organized and chaired a session at the E-ffiliates yearly retreat on "future power," with a focus on fusion research.

University:

Climate Futures Initiative in Science, Values and Policy (CFI) May 2024 – present
Co-chair of the program working on the intersection of ethics, policy and science.

Member of Judging Panel, Princeton Energy Case Competition Dec 2018
Evaluated high school students who created and pitched diverse solutions to contemporary energy issues, ranging across technical, economic, and social realms.

Member, Committee on Discipline Sep 2016 – Sep 2018
Handled alleged academic infractions as well as any other violations of University codes of conduct that might result in a penalty of suspension, withheld degree, required withdrawal, or expulsion.

Organizer, Int'l Conference on Plasma Surface Interactions (PSI) Jun 2018
Princeton University organizer; Successfully bid with colleagues from around the US to host the PSI conference, the second largest fusion conference in the world held every other year. (The largest is UN-organized IAEA.)

Organizer, Roundtable on Climate Engineering and Religion May 2018
Co-organizer, with Princeton School of Public and International Affairs colleagues, of a roundtable that brought together clergy and scientists with knowledge of climate engineering. Currently working on a multi-year extension with timely publications on the issue.

Local Organizer for MHD Stability Control Workshop Nov 2015
Program committee co-chair; Princeton University organizer for planning, topic and speaker selection; arrangement of venue, transportation, accommodation and meals for the workshop.

External:

Member of the National Stellarator Coordinating Committee (NSCC) Jan 2024 – present

Member ICDDPS Executive Committee Jan 2024 – present
Help organize of International Conference on Data-Driven Plasma Science

Member of the Final Design Review (FDR) Panel Jun 2020 – present
Member of the Preliminary Design Review (PDR) Group Jan 2016 –
ITER, Cadarache, France
Expert on ITER Plasma Control System; Reviewing design and suggesting modifications.

Founding Member of the Academic Board May 2016 – present
Università degli Studi della Tuscia, Viterbo, Italy
Established Ph.D. Program in Engineering for Energy and Environment, a new program that includes fusion energy.

Expert, International Tokamak Physics Activity Jan 2015 – present
Steering efforts for ITER research in ITPA's MHD, Disruptions and Control Topical Group, via regular international meetings.

Leader, ITPA Joint Experiment Group MDC-8 Oct 2018 – Jan 2023
Leading International Tokamak Physics Activity (ITPA)'s joint experiment group on current drive prevention/stabilization of NTMs, coordinating efforts in the following Tokamaks: ASDEX-U, DIII-D, EAST, FTU, HL-2A, JT-60U, KSTAR, TEXTOR and TCV.

Member, New Jersey Space Grant Consortium (NJSGC) Feb 2017 – Jan 2022
Raising funds from NASA, promoting, and administering education programs on space science in the state of New Jersey, focusing on undergraduate research (>$500K/year).

Leader of the Operations and Control Group Jun 2013 – Jun 2015
Deputy Leader of the Operations and Control Group Jun 2011 – Jun 2013
U.S. Burning Plasma Organization (burningplasma.org)
Advanced the scientific understanding of burning plasmas by coordinating U.S. fusion research with broad community participation. Continue to participate as regular member.

Reviewer for Journals and Government Programs Ongoing
Selective list of journals, grant panels and programs includes: Science, Nature Communications; US Department of Energy Office of Science, Fusion Energy Sciences (FES); FES SBIR / STTR program; FES Early Career Research Program; US Department of Energy Office of Science, Advanced Scientific Computing Research (ASCR); Physics of Plasmas; Nuclear Fusion; Oak Ridge Institute for Science and Education (ORISE); Journal of Guidance, Control, and Dynamics; Fusion Engineering and Design; *Netherlands* Organization for Scientific Research; Research Foundation – Flanders, *Belgium*; *Czech* Science Foundation; *EUROfusion* Enabling Research Projects; *German* Research Foundation (Deutsche Forschungsgemeinschaft)

Selected Outreach/Media Activities

TVP (Polish television) Jun 2024
Interview on machine learning for fusion reactors

CNN-Portugal Apr 2024
Interview on control of fusion energy

CNN Mar 2024
Live interview with Amara Walker

NVIDIA GTC Conference Mar 2024
Our AI research was featured in the introduction to Jensen Huang's keynote

Straight Arrow News Mar 2024
Could AI and fusion be the answer to the EU's debate over nuclear energy?

Newsweek Feb 2024
Near-Unlimited Energy a Step Closer as Scientists Overcome Fusion Problem

Politico Jan 2024
Silicon Valley's crush on fusion

Wired Mar 2023
No, Fusion Energy Won't Be 'Limitless' (Postdoc J. Schwartz)

TechXplore Apr 2023
Fusion's future in the US could come down to dollars and cents

Popular Mechanics Sep 2022
As Tokamaks Get Hotter, Scientists Must Control the Unruly Plasma Inside

The Register Mar 2020
Interview on the avoidance of disruptions for fusion reactors work using control

Scilight, Physics of Plasmas Feb 2020
Article on Machine Learning Control for fusion reactor work we conducted at DIII-D Tokamak

Voice of America, Turkish Jun 2019
Video interview about the development of fusion as a clean energy source and the contributions of Princeton University

Forbes Oct 2015
Interview on Back to the Future Day: "The Science of Back to the Future: Where's My Mr. Fusion?"

IV. Previous Positions / Research

Princeton University, Princeton, NJ Jul 2021 – Jun 2025
Associate Professor of Mechanical & Aerospace Engineering
Jointly appointed with the Andlinger Center for Energy and the Environment
and the Princeton Plasma Physics Laboratory (PPPL)
Associated Faculty of the Program in Plasma Physics (Depart. of Astrophysical Sciences)

Princeton University, Princeton, NJ Sep 2014 – Jun 2021
Assistant Professor of Mechanical & Aerospace Engineering
Jointly appointed with the Andlinger Center for Energy and the Environment
and the Princeton Plasma Physics Laboratory (PPPL)
Associated Faculty of the Program in Plasma Physics (Depart. of Astrophysical Sciences)

Control Expert Jun 2011 – Aug 2014
ITER, Cadarache, France

Wrote the kinetic control specifications for the ITER fusion reactor project.

Collaborating Research Scientist Jun 2011 – Aug 2014
DIII-D, General Atomics, San Diego, CA
Developed control hardware/software solutions and conducted plasma experiments.

Research Scientist Oct 2011 – Aug 2014
Associate Research Scientist Oct 2009 – Oct 2011
Princeton Plasma Physics Laboratory
Postdoctoral Research Fellow Sep 2008 – Oct 2009
Princeton University
Developed models suitable for designing feedback control laws for plasmas and experimentally tested these concepts on NSTX.

Visiting Researcher Apr 2006 – Jun 2006
California Institute of Technology
Conducted research on the control and dynamics of the Terrestrial Planet Finder-Occulter Mission in Jerrold E. Marsden's group.

Visiting Researcher Feb 2006 – Apr 2006
Technion, Israel Institute of Technology
Conducted research on numerical methods to find invariant manifolds with Pini Gurfil.

Graduate Fellow/Research Assistant Sep 2002 – Aug 2008
Princeton University
My dissertation focused on the three main challenges of the Terrestrial Planet Finder-Occulter Mission: the dynamics of the formation, control and trajectory design of the satellites, and global optimization of the mission.

Selected Invited and Oral Presentations

[29] E. Kolemen, "AI for Fusion: Possibilities and Applications in Enhanced Diagnostics, Control and Science Discovery", *Invited Speaker* at the Symposium on Fusion Engineering (SOFE), Cambridge, MA, Jul 2025

[28] E. Kolemen, "AI for Fusion Diagnostics, Control and Science Discovery", *Invited Speaker* at the Mini-Conference: Digital Twins for Fusion Research, APS, Atlanta, GA, Oct 2024

[27] E. Kolemen, "Application of AI for Fusion", *Invited Speaker* at the AI Talk Series, Alphabet, Mountain View, CA, Aug 2024

[26] E. Kolemen, "Overview of machine learning based plasma control for fusion reactors", *Invited Speaker* at the International Conference on Data-Driven Plasma Science, Berkeley, CA, Aug 2024

[25] E. Kolemen, "AI for Plasma Control in Fusion Energy", AI for Good Webinar, International Atomic Energy Agency, Jun 2024

[24] E. Kolemen, "Overview of Artificial Intelligence and Machine Learning for Fusion Applications", *Plenary Speaker* at the International Fusion and Plasma Conference, Seoul, South Korea, Jun 2024

[23] E. Kolemen, “Avoiding plasma instabilities with artificial intelligence”, *Invited Speaker* at the IAEA Workshop on AI for Accelerating Fusion and Plasma Science, Vienna, Austria Nov 2023

[22] E. Kolemen, “Flexible and Fast Stellarator Optimization with DESC Suite", *Invited Speaker* at the Fusion HPC Workshop, Nov 2023

[21] E. Kolemen, “Experiments and simulations of free surface liquid metal flow under magnetohydrodynamic conditions at LMX-U”, *Invited Speaker* at the Technology of Fusion Energy Conference, Anaheim, CA, Jun 2022

[20] E. Kolemen, “DESC: Fast and Accurate Stellarator Equilibrium and Optimization Code with Automatic Differentiation”, *Invited Speaker* at the 30th International Toki Conference on Plasma and Fusion Research, Toki, Japan, remote, Nov. 2021

[19] E. Kolemen, “Machine Learning for Real-time Fusion Plasma Behavior Prediction and Manipulation”, *Invited Presentation* APS-DPP Mini-Conference: Machine Learning in Plasma Sciences: Today and Tomorrow Pittsburg, PA, Nov. 2021

[18] E. Kolemen, “Real-time Prediction and Avoidance of Fusion Plasmas Instabilities using Feedback Control,” *Invited Presentation* IAEA Technical Meeting on Plasma Disruptions and Their Mitigation, ITER Headquarters, France, remote, Jul. 2020

[17] E. Kolemen, “Fast Flowing Liquid Metal Divertor Design Options: Experimental and Numerical Studies,” *Oral Presentation* at the IAEA Technical Meeting on Divertor Concepts, Vienna, Austria, Nov. 2019

[16] E. Kolemen, “Stability and control of fast flowing liquid metal divertor,” *Invited Speaker* at the International Symposium on Liquid Metals Applications for Fusion, Urbana-Champaign, IL, Sep 2019

[15] E. Kolemen, “Fast Flowing Liquid Metal Divertor: Experimental Studies,” *Oral Presentation* at the IEEE Symposium on Fusion Engineering, Jacksonville, FL, June 2019

[14] E. Kolemen, “Machine Learning Control for fusion devices,” *Invited Speaker* at the International Conference on Data Driven Plasma Science, Marseille, France, May 2019

[13] E. Kolemen, “Application of machine learning to profile evolution prediction and tokamak control,” *Invited Speaker* at the IAEA Technical Meeting on Fusion Data Processing, Validation and Analysis, Vienna, Austria, May 2019

[12] E. Kolemen, “Data-based plasma stability analysis and control,” *Invited Speaker* at the MHD Workshop, Los Angeles, CA, Nov. 2018

[11] E. Kolemen, “Path to Stable Tokamak Operation: Plasma stability analysis using physics-based and data-based approaches for real-time control,” *Invited Speaker* at the APS-DPP, Portland, OR, Nov. 2018

[10] E. Kolemen, “Climate Engineering Science,” *Invited Speaker* at Roundtable on Climate Engineering and Religion, Princeton, NJ, May 2018

[9] E. Kolemen, “FLIT: Flowing LIquid metal Torus,” *Invited Speaker* at the IAEA Technical Meeting on Divertor Concepts, Suzhou, China, Nov. 2017

[8] E. Kolemen, "Plasma Control for Energy," *Invited Speaker* at PPPL's Science on Saturday Public Speaker Series, Jan. 2017

[7] E. Kolemen, "Detachment and Radiation Control at DIII-D," *Keynote Speaker* at the Taming the Flame; Divertor Detachment Control in Tokamaks Workshop, Lorentz Center, Netherlands, Sep. 2016

[6] E. Kolemen, "Tearing Mode Control for ITER," *Invited Presentation* at the IEA Workshop on Theory and Simulation of Disruptions, Princeton, NJ, July 2015

[5] E. Kolemen et al., "Burning Plasma Relevant Control Development: Advanced Magnetic Divertor Configurations, Divertor Detachment and Burn Control," *Invited Speaker* at the IAEA Fusion Energy Conference, St. Petersburg, Russia, Oct. 2014

[4] E. Kolemen et al., "Heat flux management via advanced magnetic divertor configurations and divertor detachment," *Oral Presentation* at the International Conference on Plasma Surface Interactions (PSI), Kanazawa, Japan, May 2014

[3] E. Kolemen et al., "Neoclassical Tearing Mode Control and Stabilization in Steady State Burning Plasma," *Invited Speaker* at the MHD Workshop, Santa Fe, NM, Nov. 2013

[2] E. Kolemen et al., "Neoclassical tearing mode control by electron cyclotron current drive using dynamic alignment to access higher performance," *Invited Speaker* at the XX Topical Conference on Radiofrequency Power in Plasmas, Sorrento, Italy, June 2013

[1] E. Kolemen et al., "State-of-the-art Neoclassical Tearing Mode Control in DIII-D Using Real-Time Steerable Electron Cyclotron Current Drive Launchers," *Invited Speaker* at the IAEA Fusion Energy Conference, San Diego, CA, Oct. 2012

Selected University Seminars and Technical Presentations

[29] E. Kolemen, "Fusion Plasma Control", University Tuscia, Italy, Apr. 2024

[28] E. Kolemen, "Avoiding fusion plasma tearing instability with deep reinforcement learning," Co-hosted event between Shanghai Jiao Tong University and University of Science and Technology of China, Shanghai, China, Apr. 2024

[27] E. Kolemen, "General Omnigenity Calculations with DESC," Simons Meeting, Madrid, Spain, Sep. 2023

[27] E. Kolemen, "Plasma Control," PPPL Graduate Summer School, Aug. 2023

[26] E. Kolemen, "DESC Suite: Integrated Stellarator Optimization", Simons Collaboration on Hidden Symmetries and Fusion Energy Annual Meeting, NY, NY, Mar. 2023

[25] E. Kolemen, "Overview of Fusion Research at Plasma Control Group," Plasma Physics Colloquium, Applied Physics and Applied Mathematics, Columbia University, New York, NY, Jan. 2023

[26] E. Kolemen, "Data-Based Control", ITER Summer School, UCSD, San Diego, CA, Jun. 2022

[24] E. Kolemen, "Plasma Detachment Control Overview, Liquid Metal and Machine Learning Highlights from Princeton", ENEA, Rome, Italy, Nov. 2021

[23] E. Kolemen, “Machine Learning for ITER Control”, ITER, Cadarache, France, Nov. 2021

[23] E. Kolemen, “Real-time Prediction and Avoidance of Fusion Plasmas Instabilities using Feedback Control”, IAEA Technical Meeting on Plasma Disruptions and Their Mitigation, ITER Headquarters, France, Jul. 2020

[22] E. Kolemen, “Development of Machine Learning and Physics Based Control Design to Avoid Instabilities and Disruptions,” ISF Plasma Control meeting, remote, Cadarache, France, Jun. 2020

[21] E. Kolemen, “Engineering Solutions for Fusion,” Plasma Physics Colloquium, Applied Physics and Applied Mathematics, Columbia University, New York, NY, Nov. 2019

[20] E. Kolemen, “Current drive prevention/stabilization of NTMs,” ITPA Meeting, Garching, Germany, remote, Oct. 2019

[19] E. Kolemen, “Engineering for Fusion: Control and Liquid Metals,” Engineering Physics Department Seminar, University of Wisconsin-Madison, Sep. 2019

[18] E. Kolemen, “Fast flowing liquid metal divertor stability and control,” CCFE Physics and Technology Meeting, Culham Center for Fusion Energy, UK, Jul. 2019

[17] E. Kolemen, “Machine Learning for Tokamak Control,” Institute for Advanced Studies lunch seminar, Princeton, NJ, April 2019

[16] E. Kolemen, “Machine Learning for Control applications,” Advancing Fusion with Machine Learning Research Needs Workshop, Gaithersburg, MD, Apr. 2019

[15] E. Kolemen, “Path to Stable Tokamak Operation: Plasma Stability Analysis Using Physics-based and Data-based Approaches for Real-time Control,” ITER ISFN Plasma Control Meeting, Cadarache, France, Jan. 2019

[14] E. Kolemen, “Liquid Metal Experiments at PPPL,” US-Japan Workshop on Fusion Power Plants, Oak Ridge National Laboratory, Oak Ridge, TN, Dec. 2018

[13] E. Kolemen, “Real-Time stability analysis and its incorporation,” Max Planck Institute for Plasma Physics, Garching, Germany, Oct. 2018

[12] E. Kolemen, “Engineering Solutions for Fusion,” Department of Nuclear, Plasma, and Radiological Engineering Seminar, University of Illinois Urbana-Champaign, Oct. 2018

[11] E. Kolemen, “Real-time stability analysis and its incorporation in control at DIII-D,” International Tokamak Physics Activity, Naples, Italy, Oct. 2018

[10] E. Kolemen, “Fast Liquid Metal work at PPPL: LMX (Liquid Metal Experiment) and FLIT (Flowing LIquid metal Torus),” FESS Liquid Metal PFC meeting, DOE Germantown, MD, Mar. 2018

[9] E. Kolemen, “Real-Time Stability Analysis to Achieve Transient Free Operations with Feedback Control,” Department of Energy, Germantown, MD, May 2017

[8] E. Kolemen, “Controlling fusion power,” Massachusetts Institute of Technology Plasma Science and Fusion Center Seminar, Sep. 2016

[7] E. Kolemen, "Controlling fusion power," Engineering for Energy and Environment Seminar, Università degli Studi della Tuscia, Italy, June 2016

[6] E. Kolemen, "Advanced Control Solutions for Tokamaks," W7-X, Max Planck Institute for Plasma Physics, Greifswald, Germany, May 2015

[5] E. Kolemen, "Advanced Control Solutions for Tokamaks," International Conference On Plasma Science, Antalya, Turkey, May 2015

[4] E. Kolemen, "Advanced control solutions for fusion plasmas," Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China, Jul. 2014

[3] E. Kolemen, "Neoclassical Tearing Mode Control by Electron Cyclotron Current Drive Using Dynamic Alignment to Access Higher Performance," National Fusion Research Institute, South Korea, May 2013

[2] E. Kolemen, "Results from the state-of-the-art NTM control and initial snowflake divertor studies at DIII-D," Tokamak à Configuration Variable (TCV) Seminar, École Polytechnique Fédérale de Lausanne, Switzerland, Jan. 2013

[1] E. Kolemen, "Neoclassical Tearing Mode Control System with Real-time Mirror Steering: Implementation and Results from DIII-D", Max Planck Institute for Plasma Physics, Garching, Germany, Jan. 2013

Patents/Publications

Patent Disclosures:

[7] "Segmented Planar Stellarator Coils", Provisional Patent, 63/693,040, E. Kolemen, K. Orr, D. Panici (2024)

[6] "Single-torus-liquid-metal-coil Fusion Device to Obtain All Stellarator and Tokamak Configurations", E. Kolemen, F. Saenz (grad student), D. Panici (grad student), R. Majeski, https://patents.princeton.edu/sites/g/files/toruqf1216/files/documents/Princeton-96601-Application-Receipt.pdf, Provisional Patent, EFS ID: 48746902, Application Number: 63545082 (2024)

[5] "Hybrid Divertor", R. Majeski, A. Brooks, E. Kolemen (2023)

[4] "Divertorlets", E. Kolemen and A. Fisher (grad student) (2020)

[3] "Calibrationless Rotating Lorentz-Force Flowmeter", M.G. Hvasta (postdoc), D. Dudt (grad student), and E. Kolemen (2018)

[2] "Low Friction Magnetic Bearing / Weighted Magnetic Bearing", M.G. Hvasta (postdoc), D. Dudt (grad student), and E. Kolemen (2018)

[1] "A Method to Distill Hydrogen Isotopes from Lithium", R. Majeski and E. Kolemen (2017)

Theses Advised:

[10] R. Conlin, “Numerical Methods for Stellarator Equilibrium and Optimization: Continuation Methods, Free Boundary Equilibrium, and Constrained Optimization”, PhD Thesis, MAE, Princeton 2024

[9] J. Abbate, “AI-based prediction and control of tokamaks: combining simulations and experimental data”, PhD Thesis, AST, Princeton 2024

[8] D. Dudt, “Development of the DESC Equilibrium and Optimization Suite and its Application to Omnigenous Stellarators”, PhD Thesis, MAE, Princeton 2024

[7] J. Wai, “Shape and Divertor Control in Tokamaks”, PhD Thesis, MAE, Princeton 2023

[6] R. Shousha, “Real-time kinetic profile reconstruction and Adaptive ELM Control on the DIII-D and KSTAR Tokamaks”, PhD Thesis, MAE, Princeton 2023

[5] S. Redmond, “Optomechanical Optimizations for Balloon-borne Telescopes”, PhD Thesis, MAE, Princeton 2023

[4] O. Nelson, “Comprehensive dynamic analysis of the H-mode pedestal in DIII-D”, PhD Thesis, AST, Princeton 2021

[3] T. Chen, “In situ time-resolved laser diagnostics for plasma methane reforming”, PhD Thesis, MAE, Princeton 2021

[2] A. Fisher, “Free surface liquid metal flow for fusion reactors”, PhD Thesis, MAE, Princeton 2020

[1] M.A. Roelofs (supervised grad student), “Ideal magnetohydrodynamics based filter for tearing mode prediction on the DIII-D”, Masters’ Thesis, Science and Technology of Nuclear Fusion Mechanical Engineering, Eindhoven University of Technology, 2018

Refereed Publications:

[Accepted] A. Jalalvand (postdoc), M. Curie (postdoc), S. Kim (postdoc), P. Steiner (postdoc), Qi. Hu, A. O. Nelson, E Kolemen, “Discovering hidden physics using ML-based multimodal super-resolution measurement and its application to fusion plasmas”, Accepted at Nature Communications (2025)

[Accepted] T. Jeong, Junyoung Jang, D. G. Panici, R. Gaur, H. Liu, R. Conlin, C. Zhu, E. Kolemen, J. Park, “Robustness of Quasi-Symmetry along Parametric Boundary Variation”, Accepted at Plasma Physics and Controlled Fusion (2025)

[149] R. Shousha, S. Kim, K. Erickson, S. Hahn, A. O. Nelson, N. Logan, S. Yang, Q. Hu, R. S Wilcox, J-K. Park, C. Paz-Soldan, A. F. Battey, M. Kim, G. Shin, W-H.Ko, Y. Jeon, J. Lee, Juhyeok Jang, Dongcheol Seo, Joseph Abbate, Andrew Rothstein, E. Kolemen, “Unified ELM suppression on KSTAR and DIII-D via adaptive feedback control strategies”, Nuclear Fusion, 65 086021(2025)

[148] YG Elmacioglu, R Conlin, DW Dudt, D Panici, E Kolemen, “ZERNIPAX: A fast and accurate Zernike polynomial calculator in Python”, Applied Mathematics and Computation 505, 129534 (2025)

[147] A Rothstein, M Kim, M Woo, M Cha, C Byun, S Kim, K Erickson, Y Lee, Josh Josephy-Zack, J Butt, R Shousha, M Joung, J-W Juhn, K-D Lee, E Kolemen, “TorbeamNN:

machine learning-based steering of ECH mirrors on KSTAR", Plasma Physics and Controlled Fusion 67 (5), 055036 (2025)

[146] A Garcia (postdoc), S Liu, X Du, M Curie, A Jalalvand, P Steiner, E Kolemen, "Artificial intelligence-based predictive modeling for imaging neutral particle analyzers on the DIII-D tokamak", Nuclear Fusion 65 (5), 056015 (2025)

[145] Brian Wynne (grad student), Francisco Saenz (grad student), Jabir Al-Salami (visiting grad student), Yufan Xu (postdoc), Zhen Sun (postdoc), Changhong Hu, Kazuaki Hanada, and E. Kolemen, "FreeMHD: validation and verification of the open-source, multi-domain, multi-phase solver for electrically conductive flows", 32, 013907, Physics of Plasmas (2025)

[144] J. Abbate (grad student), E. Fable, G. Tardini, R. Fischer, E. Kolemen, and ASDEX Upgrade Team, "Combining physics-based and data-driven predictions for quantitatively accurate models that extrapolate well; with application to DIII-D, AUG, and ITER tokamak fusion reactors", Nuclear Fusion 65 (5), 056014 (2024)

[143] S. Dubbioso (grad student), A. Jalalvand (researcher), J. Wai (grad student), G. De Tommasi, E. Kolemen, "Model-free stabilization via Extremum Seeking using a cost neural estimator", Expert Systems with Applications 258, 125204 (2024)

[142] V. A Soukhanovskii, SL Allen, ME Fenstermacher, CJ Lasnier, AG McLean, F Scotti, E Kolemen, A Diallo, S Gerhardt, S Kaye, BP LeBlanc, R Maingi, JE Menard, R Raman, AW Hyatt, AW Leonard, TH Osborne, NSTX The, DIII-D Teams, "In search of X-point radiator regime features in NSTX and DIII-D discharges with the snowflake divertor", Nuclear Materials and Energy 41, 101790 (2024)

[141] "DIII-D research to provide solutions for ITER and fusion energy", C.T. Holcomb, et al. with E. Kolemen, Nuclear Fusion 64 (11), 112003 (2024)

[140] J. Seo (postdoc), R. Conlin (grad student), A. Rothstein (grad student), S. Kim (postdoc), J. Abbate (grad student), Keith Erickson, J. Wai (grad student), A. Jalalvand (postdoc) and E.Kolemen, "Avoiding tearing instabilities with artificial intelligence in a tokamak", 626 (8000), 746-751, Nature (2024)

[139] S.K. Kim (postdoc), R. Shousha (grad student), S.M. Yang, Q. Hu, S.H. Hahn, A. Jalalvand (postdoc), J.-K. Park, N.C. Logan, A.O. Nelson, Y.-S. Na, R. Nazikian, R. Wilcox, R. Hong, T. Rhodes, C. Paz-Soldan, Y.M. Jeon, M.W. Kim, W.H. Ko, J.H. Lee, A. Battey, G. Yu, A. Bortolon, J. Snipes, and E. Kolemen, "Highest Fusion Performance without Harmful Edge Energy Bursts in Tokamak", 15, 3990, Nature Communications (2024)

[138] A. Rothstein (grad student), A. Jalalvand (postdoc), J. Abbate (grad student), K. Erickson, E. Kolemen, "Initial testing of Alfvén Eigenmode feedback control with machine-learning observers on DIII-D", Accepted, In press, Nuclear Fusion (2024)

[137] R. Conlin (grad student), P. Kim (undergrad student), D. W Dudt (grad student), D. Panici (grad student), E. Kolemen, "Stellarator Optimization with Constraints", https://doi.org/10.1017/S0022377824000655, In press, Journal of Plasma Physics, (2024)

[136] K. Gill, D. Smith, S. Joung, B. Geiger, G. McKee, J. Zimmerman, R. Coffee, A. Jalalvand and E. Kolemen, "Real-time confinement regime detection in fusion plasmas with convolutional neural networks and high-bandwidth edge fluctuation measurements", Mach. Learn.: Sci. Technol. 5 035012 (2024)

[135] S. Joung, D. R Smith, G. R McKee, Z Yan, K. Singh Gill, J. Zimmerman, B. Geiger, R. N Coffee, F. H. O'Shea, A. Jalalvand, and E. Kolemen, “Tokamak edge localized mode onset prediction with deep neural network and pedestal turbulence”, 64 066038, Nuclear Fusion, (2024)

[134] Won-Ha Ko, et al., (with E. Kolemen), “Overview of the KSTAR experiments toward fusion reactor”, Accepted, Nuclear Fusion, (2024)

[133] J. Abbate (grad student), E. Fable, B. Grierson A. Pankin, G. Tardini, E. Kolemen "Large-database cross-verification and validation of tokamak transport models using baselines for comparison”, Physics of Plasmas 31 (4): 042506 (2024)

[132] P. Kim (undergrad student), S. Buller, R. Conlin (grad student), W. Dorland, D. W Dudt (grad student), R. Gaur, R. Jorge, E. Kolemen, M Landreman, N. R Mandell, D. Panici (grad student), “Optimization of nonlinear turbulence in stellarators” 90(2):905900210, Journal of Plasma Physics (2024)

[131] V. Mehta, J. Barr, J. Abbate, M. D. Boyer, I. Char, W. Neiswanger, E Kolemen, J. Schneider, “Automated experimental design of safe rampdowns via probabilistic machine learning”, 64 4, Nuclear Fusion (2024)

[130] John W Berkery, et al., (with E. Kolemen), “NSTX-U research advancing the physics of spherical tokamaks”, DOI 10.1088/1741-4326/ad3092, Nuclear Fusion (2024)

[129] D.W. Dudt (grad student), A.G. Goodman, R. Conlin (grad student), D. Panici (grad student), E. Kolemen, “Magnetic fields with general omnigenity”, Journal of Plasma Physics 90 (1), 905900120, (2023)

[128] R. Shousha, J. Seo, K. Erickson, Z. Xing, S.K Kim, J. Abbate, E. Kolemen, “Machine learning-based real-time kinetic profile reconstruction in DIII-D”, Nuclear Fusion 64 (2), 026006 (2023)

[127] V. Mehta, J. Abbate (grad student), A. Wang, A. Rothstein (grad student), I. Char, J. Schneider, E. Kolemen, C. Rea, D. Garnier, “Towards LLMs as Operational Copilots for Fusion Reactors”, NeurIPS (2023)

[126] A. Garcia (postdoc), A. Jalalvand (postdoc), P. Steiner (postdoc), A. Rothstein, M. Zeeland, B. Heidbrink, E. Kolemen, “Comparison of machine learning systems trained to detect Alfvén eigenmodes using the CO2 interferometer on DIII-D”, Nuclear Fusion 63 (12), 126039 (2023)

[125] S.K. Kim (postdoc), N.C. Logan, M. Becoulet, M. Hoelzl, Q. Hu, G.T.A. Huijsmans, S.J.P. Pamela, Q. Yu, SM Yang, C. Paz-Soldan, E. Kolemen, J-K. Park, “Transition in particle transport under resonant magnetic perturbations in a tokamak”, Nuclear Fusion 63 (10), 106013 (2023)

[124] F. Saenz (grad student), A.E. Fisher (grad student), J Al-Salami (visiting grad student), B Wynne (grad student), Z Sun (postdoc), T. Tanaka, T. Kunugi, J. Yagi, K. Kusumi, Y. Wu, G. Yamazaki, C. Hu, K. Hanada, E. Kolemen, “Experimental, numerical and analytical evaluation of-thrust for fast-liquid-metal-flow divertor systems of nuclear fusion devices”, Nuclear Fusion 63 (9), 096015 (2023)

[123] M. Kim, G. Shin, J. Lee, W.H. Ko, H Han, S.H. Hahn, S.K. Kim (postdoc), S.M. Yang, R. Shousha (grad student), H.S. Kim, J.W. Juhn, G.Y. Park, E. Kolemen, “Integrated RMP-

based ELM-crash-control process for plasma performance enhancement during ELM crash suppression in KSTAR", Nuclear Fusion 63 (8), 086032 (2023)

[122] A. Garcia (postdoc), A. Jalalvand (postdoc), P. Steiner (postdoc), A. Rothstein, M. Zeeland, B. Heidbrink, E. Kolemen, "Alfvén eigenmode detection using Long-Short Term Memory Networks and CO2 Interferometer data on the DIII-D National Fusion Facility", 2023 International Joint Conference on Neural Networks (IJCNN), 1-8 (2023)

[121] J. Seo (postdoc), R. Conlin (grad student), A. Rothstein (grad student), S.K. Kim, J. Abbate (grad student), A. Jalalvand (postdoc), E. Kolemen, "Multimodal prediction of tearing instabilities in a tokamak", 2023 International Joint Conference on Neural Networks (IJCNN), 1-8 (2023)

[120] Z. Sun (postdoc), J Al Salami (visiting grad student), A Khodak, F Saenz (grad student), B Wynne (grad student), R Maingi, K Hanada, CH Hu, E Kolemen, "Magnetohydrodynamics in free surface liquid metal flow relevant to plasma-facing components", Nuclear Fusion 63 (7), 076022 (2023)

[119] I. Char, J. Abbate (grad student), L. Bardóczi, M. Boyer, Y. Chung, R. Conlin (grad student), K. Erickson, V. Mehta, N. Richner, E. Kolemen, J. Schneider , "Offline Model-Based Reinforcement Learning for Tokamak Control", Learning for Dynamics and Control Conference, 1357-1372 (2023)

[118] D. Panici (grad student), R. Conlin (grad student), D.W. Dudt (grad student), E. Kolemen, "The DESC Stellarator Code Suite Part I: Quick and accurate equilibria computations", Journal of Plasma Physics 89 (3), 955890303 (2023)

[117] R. Conlin (grad student), D.W. Dudt (grad student), D. Panici (grad student), E. Kolemen, "The DESC Stellarator Code Suite Part II: Perturbation and continuation methods", Journal of Plasma Physics 89 (3), 955890305 (2023)

[116] D.W. Dudt (grad student), R. Conlin (grad student), D. Panici (grad student), E. Kolemen, "The DESC Stellarator Code Suite Part III: Quasi-symmetry optimization", Journal of Plasma Physics 89 (2), 955890201 (2023)

[115] J. A. Schwartz (postdoc), W. Ricks, E. Kolemen, J. D. Jenkins, "The value of fusion energy to a decarbonized United States electric grid", Joule 7 (4), 675-699 (2023)

[114] J. Abbate (grad student), R. Conlin (grad student), R. Shousha(grad student), K. Erickson, E. Kolemen, "A general infrastructure for data-driven control design and implementation in tokamaks", Journal of Plasma Physics 89 (1), 895890102 (2023)

[113] T. Y. Chen (grad student), X. Mao, H. Zhong, Y. Lin, N. Liu, B. M. Goldberg, Y. Ju, E. Kolemen, "Impact of CH4 addition on the electron properties and electric field dynamics in a Ar nanosecond-pulsed dielectric barrier discharge", Plasma Sources Science and Technology 31 (12), 125013 (2023)

[112] M. R. Halfmoon, D. R Hatch, M. T. Kotschenreuther, S. M. Mahajan, A. O. Nelson, E. Kolemen, M. Curie, A. Diallo, R. J. Groebner, E. Hassan, E. A. Belli, J. Candy, "Gyrokinetic analysis of inter-edge localized mode transport mechanisms in a DIII-D pedestal", Physics of Plasmas 29 (11), 112505 (2022)

[111] T. Y. Chen (grad student), X. Mao, H. Zhong, Y. Lin, N. Liu, B. M. Goldberg, Y. Ju and E. Kolemen, "Coupling of electron properties and electric field dynamics in a CH4/Ar

nanosecond-pulsed dielectric barrier discharge", Plasma Sources Sci. Technol. 31 125013 (2022)

[110] J.T. Wai (grad student), M.D. Boyer, E. Kolemen, "Neural net modeling of equilibria in NSTX-U", Nuclear Fusion, 62 (8), 086042 (2022)

[109] F. Saenz (grad student), Z. Sun (postdoc), A.E. Fisher (grad student), B. Wynne (grad student) and E. Kolemen, "Divertorlets concept for low-recycling fusion reactor divertor: experimental, analytical and numerical verification", Nuclear Fusion, 62, 086008 (2022)

[108] A.A. Kaptanoglu (grad student), A. Jalalvand (postdoc), A.V. Garcia, M.E. Austin, G. Verdoolaege, J. Schneider, C. J. Hansen, S.L. Brunton, W.W. Heidbrink, and E. Kolemen "Exploring data-driven models for spatiotemporally local classification of Alfvén eigenmodes", Nuclear Fusion, 62 (10), 106014 (2022)

[107] J. Schwartz (postdoc), A.O. Nelson (grad student), E. Kolemen, "To dee or not to dee: costs and benefits of altering the triangularity of a steady-state DEMO-like reactor", Nuclear Fusion, 62 (7), 076006 (2022)

[106] S.K. Kim (postdoc), R. Shousha (grad student), S.H. Hahn, A.O. Nelson (grad student), J. Wai (grad student), S.M. Yang, J.K. Park, R. Nazikian, N. Logan, Y.M. Jeon, Y. In, J. Lee, J.W. Kim, C.Y. Lee, Y.S. Na, E. Kolemen "Optimization of 3D controlled ELM-free state with recovered global confinement for KSTAR with n=1 resonant magnetic field perturbation", Nuclear Fusion, 62 (2), 026043 (2022)

[105] T.Y. Chen (grad students), N. Liu, C.J. Kliewer, A. Dogariu, E. Kolemen, Y. Ju, "Simultaneous single-shot rotation–vibration non-equilibrium thermometry using pure rotational fs/ps CARS coherence beating", Optics Letters 47 (6), 1351-1354 (2022)

[104] R. Shousha (grad student), S.K. Kim, K.G. Erickson, S.H. Hahn, A.O. Nelson, S.M. Yang, J.K. Park, J. Wai, Y.M. Jeon, J.H. Lee, J. Jang, D. Seo, E. Kolemen, "Design and experimental demonstration of feedback adaptive RMP ELM controller toward complete long pulse ELM suppression on KSTAR", Physics of Plasmas 29 3 (2022)

[103] W Guttenfelder et al. (with E. Kolemen), "NSTX-U theory, modeling and analysis results", Nuclear Fusion, 62 (4), 042023 (2022)

[102] A. Jalalvand (postdoc), A. A. Kaptanoglu, A. V. Garcia, A. O. Nelson, J. Abbate, M. E. Austin, G. Verdoolaege, S. Brunton, W. W. Heidbrink, E. Kolemen, "Alfvén eigenmode classification based on ECE diagnostics at DIII-D using deep recurrent neural networks", Nuclear Fusion 62 026007 (2022)

[101] A. Jalalvand (postdoc), J. Abbate (grad student), R. Conlin (grad student), G. Verdoolaege, E. Kolemen, "Real-Time and Adaptive Reservoir Computing with an Application to Profile Prediction in Fusion Plasma", IEEE Transactions on Neural Networks and Learning Systems, doi:10.1109/TNNLS.2021.3085504 (2021)

[100] A. O. Nelson (grad student), F. M. Laggner, A. Diallo, Z. A. Xing, D. R. Smith, and E. Kolemen, "Time-dependent experimental identification of inter-ELM microtearing modes in the tokamak edge on DIII-D", Nuclear Fusion 61 (11), 116038 (2021)

[99] J. Abbate (grad student), R. Conlin (grad student), and E. Kolemen, "Data-Driven Profile Prediction for DIII-D", Nuclear Fusion, 61 046027 (2021)

[98] KC Hammond, FM Laggner, A Diallo, S Doskoczynski, C Freeman, H Funaba, DA Gates, R Rozenblat, G Tchilinguirian, Z Xing, I Yamada, R Yasuhara, E Kolemen, “Initial operation of a real-time Thomson scattering evaluation system on the Large Helical Device,” Review of Scientific Instruments 92 (6), 063523 (2021)

[97] A.O. Nelson, Z.A. Xing, O. Izacard, F.M. Laggner, E. Kolemen, “Interpretative SOL modeling throughout multiple ELM cycles in DIII-D” Nuclear Materials and Energy, 26 100883 (2021)

[96] R. Conlin (grad student), K. Erickson, J. Abbate (grad student), and E. Kolemen, “Keras2c: A library for converting Keras neural networks to real-time compatible C”, Engineering Applications of Artificial Intelligence 100, 104182 (2021)

[95] A. Xing (postdoc), D. Eldon (postdoc), M.A. Roelofs (visiting grad student), W.J. Eggert (grad student), A.S. Glasser (grad student), N.C. Logan, Q. Hu, D.A. Humphreys, O. Meneghini, S.P. Smith, and E. Kolemen, “CAKE: Consistent Automatic Kinetic Equilibrium reconstruction”, Fusion Engineering and Design, 163, 112163 (2021)

[94] D. Dudt (grad student) and E. Kolemen, “DESC: A Stellarators Equilibrium Code”, Physics of Plasmas, 27 (10), 102513 (2020)

[93] A. Fisher (grad student), Z. Sun (postdoc), and E. Kolemen, “Liquid metal "divertorlets" concept for fusion reactors”, Nuclear Materials and Energy 100855 (2020)

[92] J.T. Wai (grad student), P.J. Vail (grad student), E. Kolemen, “Control pathway for an advanced divertor on ITER” Fusion Engineering and Design 159, 111957 (2020)

[91] J.T. Wai (grad student), P.J. Vail (grad student), Z.A. Xing (postdoc), A.O. Nelson (grad student), C. Lasnier, and E. Kolemen, “Infrared Constrained Equilibria and Application to Snowflake Divertor Studies”, Nuclear Materials and Energy, 25, 100835 (2020)

[90] A.C. Rousso, B.M. Goldberg, T.Y. Chen (grad student), S. Wu, A. Dogariu, R.B. Miles, E. Kolemen, Y. Ju, “Time and space resolved diagnostics for plasma thermal-chemical instability of fuel oxidation in nanosecond plasma discharges”, Plasma Sources Science and Technology, 29, 10, 105012 (2020)

[89] A.O. Nelson (grad student), N. Logan, W. Choi, E. Strait, and E. Kolemen, "Experimental evidence of ECCD-based NTM suppression threshold reduction during mode locking on DIII-D" Plasma Physics and Controlled Fusion 62 9 (2020)

[88] A.O. Nelson (grad student), Z.A. Xing (postdoc), O. Izacard (postdoc), F.M. Laggner (postdoc), and E. Kolemen, “Interpretative SOL modeling throughout multiple ELM cycles in DIII-D”, Nuclear Materials and Energy, 100883 (2020)

[87] F.M. Laggner (postdoc), D. Eldon (postdoc), A.O. Nelson (grad student), C. Paz-Soldan, A. Bortolon, T.E. Evans, M.E. Fenstermacher, B.A. Grierson, Q. Hu (partial postdoc), D.A. Humphreys, A. Hyatt, R. Nazikian, O. Meneghini, P.B. Snyder, E.A. Unterberg, and E. Kolemen, “Real-time pedestal optimization and ELM control with 3D fields and gas flows on DIII-D”, Nuclear Fusion 60 076004 (2020)

[86] A.O. Nelson (grad student), F.M. Laggner (postdoc), R.J. Groebner, B.A. Grierson, O. Izacard (postdoc), D. Eldon (postdoc), M. Shafer, A.W. Leonard, D. Shiraki, A.C. Sontag, and E. Kolemen, “Setting the H-mode pedestal structure: variations of particle source location using gas puff and pellet fueling”, Nuclear Fusion 60 046003 (2020)

[85] Y. Fu (grad student), D. Eldon (postdoc), K. Erickson, K. Kleijwegt (visiting grad student), L. Lupin-Jimenez (undergrad), M. D Boyer, N. Eidietis, N. Barbour, O. Izacard (postdoc), and E. Kolemen, "Machine learning control for disruption and tearing mode avoidance", Physics of Plasmas 27, 022501 (2020), "Featured Article" by the PoP Editors (2020)

[84] A.S. Glasser (grad student), A.H. Glasser, R. Conlin (grad student), and E. Kolemen, "An ideal MHD δW stability analysis that bypasses the Newcomb equation", Physics of Plasmas, 27, 022114 (2020)

[83] M.G. Hvasta (postdoc), G. Bruhaug (undergrad), A.E. Fisher (grad student), D. Dudt (grad student), and E. Kolemen, "Liquid Metal Diagnostics", Fusion Science and Technology 76 (1), 62-69 (2020)

[82] T.Y. Chen (grad student), C.J. Kliewer, B.M. Goldberg, E. Kolemen, Y. Ju, "Time-domain modelling and thermometry of the CH4 ν1 Q-branch using hybrid femtosecond/picosecond coherent anti-Stokes Raman scattering", Combustion and Flame, 11228 (2020)

[81] T.Y. Chen (grad student), B.M. Goldberg, E. Kolemen, Y. Ju, and C.J. Kliewer, "1-D imaging of rotation-vibration non-equilibrium from pure rotational ultrafast coherent anti-Stokes Raman scattering", Optics Letters, 45 (15), 4252-4255 (2020)

[80] T.Y. Chen (grad student), T.S. Taneja, A.C. Rousso, S. Yang, E. Kolemen, and Y. Ju, "Time-resolved in situ measurements and predictions of plasma-assisted methane reforming in a nanosecond-pulsed discharge", Proceedings of the Combustion Institute, https://doi.org/10.1016/j.proci.2020.06.100 (2020)

[79] D. Andruczyk, R. Maingi, C. Kessel, D. Curreli, E. Kolemen, J. Canik, B. Pint, D. Youchison, S. Smolentsev, "A Domestic Program for Liquid Metal PFC Research in Fusion", Journal of Fusion Energy 1-7 (2020)

[78] D. Humphreys, A. Kupresanin, M.D. Boyer, J. Canik, C.S. Chang, E.C. Cyr, R. Granetz, J. Hittinger, E. Kolemen, E. Lawrence, V. Pascucci, A. Patra, and D. Schissel, "Advancing Fusion with Machine Learning Research Needs Workshop Report", Journal of Fusion Energy 39 (4), 123-155 (2020)

[77] E. Kolemen, M.Hvasta (postdoc), R. Majeski, R. Maingi, A. Brooks, and T. Kozub, "Design of the Flowing LIquid Metal Torus (FLIT)", Nuclear Materials and Energy, Vol. 19, pp. 524-530 (2019)

[76] P.J. Vail (grad student), M.D. Boyer, A.S. Welander, and E. Kolemen, "Design and simulation of the snowflake divertor control for NSTX–U", Plasma Physics and Controlled Fusion, Volume 61, Number 3, (2019)

[75] A.O. Nelson (grad student), M.E. Austin, and E. Kolemen, "Electron cyclotron emission based q-profile measurement and concept for equilibrium reconstruction", Plasma Physics and Controlled Fusion, 61 085013 (2019)

[74] A.O. Nelson (grad student), A.S. Welander, M.E. Austin, R.J. La Haye, and E. Kolemen, "Simultaneous detection of neoclassical tearing mode and electron cyclotron current drive locations using electron cyclotron emission in DIII-D", Nuclear Engineering and Design, Vol. 141, pp. 25-29 (2019)

[73] T.Y. Chen (grad student), A.C. Rousso, S. Wu, B.M. Goldberg (postdoc), H.V.D. Meiden, Y. Ju, and E. Kolemen, "Time-resolved characterization of plasma properties in a CH4/He nanosecond-pulsed dielectric barrier discharge", Journal of Physics D: Applied Physics, 52 18LT02 (2019)

[72] F.M. Laggner (postdoc), A. Diallo, M. Cavedon, and E. Kolemen, "Inter-ELM pedestal localized fluctuations in tokamaks: Summary of multi-machine observations", Nuclear Materials and Energy, Vol. 19, pp. 479-486 (2019)

[71] D. Eldon (postdoc), E. Kolemen, D.A. Humphreys, A.W. Hyatt, A.E. Jarvinen, A.W. Leonard, A.G. McLean, A.L. Moser, T.W. Petrie, and M.L. Walker, "Advances in radiated power control at DIII-D", Nuclear Materials and Energy, Vol. 18, pp. 285-290 (2019)

[70] F.M. Laggner (postdoc), A. Diallo, B.P. LeBlanc, R. Rozenblat, G. Tchilinguirian, and E. Kolemen, "A scalable real-time framework for Thomson scattering analysis: Application to NSTX-U", Review of Scientific Instruments 90, 043501 (2019)

[69] P.J. Vail (grad student), O. Izacard (postdoc), and E. Kolemen, "Optimization of the snowflake divertor for power and particle exhaust on NSTX-U", Nuclear Materials and Energy, vol. 19, pp. 516-523, (2019)

[68] A. Fisher (grad student), M. Hvasta (postdoc), and E. Kolemen, "Study of liquid metal surface wave damping in the presence of magnetic fields and electrical currents", Nuclear Materials and Energy, Vol. 19, pp. 101-106 (2019)

[67] Z.R. Wang, N.C. Logan, S. Munaretto, Y.Q. Liu, Y.W. Sun, S. Gu, J.-K. Park, J.M. Hanson, Q.M. Hu (partial postdoc), T. Strait, R. Nazikian, E. Kolemen, and J.E. Menard, "Identification of multiple eigenmode growth rates in DIII-D and EAST tokamak plasmas", Nuclear Fusion 59 024001 (2019)

[66] R. Rozenblat, E. Kolemen, F. M. Laggner (postdoc), C. Freeman, G. Tchilinguirian, P. Sichta, and G. Zimmer, "Development of Real-Time Software for Thomson Scattering Analysis at NSTX-U", Fusion Science and Technology, DOI: 10.1080/15361055.2019.1658037 (2019)

[65] I. Char, Y. Chung, W. Neiswanger, K. Kandasamy, A.O. Nelson (grad student), M. Boyer, E. Kolemen, and J. Schneider, "Offline contextual bayesian optimization", Advances in Neural Information Processing Systems, pp. 4629-4640 (2019)

[64] P.B. Snyder, J.W. Hughes, T.H. Osborne, C. Paz-Soldan, W.M. Solomon, M. Knolker, D. Eldon (postdoc), T. Evans, T. Golfinopoulos, B.A. Grierson, R.J. Groebner, A.E. Hubbard, E. Kolemen, B. LaBombard, F.M. Laggner (postdoc), O. Meneghini, S. Mordijck, T. Petrie, S. Scott, H.Q. Wang, H.R. Wilson and Y.B. Zhu, "High fusion performance in Super H-mode experiments on Alcator C-Mod and DIII-D", Nuclear Fusion 59 086017 (2019)

[63] C.E. Kessel et al. with E. Kolemen, "Critical Exploration of Liquid Metal Plasma-Facing Components in a Fusion Nuclear Science Facility", Journal Fusion Science and Technology, https://doi.org/10.1080/15361055.2019.1610685, (2019)

[62] T. Strait et al. with E. Kolemen, "Progress in disruption prevention for ITER", Nuclear Fusion 59 112012 (2019)

[61] S.M. Kaye et al. with E. Kolemen, "NSTX/NSTX-U theory, modeling and analysis results", Nuclear Fusion 59 112007 (2019)

[60] E. Kolemen, P.J. Vail (grad student), M.A. Makowski, S.L. Allen, B.D. Bray, M.E. Fenstermacher, D.A. Humphreys, A.W. Hyatt, C.J. Lasnier, A.W. Leonard, A.G. McLean, R. Maingi, R. Nazikian, T.W. Petrie, V.A. Soukhanovskii, and E.A. Unterberg, "Initial development of the DIII-D snowflake divertor control" Nuclear Fusion. 58, 6, 066007 (2018)

[59] A.S. Glasser (grad student) and E. Kolemen, "A robust solution for the resistive MHD toroidal Δ' matrix in near real-time", Physics of Plasmas, 25, 082502 (2018)

[58] M. Hvasta (postdoc), D. Dudt (grad student), A.E. Fisher (grad student), and E. Kolemen, "Calibrationless rotating Lorentz-force flowmeters for low flow rate applications", Measurement Science and Technology 29 (7), 075303 (2018)

[57] H. Hu, K.E.J. Olofsson, A.S. Welander, W.W. Heidbrink, M.A. Van Zeeland, M.E. Austin, C.S. Collins, D.A. Humphreys, E. Kolemen, J. Li, and B. Xiao, "Active Real-time control of Alfven eigenmodes by neutral beam and electron cyclotron heating in the DIII-D tokamak", Nuclear Fusion, 58 124001 (2018)

[56] A.E. Fisher (grad student), E. Kolemen, and M. Hvasta (postdoc), "Experimental demonstration of hydraulic jump control in liquid metal channel flow using Lorentz force", Physics of Fluids 30 (6), 067104, (2018)

[55] A.S. Glasser (grad student), E. Kolemen, and A.H. Glasser, "A Riccati solution for the ideal MHD plasma response with applications to real-time stability control", Physics of Plasmas 25, 032507 (2018)

[54] M. Hvasta (postdoc), E. Kolemen, A. Fisher (grad student), and H. Ji, "Demonstrating electromagnetic control of free-surface, liquid-metal flows relevant to fusion reactors", Nucl. Fusion 58 016022 (2018)

[53] M. Modestov (postdoc), E. Kolemen, A.E. Fisher (grad student), and M.G. Hvasta (postdoc), "Electromagnetic control of heat transport within a rectangular channel filled with flowing liquid metal", Nucl. Fusion 58 016009 (9pp) (2018)

[52] Q. Hu (partial postdoc), X. Du, Q. Yu, N.C. Logan, E. Kolemen, R. Nazikian and Z.H. Jiang, "Fast and pervasive heat transport induced by multiple locked modes in DIII-D", 59 016005 (2018)

[51] K. Kusumi, (visiting grad student), T. Kunugi, T. Yokomine, Z. Kawara, S. Nakamura. E. Kolemen, and H. Ji, "Thermal mixing enhancement of liquid metal MHD free-surface flow by optimizing vortex generator arrays", Fusion Engineering and Design. DOI: 10.1016/j.fusengdes.2018.01.067 (2018)

[50] M.D. Boyer, D.J. Battaglia, D. Mueller, N. Eidietis, K. Erickson, J. Ferron, D.A. Gates, S. Gerhardt, R. Johnson, E. Kolemen, J. Menard, C.E. Myers, S.A. Sabbagh, F. Scotti, and P. Vail (grad student), "Plasma boundary shape control and real-time equilibrium reconstruction on NSTX-U", Nuclear Fusion, Vol. 58, Issue 3, pp. 036016 (2018)

[49] V.A. Soukhanovskii, S.L. Allen, M.E. Fenstermacher, C.J. Lasnier, M.A. Makowski, A.G. McLean, W.H. Meyer, D.D. Ryutov, E. Kolemen, R.J. Groebner, A.W. Hyatt, A.W. Leonard, T.H. Osborne, T.W. Petrie, J. Watkins, "Developing physics basis for the snowflake divertor in the DIII-D tokamak", Nuclear Fusion, Vol. 58, Issue 3, pp. 036018 (2018)

[48] D. Eldon (postdoc), E. Kolemen, J.L. Barton, A.R. Briesemeister, D.A. Humphreys, A.W. Leonard, R. Maingi, M.A. Makowski, A.G. McLean, and A.L. Moser, "Controlling marginally detached divertor plasmas", Nuclear Fusion 57 066039 (2017)

[47] A. Fil (postdoc), E. Kolemen, N. Ferraro, S. Jardin, P.B. Parks, R. Lunsford, and R. Maingi, "Modeling of lithium granule injection in NSTX using M3D-C1", Nuclear Fusion 57 (5), 056040 (2017)

[46] M. Hvasta (postdoc), N. Slighton (undergrad student), E. Kolemen, and A. E. Fisher (grad student), "Experimental calibration procedures for rotating Lorentz-force flowmeters", Measurement Science and Technology, Volume 28, Number 8, 085901 (2017)

[45] K. Kusumi, (visiting grad student), T. Kunugi, T. Yokomine, Z. Kawara, E. Kolemen, H. Ji, and E.P. Gilson, "Study on thermal mixing of MHD liquid metal free-surface film flow", Fusion Science and Technology, Vol. 72, Issue 4, Pages 796-800 (2017)

[44] M.G. Hvasta (postdoc), E. Kolemen, and A. Fisher (grad student), "Application of IR imaging for free-surface velocity measurements in liquid-metal systems" Rev. Sci. Instrum. 88 013501 (2017)

[43] A. Fil (postdoc), E. Kolemen, A. Bortolon, N. Ferraro, S. Jardin, P.B. Parks, and R. Lunsford, "Modeling of lithium granule injection in NSTX with M3D-C1", Nuclear Materials and Energy, Volume 12, Pages 1094-1099, (2017)

[42] I.R. Goumiri (grad student I assisted), C.W. Rowley, S.A. Sabbagh, D.A. Gates, M.D. Boyer, S.P. Gerhardt, E. Kolemen, and J.E. Menard, "Simultaneous feedback control of plasma rotation and stored energy on NSTX-U using neoclassical toroidal viscosity and neutral beam injection", Physics of Plasmas 24, 056101 (2017)

[41] J.E. Menard et al., with E. Kolemen, "Overview of NSTX Upgrade initial results and modelling highlights", Nuclear Fusion 57 (10), 102006, (2017)

[40] C. Petty et al., with E. Kolemen, "Advances in the steady-state hybrid regime in DIII-D—a fully non-inductive, ELM-suppressed scenario for ITER", Nuclear Fusion 57 (11), 116057, (2017)

[39] V.A. Soukhanovskii et al., with E. Kolemen, "Snowflake Divertor Experiments in the DIII-D, NSTX, and NSTX-U Tokamaks Aimed at the Development of the Divertor Power Exhaust Solution", IEEE Transactions on Plasma Science, 44, 12, 3445-3455 (2016)

[38] I.R. Goumiri (grad student I assisted), C.W. Rowley, S.A. Sabbagh, D.A. Gates, S.P. Gerhardt, M.D. Boyer, R. Andre, E. Kolemen, and K. Taira, "Modeling and control of plasma rotation for NSTX using neoclassical toroidal viscosity and neutral beam injection", Nuclear Fusion, 56, 3, 036023, (2016)

[37] H.Y. Guo, et al., with D. Eldon (postdoc) and E. Kolemen, "Developing and validating advanced divertor solutions on DIII-D for next-step fusion devices", Nuclear Fusion, Vol. 56, Iss. 12, pages 126010 (2016)

[36] K. Kusumi (visiting grad student), T. Kunugi, T. Yokomine, Z. Kawara, J.A. Hinojosa (post-baccalaureate student), E. Kolemen, H. Ji, and E. Gilson, "Study on thermal mixing of liquid–metal free-surface flow by obstacles installed at the bottom of a channel", Fusion Engineering and Design 109-111, 1193-1198 (2016)

[35] C. Petty, R Nazikian, M. Van Zeeland, D. Pace, B. Grierson, E. Kolemen, G.R. McKee, R. Prater, and F. Turco, "Impact Of Central Eccd On Steady-State Hybrid Scenario In DIII-D", Radio Frequency Power In Plasmas, AIP, Vol. 1689, pp. 090002, (2015)

[34] D. Eldon (postdoc), R.L. Boivin, C. Chrystal, R.J. Groebner, G.R. McKee, L. Schmitz, G.R. Tynan, Z. Yan, J.A. Boedo, K.H. Burrell, J.D. King, E. Kolemen, N.C. Luhmann Jr, C.M. Muscatello, T.H. Osborne, and P.B. Snyder, "Evolution Of E×B Shear And Coherent Fluctuations Prior To H-L Transitions In DIII-D And Control Strategies For HL Transitions", Physics Of Plasmas, 22, 112506, (2015)

[33] S. Kaye et al., with E. Kolemen, "An Overview of Recent Physics Results From NSTX, Nuclear Fusion, 55, 104002, (2015)

[32] J.R. Ferron, C.T. Holcomb, T.C. Luce, J.M. Park, E. Kolemen, R.J. La Haye, W.M. Solomon, and F. Turco, "High Internal Inductance for Steady-State Operation in ITER And A Reactor", Nuclear Fusion 55 (7), 073030, (2015)

[31] D. Eldon (postdoc), R.L. Boivin, R.J. Groebner, T.H. Osborne, P.B. Snyder, A.D. Turnbull, G.R. Tynan, J.A. Boedo, K.H. Burrell, E. Kolemen, L. Schmitz, and H.R. Wilson, "Investigation Of Peeling-Ballooning Stability Prior To Transient Outbursts Accompanying Transitions Out Of H-Mode In DIII-D", Physics Of Plasmas, 22 (5), 052109, (2015)

[30] R.J. Hawryluk, N.W. Eidietis, B.A. Grierson, A.W. Hyatt, E. Kolemen, N.C. Logan, R. Nazikian, C. Paz-Soldan, W.M. Solomon, and S. Wolfe, "Control of Plasma Stored Energy For Burn Control Using DIII-D In-Vessel Coils", Nuclear Fusion, 55, 053001, (2015)

[29] D. Humphreys, G. Ambrosino, P. De Vries, F. Felici, S.H. Kim, G. Jackson, A. Kallenbach, E. Kolemen, J. Lister, D. Moreau, A. Pironti, G. Raupp, O. Sauter, E. Schuster, J. Snipes, W. Treutterer, M. Walker, A. Welander, A. Winter, and L. Zabeo, "Novel Aspects of Plasma Control In ITER", Physics Of Plasmas, 22, 021806 (2015)

[28] V.A. Soukhanovskii, S.L. Allen, M.E. Fenstermacher, D.N. Hill, C.J. Lasnier, M.A. Makowski, A.G. McLean, W.H. Meyer, E. Kolemen, R.J. Groebner, A.W. Hyatt, A.W. Leonard, T.H. Osborne, and T.W. Petrie, "Radiative Snowflake Divertor Studies In DIII-D", Journal of Nuclear Materials, Vol. 463, pp. 1191–1195, (2015)

[27] E. Kolemen, S.L. Allen, B.D. Bray, M.E. Fenstermacher, D.A. Humphreys, A.W. Hyatt, C.J. Lasnier, A.W. Leonard, M.A. Makowski, A.G. McLean, R. Maingi, R. Nazikian, T.W. Petrie, V.A. Soukhanovskii, and E.A. Unterberg, "Heat Flux Management Via Advanced Magnetic Divertor Configurations And Divertor Detachment", Journal of Nuclear Materials, Vol. 463, pp. 1186–1190, (2015)

[26] T.W. Petrie, S.L. Allen, M.E. Fenstermacher, R.J. Groebner, C.T. Holcomb, E. Kolemen, R.J. La Haye, C.J. Lasnier, A.W. Leonard, T.C. Luce, A.G. McLean, R. Maingi, R.A. Moyer, W.M. Solomon, V.A. Soukhanovskii, F. Turco, and J.G. Watkins, "Application of the radiating divertor approach to innovative tokamak divertor concepts", Journal of Nuclear Materials, Vol. 463, pp. 1225-1228, (2015)

[25] K.E.J. Olofsson, J.M. Hanson, D. Shiraki, F.A. Volpe, D.A. Humphreys, R.J.. La Haye, M.J. Lanctot, E.J. Strait, A.S. Welander, E. Kolemen, and M. Okabayashi, "Array magnetics modal analysis for the DIII-D tokamak based on localized time-series modeling", Plasma Physics and Controlled Fusion, Vol. 56, 095012, (2014)

[24] M. Cengher, J. Lohr, Y.A. Gorelov, R. Ellis, E. Kolemen, D. Ponce, S. Noraky, and C.P. Moeller, "Performance and Upgrades for the Electron Cyclotron Heating System on DIII-D", IEEE Transactions on Plasma Science, Vol. 47, Iss. 7, pp. 1964-1970, (2014)

[23] E. Kolemen et al., "State-of-the-art Neoclassical Tearing Mode Control in DIII-D Using Real-Time Steerable Electron Cyclotron Current Drive Launchers", Nuclear Fusion, Vol. 54, 073020, (2014)

[22] S. Hahn, A.S. Welander, S.W. Yoon, J.G. Bak, N.W. Eidietis, H.S. Han, D.A. Humphreys, A. Hyattb, Y.M. Jeon, R.D. Johnson, H.S. Kim, J. Kim, E. Kolemen, D. Mueller, B.G. Penaflor, D.A. Piglowski, G.W. Shin, M.L. Walker, and M.H. Woo, "Progress and improvement of KSTAR plasma control using model-based control simulators", Fusion Engineering and Design, Vol. 89, Issue 5, Pages 542–547 (2014)

[21] E. Kolemen et al., "Real-time Mirror Steering for Improved Closed Loop NTM Suppression by ECCD in DIII-D", *Fusion Engineering and Design*, Vol. 88, pp. 2757-2760 (2013)

[20] J.-G. Kwak et al., with E. Kolemen, "An overview of KSTAR results", Nuclear Fusion, Vol 53 104005 (2013)

[19] V.A. Soukhanovskii et al., with E. Kolemen, "Advanced divertor configurations with large flux expansion", *Journal of Nuclear Materials*, Vol. 438, pp. 96-101 (2013)

[18] A.W. Hyatt et al., with E. Kolemen, "Designing, constructing and using Plasma Control System algorithms on DIII-D", Fusion Engineering, doi:10.1109/SOFE.2013.6635498, (2013)

[17] J. Menard et al., with E. Kolemen, "Overview of the physics and engineering design of NSTX upgrade", *Nuclear Fusion*, Vol. 52, 083015 (2012)

[16] V.A. Soukhanovskii et al., with E. Kolemen, "Snowflake divertor configuration studies in National Spherical Torus Experiment", *Physics of Plasmas*, Vol. 19, 082504 (2012)

[15] S.P. Gerhardt et al., with E. Kolemen, "Implementation of β_N Control in the National Spherical Torus Experiment", *Fusion Science and Technology*, Vol. 61, pp. 11-18 (2012)

[14] E. Kolemen and N.J. Kasdin, "Optimization of an Occulter-Based Extrasolar-Planet-Imaging Mission", *Journal of Guidance, Control, and Dynamics*, Vol. 35, Issue 1, pp. 172-185 (2012)

[13] E. Kolemen, D.A. Gates, et al., "Plasma modelling results and shape control improvements for NSTX", *Nuclear Fusion*, Vol. 51, 113024 (2011)

[12] E. Kolemen, N.J. Kasdin, and P. Gurfil, "Multiple Poincare Sections Method for Finding the Quasi-Periodic Orbits of the Restricted Three Body Problem", *Celestial Mechanics and Dynamical Astronomy*, Vol. 111, Issue 4, pp. 1-28 (2011)

[11] R. Raman et al., with E. Kolemen, "Overview of physics results from NSTX", *Nuclear Fusion*, Volume 51, Issue 9, 094011 (2011)

[10] S.P. Gerhardt et al., with E. Kolemen, "Recent progress toward an advanced spherical torus operating point in NSTX", *Nuclear Fusion*, Vol. 51, Issue 7, 073031 (2011)

[9] V.A. Soukhanovskii et al., with E. Kolemen, “Taming the plasma-material interface with the 'snowflake' divertor in NSTX”, *Nuclear Fusion*, Vol. 51, Issue 1, 012001, (2011)

[8] E. Kolemen, D.A. Gates et al., “Strike point control for the National Spherical Torus Experiment (NSTX)”, *Nuclear Fusion*, Vol. 50, Issue 10, 105010 (2010)

[7] V.A. Soukhanovskii et al., with E. Kolemen, “Snowflake divertor configuration in NSTX”, *Journal of Nuclear Materials* (2010)

[6] D.A. Humphreys et al., with E. Kolemen, “Experimental vertical stability studies for ITER performance and design guidance”, *Nuclear Fusion*, Vol. 49, 115003 (2009)

[5] D.A. Gates et al., with E. Kolemen, “Overview of results from the National Spherical Torus Experiment (NSTX)”, *Nuclear Fusion*, Vol. 49, Issue 10,104016 (2009)

[4] R.J. Vanderbei and E. Kolemen, “Linear Stability of Ring Systems”, *Astronomical Journal*, Vol. 133, Issue 2, pp. 656-664 (2007)

[3] P. Gurfil, N.J. Kasdin, and E. Kolemen, “Hamilton-Jacobi Modeling of Stellar Dynamics”, *Advances in Space Research*, Vol. 36, No. 6, pp.1143-1150 (2005)

[2] E. Kolemen, N.J. Kasdin, and P. Gurfil, “Hamilton-Jacobi Modelling of Relative Motion for Formation Flying”, *Annals of the New York Academy of Sciences*, Vol. 1065, pp. 93-111 (2005)

[1] N.J. Kasdin, P. Gurfil, and E. Kolemen, “Canonical Modeling of Relative Spacecraft Motion via Epicyclic Orbital Elements”, *Celestial Mechanics and Dynamical Astronomy*, Vol. 92, Issue 4, pp. 337-370 (2005)

Selected Proceedings:

[11] T. Chen (grad student), N. Liu, A. Dogariu, E. Kolemen, Y. Ju, “Rotation-vibration non-equilibrium measurement using pure rotational fs/ps CARS coherence beating” AIAA SCITECH Forum, 2123 (2022)

[10] V. Mehta, I. Char, W. Neiswanger, Y. Chung, A.O. Nelson, M.D. Boyer, E. Kolemen, and J. Schneider, “Neural Dynamical Systems” ICLR 2020 Workshop on Integration of Deep Neural Models and Differential Equations, (2020)

[9] T. Chen (grad student), B. Goldberg, A.C. Rousso, Y. Ju, and E. Kolemen, “Time-resolved Measurements of Electric Field, Electron Temperature, and Electron Density in a Nanosecond-Pulsed Dielectric Barrier Discharge.” AIAA Scitech Forum p. 2148 (2020)

[8] Y. Chung, I. Char, W. Neiswanger, K. Kandasamy, A.O. Nelson, M.D. Boyer, E. Kolemen, and J. Schneider, "Offline Contextual Bayesian Optimization for Nuclear Fusion", NeurIPS workshop on Machine Learning and the Physical Sciences, (2019) https://arxiv.org/pdf/2001.01793.pdf (2019)

[7] E. Kolemen et al., “Heat Flux Management via Advanced Magnetic Divertor Configurations and Divertor Detachment”, eNews, USBPO, Issue 79, pp. 3- 8 (2013)

[6] E. Kolemen and N.J. Kasdin, “Optimal Trajectory Control of an Occulter Based Planet Finding Telescope”, *Advances in Astronautical Sciences*, AAS 07-037, Vol. 128, pp. 215-233 (2007)

[5] E. Kolemen and N.J. Kasdin, "Optimal Configuration of a Planet-Finding Mission Consisting of a Telescope and a Constellation of Occulters", *Advances in Astronautical Sciences*, AAS 07-202, Vol. 127, pp. 1503-1524 (2007)

[4] E. Kolemen and N.J. Kasdin, "Dynamics and Control of a Space Based Extra-Solar Planet Imaging Mission Consisting of a Telescope and Multiple Occulters", *Society of Photographic Instrumentation Engineers Conference Proceedings*, SPIE 6687-38 (2007)

[3] E. Kolemen, N.J. Kasdin, and P. Gurfil, "Quasi-Periodic Orbits of the Restricted Three Body Problem Made Easy", *AIP Conference Proceedings,* Vol. 886, pp. 68-77 (2006)

[2] N.J. Kasdin and E. Kolemen, "Bounded, Periodic Relative Motion using Canonical Epicyclic Orbital Elements", *Advances in the Astronautical Sciences*, *Spaceflight Mechanics*, Vol. 120, No. 2, pp. 1381-1398 (2005)

[1] E. Kolemen and N.J. Kasdin, "Relative Spacecraft Motion: A Hamiltonian Approach to Eccentricity Perturbations", *Advances in the Astronautical Sciences, Spaceflight Mechanics*, Vol. 119, pp. 3075-3085 (2005)