Constance Crozier

Phone: +1 (303) 885-0301
Email: constance.crozier@colorado.edu
Website: constancecrozier.com

Research Interests

FUTURE POWER SYSTEMS GRID OPTIMIZATION MACHINE LEARNING HUMAN-IN-THE-LOOP

Education

2016-2020 **D.Phil** in Electrical Engineering, *University of Oxford*

Thesis: The Impact of Domestic Electric Vehicle Charging on Electricity Networks

Advisor: Malcolm McCulloch

2012-2016 **M.Eng** in Information Engineering (First Class), *University of Oxford*

Thesis: Bayesian Non-Parametrics for the War in Afghanistan

Advisor: Michael Osborne

Academic Experience

2020-2022 Postdoctoral Associate, *University of Colorado Boulder*
» Developed winning code for the ARPA-E Grid Optimization competition

2018-2019 Stipendiary Lecturer, Mansfield College (Oxford), *Electrical and Information Engineering*

2017-2019 Stipendiary Lecturer, Christ Church (Oxford), *Electrical Engineering and Mathematics*

Industry Experience

2019-pres Consultant Research Scientist, *Various*,
» Developed and integrated power flow physics into energy trading algorithm
» Built cost optimization for smart hot water tanks to respond to LMPs

2019-2020 Technical Energy Specialist, *UK Government, Department of Business, Energy & Industrial Strategy*,
» Technical advice and research for policy makers regarding electric vehicles and energy storage

2018 Data Scientist Intern - Route planning for autonomous vehicles, *Five AI*, .

Publications

Ordered reverse chronologically, author's name is shown in **bold**„ mentored students denoted by underline.

Journal articles - Published

[j.11] **C. Crozier**, K. Baker, B. Toomey, Feasible region-based heuristics for optimal transmission switching, *Sustainable Energy, Grids and Networks*, 2022.

[j.10] **C. Crozier**, C. Quarton, N. Mansor, D. Pagnano, I. Llewellyn, Modeling of the ability of a mixed renewable generation electricity system with storage to meet consumer demand, *Electricity*, 2022.

[j.9] K. Collett, S. Hirmer, H. Dalkmann, **C. Crozier**, Y. Mulugetta, M. McCulloch, Can electric vehicles be good for Sub-Saharan Africa?, *Energy Strategy Review*, 2021.

[j.8] **C. Crozier**, T. Morstyn, M. McCulloch, Capturing diversity in electric vehicle charging behaviour for network capacity estimation, *Transportation Research Part D: Transport and Environment*, 2021.

[j.7] **C. Crozier**, T. Morstyn, M. McCulloch, The opportunity for smart charging to mitigate the impact of EVs on the GB transmission and distribution systems, *Applied Energy*, 2020

[j.6] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, Co-ordinated electric vehicle charging to reduce losses without network impedance information, *IET Smart Grid*, 2020.

[j.5] T. Morstyn, **C. Crozier**, M. Deakin, M. McCulloch, Electric vehicle smart charging with battery voltage awareness using second-order cone programming, *IEEE Transactions on Transport Electrification*, 2020.

[j.4] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, The case for bi-directional charging of electric vehicles in low voltage distribution networks, *Applied Energy*, 2020

[j.3] K. Collett, M. Byamukama, **C. Crozier**, M. McCulloch, Energy and transport in Africa and South Asia, *Energy and Economic Growth*, 2020.

[j.2] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Mitigating the impact of personal vehicle electrification: A power generation perspective, *Energy Policy*, 2018.

[j.1] J. Cao, **C. Crozier**, M. McCulloch, Optimal design and operation of a low carbon community based multi-energy systems considering EV integration, *IEEE Trans. of Sustainable Energy*, 2018.

Journal articles - Under review

[j.12] **C. Crozier**, K. Baker, The effect of renewable electricity generation on the value of cross-border interconnection, *1st revision submitted: Applied Energy*.

Peer reviewed conference papers

[c.11] **C. Crozier**, K. Baker, Data-driven probabilistic constraint elimination for accelerated optimal power flow, *IEEE PES General Meeting*, 2022.

[c.10] **C. Crozier**, A. Pigott, K. Baker, Spatial arbitrage through bidirectional electric vehicle charging, *IEEE PES General Meeting*, 2022.

[c.9] M. Li, Y. Du, J. Mohammadi, **C. Crozier**, K. Baker Numerical comparisons of linear power flow approximations: optimality, feasibility, and computation time, *IEEE PES General Meeting*, 2022.

[c.8] A. Pigott, **C. Crozier**, K. Baker, Z. Nagy, GridLearn: multiagent reinforcement learning for grid-aware building energy management, *Power Systems Computation Conference*, 2022.

[c.7] **C. Crozier**, K. Baker, Y. Du, M. Li, J. Mohammadi, Data driven methods for contingency filtering in security constrained optimal power flow, *International Conference on Probabilistic Methods Applied to Power Systems*, 2022.

[c.6] **C. Crozier**, K. Baker, Optimal sizing of an energy storage portfolio considering multiple timescales, *IEEE PES General Meeting*, 2021.

[c.5] M. Deakin, **C. Crozier**, T. Morstyn, D. Apostolopoulou, M. McCulloch, Stochastic hosting capacity in distribution networks, *IEEE PES General Meeting*, 2019.

[c.4] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, Incorporating charger efficiency into electric vehicle charging optimization, *Innovation in Smart Grid Technologies (ISGT) Europe*, 2019.

[c.3] L. Han, T. Morstyn, **C. Crozier**, M. McCulloch, Improving the scalability of a prosumer cooperative game with k-means clustering, *IEEE PowerTech*, 2019.

[c.2] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Numerical analysis of national travel data to assess the impact of UK fleet electrification, *Power Systems Computation Conference*, 2018.

[c.1] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Clustering of usage profiles for electric vehicle behaviour analysis, *Innovation in Smart Grid Technologies (ISGT) Europe*, 2018.

Prizes & Awards

2021 Outstanding Postdoc Award, *CU Boulder* (University-wide award, two given annually).

2020 Winner of UK Power Networks Charge Challenge

2020 High Performance Award, *UK Department for Business, Energy & Industrial Strategy* (Department-wide award, decided by review panel)

2017 Best Presentation at Manchester Energy and Electrical Power Systems Workshop

2016-2019 EPSRC Industrial Case Award

2015 Gibbs Prize for Best Part B Project, *University of Oxford*

2014-2016 Academic Scholarship, *Christ Church (University of Oxford)*

Gifts

2021 ARPA-E Gird Optimization Competition Challenge 2 Prize, **$140,000**.

Grants

2022-2025 **Locational Demand Response for Equitable and Sustainable Electricity Networks** *
**Submitted, not currently funded*
PI: Kyri Baker, Co-PI: **Constance Crozier**
Budget: **$369,275**, Submitted to: *NSF Civil Infrastructure Systems*.

2022-? **Fast and robust strategies for large-scale mixed-integer SCOPF** *
**Submitted, not currently funded*
PI: Javad Mohammadi, Co-PIs: Kyri Baker, **Constance Crozier**
Budget: **$400,000**, Submitted to: *ARPA-E*.

2021-2022 **Predicting Binding Constraints using Physics-Informed Deep Learning**
PI: Kyri Baker, Co-PI: **Constance Crozier**
Budget: **$23,090**, Funding organisation: *Solea*.

2021-2022 **Efficacy and equity of demand response programs across socioeconimic groups**
PI: Kyri Baker, Co-PI: Barry Mather, Collaborator: **Constance Crozier**
Budget: **$25,000**, Funding organisation: *Renewable and Sustainable Energy Initiative*.

2021-2022 **Electric vehicle adoption and associated impacts on infrastructure and society**
PI: Kyri Baker, Co-PIs: Cristina Torres-Machi, Amy Javernick-Will, **Constance Crozier**
Budget: **$8,500**, Funding organisation: *RISE Seed Grant - University of Colorado, Boulder*.

Supervision & Mentoring

2020-pres Aisling Pigott, *PhD Student, University of Colorado Boulder.*

2020-2021 Meiyi Li, *PhD Student, Carnegie Mellon University.*

2020-2021 Yuhan Du, *Masters Student, Carnegie Mellon University.*

2021 John Montagu, *Undergraduate Research Assistant, University of Colorado Boulder.*

2019 Lyn Yeoh, *Undergraduate Research Assistant, University of Oxford.*

Presentations

2022 Imperial College London Electrical Engineering Seminar, "Large scale low carbon electricity networks with human-in-the-loop", Online.

2022 Boston University College of Engineering Seminar, "Large scale low carbon electricity networks with human-in-the-loop", Online.

2022 MIT Mechanical Engineering Seminar, "Large scale low carbon electricity networks with human-in-the-loop", Online.

2022 Temple University ECE Department Spring Seminar Series, "Large scale low carbon electricity net-

works with human-in-the-loop", Online.

2022 University of Oxford Energy and Power Group Seminar Series, "Solving large-scale optimal power flow problems efficiently", Online.

2021 Newcastle University Optimization Group Webinar Series , "Developing fast and scalable algorithms for the ARPA-E grid optimization competition', Online [Link].

2021 INFORMS Annual Meeting, "Approximations and heuristics for fast security constrained optimal power flow", Anaheim, California.

2021 ARPA-E GO Competition Challenge 2 Outreach Event, "Electric Stampede's approach", Online.

2021 IEEE PES General Meeting, "Optimal sizing of an energy storage portfolio considering multiple timescales", Online.

2019 IEEE PES Innovation in Smart Grid Technologies, "Incorporating charger efficiency into electric vehicle charging optimization", Bucharest, Romania.

2019 EPSRC Supergen Energy Networks Hub Risk Day, "Stochastic optimization of electric vehicle charging with solar generation", Cambridge, UK.

2018 IEEE PES Innovation in Smart Grid Technologies, "Clustering of usage profiles for electric vehicle behaviour analysis", Sarajevo, Bosnia & Herzegovina.

2018 Power Systems Computation Conference, "Numerical analysis of national travel data to assess the impact of UK fleet electrification", Dublin, Ireland.

2017 IEEE PES Manchester Energy and Electrical Power Systems Workshop, "Clustering of vehicle usage profiles for efficient smart charging, Manchester, UK

2017 WMG Catapult Energy Storage Conference, "The grid impacts of e-mobility", Coventry, UK.

Outreach & Engagement

2020-pres Write and manage a personal science communication blog, which has had over 40,000 views.

2020-pres Created animated graphs for Twitter posts that have attracted 600,000+ views.

2019 Helped create a series of challenges designed to help students teach themselves to code in Python.

2019 Participated in video series showing an example undergraduate engineering interview.

2018 Ran an engineering workshop for school leavers as part of Christ Church Horizons program.

2015-2016 Access and academic affairs officer at Christ Church – co-ordinated outreach and the open day.

Coding Languages

Expert: Python, MATLAB

Intermediate: SQL, Javascript, C++

Profitiant: C, Julia, HTML, CSS