Filippo Pecci

CONTACT INFORMATION

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RESEARCH OBJECTIVE

Develop and apply computational methods to solve large-scale mixed-integer optimization models, optimize design and control of complex network systems, and provide decision support to accelerate transition to net-zero emissions and resilient infrastructure systems.

APPOINTMENTS

2022-present	Associate Research Scholar, Andlinger Center for Energy & the Environment, Princeton University
2018-2022	Postdoctoral Research Associate, Department of Civil & Environmental Engineering, Imperial College London

EDUCATION

2018	Ph.D. in Computational Optimization, Department of Civil & Environmental Engineering, Imperial College London Thesis: Optimal design for control of water supply networks by mixed integer programming [pdf]
2014	MSc in Mathematics, Università degli Studi di Padova (Italy)
2011	BSc in Mathematics, Università degli Studi di Padova (Italy)

TEACHING & SUPERVISION

Princeton University

- Guest lecturer for Applied Optimization Methods for Energy Systems Engineering, Fall 2022 (500 level graduate elective). Lecture on decomposition methods with application to energy systems.

Imperial College London

- Main lecturer for BSc and MSc modules on convex optimization with applications in water systems, Fall & Spring 2020 and 2021.
- Guest lecturer and teaching assistant for MSc modules on modelling and optimization of water distribution networks, Spring 2016, 2017, 2018, 2019, 2020, and 2021.
- Mathematics tutor for MSc students, with focus on linear algebra and calculus, Fall 2015, 2016, 2017.
- Technical supervision of 4 PhD students working on optimal design, model identification and fault estimation problems for water distribution networks.
- Co-supervision of 4 final year MSc projects on analysis and optimization of water distribution networks.

PREPRINTS

[P1] Shmaya, T., Houssh, M., **Pecci, F.**, Baker, K., Kasprzyk, J., and Ostfeld, A. "Conjunctive Optimal Operation of Water and Power Networks". Water Resources Research (revise and resubmit). [Manuscript available upon request].

REFEERED JOURNAL ARTICLES

[J20] Jacobson, A., **Pecci, F.**, Sepulveda, N., Xu, Q., and Jenkins, J. "A computationally efficient Benders decomposition for energy systems planning problems with detailed operations and time-coupling constraints". In: *INFORMS Journal on Optimization* (2023). DOI: 10.1287/ijoo.2023.0005. In press. [preprint].

[J19] Jenks, B., **Pecci, F.**, and Stoianov, I. "Optimal design-for-control of self-cleaning water distribution networks using a convex multi-start algorithm". In: *Water Research* (2023), p. 119602. ISSN: 0043-1354. DOI: 10.1016/j.watres.2023.119602.

[J18] Jenks, B., Ulusoy, A.-J., **Pecci, F.**, and Stoianov, I. "Dynamically adaptive networks for integrating optimal pressure management and self-cleaning controls". In: *Annual Reviews in Control* (2023). ISSN: 1367-5788. DOI: https://doi.org/10.1016/j.arcontrol.2023.03.014.

[J17] **Pecci, F.** and Stoianov, I. "Bounds and convex heuristics for bi-objective optimal experiment design in water networks". In: *Computers and Operations Research* (2023). DOI: 10.1016/j.cor.2023.106181.

[J16] **Pecci, F.**, Stoianov, I., and Ostfeld, A. "Convex Heuristics for Optimal Placement and Operation of Valves and Chlorine Boosters in Water Networks". In: *Journal of Water Resources Planning and Management* 148.2 (2022), pp. 1–14. DOI: 10.1061/(ASCE)WR.1943-5452.0001509.

[J15] Ulusoy, A.-J., Mahmoud, H. A., **Pecci, F.**, Keedwell, E. C., and Stoianov, I. "Bi-objective design-for-control for improving the pressure management and resilience of water distribution networks". In: *Water Research* 222 (2022), p. 118914. DOI: 10.1016/j.watres.2022.118914.

[J14] Waldron, A., Ulusoy, A.-J., **Pecci, F.**, and Stoianov, I. "Principal Component Based Sampling for the Continuous Maintenance of Hydraulic Models". In: *Water Research* 222 (2022), p. 118905. DOI: 10.1016/j.watres.2022.118905.

[J13] Blocher, C., **Pecci, F.**, and Stoianov, I. "Prior Assumptions for Leak Localisation in Water Distribution Networks with Uncertainties". In: *Water Resources and Management* (2021). DOI: 10.1007/s11269-021-02988-z.

[J12] **Pecci, F.**, Stoianov, I., and Ostfeld, A. "Relax-tighten-round algorithm for optimal placement and control of valves and chlorine boosters in water networks". In: *European Journal of Operational Research* 295.2 (2021), pp. 690–698. DOI: 10.1016/j.ejor.2021.03.004.

[J11] Ulusoy, A.-J., **Pecci, F.**, and Stoianov, I. "Bi-objective design-for-control of water distribution networks with global bounds". In: *Optimization and Engineering* (2021). Published online. DOI: 10.1007/s11081-021-09598-z.

[J10] Blocher, C., **Pecci, F.**, and Stoianov, I. "Localizing Leakage Hotspots in Water Distribution Networks via the Regularization of an Inverse Problem". In: *Journal of Hydraulic Engineering* 146.4 (2020). DOI: 10.1061/(ASCE)HY.1943-7900.0001721.

[J9] Nerantzis, D., **Pecci, F.**, and Stoianov, I. "Optimal control of water distribution networks without storage". In: *European Journal of Operational Research* 284.1 (2020), pp. 345–354. DOI: 10.1016/j.ejor.2019.12.011.

[J8] **Pecci, F.**, Parpas, P., and Stoianov, I. "Sequential Convex Optimization for Detecting and Locating Blockages in Water Distribution Networks". In: *Journal of Water Resources Planning and Management* 146.8 (2020). DOI: 10.1061/(ASCE)WR.1943-5452.0001233.

[J7] Ulusoy, A.-J., **Pecci, F.**, and Stoianov, I. "An MINLP-Based Approach for the Design-for-Control of Resilient Water Supply Systems". In: *IEEE Systems Journal* 14.3 (2020), pp. 4579–4590. DOI: 10.1109/JSYST.2019.2961104.

[J6] Waldron, A., **Pecci, F.**, and Stoianov, I. "Regularization of an Inverse Problem for Parameter Estimation in Water Distribution Networks". In: *Journal of Water Resources Planning and Management* 146.9 (2020). DOI: 10.1061/(ASCE)WR.1943-5452.0001273.

[J5] **Pecci, F.**, Abraham, E., and Stoianov, I. "Global optimality bounds for the placement of control valves in water supply networks". In: *Optimization and Engineering* 20.2 (2019), pp. 457–495. DOI: 10.1007/s11081-018-9412-7.

[J4] **Pecci, F.**, Abraham, E., and Stoianov, I. "Model Reduction and Outer Approximation for Optimizing the Placement of Control Valves in Complex Water Networks". In: *Journal of Water Resources Planning and Management* 145.5 (2019). DOI: 10.1061/(ASCE)WR.1943-5452.0001055.

[J3] **Pecci, F.**, Abraham, E., and Stoianov, I. "Penalty and relaxation methods for the optimal placement and operation of control valves in water supply networks". In: *Computational Optimization and Applications* 67.1 (2017), pp. 201–223. DOI: 10.1007/s10589-016-9888-z.

[J2] **Pecci, F.**, Abraham, E., and Stoianov, I. "Quadratic head loss approximations for optimisation problems in water supply networks". In: *Journal of Hydroinformatics* 19.4 (2017), pp. 493–506. DOI: 10.2166/hydro.2017.080.

[J1] **Pecci, F.**, Abraham, E., and Stoianov, I. "Scalable Pareto set generation for multiobjective co-design problems in water distribution networks: a continuous relaxation approach". In: *Structural and Multidisciplinary Optimization* 55.3 (2017), pp. 857–869. DOI: 10.1007/s00158-016-1537-8.

Refereed conference proceedings

[C4] **Pecci, F.**, Stoianov, I., and Ostfeld, A. "Optimal Design-for-Control of Chlorine Booster Systems in Water Networks via Convex Optimization". In: *2022 European Control Conference (ECC)*. 2022, pp. 1988–1993. DOI: 10.23919/ECC55457.2022.9838063.

[C3] **Pecci, F.**, Abraham, E., and Stoianov, I. "Outer approximation methods for the solution of co-design optimisation problems in water distribution networks". In: *IFAC-PapersOnLine*. Vol. 50. 1. 2017, pp. 5373–5379. DOI: 10.1016/j.ifacol.2017.08.1069.

[C2] **Pecci, F.** and Stoianov, I. "Optimising valve placement and pressure control for multi-feed sectors in water supply networks using outer approximation". In: Figshare, 2017. DOI: 10.15131/shef.data.5364196.v1. CCWI 2017 - 15th International Conference on Computing and Control for the Water Industry.

[C1] **Pecci, F.**, Abraham, E., and Stoianov, I. "Mathematical programming methods for pressure management in water distribution systems". In: *Procedia Engineering*. Vol. 119. 1. 2015, pp. 937–946. DOI: 10.1016/j.proeng.2015.08.974. Computing and Control for the Water Industry (CCWI2015).

Patents

[B2] Waldron, A., **Pecci, F.**, and Stoianov, I. "Online maintenance of hydraulic models for WSN through continuous monitoring and adaptive control". 2021. Filed. GB application number 2112111.6.

[B1] Stoianov, I., Abraham, E., and **Pecci, F.** "Management of liquid conduit systems". 2015. Granted. PCT/GB2016/054026. GB2545899B (2018), US11078650B2 (2021), EP3394697B1 (2021).

Conference presentations and invited seminars

10. 2023 INFORMS Annual Meeting, Phoenix (Arizona), 15-18 October, 2023. Learning to optimize macro-energy systems.
9. International Conference on Optimization and Decision Science 2022, Florence, Italy, 30 August - 2 September, 2022. A global optimization framework for resilient water distribution networks. [slides]
8. European Control Conference 2022, London, United Kingdom, 12-15 July, 2022. Optimal Design-for-Control of Chlorine Booster Systems in Water Networks via Convex Optimization. [slides]
7. Control & optimization Seminars, Imperial College London, 22 Gennaio 2020. Mathematical optimization for intelligent water distribution networks: model calibration, and event detection and localisation.
6. 17th Computing and Control for the Water Industry (CCWI), Exeter, United Kingdom, 1-4 September, 2019. Tight Convex Relaxations for Optimal Design and Control Problems in Water distribution Networks. [slides]
5. 6th International Conference on Continuous Optimization (ICCOPT), Berlin, Germany, 3 - 8 August, 2019. Non-linear inverse problems via sequential convex optimization. [slides]
4. 6th International Conference on Engineering Optimization (EngOpt), Lisbon, Portugal, 17 - 19 September, 2018. A branch and bound method for globally optimizing valve locations in water distribution networks.[slides]
3. 20th IFAC World Congress, Toulouse, France, 9 - 14 July, 2017. Outer approximation methods for the solution of co-design optimization problems in water distribution networks. [slides]
2. 14th Computing and Control for the Water Industry (CCWI), Amsterdam, the Netherlands, 7-9 November, 2016. Multiobjective pressure optimization in water distribution systems (Poster Presentation).
1. 13th Computing and Control for the Water Industry (CCWI), Leicester, United Kingdom, 2-4 September, 2015. Mathematical programming methods for pressure management in water distribution systems. [slides]