

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

REFERRED JOURNAL ARTICLES

- [J20] **F. Pecci** and I. Stoianov. “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](https://doi.org/10.1016/j.cor.2023.106181).
- [J19] A. Jacobson, **F. Pecci**, N. Sepulveda, Q. Xu, and J. Jenkins. “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](https://doi.org/10.1287/ijoo.2023.0005). In press. [[preprint](#)].

- [J18] B. Jenks, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1016/j.watres.2023.119602).
- [J17] B. Jenks, A.-J. Ulusoy, **F. Pecci**, and I. Stoianov. “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>.
- [J16] **F. Pecci**, I. Stoianov, and A. Ostfeld. “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](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001509).
- [J15] A.-J. Ulusoy, H. A. Mahmoud, **F. Pecci**, E. C. Keedwell, and I. Stoianov. “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](https://doi.org/10.1016/j.watres.2022.118914).
- [J14] A. Waldron, A.-J. Ulusoy, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1016/j.watres.2022.118905).
- [J13] C. Blocher, **F. Pecci**, and I. Stoianov. “Prior Assumptions for Leak Localisation in Water Distribution Networks with Uncertainties”. In: *Water Resources and Management* (2021). DOI: [10.1007/s11269-021-02988-z](https://doi.org/10.1007/s11269-021-02988-z).
- [J12] **F. Pecci**, I. Stoianov, and A. Ostfeld. “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](https://doi.org/10.1016/j.ejor.2021.03.004).
- [J11] A.-J. Ulusoy, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1007/s11081-021-09598-z).
- [J10] C. Blocher, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1061/(ASCE)HY.1943-7900.0001721).
- [J9] **F. Pecci**, P. Parpas, and I. Stoianov. “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](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001233).
- [J8] D. Nerantzis, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1016/j.ejor.2019.12.011).
- [J7] A.-J. Ulusoy, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1109/JSYST.2019.2961104).
- [J6] A. Waldron, **F. Pecci**, and I. Stoianov. “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](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001273).
- [J5] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1007/s11081-018-9412-7).
- [J4] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001055).
- [J2] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1007/s10589-016-9888-z).
- [J1] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.2166/hydro.2017.080).
- [J3] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1007/s00158-016-1537-8).

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CONFERENCE
PROCEEDINGS

- [C4] **F. Pecci**, I. Stoianov, and A. Ostfeld. “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](https://doi.org/10.23919/ECC55457.2022.9838063).
- [C3] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1016/j.ifacol.2017.08.1069).
- [C2] **F. Pecci** and I. Stoianov. “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](https://doi.org/10.15131/shef.data.5364196.v1). CCWI 2017 - 15th International Conference on Computing and Control for the Water Industry.
- [C1] **F. Pecci**, E. Abraham, and I. Stoianov. “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](https://doi.org/10.1016/j.proeng.2015.08.974). Computing and Control for the Water Industry (CCWI2015).

PATENTS

- [B2] A. Waldron, **F. Pecci**, and I. Stoianov. “Online maintenance of hydraulic models for WSN through continuous monitoring and adaptive control”. 2021. Filed. GB application number 2112111.6.
- [B1] I. Stoianov, E. Abraham, and **F. Pecci**. “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](#)]