Vasileios Charitopoulos, PhD, FHEA

v.charitopoulos@ucl.ac.uk

Lecturer (Assistant Professor) — Sargent Centre for Process Systems Engineering

Dept. of Chemical Engineering — orcid.org/0000-0001-9051-917X

University College London

Research Domain: Computational Optimisation & Uncertainty modelling

Foundations

Stochastic programming, Robust Optimisation, Data-driven optimisation, Multi-scale modelling, Game theory

Applications

Digitalisation of process & energy systems, Net-zero energy & chemicals, Model-based control for smart manufacturing, Enterprise wide optimisation, Continuous Pharmaceutical Manufacturing.

Education

University College London (UCL) — London, UK
PhD in Chemical Engineering — 2015 – 2018

National Technical University of Athens (NTUA) — Athens, Greece
Diploma (5-year integrated MSc) in Chemical Engineering — 2010 – 2015

Professional Appointments

Lecturer (Assistant Professor) — **UCL, Dept. Chemical Engineering**
Research Domain: Product & Process Systems Engineering — 2019 –

Research Associate — **Cambridge Judge Business School**
Optimisation of decarbonisation pathways for net-zero — 2018 – 2019

Teaching Fellow — **UCL, Dept. Chemical Engineering**
Process Plant Design Project — 2017 – 2018

Funding Secured & Distinctions

Fellowships

Cambridge University Early Career Fellowship, Isaac Newton Trust (Declined) …….. 2019

Research Funding

UKRI/EPSRC Grants

International Centre to Centre on Data-driven Global Optimisation [£820k] …… 2022-2025
Artificial Intelligence powered framework for OnLine production Scheduling [£1.3m] …… 2022-2025
Right First Time Manufacture of Pharmaceuticals [£1.6m] …….. 2021-2024
MedIcal Oxygen Supply ChaiN DeSIGn And Planning For COVID-19 HospiTals [£350k] …. 2020-2022
Hydrogen Infrastructure Uncertainty Management For Heat Decarbonisation [£1.5m] …… 2020-2024

Scholarships

PhD Scholarship, Department of Chemical Engineering, UCL 2015-2018
Hellenic Petroleum S.A. Postgraduate Scholarship (declined) 2015
Erasmus+ mobility Scholarship 2014-2015

Awards & Distinctions

IChemE Best Young Researcher (Hon. Men.), IChemE Global Awards ……..…….. 2022
Sir Stephen Wall award: Inspiring Role Model (Shortlisted), UCL Inclusion Awards …… 2021

Education Success For All, UCL Provost Awards 2021
Exceptional Personal Tutoring (Honourable Mention), UCL Student Choice Awards 2021
Exceptional PhD Thesis Award in CAPE (Hon. Men.), EFCE 2020
Springer Thesis Award, Springer International Publishing 2019
Newton Prize Best for PhD thesis, Department of Chemical Engineering, UCL 2019
DAI Best Teaching Demonstrator Award, Department of Chemical Engineering, UCL 2018
Rookie Prize for academic excellence, Department of Chemical Engineering, UCL 2017
Best Leadership Award in teaching, Faculty of Engineering Science, UCL 2017
Undergraduate Researcher Award, Thomaideion fund, NTUA 2015

Travel Grants

International conference participation, Thomaideion fund, NTUA 2015

Peer – Reviewed Publications (Google Scholar)

Journal Articles (Corresponding author in bold)

J1. Zhou, X., Efthymiadou, M. E., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2024). Data-driven robust optimisation of hydrogen infrastructure planning under demand uncertainty using a hybrid decomposition method. Appl. Energy, 376, 124222. doi: https://doi.org/10.1016/j.apenergy.2024.124222

J2. Lee, Y., Thyagarajan, K., Pinto, J. M., Charitopoulos, V. M., & Papageorgiou, L. G. (2024). Towards efficient solutions for vehicle routing problems for oxygen supply chains. *Comput. Chem. Eng.* , 108827. doi: https://doi.org/10.1016/j.compchemeng.2024.108827

J3. Bounitsis, G. L., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2024). Stable optimisation-based scenario generation via game theoretic approach. *Comput. Chem. Eng.*, *185*, 108646. doi:10.1016/j.compchemeng.2024.108646

J4. Herding, R., Ross, E., Jones, W. R., Endler, E., Charitopoulos, V. M., & Papageorgiou, L. G. (2024). Risk-aware microgrid operation and participation in the day-ahead electricity market. Adv. Appl. Energy, 100180.

J5. Bounitsis, G. L., & **Charitopoulos, V. M.** (2024). The value of ammonia towards integrated power and heat system decarbonisation. *Sustain. Energy Fuels*. doi:10.1039/d4se00449c

J6. Marousi, A., Thyagarajan, K., Pinto, J. M., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2024). Game-theoretic optimisation of supply chain design with customer contracts: The case of industrial gases market. *Comput. Chem. Eng.*, *184*. doi:10.1016/j.compchemeng.2024.108625

J7. Efthymiadou, M. E., Charitopoulos, V. M., & Papageorgiou, L. G. (2024). Optimal hydrogen infrastructure planning for heat decarbonisation. *Chem. Eng. Res. Des.*, *204*, 121-136. doi:10.1016/j.cherd.2024.02.028

J8. **Charitopoulos, V. M.**, Fajardy, M., Chyong, C. K., & Reiner, D. M. (2023). The impact of 100% electrification of domestic heat in Great Britain. *iScience*, *26*(11). doi:10.1016/j.isci.2023.108239

J9. Herding, R., Ross, E., Jones, W. R., Charitopoulos, V. M., & Papageorgiou, L. G. (2023). Stochastic programming approach for optimal day-ahead market bidding curves of a microgrid. *Appl. Energy*, *336*. doi:10.1016/j.apenergy.2023.120847

J10. Marousi, A., & **Charitopoulos, V. M.** (2023). Game theoretic optimisation in process and energy systems engineering: A review. *Frontiers in Chemical Engineering*, *5*. doi:10.3389/fceng.2023.1130568

J11. Bounitsis, G. L., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2022). Data-driven scenario generation for two-stage stochastic programming. *Chem. Eng. Res. Des.*, *187*, 206-224. doi:10.1016/j.cherd.2022.08.014

J12. Lee, Y., Charitopoulos, V. M., Thyagarajan, K., Morris, I., Pinto, J. M., & Papageorgiou, L. G. (2022). Integrated production and inventory routing planning of oxygen supply chains. *Chem. Eng. Res. Des.*, *186*, 97-111. doi:10.1016/j.cherd.2022.07.027

J13. Jiang, S. -L., Papageorgiou, L. G., Bogle, I. D. L., & **Charitopoulos, V. M.** (2022). Investigating the Trade-Off between Design and Operational Flexibility in Continuous Manufacturing of Pharmaceutical Tablets: A Case Study of the Fluid Bed Dryer. *Processes*, *10*(3). doi:10.3390/pr10030454

J14. Charitopoulos, V. M., Papageorgiou, L. G., & Dua, V. (2021). Multi set-point explicit model predictive control for nonlinear process systems. *Processes*, *9*(7). doi:10.3390/pr9071156

J15. Charitopoulos, V. M., Dua, V., Pinto, J. M., & Papageorgiou, L. G. (2020). A game-theoretic optimisation approach to fair customer allocation in oligopolies. *Optim. Eng.* doi:10.1007/s11081-019-09482-x

J16. Charitopoulos, V. M., Papageorgiou, L. G., & Dua, V. (2019). Closed-loop integration of planning, scheduling and multi-parametric nonlinear control. *Comput. Chem. Eng.*. doi:10.1016/j.compchemeng.2018.06.021

J17. Charitopoulos, V. M., Dua, V., & Papageorgiou, L. G. (2017). Traveling Salesman Problem-Based Integration of Planning, Scheduling, and Optimal Control for Continuous Processes. *Ind. Eng. Chem. Res.*, doi:10.1021/acs.iecr.7b01122

J18. Charitopoulos, V. M., Papageorgiou, L. G., & Dua, V. (2018). Multi-parametric mixed integer linear programming under global uncertainty. *Comput. Chem. Eng.*. doi:10.1016/j.compchemeng.2018.04.015

J19. Charitopoulos, V. M., Papageorgiou, L. G., & Dua, V. (2017). Multi-parametric linear programming under global uncertainty. *AIChE J.*. doi:10.1002/aic.15755

J20. Charitopoulos, V. M., Papageorgiou, L. G., & Dua, V. (2017). Nonlinear Model-Based Process Operation under Uncertainty Using Exact Parametric Programming. *Engineering*. doi:10.1016/J.ENG.2017.02.008

J21. Charitopoulos, V., & Dua, V. (2016). Explicit Model Predictive Control of Hybrid Systems using Multi-parametric Mixed Integer Polynomial Programming, AIChE J., doi:10.1002/aic.15396

J22. Charitopoulos, V. M., & Dua, V. (2016). A unified framework for model-based multi-objective linear process and energy optimisation under uncertainty. *Appl. Energy*, *186*, 539-548. doi:10.1016/j.apenergy.2016.05.082

CONFERENCE PROCEEDINGS (Corresponding author in bold)

CP1. Johnn, S. N., & **Charitopoulos, V. M.** (2024). A Reinforcement Learning Framework for Online Batch Process Scheduling. In *Computer Aided Chemical Engineering* (Vol. 53, pp. 1783-1788). Elsevier. doi: https://doi.org/10.1016/B978-0-443-28824-1.50298-2

CP2. Nikkhah, H., Charitopoulos, V. M., Avraamidou, S., & Beykal, B. (2024). Bilevel optimization of mixed-integer nonlinear integrated planning and scheduling problems using the DOMINO framework. In *Computer Aided Chemical Engineering* (Vol. 53, pp. 1909-1914). Elsevier. doi: https://doi.org/10.1016/B978-0-443-28824-1.50319-7

CP3. Zhou, X., Efthymiadou, M. E., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2024). Data-driven robust hydrogen infrastructure planning under demand uncertainty using a hierarchical-based decomposition method. In *Comput. Aid. Chem. Eng.* (Vol. 53, pp. 3397-3402). doi:10.1016/B978-0-443-28824-1.50567-6

CP4. Efthymiadou, M. E., Charitopoulos, V. M., & Papageorgiou, L. G. (2024). Hydrogen strategic planning for heat decarbonisation under uncertainty. In *Comput. Aid. Chem. Eng.* (Vol. 53, pp. 2257-2262). doi:10.1016/B978-0-443-28824-1.50377-X

CP5. Meng, Q., Bogle, I. D. L., & **Charitopoulos, V. M.** (2024). Data-Driven Chance-Constrained Optimization for Minimizing the Influence of Material Uncertainty on Product Quality. In *Comput. Aid. Chem. Eng.* (Vol. 53, pp. 1579-1584). doi:10.1016/B978-0-443-28824-1.50264-7

CP6. Bounitsis, G. L., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2023). Stable two-stage scenario generation via game-theoretic optimisation. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 739-744). doi:10.1016/B978-0-443-15274-0.50118-9

CP7. Bounitsis, G. L., & **Charitopoulos, V. M.** (2023). Optimal capacity planning integrating ammonia storage for power and heat decarbonisation. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 3049-3054). doi:10.1016/B978-0-443-15274-0.50486-8

CP8. Marousi, A., Pinto, J. M., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2023). Multi-period optimisation of oligopolies with contracts: A cooperative approach to customer fairness. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 1603-1608). doi:10.1016/B978-0-443-15274-0.50255-9

CP9. Efthymiadou, M. E., Charitopoulos, V. M., & Papageorgiou, L. G. (2023). Hydrogen infrastructure planning for heat decarbonisation in Great Britain. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 3025-3030). doi:10.1016/B978-0-443-15274-0.50482-0

CP10. Bounitsis, G. L., Lee, Y., Thyagarajan, K., Pinto, J. M., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2023). Distribution planning of medical oxygen supply chains under uncertainty. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 3387-3392). doi:10.1016/B978-0-443-15274-0.50540-0

CP11. Vaes, J., & **Charitopoulos, V. M.** (2023). A data-driven uncertainty modelling and reduction approach for energy optimisation problems. In *Comput. Aid. Chem. Eng.* (Vol. 52, pp. 1161-1167). doi:10.1016/B978-0-443-15274-0.50185-2

CP12. Bounitsis, G. L., Papageorgiou, L. G., & **Charitopoulos, V. M.** (2022). Data-Driven Scenario Generation for Two-Stage Stochastic Programming. In *Comput. Aid. Chem. Eng.* (Vol. 49, pp. 1231-1236). doi:10.1016/B978-0-323-85159-6.50205-0

CP13. Fajardy, M., Charitopoulos, V. M., & Reiner, D. (2020). The Value of Bioenergy with CO_2 Capture and Storage in an Electrified UK Heat Sector. In *Comput. Aid. Chem. Eng.* (Vol. 48, pp. 1573-1578). doi:10.1016/B978-0-12-823377-1.50263-9

CP14. Charitopoulos, V. M., Chyong, C. K., & Reiner, D. (2020). Heat Decarbonisation Pathways in the UK: Modelling and Policy Insights. In *Comput. Aid. Chem. Eng* (Vol. 48, pp. 1465-1470). doi:10.1016/B978-0-12-823377-1.50245-7

CP15. Charitopoulos, V. M., Aguirre, A. M., Papageorgiou, L. G., & Dua, V. (2018). Uncertainty aware integration of planning, scheduling and multi-parametric control. In *Comput. Aid. Chem. Eng.* (Vol. 44, pp. 1171-1176). doi:10.1016/B978-0-444-64241-7.50190-7

CP16. Charitopoulos, V. M., Dua, V., & Papageorgiou, L. G. (2017). Closed loop integration of planning, scheduling and control via exact multi-parametric nonlinear programming. In

Comput. Aid. Chem. Eng. (Vol. 40B, pp. 1273-1278). doi:10.1016/B978-0-444-63965-3.50214-2

RESEARCH MONOGRAPHS

B1. Charitopoulos, V.M. (2020). Uncertainty-aware integration of control with process operations and multi-parametric programming under global uncertainty (Series ISSN: 2190-5053). Springer International Publishing.

INVITED TALKS

ST1. **Charitopoulos V.M.** "Sustainable industries", HIAS Symposium on Sustainability, Hellenic Institute of Advanced Studies, July 4, 2024

ST2. **Charitopoulos V.M.** "Machine learning and optimisation-based risk averse methods with applications to energy and process design", University of Cambridge, July 17, 2023

ST3. **Charitopoulos V.M.** "Optimisation-based approaches to fairness", Technical University of Crete, March 20, 2023

ST4. **Charitopoulos V.M.** "Data-driven stochastic optimisation of chemical process systems", Data Science Group, Solvay plc., June 16, 2022

ST5. **Charitopoulos, V.M.** "Integrated Systems Optimisation", BP Technical Discussion Day, Sargent Centre for Process Systems Engineering, March 23, 2021.

ST6. **Charitopoulos V.M.**, "Enterprise-Wide Optimisation of Process Systems: A digital twins paradigm", Department of Chemical Engineering and Materials Science Seminar Series, University of Minnesota, February 12, 2021.

ST7. **Charitopoulos V.M.**, "Towards the Development of Operational Digital Twins for Autonomous Manufacturing", CPSE Summer Webinar Series, Sargent Centre for Process Systems Engineering, September 30, 2020.

ST8. **Charitopoulos V.M.** "Uncertainty impacts on hydrogen-led heat decarbonisation pathways: Challenges & opportunities", H+C Decarbonisation of Heating and Cooling Knowledge Sharing Day, September 7, 2020.

ST9. **Charitopoulos V.M.**, Fajardy M., Chyong C.K., Reiner, D. "The role of negative emissions towards heat decarbonisation in GB", OFGEM Seminar Series, September 4, 2019.

ST10. **Charitopoulos V.M.** "The case of 100% electrification of domestic heat in Great Britain", UKCCSRC Summer Webinar Series, August 6, 2020.

ST11. **Charitopoulos V.M.** "Integrating control with process operations: Process resiliency and digital transformation for the process industry", Departmental Seminar Series, School of Chemical Engineering, National Technical University of Athens, December 10, 2019.

ST12. **Charitopoulos V.M.**, Chyong C.K., Reiner D. "Impacts on energy systems planning and reliability from joint decarbonisation of heat & electricity in Great Britain", National Grid ESO Meeting, October 15, 2019.

ST13. **Charitopoulos V.M.**, Chyong C.K., Reiner D. "Scenario-based exploration of decarbonisation pathways for the UK heat sector", UKCCSRC Autumn Conference 2019, September 5, 2019.

ST14. **Charitopoulos V.M.**, Chyong C.K., Reiner D. "Modelling & optimisation of decarbonisation pathways for the UK heat sector", EPRG & CEEPR International Energy Policy Conference, September 3, 2019.

ST15. **Charitopoulos V.M.** "Advances in optimisation under uncertainty for integrated process operations", Departmental Seminar Series, Department of Chemical Engineering, University of Cambridge, February 23, 2018.

Research Mentoring – Postdoctoral Research Associates

Current researchers

Dr Syu – Ning Johnn
Research area: Reinforcement Learning for process scheduling — 2023 -
Funding: EPSRC – AIOLOS project

Dr Xu Zhou
Research area: Data-driven energy systems decarbonisation under uncertain — 2022 -
Funding: EPSRC – HUMAN project

Dr Qingbo Meng
Research area: AI for continuous pharmaceutical manufacturing — 2022 -
Funding: EPSRC/NSF – RiftMaP project

Past Researchers

Dr Julien Vaes
Research area: Robust optimisation approaches to energy systems optimisation — 2021 - 22
Funding: EPSRC – HUMAN project
Now Data Scientist at UBS Switzerland

Research Mentoring – PhD Candidates

Current students

Asimina Marousi
Thesis: Algorithms for cooperative nonconvex optimization under uncertainty — 2021 -
Awarded UCL Rookie Prize for Best MPhil Thesis (2023); Best Poster presentatior UCL Chemical Engineering Annual Industrial Advisory Board Meeting (2023); FOCAPO/CPC travel grant (2022), SCPSE conference travel grant (2024)

Margarita Efthymiadou (Co-supervised with Prof. Lazaros Papageorgiou)
Thesis: Optimisation approaches to hydrogen-led decarbonisation pathways for heat & power in the UK. — 2021 -

Consuelo Vega Zambrano
Thesis: Digital control strategies for continuous pharmaceutical manufacturing — 2022 -
Awarded PRONABEC Scholarship (2022); "Mini-APACT" scholarship for presenting at AstraZeneca's Advances In Process Analytics And Control Technologies 2024 conference (2024), 2nd place for best oral presentation at PSEResearchDayUK24 conference (2024).

Reka Keresztes
Thesis: Machine learning-based process scheduling of chemical industries — 2024 -
Awarded UCL Doctoral Training Partnerships Scholarship (2024)

Efthymis Charalambous
Thesis: Digital twins for waste-to-hydrogen process — 2024 -
Awarded UCL Doctoral Training Partnerships Scholarship (2024)

Yuhui Yin
Thesis: Quantum optimisation approaches to digital manufacturing — 2024 -
Awarded UCL-CSC Research Excellence Scholarship (2024)

GRADUATED DOCTORAL STUDENTS

Dr George Bounitsis 2020 -24
Thesis: Advances in data-driven stochastic programming with applications to energy systems planning
Awarded SCPSE conference travel grant (2023, 2024);
CA Floudas Junior Award for Mathematical Optimization (2023)
Now *Senior Software Engineering at Aurora Energy Research*

Dr Robert Herding (Co-supervised with Prof. Lazaros Papageorgiou) 2019 - 23
Thesis: Optimal Operation of Energy Microgrids under Uncertainty
Funded by Shell Plc
Now Optimisation Engineer at Shell Global Solutions International

PHD THESIS EXAMINATIONS

TC1. Dr Dan Li, Thesis: Advanced intelligent and machine learning solution approaches for chemical production scheduling of multipurpose batch plants, University of Manchester, 02/2024
TC2. Dr Changgun Lee, Thesis: Strategic Design and Planning of Reverse Supply Chains, Imperial College London, 03/2023
TC3. Dr Deemah Aljuhani, Thesis: Modelling and Optimisation of Space Allocation and layout Problems, University College London, 07/2021
TC4. Dr Katerina Tsatse, Thesis: Methodologies for the optimisation, control and consideration of uncertainty of reactive distillation, University College London, 04/2021

TEACHING

CENG0010: Separation Processes I (Y2 module; 15 credits) UCL, 2020 -
Module lead

CENG0053: Process Plant Design Project (Y3 module; 30 credits) UCL, 2020 -
Separations' lead during UD I & II

CENG0023: Advanced Process Optimisation (M-level; 15 credits) UCL, 2020 -
Lecturer on Optimization under uncertainty (2021-) & Module lead for 2020-21;

ENGF0003: Mathematical Modelling & Analysis I (Y1 module; 15 credits) UCL, 2019 -
Departmental workshops' lead

CENG0053: Process Engineering Modelling & Design (M-level; 15 credits) UCL, 2019
Lecturer on high-index DAE systems

CENG0053: Process Plant Design Project (Y3 module; 30 credits) UCL, 2018-19
Lecturer & Representative during Appraise & Select phases

PROFESSIONAL SERVICE

Organiser, 2024 Annual Technical Meeting of CAPE SIG, IChemE 2024 -

Member of Management Team, Computer Aided Process Engineering Special Interest Group (CAPE SIG), IChemE 2021 -

International Scientific Committee Member, EFCE/AIDIC E2DT Conference 2021-22

Organising Committee Member , IChemE ChemEng Day UK 2022 2021-22

Member of Management Team, Sargent Centre for Process Systems Engineering 2020 - 22

Member, Early Careers Forum on CCUS, HM's Dept. of Business, Energy & Industrial Strategy 2020 - 22

President, Postgraduate Research Society, Department of Chemical Engineering UCL	2017 -18
Organiser, PhD Seminar Series, Department of Chemical Engineering, UCL	2016 - 17
Facilitator, Advanced optimisation seminar series, Imperial College London	2016
Facilitator, Panhellenic Conference of Chemical Engineering, NTUA	2013

AFFILIATIONS

Fellow, Higher Academy of Education (FHEA)	UK HEA, 2022 -
Associate Researcher, Energy Policy Research Group, Judge Business School	EPRG, 2019 -
Senior Member, American Institute of Chemical Engineering	AIChE, 2019 -
Member, Sargent Centre for Process Systems Engineering	CPSE, 2019 -
Member, UK Carbon Capture & Storage Research Community	UKCCSRC, 2018-22
Associate Member (AMIChemE), Institute of Chemical Engineers	IChemE, 2016 -