

# Saurab Chhachhi

POSTGRADUATE RESEARCHER · CONTROL AND POWER GROUP

Dept. Electrical and Electronic Engineering, Imperial College London, SW7 2AZ, London, UK

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## Education

### Imperial College London

London, UK

#### PHD ELECTRICAL AND ELECTRONIC ENGINEERING

2019 - 2024

- Thesis Title: Balancing Privacy and Data Access: An Interdisciplinary Approach for Differentially-Private Smart Meter Data
- Developed privacy-preserving mechanisms for data valuation and procurement using incentive mechanism design theory, machine learning and mathematical optimisation techniques.
- Investigated valuation frameworks for smart meter data from the perspective of the system, suppliers, and consumers.
- Designed and deployed discrete choice experiment to estimate consumer privacy valuations for smart meter data including the quantification of behavioural effects such as information asymmetries and policy framing.

### Imperial College London

London, UK

#### MENG ELECTRICAL AND ELECTRONIC ENGINEERING - *First Class Honours*

2011 - 2015

- Thesis Title: Data Center Demand Response through Geographical Load Balancing
- Techno-economic study investigating data center participation in distribution grid level demand response programs, through their locational flexibility, to facilitate increased renewable generation.

## Research Employment

### Energy Futures Lab, Imperial College London

London, UK

#### RESEARCH ASSISTANT - *Smart Meter Data under Privacy Concerns*

2020 - 2023

- Assisted in grant writing to secure funding for nationally representative survey on consumer privacy concerns and production of a policy briefing paper on privacy-preserving techniques for smart meter data.
- Led and managed project including writing interim and final reports, budget management and liaison with external partners.

### Holst Centre/imec

Eindhoven, NL

#### INTERN - *Characterisation and Readout for AlGaIn based NO<sub>x</sub> Sensing with Integrated Heating*

2014

- Developed a readout and control circuit for novel low-power nitrogen oxide gas sensors for continuous air quality monitoring.
- Presented product to partner institutions which were trialled in Lisbon, PT.

## Publications

### PUBLISHED

**S. Chhachhi** and F. Teng, "Market value of differentially-private smart meter data," in 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), IEEE, Feb. 2021, pp. 1–5, isbn: 978-1-7281-8897-3, doi: 10.1109/ISGT49243.2021.9372228.

**S. Chhachhi**, F. Teng, P. Ge, J. Graham, and D. Gunduz, "Balancing privacy and access to smart meter data: An Energy Futures Lab briefing paper," Imperial College London, pp. 1–64, May 2022, doi: 10.25561/96974.

R. Hledik, P. Bagci, and **S. Chhachhi**, "Two Paths for Advancing Great Britain's Smart Metering Programme," The Brattle Group, Dec. 2018, coi: 20.500.12592/6gcngb

### IN REVIEW

**S. Chhachhi** and F. Teng, "On the 1-Wasserstein distance between location-scale distributions and the effect of differential privacy," arXiv preprint, Apr. 2023, doi: 10.48550/arXiv.2304.14869.

### IN PREPARATION

**S. Chhachhi** and F. Teng, "Wasserstein distance based market for differentially-private data," Working Paper to be submitted to Journal of Machine Learning Research (JMLR), Nov. 2024.

- S. Chhachhi** and F. Teng, “Wasserstein distance based joint energy and data differentially private smart meter data market,” Working Paper to be submitted to IEEE Transactions on Smart Grids, Nov. 2024
- S. Chhachhi** and F. Teng, “Willingness-to-Pay/Accept for Smart Meter Data Privacy: The Effect of Framing and Information Asymmetries,” Working Paper to be submitted to Nature Energy, Dec. 2024.

## Skills

**Software** Python (inc. NumPy, sci-kit learn, Keras), Gurobi, R, LaTeX, Excel + VBA, MATLAB, STATA

**Languages** English (Fluent), Dutch (Fluent), Hindi (Fluent)

**Techniques** Optimisation, Game Theory, Machine Learning, Econometrics, Financial Modelling, Grant Writing

## Awards, Fellowships, & Grants

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|------|--|---------|
| 2021 | <b>Strategic Priorities Fund 2021-22</b> , Research England UKRI   | £10,000 |
| 2019 | <b>Fully-Funded Studentship</b> , London Interdisciplinary Social Science DTP, ERSC ES/P000703/1:2113082 |         |

## Presentations

### INVITED TALKS

- May 2024. *Wasserstein Distance Based Market for Differentially-Private Data Trading*. EURO 2024, Copenhagen, DK.
- May 2022. *Balancing Privacy and Access to Smart Meter Data*. Energy Futures Lab, London, UK.

### CONTRIBUTED PRESENTATIONS

- S. Chhachhi** and F. Teng, “Market value of differentially-private smart meter data,” in 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), IEEE, Feb. 2021

## Teaching Experience

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|------------|---|
| March 2023 | <b>Digitalisation and Data Privacy in Energy Systems, Msc Sustainable Energy Futures,</b><br>Graduate Teaching Assistant/Lecturer |
| March 2022 | <b>Digitalisation and Data Privacy in Energy Systems, Msc Sustainable Energy Futures,</b><br>Graduate Teaching Assistant          |

## Employment

### The Brattle Group - Economic Consultancy

SENIOR RESEARCH ANALYST

London, UK

2016-2018

- Analysed regulatory regime in Spain for renewable generation, including valuation of over 100 solar, hydro and wind assets.
- Reviewed the UK's Smart Meter Roll-Out, identifying potential risks and developing risk mitigation strategies.
- Modelled regulatory changes in district heating and electricity sectors in Lithuania including valuations of biofuel plants.
- Analysed of the impact of government intervention on foreign currency indexation of loans in Croatia including the modelling of consumer loans and projection of macro economic conditions.

### Sunchine Ltd. - Quality Control for Solar PV

RESEARCH CONSULTANT

The Hague, NL/ Bangalore, IND

2016-2016

- Conducted market research on Indian PV sector including tracking of market trends, policy analysis and company profiling.
- Developed, and managed an end-to-end quality assurance package for solar modules integrating in-line inspection, transportation and installation for a 4MW plants in India.
- Developed discounted cashflow models to investigate the feasibility of rooftop solar in various states across India.

## **e.quinox - Social Enterprise for Rural Electrification**

London, UK/ Kigali, RW

VICE-CHAIRPERSON

2012-2015

- Managed a team working on evaluating and streamlining existing solutions to reduce costs and improve usability.
- Developed a battery evaluation mechanism through a composite comparison index and automated test-benching platform.
- Liaised with local village authorities and government officials to evaluate the current impact and future expansion.

## **Professional Development**

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### **OUTREACH**

**S. Chhachhi**, “Remote working: implications for the electricity network and emissions,” The London Journal of Energy, Winter 2020/Illuminem Voices Jul. 2021

### **TRAINING & DEVELOPMENT**

**COWork Summer School**, Two week online workshop on computational optimisation techniques. 2020

**DTU**, Advanced Optimization and Game Theory for Energy Systems (audit). 2021

**Imperial Graduate School**, Research Computing, Research Publication & Maximising Your Management Skills. 2019-2021

**DTU CEE Summer School**, Data-Driven Analytics and Optimization for Energy Systems. Cancelled due to Covid-19. 2020

**LISS DTP Training Courses**, Intro to Qualitative Research and Qualitative Data Analysis. 2019.

**AQMEN Workshop Series**, Data Wrangling, Predictive Data Analysis, Data Visualisation, London/Edinburgh, 2019

### **ACADEMIC ACTIVITIES**

**Reviewer**, IEEE Transactions on Power Systems, Sustainable Cities

**Member**, IEEE, IEEE PES

## **References**

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**Dr Fei Teng**, Director of Education at Energy Futures Lab & Senior Lecturer, 1116, Electrical Engineering, Imperial College London, +44 (0)20 7594 6178, f.teng@imperial.ac.uk