Sachit **Mahajan**

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Interests

Data Science, Human-Centered Computing, Machine Learning, Environment Monitoring, Internet of Things, Citizen Science

Current Position

Researcher and Lecturer
ETH ZURICH
Zurich, Switzerland
Oct 2020-Present

- Working on the ERC CoCi project as part of the Computational Social Science (COSS) group
- Researching participatory formats to explore innovative and problem solving potential of societies
- Exploring the use of IoT and Data Science to build resilient cities
- Lecturing duties: 851-0467-00L From Traffic Modeling to Smart Cities and Digital Democracies, 860-0022-00L Complexity and Global System Science

Education

PhD in Social Networks and Human Centered Computing
ACADEMIA SINICA AND NATIONAL CHENGCHI UNIVERSITY (JOINT PROGRAM)
Taipei, Taiwan
Sep 2015 - Jun 2019

- Received Taiwan International Graduate Program Fellowship from Academia Sinica
- Thesis: Internet of Environmental Things (IoET): A Human Centered Approach

M.Sc in Communication Engineering (Merit)
UNIVERSITY OF MANCHESTER
Manchester, UK
Sep 2012 - Dec 2013

- Thesis: Brain Tumor Detection and Localization using Time Reversal Algorithm and FDTD Method

B.Tech in Electronics and Communication Engineering (First Class with Distinction)
PUNJAB TECHNICAL UNIVERSITY
Punjab, India
Sep 2008 - Jul 2012

- Project: Designing RFID Based Attendance System

Experience

University of Cambridge
RESEARCH ASSOCIATE
Cambridge, UK
Jun 2019- Sep 2020

- Working on the AirKit proof of concept project as part of the Citizen Sense research group
- Work focused on Citizen Sense research to investigate the role of low-cost and digital monitoring technologies in facilitating and organising new types of environmental engagement
- Design and development of environment monitoring devices (Raspberry pi, Arduino)
- Development of data analysis tools and machine learning algorithms for data mining, outlier detection and data visualization

University of Surrey
GCARE RESEARCH FELLOW
Guildford, UK
Oct 2018 - May 2019

- Worked on EU H2020 research and innovation project iSCAPE (Improving the Smart Control of Air Pollution in Europe)
- Responsibilities include leading field experimental campaigns for evaluation of air pollution control interventions
- Simulating effects of green infrastructural solutions on air quality at the neighbourhood scale using AI based systems
- Assessing air pollution sensor technologies and citizen involvement by organizing Citizen Science activities
- Development of data analysis toolbox and machine learning based calibration algorithms

Academia Sinica
TEACHING ASSISTANT
Taipei, Taiwan
Aug 2017 - Jan 2018

- Teaching Assistant for Mobile and Social Networks Course.

National Institute of Technology, Goa, India

ASSISTANT PROFESSOR (ON CONTRACT)

Goa, India
July 2014 - July 2015

- Subjects Taught : Data Communication, Computer Architecture and Ad-Hoc and Sensor Networks.
- Labs Supervised : Digital System Design lab, Analog Electronics lab.
- Research area: Time-series analysis and data science.

Honors, Awards & Grants ───────────────

2021	**UpStream:Community-led monitoring to improve water quality in the UK and Taiwan**, Funded by ESRC, UK and MOST, Taiwan. Role: Co-Investigator	*ETH Zurich*
2019	**CArE-Cities: Clean Air Engineering for Cities**, Funded by Research England under the GCRF. Role: Core Team Member, Grant Writing	*University of Surrey*
2018	**Best Paper Award**, Best paper award for the paper "Vector Mosquitoes Classification System Based on Edge Computing and Deep Learning" at IEEE TAAI.	*Taipei, Taiwan*
2018	**Best Presenter Award**, Best presenter award for presentation of PhD Dissertation work at PhD Forum of ACM MobiSys.	*Munich, Germany*
2018	**Travel Grant**, Awarded by Taiwan International Graduate Program, Academia Sinica for presenting work at ACM MobiSys 2018.	*Munich, Germany*
2017	**Travel Grant**, Awarded by Network Research Lab, Institute of Information Science, Academia Sinica for presenting work at IEEE Globecom 2017.	*Singapore*
2017	**Travel Grant**, Awarded by Ministry of Science and Technology (MOST) Taiwan for presenting work at IEEE Smart World Congress,2017.	*San Francisco, U.S.A*
2016	**Best Poster Award**, Best poster award for work on "SwapItUp: A Face Swap Application for Privacy Protection" by Social Networks and Human Centered Computing Program, Academia Sinica.	*Taipei, Taiwan*
2015	**TIGP Fellowship**, Taiwan International Graduate Program (TIGP) fellowship awarded by Academia Sinica, Taiwan.	*Taipei, Taiwan*

Applications and Projects ───────────────

VAYU: Data Analysis Application

A PYQT5 BASED DATA ANALYSES APPLICATION FOR EXPLORING AND INTERPRETING CITIZEN-GENERATED SENSR DATA.

2021

- The application supports data processing, aggregation, summarization, analysis and visualization.

Sense Your Data: Sensor Toolbox

DESIGNED A TOOLBOX THAT CAN ASSIST RESEARCHERS AS WELL AS PEOPLE FROM NON-TECHNICAL BACKGROUND TO ANALYZE AND VISUALIZE DATA IN AN EASY WAY.

2019

- The tool supports several functions like data summary, plotting, outlier detection and gap filling.

Health-Optimal route recommendation application

DESIGNED AN APPLICATION FOR CLEAN ROUTE RECOMMENDATION BASED ON BEST AIR QUALITY IN TAIWAN

2018

- The application recommends routes from origin to destination with lowest PM2.5 exposure.

An Anomaly Detection Framework (ADF) for Large-Scale PM2.5 Sensing Systems

DEVELOPMENT AND IMPLEMENTATION OF AN ADF THAT CAN IDENTIFY OUTLIERS IN THE RAW MEASUREMENT DATA AS WELL AS INFER ANOMALOUS EVENTS

2018

- The framework ensures the data quality for large-scale environmental sensing systems.

PM2.5 Forecast Service

REAL-TIME PM2.5 FORECAST SERVICE IN TAIWAN FOR THE NEXT 5 HOURS

2017

- Designed a real-time PM2.5 forecast service in Taiwan using a neural network based hybrid model.

PM2.5 Visualization Service

<small>APPLICATION TO VISUALIZE CHANGE IN TAIWAN AIR QUALITY</small>   *2017*

• Designed an Inverse Distance Weighting (IDW) animation of PM2.5 in last 24 hours.

SwapItUp Application

<small>A FACE SWAP APPLICATION FOR PRIVACY PROTECTION</small>   *2016*

• Designed a face swap application for privacy protection as well as for entertainment purposes.

Skills ————————————————————————————

Programming Languages, Python, R Programming, Java Script
Hard Skills, Machine Learning, Data Mining, Modelling, Data Visualization, Statistical Analysis
Soft Skills, Problem Solving, Critical Thinking, Creativity, Interpersonal Skills

Publications ————————————————————————

Journals

1. Chen LJ, Ho YH, Hsieh HH, Huang ST, Lee HC, **Mahajan S**. "ADF: an Anomaly Detection Framework for Large-scale PM2. 5 Sensing Systems." IEEE Internet of Things Journal, 2017 Apr;5(2):559-70.
2. **Mahajan, Sachit**, et al. "Improving the accuracy and efficiency of pm2.5 forecast service using cluster-based hybrid neural network model." IEEE Access, 2018, 6:19193–19204.
3. **Mahajan, Sachit**, et al. "Short-Term PM2. 5 Forecasting Using Exponential Smoothing Method: A Comparative Analysis." Sensors, 18(10),2018, p.3223.
4. **Mahajan, Sachit**, et al. "CAR: The Clean Air Routing Algorithm for Path Navigation With Minimal PM2. 5 Exposure on the Move." IEEE Access 7 (2019): 147373-147382.
5. **Mahajan, Sachit**, Prashant Kumar, Janaina Antonino Pinto, Agnese Riccetti, Katinka Schaaf, Guillem Camprodon, Viktor Smári, Antonella Passani, and Giuseppe Forino. "A citizen science approach for enhancing public understanding of air pollution." Sustainable Cities and Society 52 (2020): 101800.
6. Liou NC, Luo CH, **Mahajan S**, Chen LJ. "Why Is Short-Time PM2. 5 Forecast Difficult? The Effects of Sudden Events." IEEE Access, 2020.
7. **Mahajan, Sachit** and Prashant Kumar. "Evaluation of low-cost sensors for quantitative personal exposure monitoring." Sustainable Cities and Society (2020): 102076.
8. **Mahajan, Sachit** and Jenny Martinez. "Water, water, but not everywhere: analysis of shrinking water bodies using open access satellite data." International Journal of Sustainable Development and World Ecology (2020): 1-13.
9. **Mahajan, Sachit**, Cyuan-Heng Luo, Dong-Yi Wu, and Ling-Jyh Chen. "From Do-It-Yourself (DIY) to Do-It-Together (DIT): Reflections on Designing a Citizen Driven Air Quality Monitoring Framework in Taiwan." Sustainable Cities and Society (2020): 102628.
10. Helbing, D.; Fanitabasi, F.; Giannotti, F.; Hänggli, R.; Hausladen, C.I.; van den Hoven, J.; **Mahajan, S.**; Pedreschi, D.; Pournaras, E. Ethics of Smart Cities: Towards Value-Sensitive Design and Co-Evolving City Life. Sustainability 2021, 13, 11162.

Book Chapters

1. **Mahajan, Sachit**, et al. "A Machine Learning Based PM2.5 Forecasting Framework Using Internet of Environmental Things." In: Lin YB., Deng DJ., You I., Lin CC. (eds) IoT as a Service. IoTaaS 2017. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 246. Springer, Cham, 2018

Conference Proceedings

1. Roberto Carvalho, Hung-Yu Lee, **Sachit Mahajan**, and Ling-Jyh Chen.A SDR-Based Indoor Localization System for Mobile Devices.ACM/USENIX International Conference on Mobile Systems, Applications, and Services (ACM/USENIX MobiSys'16), Singapore, 2016.
2. **Sachit Mahajan**, Ling-Jyh Chen, and Tzu-Chieh Tsai. SwapItUp: A Face Swap Application for Privacy Protection.IEEE International Conference on Advanced Information Networking and Applications (AINA'17), Taipei, Taiwan, 2017.(Acceptance Rate: 29.1%, 163/561)
3. **Sachit Mahajan**, Ling-Jyh Chen, and Tzu-Chieh Tsai. An Empirical Study of PM2.5 Forecasting Using Neural Network. IEEE Smart World Congress, San Francisco, CA, USA, 2017.(Acceptance Rate: 28.8%, 21/73)
4. **Sachit Mahajan**, Hao-Min Liu, Tzu-Yu Huang, Tzu-Chieh Tsai, and Ling-Jyh Chen. Opportunistic PM2.5 Sensing: A Feasibility Study. IEEE Globecom, Singapore, 2017.
5. **Sachit Mahajan**. 2018. Internet of Environmental Things : A Human Centered Approach. In ACM MobiSys PhD Forum'18:, Munich, Germany, 2018. (**Best Presenter Award**)
6. **Sachit Mahajan**, Yu-Siou Tang, Dong-Yi Wu, Tzu-Chieh Tsai, and Ling-Jyh Chen. CAR: The Cleanest Air Routing Algorithm for Path Navigation with Minimal PM2.5 Exposure on the Move. ACM International Conference on Mobile Systems, Applications, and Services (ACM MobiSys'18), Munich, Germany, 2018.
7. **Sachit Mahajan**, Wei-Lin Wu, Tzu-Chieh Tsai, and Ling-Jyh Chen. Design and Implementation of IoT-enabled Personal Air Quality Assistanton Instant Messenger. In Proceedings of ACM MEDES'18, 2018.
8. Ling-Jyh Chen, Shih-Chun Lung, **Sachit Mahajan**, Hsin-Hung Hsieh, Jin-Wei Liu. Airbox: A Participatory Ecosystem for pm2.5 Monitoring. 10th International Aerosol Conference, St. Louis, Missouri, USA, 2018.
9. Cyuan Heng Luo, Hsuan Yang, Li-Pang Huang, **Sachit Mahajan** and Ling-Jyh Chen. A Fast PM2.5 Forecast Approach Based on Time-Series Data Analysis, Regression and Regularization. International Conference on Technologies and Applications of Artificial Intelligence (TAAI'18), IEEE.
10. Li-Pang Huang, Ming-Hong Hong, Cyuan Heng Luo, **Sachit Mahajan** and Ling-Jyh Chen. A Vector Mosquitoes Classification System Based on Edge Computing and Deep Learning. International Conference on Technologies and Applications of Artificial Intelligence (TAAI'18), IEEE. (**Best Paper Award)**
11. **Sachit Mahajan**, Prashant Kumar, 2019. Sense Your Data: Sensor Toolbox Manual, Version 1.0. pp.1-7.DOI: 10.13140/RG.2.2.17249.76640/4

Reference

1	**Prof. Ling-Jyh Chen**, Research Fellow, IIS, Academia Sinica, cclljj@iis.sinica.edu.tw	*Taiwan*
2	**Prof. Tzu-Chieh Tsai**, Professor, Dept. of Computer Science, National Chengchi University, ttsai@cs.nccu.edu.tw	*Taiwan*
3	**Prof. Jennifer Gabrys**, Chair in Media, Culture and Environment, University of Cambridge, jg899@cam.ac.uk	*UK*