

Sayan Biswas

Research interests

Differential Privacy, Federated Learning, Decentralised Learning, Privacy-Preserving Machine Learning, Location Privacy.

Positions

2023 - present **Postdoctoral Researcher**, EPFL (SaCS Lab), Lausanne, Switzerland.

Education

- 2020 - 2023 **PhD in Computer Science**, INRIA and École Polytechnique (Institut Polytechnique de Paris), Palaiseau, France.
Thesis: *Understanding and optimizing the trade-off between privacy and utility from a foundational perspective*. Supervisor: Catuscia Palamidessi
- 2016 - 2020 **Master of Mathematics (M.Math.)**, **First-class honours**, University of Bath, Bath, England.
Specialisation: Probability Theory, Statistics, Data Analysis
M.Math project: *Quantifying Identifiability*. Supervisors: James H. Davenport and Theresa Smith

Publications

Peer-Reviewed Conferences

- 2023 Sayan Biswas, Kangsoo Jung, and Catuscia Palamidessi: "**Tight Differential Privacy Guarantees for the Shuffle Model with k -Randomized Response**". Proceedings of the 16th International Symposium on Foundations and Practice of Security (FPS) 2023 (to appear).
- 2023 Sayan Biswas and Catuscia Palamidessi: "**PRIVIC: A privacy-preserving method for incremental collection of location data**". Proceedings on Privacy Enhancing Technologies (PoPETs), Volume 2024, Issue 1, pp 582–596. Published: October, 2023. DOI: 10.56553/popets-2024-0033.
- 2023 Filippo Galli, Sayan Biswas, Kangsoo Jung, Tommaso Cucinotta, and Catuscia Palamidessi: "**Group privacy for Personalized Federated Learning**". Proceedings of the 9th International Conference on Information Systems Security and Privacy (ICISSP) 2023, pp 252–263, SciTePress Digital Library. Published: February 24, 2023. ISBN: 978-989-758-624-8, DOI: 10.5220/0011885000003405.
- 2022 Sayan Biswas, Graham Cormode, and Carsten Maple: "**Impact of Sampling on Locally Differentially Private Data Collection**". Proceedings of Competitive Advantage in the Digital Economy – Resilience, Sustainability, Responsibility, and Identity (CADE) 2022, pp 64–70, IET Digital Library and IEEE Xplore. Published: November 9, 2022. Winner of the **Best Paper Award**. ISBN: 978-1-83953-742-4, DOI: 10.1049/icp.2022.2042.
- 2022 Sayan Biswas, Kangsoo Jung, and Catuscia Palamidessi: "**Tight Differential Privacy Blanket for Shuffle Model**". Proceedings of Competitive Advantage in the Digital Economy – Resilience, Sustainability, Responsibility, and Identity (CADE) 2022, pp 61–63, IET Digital Library and IEEE Xplore. Published: November 9, 2022. ISBN: 978-1-83953-742-4, DOI: 10.1049/icp.2022.2041.
- 2021 Sayan Biswas, Kangsoo Jung, and Catuscia Palamidessi: "**An Incentive Mechanism for Trading Personal Data in Data Markets**". Proceedings of the 18th International Colloquium on Theoretical Aspects of Computing (ICTAC) 2021, pp 197–213, LNCS 12819, Springer. Published: August 20, 2021. ISBN: 978-3-030-85315-0, DOI: 10.1007/978-3-030-85315-0_12.

Journals

- 2024 Ugur Ilker Atmaca, Sayan Biswas, Carsten Maple, and Catuscia Palamidessi: "**A Privacy-Preserving Querying Mechanism with High Utility for Electric Vehicles**". IEEE Open Journal of Vehicular Technology, Volume 5, pp 262–277. Published: January 30, 2024. DOI: 10.1109/OJVT.2024.3360302.
- 2023 Filippo Galli, Kangsoo Jung, Sayan Biswas, Catuscia Palamidessi, and Tommaso Cucinotta: "**Advancing Personalized Federated Learning: Group Privacy, Fairness, and Beyond**". Springer Nature Computer Science, Volume 4, Issue 6, Article 831 (2023). Published: October 28, 2023. DOI: 10.1007/s42979-023-02292-0.

Book Sections

- 2021 Kangsoo Jung, Sayan Biswas, and Catuscia Palamidessi: "**Establishing the Price of Privacy in Federated Data Trading**". Protocols, Strands, and Logic, pp 232–250, LNCS 13066, Springer. Published: November 19, 2021. ISBN: 978-3-030-91631-2, DOI: 10.1007/978-3-030-91631-2_13.

Key Acceptances at Non-Archival Workshops

- 2023 Sayan Biswas and Catuscia Palamidessi: "**PRIVIC: A privacy-preserving method for incremental collection of location data**". Theory and Practice of Differential Privacy (TPDP) Workshop 2023. September 27–28, 2023; Boston, USA.

- 2023 Filippo Galli, *Sayan Biswas*, Kangsoo Jung, Tommaso Cucinotta, and Catuscia Palamidessi: “**On the adaptive sensitivity of differentially private machine learning**”. The 4th Workshop on Privacy-Preserving Artificial Intelligence in Conjunction with AAAI (PPAI) 2023. February 13, 2023; Washington DC, USA.
- 2022 Filippo Galli, *Sayan Biswas*, Kangsoo Jung, Tommaso Cucinotta, and Catuscia Palamidessi: “**Group privacy for personalized federated learning**”. International Workshop on Federated Learning: Recent Advances and New Challenges in Conjunction with NeurIPS (FL-NeurIPS) 2022. December 2, 2022; New Orleans, USA. One of the **12 amongst the 103 submissions selected for oral presentation**.

Awards and Achievements

- 2022 **Winner of the Best Paper Award at the Competitive Advantage in the Digital Economy – Resilience, Sustainability, Responsibility, and Identity (CADE) 2022** held in Venice, Italy
- 2018 **Qualified for the International Collegiate Programming Contest (ICPC) European Finals 2018** (*first solver of Problem 5 in the UK and Ireland qualification round*) held at TU Eindhoven, The Netherlands, representing University of Bath
- 2016 **Received an Honourable Mention in the final round of Indian National Philosophy Olympiad 2016** (*top 10 from India*)
- 2016 **Qualified the Zonal Informatics Olympiad, 2016** (*top 6 in West Bengal, India*), organised by the Indian Association for Research in Computing Science
- 2015 **Received an Honourable Mention at the International Linguistics Olympiad (IOL) Training Camp 2015** (*top 15 in India*) held at Microsoft Research Lab in Bangalore, India (the invitational round to be selected in the Indian team for IOL 2015)
- 2013 & 2014 **Qualified the Regional Mathematical Olympiad 2013 & 2014** (*top 28 in West Bengal, India*), organised by the National Board of Higher Mathematics and Homi Bhabha Centre for Science and Education

Miscellaneous Research Appointments

- Sep'23 - Oct'23 **Visiting Scholar**, *Macquarie University*, Sydney, Australia.
Supervisors: Annabelle McIver and Natasha Fernandes
- Jan'22 - Mar'22 **Visiting Scholar**, *The University of Warwick*, Coventry, England.
Supervisors: Carsten Maple and Graham Cormode
- Jun'20 - Aug'20 **Research Intern**, *The University of Warwick*, Coventry, England.
Supervisors: Graham Cormode and Carsten Maple
- Jun'19 - Sep'19 **Research Intern**, *INRIA*, Palaiseau, France.
Supervisor: Catuscia Palamidessi
- Jun'18 - Aug'18 **Research Intern**, *Institute for Mathematical Innovation (IMI) and University of Bath*, Bath, England.
Supervisor: Christopher Jennison

Teaching

- Aug'22 - Sep'22 **INRIA-DFKI European Summer School on AI (IDESSAI 2022)**, *Saarbrücken, Germany*.
- Delivered a hands-on session to implement *differential privacy with federated learning in Python*
- Got a *special mention* as the *most liked course* of the summer school
- Feb'21 - Jun'23 **École Polytechnique**, *Palaiseau, France*.
Teaching Assistant
- CSE 102: Advanced Programming with Python
- Oct'18 - May'20 **University of Bath**, *Bath, England*.
Teaching Assistant
- XX10190 Programming & Discrete Mathematics (with MATLAB) – 2018-19
- MA10209 Algebra 1A – 2019-20
- MA10212 Prob. & Stat. 1B – 2019-20
- Jul'17 - Aug'17 **Humen Foreign Language School**, *Humen, China*.
Foreign Exchange Teacher
- Taught Mathematics and English at the 2017 International Summer Camp organised by HFLS

Academic Services

- 2023 - present Peer Reviewer – *IEEE Journal on Selected Areas in Information Theory*
- 2021 - present Peer Reviewer – *IEEE Transactions on Dependable and Secure Computing*
- 2022 - 2023 Member of the Programme Committee – *AAAI Workshop Privacy Preserving Artificial Intelligence (PPAI) 2023*

Select Talks

- 2022 “**Incremental collection of location data: Differential Privacy and beyond...**”. 7th Franco-Japanese Cybersecurity Workshop 2022. Presentation: 24th October 2022 in Tokyo, Japan.
- 2022 “**Three-way optimization of privacy and utility of location data**”. 12th Atelier sur la Protection de la Vie Privée (APVP) 2022. Presentation: 14th March 2022 in Chatenay-sur-Seine, France.

Other Work Experience

- Nov'18 - May'20 Lead student-editor of Dept. of Mathematics newsletter of University of Bath
- Jul'19 Invigilator and examiner for the International Mathematical Olympiad (IMO) 2019 at Bath, UK

Feb'17 - Nov'19 Project coordinator and head for Mathscon (UK's largest student-led maths conference)
Jan'17 - Mar'20 Volunteer for United Kingdom Mathematics Trust and Mentor for British Mathematical Olympiad