

Debabrota Basu

Inria Starting Faculty, Equipe Scool, Inria Centre at Université de Lille, CNRS- CRISAL Laboratory, Centrale Lille

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Scholar [Link](#)

Fields of Interest

Statistical learning theory, Reinforcement learning, Multi-armed bandits, Differential privacy, Fairness and algorithmic bias, Robust machine learning, Statistical hypothesis testing, Information theory, Algorithmic auditing.

Education

2014-2018 PhD in Computer Science - School of Computing, National University of Singapore (NUS)
Thesis- *Learning to Make Decisions with Incomplete Information: Reinforcement Learning, Information Geometry, and Real-Life Applications*
Advisors- Prof. Stéphane Bressan (NUS) and Prof. Pierre Senellart (ENS, PSL)
Examiners- Olivier Cappé, Jonathan Scarlett, and Tan Kian Lee

2010-2014 B.E. in E.T.C.E. - Electronics and Telecommunication Engineering, Jadavpur University
Thesis- *Non-rigid Image Registration using Embedded Distance based Graph Cut Algorithm*
Advisor- Prof. Ananda Shankar Chowdhury

Research Experience

Nov 2020- Present **Faculty (ISFP)**
Équipe Scool, Inria Lille- Nord Europe, France.
Complete Affiliation: Univ. Lille, Inria, CNRS, Centrale Lille, UMR 9189 - CRISAL

Mar 2019- Oct 2020 **Postdoctoral research fellow**
PI: Christos Dimitrakakis.
Data Science and AI Division, Chalmers University of Technology, Sweden.

June 2019- July 2019 **Visiting researcher: Fairness in Reinforcement Learning**
PI: David Parkes.
School of Engineering and Applied Sciences, Harvard University, USA.

Aug 2018- Feb 2019 **Research fellow**
PI: Stéphane Bressan, Assoc. Prof.
School of Computing, National University of Singapore, Singapore.

April 2017- July 2017 **Visiting graduate student**
Advisor: Pierre Senellart, Prof., Computer Science Department.
DI, École Normale Supérieure, Paris, France.

May 2016- July 2016 **Visiting researcher: A Learning approach to Efficient Migration of Virtual Machines in Clouds**
Advisor: Haibo Chen, Prof., Institute of Parallel and Distributed Systems.
Shanghai Jiao Tong University, Shanghai, China.

Jan 2015- Oct 2018 **Graduate researcher**
Advisor: Stéphane Bressan (NUS) and Pierre Senellart (ENS).
Image and Pervasive Access Laboratory (IPAL), UMI CNRS, Singapore.

Aug 2015- Mar 2018 **Graduate researcher**
Advisor: Stéphane Bressan, Assoc. Prof., NUS.
Energy and Environmental Sustainability Solutions for Megacities - E2S2, NUS, Singapore and SJTU, Shanghai.

- May 2014- July 2014** **Research intern: Design of Quantum True Random Number Generator**
 Advisor: Subhamoy Maitra, Prof., Applied Statistics Unit.
 Centre for excellence in cryptology, Indian Statistical Institute, Kolkata.
- May 2013 - July 2013** **Research intern: Fuzzy Job Shop Scheduling and Manpower Scheduling Algorithms**
 Advisor: P.N. Suganthan, Assoc. Prof, School of Electrical Engineering.
 Computer Vision Laboratory, Nanyang Technological University, Singapore.
- May 2012 - July 2012** **Research intern: Design of advanced control and automation system for industrial plants**
 Control and Process Automation group, ABB.
 ABB, Bengaluru, India.

Academic Publications (Link to PDFs)

- [1] Achraf Azize and Debabrota Basu. Interactive and concentrated differential privacy for bandits. In *Sixteenth European Workshop on Reinforcement Learning*, 2023.
- [2] Achraf Azize, Marc Jourdan, Aymen Al Marjani, and Debabrota Basu. On the complexity of differentially private best-arm identification with fixed confidence. In *Sixteenth European Workshop on Reinforcement Learning*, 2023.
- [3] Emil Carlsson, Debabrota Basu, Fredrik D Johansson, and Devdatt Dubhashi. Pure exploration in bandits with linear constraints. In *Sixteenth European Workshop on Reinforcement Learning*, 2023.
- [4] Edwige Cyffers, Aurelien Bellet, and Debabrota Basu. From noisy fixed-point iterations to private admm for centralized and federated learning. In *International Conference on Machine Learning*. PMLR, 2023.
- [5] Bishwamitra Ghosh, Debabrota Basu, and Kuldeep S Meel. “how biased are your features?”: Computing fairness influence functions with global sensitivity analysis. In *Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency*, pages 138–148, 2023.
- [6] Pratik Karmakar and Debabrota Basu. Marich: A query-efficient distributionally equivalent model extraction attack using public data. In *AAAI Workshop on Privacy Preserving AI*, 2023.
- [7] Odalric-Ambrym Maillard, Timothée Mathieu, and Debabrota Basu. Farm-gym: A modular reinforcement learning platform for stochastic agronomic games. In *2nd AAAI Workshop on AI for Agriculture and Food Systems*, 2023.
- [8] Reda Ouhamma, Debabrota Basu, and Odalric Maillard. Bilinear exponential family of mdps: Frequentist regret bound with tractable exploration & planning. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 37, pages 9336–9344, 2023.
- [9] Achraf Azize and Debabrota Basu. When privacy meets partial information: A refined analysis of differentially private bandits. *Advances in Neural Information Processing Systems*, 35:32199–32210, 2022.
- [10] Hannes Eriksson, Debabrota Basu, Mina Alibeigi, and Christos Dimitrakakis. Risk-sensitive bayesian games for multi-agent reinforcement learning under policy uncertainty. In *OptLearnMAS@ AAMAS*, 2022.
- [11] Hannes Eriksson, Debabrota Basu, Mina Alibeigi, and Christos Dimitrakakis. Sentinel: taming uncertainty with ensemble based distributional reinforcement learning. In *Uncertainty in Artificial Intelligence*, pages 631–640. PMLR, 2022.
- [12] Yannis Flet-Berliac and Debabrota Basu. Saac: Safe reinforcement learning as an adversarial game of actor-critics. In *RLDM 2022-The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2022.
- [13] Bishwamitra Ghosh, Debabrota Basu, and Kuldeep S Meel. Algorithmic fairness verification with graphical models. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 36, pages 9539–9548, 2022.
- [14] Thomas Kleine Buening, Meirav Segal, Debabrota Basu, Anne-Marie George, and Christos Dimitrakakis. On meritocracy in optimal set selection. In *Equity and Access in Algorithms, Mechanisms, and Optimization*, pages 1–14. 2022.

- [15] Junxiong Wang, Debabrota Basu, and Immanuel Trummer. Procrastinated tree search: Black-box optimization with delayed, noisy, and multi-fidelity feedback. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 36, pages 10381–10390, 2022.
- [16] Junxiong Wang, Immanuel Trummer, and Debabrota Basu. UDO: Universal database optimization using reinforcement learning. In *VLDB '22*, 2022.
- [17] Shirin Tavera, Alexander Schilep, and Debabrota Basu. Federated learning of oligonucleotide drug molecule thermodynamics with differentially private admm-based svm. In *Proceedings of PharML: Machine Learning for Pharma and Healthcare Applications at ECML/PKDD*. Springer, Sept. 2021.
- [18] Bishwamitra Ghosh, Debabrota Basu, and Kuldeep S Meel. Justicia: A stochastic sat approach to formally verify fairness. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 35, pages 7554–7563, 2021.
- [19] Igor Ryazanov, Amanda T Nylund, Debabrota Basu, Ida-Maja Hassellöv, and Alexander Schliep. Deep learning for deep waters: An expert-in-the-loop machine learning framework for marine sciences. *Journal of Marine Science and Engineering*, 9(2):169, 2021.
- [20] Junxiong Wang, Immanuel Trummer, and Debabrota Basu. Demonstrating UDO: A unified approach for optimizing transaction code, physical design, and system parameters via reinforcement learning. In *SIGMOD/PODS '21*, page 2794–2797. ACM, 2021.
- [21] Naheed Anjum Arafat, Debabrota Basu, Laurent Decreusefond, and Stéphane Bressan. Construction and random generation of hypergraphs with prescribed degree and dimension sequences. *DEXA*, 2020.
- [22] Debabrota Basu, Christos Dimitrakakis, and Aristide Tossou. Differential privacy for multi-armed bandits: What is it and what is its cost? *arXiv preprint arXiv:1905.12298*, 2020.
- [23] Ashish Dandekar, Debabrota Basu, and Stéphane Bressan. Differential privacy at risk: Bridging randomness and privacy budget. In *AAAI Workshop on Privacy-Preserving Artificial Intelligence*, 2020.
- [24] Divya Grover, Debabrota Basu, and Christos Dimitrakakis. Bayesian reinforcement learning via deep, sparse sampling. In *AISTATS*, 2020.
- [25] Emilio Jorge, Hannes Eriksson, Christos Dimitrakakis, Debabrota Basu, and Divya Grover. Inferential induction: A novel framework for Bayesian reinforcement learning. In *Proceedings on "I Can't Believe It's Not Better!" at NeurIPS Workshops*, volume 137, pages 43–52. PMLR, 12 Dec 2020.
- [26] Naheed Anjum Arafat, Debabrota Basu, and Stéphane Bressan. ϵ -net induced lazy witness complex on graphs. In *International Workshop on Applications of Topological Data Analysis*. ECML-PKDD, 2019.
- [27] Naheed Anjum Arafat, Debabrota Basu, and Stéphane Bressan. Topological data analysis with ϵ -net induced lazy witness complex. In *DEXA (2)*, volume 11707 of *Lecture Notes in Computer Science*, pages 376–392. Springer, 2019.
- [28] Debabrota Basu, Christos Dimitrakakis, and Aristide C. Y. Tossou. Differential privacy for multi-armed bandits: What is it and what is its cost? *CoRR*, abs/1905.12298, 2019.
- [29] Debabrota Basu, Pierre Senellart, and Stéphane Bressan. BelMan: Information geometric approach to stochastic bandits. In *ECML-PKDD*, 2019.
- [30] Debabrota Basu, Xiayang Wang, Yang Hong, Haibo Chen, and Stéphane Bressan. Learn-as-you-go with Megh: Efficient live migration of virtual machines. *IEEE Trans. Parallel Distrib. Syst.*, 30(8):1786–1801, 2019.
- [31] Ashish Dandekar, Debabrota Basu, and Stéphane Bressan. Differentially private non-parametric machine learning as a service. In *DEXA (1)*, volume 11706 of *Lecture Notes in Computer Science*, pages 189–204. Springer, 2019.
- [32] Ashish Dandekar, Debabrota Basu, Thomas Kister, Geong Sen Poh, Jia Xu, and Stéphane Bressan. Privacy as a Service: Publishing data and models. In *DASFAA (3)*, volume 11448 of *Lecture Notes in Computer Science*, pages 557–561. Springer, 2019.

- [33] Aristide C. Y. Tossou, Debabrota Basu, and Christos Dimitrakakis. Near-optimal optimistic reinforcement learning using empirical Bernstein inequalities. In *ICML Workshop on Exploration in RL*, 2019.
- [34] Aristide C. Y. Tossou, Debabrota Basu, and Christos Dimitrakakis. Near-optimal reinforcement learning using Bayesian quantiles. *CoRR*, abs/1906.09114, 2019.
- [35] Ashish Dandekar, Debabrota Basu, and Stéphane Bressan. Differential privacy for regularised linear regression. In *DEXA (2)*, volume 11030 of *Lecture Notes in Computer Science*, pages 483–491. Springer, 2018.
- [36] Debabrota Basu, Giulia Pedrielli, Weidong Chen, Szu Hui Ng, Loo Hay Lee, and Stéphane Bressan. Sequential vessel speed optimization under dynamic weather conditions. In *Proceedings of the 5th International Maritime-Port Technology and Development Conference, MTEC 2017*, volume 2017-April, pages 431–449. Research Publishing Services, 2017.
- [37] Debabrota Basu, Xiayang Wang, Yang Hong, Haibo Chen, and Stéphane Bressan. Learn-as-you-go with Megh: Efficient live migration of virtual machines. In *ICDCS*, pages 2608–2609. IEEE Computer Society, 2017.
- [38] Qing Liu, Debabrota Basu, Shruti Goel, Talel Abdesslem, and Stéphane Bressan. How to find the best rated items on a Likert scale and how many ratings are enough. In *DEXA (2)*, volume 10439 of *Lecture Notes in Computer Science*, pages 351–359. Springer, 2017.
- [39] Debabrota Basu, Qian Lin, Weidong Chen, Hoang Tam Vo, Zihong Yuan, Pierre Senellart, and Stéphane Bressan. Regularized cost-model oblivious database tuning with reinforcement learning. *T. Large-Scale Data- and Knowledge-Centered Systems*, 28:96–132, 2016.
- [40] Qing Liu, Debabrota Basu, Talel Abdesslem, and Stéphane Bressan. Top-k queries over uncertain scores. In *OTM Conferences*, volume 10033 of *Lecture Notes in Computer Science*, pages 245–262, 2016.
- [41] Debabrota Basu, Qian Lin, Weidong Chen, Hoang Tam Vo, Zihong Yuan, Pierre Senellart, and Stéphane Bressan. Cost-model oblivious database tuning with reinforcement learning. In *DEXA (1)*, volume 9261 of *Lecture Notes in Computer Science*, pages 253–268. Springer, 2015.
- [42] Debabrota Basu, Qian Lin, Zihong Yuan, Pierre Senellart, and Stéphane Bressan. Apprentissage par renforcement pour optimiser les bases de données indépendamment du modèle de coût. In *Bases de Données Avancées*, 2015.
- [43] Saugat Bhattacharyya, Debabrota Basu, Amit Konar, and D. N. Tibarewala. Interval type-2 fuzzy logic based multiclass ANFIS algorithm for real-time EEG based movement control of a robot arm. *Robotics and Autonomous Systems*, 68:104–115, 2015.
- [44] Debabrota Basu, Saugat Bhattacharyya, Dwaipayan Sardar, Amit Konar, D. N. Tibarewala, and Atulya K. Nagar. A differential evolution based adaptive neural type-2 fuzzy inference system for classification of motor imagery EEG signals. In *FUZZ-IEEE*, pages 1253–1260. IEEE, 2014.
- [45] Swagatam Das, Subhodip Biswas, Bijaya K. Panigrahi, Souvik Kundu, and Debabrota Basu. A spatially informative optic flow model of bee colony with saccadic flight strategy for global optimization. *IEEE Trans. Cybernetics*, 44(10):1884–1897, 2014.

Awards and Honours

- 2023** **ANR Young Researcher Award**
ANR (French National Research Agency).
- 2022** **Best Paper with Student Presenter Award**
ACM EAAMO.
- 2020** **Economics and Computation (EC) Global Outreach Program**
ACM SIGECOM.
- 2019-2020** **Graduate Research Innovation Programme (GRIP)**
National University of Singapore.

2017- **I&E Practicum@SoC Award**
2018 *School of Computing and NUS Enterprise, National University of Singapore.*
2014- **NUS Research Scholarship**
2018 *National University of Singapore for graduate studies.*
2010 - **ABB JDF Scholarship (International)**
2014 *ABB Jurgen Dorman Foundation.*
2010 **KVPY Fellowship**
Dept. of Science and Technology, Govt. of India and Indian Institute of Sciences.
2010 - **National Merit Scholarship**
2014 *Ministry of Human Resource and Development, India.*
2010 - **Indian Oil Academic Scholarship.**
2014 *Indian Oil Corporation Limited.*
2010 - **West Bengal Government Merit-cum-Means Scholarship.**
2014 *Government of West Bengal, India.*

Teaching Experience

2023- **Sequential Decision Making**
2024 *Course Instructor*
M2 Data Science, Centrale Lille, Université de Lille.

2021- **Trustworthy Machine Learning**
2024 *Course Instructor*
Computer and Data Science, Centrale Lille.

2021- **Reading Group in Machine Learning**
2024 *Course Instructor*
M2 Data Science, Centrale Lille, Université de Lille.

2020- **Anonymization, Privacy**
2022 *Course Instructor*
M2 IASD, ENS, Mines Paristech, Paris Dauphine- PSL University.

Jan 2020- **FDAT070: Reinforcement Learning and Decision Making Under Uncertainty**
April 2020 *Course Instructor*
Department of CSE, Chalmers University of Technology.

Aug 2017- **CS6234: Advanced Algorithms**
Dec 2017 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Jan 2017- **CS3230: Design and Analysis of Algorithms**
May 2017 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Jan 2017- **CS1010E: Programming Methodology**
May 2017 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Aug 2016- **CS1231: Discrete Mathematics**
Dec 2016 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Aug 2015- **CS3230: Design and Analysis of Algorithms**
Dec 2015 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Jan 2015 - **CS1020E: Data Structures and Algorithms I**
May 2015 *Teaching Assistant*
Department of Computer Science, School of Computing, NUS.

Jan 2015 - **DSC5211C: Quantitative Risk Management**
May 2015 *Teaching Assistant*
Department of Decision Sciences, NUS Business School.

Thesis Supervision (Official)

- PhD Thesis** **Udvas Das, Université de Lille**
2024- Topic: Constraints in Decision Making
- PhD Thesis** **Ayoub Azara, Université de Lille**
2022- Topic: Algorithmic Auditing of AI
- PhD Thesis** **Achraf azize, Université de Lille**
2021- Topic: The Privacy Game
- MSc. Thesis** **Igor Ryazanov, University of Gothenburg**
2020 Topic: Deep Learning for Deep Water
(In collaboration with Department of Mechanics and Maritime Sciences, Chalmers)
- MSc. Thesis** **Sushma Tungal and Pragya Singh, Chalmers University of Technology**
2020 Topic: Preconditioning of Batteries using Machine Learning
(In collaboration with Volvo Cars)

Pedagogical Courses

- Aug 2019-** **CIU950: University Teaching and Learning**
Dec 2019 Chalmers University of Technology, Sweden
- Feb 2019-** **CIU965: Diversity and Inclusion for Learning in Higher Education**
March 2019 Chalmers University of Technology, Sweden

Peer-review Experience (Selected)

Conferences: NeuRIPS, ICML, AAAI (PC), AISTATS, IJCAI (PC), PoPETS (PC), ICLR.
Journals: Transactions of Machine Learning Research (TMLR), IEEE Transactions on Dependable and Secure Computing (TDSC), IEEE Transactions on Automatic Control (TAC), IEEE Transactions on Parallel and Distributed Systems (TPDS), Journal of American Statistical Association (JASA), IEEE Access, IEEE Transactions on Information Forensics & Security (TIFS), Automatika, Neurocomputing, Applied Soft Computing (ASOC), IEEE Transactions on Network Science and Engineering (TNSE).

Business/Managerial Experience

- Apr 2018-** **Chief Data Science Lead**
Jan 2019 OPINIR, Singapore.
- Jan 2018-** **Entrepreneurial Lead for OPINIR**
Apr 2018 Lean Launch Pad Program by NUS Enterprise, Singapore.
- Dec 2017-** **Project Lead for InDivision**
Dec 2018 Supported by Innovation & Entrepreneurship Practicum at SoC award, 2017-2018, and mentored by Francis Yeoh, ex-head of National Research Foundation (NRF), Singapore.

Research Grants and Funds

- Aug 2023-** **PEPR in AI, France**
Aug 2027 Co-applicant, Topic: Learning the Privacy Game
- Feb 2023-** **ANR JCJC Project REPUBLIC, France**
Feb 2026 Applicant, Topic: Responsible Reinforcement Learning with and under Constraints
- Sept 2022-** **MOBLILEX grant, Lille, France**
May 2023 Applicant, Topic: Auditing Bias of Algorithms
- Sept 2021-** **AI_PhD at Lille, France**
Aug 2024 Applicant, Topic: Learning the Privacy Game
- Sept 2019-** **AoA Transport, 2019 program, Chalmers, Sweden**
Dec 2019 Co-applicant, Topic: Deep Learning for Deep Water
- Jan 2019-** **Graduate Research Innovation Programme (GRIP), National University of Singapore**
Dec 2019 Co-applicant, Topic: Learning to Optimise Resources in Clouds
- Dec 2017-** **Innovation & Entrepreneurship Practicum at SoC award**
Dec 2018 Applicant, Topic: Learning to Recognise Health Information from Videos