Resume of Arindam Pal

Summary

I am a Senior Research Scientist at Data61 in Commonwealth Scientific and Industrial Research Organisation (CSIRO), and a Research Fellow at Cyber Security Cooperative Research Centre (CSCRC). Previously, I was a Research Scientist at TCS Research and Innovation. I earned my PhD in Computer Science from IIT Delhi. I have over 12 years of industrial research experience in companies like Microsoft, Yahoo! and Novell. I work on business and research problems of CSIRO, and collaborate with faculty members of universities, both in India and abroad. I publish academic papers in conferences and journals and file patents in various countries like India, USA, and Europe. I am a Senior Member of both ACM and IEEE.

Objective

To work as a researcher in a world-class university or research lab on challenging and interesting problems with highly competent and visionary researchers. The work should be exciting and motivate me to come up with new ideas, that will influence the way computers are used, and make a positive impact on people's life.

Research

Algorithms, Optimization, Data Science, Machine Learning, Network Science.

Skill Set

C, C++, C#, Java, Python, R, MATLAB, Linux, Windows.

Education

Indian Institute of Technology — Delhi, India
Ph.D., Computer Science and Engineering, August, 2007 – November, 2012.
CGPA: 9.2 on a scale of 10.
Thesis: *Approximation Algorithms for Covering and Packing Problems on Paths.*
Advisors: Professor Amit Kumar and Professor Naveen Garg.

Indian Institute of Science — Bangalore, India
Master of Engineering, Computer Science and Engineering, 2000 – 2002.
Graduated with First Class with Distinction.
Thesis: *Efficient algorithms for generating all minimum cuts and the Cactus representation of a graph.*
Adviser: Professor Ramesh Hariharan.

Jadavpur University — Kolkata, India
Bachelor of Engineering, Computer Science and Engineering, 1996 – 2000.
Graduated with First Class with Honors.
Project: *Simulator for UML diagrams.*
Adviser: Professor Samiran Chattopadhyay.

Experience

Employment

Data61, CSIRO — Sydney, Australia
November, 2019 – Now
Designation: Senior Research Scientist.
Research Area: Cyber Security.
Description: I work on appying artificial intelligence and machine learning algorithms to solve computer security problems such as intrusion detection, user behavior modeling and fraud detection.

Cyber Security CRC — Sydney, Australia
November, 2019 – Now

Designation: Research Fellow.
Research Area: Cyber Security.
Description: I solve cyber security problems faced by Australian federal government, state governments, and IT companies.

TCS Research and Innovation — Kolkata, India
March, 2013 – October, 2019
Designation: Research Scientist.
Research Area: Embedded Systems and Robotics.
Description: I work on warehouse automation problems such as multi-robot task allocation, bin packing, truck routing, and job scheduling.
Research Area: Data and Decision Sciences.
Description: I worked on legal data mining, citation analysis, and patent analysis (both text and network).
Research Area: Cyber-physical Systems and Internet of Things.
Description: I worked on machine learning and optimization problems such as evacuation planning and vehicle arrival time prediction.

Yahoo! Inc — Bangalore, India
August, 2006 – July, 2007
Designation: Technical Lead.
Project: Strategic Data Solutions.
Primary Responsibility: Design and implementation of analytical and instrumentation products.

Cognizant — Kolkata, India
August, 2005 – July, 2006
Designation: Technical Lead.
Project: Retail Technology Consultancy Group.
Primary Responsibility: To define the charter for Performance Engineering and Capacity Planning across the company. In addition, I do architecture, design, and code review for various projects.

Microsoft Corporation — Hyderabad, India
August, 2002 – July, 2005
Designation: Software Design Engineer.
Project: Windows Serviceability.
Primary Responsibility: Debugging customer problems in Windows kernel, NTFS, and WDM device drivers. The devices range from USB, SCSI, IEEE 1394.
Project: Microsoft Data Protection Manager.
Primary Responsibility: Design and implementation of UI and Archive Manager.

Novell Inc — Bangalore, India
February, 2002 – July, 2002
Designation: Software Development Engineer.
Project: Novell DNS Server.
Primary Responsibility: Design and implementation of DNS Name Resolution Service and integration with Novell eDirectory.

Internship

IBM Research Labs — Delhi, India
May, 2011 – July, 2011
Designation: Intern Researcher.

Mentor: Venkatesan Chakaravarthy, Sambuddha Roy, Yogish Sabharwal.
Project: Approximation Algorithms for Resource Allocation Problems.
Job Description: I worked on design of efficient approximation algorithms for resource allocation for partial covering of jobs. The goal is to meet the demands of a set of jobs using a set of resources with certain capacities at minimum cost.

YAHOO! RESEARCH LABS — BANGALORE, INDIA
May, 2009 – July, 2009

Designation: Intern Researcher.
Mentor: Rajeev Rastogi.
Project: Algorithms for XPath wrapper induction and Graph compression.
Job Description: I worked on design of efficient algorithms for compressing the adjacency list representation of graphs, in particular web graphs and social networks. I also worked on designing XPath wrappers for information extraction from HTML and XML documents.

Achievements

Senior Member of ACM (2016).
Senior Member of IEEE (2015).
Best Poster Award, TCS Technical Architects Conference on Social Media Analytics (2016).
Recipient of Infosys Ph.D. Fellowship for Computer Science at IIT Delhi (2007).
Recipient of IIT institute scholarship for pursuing Ph.D. in Computer Science (2007).
Secured All India 11th rank out of 30,000 candidates in Graduate Aptitude Test in Engineering (GATE) in Computer Science in 2000 (99.82 percentile).
Jagadish Bose National Science Talent Search Award winner 1997.
Placed in the top 0.2% among 300,000 candidates in IIT JEE in 1996.
Got admission in the B.Stat. programme of Indian Statistical Institute in 1996.
Ranked 18th out of 100,000 candidates in West Bengal JEE in 1996.
Indian National Mathematical Olympiad (INMO) Awardee 1995.
Mathematics Talent Search (MTS) Scholarship by NCERT and NBHM in 1994.

Projects

- **IC-IMPACTS: Smart Sensor Deployment in Buildings: Evacuation Planning and Energy Management**
  PRINCIPAL INVESTIGATOR (INDIA): Professor Krithi Ramamritham, Indian Institute of Technology, Bombay, India
  PRINCIPAL INVESTIGATOR (CANADA): Professor Mark Fox, University of Toronto, Canada
  CO-PRINCIPAL INVESTIGATOR (INDIA): Dr. Arindam Pal, TCS Research and Innovation, Kolkata, India
- **Evacuation Planning in Large Buildings: Algorithms and Sensors**
  PRINCIPAL INVESTIGATOR (INDIA): Dr. Arindam Pal, TCS Research and Innovation, Kolkata, India
  PRINCIPAL INVESTIGATOR (USA): Professor V.S. Subrahmanian, Dartmouth College, USA
  PRINCIPAL INVESTIGATOR (ITALY): Professor Francesco Parisi, University of Calabria, Italy
- **Analysis of Scientific Publications and Patents with Machine Learning**
  PRINCIPAL INVESTIGATOR: Dr. Arindam Pal, TCS Research and Innovation, Kolkata, India
  PRINCIPAL INVESTIGATOR: Professor Animesh Mukherjee, Indian Institute of Technology, Kharagpur, India

- **Legal Data Analytics and Mining**
  Principal Investigator: Dr. Arindam Pal, TCS Research and Innovation, Kolkata, India
  Principal Investigator: Professor Saptarshi Ghosh, Indian Institute of Technology, Kharagpur, India
- **Analysis of Interdependent Networks**
  Principal Investigator: Dr. Arindam Pal, TCS Research and Innovation, Kolkata, India
  Principal Investigator: Professor Sushmita Ruj, Indian Statistical Institute, Kolkata, India

Collaborators

Professor V.S. Subrahmanian, Dartmouth College, USA
Professor Henri Bal, Vrije Universiteit, Amsterdam, The Netherlands
Professor Mark S. Fox, University of Toronto, Canada
Professor Krithi Ramamritham, Indian Institute of Technology, Bombay
Professor Francesco Parisi, University of Calabria, Italy
Professor Sushmita Ruj, Indian Statistical Institute, Kolkata
Professor Animesh Mukherjee, Indian Institute of Technology, Kharagpur
Professor Saptarshi Ghosh, Indian Institute of Technology, Kharagpur
Professor Arnab Bhattacharya, Indian Institute of Technology, Kanpur
Dr. Kripabandhu Ghosh, TCS Research and Innovation
Professor Tanmoy Chakraborty, IIIT, Delhi
Professor Mayank Singh, Indian Institute of Technology, Gandhinagar

Interns

Mayank Singh, Indian Institute of Technology, Kharagpur
Arpan Mandal, Indian Institute of Engineering Science And Technology, Shibpur
Soumya Sarkar, Indian Institute of Technology, Kharagpur
Abhipsa Basu, Indian Institute of Technology, Kharagpur
Paheli Bhattacharya, Indian Institute of Technology, Kharagpur
Pritam Bhattacharya, Indian Institute of Technology, Kharagpur
Ayan Das, Indian Statistical Institute Kolkata

Services

- Journals
  Technical Reviewer
  - AMS Mathematical Reviews
  - IEEE Transactions on Automation Science and Engineering
  - IEEE Transactions on Big Data
  - IEEE Transactions on Computational Social Systems
  - IEEE Transactions on Emerging Topics in Computing
  - IEEE Transactions on Signal Processing
  - Theoretical Computer Science
  - Journal of Parallel and Distributed Computing
  - Scientometrics
  - Sadhana
- Conferences
  Organization and Technical Program Committee
  - TPC Member of COMSNETS 2020
  - TPC Member of ACM India Joint International Conference on Data Science and Management of Data (CoDS-COMAD) 2020
  - Organizing Committee Member of Artificial Intelligence for Legal Assistance (AILA 2019) track of FIRE 2019

- General Chair of ParLearning 2019, in conjunction with KDD 2019
- TPC Member of IEEE BigData 2019
- TPC Member of CoDS-COMAD 2019 Young Researchers Symposium
- TPC Member of COMSNETS 2019
- Organizing Committee Member of LeDAM 2018, co-located with ACM CIKM 2018
- General Chair of ParLearning 2018, in conjunction with IPDPS 2018
- TPC Member of AIoTAS 2018, in conjunction with ISCA 2018
- TPC Member of PABS 2018, in conjunction with ICPE 2018
- Organizing Committee Member of Information Retrieval from Legal Documents (IRLeD) track of FIRE 2017
- TPC Member of COMSNETS 2018
- TPC Member of ACM COMPUTE 2017
- Publicity Chair and TPC Member of IEEE International Workshop on Foundations of Big Data Computing, in conjunction with HiPC 2017
- TPC Chair of ParLearning 2017, in conjunction with IPDPS 2017
- TPC Member of IEEE TrustCom 2017
- Publicity Chair and TPC Member of International Conference on Contemporary Computing (IC3)
- TPC Member of AIoTAS 2017
- Publicity Chair and TPC Member of IEEE International Workshop on Foundations of Big Data Computing, in conjunction with HiPC 2016
- TPC Member of IEEE International Workshop on Big Data Metadata and Management, in conjunction with 2016 IEEE International Conference on Big Data
- TPC Member of Social Networking Workshop, in conjunction with COMSNETS 2017
- Organizing Committee Member of ParLearning 2016, in conjunction with IPDPS 2016
- TPC Chair of International Workshop on Security, Trust, Privacy and Analytics (STPA 2016), in conjunction with AINA 2016
- TPC Member of International Workshop on Hardware Accelerated Data Mining, in conjunction with ICDM 2015
- Publicity Chair and TPC Member of IEEE International Workshop on Foundations of Big Data Computing, in conjunction with HiPC 2015
- Organizing Committee Chair of ParLearning 2015, in conjunction with IPDPS 2015

Technical Reviewer

- IEEE Global Communications Conference (GLOBECOM) 2016
- International Conference on Algorithms and Discrete Applied Mathematics (CALDAM) 2016
- IEEE International Conference on Data Mining (ICDM) 2015
- IEEE International Conference on Intelligent Transportation Systems (ITSC) 2015
- IEEE International Conference on Advanced Networks and Telecommunication Systems (ANTS) 2015

Publications

- Granted US Patents

1. *Methods and systems for planning evacuation paths*
   Arindam Pal, Gopinath Mishra and Subhra Mazumdar
2. *Systems and methods for planning location-sensitive probabilistic behavior-based evacuation paths*
   Arindam Pal, Francesco Parisi, Venkatramanan Siva Subrahmanian and Subhra Mazumdar

- Book Chapters

1. *Fault-tolerance and Reliability of Smart Grids*
   Sushmita Ruj and Arindam Pal
   Encyclopedia of Wireless Networks (2020).

- Journals

1. *Editoral: Parallel and Distributed Machine Learning Algorithms for Scalable Big Data Analytics*
   Henri Bal and Arindam Pal
   Special issue of Future Generation Computer Systems (2019) containing selected papers of ParLearning 2017.
2. *Improved Algorithms for the Evacuation Route Planning Problem*
   Gopinath Mishra, Subhra Mazumdar and Arindam Pal
   Journal of Combinatorial Optimization, 36(1): 280–306 (2018).
3. *k-means++ under Approximation Stability*
   Manu Agarwal, Ragesh Jaiswal and Arindam Pal
   Theoretical Computer Science, 588: 37–51 (2015).

- Conferences

1. *PhishZip: A New Compression-based Algorithm for Detecting Phishing Websites*
   Rizka Purwanto, Arindam Pal, Alan Blair and Sanjay Jha
   IEEE Conference on Communications and Network Security (CNS 2020).
2. *Identification, Tracking and Impact: Understanding the trade secret of catchphrases*
   Jagriti Jalal, Mayank Singh, Arindam Pal, Lipika Dey and Animesh Mukherjee
   ACM/IEEE Joint Conference on Digital Libraries (JCDL 2020).
3. *HushRelay: A Privacy-Preserving, Efficient, and Scalable Routing Algorithm for Off-Chain Payments*
   Subhra Mazumdar, Sushmita Ruj, Ram Govind Singh and Arindam Pal
   IEEE International Conference on Blockchain and Cryptocurrency (ICBC 2020).
4. *Innovation and Revenue: Deep Diving into the Temporal Rank-shifts of Fortune 500 Companies*
   Mayank Singh, Arindam Pal, Lipika Dey and Animesh Mukherjee
   ACM India Joint International Conference on Data Science and Management of Data (CoDS-COMAD) 2020.
5. *Methods for Computing Legal Document Similarity: A Comparative Study*
   Paheli Bhattacharya, Kripabandhu Ghosh, Arindam Pal and Saptarshi Ghosh
   International Workshop on Legal Data Analysis (LDA 2019)
   International Conference on Legal Knowledge and Information Systems (JURIX 2019).
6. *A scalable multi-robot task allocation algorithm*
   Chayan Sarkar, Himadri Sekhar Paul and Arindam Pal
   IEEE International Conference on Robotics and Automation (ICRA) 2018.

7. *Measuring Similarity among Legal Court Case Documents*
   Arpan Mandal, Raktim Chaki, Sarbajit Saha, Kripabandhu Ghosh, Arindam Pal and Saptarshi Ghosh
   ACM COMPUTE 2017.
8. *Automatic Catchphrase Identification from Legal Court Case Documents*
   Arpan Mandal, Kripabandhu Ghosh, Arindam Pal and Saptarshi Ghosh
   ACM International Conference on Information and Knowledge Management (CIKM) 2017.
9. *Understanding the Impact of Early Citers on Long-Term Scientific Impact*
   Mayank Singh, Ajay Jaiswal, Priya Shree, Arindam Pal, Animesh Mukherjee and Pawan Goyal
   ACM/IEEE-CS Joint Conference on Digital Libraries (JCDL) 2017.
10. *A Graph Analytics Framework for Ranking Authors, Papers and Venues*
    Arindam Pal and Sushmita Ruj
    International Workshop on Mining and Learning with Graphs (MLG 2016)
    ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) 2016.
11. *Automatic Discovery of Emerging Trends using Cluster Name Synthesis on User Consumption Data*
    Tanushyam Chattopadhyay, Santa Maiti, Arindam Pal, Avik Ghose and Arpan Pal
    Wiki Workshop, International World Wide Web Conference (WWW 2016).
12. *Preferential Attachment Model with Degree Bound and its Application to Key Predistribution in WSN*
    Sushmita Ruj and Arindam Pal
    IEEE International Conference on Advanced Information Networking and Applications (AINA) 2016.
13. *Improved Algorithms for the Evacuation Route Planning Problem*
    Gopinath Mishra, Subhra Mazumdar and Arindam Pal
    9th Annual International Conference on Combinatorial Optimization and Applications (COCOA) 2015.
14. CITEX*: A new citation index to measure the relative importance of authors and papers in scientific publications*
    Arindam Pal and Sushmita Ruj
    IEEE International Conference on Communications (ICC) 2015.
15. *Historical Data based Real Time Prediction of Vehicle Arrival Time*
    Santa Maiti, Arpan Pal, Arindam Pal, Tanushyam Chattopadhyay and Arijit Mukherjee
    17th IEEE International Conference on Intelligent Transportation Systems (ITSC) 2014.
16. *Analyzing Cascading Failures in Smart Grids under Random and Targeted Attacks*
    Sushmita Ruj and Arindam Pal
    28th IEEE International Conference on Advanced Information Networking and Applications (AINA) 2014.
17. *k-means++ under Approximation Stability*
    Manu Agarwal, Ragesh Jaiswal and Arindam Pal
    10th Annual Conference on Theory and Applications of Models of Computation (TAMC) 2013.
18. *Approximation Algorithms for Unsplittable Flow Problems on Paths and Trees*

Khaled Elbassioni, Naveen Garg, Divya Gupta, Amit Kumar, Vishal Narula and Arindam Pal
32nd Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS) 2012.

19. *Scheduling resources for executing a partial set of jobs*
Venkatesan Chakaravarthy, Arindam Pal, Sambuddha Roy and Yogish Sabharwal
32nd Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS) 2012.
20. *A Token-based Distributed Algorithm for Total Order Atomic Broadcast*
Sandip Dey and Arindam Pal
International Workshop on Distributed Computing (IWDC) 2002, Lecture Notes in Computer Science (LNCS) 2571.

- Under Review
  1. *Hier-SPCNet: A Legal Statute Hierarchy-based Heterogeneous Network for Computing Legal Document Similarity*
  Paheli Bhattacharya, Kripabandhu Ghosh, Arindam Pal and Saptarshi Ghosh
  International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR 2020).
  2. *Towards IoT Security Automation and Orchestration: Challenges and Future Directions*
  Yifeng Zheng, Arindam Pal, Sharif Abuadbba, Shiva Raj Pokhrel, Surya Nepal and Helge Janicke
  IEEE Transactions on Industrial Informatics.
  3. *Connecting Link Edit Similarity to Co-linking Similarity of Wikipedia Pages using Hawkes Process*
  Soumya Sarkar, Animesh Mukherjee, Indrajit Bhattacharya and Arindam Pal
  ACM/IEEE Joint Conference on Digital Libraries (JCDL 2020).
  4. *On the Vulnerability of Community Structure in Complex Networks*
  Viray Parimi, Arindam Pal, Sushmita Ruj, Ponnurangam Kumaraguru, Tanmoy Chakraborty
  ACM Transactions on Data Science.
  5. *BB_Evac: Fast Location-Sensitive Behavior-Based Building Evacuation*
  Subhra Mazumdar, Arindam Pal, Francesco Parisi and V.S. Subrahmanian
  Artificial Intelligence Journal.
  6. Citex*: A new citation index to measure the relative importance of authors and papers in scientific publications*
  Arindam Pal and Sushmita Ruj
  IEEE Transactions on Knowledge and Data Engineering.
  7. *Cascading Failures in Smart Grids under Random, Targeted and Adaptive Attacks.*
  Sushmita Ruj and Arindam Pal
  IEEE Transactions on Smart Grid.

Talks

1. *Fraud Detection and Prediction using Graph-Based User Behaviour Modelling*
Distributed Systems Security Seminar
Data61, CSIRO, Sydney, November 26, 2019.
2. *The Mathematics of Machine Learning and Deep Learning*
R&D Bytes Seminar Series
TCS Research and Innovation, Kolkata, May 24 and June 7, 2019.
3. *Machine Learning and Deep Learning – Theory and Practice*
Invited Talk, Workshop on Deep Learning Techniques and Tools: An Aca-

demic and Industrial Approach
National Institute of Technology, Silchar, April 11, 2019.

4. *Graph Analytics*
   Keynote Talk, Aegis–IBM Meetup on AI, Data Science, and Analytics
   Birla Industrial and Technological Museum, Kolkata, March 16, 2019.
5. *Analysis and Design of a New Citation Index*
   Keynote Talk, IEMGraph 2018
   Institute of Engineering and Management, Kolkata, September 6, 2018.
6. *Social Network Analysis: Algorithms and Applications*
   Keynote Talk, 2nd Workshop On Big Data Analytics: Theory and Practice
   Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Belur Math, Howrah, June 2, 2018.
7. *Understanding the Impact of Early Citers on Long-Term Scientific Impact*
   IIT Kharagpur, October 27, 2017
   DDS R&D Bytes, TCS Research and Innovation, July 28, 2017
   University of Toronto, Canada, June 21, 2017.
8. *The Design and Analysis of Complex Networks*
   Invited Talk, AICTE sponsored Quality Improvement Programme on Business Analytics and Intelligence
   Coimbatore Institute of Technology, Coimbatore, April 26, 2017.
9. *Efficient algorithms for large-scale network analysis*
   Invited Talk, Workshop on Big Data Analytics and Management
   Indian Institute of Engineering Science and Technology, Shibpur, September 1, 2016.
10. *Preferential Attachment Model with Degree Bound and its Application to Key Predistribution in WSN*
    IEEE International Conference on Advanced Information Networking and Applications (AINA) 2016
    Crans-Montana, Switzerland, March 24, 2016.
11. *Cascading Failures in Smart Grids under Random, Targeted and Adaptive Attacks*
    DIMES, University of Calabria, Rende, Italy, March 27, 2015.
12. CITEX*: A new citation index to measure the relative importance of authors and papers in scientific publications*
    University of Technology, Sydney, Australia, August 14, 2015
    IEEE International Conference on Communications, London, UK, June 11, 2015
    CTO Analytics Series Seminar, TCS Innovation Labs Kolkata, April 21, 2015
    DIMES, University of Calabria, Rende, Italy, March 26, 2015.
13. *Analyzing Cascading Failures in Smart Grids under Random and Targeted Attacks,* 28th IEEE International Conference on Advanced Information Networking and Applications (AINA) 2014*, University of Victoria, Canada, May 14, 2014.*
14. *Approximation Algorithms for Covering and Packing Problems on Paths,* Ph.D. thesis defence, IIT Delhi.
15. *Rich get Richer: Power Laws, Long Tails and Preferential Attachment Models in World Wide Web and Social Networks,* JSPS-DST Asian Academic Seminar 2013: Discrete Mathematics and its Applications, University of Tokyo.
16. *k-means++ under Approximation Stability,* 10th annual conference on Theory and Applications of Models of Computation (TAMC) 2013, University of Hong Kong.

17. *Approximation and Online Algorithms for Generalized Interval Coloring Problems*
    Invited Talk, WALCOM Pre-Workshop School on Graph and Geometric Algorithms, ISI Kolkata.
18. *Finding Maximum Independent Sets in Unions of Perfect Graphs,* IIT Delhi.
19. *Approximation Algorithms for Unsplittable Flow Problems on Paths and Trees*
    IIT Kharagpur
    ISI Kolkata
    TCS Research and Innovation Kolkata.
20. *Approximation Algorithms for Covering and Packing Problems on Paths,* IIT Delhi.
21. *Algorithms for Interval Coloring with Capacities and Demands,* IIT Delhi.
22. *Approximate Counting and Markov Chain Monte Carlo,* IIT Delhi.
23. *Algorithms for graph compression,* Yahoo! Research Labs.
24. *All-or-Nothing multicommodity flow and related problems,* IIT Delhi.

References

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