

# Palash Dey

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## Current Affiliation

Assistant Professor in the Department of Computer Science and Engineering, IIT Kharagpur.

## Research Interest

I am broadly interested in theoretical computer science. My current research focuses on algorithmic game theory, computational social choice, and parameterized algorithms.

## Professional Services

- ▶ Newsletter and Social Media Chair of IEEE Kharagpur Section (2021-22)
- ▶ Senior Program Committee member: AAAI (2021-23)
- ▶ Program Committee member of following conferences: IJCAI (2018-23, 2016), AAAI (2019-20), AAMAS (2021-23), ECAI (2023), COMSOC (2020, 2018).
- ▶ Reviewed papers for following conferences: STOC, CSR, WINE, FSTTCS, PODS, ICALP.
- ▶ Reviewed papers for following journals: Discrete Applied Mathematics, Artificial Intelligence, Autonomous Agents and Multi-Agent Systems, Theoretical Computer Sciences.

## Awards and Achievements

- ▶ **Fellow of West Bengal Academy of Science and Technology**, Government of West Bengal, India in 2022.
- ▶ **ACM India Doctoral Dissertation Award** in 2018.
- ▶ **Best Ph.D. Thesis Award in Department of CSA, IISc** in 2018.
- ▶ **INSPIRE faculty award** in 2017.
- ▶ **Google India Ph.D. fellowship award** in 2015 for the period 2015-19.
- ▶ **gold medal** for the academic year 2012-13 in Indian Institute of Science.
- ▶ **Computer Society of India Medal (Bangalore chapter)** as best Master of Engineering (M.E.) student in the Department of Computer Science and Automation in Indian Institute of Science.
- ▶ **Topper of Master of Engineering** batch 2011-13 in the Department of Computer Science and Automation in Indian Institute of Science with a CGPA of 7.7/8.
- ▶ Travel grant from **Google India** in 2017.
- ▶ **Best presentation award in EECS Research Students Symposium 2016** in Indian Institute of Science.
- ▶ Student travel/volunteer scholarship for IJCAI 2016, AAMAS 2015.
- ▶ GATE(Graduate Aptitude Test in Engineering) rank 35 among more than 1,00,000 students in 2010.
- ▶ National Merit Scholarship in 2006.

## Research Projects

- ▶ “Computational Social Choice with Focus on Networks and Fairness,” SERB Core Research Grant for 2023-26 (grant sanctioned INR 40 lac).
- ▶ “Resolving Some Fundamental Problems in Computational Social Choice,” DST-INSPIRE Faculty Fellowship for 2017-22 (grant amount was INR 35 lac).

- ▶ “Voting and Society,” Scheme for Innovative Research and Development (ISIRD), IIT Kharagpur for 2019-22 (grant amount was INR 9.75 lac).

## Refereed Journal Articles

- [J12] Palash Dey and Neeldhara Misra. “On the Exact Amount of Missing Information that makes Finding Possible Winners Hard”. *Journal of Computer and System Sciences*, in print, **2023**. Keywords: voting, possible winner, incomplete information, NP-completeness, algorithm.
- [J11] Aditya Anand and Palash Dey. “Distance Restricted Manipulation in Voting”. In *Theoretical Computer Science*, volume 891, pp. 149–165, **2021**. Keywords: voting, algorithm, manipulation, control, theory.
- [J10] Palash Dey, Neeldhara Misra, Swaprava Nath, and Garima Shakya. “A Parameterized Perspective on Protecting Elections”. In *Theoretical Computer Science*, volume 874, pp. 15–31, **2021**. Keywords: voting, algorithm, bribery, control, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 28<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-19).
- [J9] Arnab Bhattacharyya and Palash Dey. “Predicting Winner and Estimating Margin of Victory in Elections using Sampling”. In *Artificial Intelligence*, volume 296, pp. 103476, **2021**. Keywords: voting, sampling, prediction, margin of victory, theory.  
Remarks: Part of this work was appeared in Proc. 14<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-15) and in Proc. 24<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-15).
- [J8] Palash Dey. “Local Distance Restricted Bribery in Voting”. In *Theoretical Computer Science*, volume 849, pp. 1–21, **2021**. Keywords: voting, algorithm, bribery, control, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 18<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-19).
- [J7] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Parameterized Dichotomy of Choosing Committees Based on Approval Votes in the Presence of Outliers”. In *Theoretical Computer Science*, volume 783, pp. 53–70, **2019**. Keywords: voting, algorithm, approval ballot, committee selection, outliers, parameterized complexity, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 16<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-17).
- [J6] Arnab Bhattacharyya, Palash Dey, and David P. Woodruff. “An Optimal Algorithm for  $\ell_1$ -Heavy Hitters in Insertion Streams and Related Problems”. In *ACM Transactions on Algorithms*, volume 15, number 1, pp. 2:1–2:27, **2019**. Keywords: heavy hitters, insertion, stream, large data, algorithm, theory.  
Remarks: A preliminary version of this work was appeared in Proc. ACM SIGMOD-SIGACT-SIGAI Symposium on Principles of Database Systems (PODS 2016).
- [J5] Palash Dey. “Manipulative Elicitation – A New Attack on Elections with Incomplete Preferences”. In *Theoretical Computer Science*, volume 731, pp. 36–49, **2018**. Keywords: voting, manipulation, elicitation, algorithm, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 32<sup>nd</sup> AAI Conference on Artificial Intelligence (AAAI 2018).
- [J4] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Complexity of Manipulation with Partial Information in Voting”. In *Theoretical Computer Science*, volume 726, pp. 78–99, **2018**. Keywords: voting, algorithm, manipulation, partial information, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 25<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-16).
- [J3] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Frugal Bribery in Voting”. In *Theoretical Computer Science*, volume 676, pp. 15–32, May **2017**. Keywords: voting, bribery, manipulation, frugal, algorithm, theory.  
Remarks: A preliminary version of this work was appeared in Proc. 30<sup>th</sup> AAI Conference on Artificial Intelligence (AAAI-16).

- [J2] Palash Dey, Neeldhara Misra, and Yadati Narahari “Kernelization Complexity of Possible Winner and Coalitional Manipulation Problems in Voting”. In *Theoretical Computer Science*, volume 616, pp. 111-125, February 2016. Keywords: voting theory, possible winner, kernelization, parameterized complexity, algorithm, theory. Remarks: A preliminary version of this work was appeared in Proc. 14<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-15).
- [J1] Palash Dey and Yadati Narahari. “Asymptotic Collusion-Proofness of Voting Rules: The Case of Large Number of Candidates”. In *Studies in Microeconomics*, volume 3(2), pp. 120 – 139, December 2015. Keywords: voting theory, asymptotic collusion-proofness. Remarks: Also appeared in Proc. 13<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-14) as an extended abstract.

## Peer Reviewed Conference Publications

- [C36] Debajyoti Kar, Mert Kosan, Debmalya Mandal, Sourav Medya, Arlei Silva, Palash Dey, and Swagato Sanyal. “Feature-based Individual Fairness in  $k$ -Clustering”, extended abstract. In Proc. 22<sup>nd</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-23), London, UK 2023. Keywords: clustering, fairness, individual fairness, algorithm, approximation. (Acceptance rate was ~ 45%.)
- [C35] Debajyoti Kar, Palash Dey, and Swagato Sanyal. “Sampling-Based Winner Prediction in District-Based Elections”, extended abstract. In Proc. 22<sup>nd</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-23), London, UK 2023. Keywords: voting, sampling, prediction, winner, estimation, algorithm. (Acceptance rate was ~ 45%.)
- [C34] Arnab Maiti and Palash Dey. “Parameterized Algorithms for Kidney Exchange”. In Proc. 31<sup>st</sup> International Joint Conference on Artificial Intelligence (IJCAI-22), Vienna, Austria. (Acceptance rate was ~ 15%.) Also as an extended abstract in Proc. 21<sup>st</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-22), Auckland, New Zealand (virtual) 2022. Keywords: kidney exchange, game theory, algorithm, cycle packing, parameterized algorithm.
- [C33] Neel Karia, Faraaz Mallick, and Palash Dey. “How Hard is Safe Bribery?”. In Proc. 21<sup>st</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-22), Auckland, New Zealand (virtual) 2022. Keywords: voting, social choice, bribery, safe, game theory, algorithm, parameterized algorithm. (Acceptance rate was ~ 26%.)
- [C32] Arnab Maiti and Palash Dey. “On Parameterized Complexity of Binary Networked Public Goods Game”. In Proc. 21<sup>st</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-22), Auckland, New Zealand (virtual) 2022. Keywords: binary networked public goods game, network, game theory, algorithm, parameterized algorithm. (Acceptance rate was ~ 26%.)
- [C31] Palash Dey. “Priced Gerrymandering”, extended abstract. In Proc. 21<sup>st</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-22), Auckland, New Zealand (virtual) 2022. Keywords: gerrymandering, theory, algorithm, voting, district. (Acceptance rate was ~ 40%.)
- [C30] Nuno Mota, Negar Mohammadi, Palash Dey, Krishna P. Gummadi and Abhijnan Chakraborty. “Fair Partitioning of Public Resources: Redrawing District Boundary to Minimize Spatial Inequality in School Funding”. In Proc. 30<sup>th</sup> The Web Conference (WWW-21), Ljubljana, Slovenia 2021. Keywords: fairness, graph partitioning, districts, resource allocation. (Acceptance rate was ~ 21%.)
- [C29] Palash Dey, Suman Kalyan Maity, Sourav Medya, and Arlei Silva. “Network Robustness via Global  $k$ -cores”. In Proc. 20<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (AAMAS-21), London, United Kingdom 2021. Keywords: network design, core. (Acceptance rate was ~ 25%.)
- [C28] Palash Dey, Arnab Maiti, and Amatya Sharma. “On Parameterized Complexity of Liquid Democracy”. In Proc. 7th Annual International Conference on Algorithms and Discrete Applied Mathematics (CALDAM-21), IIT Ropar, India. 2021.
- [C27] Palash Dey, Jaikumar Radhakrishnan and Santhoshini Velusamy. “Improved Explicit Data Structures in the Bit-probe Model using Error Correcting Codes”. In Proc. 45<sup>th</sup> International Symposium on Mathematical

- Foundations of Computer Science (MFCS-20)*, Charles University. Prague, Czechia **2020**. Keywords: data structure, bit probe, error correcting code. (Acceptance rate was ~ 33%.)
- [C26] Chinmay Sonar, Palash Dey, and Neeldhara Misra. “On the complexity of Winner Verification and Candidate Winner for Multiwinner Voting Rules”. In Proc. 29<sup>th</sup> International Joint Conference on Artificial Intelligence (*IJCAI-20*), Yokohama, Japan **2020**. Keywords: multi-winner rule, computational complexity. (Acceptance rate was ~ 13%.)
- [C25] Palash Dey and Sourav Medya. “Manipulating Node Similarity Measures in Networks”. In Proc. 19<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-20*), Auckland, New Zealand **2020**. Keywords: network design, parameterized complexity. (Acceptance rate was ~ 23%.)
- [C24] Ana-Andreea Stoica, Abhijnan Chakraborty, Palash Dey, and Krishna Gummadi. “Minimizing Margin of Victory for Fair Political and Educational Districting”. In Proc. 19<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-20*), Auckland, New Zealand **2020**. Keywords: voting, margin of victory, fairness, districts algorithm. (Acceptance rate was ~ 23%.)
- [C23] Palash Dey, Neeldhara Misra, Swaprava Nath, and Garima Shakya. “A Parameterized Perspective on Protecting Elections”. In Proc. 28<sup>th</sup> International Joint Conference on Artificial Intelligence (*IJCAI-19*), Macao, China, **2019**. Keywords: voting, protection, parameterized complexity, theory, algorithm. (Acceptance rate was ~ 18%.)
- [C22] Palash Dey, Swaprava Nath, and Garima Shakya. “Testing Preferential Domains using Sampling”. In Proc. 18<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-19*), Montreal, Canada, **2019**. Keywords: social domain, sampling, testing, single peaked, single crossing. (Acceptance rate was ~ 24%.)
- [C21] Palash Dey and Sourav Medya. “Covert Networks: How Hard is It to Hide?”. In Proc. 18<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-19*), Montreal, Canada, **2019**. Keywords: social network, covert network, influence, complexity. (Acceptance rate was ~ 24%.)
- [C20] Palash Dey. “Local Distance Restricted Bribery in Voting”, extended abstract. In Proc. 18<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-19*), Montreal, Canada, **2019**. Keywords: voting, complexity, bribery, campaigning. (Acceptance rate was ~ 52%.)
- [C19] Palash Dey, Pravesh Kothari, and Swaprava Nath. “The Social Network Effect on Surprise in Elections”. In Proc. 6th ACM IKDD CoDS and 24th COMAD (*CODS-COMAD-2019*). Keywords: election, surprise, social networks, voting, prediction. (Acceptance rate was ~ 25%.)
- [C18] Palash Dey. “Manipulative Elicitation – A New Attack on Elections with Incomplete Preferences”. In Proc. 32<sup>nd</sup> AAI Conference on Artificial Intelligence (*AAAI-18*). Keywords: voting, manipulation, elicitation, algorithm, theory. (Acceptance rate was 24.6%.)
- [C17] Palash Dey. “Query Complexity of Tournament Solutions”. In Proc. 31<sup>st</sup> AAI Conference on Artificial Intelligence (*AAAI-17*), pp. 2992 – 2998, San Francisco, USA, **2017**. Keywords: query complexity, voting, tournament, algorithm, theory. (Acceptance rate was 24.6%. Was chosen for oral presentation. Only 0.02% papers were chosen for oral presentation)
- [C16] Palash Dey and Neeldhara Misra. “On the Exact Amount of Missing Information that makes Finding Possible Winners Hard”. In Proc. 42<sup>nd</sup> International Symposium on Mathematical Foundations of Computer Science (*MFCS-17*), Aalborg, Denmark, **2017**. Keywords: voting, possible winner, incomplete information, NP-completeness, algorithm. (Acceptance rate was 41.7%.)
- [C15] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Parameterized Dichotomy of Choosing Committees Based on Approval Votes in the Presence of Outliers”. In Proc. 16<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-17*), pp. 42 – 50, São Paulo, Brazil, **2017**. Keywords: committee selection, voting, outliers, parameterized complexity, dichotomy, algorithm. (Acceptance rate was 26%.)
- [C14] Palash Dey, Nimrod Talmon, and Otniel van Handel. “Proportional Representation in Vote Streams”. In Proc. 16<sup>th</sup> International Conference on Autonomous Agents and Multiagent Systems (*AAMAS-17*), pp. 15 – 23,

- São Paulo, Brazil, 2017. Keywords: data stream, voting, proportional representation, algorithm, theory. (Acceptance rate was 26%.)
- [C13] Arnab Bhattacharyya, Palash Dey, and David P. Woodruff. “An Optimal Algorithm for  $\ell_1$ -Heavy Hitters in Insertion Streams and Related Problems”. In Proc. *ACM SIGMOD-SIGACT-SIGAI Symposium on Principles of Database Systems (PODS-16)*, pp. 385 – 400, San Francisco, USA, 2016. Keywords: heavy hitters, insertion, stream, large data, algorithm, theory. (Acceptance rate was 33%.)
- [C12] Palash Dey and Neeldhara Misra. “Elicitation for Preferences Single Peaked on Trees”. In Proc. *25<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-16)*, pp. 215 – 221, New York, USA, 2016. Keywords: voting, algorithm, single peaked domain, elicitation, theory. (Acceptance rate was 24%.)
- [C11] Palash Dey and Neeldhara Misra. “Preference Elicitation For Single Crossing Domain”. In Proc. *25<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-16)*, pp. 222 – 228, New York, USA, 2016. Keywords: voting, algorithm, single crossing domain, elicitation, theory. (Acceptance rate was 24%.)
- [C10] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Complexity of Manipulation with Partial Information in Voting”. In Proc. *25<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-16)*, pp. 229 – 235, New York, USA, 2016. Keywords: voting, algorithm, manipulation, partial information, theory. (Acceptance rate was 24%.)
- [C9] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Frugal Bribery in Voting”. In Proc. *30<sup>th</sup> AAAI Conference on Artificial Intelligence (AAAI-16)*, pp. 2466 – 2672, vol. 4, Phoenix, Arizona, USA, 2016. Keywords: voting, bribery, manipulation, frugal. (Acceptance rate was 25.8%.)
- [C8] Palash Dey and Yadati Narahari. “Estimating the Margin of Victory of Elections using Sampling”. In Proc. *24<sup>th</sup> International Joint Conference on Artificial Intelligence (IJCAI-15)*, pp. 1120 – 1126, Buenos Aires, Argentina, 2015. Keywords: voting, margin of victory, estimation, sampling, algorithm, theory. (Acceptance rate was 28.8%.)
- [C7] Palash Dey and Arnab Bhattacharyya. “Sample Complexity for Winner Prediction in Elections”. In Proc. *14<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-15)*, pp. 1421 – 1430, Istanbul, Turkey, 2015. Keywords: voting theory, polling, winner prediction, sampling, algorithm, theory. (Acceptance rate was 25%.)
- [C6] Palash Dey, Neeldhara Misra, and Yadati Narahari. “Detecting Possible Manipulators in Elections”. In Proc. *14<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-15)*, pp. 1441 – 1450, Istanbul, Turkey, 2015. Keywords: voting, manipulation, detection, algorithm, theory. (Acceptance rate was 25%.)
- [C5] Palash Dey, Neeldhara Misra, and Yadati Narahari “Kernelization Complexity of Possible Winner and Coalitional Manipulation Problems in Voting”. In Proc. *14<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-15)*, pp. 87 – 96, Istanbul, Turkey, 2015. Keywords: voting, possible winner, kernelization, parameterized complexity, algorithm, theory. (Acceptance rate was 25%.)
- [C4] Palash Dey. “Computational Complexity of Fundamental Problems in Social Choice Theory (Doctoral Consortium)”. In Proc. *14<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-15)*, pp. 1973-1974, Istanbul, Turkey, 2015.
- [C3] Palash Dey and Yadati Narahari “Asymptotic Collusion-Proofness of Voting Rules: The Case of Large Number of Candidates”, extended abstract. In Proc. *13<sup>th</sup> International Conference on Autonomous Systems and Multiagent Systems (AAMAS-14)*, pp. 1419 – 1420, Paris, France, 2014. Keywords: voting theory, asymptotic collusion-proofness, theory. (Acceptance rate was 46%.)
- [C2] Palash Dey, Prachi Goyal, and Neeldhara Misra “UNO Gets Easier for a Single Player”. In Proc. *7<sup>th</sup> International Conference on Fun with Algorithms (FUN-14)*, pp. 147 – 157, Lipari Island, Sicily, Italy, 2014. Keywords: UNO, parameterized complexity. (Acceptance rate was 59%.)
- [C1] Palash Dey, A. Kundu, M. K. Naskar, A. Mukherjee, and A. Nasipuri “Dynamic Multipath Bandwidth Provisioning with Jitter, Throughput and SLA constraint in MPLS over WDM network”. In Proc. *11<sup>th</sup> International Conference*

on *Distributed Computing and Networking (ICDCN-10)*, pp. 376 – 391, Kolkata, India, 2010. **Keywords:** optical networks. (Acceptance rate was 21%.)

## Research Visits Abroad

- May 2019 – July 2019: Max Planck Institute for Software Systems, Saarbrücken, Germany  
hosted by *Prof. Krishna Gummadi*
- May 2016 – July 2016: Stanford University, USA  
hosted by *Prof. Ashish Goel*

## Teaching

- ▶ Algorithm Design and Analysis: many times in IIT Kharagpur.
- ▶ Randomized Algorithm Design: many times in IIT Kharagpur.
- ▶ Algorithmic Game Theory: many times in IIT Kharagpur.
- ▶ Advanced Graph Theory: Winter of 2019 in IIT Kharagpur (with Prof. Bhargab B. Bhattacharyya).
- ▶ Parameterized Algorithms: many times in IIT Kharagpur (with Prof. Sudeshna Kolay).
- ▶ Algorithm 1: many times in IIT Kharagpur (with Prof. Partha Pratim Chakrabarty).
- ▶ Programming and Data Structures: many times in IIT Kharagpur.
- ▶ Algorithms Laboratory: Many times in IIT Kharagpur.
- ▶ Programming and Data Structures Laboratory: Many times in IIT Kharagpur.

## Education and Related Experience

- Apr 2018 – Present: Department of Computer Science and Engineering  
**IIT Kharagpur**  
Assistant Professor
- Jan. 2017 – March 2018: School of Technology and Computer Science  
**Tata Institute of Fundamental Research, Mumbai**  
Post-doctoral Visiting Fellow
- Aug. 2013 – Dec. 2016: **Doctor of Philosophy**  
Computer Science and Automation, **Indian Institute of Science, Bangalore**  
Thesis title: *Resolving the Complexity of Some Fundamental Problems in Computational Social Choice*  
(Supervised by **Prof. Y. Narahari** and **Prof. Arnab Bhattacharyya**)  
(Submitted in August 2016; defended in March 2017)  
**Winner of ACM India best thesis in Computer Science in India in 2017**  
**Winner of best thesis in Computer Science in IISc in 2016-17**
- August 2011 – July 2013: **Master of Engineering**  
Computer Science and Automation, **Indian Institute of Science, Bangalore**  
Thesis title: *Asymptotic Coalitional Strategy Proofness in Voting*  
(Supervised by **Prof. Y. Narahari**)  
**Winner of best Master of Engineering student in Computer Science in India in 2017**
- May 2010 – July 2011: **Adobe Systems India Pvt. Ltd.**  
Member of technical staff
- July 2006 – April 2010: **Bachelor of Engineering**  
Computer Science and Engineering, **Jadavpur University, Kolkata**  
(Supervised by **Prof. Avijit Kar**)

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