

Abhishek Kumar

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Career objective

To acquire technical acumen and become a component in national and international progress through research oriented exercise.

Education

- 2019 **Ph.D, Electrical Engineering**, *Indian Institute of Technology (BHU)*, Varanasi, India.
Ph.D Thesis awarded, Sept. 2019
- 2013 **B.Tech, Electrical Engineering**, *Uttarakhand Technical University*, Dehradun, India.
Percentage: 78%

Research Interest

I am broadly interested in Evolutionary Computation, Nature-inspired Algorithms, Swarm Intelligence, Constraint Handling Techniques, and Multi- and Many-objective Optimization. I am also interested in the following areas.

- ↪ Conventional Optimization Algorithms,
- ↪ Power System Optimization,
- ↪ Assessment of Electric Vehicle, Distributed Generation (DGs) and Distributed Battery Energy Storage System (D-BESS),
- ↪ Load Flow Algorithms,
- ↪ Load Modelling,
- ↪ Renewable Energy Resources,
- ↪ Islanded Microgrids Operations.

List of Publications

A. Refereed International Journal Articles.

Accepted/Published.

1. **Abhishek Kumar**, Swagatam Das, and Rammohan Mallipeddi. “**An Inversion-free Robust Power Flow Algorithm for Microgrids.**” *IEEE Transactions on Smart Grid*, **Accepted for Publication.** (ISSN:1949-3053), (SCI, Impact Factor: 8.267).
2. **Abhishek Kumar**, Swagatam Das and Rammohan Mallipeddi. “**A Reference Vector based Simplified Covariance Matrix Adaptation Evolution Strategy for Constrained Global Optimization.**” *IEEE Transaction on Cybernetics*, **Accepted for Publication.** (ISSN:2168-2267), (SCI, Impact Factor: 11.079).

3. **Abhishek Kumar**, Swagatam Das, Rakesh Kumar Misra, and Devender Singh. “**A v -constrained Matrix Adaptation Evolution Strategy with Broyden-based Mutation for Constrained Optimization.**” *IEEE Transaction on Cybernetics*, **Accepted for Publication**. (ISSN:2168-2267), (**SCI, Impact Factor: 11.079**).
4. **Abhishek Kumar**, Guohua Wo, Mostafa Ali, Rammohan Mallipeddi, Ponnuthurai Suganthan and Swagatam Das. “**A Test-suite of Non-Convex Constrained Optimization Problems from the Real-World and Some Baseline Results.**” *Swarm and Evolutionary Computation*, vol. 56, Aug. 2020. (ISSN: 2210-6502), (**SCI Expanded, Impact Factor: 6.912**).
5. **Abhishek Kumar**, Bablesh Kumar Jha, Dharmender Kumar Dheer, Devender Singh, and Rakesh Kumar Misra. “**A Nested-Iterative Newton-Raphson based Power Flow Formulation for Droop-based Islanded Microgrids**” *Electric Power Systems Research*, vol.180, March 2020. (ISSN:0378-7796), (**SCI Expanded, Impact Factor: 3.221**).
6. **Abhishek Kumar**, Bablesh Kumar Jha, Rakesh Kumar Misra, and Devender Singh. “**Current Injection based Newton-Raphson Power flow algorithm for droop-based Islanded Microgrids.**” *IET Generation, Transmission, & Distribution*, vol.13, Dec. 2019. (ISSN:1350-2360), (**SCI, Impact Factor: 3.229**).
7. **Abhishek Kumar**, Rakesh Kumar Misra, Devender Singh, Sujeet Mishra and Swagatam Das. “**The spherical search algorithm for bound-constrained global optimization problems.**” *Applied Soft Computing* (2019): 105734. (ISSN: 1568-4946), (**SCI Expanded, Impact Factor: 5.472**).
8. **Abhishek Kumar**, Bablesh Kumar Jha, Dharmender Kumar Dheer, Devender Singh and Rakesh Kumar Misra. “**Nested backward/forward sweep algorithm for power flow analysis of droop regulated islanded microgrids.**” *IET Generation, Transmission & Distribution* 13.14 (2019): 3086-3095. (ISSN:1350-2360), (**SCI, Impact Factor: 3.229**).
9. **Abhishek Kumar**, Bablesh Kumar Jha, Rakesh Kumar Misra, and Devender Singh. “**A New Current Injection Based Power flow Formulation.**” *Electric Power Components and Systems*, in **accepted**. (ISSN: 1532-5016), (**SCI Expanded, Impact Factor: 0.824**).
10. Bablesh Kumar Jha, **Abhishek Kumar**, Dharmendra Kumar Dheer, Devender Singh and Rakesh Kumar Misra. “**A modied current injection load flow method under different load model of EV for distribution system.**” *International Transactions on Electrical Energy Systems*, vol. 30, April. 2020. (ISSN:2050-7038), (**SCI Expanded, Impact Factor: 1.692**).
11. Bablesh Kumar Jha, **Abhishek Kumar**, Devender Singh, and Rakesh Kumar Misra. “**Coordinated effect of PHEVs with DGs on distribution network.**” *International Transactions on Electrical Energy Systems*, vol. 29, April. 2019. (ISSN:2050-7038), (**SCI Expanded, Impact Factor: 1.692**).
12. Tarun Maini, **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Intelligent Fuzzy Rough Set Based Feature Selection using Swarm algorithms with improved initialization.**” *Journal of Intelligent and Fuzzy Systems (JIFS)*, vol. 27, July. 2019. (ISSN: 1875-8967), (**SCI Expanded, Impact Factor: 1.851**).
13. Bablesh Kumar Jha, Amit Singh, **Abhishek Kumar**, Dharmendra Kumar Dheer, Devender Singh and Rakesh Kumar Misra. “**Day ahead scheduling of PHEVs and D-BESSs in presence of DGs in distribution system.**” *IET Electrical Systems in Transportation*, **accepted for publication**. (ISSN:2042-9738), (**SCI**).
14. Bablesh Kumar Jha, Amit Singh, **Abhishek Kumar**, Devender Singh and Rakesh Kumar Misra. “**Phase Unbalance and PAR Constrained Optimal Active and Reactive Power Scheduling of Virtual Power Plants (VPPs).**” *International Journal of Electrical Power and Energy Systems*, **Accepted for Publication**. (ISSN:0142-0615), (**SCI Expanded, Impact Factor: 3.588**).

15. Tarun Maini, Rakesh Kumar Misra, Devender Singh, and **Abhishek Kumar**. “**Rough Set Based Feature Selection Using Swarm Algorithms with Improved Initialization.**” *Journal of Computational and Theoretical Nanoscience* 15, no. 6-7 (2018): 2350-2354. (ISSN 1546-1963), (**SCOPUS Indexed**).
16. Sujeet Mishra, **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Feeder Phase Balancing using Single Phase Distributed Generations Considering Voltage Dependency of Loads.**” *Journal of Advanced Research in Dynamical and Control Systems*, **accepted for publication**. (ISSN: 1943-023X), (**SCOPUS Indexed**).

In Revision.

17. **Abhishek Kumar**, Swagatam Das, and Vaclav Snasel “**Self-Adaptive Spherical Search for Bound-constrained and Constrained Optimization.**” *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, **revise and resubmit**. (ISSN:2168-2216), (**SCI, Impact Factor: 9.309**).
18. **Abhishek Kumar**, Bables Kumar Jha, Swagatam Das, and Rammohan Mallipeddi. “**Solving the Power Flow Problem of Droop Controlled Islanded Microgrids: A Differential Evolution Approach.**” *IEEE Access*, **revise and resubmit**. (ISSN:2169-3536), (**SCI, Impact Factor: 3.745**).
19. **Abhishek Kumar**, Guohua Wo, Mostafa Ali, Qizhang Luo, Rammohan Mallipeddi, Ponuthurai Suganthan and Swagatam Das. “**A Benchmark-Suite of Real-World Constrained Multi-Objective Optimization Problems and some Baseline Results.**” *Swarm and Evolutionary Computation*, **in first revision**. (ISSN: 2210-6502), (**SCI Expanded, Impact Factor: 6.912**).

Under Review.

20. **Abhishek Kumar**, Swagatam Das, Lingping Kong and Vaclav Snasel “**Spherical Search with A Low Precision Projection Matrix for Real-World Optimization.**” *IEEE Transaction on Cybernetics*, **under review**. (ISSN:2168-2267), (**SCI, Impact Factor: 10.387**).
21. **Abhishek Kumar**, Bables Kumar Jha, Swagatam Das, and Rammohan Mallipeddi. “**Spherical Search based Constrained Optimization Algorithm for Power Flow Analysis of Islanded Microgrids.**” *Applied Soft Computing*, **under review**. (ISSN: 1568-4946), (**SCI Expanded, Impact Factor: 5.472**).

B. Peer Reviewed Book Chapters.

1. **Abhishek Kumar**, Tarun Maini, Rakesh Kumar Misra, and Devender Singh. “**Butterfly Constrained Optimizer for Constrained Optimization Problems.**” In *Computational Intelligence: Theories, Applications and Future Directions- Volume II*, pp. 477-486. *Advances in Intelligent Systems and Computing*, vol 799. Springer, Singapore, 2019. (ISSN:978-981-13-1135-2).
2. Sujeet Mishra, **Abhishek Kumar**, Devender Singh, and Rakesh Kumar Misra. “**Butterfly Optimizer for Placement and Sizing of Distributed Generation for Feeder Phase Balancing.**” In *Computational Intelligence: Theories, Applications and Future Directions- Volume II*, pp. 519-530. *Advances in Intelligent Systems and Computing*, vol 799. Springer, Singapore, 2019. (ISSN:978-981-13-1135-2).

3. Tarun Maini, **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Fuzzy Rough Set-Based Feature Selection with Improved Seed Population in PSO and IDS.**” In *Computational Intelligence: Theories, Applications and Future Directions- Volume II*, pp. 137-149. *Advances in Intelligent Systems and Computing*, vol 799. Springer, Singapore, 2019. (ISSN:978-981-13-1135-2).

C. Refereed International Conferences/Symposiums/Workshops.

1. **Abhishek Kumar**, Swagatam Das, and Ivan Zelinka. “**A self-adaptive spherical search algorithm for real-world constrained optimization problems.**” *Proceedings of the 2020 Genetic and Evolutionary Computation Conference Companion*. 2020, (First Rank in competition).
2. **Abhishek Kumar**, Swagatam Das, and Ivan Zelinka. “**A modified covariance matrix adaptation evolution strategy for real-world constrained optimization problems.**” *Proceedings of the 2020 Genetic and Evolutionary Computation Conference Companion*. 2020, (Third Rank in competition).
3. **Abhishek Kumar**, Rakesh Kumar Misra, Devender Singh and Swagatam Das. “**Testing A Multi-Operator based Differential Evolution Algorithm on the 100-Digit Challenge for Single Objective Numerical Optimization.**” *2019 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2019, (Fifth Rank in competition).
4. **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh “**Improving the local search capability of effective butterfly optimizer using covariance matrix adapted retreat phase.**” In *2017 IEEE Congress on Evolutionary Computation (CEC)*, pp. 1835-1842. IEEE, 2017. (Winner of competition of IEEE CEC-2017).
5. Tarun Maini, **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Rough set based feature selection using swarm intelligence with distributed sampled initialization.**” In *2017 6th International Conference on Computer Applications In Electrical Engineering-Recent Advances (CERA)*, pp. 92-97. IEEE, 2017.
6. Tarun Maini, **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Feature selection with intelligent dynamic swarm and fuzzy rough set.**” *2017 International Conference on Computing, Communication and Automation (ICCCA)*, Greater Noida, 2017, pp. 384-388.
7. **Abhishek Kumar**, Rakesh Kumar Misra, and Devender Singh. “**Butterfly Optimizer.**” In *2015 IEEE Workshop on Computational Intelligence: Theories, Applications and Future Directions (WCI)*, pp. 1-6. IEEE, 2015.

Ongoing Research Work

- ↪ **For constrained optimization algorithm**, developing real-world problem suite to analyze the performance and robustness of algorithms.
- ↪ **For single-, multi-, and many-objective constrained optimization problems**, developing new constraint handling techniques to deal with complex non-linear constraints, especially equality constraints.
- ↪ **For popular unconstrained optimization algorithms**, especially DE and CMA-ES, developing new search strategies and parameter adaptation techniques that utilize the information of constraint-space to guide solutions for moving towards feasible region.
- ↪ **For many-objective optimization problems**, developing new adaptive search strategies and selection procedure to deal with irregular Pareto front.
- ↪ **For Spherical Search Algorithm**, designing new strategies to solve single-, multi-, many-objective unconstrained and constrained optimization problems effectively.

Computer Skill

- ↪ Package: C/C++, Java, MATLAB, Julia, Python, PSCAD, ETAP, Origin, GAMS and OpenDss.
- ↪ Operating System: Windows, UNIX(Linux) and Android.
- ↪ Word Processor: MS word, MS powerpoint, LATEX, Beamer, and Overleaf.

Doctoral Thesis

Title *Mathematical Algorithms for Power Distribution Systems.*

Supervisor Dr. Rakesh Kumar Misra, Dr. Devender Singh

- Contribution
- The objective of this thesis is to propose different algorithms (conventional and nature-inspired algorithms) to solve the load flow problem and optimal load flow problem of modern distribution systems.
 - Conventional algorithms have been modified to deal with the current issues of modern distribution systems.
 - Load flow problem of ill-conditioned distribution systems is proposed as optimization problem and nature-inspired algorithms are proposed to solve this proposed optimization problem.
 - Novel constraint handling techniques are proposed to deal with constraints of optimization problem of modern distribution systems.
 - An iterative approach is proposed to solve the power flow problem of islanded microgrids.

Achievements

- ↪ Stood **First** for proposing optimization algorithm titled: “**SASS**”, in Special Session and Competition on Real-World Constrained Single Objective Optimization at **IEEE CEC-2020**, Glasgow, United Kingdom, 19-24 July 2020 and **GECCO-2020**, Cancun, Mexico, 8-12 July 2020.
- ↪ Stood **Third** for proposing optimization algorithm titled: “**sCMAgES**”, in Special Session and Competition on Real-World Constrained Single Objective Optimization at **IEEE CEC-2020**, Glasgow, United Kingdom, 19-24 July 2020 and **GECCO-2020**, Cancun, Mexico, 8-12 July 2020.
- ↪ Stood **Fifth** for proposing optimization algorithm titled: “**ESHADE_USM**”, in 100-Digit Challenge for Single Objective Numerical Optimization at **IEEE CEC-2019**, Wellington, New Zealand, 10-13 June 2019.
- ↪ Stood **Second** for proposing optimization algorithm titled: “**EBOwithCMAR**”, in Non-tuning Algorithm Section in 100-Digit Challenge for Single Objective Numerical Optimization at **IEEE CEC-2019**, Wellington, New Zealand, 10-13 June 2019.
- ↪ Stood **First** for presenting poster/model titled: “**Effective Butterfly optimizer**”, in the Institute Day at Indian Institute of Technology (BHU), Varanasi, 16-18 Feb 2018.
- ↪ Stood **First** for proposing optimization algorithm titled: “**Effective Butterfly Optimizer (EBOwithCMAR)**”, in Special Session and Competition on Real- Parameter Single Objective Optimization at **IEEE CEC-2017**, Donostia, Spain, 5-8 June 2017.
- ↪ Recipient of “**Young Researcher Awards-2016**” from “CIS Chapter, IEEE UP Section”, IIT Kanpur, Kanpur.
- ↪ Recipient of scholarship for 5 Years from MHRD, India for Ph.D through GATE examination.
- ↪ Remained in **Top 3** throughout my **B.Tech course**.

Professional Activity

- ↪ Serving as a Co-organizer in Special Session & Competitions on Real-World Multi- Objective Constrained Optimization at IEEE CEC-2021, Krakow, Poland, 28 June -01 July 2021.
- ↪ Serving as a Co-organizer in Special Session & Competitions on Single Objective Bound Constrained Optimization at IEEE CEC-2021, Krakow, Poland, 28 June -01 July 2021.
- ↪ Serving as a Co-organizer in Special Session & Competitions on Real-World Multi Objective Constrained Optimization at GECCO 2021, Lille, France, 10-14 July 2021.
- ↪ Serving as a Co-organizer in Special Session & Competitions on Single Objective Bound Constrained Optimization at GECCO 2021, Lille, France, 10-14 July 2021.
- ↪ Served as a Co-organizer in Special Session & Competitions on Real-World Single Objective Constrained Optimization at IEEE CEC-2020, Glasgow, UK, 19-24 July 2020.
- ↪ Served as a Co-organizer in Special Session & Competitions on Real-World Single Objective Constrained Optimization at SEMCCO 2020, Wuhan, China, 12-14 June 2020.
- ↪ Served as a Co-organizer in Special Session & Competitions on Real-World Single Objective Constrained Optimization at GECCO 2020, Cancun, Mexico, 8-12 July 2020.
- ↪ Teaching Assistantship (during Ph.D): Digital Technique and Instrumentation, Artificial Intelligence, Computer Methods in Power System, Fundamentals of Electrical Engineering, Network Analysis and synthesis and Operation Research.
- ↪ Lab Assistantship (during Ph.D): Power System Simulation Lab, High Voltage Engineering, Electrical Machine Lab, Network Theory and Measurement and Instrumentation.
- ↪ Student Membership: IEEE Power & Energy Society and IEEE Computational Intelligence Society.
- ↪ Served as a Senior Advisor in IEEE Student Chapter, IIT(BHU), Varanasi.
- ↪ Served as an Executive Committee Member in CIS Chapter, IEEE UP Section (CIS11), IIT, Kanpur.
- ↪ Served as a Key-organising Committee Member in UPCON 2016 Conference at IIT(BHU), Varanasi.

Research Collaborators/ Co-authors

- Prof. Rakesh Kumar Misra
- Prof. Devender Singh
- Prof. Václav Snášel
- Dr. Swagatam Das
- Dr. Ponnuthurai Nagaratnam Suganthan
- Dr. Rammohan Mallipeddi
- Dr. Guohua Wu
- Dr. Mostafa Z. Ali
- Dr. Dharmender Kumar Dheer
- Dr. Ling-Ping Kong
- Dr. Sujeet Mishra
- Dr. Bablesh Kumar Jha
- Mr. Tarun Maini
- Mr. Amit Kumar Singh

References

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