Tinkle Chugh

Postdoctoral researcher
Faculty of Information Technology
P.O. Box 35 (Agora)
FI-40014 University of Jyväskylä, Finland

Phone: +358 465982734
Birth: March 4, 1989, Sonepat, India
Home: http://users.jyu.fi/~tichugh/
Email: tinkle.chugh@gmail.com

Research Interests

I am interested in working on machine learning techniques, evolutionary computation, decision making and applications. Particularly, I focus on developing single- and multi-objective optimization methods e.g. Bayesian optimization methods using evolutionary algorithms and machine learning techniques like Gaussian processes, response surface approximation and clustering. I apply these algorithms to real-world optimization problems e.g. from mechanical and chemical engineering. Moreover, I use expert's (or decision maker's) preferences in the solution process to find a single or small set of desirable (optimal) solutions.

Keywords: Bayesian optimization, Machine learning, Evolutionary computation, single, multi and many-objective optimization, surrogate-assisted optimization, data-driven optimization, and decision making

Education

2013–2017	Doctor of Philosophy (Ph.D.), Mathematical Information Technology, University of Jyväskylä, Finland
	Thesis Title: Handling expensive multiobjective optimization problems with evolutionary algorithms
	Supervisors: Prof. Yaochu Jin, Prof. Kaisa Miettinen, Dr. Karthik Sindhya and Dr. Jussi Hakanen
2010–2012	Master of Technology (M.Tech), Chemical Engineering, Indian Institute of Technology (IIT) Hyderabad, India
	Thesis Title: Moment based evolutionary approach to model and optimize the free radical polymerization with long chain branching
	Supervisors: Associate Prof. Kishalay Mitra and Dr. Saptarshi Majumdar
2006–2010	Bachelor of Engineering (B.E.), Chemical Engineering, MD University Rohtak, India

My PhD thesis was a part of the project "Decision Support for Complex Multiobjective optimization problems (DeCoMo)", where I worked with "Finland Distinguished Professor (FiDiPro)" Yaochu Jin and industries involved. For more details, see DeCoMo

Projects

[1] FiDiPro (Finland Distinguished Professor) project DeCoMo (Decision support for complex multiobjective optimization problems) from Jan 2015 to Dec 2017. The project is funded by Tekes: The Finnish Funding Agency for Innovation and the principle investigator is Prof. Kaisa Miettinen from the University of Jyvaskyla, Finland. I worked as a PhD student and Postdoctoral Researcher in the project.

[2] The BigFoot project from Jan 2018 to April 2021 funded by National Environment Research Council (NERC) UK. The principle investigators are Prof. Richard Everson from and Prof. Peter Challenor from the University of Exeter, UK. I will work as a Postdoctoral Research Fellow in the project.

Publications

Theses and dissertations

[1] **T. Chugh**. (2017). Handling expensive multiobjective optimization problems with evolutionary algorithms. PhD thesis, Jyväskylä studies in computing 263, ISBN: 978-951-39-7090-1, 2017 Retrieved from http://urn.fi/URN:ISBN:978-951-39-7090-1

[2] **T. Chugh**. (2012). Moment based evolutionary approach to model and optimize the free radical polymerization with long chain branching, Master Thesis, Indian Institute of Technology Hyderabad, India

Book Chapters

[1] **T. Chugh**, A. Rahat, V. Volz and M. Zaefferer. Towards Better Integration of Surrogate Models and Optimizers. Accepted in "High-Performance Simulation Based Optimization" edited by Prof. Thomas Bartz-Beielstein, Prof. Bogdan Filipic, Assoc. Prof. Peter Korosec and Prof. El-Ghazali Talbi, in the Springer series "*Studies in Computational Intelligence*", to appear.

[2] **T. Chugh**, C. Sun, H. Wang and Y. Jin. Surrogate-assisted optimization of large problems. Submitted to the book "High-Performance Simulation Based Optimization" edited by Prof. Thomas Bartz-Beielstein, Prof. Bogdan Filipic, Assoc. Prof. Peter Korosec and Prof. El-Ghazali Talbi,in the Springer series "*Studies in Computational Intelligence*".

Peer-reviewed Journal Papers

[1] **T. Chugh**, K. Sindhya, J. Hakanen and K. Miettinen. A survey on handling computationally expensive multiobjective optimization problems with evolutionary algorithms. *Soft Computing*, to appear, DOI: 10.1007/s00500-017-2965-0

[2] **T. Chugh**, Y. Jin, K. Miettinen, J. Hakanen and K. Sindhya. A surrogate-assisted evolutionary algorithm for computationally expensive many-objective optimization. *IEEE Transactions on Evolutionary Computation*, to appear, DOI: 10.1109/TEVC.2016.2622301

[3] **T. Chugh**, N. Chakraborti, K. Sindhya and Y. Jin. A data-driven surrogate-assisted evolutionary algorithm applied to a many-objective blast furnace optimization problem. *Materials and Manufacturing Processes*, 32, 1172-1178, 2017

[4] M. Anitha, **T. Chugh**, S. Majumdar, K. Mitra. "Multi-objective optimization of bulk vinyl acetate polymerization with branching", *Materials and Manufacturing Processes*, 29, 210-217, 2014

Peer-reviewed Conference Papers

[1] **T. Chugh**, K. Sindhya, K. Miettinen, Y. Jin, T. Kratky and P. Makkonen. Surrogate-assisted evolutionary multiobjective shape optimization of an air intake system. In *Proceedings of 2017 IEEE Congress on Evolutionary Computation (CEC)*, IEEE, 1541-1548, 2017 (The article won the best student paper award in IEEE CEC 2017).

[2] J. Hakanen, **T. Chugh** , K. Sindhya, Y. Jin and K. Miettinen. Connections of Reference Vectors and Different Types of Preference Information in Interactive Multiobjective Evolutionary Algorithms. In *Proceedings of 2016 IEEE Symposium Series on Computational Intelligence (SSCI)*, IEEE, 1-8, 2016.

[3] **T. Chugh**, K. Sindhya, K. Miettinen and J. Hakanen and Y. Jin. On constraint handling in surrogate-assisted many-objective optimization. In *Proceedings of 14th International Conference on Parallel Problem Solving from Nature (PPSN)*, Springer International Publishing, 214-224, 2016.

[4] **T. Chugh**, K. Sindhya, J. Hakanen, K. Miettinen. An interactive simple indicator-based evolutionary algorithm (I-SIBEA) for multiobjective optimization problems. In *Proceedings of Evolutionary Multi-Criterion Optimization (EMO)*, Springer International Publishing, 277-291, 2015.

Journal articles under review

[1] **T. Chugh**, T. Kratky, K. Sindhya, K. Miettinen, Y. Jin and P. Makkonen. Preference incorporation in surrogate-assisted multiobjective optimization: A case study.

[2] J. Kaur, **T. Chugh** and V.K. Sangal. Efficient Global Optimization for the Synthesis of Ethyl Tertiary Butyl Ether via Reactive Dividing Wall distillation Column.

Technical Reports

[1] **T. Chugh**, K. Sindhya, J. Hakanen, K. Miettinen. Handling Computationally Expensive Multiobjective Optimization Problems with Evolutionary Algorithms: A Survey, *Reports of the Department of Mathematical Information Technology, Series B, Scientific Computing, No. B 4/2015*, University of Jyväskylä, Jyväskylä, 2015.

[2] **T. Chugh**, Y. Jin, K. Miettinen, J. Hakanen and K. Sindhya. A Kriging-assisted evolutionary algorithm for many-objective optimization, *Reports of the Department of Mathematical Information Technology, Series B, Scientific Computing, No. B 2/2016*, University of Jyväskylä, Jyväskylä, 2016.

Other Conferences

[1] J. Hakanen, **T. Chugh**, K. Sindhya, Y. Jin and K. Miettinen. Interactive K-RVEA: interactive evolutionary multiobjective optimization algorithm for computationally expensive problems. Accepted in the conference Multiple Criteria Decision Making (MCDM), 2017.

[2] K. Sindhya, T. Rauhala, **T. Chugh**, Y. Jin, K. Miettinen and J. Hakanen. Multiobjective Optimization in Assessment of Transmission Network Compensation Strategy, 28th European Conference on Operational Research 2016 , Poznan, Poland, July 3- 7, 2016.

[3] **T. Chugh**, K. Sindhya, J. Hakanen, K. Miettinen, Y. Jin. A surrogate assisted inverse model based evolutionary multiobjective optimization algorithm for computationally expensive problems, Multiple Criteria Decision Making (MCDM) 2015 , Hamburg, Germany, August 2 - 7, 2015.

[4] **T. Chugh**. Handling computationally expensive multi-objective optimization problems using evolutionary algorithms: A survey, In International conference for Mathematical Modeling and Optimization in Mechanics (MMOM) 2014, Jyväskylä, Finland, March 6 - 7, 2014.

[5] M. Anitha, **T. Chugh**, K. Mitra, S. Majumdar. Effect of live radical species in controlled branching of bulk free radical polymerization system: A multi objective evolutionary approach. In International Conference on Advances in Chemical Engineering (ACE 2013), IIT Roorkee, India, February 22 - 24, 2013.

[6] M. Anitha, **T. Chugh**, S. Majumdar, K. Mitra. Optimal process conditions for the controlled branching of free radical polymerization: A case study. In Chemcon 2012, NIT Jalandhar, India, December 27-30, 2012.

[7] **T. Chugh**, M. Anitha, S. Majumdar. Study of branching in batch free radical polymerization of vinyl acetate. In TACEE 2012, BITS Pilani, India, March 23-24, 2012

Selected Honours and Awards

2017 Best Student Paper Award at the IEEE Congress on Evolutionary Computation (IEEE CEC), San Sebastian, Spain

2012 Academic Excellence Award in M.Tech from former President of India Dr. APJ Abdul Kalam

2012 Received silver medal for being first in M.Tech in Indian Institute of Technology Hyderabad, India

Professional Activities

- Reviewer of journals, IEEE Transactions on Evolutionary Computation, Soft Computing, Applied Soft Computing, Information Sciences and Materials and Manufacturing Processes
- Reviewer of conferences, The Genetic and Evolutionary Computation Conference (GECCO), IEEE Symposium Series on Computational Intelligence (IEEE SSCI)

- Visited Prof. K.C. Giannakoglou, School of Mechanical Engineering, National Technical University of Athens, Greece as a visiting researcher, Aug 22- Sep 03, 2017
- Participated in Doctoral Network Training Cruise Seminar (coordinated by Prof. Ahti Salo, Aalto University School of Science) from Helsinki to Tallinn, 29-30 May, 2017
- Visited University of Surrey, UK as a PhD student from September-November 2015 and September-October 2016
- Participated in workshop on surrogate-assisted multi-criteria optimization (SAMCO) from Feb 29 to March 4, 2016, Leiden, Netherlands
- Participated in EURO PhD School on MCDM from Feb 17 to Feb 28, 2014, Madrid, Spain

Previous work experience

- Post graduate engineer trainee in Mercedes Benz Research and Development India Pvt Ltd from July 2012 to Aug 2013
  Tasks: Worked for various computational fluid dynamics involving three dimensional and one dimensional simulations to get the optimized flow parameters

References

- Prof. Yaochu Jin
  Professor in Computational Intelligence
  Head, Nature Inspired Computing and Engineering Group
  Department of Computer Science, University of Surrey
  Guildford, Surrey, GU2 7XH, UK
  Finland Distinguished Professor, University of Jyväskylä , Finland
  Email: yaochu.jin@surrey.ac.uk
- Prof. Kaisa Miettinen
  Vice-rector of University of Jyväskylä
  Industrial Optimization Group
  Professor at the Faculty of Information Technology
  P.O. Box 35 (Agora)
  FI-40014 University of Jyväskylä Finland
  Email: kaisa.miettinen@jyu.fi
- Adjunct Professor Jussi Hakanen
  Industrial Optimization Group
  Professor at the Faculty of Information Technology
  P.O. Box 35 (Agora)
  FI-40014 University of Jyväskylä Finland
  Email: jussi.hakanen@jyu.fi