CURRICULUM VITAE

Miettinen, Kaisa Marketta, ORCID id: orcid.org/0000-0003-1013-4689
Nationality: Finnish, homepage: http://www.mit.jyu.fi/miettine/engl.html

Education and degrees completed
+ August 24, 1994, Doctor of Philosophy (Mathematical Inform. Technology), University of Jyväskylä, Finland
+ November 16, 1988, Master of Science (Mathematics), University of Jyväskylä, Finland

Current position
September 2007 –: Professor in industrial optimization, University of Jyväskylä (JYU)

Examples of previous work experience
+ August 2012 – October 2017: Vice-rector of JYU (part-time); 2011–2012: Visiting professor in optimization and systems theory, KTH Royal Institute of Technology, Stockholm, Sweden (part-time); 2004–2007: Professor in financial mathematics, Helsinki School of Economics (HSE)

Examples of research funding
+ Tekes and 5 companies, PI, 2001–2005, 756.000 EUR
+ Tekes and 9 companies, coordinator of whole project and PI at JYU and HSE, 2005–2008, 1.149.325 EUR
+ Academy of Finland, FiDiPro project of Kalyanmoy Deb at HSE, initial PI, 2007
+ Tekes, JYU and 5 companies, PI of JYU part, 2008–2011, JYU share 212.824 EUR
+ Tekes, JYU and 2 companies, FiDiPro project of Yaochu Jin at JYU, PI, 2015–2017, 876.150 EUR
+ Academy of Finland, PI, 2009–2012, 420.000 EUR; Academy of Finland and JYU, PI, 2015–2019, 783.556 EUR; 2019–2023, 846.480 EUR

Leadership and supervision experience
+ Main supervisor of 13 post-doc researchers since 2006
+ Main supervisor of 16 and secondary supervisor of 1 doctoral theses
+ Founder and active leader of the "Multiobjective Optimization Group", JYU, 1998– http://www.mit.jyu.fi/optgroup
+ Director of the profiling area at JYU: Decision Analytics Utilizing Causal Models and Multiobjective Optimization (DEMO), http://www.jyu.fi/demo

Some awards and honours
+ International Society on MCDM: Georg Cantor Award 2017; Presidential Service Award 2015; Conference Chairmanship Award 2011
+ Member of the Finnish Academy of Science and Letters, Section of Science, 2014–
+ Vaisala Award of the Finnish Academy of Science and Letters in mathematics for research merits, 2009

Other key scientific or academic merits
Pre-examiner or opponent of doctoral dissert. member of dissert. committees, eval. of competence
+ for 14 PhD theses

Examples of invited international keynote lectures
+ Invited plenaries: Int. Workshop on Neural Network and Genetic Algorithm in Material Science and Engineering (Howrah, 2006), MCDM2006 (Chania, 2006), EurOPT-2008 (Neringa, 2008), 11th Int. Conf. on AI and Soft Computing (Zakopane, 2012), 59th Workshop on Nonlinear Optim. (Erice, 2013), ENUMATH2015 (Ankara, 2015), Int. Conf. on OR (Hamburg, 2016), MOPTA2017 (Bethlehem, 2017), MACODA Workshop at Lorenz Center (Leiden, 2019), EUROGEN2021 (Athens, 2021)
+ Invited keynote talks: IEEE-SSCI-MCDM (Orlando, 2014), Int. Conf. on Management Sciences and Decision Making (New Taipei City, 2018), Int. Global Optim. Workshop (Leiden, 2018), 5th Int. Conf. on Machine Learning, Optim. and Data Science (Siena, 2019), IEEE World Congress on Comput. Intelligence (Glasgow, 2020)
+ Invited tutorials: 1st Int. Conf. on EMO (Zurich, 2001), 20th Int. Conf. on MCDM (Chengdu, 2009), Conf. of the Dutch OR Society (Lunteren, 2014), 10th Int. Conf. on EMO (East Lansing, 2019), 11th Int. Conf. on EMO (Shenzhen, 2021)

Merits related to open science production
+ open software framework DESDEO, https://desdeo.it.jyu.fi/

Memberships and positions of trust in scientific societies
+ International Society on MCDM: 2015–2019 *Immediate-Past-President*, 2011–2015 *President*, 2008–2011 President-Elect, 1997–2008 Secretary
+ EUROPT – The Continuous Optimization Working Group of EURO: 2010–2012 President (Chair), 2008–2010 General Vice-Chair, 2006–2008 Member of the Managing Board (and Newsletter Editor)

Positions as member of editorial boards of scientific journals
+ In 7 journals

Scientific and societal impact of research
+ 1 C1 monograph, 115 A1 refereed journal articles, 9 A3 chapters in research books, 68 A4 conference proceedings articles, 2 B1 non-refereed journal articles, 6 B3 non-refereed proceedings articles, 17 C2 edited books or special issues + 1 in preparation, 8 D1 articles in trade journals, 74 D4 reports, 2 D5 lecture notes and 4 G theses.
+ Publications cited according to Google Scholar about 16980 times, h-index 50 and (excluding the monograph) according to Scopus 4984 times, h-index 41 (in March 2022)

The Multiobjective Optimization Group at the University of Jyväskylä

The Multiobjective Optimization Group at the University of Jyväskylä, Finland, is a part of the Faculty of Information Technology and is led by Prof. Kaisa Miettinen (since 1998). The Multiobjective Optimization Group develops theory, methodology and computer implementations for solving real-world decision-making problems. The research is inspired by the need of supporting decision making in real-world applications and focuses on (nonlinear) multiobjective optimization, that is, finding the best balance among conflicting objectives. The group is active in the thematic research area Decision Analytics utilizing Causal Models and Multiobjective Optimization (DEMO, jyu.fi/demo), which specialized in data-driven decision support. The group is also interested in developing visualizations for decision support, considering uncertainty in decision making and employing artificial intelligence, machine learning and, in particular, explainable artificial intelligence. The group develops interactive, evolutionary and hybrid methods for both simulation-based and (online and offline) data-driven problems. It develops the following types of interactive methods: classification-based methods, navigation methods, trade-off free methods and methods where different types of preference information can be provided by the decision maker. The group also actively explores new paradigms for multiobjective optimization. The research is inspired by needs of real decision making problems.

The group specializes in implementing old and new interactive multiobjective optimization methods as open-source software in the modular DESDEO framework. DESDEO is a free and open-source Python-based framework for developing and experimenting with interactive multiobjective optimization. The mission of DESDEO is to increase the awareness of the benefits of interactive methods and make them easily available and applicable. The framework consists of reusable components that can be utilized for implementing new methods or modifying the existing ones. Besides methods, DESDEO also includes user interfaces for them, and the group pays attention in user interface design taking human cognitive and affective processes into account. DESDEO currently contains the implementations of multiple interactive and non-interactive methods. Among the interactive methods available in DESDEO are the synchronous NIMBUS method, different variants of the NAUTILUS method family (including NAUTILUS Navigator), Wierzbicki's reference point method, Pareto Navigator, PBEA, interactive RVEA, and interactive NSGA-III. The list of non-interactive methods in DESDEO includes ε-constraint method, IBEA, RVEA, NSGA-III, MOEA/D, EvoNN and BioGP. Having many methods in the same framework enables method comparison and DESDEO includes, for example, artificial decision makers for comparing interactive methods without humans.

The general theoretical and methodological development in the group focuses on methods that are suitable and applicable for industrial or other real applications. In addition, the methods developed are independent of the application, so they can be utilized for solving different problems.

The group has a weekly seminar and vast international collaboration networks. Members of the group publish research articles actively. Visitors are welcome for longer or shorter periods.

For more information about the Multiobjective Optimization Group, see the group's website: http://www.mit.jyu.fi/optgroup

Utilizing Interactive Multiobjective Evolutionary Algorithms for Supporting Decision-Making in Real World Problems

Real-world problems often have multiple conflicting objective functions that must be optimized simultaneously. The optimization process involves finding compromise solutions called Pareto optimal solution that represent different trade-offs among the objective functions. Evolutionary algorithms are commonly utilized to solve these problems because they can efficiently approximate the set of Pareto optimal solutions with population members. However, in real-world applications, a decision maker (DM), a problem domain expert, is interested in some Pareto optimal solutions based on their preferences (called a region of interest), and eventually, a single solution to be put into practice. A multiobjective optimization solution process aims to support the DM find their most preferred solution(s) within the region of interest. Multiobjective optimization methods can be classified based on how the DM proved preference information to be incorporated to direct the solution processt. The classes are no preference, *a priori*, interactive, and *a posteriori* methods where no preferences are available or they are provided before, during or after the solution process, respectively. Interactive methods allow the DM to provide preference information iteratively during the optimization process. Interactive methods often involve two phases: learning and decision phases. In the learning phase, the DM explores solutions until finding a preferred region of interest. In the decision phase, the DM refines solutions within that region to find the most preferred one(s). Although many interactive multiobjective evolutionary algorithms have been proposed in the literature, there is still a considerable gap between theory and practice, as the needs of real DMs are often ignored. The interested candidate will work on enhancing the applicability of interactive multiobjective evolutionary algorithms for real-world problems. We are interested in the following research topics:

1) Developing new interactive multiobjective evolutionary algorithms: developing new interactive multiobjective evolutionary algorithms that allow the DM to provide multiple types of preferences.
2) Enhancing the communication between DMs and interactive multiobjective evolutionary algorithms: this topic involves designing graphical user interfaces for retrieving preferences and showing solutions to the DM. This includes also developing new types of visualizations.
3) Experimental studies with different interactive multiobjective evolutionary algorithms: Most interactive multiobjective evolutionary algorithms have been tested only with benchmark problems. We are interested in experimenting with these methods utilizing engineering problems to uncover their strengths and limitations.

The work developed during the scholarship will be implemented as open-source software utilizing the DESDEO framework [1]. DESDEO is a Python-based software framework that has been developed in our research group. Its mission is to increase awareness of the benefits of interactive methods and make them more easily available and applicable.

Requirements: Background in multiobjective optimization, programming experience in Python, knowledge of evolutionary algorithms, ability to work in a team in English.

Multiobjective Optimization Group website: http://www.mit.jyu.fi/optgroup/

DESDEO website: https://desdeo.it.jyu.fi/

Reference: [1] G. Misitano, B. S. Saini, B. Afsar, B. Shavazipour and K. Miettinen, "DESDEO: The Modular and Open Source Framework for Interactive Multiobjective Optimization," in IEEE Access, vol. 9, pp. 148277-148295, 2021, doi: 10.1109/ACCESS.2021.3123825.