A Survey of Decomposition-Based Evolutionary Multi-Objective Optimization: PART II—A Data Science Perspective

Anonymous authors

APPENDIX A
GPT PROMPTS

Prompt for Affiliation Wrangling

"Imagine this scenario: You are given with a list of academic institutions:
`[DOCUMENTS]`
Your task is to identify institutions that appear with multiple spellings or abbreviations but actually refer to the same entity, and suggest a standardized name for them in this format:
`[RAW NAME] -> [STANDARDIZED NAME]`
Examples:
`[Examples]`"

Prompt for Venue Wrangling

"Imagine this scenario: You are given with a list of academic venues:
`[DOCUMENTS]`
Your task is to identify venues that appear with multiple spellings or abbreviations but actually refer to the same entity, and suggest a standardized name for them in this format:
`[RAW NAME] -> [STANDARDIZED NAME]`
Examples:
`[Examples]`"

Prompt for Citation Intent Classification

"Given the citation statement:
`[CITATION STATEMTN]`
Which of the following options is the most appropriate way to categorize `#[CITATION TAG]` according to the author's reasoning for citing it?
`[CATEGORIES WITH DESCRIPTIONS]`
Examples:
`[Examples]`"

Prompt for Topic Representation

"This is a list of paper titles and abstracts:
`[SAMPLE PAPER CONTENTS]`
Each collection of papers describe a certain specific research topic within (decomposition-based) evoluationry multi-objective optimization. After each collection of papers, the name of the topic they represent is mentioned as a short-highly-descriptive title, and description of the topic is a concise highlighting summary with 1-2 sentence. The description should only offers a bird-view on the essence of the topics (e.g., those related to the keywords). For topics focused on applications, the description should include what are the conflicting objectives, and what are the optimization variables.
Examples:
`[Examples]`"

APPENDIX B
GPT-GENERATED TOPIC REPRESENTATIONS

T0 **Multi-Objective Optimization for Energy Systems.** This area investigates the application of multi-objective evolutionary algorithms to optimize renewable energy systems and electric power distribution. The research emphasizes on balancing conflicting objectives such as maximizing energy production from renewable sources like wind and solar, optimizing power load and distribution, and enhancing system efficiency and reliability. It covers diverse methodologies for planning, operating, and managing renewable energy sources and storage units within electric power systems, addressing challenges related to power fluctuation, load management, and environmental impact.

T1 **Multi-Objective Production Systems Scheduling.** This research theme is centered on the application of decomposition-based multi-objective evolutionary algorithms (MOEA/D) to develop strategies for efficient scheduling across various types of production environments, such as job shops, flow shops, and hybrid systems. It particularly addresses the optimization of production schedules to minimize energy consumption and operational costs while meeting production targets and constraints (e.g., makespan, machine availability). Conflicting objectives often include energy efficiency, production throughput, and adherence to schedules, with optimization variables encompassing job sequencing, machine assignments, and maintenance planning.

T2 **Evolutionary Multi-Objective Optimization: Broad Approaches and Applications.** This area of research delves into the diverse methodologies and applications of evolutionary algorithms for solving multi-objective optimization problems, showcasing a wide range of algorithmic innovations and practical applications. It highlights the development and assessment of algorithms capable of handling complex optimization landscapes involving multiple, often conflicting objectives. The applications span from financial industry structure optimization to hot mix asphalt problem-solving, underlining the versatility and adaptability of evolutionary multi-objective optimization strategies in addressing real-world challenges with multiple objectives.

T3 **Adaptive and Differential Evolution Strategies in MOEA/D.** This research theme delves into the refinement of multi-objective evolutionary algorithms based on decomposition (MOEA/D), focusing on adaptive and differential evolution strategies. Key innovations include the development of novel operator selection mechanisms, differential evolution techniques, and strategies for enhancing algorithm performance through adaptation and decomposition. These approaches aim to boost convergence rates, maintain diversity across solutions, and efficiently solve complex multi-objective optimization problems, thereby extending MOEA/D applicability to a broader range of challenging scenarios.

T4 **Constraint Handling in MOEA/D.** This area delves into sophisticated strategies for managing constraints in decomposition-based MOEA/D frameworks, focusing on constrained multi-objective and many-objective optimization problems. The research pioneers methods for balancing the intricacies of optimizing multiple conflicting objectives while efficiently dealing with constraints to find feasible solutions. Techniques such as dynamic penalty functions, adaptive constraint handling, and novel operator designs highlight the innovative approaches to enhance algorithmic performance and solution quality in complex constrained optimization landscapes.

T5 **Swarm Intelligence and Particle Swarm Optimization in Multi-Objective Problems.** This topic delves into the innovative applications of swarm intelligence principles, particularly focusing on Particle Swarm Optimization (PSO) algorithms, for solving multi-objective optimization problems. The research primarily harnesses the natural behavior-inspired algorithms like PSO, glowworm swarm optimization, and others, for effectively navigating through complex search spaces to find optimal solutions across multiple objectives. Techniques involve adapting swarm behaviors to enhance exploration and exploitation capabilities, utilizing archives for solution selection, and developing hybrid strategies to address the intricacies of many-objective optimization scenarios.

T6 **Surrogate-Assisted Techniques for Expensive Many-Objective Problems.** This research area delves into enhancing the capabilities of surrogate-assisted decomposition-based multi-objective evolutionary algorithms (MOEA/D) to address high-dimensional and computationally intensive optimization tasks. It concentrates on leveraging advanced surrogate modeling techniques, such as kriging, transfer learning, and Gaussian processes, to efficiently approximate the objective functions of expensive problems. The focus is on improving algorithmic efficiency and scalability, with a particular emphasis on handling many-objective optimization scenarios where direct evaluations are prohibitively costly, aiming to strike a balance between accuracy and computational resource usage.

T7 **Interactive Preference-Based Evolutionary Multi-Objective Optimization.** This field concentrates on the inclusion of decision maker (DM) preferences into the process of multi-objective optimization using MOEA/D. The core idea revolves around dynamically incorporating user preferences to guide the evolutionary search towards more desirable regions of the solution space. Emphasis is placed on interactive techniques that allow decision makers to iteratively refine their preferences, facilitating a more targeted and efficient search for optimal solutions that align with the decision maker's goals. This approach is particularly valuable in complex optimization scenarios where identifying trade-offs between conflicting objectives is crucial, and it seeks to enhance the decision-making process by making the optimization more responsive and tailored to individual preferences.

T8 **Community Detection in Complex Networks by Evolutionary Multi-Objective Optimization.** This research area delves into the utilization of evolutionary multi-objective optimization algorithms for identifying communities within complex networks. The primary focus lies in uncovering the intricate community structures that naturally exist within various types of networks, such as social, biological, and technological systems. By leveraging approaches like MOEA/D, researchers aim to optimize conflicting objectives, such as maximizing modularity or minimizing overlap, to accurately detect and analyze communities. The optimization variables often include node groupings and edge weights, which are crucial for understanding the underlying network dynamics and facilitating tasks like influence maximization and structural analysis.

T9 **Dynamic Multi-Objective Optimization in Evolutionary Algorithms.** This research field delves into the challenges of dynamic multi-objective optimization (DMOPs) where the optimization landscape changes over time. It leverages prediction strategies, environmental change detection, and adaptation techniques within multi-objective evolutionary algorithms (MOEA/D) to maintain solution relevance and adaptability. The focus is on developing algorithms that can efficiently track and adapt to changes in the optimization objectives and constraints, ensuring robustness and flexibility in dynamically evolving problem environments.

T10 **Hybrid and Metaheuristic Approaches in MOEA/D for the Knapsack Problem.** This research theme explores the integration of hybrid and metaheuristic techniques within the framework of MOEA/D to solve variants of the knapsack problem, a classic discrete optimization challenge involving decisions on items to include in a knapsack to maximize benefits without exceeding capacity constraints. The focus lies on enhancing algorithmic efficiency and effectiveness in dealing with multi-objective, many-objective, and constrained versions of the knapsack problem, employing advanced strategies like Bayesian estimation, swarm intelligence, and local search. These approaches aim to balance between exploration and exploitation, effectively navigating the search space to find high-quality solutions that respect multiple, often conflicting objectives.

T11 **Evolutionary Multi-Objective Optimization in Deep Neural Network Design.** This area of research applies evolutionary multi-objective optimization techniques to the design and compression of deep neural networks. By focusing on objectives such as network sparsity, performance, and computational efficiency, the work aims to develop lightweight models without sacrificing accuracy. Techniques include pruning, architecture search, and ensemble methods to balance between model complexity and task performance, particularly relevant in resource-constrained environments and applications requiring high-speed processing.

T12 **Wireless Sensor Network Optimization with MOEA/D.** This research domain explores the use of decomposition-based multi-objective evolutionary algorithms (MOEA/D) for optimizing wireless sensor networks (WSNs). The primary focus is on achieving an optimal balance among critical performance metrics such as coverage, network lifetime, energy efficiency, and deployment cost. Solutions aim to strategically place and manage sensor nodes within various environments, including hazardous or inaccessible areas, ensuring reliable data collection and transmission with minimal energy consumption and cost, while maximizing network lifespan and coverage.

T13 **Reference Vector and Point-Based Evolutionary Many-Objective Optimization.** This research topic delves into the advancements and strategies within MOEA/D that utilize reference vectors and points to guide the search process in many-objective optimization scenarios. The emphasis is on improving algorithm performance and solution quality by dynamically adjusting reference vectors or points, particularly for tackling problems with irregular or complex Pareto fronts. The approaches focus on enhancing the diversity and convergence of solutions, ensuring a comprehensive exploration of the objective space, and efficiently dealing with many-objective optimization challenges.

T14 **Evolutionary Multi-Objective Optimization for Vehicle Routing Problems.** This area delves into the application of decomposition-based multi-objective evolutionary algorithms (MOEA/D) to vehicle routing problems (VRPs), focusing on optimizing routes for delivery and pickup services under various constraints such as time windows, stochastic demands, and environmental considerations. The research emphasizes developing algorithms that can efficiently balance conflicting objectives, such as minimizing travel distance, cost, and environmental impact, while ensuring timely deliveries and pickups. Optimization variables typically include route planning, vehicle scheduling, and resource allocation, aiming to achieve sustainable and efficient transportation and logistics operations.

T15 **Multi-Objective Optimization for Traveling Salesman Problems (TSP) Using Evolutionary Algorithms.** This research area delves into the application of decomposition-based multi-objective evolutionary algorithms (MOEA/D) to solve various formulations of the Traveling Salesman Problem (TSP), including the multi-objective, bi-objective, and dynamic variants. It explores innovative integration of techniques like ant colony optimization (ACO), simulated annealing, and estimation of distribution algorithms, focusing on balancing the optimization of conflicting objectives such as minimizing distance while maximizing tour quality or other problem-specific criteria. The efforts are directed towards enhancing the efficiency and solution quality in solving these combinatorially complex problems, leveraging adaptive and hybrid approaches to navigate the intricate search spaces effectively.

T16 **Multimodal Multi-Objective Optimization in Evolutionary Algorithms.** This research area delves into the challenges of identifying multiple optimal solutions in multimodal multi-objective optimization landscapes, where each solution represents a different set of trade-offs among conflicting objectives. It emphasizes the importance of maintaining diversity in both objective and decision spaces, enabling the exploration of various Pareto-optimal fronts. The application of niching methods, decision space analysis, and multimodal techniques are pivotal for achieving balanced convergence and diversity, crucial for tasks like credit card fraud detection where multiple, equally viable solutions are sought for complex decision-making scenarios.

T17 **Edge-Cloud Computing and Service Offloading for IoT in Multi-Objective Optimization.** This area of research focuses on the intersection of multi-objective optimization, Internet of Things (IoT), and edge-cloud computing, emphasizing the efficient allocation and offloading of computational resources and services. The conflicting objectives often involve minimizing latency and energy consumption while maximizing bandwidth efficiency and service adaptiveness, particularly in mobile and vehicular networks. The optimization variables revolve around resource distribution, task assignment, and service deployment strategies to enhance performance and sustainability in IoT ecosystems.

T18 **Multi-Objective Portfolio Optimization Using Evolutionary Algorithms.** This topic delves into the development of advanced multi-objective evolutionary algorithms (MOEA/D) for optimizing investment portfolios. It highlights the challenge of balancing between maximizing returns and minimizing risks, among other conflicting objectives such as diversification and liquidity. The research predominantly focuses on creating models that accommodate various constraints (e.g., cardinality, transaction costs) and preferences, employing a mix of financial theories and evolutionary strategies to derive optimal or near-optimal portfolios under uncertain market conditions.

T19 **Indicator-Based Evolutionary Multi-Objective Optimization for Many-Objective Problems.** This research domain delves into the use of indicator-based approaches, notably IGD (Inverted Generational Distance), R2, and others, within multi-objective evolutionary algorithms for solving many-objective optimization problems. It focuses on enhancing algorithm performance and decision-making quality by leveraging indicators as key components for selection, evaluation, and diversity maintenance. The methodologies aim to efficiently navigate the complex trade-offs among a higher number of objectives, offering insights into algorithm adaptability and scalability in many-objective optimization environments.

T20 **Multi-Objective Evolutionary Algorithms for Feature Selection in Classification.** This area of research applies multi-objective evolutionary algorithms (MOEA) to the problem of feature selection for classification tasks. By leveraging concepts such as sparsity, diversity, and information theory, these studies aim to identify the most relevant subset of features that can improve classification accuracy while maintaining a balance between the complexity of the model and its predictive power. The conflicting objectives often involve maximizing classification performance and minimizing feature set size, addressing challenges in high-dimensional datasets and various application domains like credit card fraud detection and drug discovery.

T21 **Multi-Objective Optimization in Analog and RF Circuit Design.** This area delves into applying decomposition-based multi-objective evolutionary algorithms (MOEA/D) to the design and optimization of analog and RF (Radio Frequency) circuits. The primary focus is on balancing multiple conflicting objectives such as power, noise, and performance under varying conditions, utilizing techniques like Bayesian optimization and surrogate modeling. Optimization variables include the physical dimensions and electronic properties of circuit components. The goal is to automate the synthesis process, enhancing design efficiency and achieving optimal trade-offs among critical circuit parameters.

T22 **Water Resources Management through Evolutionary Multi-Objective Optimization.** This topic revolves around the application of decomposition-based multi-objective evolutionary algorithms (MOEA/D) for managing water resources, including reservoir operations, flood control, and irrigation systems. Research in this area seeks to optimize multiple conflicting objectives such as water distribution efficiency, energy production from hydropower, and minimizing flood risks. Optimization variables often include water release volumes, timing of irrigation, and operation schedules of reservoirs and pumps, aiming to achieve a sustainable balance between water availability, agricultural needs, and ecological considerations.

T23 **Multi-Objective Antenna Array Design and Synthesis.** This topic delves into the use of MOEA/D for optimizing the design and synthesis of antenna arrays, addressing the intricate balance between various performance metrics such as bandwidth, radiation patterns, and physical dimensions. Research in this area often explores the application of characteristic modes and surrogate models to efficiently navigate the trade-offs involved in designing antennas for specific frequencies or multi-band applications. The optimization objectives commonly include improving the gain, reducing the side lobe level, and minimizing the overall size of the antenna, with variables including antenna geometry, element spacing, and feeding strategies.

T24 **Adaptive Weight Strategies in MOEA/D.** This domain focuses on enhancing MOEA/D through the development and application of adaptive weight strategies. It underscores the significance of dynamically adjusting weight vectors to effectively navigate and optimize across varied Pareto front geometries, thus improving solution diversity and convergence. The research delves into methodologies for generating, updating, and adapting weight vectors in response to evolving optimization landscapes, aiming to address challenges associated with many-objective optimization problems.

T25 **Multi-Objective Optimization in Structural Engineering Design.** This research theme delves into the development of advanced evolutionary algorithms for multi-objective optimization in structural engineering, targeting the optimal design of various structures like wind turbine blades, steel trusses, and reinforced concrete bridges. The core objective revolves around optimizing structural elements to meet criteria such as durability, cost-effectiveness, vibration control, and seismic resistance. Conflicting objectives commonly include minimizing weight or material use while maximizing strength, stability, and environmental sustainability, utilizing a diverse array of optimization variables from material properties to geometric configurations.

T26 **Scalable Test Problems for Many-Objective Optimization.** This research domain is centered on creating and analyzing test problems to benchmark and evaluate the performance of evolutionary multi-objective optimization (EMO) algorithms, particularly in scenarios with a large number of objectives and decision variables. It emphasizes the design of scalable and diverse test suites that simulate a wide range of real-world complexities, including various Pareto front shapes and objective space dimensions. The goal is to provide insights into algorithmic behavior, scalability, and effectiveness across different many-objective optimization landscapes, facilitating the development of algorithms capable of handling high-dimensional and complex optimization challenges.

T27 **Multi-Objective Workflow and Resource Scheduling in Cloud Computing.** This topic delves into the strategies for optimizing workflow and resource scheduling within cloud computing environments, employing decomposition-based evolutionary multi-objective optimization to balance conflicting objectives such as energy efficiency, task scheduling efficiency, and resource allocation. The research focuses on developing algorithms that effectively handle the dynamic, heterogeneous nature of cloud resources and workflows, aiming to optimize virtual machine placement, data locality, and task execution with minimal energy consumption and maximal performance.

T28 **Multi-Objective Aerodynamic Design and Optimization in Aerospace Engineering.** This research domain delves into the application of multi-objective evolutionary algorithms (MOEA/D) to enhance aerodynamic design and optimization within aerospace engineering. It focuses on optimizing aircraft and spacecraft components such as wings, control mechanisms, and trajectories, addressing multiple conflicting objectives such as improving aerodynamic efficiency, minimizing fuel consumption, and optimizing flight paths. The optimization variables span design parameters like shape, size, and material properties against constraints such as airflow dynamics and space mission requirements.

T29 **Evolutionary Multi-Objective Clustering for Heterogeneous and High-Dimensional Data.** This area of research leverages decomposition-based multi-objective evolutionary algorithms (MOEA/D) to enhance clustering methods across various applications, including patient stratification and single-cell RNA sequencing data analysis. It focuses on the development of algorithms that can efficiently process large and complex datasets, aiming to uncover meaningful patterns and clusters within the data. The use of evolutionary optimization techniques is pivotal in dealing with the challenges of clustering high-dimensional and heterogeneous datasets, where the objectives often involve optimizing the compactness and separation of clusters while incorporating constraints like feature selection and cluster validity.

T30 **Multi-Objective Evolutionary Optimization for Image Processing Applications.** This field explores the application of multi-objective evolutionary algorithms (MOEA/D) to address complex challenges in image processing, such as segmentation, clustering, change detection, and feature extraction. The research primarily focuses on synthetic aperture radar (SAR) images, infrared images, and remote sensing data, aiming to improve accuracy and efficiency in tasks like damage detection, image matting, and segmentation. Conflicting objectives often include maximizing detection accuracy while minimizing noise and computational resources, optimizing the balance between precision and generalization across various imaging conditions.

T31 **Whale Optimization Techniques for Multi-Objective Problems.** This niche within evolutionary multi-objective optimization emphasizes the enhancement and application of Whale Optimization Algorithm (WOA) strategies to address complex, multi-dimensional engineering and design challenges. Research efforts concentrate on refining the WOA by integrating it with other optimization techniques, dynamic adaptation mechanisms, and opposition-based learning to improve its efficiency and effectiveness in discovering optimal solutions. These modifications aim to tackle the inherent complexities of balancing conflicting objectives, such as optimizing performance while minimizing costs and environmental impact in engineering design problems.

T32 **Bee-Inspired Algorithms for Multi-Objective Optimization.** This topic delves into the exploration and application of bee-inspired algorithms, specifically the Artificial Bee Colony (ABC) and its variants, within the realm of multi-objective optimization. Focusing on bioinformatics applications such as multiple sequence alignment (MSA) and phylogenetic inference, these studies aim to harness the natural foraging behavior of bees to solve complex optimization problems involving competing objectives. The algorithms adapt principles from bee colony behaviors to efficiently search for optimal solutions across diverse problem landscapes, demonstrating the versatility and effectiveness of nature-inspired optimization strategies in handling multiple, often conflicting, objectives.

T33 **Evolutionary Multitasking for Multi-Objective Optimization.** This area investigates the application of evolutionary multitasking, which involves solving multiple optimization problems simultaneously using a single evolutionary process, within the context of multi-objective optimization. It emphasizes the importance of knowledge transfer across different tasks to enhance optimization efficiency and effectiveness. This approach is particularly useful for tackling problems where multiple objectives across different domains or tasks need to be optimized concurrently, leveraging shared information to find superior solutions more rapidly. Techniques include adaptive knowledge transfer, cross-task learning, and alignment of solution spaces to improve performance on computationally expensive and high-dimensional problems.

T24 **Multi-Objective Path and Trajectory Planning for Robotics.** This area investigates the development of multi-objective optimization strategies for robotic systems, focusing on trajectory and path planning. The research aims to optimize robotic movements in complex environments for various applications, including inspection, welding, and rescue operations. Conflicting objectives often include optimizing path length, ensuring safety and obstacle avoidance, improving energy efficiency, and enhancing task execution speed. Optimization variables range from robotic joint parameters to navigational waypoints, highlighting the integration of MOEA/D approaches to address the challenges of robotic autonomy and efficiency in dynamic and uncertain environments.

T35 **Multi-Objective Optimization for Hyperspectral Image Processing.** This domain explores the use of MOEA/D to enhance hyperspectral image analysis, focusing on band selection, endmember extraction, and sparse unmixing. The conflicting objectives typically involve maximizing the information extracted from limited spectral bands while minimizing redundancy and noise, leveraging spatial-spectral relationships for improved accuracy. Optimization variables span the selection of spectral bands, determination of endmember spectra, and the coefficients of sparse representation, aiming to improve efficiency and effectiveness in hyperspectral image processing tasks.

T36 **Parallel Computing in Multi-Objective Evolutionary Algorithms.** This domain investigates the synergistic integration of parallel computing techniques with multi-objective evolutionary algorithms (MOEA/D) to address complex optimization problems more efficiently. By leveraging the computational power of modern hardware architectures, such as GPUs and multicore CPUs, research in this area aims to significantly enhance the scalability and performance of MOEAs. The focus is on developing algorithms that can effectively utilize parallel processing to accelerate the evolutionary process, enabling real-time solution generation and improving the handling of large-scale, high-dimensional optimization challenges.

T37 **Quality-of-Service-Driven Multi-Objective Optimization for Service Composition in Cloud Environments.** This field of research focuses on optimizing the composition of services in cloud and web-based environments, guided by multi-objective evolutionary algorithms to meet various Quality-of-Service (QoS) criteria. The conflicting objectives often include optimizing performance, reliability, cost, and availability while selecting and orchestrating services in cloud manufacturing and web service ecosystems. Optimization variables typically involve the selection, scheduling, and configuration of services to achieve an optimal balance among these QoS attributes.

T38 **Multi-Objective Optimization for Disassembly Line Balancing in Remanufacturing.** This research field delves into the challenges of disassembly line balancing in the context of remanufacturing, focusing on optimizing multiple objectives such as efficiency, cost, energy consumption, and environmental impact. By employing evolutionary multi-objective optimization algorithms, the studies aim to develop strategies for balancing disassembly lines that handle various products, including end-of-life and electronic equipment, ensuring profitable and sustainable remanufacturing processes. The optimization variables often include task assignments, sequencing, and resource allocation, with conflicting objectives being to minimize time, cost, and environmental footprint while maximizing disassembly efficiency and resource utilization.

T39 **Hypervolume-Based Approaches in Evolutionary Multi-Objective Optimization.** This topic delves into the utilization of the hypervolume indicator within evolutionary multi-objective optimization algorithms, focusing on enhancing the effectiveness and efficiency of solution selection and progress measurement. Research in this area is primarily concerned with the development and improvement of hypervolume-based selection mechanisms, reference point specification, and approximation techniques. These methodologies aim to optimize the distribution and diversity of solutions on the Pareto front by maximizing the hypervolume metric, which quantifies the space covered by the solutions in the objective space, facilitating the fair comparison and efficient search in many-objective optimization scenarios.

T40 **Large-Scale Multi-Objective Optimization in Evolutionary Algorithms.** This field of research concentrates on addressing the unique challenges posed by large-scale multi-objective optimization problems (LSMOPs) using evolutionary algorithms. It involves the development of strategies for efficiently managing a high number of decision variables, aiming to enhance the scalability and effectiveness of MOEA/D approaches. The focus is on innovative methods like cooperative co-evolution, problem decomposition, and adaptive sampling to tackle the complexity of optimizing multiple objectives across vast search spaces, thereby facilitating solutions for problems that were previously intractable due to their scale.

T41 **Multi-Objective Optimization for Weapon Target Assignment and Combat Systems.** This research area investigates the application of multi-objective evolutionary algorithms (MOEA/D) to optimize weapon target assignment (WTA) and related combat system strategies, focusing on efficiently solving dynamic, uncertain, and multi-stage WTA problems. It centers on balancing the conflicting objectives of maximizing combat effectiveness and minimizing resource utilization or risk, under constraints like resource limitations and operational constraints. The optimization variables include weapon selection, target allocation, and combat resource distribution, addressing both deterministic and probabilistic scenarios to enhance strategic decision-making in military operations.

T42 **Convergence and Diversity in Many-Objective Evolutionary Algorithms.** Central to this research domain is the optimization of algorithms for many-objective problems, with a focus on achieving both convergence to the Pareto front and maintaining diversity among solutions. Techniques such as hyperplane projection, adaptive selection strategies, and dynamic learning evolution emphasize nuanced balance between convergence (quality of solutions) and diversity (variability among solutions), essential for tackling the complex trade-offs in many-objective optimization landscapes.

T43 **Dominance Relations in Many-Objective Evolutionary Optimization.** This area of research delves into the refinement and application of dominance relations within many-objective evolutionary optimization, aiming to effectively balance between solution convergence and diversity. Innovations include new dominance frameworks, such as ϵ-dominance, α-dominance, and θ-dominance, and their integration into decomposition-based algorithms. These strategies seek to improve the selection process by better distinguishing between solutions in high-dimensional objective spaces, thereby enhancing the algorithm's ability to navigate the complex trade-offs inherent in many-objective optimization problems.

T44 **Objective Reduction Techniques in Many-Objective Optimization.** This area delves into strategies for reducing the number of objectives in many-objective optimization problems (MAOPs), a crucial step for simplifying problem complexity and enhancing algorithmic efficiency. By focusing on methods like principal component analysis, clustering, and hyperplane approximation, research aims to identify and eliminate redundant objectives, thereby streamlining the optimization process while ensuring that the essential characteristics of the problem are preserved.

T45 **Multi-objective Search-Based Software Engineering Optimization.** This research area investigates the application of multi-objective evolutionary algorithms to optimize various aspects of software engineering, such as code refactoring, architecture discovery, and defect prediction. By focusing on trade-offs among multiple software quality attributes (e.g., maintainability, performance, and modularity), it employs decomposition-based approaches to navigate the complex search spaces inherent in software projects. The goal is to automate the enhancement of software systems, emphasizing the balance between conflicting objectives like improving code quality while minimizing changes or disruptions.

T46 **Multi-Objective Optimization in Manufacturing Processes.** This research area delves into the optimization of various manufacturing and machining processes through decomposition-based multi-objective evolutionary algorithms. The primary focus is on identifying optimal process parameters that balance conflicting objectives such as energy efficiency, production cost, material properties, and product quality. Techniques and applications span from traditional machining and welding to advanced manufacturing processes like laser cladding and selective laser melting, highlighting the role of MOEA/D in enhancing the sustainability and efficiency of manufacturing operations.

T47 **Archiving Strategies in Evolutionary Multi-Objective Optimization.** This area of research focuses on the development and assessment of archiving methods in MOEAs, particularly targeting the effective approximation and maintenance of the Pareto front. Utilizing techniques like Hausdorff distance measures and space partitioning, the emphasis is on enhancing algorithms' ability to converge towards and uniformly represent the Pareto optimal set, ensuring both convergence accuracy and solution diversity. This is critical for achieving a balanced exploration of the solution space in multi- and many-objective optimization scenarios.

T48 **Knee-Point Driven Approaches in Many-Objective Optimization.** This research niche concentrates on identifying and exploiting knee points within the Pareto front of many-objective optimization problems. Knee points represent solutions that offer the most significant trade-off benefits, thus serving as critical decision-making aids. The strategies discussed involve advanced knee point identification techniques and their integration into MOEA/D frameworks to guide the search towards these regions of interest, improving decision support in complex optimization scenarios with numerous conflicting objectives.

T49 **Multi-Objective Optimization in Personalized Recommender Systems.** This research avenue delves into the design and improvement of personalized recommender systems through the lens of multi-objective evolutionary optimization, emphasizing the delicate balance between accuracy and diversity. The objective is to tailor recommendations to individual users' preferences while ensuring a broad spectrum of choices, leveraging evolutionary algorithms to optimize multiple conflicting criteria such as user satisfaction, novelty, and the long tail of item distribution.

T50 **Estimation of Distribution Algorithms in Multi-Objective Optimization.** This topic investigates the integration of Estimation of Distribution Algorithms (EDAs) within multi-objective optimization frameworks, focusing on evolving populations based on probabilistic models rather than traditional genetic operators. Emphasizing on capturing the underlying distribution of Pareto-optimal solutions, research in this area seeks to enhance convergence and diversity through advanced modeling techniques, such as regularity models and copula-based approaches. This method offers a sophisticated alternative for exploring complex optimization landscapes by learning and exploiting the probabilistic relationships between variables and objectives.

T51 **Advanced NSGA Variants for Many-Objective Optimization.** This topic delves into the refinement and adaptation of the Non-dominated Sorting Genetic Algorithm (NSGA) series, particularly NSGA-II and NSGA-III, for tackling many-objective optimization problems. Emphasizing improvements in dominance relations, reference point utilization, and selection mechanisms, these studies aim to enhance convergence, diversity, and computational efficiency. The focus is on developing algorithms that effectively handle the complex dynamics of many-objective landscapes, improving solution quality and algorithmic robustness by integrating novel strategies like opposition-based learning, local search, and neighborhood information.

T52 **Immune-Inspired Algorithms for Multi-Objective Optimization.** This theme delves into the cross-pollination between immunology and multi-objective optimization, particularly through algorithms inspired by the immune system's mechanisms like clonal selection and hypermutation. Such immune-inspired multi-objective algorithms (MOIAs) aim to solve complex optimization problems by mimicking the adaptability and diversity generation of the immune system, focusing on enhancing convergence rates, diversity among solutions, and robustness against changing environments. The approach is notable for its application in dynamic optimization scenarios, where objectives and constraints can evolve over time.

T53 **Penalty-Based Boundary Intersection Approaches in MOEA/D.** This niche concentrates on refining the MOEA/D framework using penalty-based boundary intersection (PBI) methods, which are pivotal for guiding the search towards the Pareto front in many-objective optimization scenarios. The research accentuates the design and adaptation of PBI scalarization techniques to enhance algorithmic performance, focusing on aspects like penalty parameter adjustment, normalization effects, and the introduction of adaptive strategies to effectively handle complex Pareto front geometries and dynamic optimization environments.

T54 **Multi-Objective Optimization for Air Traffic Management.** This research theme delves into optimizing air traffic management through MOEA/D, focusing on reducing flight delays and airspace congestion while considering safety and noise abatement. Key optimization variables include aircraft departure times, routes, and sequencing, with conflicting objectives of minimizing overall delays and environmental impact versus maximizing airspace and airport throughput.

T55 **Multi-Objective Evolutionary Approaches for Sparse Reconstruction.** This topic revolves around leveraging multi-objective evolutionary algorithms to address sparse reconstruction challenges, where the goal is to recover or estimate sparse signals from limited or compressed measurements. The research focuses on optimizing conflicting objectives such as minimizing reconstruction error and maximizing sparsity of the signal, employing techniques like regularization, iterative thresholding, and knowledge transfer to enhance reconstruction accuracy and efficiency. This area is crucial in applications like compressed sensing, image processing, and signal processing, where achieving a balance between accuracy and sparsity under constraints is essential.

T56 **Multi-Objective Optimization for Routing in Optical Networks.** This area of research focuses on applying multi-objective evolutionary algorithms to optimize routing, wavelength allocation, and traffic grooming in optical and WDM networks. Key objectives include enhancing quality of service (QoS), optimizing resource allocation, and balancing traffic load. The conflicting goals often involve minimizing path lengths, maximizing throughput, and reducing latency, with optimization variables including routing paths, wavelength assignments, and spectrum allocation strategies.

T57 **Robust Multi-Objective Optimization under Uncertainty.** This topic delves into enhancing the resilience of decomposition-based multi-objective evolutionary algorithms (MOEA/D) against uncertainties, focusing on robust design optimization (RDO). Research emphasizes developing strategies to effectively handle epistemic uncertainty and improve decision-making under variable conditions. By integrating robustness measures and multi-fidelity models, the aim is to achieve optimal designs that are less sensitive to variations, ensuring performance stability across a wide range of scenarios.

T58 **Angle-Based Selection Strategies in Many-Objective Evolutionary Algorithms.** This topic zeroes in on the use of angle-based selection strategies to enhance convergence and diversity in many-objective evolutionary optimization. By employing vector angles and other geometrical measures, these methods aim to improve the selection process of individuals, ensuring a well-distributed Pareto front. This approach is particularly beneficial for managing the complex dynamics between objectives, aiding in the efficient navigation through high-dimensional optimization spaces.

T59 **Many-Objective Optimization in Software Testing and Configuration.** This research niche focuses on applying many-objective evolutionary optimization techniques to address complex software testing and configuration challenges. The goal is to optimize software product lines, enhance test suite effectiveness, and ensure comprehensive feature coverage with minimal redundancy. Conflicting objectives often include maximizing fault detection while minimizing cost, time, and resource utilization. Optimization variables range from selection of product features for inclusion in a release to allocation of testing resources across various modules or functions.

T60 **Ensemble Learning and Classification with Multi-Objective Evolutionary Optimization.** This research niche focuses on the development of ensemble learning techniques within multi-objective optimization frameworks, specifically aiming to enhance classification performance. Utilizing evolutionary algorithms, it addresses challenges such as class imbalance and feature selection by optimizing a set of conflicting objectives like accuracy and simplicity. The integration of support vector machines (SVM), decision trees, and other base classifiers in ensemble methods underscores the goal of achieving robust, generalizable models capable of handling complex data landscapes, including cybersecurity and disease classification.

T61 **Classification and Convex Hull Integration with Evolutionary Multi-Objective Optimization.** This research avenue concentrates on the innovative incorporation of classification techniques and convex hull concepts into evolutionary multi-objective optimization to refine selection processes and improve algorithm performance on complex landscapes. By leveraging classification for environmental selection and utilizing convex hulls for objective space exploration, these approaches aim to enhance the accuracy and efficiency of identifying Pareto-optimal solutions, particularly in scenarios like ROC and AUC maximization where trade-offs between false positives and true positives are critical.

T62 **UAV Path Planning and Optimization Using Multi-Objective Evolutionary Algorithms.** This research niche applies decomposition-based multi-objective evolutionary algorithms (MOEA/D) to optimize path planning and operational strategies for unmanned aerial vehicles (UAVs). It focuses on achieving efficient, real-time solutions that balance conflicting objectives such as route efficiency, energy consumption, and coverage area. Key challenges include navigating complex environments, coordinating multiple UAVs, and adhering to operational constraints, with applications spanning from autonomous flight and surveillance to environmental monitoring and disaster response.

T63 **Grid-Based Decomposition in Many-Objective Evolutionary Optimization.** This area delves into the refinement of decomposition-based multi-objective evolutionary algorithms (MOEA/D) through grid-based approaches for managing the complexity of many-objective optimization problems. By integrating grid mechanisms for dominance, selection, and decomposition, these strategies focus on enhancing the convergence and diversity among solutions. The grid-based methods are particularly notable for their ability to systematically organize and navigate the search space, facilitating effective trade-off management between a high number of conflicting objectives.

T64 **Sustainable Supply Chain Optimization in Evolutionary Algorithms.** This area of research delves into optimizing various aspects of the supply chain, including production, distribution, and scheduling, through the lens of multi-objective evolutionary algorithms. The focus is on enhancing sustainability and efficiency, addressing the conflicting objectives of minimizing costs, reducing carbon emissions, and ensuring timely delivery. Optimization variables span across warehouse location decisions, inventory levels, and transportation routes, aiming to construct resilient and environmentally friendly supply chains.

T65 **Multi-Objective Evolutionary Optimization for Software Project Scheduling.** This research area delves into the application of multi-objective evolutionary algorithms to optimize software project scheduling, addressing the intricate balance between project completion time, resource allocation, and cost constraints. It focuses on the challenges of dynamically scheduling tasks and resources in agile software development environments and large-scale projects, such as the Chinese

Navigation Satellite System project. Key objectives often involve minimizing project duration and cost while maximizing resource utilization and adherence to project requirements and timelines.

T66 **Multi-Objective Optimization in Satellite Scheduling and Mission Planning.** This area of research applies MOEA/D principles to the complex realm of satellite operations, focusing on optimizing the scheduling of satellite-ground communications and mission planning for earth observation. The conflicting objectives often include maximizing observation coverage, minimizing energy consumption, and optimizing time synchronization between satellites and ground stations. Optimization variables span scheduling times, satellite trajectories, and resource allocation, aiming to enhance the efficiency and effectiveness of satellite networks in observing and communicating with Earth.

T67 **Multi-Objective Optimization for Emergency Response and Resource Allocation.** This research area delves into the application of decomposition-based multi-objective evolutionary algorithms (MOEA/D) for optimizing emergency response and resource allocation tasks. It focuses on the critical balance between various conflicting objectives such as speed, efficiency, fairness, and coverage in the context of disaster management, including emergency material scheduling, rescue facility location, and evacuation planning. The optimization variables often involve resource distribution, emergency vehicle deployment, and scheduling under uncertain conditions, aiming to enhance responsiveness and effectiveness in crisis situations.

T68 **Reinforcement Learning in Multi-Objective Evolutionary Optimization.** This niche intersects reinforcement learning (RL) with multi-objective optimization, innovating on how evolutionary algorithms can benefit from RL techniques to address complex decision-making scenarios. The focus is on dynamically adapting algorithm parameters, optimizing game difficulty levels, and enhancing real-time system testing. It bridges the gap between achieving optimal solutions across multiple objectives and the adaptability of RL agents to diverse and changing environments, showcasing applications ranging from game difficulty balancing to structural damage identification and resource allocation.

T69 **Fuzzy Rule-Based Systems Optimization with Multi-Objective Evolutionary Algorithms.** This area delves into the synthesis and enhancement of fuzzy rule-based systems through multi-objective evolutionary algorithms, highlighting the balance between interpretability and accuracy. It emphasizes the optimization of fuzzy rules and systems for a range of applications, from machine learning to remote sensing and stock prediction, using MOEA/D frameworks. The research focuses on the development of methodologies that integrate expert knowledge with data-driven insights to construct fuzzy rule-based classification systems, aiming for high performance in interpretability and decision-making accuracy.

T70 **Multi-Objective Optimization in Electric Machine Design.** This research theme focuses on applying multi-objective evolutionary algorithms to the design and optimization of electric machines, such as motors and generators. The primary conflicting objectives often involve enhancing performance metrics like efficiency and torque while minimizing cost and material usage. Optimization variables typically include geometric dimensions of the machine, material properties, and winding configurations. The goal is to navigate the trade-offs between these objectives to develop more efficient, cost-effective, and robust electric machine designs.

T71 **Evolutionary Multi-Objective Optimization in Wireless Network Planning.** This area delves into the application of multi-objective evolutionary algorithms (MOEAs) for the optimal planning and deployment of wireless networks, focusing on reducing interference, optimizing base station (BS) placement, and enhancing network coverage and capacity. The conflicting objectives often include minimizing the number of base stations and interference while maximizing coverage and quality of service, with optimization variables ranging from transmitter locations to power settings and channel allocations.

T72 **Non-Dominated Sorting Approaches in Evolutionary Multi-Objective Optimization.** This research area delves into the development of efficient non-dominated sorting algorithms, crucial for identifying Pareto-optimal solutions in evolutionary multi-objective optimization (EMO). The focus is on enhancing the sorting process through techniques like incremental updates, set-based approaches, and space-partitioned data structures, aiming to improve the scalability and efficiency of EMO algorithms in handling large-scale and many-objective problems. These advancements target the reduction of computational complexity involved in distinguishing between dominated and non-dominated solutions, thereby streamlining the selection process for the next generation of solutions.

T73 **Ensemble Strategies in Many-Objective Evolutionary Optimization.** This theme investigates the fusion of ensemble methods with many-objective evolutionary algorithms (MOEAs) to enhance performance metric evaluation and decision-making processes. Focusing on ensemble fitness ranking, operator combination, and adaptive selection mechanisms, the research aims to improve optimization outcomes by leveraging diverse algorithmic strengths. Such strategies are pivotal for navigating complex objective spaces, ensuring robustness and efficiency in identifying optimal solutions across varied problem landscapes.

T74 **NSGA-II and Its Variants in Real-world Multi-Objective Optimization.** This area investigates the applications and enhancements of the Non-dominated Sorting Genetic Algorithm II (NSGA-II) and its extensions in solving practical multi-objective optimization problems across various domains, including sustainable port development, vehicle speed measurement, and genetic programming for process optimization. Emphasis is placed on adapting NSGA-II to handle complex, real-world scenarios characterized by interval objectives, set-based optimization, and multi-video synopsis, showcasing the algorithm's flexibility and effectiveness in achieving a balance between competing objectives through advanced selection and ranking mechanisms.

T75 **Multi-Objective Optimization in Gene Selection for Cancer Classification.** This research theme delves into employing multi-objective optimization strategies, particularly MOEA/D, for enhancing gene selection processes in cancer diagnosis and classification tasks. By focusing on the extraction and classification of relevant gene expressions from complex datasets, such as microarrays, the goal is to identify biomarkers critical for distinguishing cancer subtypes. The conflicting objectives often involve maximizing the accuracy of cancer classification while minimizing the number of selected features, thereby balancing predictive performance against model simplicity and computational efficiency.

T76 **Multi-Objective Evolutionary Algorithms for Rule Mining and Association Analysis.** This area explores the use of multi-objective evolutionary algorithms (MOEAs) for the extraction of valuable patterns and association rules from large datasets. The focus is on balancing the trade-offs between rule interestingness, such as support and confidence, and other objectives like rule rarity or utility, often in the context of sensitive data protection or credit risk assessment. Techniques aim to efficiently mine quantitative association rules, high-utility itemsets, and perform task-oriented pattern mining, highlighting the adaptability of MOEAs to diverse data mining challenges.

T77 **Clustering-Based Selection in Evolutionary Multi-Objective Optimization.** This niche concentrates on the integration of clustering techniques within multi-objective evolutionary algorithms (MOEAs) to enhance selection mechanisms. By leveraging clustering methods like fuzzy c-means and spectral clustering, these approaches aim to improve the balance between exploration and exploitation during the optimization process. This strategy is particularly effective in managing the mating selection and restriction, thereby refining the algorithm's ability to identify diverse and high-quality solutions across complex Pareto fronts.

T78 **Teaching-Learning-Based Optimization in Multi-Objective Settings.** This research niche focuses on the adaptation of the Teaching-Learning-Based Optimization (TLBO) algorithm for multi-objective optimization scenarios. It emphasizes creating and improving algorithms that mimic the teaching and learning process in classrooms for solving complex problems with multiple conflicting objectives. The TLBO's unique approach to optimization, leveraging concepts of teacher influence and student learning, is applied to diverse areas ranging from engineering design to personalized education and operational optimization, showcasing its versatility and effectiveness in handling multi-dimensional optimization tasks.

T79 **Visualization Techniques in Multi-Objective Optimization.** This area explores the development and application of visualization methods to interpret and analyze the results of multi-objective optimization, particularly in high-dimensional spaces. Emphasizing the need for clear and intuitive visual mappings, such as parallel coordinates and multidimensional scaling (MDS), the research facilitates the understanding of algorithm performance, convergence, and diversity of solutions on the Pareto front. It underscores the importance of visual tools in decision-making processes and algorithm parameter tuning, especially for complex many-objective problems.

T80 **UAV-Assisted Optimization in Wireless IoT Networks.** This research focuses on the deployment and operation of unmanned aerial vehicles (UAVs) to enhance wireless connectivity and energy efficiency in Internet of Things (IoT) networks. By addressing conflicting objectives such as maximizing coverage, optimizing energy use, and ensuring efficient data transmission, the studies deploy MOEA/D techniques to balance the trade-offs between enhancing wireless network performance and minimizing operational costs. Optimization variables include UAV flight paths, power allocation, and resource distribution, crucial for supporting robust and energy-efficient IoT applications.

T81 **Grey Wolf Optimization in Decomposition-Based Multi-Objective Problems.** This topic investigates the adaptation of the Grey Wolf Optimizer (GWO), inspired by the social hierarchy and hunting techniques of grey wolves, to the domain of decomposition-based multi-objective optimization. Focusing on enhancing decision-making in various application areas, from sports team selection to architectural design and ecological scheduling, the research emphasizes the algorithm's efficiency in navigating complex trade-offs between competing objectives. Techniques often incorporate novel mechanisms like Levy flights and simulated annealing to improve convergence and diversity within the multi-objective context.

T82 **Multi-Objective Optimization for Quadratic Assignment Problems.** This area focuses on the application of multi-objective evolutionary algorithms, particularly MOEA/D, to the quadratic assignment problem (QAP), a classic problem in combinatorial optimization. Research in this domain seeks to explore and address the complex trade-offs between multiple objectives inherent in QAPs, such as minimizing cost while maximizing efficiency or quality. Techniques include the use of hyper-heuristics, landscape decomposition, and novel evolutionary strategies to effectively navigate and optimize these conflicting objectives, highlighting the adaptability and robustness of MOEAs in handling the intricate dynamics of combinatorial spaces.

APPENDIX C
ESSENTIAL PUBLICATIONS IN THE MOEA/D LANDSCAPE (MAIN PATH ANALYSIS)

TABLE A1
ESSENTIAL PUBLICATIONS IN THE MOEA/D LANDSCAPE.

ID	Title	Venue	Year
Q. Zhang 2007	MOEA/D: A Multiobjective Evolutionary Algorithm Based on Decomposition	TEVC	2007
Q. Zhang 2009	The performance of a new version of MOEA/D on CEC09 unconstrained MOP test instances	CEC	2009
H. Li 2009	Multiobjective Optimization Problems With Complicated Pareto Sets, MOEA/D and NSGA-II	TEVC	2009
H. Ishibuchi 2009a	Adaptation of Scalarizing Functions in MOEA/D: An Adaptive Scalarizing Function-Based Multiobjective Evolutionary Algorithm	EMO	2009
H. Ishibuchi 2009b	Evolutionary many-objective optimization by NSGA-II and MOEA/D with large populations	SMC	2009
Q. Zhang 2010	Expensive Multiobjective Optimization by MOEA/D With Gaussian Process Model	TEVC	2010
H. Ishibuchi 2010b	Simultaneous use of different scalarizing functions in MOEA/D	GECCO	2010
H. Ishibuchi 2010a	Many-Objective Test Problems to Visually Examine the Behavior of Multiobjective Evolution in a Decision Space	PPSN	2010
H. Li 2011	An Adaptive Evolutionary Multi-Objective Approach Based on Simulated Annealing	ECJ	2011
YY Tan 2012	A modification to MOEA/D-DE for multiobjective optimization problems with complicated Pareto sets	Info. Sci.	2012
Y. Wang 2012	A regularity model-based multiobjective estimation of distribution algorithm with reducing redundant cluster operator	Appl. Soft. Comput.	2012
S-Z Zhao 2012	Decomposition-Based Multiobjective Evolutionary Algorithm With an Ensemble of Neighborhood Sizes	TEVC	2012
S. Yang 2013	A Grid-Based Evolutionary Algorithm for Many-Objective Optimization	TEVC	2013
R. Wang 2013	Preference-Inspired Coevolutionary Algorithms for Many-Objective Optimization	TEVC	2013
K. Sindhya 2013	A Hybrid Framework for Evolutionary Multi-Objective Optimization	TEVC	2013
DK Saxena 2013	Objective Reduction in Many-Objective Optimization: Linear and Nonlinear Algorithms	TEVC	2013
Z. He 2014	Fuzzy-Based Pareto Optimality for Many-Objective Evolutionary Algorithms	TEVC	2014
Y. Qi 2014	MOEA/D with Adaptive Weight Adjustment	ECJ	2014
M. Li 2014	Shift-Based Density Estimation for Pareto-Based Algorithms in Many-Objective Optimization	TEVC	2014
K. Li 2014a	Adaptive Operator Selection With Bandits for a Multiobjective Evolutionary Algorithm Based on Decomposition	TEVC	2014
K. Li 2014b	Stable Matching-Based Selection in Evolutionary Multiobjective Optimization	TEVC	2014
K. Deb 2014	An Evolutionary Many-Objective Optimization Algorithm Using Reference-Point-Based Nondominated Sorting Approach, Part I: Solving Problems With Box Constraints	TEVC	2014
H. Jain 2014	An Evolutionary Many-Objective Optimization Algorithm Using Reference-Point Based Nondominated Sorting Approach, Part II: Handling Constraints and Extending to an Adaptive Approach	TEVC	2014
H-L Liu 2014	Decomposition of a Multiobjective Optimization Problem Into a Number of Simple Multiobjective Subproblems	TEVC	2014
Gary G. Yen 2014	Performance Metric Ensemble for Multiobjective Evolutionary Algorithms	TEVC	2014
X. Zhang 2015	A Knee Point-Driven Evolutionary Algorithm for Many-Objective Optimization	TEVC	2015
X. Cai 2015	An External Archive Guided Multiobjective Evolutionary Algorithm Based on Decomposition for Combinatorial Optimization	TEVC	2015
R. Cheng 2015	A Multiobjective Evolutionary Algorithm Using Gaussian Process-Based Inverse Modeling	TEVC	2015
M. Asafuddoula 2015	A Decomposition-Based Evolutionary Algorithm for Many Objective Optimization	TEVC	2015
K. Li 2015	An Evolutionary Many-Objective Optimization Algorithm Based on Dominance and Decomposition	TEVC	2015
H. Wang 2015	Two_Arch2: An Improved Two-Archive Algorithm for Many-Objective Optimization	TEVC	2015
H. Ishibuchi 2015	Behavior of Multiobjective Evolutionary Algorithms on Many-Objective Knapsack Problems	TEVC	2015
Y. Yuan 2016	A New Dominance Relation-Based Evolutionary Algorithm for Many-Objective Optimization	TEVC	2016
Y Yuan 2016	Balancing Convergence and Diversity in Decomposition-Based Many-Objective Optimizers	TEVC	2016
X. Ma 2016	A Multiobjective Evolutionary Algorithm Based on Decision Variable Analyses for Multiobjective Optimization Problems With Large-Scale Variables	TEVC	2016
R. Wang 2016	Decomposition-Based Algorithms Using Pareto Adaptive Scalarizing Methods	TEVC	2016
R. Cheng 2016	A Reference Vector Guided Evolutionary Algorithm for Many-Objective Optimization	TEVC	2016
M. Li 2016	Pareto or Non-Pareto: Bi-Criterion Evolution in Multiobjective Optimization	TEVC	2016
PlatEMO 2017	PlatEMO: A MATLAB Platform for Evolutionary Multi-Objective Optimization	IEEE CIM	2017
H. Ishibuchi 2017	Performance of Decomposition-Based Many-Objective Algorithms Strongly Depends on Pareto Front Shapes	TEVC	2017
X. Zhang 2018	A Decision Variable Clustering-Based Evolutionary Algorithm for Large-Scale Many-Objective Optimization	TEVC	2018