Application of optimization techniques to power systems

In this paper, the application of heuristic and optimization algorithms based on artificial intelligence (AI) is investigated on electrical power systems. Three distinct areas have been categorized validating the application of AI methods in power systems. It involves classical problem of economic load dispatch in conventional power plant, continuing with optimal sizing issue of ...

Keywords--Optimization; photovoltaic systems; education; performance; controller; SIMULINK I. INTRODUCTION The application of optimization techniques to enhance the efficiency of a photovoltaic (PV) system combines technology, design, and maintenance procedures. To make sure that the PV system runs at its maximum power point and maximizes energy

With practical applications and examples the use of functional analysis, simulated annealing, Tabu-search, Genetic algorithms and fuzzy systems for the optimization of power systems is ...

Optimization methodshave been appliedin power systems for the last hundred years. They have been applied across a broad regionspanning from power system design to power system planning and economic power dispatch to protection. This workpresents an overview of the metaheuristicoptimization techniques and their applications to power systems.

This paper presents a comprehensive overview of diverse AI techniques that can be applied in power system operation, control and planning, aiming to facilitate their various applications.

The research includes various artificial intelligence techniques and applications in power systems: ... In this research, a hybrid ANN technique is given to tackle combinational optimization issues in power systems, including unit commitment: Lagrangian relaxation and artificial neural network: Kumar et al.

ing conditions of a power system to obtain secure power dispatches in an electricity market has gained particular attention. This thesis studies and develops optimiza-tion models and techniques to detect or avoid voltage instability points in a power system in the context of a competitive ...

an overview of power system applications. The second part of the tutorial deals with specific applications of the heuristic approaches to power system problems, such as security assessment, operational planning, generation, transmission and distribution planning, state estimation, and power plant and power system control. Evolutionary Computation:

BSA method is utilized in numerous applications to solve the optimization problems such as to find the solution of distributed generators and enhance power flow of DC power systems [115, 172, 173]. It is also utilized to develop optimal analogue operational amplifier circuits [...

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The objective of this paper is to offer a comprehensive overview of the existing methods used for modeling and optimization of problems that are affected by uncertainty, with a specific focus ...

Optimization problems are widely encountered in various fields in science and technology. The fact that most optimization problems, when modeled accurately, are of non-convex and sometimes discrete nature has encouraged many researchers to develop new optimization techniques to overcome such difficulties.

Optimization models for the solution of planning problems related to power distribution system (PDS) have been studied and used for decades. The main objective is to optimize investments and minimize total costs, including investment and operation costs. Some of the major concerns of the short-term expansion planning carried out by utilities are high ...

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This survey aims to be a valuable resource for researchers and practitioners across power systems, control theory, optimization, and machine learning, ofering insights into the ...

the application of distributed optimization and ML techniques to power system problems, particularly OPF. Building upon the foundation laid by existing comprehensive surveys on distributed optimization (e.g., (1-3, 6)) and ML (e.g.,(5)), we delve into the intersection of these fields with a focus on the following key aspects:

As the complexity of power systems and the challenges posed by uncertainty continue to evolve, identifying promising areas for further investigation becomes essential to improve decision-making processes and enhance the resilience and efficiency of power systems. The objective of this paper is to offer a comprehensive overview of the existing methods used for modeling and ...

Therefore, in this paper, the application potentials of AI technologies in power systems will be discussed by mainly focusing on the power system operation and monitoring. For the power system operation, the problems, the demands, and the possible applications of AI techniques in control, optimization, and decision making problems are discussed.

The topics of interest in this Special Issue include different optimization methods applied to any field related to power systems, such as conventional and renewable energy generation, distributed generation, transport and distribution of electrical energy, electrical machines and power electronics, intelligent systems, advances in electric ...

Power optimizations often adversely impact performance and area; therefore, the practical application of power optimization techniques involves the analysis and tradeoff of power, performance, and area (PPA). ...

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From system OEMs to mobile device manufacturers and aerospace companies designing airborne and satellite communications systems ...

In electrical power systems, FACTS devices effectively control power flow and change bus voltages, leading to lower system losses and excellent system stability. The article discusses the research from the last decade that evaluated various methods for placing FACTS devices using the meta-heuristic approach to address the positioning of FACTS devices to ...

No. 2, 2010, ISSN 1335-8243, pp. 5-9 - 235 - P. Kádár Application of Optimization Techniques in the Power System Control [12] Peter Kadar: Multi Objective Power Mix Optimization; 8th International Symposium on Applied Machine Intelligence and Informatics (SAMI 2010) Herl"any, Slovakia January 28-30, 2010 [13] Petar ?isar, Sanja ...

This paper provides basic knowledge about most widely used (meta)heuristic optimization techniques, and their application in optimization problems in power systems. Discover the world"s research ...

This chapter aims to provide a comprehensive review on robust optimization employment in power system problems. Different types of power systems problems, which are handled by implementation of robust optimization method, are classified and studied. Moreover, a case study is introduced for applying robust optimization methods to familiarize the ...

Reviews state-of-the-art technologies in modern heuristic optimization techniques and presents case studies showing how they have been applied in complex power and energy systems problems Written by a team of international experts, this book describes the use of metaheuristic applications in the ...

Fig. 1: Classification of optimization techniques and related works IV. APPLICATION AREAS OF OPTIMIZATION TECHNIQUES Optimization techniques are applicable on different power system stages such as generation, transmission, distribution and customers side for minimizing different

On the other hand, the optimization applications in electrical power systems are diverse and challenging. Unit commitment [21,22,23] and economic dispatch [24,25,26] problems, which involve determining the optimal scheduling and output power of generating units, have been traditionally solved using mathematical programming techniques.

This project has focused on the application of robust optimization for power system operations and operational planning. Part one of this project report provides an overview of robust optimization as well as it investigates two applications for robust optimization: robust unit commitment and robust corrective topology control. The optimal

Forecasting is another very popular application of ML techniques, developed since the early seventies. A

number of ANNs have been proposed, mainly in the areas of ... Power system operation optimization is another versatile field for ML applications. The problems of Unit Commitment and Economic Dispatch, traditionally tackled as

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