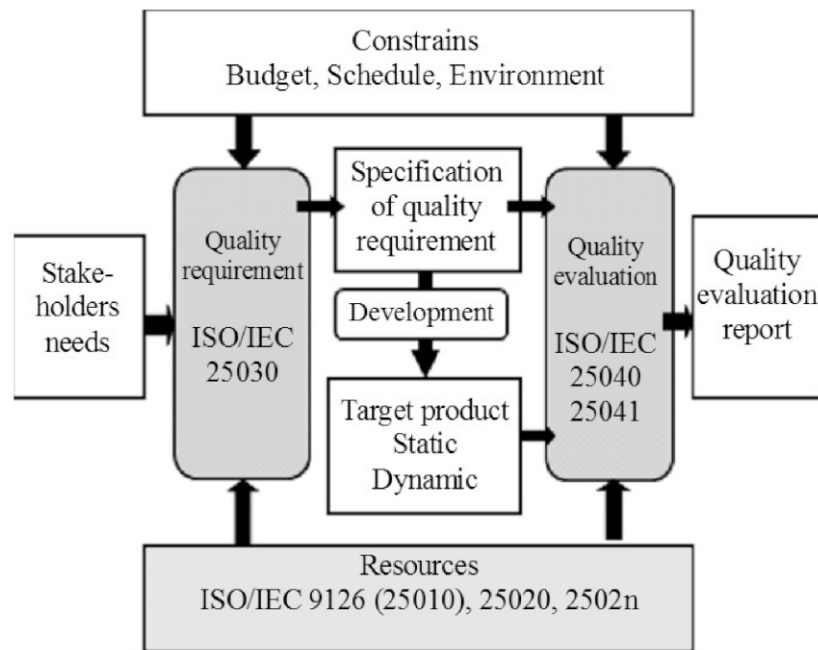


# American Journal of Operations Research



ISSN: 2160-8830



# Journal Editorial Board

ISSN 2160-8830 (Print) ISSN 2160-8849 (Online)

<http://www.scirp.org/journal/ajor>

---

## Editor in Chief

Prof. Jinfeng Yue

Middle Tennessee State University, USA

## Editorial Advisory Board

Prof. Bintong Chen  
Prof. Wade D. Cook  
Prof. William W. Cooper  
Prof. Shu-Cherng Fang  
Prof. Panos Kouvelis  
Prof. Lawrence M. Seiford  
Prof. Suresh P. Sethi

University of Delaware, USA  
York University, Canada  
University of Texas at Austin, USA  
North Carolina State University, USA  
Washington University in St. Louis, USA  
University of Michigan, USA  
University of Texas at Dallas, USA

## Editorial Board

Dr. Javier De Andrés  
Prof. Janine E. Aronson  
Dr. Annamaria Barbagallo  
Dr. Nabil Belacel  
Prof. Ignacio Castillo  
Prof. Xu Chen  
Prof. Muhammad El-Taha  
Dr. Vladimir Filipović  
Dr. Carmen Galé  
Dr. Xianghua Gan  
Dr. Xiuli He  
Prof. Mhand Hifi  
Prof. Zhimin Huang  
Prof. Zhibin Jiang  
Dr. Ricardo Josa-Fombellida  
Prof. Dennis Leech  
Prof. Deng-Feng Li  
Prof. Liang Liang  
Dr. Pedro Lorca  
Dr. Zhaosong Lu  
Prof. Monga Kalonda Luhandjula  
Prof. Charles L. Munson  
Dr. Jamal Ouenniche  
Prof. Joaquín Antonio Pacheco Bonrostro  
Prof. Gregory P. Prastacos  
Prof. Javier Ramirez Rodriguez  
Prof. Bhaba R. Sarker  
Prof. Renduchintala Raghavendra Kumar Sharma  
Dr. Chunming (Victor) Shi  
Prof. Andranik Tangian  
Prof. Etsuji Tomita  
Dr. Delfim F. M. Torres  
Prof. Evangelos Triantaphyllou  
Dr. Manish Verma  
Dr. Yu Amy Xia  
Prof. Yi-Min Xie  
Prof. Farouk Yalaoui  
Dr. Jiping Yang  
Dr. Shilei Yang  
Prof. Peng-Yeng Yin  
Dr. Xiaohang Yue  
Dr. Bin Zhang

University of Oviedo, Spain  
University of Georgia, USA  
University of Naples "Federico II", Italy  
NRC Institute for Information Technology, Canada  
Wilfrid Laurier University, Canada  
University of Electronic Science and Technology of China, China  
University of Southern Maine, USA  
University of Belgrade, Serbia  
University of Zaragoza, Spain  
The Hong Kong Polytechnic University, China  
The University of North Carolina at Charlotte, USA  
University of Picardie Jules Verne, France  
Adelphi University, USA  
Shanghai Jiao Tong University, China  
University of Valladolid, Spain  
University of Warwick, UK  
Fuzhou University, China  
University of Science and Technology of China, China  
University of Oviedo, Spain  
Simon Fraser University, Canada  
University of South Africa, South Africa  
Washington State University, USA  
University of Edinburgh, UK  
University of Burgos, Spain  
Athens University of Economics and Business, Greece  
The Metropolitan Autonomous University, Mexico  
Louisiana State University, USA  
IIT Kanpur, India  
Wilfrid Laurier University, Canada  
Karlsruhe Institute of Technology, Germany  
The University of Electro-Communications, Japan  
University of Aveiro, Portugal  
Louisiana State University, USA  
Memorial University of Newfoundland, Canada  
Northeastern University, USA  
RMIT University, Australia  
University of Technology of Troyes, France  
Beihang University, China  
Southwestern University of Finance and Economics, China  
National Chi Nan University, Chinese Taipei  
University of Wisconsin-Milwaukee, USA  
Sun Yat-sen University, China

---

## Guest Reviewers

Jose Humberto Ablanado-Rosas  
Lingyan Cao  
Yuan-Shyi Peter Chiu  
Petr Ya. Ekel  
Wang-Ting Hu  
Vassilis Kostoglou  
Ulrike Leopold-Wildburger  
Chih-Chin Liang  
Pedro Lorca

Fabrizio Marinelli  
V.N. Maurya  
Frank Meisel  
Jerzy Michnik  
Ahmed Nait-Sidi-Moh  
Hussein Naseraldin  
Alain Pietrus  
Han Qiao  
Andre Rossi

Zhenjun Shi  
Xiang Song  
Nodari Vakhania  
Tao Wu  
Gongxian Xu  
Zixiang Xu  
Takeo Yamada  
Xiaoning Zhang

## TABLE OF CONTENTS

Volume 3 Number 1

January 2013

### Computational Tools to Support Ethanol Pipeline Network Design Decisions

G. D. da Silva, V. J. M. F. Filho, L. Bahiense.....1

### Bi-Criteria Optimization Technique in Stochastic System Maintenance Allocation Problem

I. Ali, S. S. Hasan.....17

### Balanced Scorecard and Efficiency: Design and Empirical Validation of a Strategic Map in the University by Means of DEA

T. García Valderrama, V. R. Cornejo, D. R. Bordoy.....30

### Constraint Optimal Selection Techniques (COSTs) for Linear Programming

G. Saito, H. W. Corley, J. M. Rosenberger.....53

### Model for Solving Fuzzy Multiple Objective Problem

R. Chopra, R. R. Saxena.....65

### Verification of Quality Requirement Method Based on the SQuaRE System Quality Model

K. Esaki.....70

---

The figure on the front cover is from the article published in American Journal of Operations Research, 2013, Vol. 3, No. 1, pp. 70-79 by Kazuhiro Esaki.

# **American Journal of Operations Research (AJOR)**

## **Journal Information**

### **SUBSCRIPTIONS**

The *American Journal of Operations Research* (Online at Scientific Research Publishing, [www.SciRP.org](http://www.SciRP.org)) is published bimonthly by Scientific Research Publishing, Inc., USA.

#### **Subscription rates:**

Print: \$59 per issue.

To subscribe, please contact Journals Subscriptions Department, E-mail: [sub@scirp.org](mailto:sub@scirp.org)

### **SERVICES**

#### **Advertisements**

Advertisement Sales Department, E-mail: [service@scirp.org](mailto:service@scirp.org)

#### **Reprints (minimum quantity 100 copies)**

Reprints Co-ordinator, Scientific Research Publishing, Inc., USA.

E-mail: [sub@scirp.org](mailto:sub@scirp.org)

### **COPYRIGHT**

Copyright©2013 Scientific Research Publishing, Inc.

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as described below, without the permission in writing of the Publisher.

Copying of articles is not permitted except for personal and internal use, to the extent permitted by national copyright law, or under the terms of a license issued by the national Reproduction Rights Organization.

Requests for permission for other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works or for resale, and other enquiries should be addressed to the Publisher.

Statements and opinions expressed in the articles and communications are those of the individual contributors and not the statements and opinion of Scientific Research Publishing, Inc. We assume no responsibility or liability for any damage or injury to persons or property arising out of the use of any materials, instructions, methods or ideas contained herein. We expressly disclaim any implied warranties of merchantability or fitness for a particular purpose. If expert assistance is required, the services of a competent professional person should be sought.

### **PRODUCTION INFORMATION**

For manuscripts that have been accepted for publication, please contact:

E-mail: [ajor@scirp.org](mailto:ajor@scirp.org)



# American Journal of Operations Research

ISSN 2160-8830 (Print) ISSN 2160-8849 (Online)  
<http://www.scirp.org/journal/ajor>

AJOR is an international scientific journal dedicated to the publication and public discussion of high quality, original papers that contribute to the methodology of operational research and to the practice of decision making.

## Editor in Chief

**Prof. Jinfeng Yue**

Middle Tennessee State University, USA

## Editorial Board

Dr. Javier De Andrés  
 Prof. Janine E. Aronson  
 Dr. Annamaria Barbagallo  
 Dr. Nabil Belacel  
 Prof. Ignacio Castillo  
 Prof. Xu Chen  
 Prof. Muhammad El-Taha  
 Dr. Vladimir Filipović  
 Dr. Carmen Galé  
 Dr. Xianghua Gan  
 Dr. Xiuli He  
 Prof. Mhand Hifi  
 Prof. Zhimin Huang  
 Prof. Zhibin Jiang

Dr. Ricardo Josa-Fombellida  
 Prof. Dennis Leech  
 Prof. Deng-Feng Li  
 Prof. Liang Liang  
 Dr. Pedro Loreca  
 Dr. Zhaosong Lu  
 Prof. Monga Kalonda Luhandjula  
 Prof. Charles L. Munson  
 Dr. Jamal Ouenniche  
 Prof. Joaquín Antonio Pacheco Bonrostro  
 Prof. Gregory P. Prastacos  
 Prof. Javier Ramirez Rodriguez  
 Prof. Bhaba R. Sarker  
 Prof. Renduchintala Raghavendra Kumar Sharma

Dr. Chunming (Victor) Shi  
 Prof. Andranik Tangian  
 Prof. Etsuji Tomita  
 Dr. Delfim F. M. Torres  
 Prof. Evangelos Triantaphyllou  
 Dr. Manish Verma  
 Dr. Yu Amy Xia  
 Prof. Yi-Min Xie  
 Prof. Farouk Yalaoui  
 Dr. Jiping Yang  
 Dr. Shilei Yang  
 Prof. Peng-Yeng Yin  
 Dr. Xiaohang Yue  
 Dr. Bin Zhang

## Subject Coverage

This journal invites original research and review papers that address the following issues in operations research.

Topics of interest include, but are not limited to:

### 1. Operations Research and Optimization Theory and Research

#### Technical Approaches

Computational Intelligence and Information Management  
 Continuous Optimization  
 Decision Support Systems, Multi-Criteria Decision Methods  
 Discrete Optimization  
 Expert Systems  
 Heuristics Mathematical Programming  
 Networks  
 Queues  
 Simulation  
 Stochastic Models and Statistics  
 Time Series Analysis

### 2. Manufacturing and Service Operations Research

Forecasting  
 Inventory  
 Location  
 Logistics, Transportation Warehousing and Maintenance  
 Planning and Scheduling

Product and Service Design  
 Project Management  
 Quality Management  
 Revenue Management  
 Supply Chain Management

### 3. Interfaces with Other Disciplines

Community Operations Research  
 Education Operations Research  
 Environmental and Energy Issues  
 Financial Engineering  
 Government Operations Research  
 Health Services Operations Research  
 Marketing Science  
 Military and Homeland Security  
 Operations Research in Nonprofit Organization  
 Policy Modeling and Public Sector OR  
 Productivity and Efficiency in the Public Sector  
 Sports Operations Research  
 Telecommunications and Networking

We are also interested in short papers (letters) that clearly address a specific problem, and short survey or position papers that sketch the results or problems on a specific topic. Authors of selected short papers would be invited to write a regular paper on the same topic for future issues of the AJOR.

## Notes for Intending Authors

Submitted papers should not have been previously published nor be currently under consideration for publication elsewhere. Paper submission will be handled electronically through the website. All papers are refereed through a peer review process. For more details about the submissions, please access the website.

## Website and E-mail

<http://www.scirp.org/journal/ajor>

E-mail: [ajor@scirp.org](mailto:ajor@scirp.org)