

ISSN: 2160-8830 Volume 7, Number 6, November 2017



# American Journal of Operations Research



ISSN: 2160-8830



[www.scirp.org/journal/ajor](http://www.scirp.org/journal/ajor)

# 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. Shu-Cherng Fang

Prof. Panagiotis Kouvelis

Prof. Lawrence M. Seiford

University of Delaware, USA

York University, Canada

North Carolina State University, USA

Washington University in St. Louis, USA

University of Michigan, 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. Carmen Galé

Prof. Xianghua Gan

Prof. Bibhas Chandra Giri

Prof. Xiuli He

Prof. Mhand Hifi

Prof. Zhimin Huang

Prof. Zhibin Jiang

Dr. Ricardo Josa-Fombellida

Prof. Nguyen Khac Minh

Prof. Dennis Leech

Prof. Dengfeng Li

Prof. Liang Liang

Dr. Pedro Lorca

Prof. Charles L. Munson

Dr. Jamal Ouenniche

Prof. Joaquín Antonio Pacheco Bonrostro

Prof. Javier Ramirez Rodriguez

Prof. Bhaba R. Sarker

Prof. Renduchintala Raghavendra Kumar Sharma

Dr. Chunming (Victor) Shi

Prof. Andranik Tangian

Prof. Etsuji Tomita

Prof. Delfim F. M. Torres

Dr. Manish Verma

Dr. Yu Amy Xia

Dr. Shenghan Xu

Dr. Jiping Yang

Dr. Shilei Yang

Prof. Peng-Yeng Yin

Dr. Xiaohang Yue

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 Zaragoza, Spain

The Hong Kong Polytechnic University, China

Jadavpur University, India

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

Thang Long University, Vietnam

University of Warwick, UK

Fuzhou University, China

University of Science and Technology of China, China

University of Oviedo, Spain

Washington State University, USA

University of Edinburgh, UK

University of Burgos, Spain

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

McMaster University, Canada

Northeastern University, USA

University of Idaho, USA

Beihang University, China

Southwestern University of Finance and Economics, China

National Chi Nan University, Chinese Taipei

University of Wisconsin-Milwaukee, USA

# Table of Contents

**Volume 7    Number 6**

**November 2017**

## **The Optimum of a Quadratic Univariate Response Function Is Located at the Origin**

I. Etukudo.....323

## **Stochastic Modeling of Flow and Sediment of the Rivers at Delta Head, East Coast of India**

S. P. Mishra.....331

## **Compact Model for the Obnoxious $p$ -Median Problem**

Y.-I Chiang, C.-C. Lin.....348

## **A Review of Activity Time Distributions in Risk Analysis**

E. F. Udoumoh, D. W. Ebong.....356

## **Fédération Internationale Des Ingénieurs Conseils (FIDIC) Variation Order Clause**

M. Kotb, M. I. A. Razik, R. A. Sabry.....372

# 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: \$79 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 and reuse rights for the front matter of the journal:

Copyright © 2017 by Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>

#### Copyright for individual papers of the journal:

Copyright © 2017 by author(s) and Scientific Research Publishing Inc.

#### Reuse rights for individual papers:

Note: At SCIRP authors can choose between CC BY and CC BY-NC. Please consult each paper for its reuse rights.

#### Disclaimer of liability

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. Carmen Galé  
Prof. Xianghua Gan  
Prof. Bibhas Chandra Giri  
Prof. Xiuli He  
Prof. Mhand Hifi  
Prof. Zhimin Huang

Prof. Zhibin Jiang  
Dr. Ricardo Josa-Fombellida  
Prof. Nguyen Khac Minh  
Prof. Dennis Leech  
Prof. Dengfeng Li  
Prof. Liang Liang  
Dr. Pedro Lorca  
Prof. Charles L. Munson  
Dr. Jamal Ouenniche  
Prof. Joaquín Antonio Pacheco Bonrosto  
Prof. Javier Ramirez Rodriguez  
Prof. Bhaba R. Sarker  
Prof. Renduchintala Raghavendra Kumar Sharma

Dr. Chunming (Victor) Shi  
Prof. Andranik Tangian  
Prof. Etsuji Tomita  
Prof. Delfim F. M. Torres  
Dr. Manish Verma  
Dr. Yu Amy Xia  
Dr. Shenghan Xu  
Dr. Jiping Yang  
Dr. Shilei Yang  
Prof. Peng-Yeng Yin  
Dr. Xiaohang Yue

## 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  
Complex Systems  
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)