

[Look Up Full Text](#)[Find PDF](#)[Export...](#)[Add to Marked List](#)

◀ 1 of 1 ▶

Human Reliability Assessment in Healthcare Operations Using Fuzzy Cognitive Maps

By: [Naskali, YK](#) (Naskali, Yesim Kop)^[1]; [Gurbuz, T](#) (Gurbuz, Tuncay)^[1]; [Albayrak, YE](#) (Albayrak, Y. Esra)^[1][View Web of Science ResearcherID and ORCID](#)

JOURNAL OF MULTIPLE-VALUED LOGIC AND SOFT COMPUTING

Volume: 32 Issue: 1-2 Pages: 57-86

Published: 2019

Document Type: Article

Abstract

Reliability is the fundamental element of safety operation of all systems. Human performance plays a significant role in the development and operation of complex systems so it is obvious that human errors have serious effects on the complex system performance. Healthcare services sector is one of the major fields that require human reliability assessment as most of the applications involve human handling, decisions and processing. This study aims to draw a complete representation of doctor's behavior leading to clinical error by acquiring a complete causal relation model between all possible performance-influencing factors (PIFs) in healthcare operations which have been determined and analyzed for various healthcare operations.

Fuzzy Cognitive Maps (FCM) has been used to procure an explicit understanding of human behavior and all of the reasons relying under his behavior. In this respect, four doctors working in different high-risk involving healthcare fields evaluated all PIFs. The causal relationships are obtained and evaluated through a sensitivity analysis using different alpha-cuts. In real-life decisions, decision-makers may have different confidence levels on expert judgments. The sensitivity analysis procures to the decision-makers a perspective that explains how the fuzziness in judgment may affect the solution robustness.

Keywords

Author Keywords: [Human reliability assessment \(HRA\)](#); [healthcare](#); [fuzzy cognitive maps \(FCMs\)](#); [fuzzy inference systems](#); [fuzzy rule-based systems](#)

KeyWords Plus: [RISK-MANAGEMENT](#); [SAFETY](#); [ERRORS](#); [SURGEONS](#); [QUALITY](#); [SYSTEM](#); [HAZARD](#)

Author Information

Reprint Address:

Galatasaray University Galatasaray Univ, Ind Engn Dept, Ciiragan Cad 36, TR-34357 Istanbul, Turkey.

Corresponding Address: [Naskali, YK](#) (corresponding author)

Galatasaray Univ, Ind Engn Dept, Ciiragan Cad 36, TR-34357 Istanbul, Turkey.

Organization-Enhanced Name(s)

Galatasaray University

Addresses:

[1] Galatasaray Univ, Ind Engn Dept, Ciiragan Cad 36, TR-34357 Istanbul, Turkey

Organization-Enhanced Name(s)

Galatasaray University

E-mail Addresses: ykop@gsu.edu.tr

Funding

Funding Agency Show details	Grant Number
Galatasaray University	

Close funding text

This study has been financially supported by Galatasaray University Research Fund.

Publisher

OLD CITY PUBLISHING INC, 628 NORTH 2ND ST, PHILADELPHIA, PA 19123 USA

Citation Network

In Web of Science Core Collection

0

Times Cited

[Create Citation Alert](#)

72

Cited References

[View Related Records](#)

Use in Web of Science

Web of Science Usage Count

1

Last 180 Days

6

Since 2013

[Learn more](#)

This record is from:

Web of Science Core Collection
- Science Citation Index Expanded
- Social Sciences Citation Index

Suggest a correction

If you would like to improve the quality of the data in this record, please [suggest a correction](#).

Journal InformationTable of Contents: [Current Contents Connect](#)**Categories / Classification**

Research Areas: Computer Science; Science & Technology - Other Topics

Web of Science Categories: Computer Science, Artificial Intelligence; Computer Science, Theory & Methods; Logic

Document Information

Language: English

Accession Number: WOS:000458190000003

ISSN: 1542-3980

eISSN: 1542-3999

Other Information

IDS Number: HK7SO

Cited References in Web of Science Core Collection: **72**Times Cited in Web of Science Core Collection: **0**[See fewer data fields](#)

◀ 1 of 1 ▶

Cited References: 72Showing 30 of 72 [View All in Cited References page](#)*(from Web of Science Core Collection)*

1. **A Technique for Human Event Analysis (ATHEANA)-Technical Basis and Methodological Description** Times Cited: **1**
By: [Anonymous].
NUREG/CR-6350 US Nuclear Regulatory Commission (USNRC) Published: 1996
Publisher: Brookhaven National Laboratory, Upton, New York
2. **The SPAR-H Human Reliability Analysis Method** Times Cited: **1**
By: [Anonymous].
NUREG/CR-6883 US Nuclear Regulatory Commission (USNRC) Published: 2005
Publisher: Idaho National Laboratory, Idaho Falls
3. Title: [not available] Times Cited: **373**
By: AXELROD R
STRUCTURE DECISION Published: 1976
4. **Review of Human Reliability Assessment Methods** Times Cited: **64**
By: Bell, J.; Holroyd, J.
RR679 Published: 2009
Publisher: Health and Safety Laboratory, Derbyshire
5. **Assessment of human reliability factors: A fuzzy cognitive maps approach** Times Cited: **47**
By: Bertolini, Massimo
INTERNATIONAL JOURNAL OF INDUSTRIAL ERGONOMICS Volume: 37 Issue: 5 Pages: 405-413 Published: MAY 2007
6. **Fuzzy Cognitive Maps for Human Reliability Analysis in Production Systems** Times Cited: **16**
By: Bertolini, Massimo; Bevilacqua, Maurizio
PRODUCTION ENGINEERING AND MANAGEMENT UNDER FUZZINESS Book Series: Studies in Fuzziness and Soft Computing Volume: 252
Pages: 381-415 Published: 2010
7. **Techniques aren't everything: Why conscientious well-trained surgeons make mistakes?** Times Cited: **1**
By: Bethune, R.; Francis, N.
TECHNIQUES IN COLOPROCTOLOGY Volume: 19 Issue: 9 Pages: 503-504 Published: SEP 2015
8. **Fuzzy Rule-Based System Applied to Risk Estimation of Cardiovascular Patients** Times Cited: **4**
By: Bohacik, Jan; Davis, Darryl N.
JOURNAL OF MULTIPLE-VALUED LOGIC AND SOFT COMPUTING Volume: 20 Issue: 5-6 Pages: 445-466 Published: 2013
9. **Systems mapping workshops and their role in understanding medication errors in healthcare** Times Cited: **14**

- By: Buckle, P.; Clarkson, P. J.; Coleman, R.; et al.
APPLIED ERGONOMICS Volume: 41 Issue: 5 Special Issue: SI Pages: 645-656 Published: SEP 2010
10. **Human factors systems approach to healthcare quality and patient safety** Times Cited: 211
By: Carayon, Pascale; Wetterneck, Tosha B.; Rivera-Rodriguez, A. Joy; et al.
APPLIED ERGONOMICS Volume: 45 Issue: 1 Pages: 14-25 Published: JAN 2014
11. **Importance of human contribution within the human reliability analysis (IJS-HRA)** Times Cited: 29
By: Cepin, Marko
JOURNAL OF LOSS PREVENTION IN THE PROCESS INDUSTRIES Volume: 21 Issue: 3 Pages: 268-276 Published: MAY 2008
12. **DEPEND-HRA - A method for consideration of dependency in human reliability analysis** Times Cited: 44
By: Cepin, Marko
RELIABILITY ENGINEERING & SYSTEM SAFETY Volume: 93 Issue: 10 Pages: 1452-1460 Published: OCT 2008
13. Title: [not available] Times Cited: 3
By: Codara, L.
Le mappe cognitive Published: 1998
Publisher: Carrocci Editore, Roma
14. **SLIM-MAUD: An approach to assessing human error probabilities using structured expert judgment** Times Cited: 43
By: Embrey, D. E.; Humphreys, P.; Rosa, E. A.; et al.
NUREG/CR-3518 Published: 1984
Publisher: U.S. Nuclear Regulatory Commission, Washington, DC
[Show additional data]
15. **Expanding healthcare failure mode and effect analysis: A composite proactive risk analysis approach** Times Cited: 26
By: Faiella, Giuliana; Parand, Anam; Franklin, Bryony Dean; et al.
RELIABILITY ENGINEERING & SYSTEM SAFETY Volume: 169 Pages: 117-126 Published: JAN 2018
16. **Measuring safety culture in healthcare: A case for accurate diagnosis** Times Cited: 146
By: Flin, Rhona
SAFETY SCIENCE Volume: 45 Issue: 6 Pages: 653-667 Published: JUL 2007
17. **Advances in fuzzy cognitive maps theory** Times Cited: 5
By: Froelich, Wojciech; Salmeron, Jose L.
NEUROCOMPUTING Volume: 232 Special Issue: SI Pages: 1-2 Published: APR 5 2017
18. **Towards improving the efficiency of the fuzzy cognitive map classifier** Times Cited: 16
By: Froelich, Wojciech
NEUROCOMPUTING Volume: 232 Special Issue: SI Pages: 83-93 Published: APR 5 2017
19. **Identification and evaluation of dentists' errors in infection control in a specialized clinic in Tehran.** Times Cited: 1
By: Ghareneh, N. S.; Jazani, H. K.; Rostamkhani, F.; et al.
Iran Occupational Health Volume: 12 Issue: 5 Pages: 100-110 Published: 2015
20. Title: [not available] Times Cited: 1
By: Golledge, R. G.
Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes Published: 1999
Publisher: The Johns Hopkins University Press, Baltimore
21. **Fuzzy Cognitive Maps: Basic Theories and Their Application to Complex Systems** Times Cited: 89
By: Groumpos, Peter P.
FUZZY COGNITIVE MAPS: ADVANCES IN THEORY, METHODOLOGIES, TOOLS AND APPLICATIONS Book Series: Studies in Fuzziness and Soft Computing Volume: 247 Pages: 1-22 Published: 2010
22. **Human cognitive reliability model for PRA analysis** Times Cited: 39
By: Hannaman, G.; Spurgin, A.; Lukic, Y.
Technical Report NUS-4531 Published: 1984
Publisher: Electric Power Research Institute, Palo Alto
23. Title: [not available] Times Cited: 779
By: Hollnagel, E.
Cognitive reliability and error analysis method (CREAM) Published: 1998
Publisher: Elsevier, U. S.A.

24. Title: [not available] Times Cited: 248
By: Hollnagel, E.
Human reliability analysis: Context and control Published: 1993
Publisher: Academic Press, London, UK
25. [A fuzzy set approach for event tree analysis](#) Times Cited: 112
By: Huang, D; Chen, T; Wang, MJJ
FUZZY SETS AND SYSTEMS Volume: 118 Issue: 1 Pages: 153-165 Published: FEB 16 2001
26. Title: [not available] Times Cited: 1
By: Hunns, D. M.
The method of paired comparisons Published: 1982
Publisher: A.E. Green, Wiley, Chichester
27. [Safety Culture](#) Times Cited: 11
Group Author(s): IAEA, International Atomic Energy Agency
A Report by the International Nuclear Safety Advisory Group, No. 75-INSAG-4 Published: 1991
28. Title: [not available] Times Cited: 836
Group Author(s): Institute of Medicine
To Err Is Human, Building a Safer Health System Published: 2000
Publisher: Institute of Medicine, Washington, DC
29. [Patient safety ethics and human error management in ED contexts Part I: Development of the global patient safety movement](#) Times Cited: 8
By: Johnstone, Megan-Jane
AUSTRALASIAN EMERGENCY NURSING JOURNAL Volume: 10 Issue: 1 Pages: 13-20 Published: MAR 2007
30. [Fuzzy Decision Making in Risk Management Preface](#) Times Cited: 2
By: Kahraman, Cengiz
JOURNAL OF MULTIPLE-VALUED LOGIC AND SOFT COMPUTING Volume: 17 Issue: 4 Special Issue: SI Pages: 289-292 Published: 2011

Showing 30 of 72 [View All in Cited References page](#)

Clarivate

Accelerating innovation

© 2020 Clarivate

[Copyright notice](#)

[Terms of use](#)

[Privacy statement](#)

[Cookie policy](#)

[Sign up for the Web of Science newsletter](#)

[Follow us](#)

