



**COLLEGE OF ENGINEERING
AND COMPUTER SCIENCE**
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Azadeh Abdollah Zadeh

for the degree of Doctor of Philosophy (Ph.D.)

**“Advancing One-Class Classification: a comprehensive analysis from
theory to novel applications”**

March 25, 2024, 10:30 a.m.

**In-person
Room EE-405**

DEPARTMENT:

Electrical Engineering and Computer Science

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ABSTRACT OF DISSERTATION

This dissertation explores one-class classification (OCC) in the context of big data and fraud detection, addressing challenges posed by imbalanced datasets. A detailed survey of OCC-related literature forms a core part of the study, categorizing works into outlier detection, novelty detection, and deep learning applications. This survey reveals a gap in the application of OCC to the inherent problems of big data, such as class rarity and noisy data. Building upon the foundational insights gained from the comprehensive literature review on OCC, the dissertation progresses to a detailed comparative analysis between OCC and binary classification methods. This comparison is pivotal in understanding their respective strengths and limitations across various applications, emphasizing their roles in addressing imbalanced datasets. The research then specifically evaluates binary and OCC using credit card fraud data. This practical application highlights the nuances and effectiveness of these classification methods in real-world scenarios, offering insights into their performance in detecting fraudulent activities. After the evaluation of binary and OCC using credit card fraud data, the dissertation extends this inquiry with a detailed investigation into the effectiveness of both methodologies in fraud detection. This extended analysis involves utilizing not only the Credit Card Fraud Detection Dataset but also the Medicare Part D dataset. The findings show the comparative performance and suitability of these classification methods in practical fraud detection scenarios. Finally, the dissertation examines the impact of training OCC algorithms on majority versus minority classes, using the two previously mentioned datasets in addition to Medicare Part B and Durable Medical Equipment, Prosthetics, Orthotics and Supplies (DMEPOS) datasets. This exploration offers critical insights into model training strategies and their implications, suggesting that training on the majority class can often lead to more robust classification results. In summary, this dissertation provides a deep understanding of OCC, effectively bridging theoretical concepts with novel applications in big data and fraud detection. It contributes to the field by offering a comprehensive analysis of OCC methodologies, their practical implications, and their effectiveness in addressing class imbalance in big data.

BIOGRAPHICAL SKETCH

Born in Tehran, Iran

B.S., University of Research and Science, Tehran 2009

M.S., University of Research and Science, Tehran 2013

Ph.D., Florida Atlantic University, Boca Raton, Florida 2024

CONCERNING PERIOD OF PREPARATION & QUALIFYING EXAMINATION

Time in Preparation: 2018 - 2024

Qualifying Examination passed: Fall 2017

Published Papers:

N. Seliya, A. Abdollah Zadeh, and T. M. Khoshgoftaar. A literature review on one-class classification and its potential applications in big data. *Journal of Big Data*, 8(1):1–31, 2021.

A. Abdollah Zadeh, J. L. Leevy, and T. M. Khoshgoftaar. A survey on the choice between binary classification and one-class classification. In 27th ISSAT International Conference on Reliability and Quality in Design, RQD 2022, 2022.

J. L. Leevy, J. Hancock, T. M. Khoshgoftaar, and A. Abdollah Zadeh. Investigating the effectiveness of one-class and binary classification for fraud detection. *Journal of Big Data*, 10(1):157, 2023.

J. L. Leevy, J. Hancock, T. M. Khoshgoftaar, and A. Abdollah Zadeh. One-class classifier performance: Comparing majority versus minority class training. In 2023 IEEE 35th International Conference on Tools with Artificial Intelligence (ICTAI). IEEE, 2023.

J. L. Leevy, J. Hancock, T. M. Khoshgoftaar, and A. Abdollah Zadeh. Using credit card fraud data to evaluate binary and one-class classification. In 28th ISSAT International Conference on Reliability and Quality in Design, RQD 2023, 2023.

A. Abdollah Zadeh, J. L. Leevy, and T. M. Khoshgoftaar. One-class classification: Advances and comparisons with binary classification. In 29th ISSAT International Conference on Reliability and Quality in Design, RQD 2024, 2024.

J. L. Leevy, J. Hancock, T. M. Khoshgoftaar, and A. Abdollah Zadeh. One-class classification for credit card fraud detection: A detailed study with comparative insights from binary classification. In *Analytics Modeling in Reliability and Machine Learning and Its Applications*. Springer, 2024.

J. L. Leevy, J. Hancock, T. M. Khoshgoftaar, and A. Abdollah Zadeh. Evaluating the impact of majority vs. minority class training for one-class classification. *International Journal on Artificial Intelligence Tools*, Under Review, 2024.