COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Richard A. Bauder

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

"Machine Learning Algorithms with Big Medicare Fraud Data"

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DEPARTMENT: Computer and Electrical Engineering and Computer Science

ADVISOR: Taghi M. Khoshgoftaar, Ph.D.

PH.D. SUPERVISORY COMMITTEE:
Mehrdad Nojoumian, Ph.D.
Dingding Wang, Ph.D.
Xingquan Zhu, Ph.D.

ABSTRACT OF DISSERTATION
Machine Learning Algorithms with Big Medicare Fraud Data
Healthcare is an integral component in people's lives, especially for the rising elderly population, and must be affordable. The United States Medicare program is vital in serving the needs of the elderly. The growing number of people enrolled in the Medicare program, along with the enormous volume of money involved, increases the appeal for, and risk of, fraudulent activities. For many real-world applications, including Medicare fraud, the interesting observations tend to be less frequent than the normative observations. This difference between the normal observations and those observations of interest can create highly imbalanced datasets. The problem of class imbalance, to include the classification of rare cases, is an important and well-studied area in machine learning. The effects of class imbalance with big data in the real-world Medicare fraud application domain, however, is limited. In particular, the impact of detecting fraud with very limited numbers of known fraudulent Medicare claims is critical in lessening the financial and personal impacts of these transgressions. Fortunately, the healthcare domain is one such area where the successful detection of fraud can garner meaningful positive results. The application of machine learning techniques, plus methods to mitigate the adverse effects of class imbalance, can be used to detect fraud and lessen the impacts for all Medicare beneficiaries. This dissertation presents the application of machine learning approaches to detect Medicare provider claims fraud in the United States. We discuss novel techniques to process three big Medicare datasets and create a new, combined dataset, which includes mapping fraud labels associated with known excluded providers. We investigate the ability of machine learning techniques, unsupervised and supervised, to detect Medicare claims fraud and leverage data sampling methods to lessen the impact of class imbalance and increase fraud detection performance. Additionally, we extend the study of class imbalance to assess the impacts of rare cases in big data for Medicare fraud detection.

BIOGRAPHICAL SKETCH
Born in Suwon, South Korea
B.S., University of Portland, Portland, Oregon, 1999
M.S., University of Massachusetts, Lowell, Massachusetts, 2004
Ph.D., Florida Atlantic University, Boca Raton, Florida, 2018

CONCERNING PERIOD OF PREPARATION & QUALIFYING EXAMINATION

Time in Preparation: 2015 - 2018

Qualifying Examination Passed: Spring 2015

Selected Published Papers:

Richard A. Bauder, and Taghi M. Khoshgoftaar. "The Effects of Varying Class Distribution on Learner Behavior for Medicare Fraud Detection with Imbalanced Big Data." International Journal of Health Information Science and Systems 6:9 (2018), 14 pages.

Richard A. Bauder, and Taghi M. Khoshgoftaar. "Medicare Fraud Detection Using Machine Learning Methods." Machine Learning and Applications (ICMLA), 2017 16th IEEE International Conference on. IEEE, 2017, pages 858-865.

Richard A. Bauder, and Taghi M. Khoshgoftaar. "Estimating Outlier Score Probabilities." Information Reuse and Integration (IRI), 2017 IEEE International Conference on. IEEE, 2017, pages 559-568.

Richard A. Bauder, and Taghi M. Khoshgoftaar. "Multivariate Outlier Detection in Medicare Claims Payments Applying Probabilistic Programming Methods." International Journal of Health Services and Outcomes Research Methodology 17 3-4 (2017): pages 256-289.

Richard A. Bauder, Taghi M. Khoshgoftaar, Aaron Richter, and Matthew Herland. "Predicting Medical Provider Specialties to Detect Anomalous Insurance Claims." Tools with Artificial Intelligence (ICTAI), 2016 IEEE 28th International Conference on. IEEE, 2016, pages 784-790.