

Accepted Manuscript

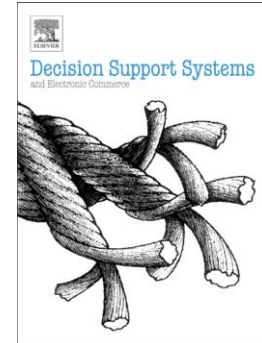
Predicting heart transplantation outcomes through data analytics

Ali Dag, Asil Oztekin, Ahmet Yucel, Serkan Bulur, Fadel M. Megahed

PII: S0167-9236(16)30181-6
DOI: doi: [10.1016/j.dss.2016.10.005](https://doi.org/10.1016/j.dss.2016.10.005)
Reference: DECSUP 12782

To appear in: *Decision Support Systems*

Received date: 14 January 2016
Revised date: 29 October 2016
Accepted date: 30 October 2016



Please cite this article as: Ali Dag, Asil Oztekin, Ahmet Yucel, Serkan Bulur, Fadel M. Megahed, Predicting heart transplantation outcomes through data analytics, *Decision Support Systems* (2016), doi: [10.1016/j.dss.2016.10.005](https://doi.org/10.1016/j.dss.2016.10.005)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Predicting Heart Transplantation Outcomes through Data Analytics

Ali Dag^a, Asil Oztekin^b, Ahmet Yucel^c, Serkan Bulur^d, Fadel M. Megahed^e^aBeacom School of Business, University of South Dakota, Vermillion, SD 57069, USA — Email: ali.dag@usd.edu^bOperations & Information Systems, University of Massachusetts Lowell, MA 01854 USA — Email: Asil.Oztekin@uml.edu^cDepartment of Mathematics, Auburn University, AL 36849 USA — Email: azy0002@auburn.edu^dDivision of Cardiovascular Disease, University of Alabama at Birmingham, AL 35233, USA — Email: serkanbulur@gmail.com^eFarmer School of Business, Miami University, OH 45056, USA — Email: fmegahed@miamioh.edu

Abstract

Predicting the survival of heart transplant patients is an important, yet challenging problem since it plays a crucial role in understanding the matching procedure between a donor and a recipient. Data mining models can be used to effectively analyze and extract novel information from large/complex transplantation datasets. The objective of this study is to predict the 1-, 5-, and 9-year patient's graft survival following a heart transplant surgery via the deployment of analytical models that are based on four powerful classification algorithms (i.e. decision trees, artificial neural networks, support vector machines, and logistic regression). Since the datasets used in this study has a much larger number of survival cases than deaths for 1- and 5-year survival analysis and vice versa for 9-year survival analysis, random under sampling (RUS) and synthetic minority over-sampling (SMOTE) are employed to overcome the data-imbalance problems. The results indicate that *logistic regression* combined with SMOTE achieves the best classification for the 1-, 5-, and 9-year outcome prediction, with area-under-the-curve (AUC) values of 0.624, 0.676, and 0.838, respectively. By applying sensitivity analysis to the data analytical models, the most important predictors and their associated contribution for the 1-, 5-, and 9-year graft survival of heart transplant patients are identified. By doing so, variables, whose importance changes over time, are differentiated. Not only this proposed hybrid approach gives superior results over the literature but also the models and identification of the variables present important retrospective findings, which can be the basis for a prospective medical study.

Keywords: Data mining, Health-care analytics, Medical decision making, Transplants, Unbalanced data, United Network for Organ Sharing (UNOS)

Download English Version:

<https://daneshyari.com/en/article/4972498>

Download Persian Version:

<https://daneshyari.com/article/4972498>

[Daneshyari.com](https://daneshyari.com)