

Title

## **Prediction of Health Care Insurance Expenses using Machine Learning and Artificial Neural Network**

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Speaker/Company

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Abstract

The application of artificial intelligence (AI) in health insurance is an important innovation that is rapidly driving improvements and redefining the interaction between the insurer and policyholder. It contributes to improving and streamlining the user experience, as well as making operations easier. Machine learning and AI can help insurers more correctly analyze the risks involved in underwriting a policy, and thus estimate premiums and losses. Traditional loss models in healthcare, such as Generalized Linear Models and Multiple Linear Regression, rely on statistical methods and actuarial assumptions, whereas machine learning models leverage data-driven algorithms and patterns to predict healthcare expenses with greater accuracy, adaptability, and computational speed. The purpose of this study is to estimate and predict health insurance expenses based on several variables including age, BMI, sex, number of children, region, and whether the individual is a smoker. The prediction is conducted using several machine learning algorithms, including Regression Decision Tree, Gradient Boosting Machine, XGBoost, Multiple Linear Regression, and Feedforward Artificial Neural Network. Since the dataset used in the study has a highly skewed distribution for expenses, a logarithmic transformation is applied on the data of expenses, to be used in predicting the logarithm of expenses to improve each model's accuracy. The results show that the Feedforward Artificial Neural Network performed the best, with mean absolute percentage error of 2.11% to predict the logarithm of expenses.

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Biography

Liana Barsoumian is a Senior Underwriter at SNA S.A.L. with almost 3 years of experience in the Insurance industry, and holds a Bachelor and Master's degree in Actuarial Sciences from Notre Dame University - Louaize. Liana's interests include Machine Learning, Statistical Learning, Modeling, Predictive Analytics and Risk Analysis, especially in the field of Life and Health insurance. Her commitment to continuous learning and staying at the forefront of industry trends drives her dedication to excellence.

Re-Mi Hage is an associate professor at Notre Dame University-Louaize and Academic Advisor for graduate and undergraduate program in Actuarial Sciences with more than ten years of solid experience in Modeling, Estimation, Prediction, Analysis, Econometric, Computational Statistics. Re-Mi's Research interest and teaching topics include Nonparametric estimation, Statistical Learning, Statistical inference, Computational Statistics, Optimisation, Machine Learning/deep learning, Modeling in engineering, finance, biology/health/medicine, and actuarial science.

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