

# Predict The Thyroid Abnormality Particular Disease Likelihood of The Symptoms' Certainty Factor Value and Its Confidence Level: A Regression Model Analysis

<sup>1,2</sup>Rosyid Ridlo Al-Hakim\*, <sup>1,3</sup>Yanuar Zulardiansyah Arief, <sup>1</sup>Agung Pangestu, <sup>4</sup>Hexa Apriliana Hidayah, <sup>1</sup>Aditia Putra Hamid, <sup>5</sup>Aviasenna Andriand, <sup>6,7</sup>Nur Fauzi Soelaiman, <sup>8</sup>Machnun Arif, <sup>9</sup>Mahmmoud Hussein A. Alrahman

<sup>1</sup>Electrical Engineering Department, Jakarta Global University, Depok, Indonesia

<sup>2</sup>Primateology Graduate Study Program, Graduate School, IPB University, Bogor, Indonesia

<sup>3</sup>Electrical & Electronic Engineering Department, Universiti Malaysia Sarawak, Samarahan, Malaysia

<sup>4</sup>Faculty of Biology, Universitas Jenderal Soedirman, Purwokerto, Indonesia

<sup>5</sup>Faculty of Medicine, Universitas Jenderal Soedirman, Purwokerto, Indonesia

<sup>6</sup>Computer and Informatics Department, Jakarta State Polytechnic, Depok, Indonesia

<sup>7</sup>Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka, Malaysia

<sup>8</sup>School of Computer Science, Nusa Putra University, Sukabumi, Indonesia

<sup>9</sup>Department of Vertebrates, Iraqi Natural History Museum and Research Center, University of Baghdad, Baghdad, Iraq

\*e-mail: [rosyidridlo10@gmail.com](mailto:rosyidridlo10@gmail.com)

(received: 3 Januari 2023, revised: 19 Maret 2023, accepted: 14 April 2023)

## Abstract

The traditional expert system (TES) in the medical field commonly uses a certainty factor (CF) rule-based algorithm that can be calculated several symptoms to determine the inference solutions. The main issue for this TES included a prediction for some particular disease likelihood in the cases of new patients. CF is calculated based on symptoms related to clinical signs in patients' diagnoses. For some reason, this TES probably won't predict uncertain things, such as particular disease likelihood of some diseases. So, supervised learning, such as linear regression, can solve this problem. We tried to analyse the existing TES for thyroid disorders due to modelling the regression equation to predict the thyroid abnormality particular disease likelihood, based on the symptoms' CF value and its confidence level. We used multiple linear regression (MLR) and multiple polynomial regression (MPR) to analyse the best regression model to solve the problem. The results show that the MPR model indicates the best regression model for predicting particular disease likelihood of thyroid abnormality, supported by R-squared 94.7%, R-squared adjusted 94.4%, F-value 265.925, and p-value < 0.05, which are higher than MLR model. Our study proposed a foundation for expert system development by focusing more on machine learning expert system (MLES) analysis approaches than TES.

**Keywords:** expert system, fuzzy, linear regression, prediction, supervised learning algorithm.

## 1 Introduction

Thyroid glands regulate the hormone condition and are a crucial body organ supporting quality of life [1]. Thyroid patients might have different symptoms and are reported several psychological issues caused by abnormal T4 hormone regulation [2]. Patients with this illness frequently ignore their actions [3], [4]. Besides, in the era of health informatics, the role of the expert system (ES) was used to diagnose this issue [5].

ES, as the product of artificial intelligence (AI), tried to integrate with the medical expert for developing this system [6], [7]. Related studies about ES implemented in the medical field, such as COVID-19 [8], [9], psychology [10]–[13], traditional medicine [14], [15], internal medicine [16], [17], cancer [18]–[21]. ES is purposed to help medical experts solve health problems, including diagnosis, prediction, and treatment [22]. Meanwhile, Hariadha et al. [23] developed the medical ES to solve thyroid disorders. Besides, Al-Hakim et al. [5] coded this current ES to an Android-based app

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