CLUSTERING ALUMNI EMPLOYMENT BASED ON GRADUATE COMPETENCIES USING THE K-MEANS ALGORITHM (A CASE STUDY OF THE DEPARTMENT OF INFORMATION TECHNOLOGY)

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ABSTRACT

This study aims to develop a web-based tracer study system to cluster alumni employment based on job description similarities and their relevance to graduate competencies. The dataset consists of 1,594 alumni from the Department of Information Technology at Jember State Polytechnic who graduated between 2019 and 2025. A total of 558 alumni who were unemployed, seeking employment, or pursuing further studies were assigned to category C3, while 1,036 employed alumni were processed through text preprocessing, Term Frequency–Inverse Document Frequency (TF-IDF) feature extraction, and the K-Means algorithm. The model used four clusters (K = 4) with K-Means initialization and converged at the 12th iteration, achieving an inertia value of 791.82 and a Silhouette Score of 0.1063. The profiling results consisted of four categories: C0 (employment aligned with graduate profiles), comprising 222 alumni (13.93%); C1 (formal non-IT employment), comprising 537 alumni (33.69%); C2 (employment fields that were insufficiently identified), comprising 277 alumni (17.38%); and C3, comprising 558 alumni (35.01%). The system was developed using React, FastAPI, and MySQL. Black Box Testing of 23 scenarios conducted by four testers achieved a conformity rate of 100%, while User Acceptance Testing (UAT) involving 15 respondents and 12 evaluation statements obtained a score of 90.8%, categorized as Highly Feasible. The system is expected to support alumni employment analysis for curriculum evaluation and graduate competency development.

Keywords: Tracer Study, Alumni Employment, TF-IDF, K-Means, Clustering.