

## Ontology-Driven Knowledge Discovery and Validation from Admission Databases: A Structural Causal Model Approach for Polytechnic Education in Nigeria

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**Abstract :** This study presents an ontology-driven approach for knowledge discovery and validation from admission databases in Nigerian polytechnic institutions. The research aims to address the challenges of extracting meaningful insights from vast amounts of admission data and utilizing them for decision-making and process improvement. The proposed methodology combines the knowledge discovery in databases (KDD) process with a structural causal model (SCM) ontological framework. The admission database of Benue State Polytechnic Ugbokolo (Benpoly) is used as a case study. The KDD process is employed to mine and distill knowledge from the database, while the SCM ontology is designed to identify and validate the important features of the admission process. The SCM validation is performed using the conditional independence test (CIT) criteria, and an algorithm is developed to implement the validation process. The identified features are then used for machine learning (ML) modeling and prediction of admission status. The results demonstrate the adequacy of the SCM ontological framework in representing the admission process and the high predictive accuracies achieved by the ML models, with k-nearest neighbors (KNN) and support vector machine (SVM) achieving 92% accuracy. The study concludes that the proposed ontology-driven approach contributes to the advancement of educational data mining and provides a foundation for future research in this domain.

**Keywords :** admission databases, educational data mining, machine learning, ontology-driven knowledge discovery, polytechnic education, structural causal model

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