

ITAI 1371

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Classification and Model Evaluation

In this lab, I learned how to build and evaluate classification models using logistic regression and decision trees. It helped me understand the difference between regression, which predicts continuous values, and classification, which predicts categories like whether an employee will stay or leave a company. I practiced evaluating models using metrics like accuracy, precision, recall, F1-score, and ROC-AUC, which are essential for assessing how well a model performs. I also learned how to interpret confusion matrices and ROC curves, which visually show the trade-off between true positives and false positives.

One of the most valuable parts was learning how to improve model performance through feature engineering and threshold optimization. Creating the feature *tenure_satisfaction_ratio* allowed me to capture the relationship between how long someone stays at a company and how satisfied they are. Adjusting the decision threshold helped balance precision and recall to improve predictions. Using class weights also demonstrated how to handle imbalanced data, ensuring that both classes receive fair importance during training.

These techniques are directly useful for my current project, where I am analyzing cognitive deterioration through visual data. The same evaluation principles can be applied to measure how well my models distinguish between normal and at-risk patterns. Understanding precision, recall, and ROC-AUC helps ensure that the model is not only accurate but also ethically reliable when used in sensitive contexts like health prediction. Overall, this lab strengthened my understanding of how to build trustworthy and interpretable machine learning systems that can support meaningful, data-driven decisions.