Module 5 Summary and Highlights

Congratulations! You have completed this lesson. At this point in the course, you know:

- Supervised learning evaluation assesses a model's ability to predict outcomes for unseen data, often using a train/test split to estimate performance.
- Key metrics for classification evaluation include accuracy, confusion matrix, precision, recall, and the F1 score, which balances precision and recall.
- Regression model evaluation metrics include MAE, MSE, RMSE, R-squared, and explained variance to measure prediction accuracy.
- Unsupervised learning models are evaluated for pattern quality and consistency using metrics like Silhouette Score, Davies-Bouldin Index, and Adjusted Rand Index.
- Dimensionality reduction evaluation involves Explained Variance Ratio, Reconstruction Error, and Neighborhood Preservation to assess data structure retention.
- Model validation, including dividing data into training, validation, and test sets, helps prevent overfitting by tuning hyperparameters carefully.
- Cross-validation methods, especially K-fold and stratified cross-validation, support robust model validation without overfitting to test data.
- Regularization techniques, such as ridge (L2) and lasso (L1) regression, help prevent overfitting by adding penalty terms to linear regression models.
- Data leakage occurs when training data includes information unavailable in real-world data, which is preventable by separating data properly and mindful feature selection.
- Common modeling pitfalls include misinterpreting feature importance, ignoring class imbalance, and relying excessively on automated processes without causal analysis.
- Feature importance assessments should consider redundancy, scale sensitivity, and avoid misinterpretation, as well as inappropriate assumptions about causation.