DA421 Assignment 1

Name: Varun Nagpal
Roll No: 210150020

Implementation

1. Data Preprocessing
    a. Missing value imputation
    b. Categorical feature encoding, Standardization and min-max normalization
    c. Train test splits for preventionN algorithm
    d. Data sampling for census income

2. Custom Distance function for KNN
    a. Interval-Scaled Features
    b. Nominal Features
    c. Ordinal Features

3. DiscoveryN Algorithm
4. PreventionN Algorithm

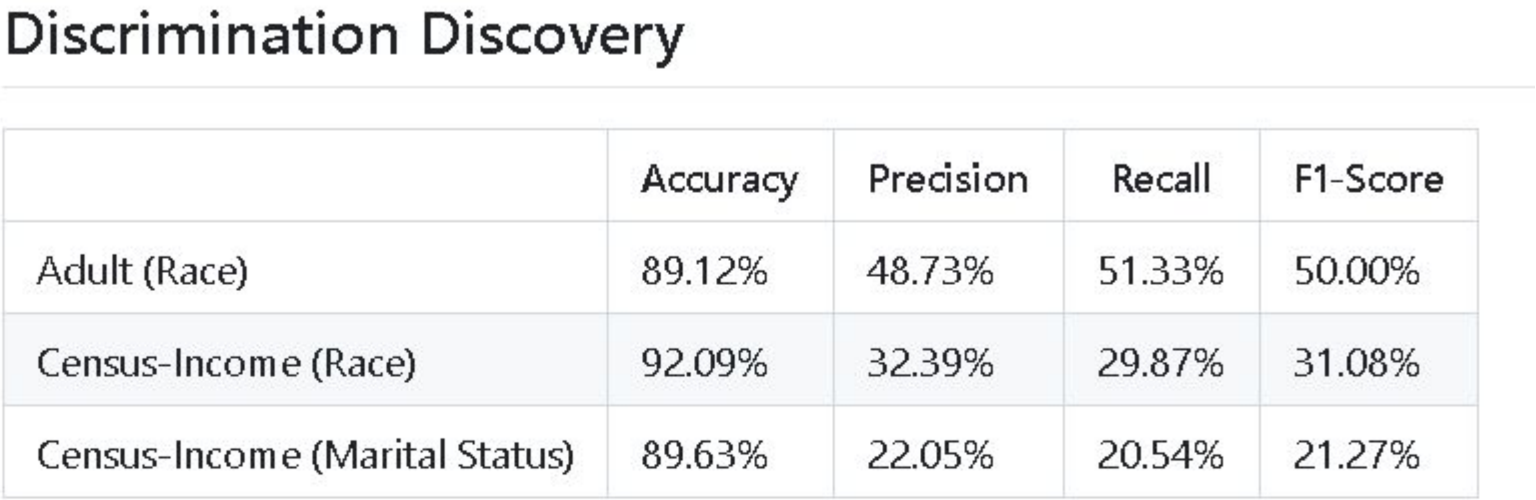
Experimental Setup

- Protected Attributes
  - Adult Dataset: Race (non-whites)
  - Census-Income Dataset: Race (non-whites) and Marital Status (Divorced, Separated and Widowed).

- DiscoveryN algorithm
  - Decision Tree classifier for 'disc' label on the t-labelled dataset
  - Analyzed performance metrics such as accuracy, precision, recall, F1-score. (8 split on the t-labelled dataset).

- PreventionN algorithm
  - Tested on original and t-corrected data (t = 0.1) using the original 66.66:33.33 splits..
  - Classifiers used: Decision Tree, Naive Bayes, Logistic Regression
  - Metrics reported: Accuracy, t = 0.10 discrimination, Classifier discrimination on predictions.
  - Additional experiment on 0.05-corrected data: Accuracy and Classifier discrimination measured.

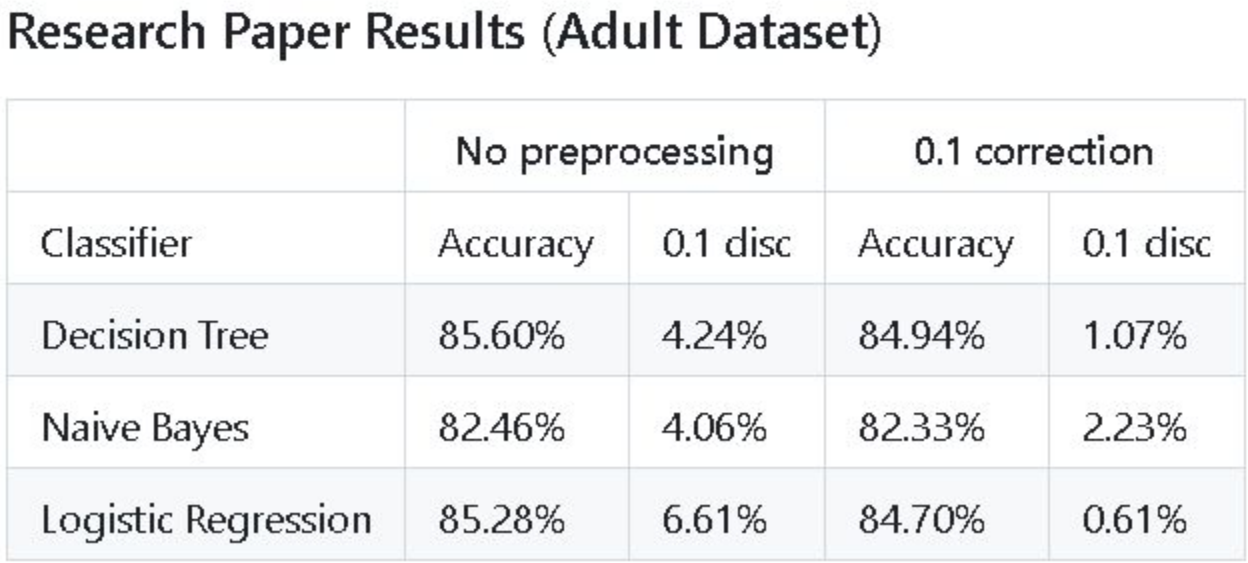
Results



Discrimination Discovery

	Accuracy	Precision	Recall	F1-Score
Adult (Race)	89.12%	48.73%	51.33%	50.00%
Census-Income (Race)	92.09%	32.39%	29.87%	31.08%
Census-Income (Marital Status)	89.63%	22.05%	20.54%	21.27%

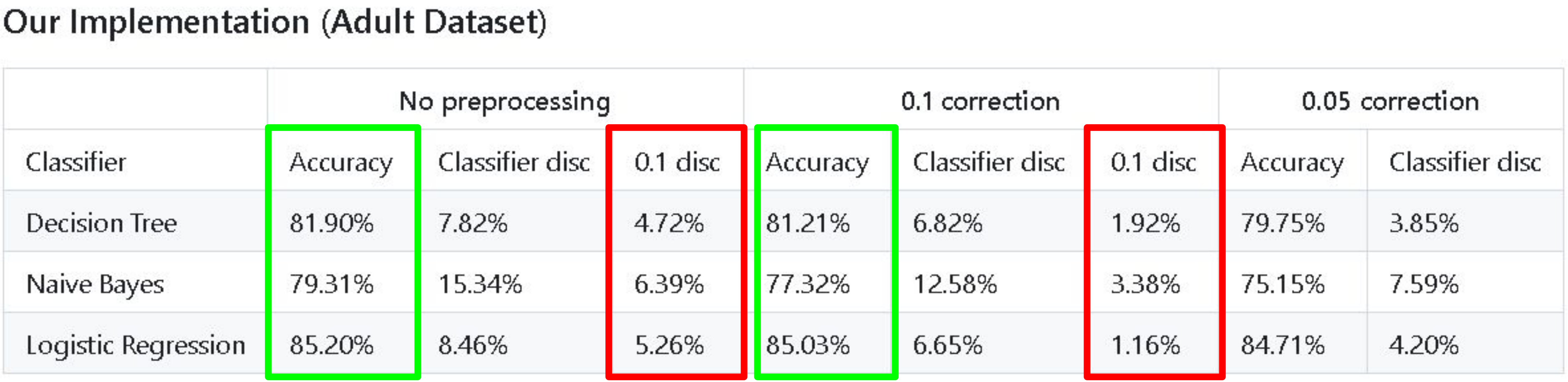
Results



Research Paper Results (Adult Dataset)

	No preprocessing		0.1 correction	
Classifier	Accuracy	0.1 disc	Accuracy	0.1 disc
Decision Tree	85.60%	4.24%	84.94%	1.07%
Naive Bayes	82.46%	4.06%	82.33%	2.23%
Logistic Regression	85.28%	6.61%	84.70%	0.61%

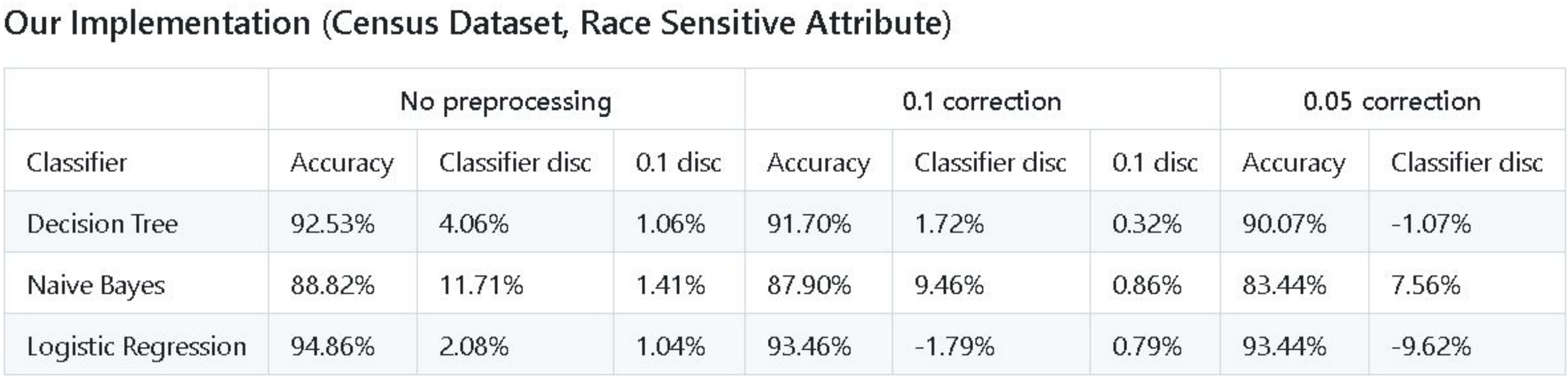
Results



Our Implementation (Adult Dataset)

	No preprocessing			0.1 correction			0.05 correction	
Classifier	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc
Decision Tree	81.90%	7.82%	4.72%	81.21%	6.82%	1.92%	79.75%	3.85%
Naive Bayes	79.31%	15.34%	6.39%	77.32%	12.58%	3.38%	75.15%	7.59%
Logistic Regression	85.20%	8.46%	5.26%	85.03%	6.65%	1.16%	84.71%	4.20%

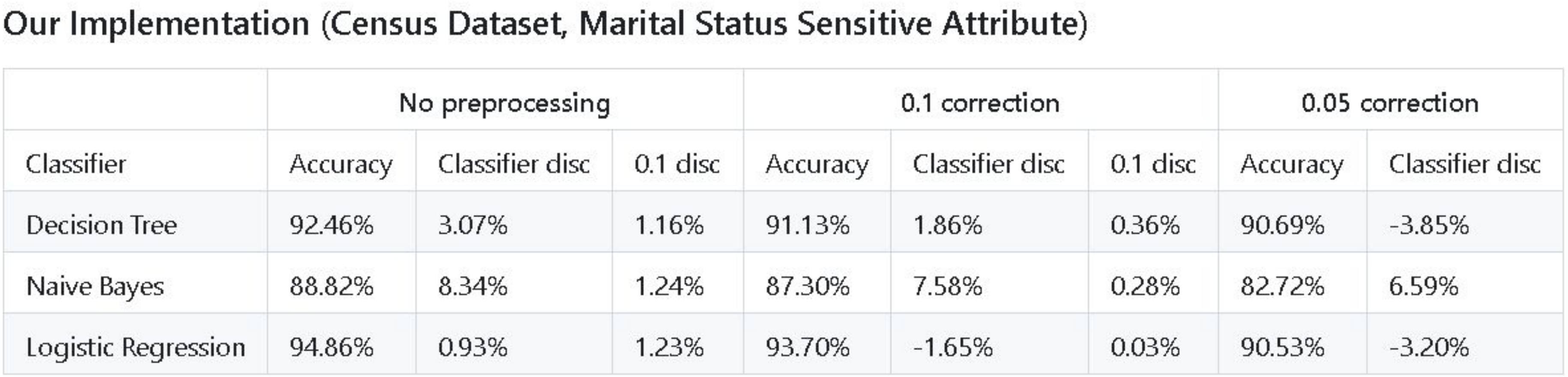
Results



Our Implementation (Census Dataset, Race Sensitive Attribute)

	No preprocessing			0.1 correction			0.05 correction	
Classifier	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc
Decision Tree	92.53%	4.06%	1.06%	91.70%	1.72%	0.32%	90.07%	-1.07%
Naive Bayes	88.82%	11.71%	1.41%	87.90%	9.46%	0.86%	83.44%	7.56%
Logistic Regression	94.86%	2.08%	1.04%	93.46%	-1.79%	0.79%	93.44%	-9.62%

Results



Our Implementation (Census Dataset, Marital Status Sensitive Attribute)

	No preprocessing			0.1 correction			0.05 correction	
Classifier	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc	0.1 disc	Accuracy	Classifier disc
Decision Tree	92.46%	3.07%	1.16%	91.13%	1.86%	0.36%	90.69%	-3.85%
Naive Bayes	88.82%	8.34%	1.24%	87.30%	7.58%	0.28%	82.72%	6.59%
Logistic Regression	94.86%	0.93%	1.23%	93.70%	-1.65%	0.03%	90.53%	-3.20%