

Predicting Employment Opportunities for Disabled Individuals in the United States

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Background

According to the U.S. Bureau of Labor Statistics only 40% of the working-age disabled individuals are employed. Vocational Rehabilitation (VR) services such as the Texas Workforce Commission aims to provide support, skills, and opportunities for those with disabilities.

This report focuses on creating a predictive model and identifying the factors that influence the employment of disabled individuals in the United States. By comparing federal data on state-level employment outcomes, this project aims to highlight the relative shortcomings of Texas VR services and explore how addressing these gaps could improve employment opportunities for disabled individuals. This research is critical to understanding and dismantling the barriers to workforce participation for this demographic, a step essential for fostering inclusivity and equity in society. Ultimately, this report is intended inspire policy changes that not only enhance rehabilitation services but also benefit the workforce and society by enabling greater participation and productivity.

Methodology

1) Data Preparation & Metadata

Used the [Current Population Survey Disability Supplement](#) (2019) from the **CensusAPI** to get data about employment opportunities and barriers to employment for disabled individuals. Identified 29 relevant input variables out of the 400 in the original dataset by creating a DAG to represent the relationship between variables. Clearly defined input and output variables for the model in a Data Dictionary. Removed all records that were not in the universe of the labor force employment status and categorized the output variable into binary options.

2) Analysis

Logistic Regression

Trained a logistic regression model using an 80/20 train-test split. The model achieved macro average of 91% precision, 92% recall, and 92% f1-score.

Decision Tree

Preliminary decision tree achieved 95% accuracy. Utilized **cross complexity pruning** to find the optimal value for alpha. Utilized **cross validation** to ensure alpha is not sensitive to a particular dataset. Pruned tree achieved macro average of 95% precision, 91% recall, and 93% f1-score.

Random Forrest

Utilized **entropy** as criterion to evaluate quality of splits when building random decision trees. Random Forrest achieved macro average of 96% precision, 91% recall and 93% f1-score.

Neural Network

Trained a multilayer perceptron (1 hidden layer, and ReLU activation) on 1000 epochs. Utilizes Cross-Entropy loss and the Adam Optimizer. Model achieved macro average of 98% precision, 90% recall, and 93% f1-score.

Results

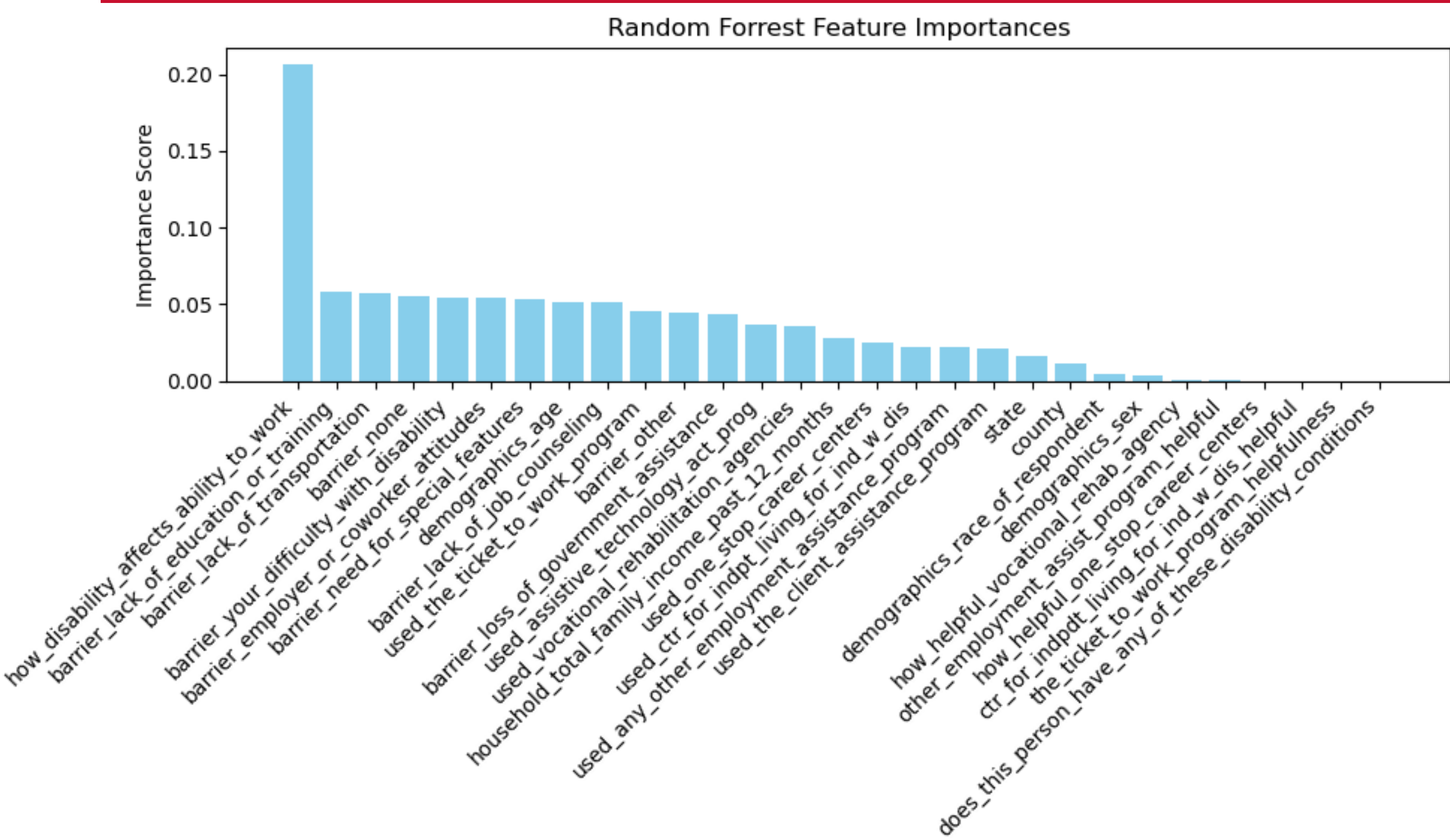


Figure 1. Feature importances (average reduction of entropy) in a Random Forrest Model

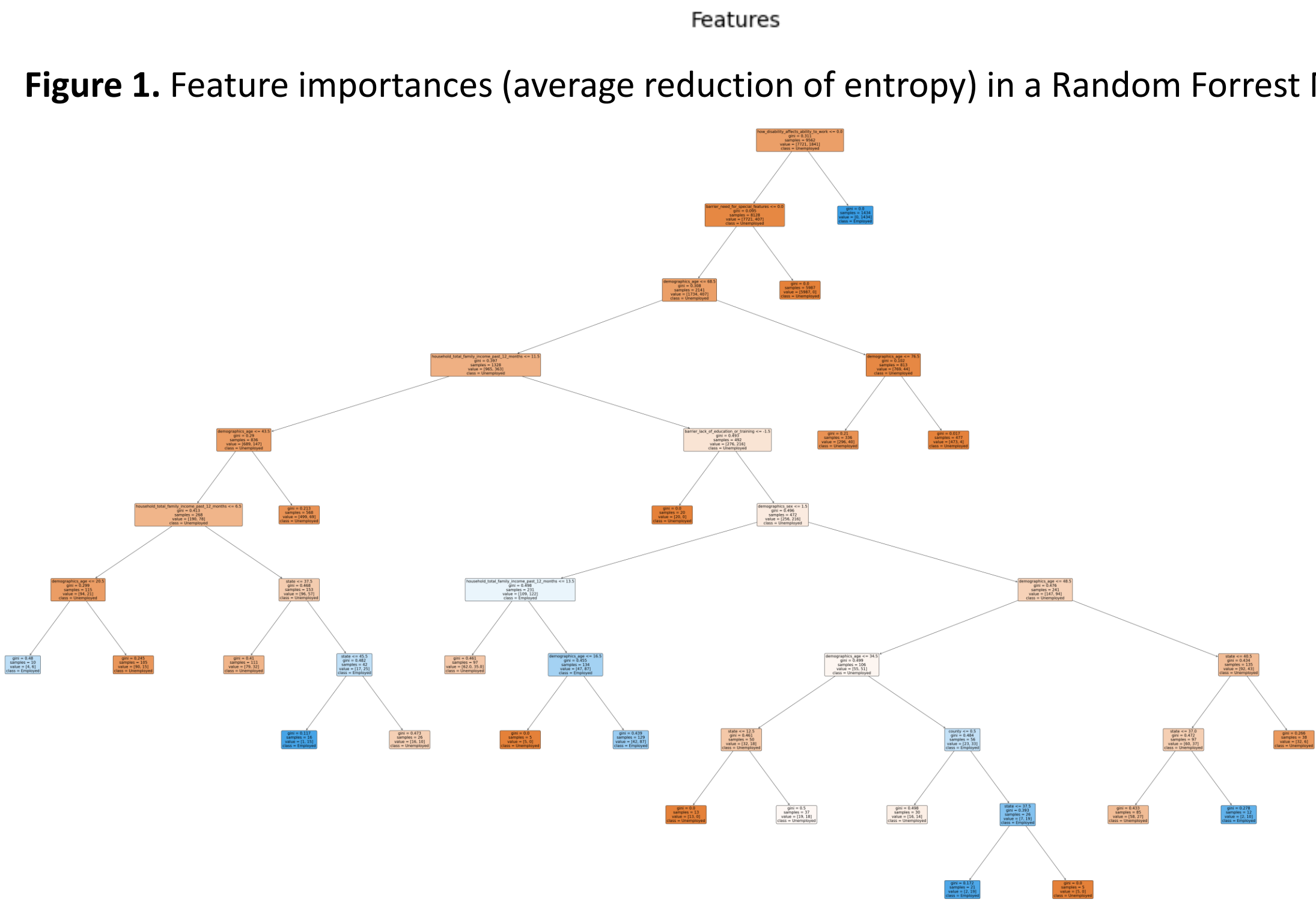


Figure 2. Pruned Decision Tree Predicting Employment Likelihood (Orange=0, Blue=1)

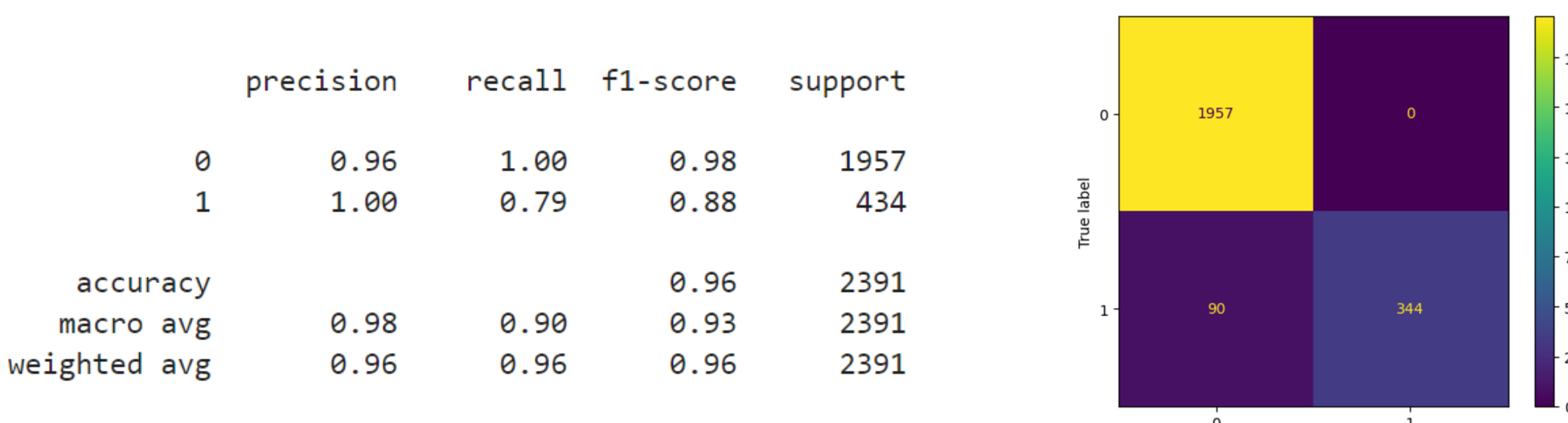


Figure 3. Classification Report and Confusion Matrix for Neural Network

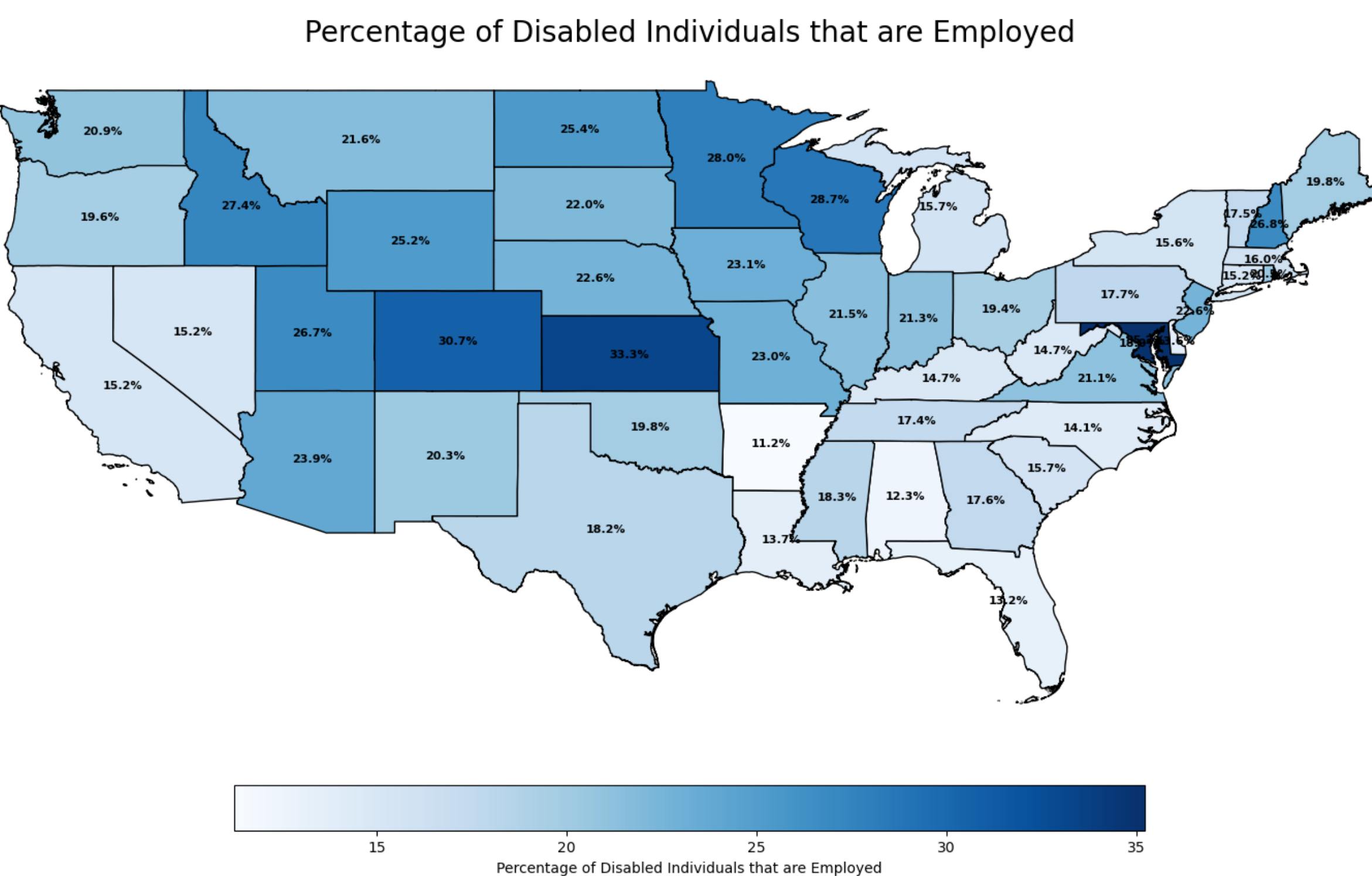


Figure 4. Percentage of Disabled Working-Age Individuals that are Employed

Conclusions

- Current VR services have struggled to effectively assist disabled working-age individuals in securing stable employment due to inconsistent service delivery across states, a lack of resources, and a limited focus on long-term career development. While some programs offer job training and placement support, they often fail to address the diverse needs of individuals with disabilities, such as specialized accommodations or long-term career counseling.
- Demonstrated by Figure 1 and 2, some of the most significant factors that influence the employment of disabled individuals are the severity at which an individual's disability affects their ability to work, barriers due to lack of education or training, barriers due to lack of transportation and barriers due to the need for special accommodations or workplace features.
- Demonstrated by Figure 1 and 2, the use of vocational rehabilitation services is not a significant factor the affected the employment of the disabled individuals in the dataset.
- Demonstrated by Figure 4, Texas falls behind on enabling working age disabled individuals to find employment opportunities in comparison to states in the Midwest.

Product

[Interactive notebook](#) that contains the four models studied in this report:



Future Directions

- Utilize long term longitudinal studies, such as National Longitudinal Transition Study (NLTS), to closely research the effectiveness of VR services in youth transition for individuals with disabilities.
- Train the model in figure 3 with more data to reduce the class imbalance of individuals who are unemployed vs employed.
- Create an interactive website to compare disability statistics between states and utilize the model in figure 3 to predict employment for disabled individuals in various locations and backgrounds. Ultimately hope to inspire change to policy to improve VR services in Texas.

Acknowledgments

Ioannis Konstantinidis, Minh Nguyen, Sydney Lozado, Shanice Desvignes, Aroluwa Adejuwon