

# Machine Learning and Data Analysis to Improve Vocational Rehabilitation Placement

Cordelia Van der Veer, Advised by Dr. Joshua Hawley  
John Glenn College of Public Affairs, Ohio Education Research Center Public Sector Data Science Internship

## Overview of Apprenticeships

According to the Department of Labor, "Apprenticeship is an industry-driven, high-quality career pathway where employers can develop and prepare their future workforce, and individuals can obtain paid work experience, classroom instruction, and a portable, nationally-recognized credential." You must have a high school diploma or equivalency to participate.

As of 2023, Ohio has the third largest number of active apprentices after Texas and California.

## Opportunities for Ohioans with Disabilities

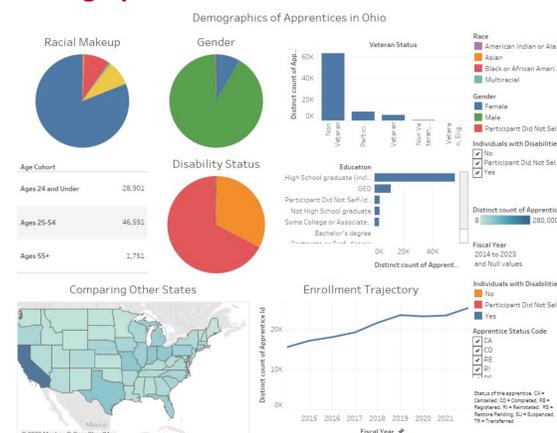
Opportunities for Ohioans with Disabilities (OOD) is a state agency that provides individuals with disabilities assistance in finding accessible jobs through the federally-funded Vocational Rehabilitation (VR) program.

Currently, there are no OOD VR participants who are active in apprenticeship programs. OOD wants to understand the current state of apprenticeship opportunities and learn if any of their participants have a job goal (IPE) aligned with apprenticeships in their area.

## Research Questions

- What are the demographics of apprentices in Ohio?
- What apprenticeship occupations and programs are available in each OOD region/county?
- Are there any VR participants who have an Individualized Plan for Employment (IPE) (job goal) aligned with an apprenticeship program(s)?
- What are the trends in geography and industry of apprentices' occupations?

## Tableau Dashboard of Apprentice Demographics in Ohio



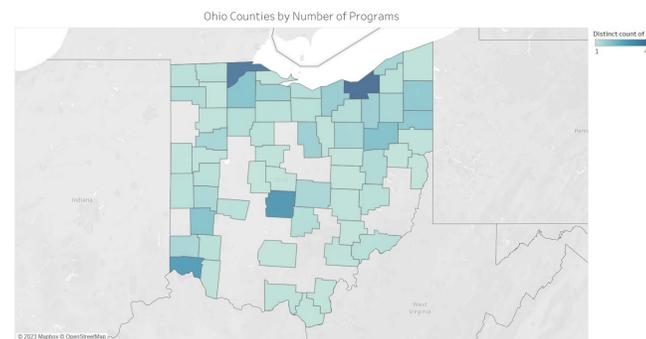
## Data and Methods

I used public data from apprenticeship.gov, which is provided by the Department of Labor. Since I was a state employee, I also had access to the OOD VR data. I primarily used Excel and Python for data preprocessing and Tableau for visualizations. For the machine learning component, I exclusively used Python.

## Understanding Available Apprenticeships

In the context of placing OOD participants, apprenticeship programs have two key qualities: location and occupation. I filtered to only include Ohio and displayed visualized the public apprenticeship data in Tableau.

## Ohio Counties by Number of Apprenticeship Programs



This chart shows Ohio counties with apprenticeship programs. The darker the county, the more apprenticeship programs.

## Most Common Occupations with Apprenticeship Programs

### Top 10 Occupations by Number of Programs

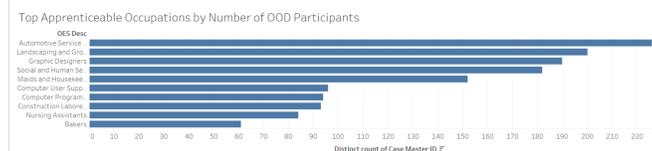
Occupation	Programs	Apprentices
DIE MANUFACTURER	66	257
PRODUCTION MACHINE..	54	298
ELECTRICIAN (Alternate ..	44	4,682
MAINT MECHANIC (Any I..	41	206
PLUMBER	27	988
MACHINIST (Alternate T..	23	126
SPRINKLER FITTER (Exis..	21	1,178
HEATING & AIR CONDITI..	19	377
MARINE MACHINERY M..	18	59
INDUSTRIAL MAINTENA..	17	60

This chart shows Ohio counties with apprenticeship programs. The darker the county, the more apprenticeship programs.

## Finding Potential Matches

To find potential OOD VR participants with apprenticeable IPEs, I added both the OOD data and the apprentice data into Tableau. I filtered the OOD data to only include participants whose IPE matched an apprenticeship occupation. There are 2,455 matches.

## Most Common VR Occupations with Apprenticeship Programs



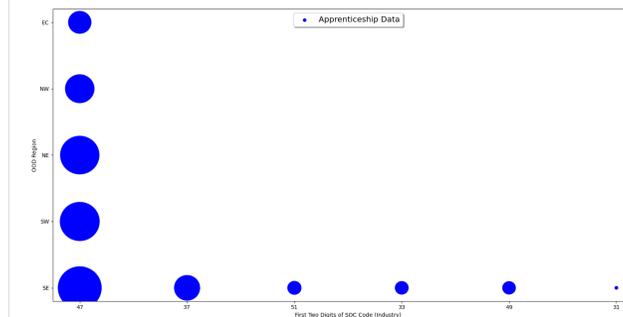
District count of Case Master ID for each OES Desc. The data is filtered on Case Status, SOC Code Edit and Index. The Case Status filter keeps Employed and Service. The SOC Code Edit filter keeps 86 members. The Index filter ranges from 1 to 10.

This shows the top apprenticeship occupations by number of VR participants who have the occupation as their IPE. In the future, these could be the occupations with the most VR participants in apprenticeships

## Machine Learning and Data Prep

To preprocess the data, I assigned an OOD region (a group of counties OOD uses to segment Ohio) to each apprenticeship program and took the first two digits of the SOC code (represents the industry). I then utilized Kmodes categorical cluster analysis to show the top ten combinations of OOD region and industry. This shows the top areas for apprenticeship opportunity.

## Cluster Analysis of Apprenticeship Region and Industry



47 = Construction and Extraction Occupations, 37 = Building and Grounds Cleaning and Maintenance Occupations, 51 = Production Occupations, 33 = Protective Service Occupations, 49 = Installation, Maintenance, and Repair Occupations, 31 = Healthcare Support Occupations

## Opportunities for Further Research

- Improve cluster analysis with additional variables
- Investigate pre-apprenticeship programs as option for OOD participants to test out apprenticeships
- How have other states integrated apprenticeship programs into vocational rehabilitation?
- Contact target apprenticeship programs and ask about accommodations for individuals with disabilities
- Interview potential matched OOD participants about their perspectives on apprenticeships

## Conclusion

- Majority of apprentices in Ohio were white, male, 25-54, did not identify as disabled, had a GED, and were non-veterans
- Automotive services, landscaping and groundskeeping, and graphic design are the most common occupations with apprenticeship programs and potential VR participants
- 2,455 current OOD VR participants have an IPE aligned with an apprenticeable occupation
- Based on cluster analysis, "hotspots" for apprenticeship programs in construction in each region, other industries in Southeast region

## Acknowledgement

Thank you to Dr. Joshua Hawley, Evelyn Arrey, Ceanna Burnheimer, and the other core members at the Ohio Education Research Center for your unwavering support. I also want to acknowledge my supervisor at OOD, Charuta Kelkar, who provided her expertise of the VR program.

## Contact

Feel free to reach out to me with questions:  
vanderveer.10@buckeyemail.osu.edu

**Ohio** Opportunities for Ohioans with Disabilities