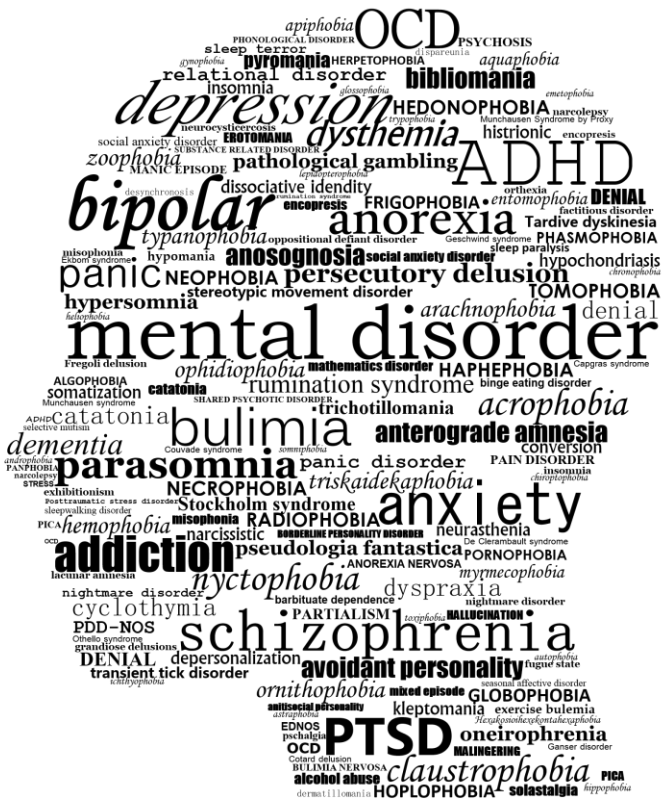
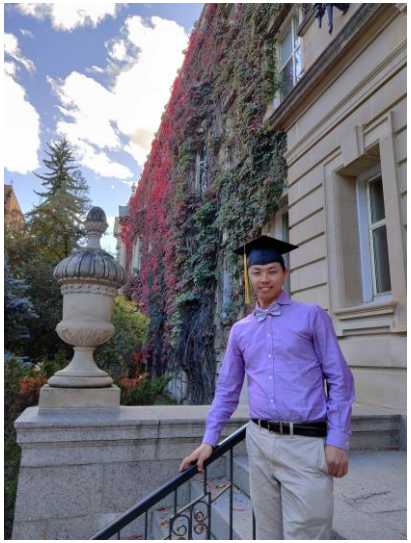



# How to Improve the Mental Health of Employees in Technology Companies

**Jia(Jiaqiang) Yi**

# About me

## Academic

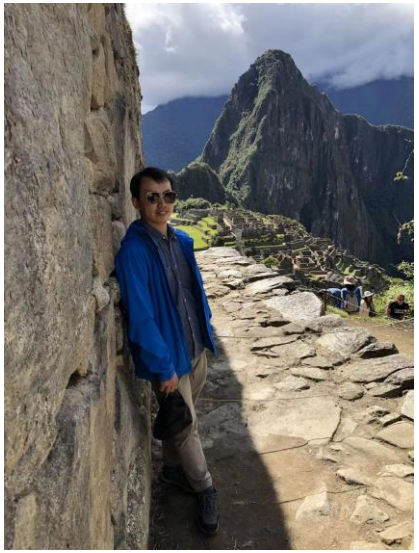


**STEM**

## Professional

**Data Science**

## Personal



**World traveler**

# Content

# 1. **Business Problem Overview**

## Background


A billion people **14%** of the world's population

Mental disorder

**After covid-19**

anxiety and depressive disorders ↑ 25%

https://www.who.int/campaigns/world-mental-health-day/2022
https://www.who.int/news/item/17-06-2022-who-highlights-urgent-need-to-transform-mental-health-and-mental-health-care

# 1. Business Problem Overview

## Background

**The market is attractive:**

- **Global market size: US$ 527.44 billion by 2030**
- **Tech companies are willing to invest in EDI (Equity, diversity, and inclusion)**
- **People in Tech can afford the mental health care**

**Market status:**

- **This is an emerging industry**
- **Blue Ocean**

# 1. **Business Problem Overview**

## Executive summary

**Problem:**

**How to improve the mental health status of different segmentations of the population**

# 2. **Dataset Overview**

**Data Source:**

kaggle

**Name: Mental Health in Tech Survey(2014)**

**Shape: (1259, 27)**

## Columns & Questions

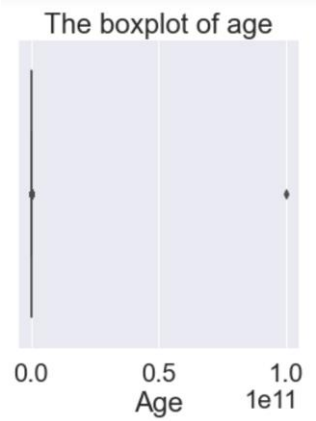
0. **Timestamp**
1. **Age**
2. **Gender**
3. **Country**
4. **state**: If you live in the United States, which state or territory do you live in?
5. **self_employed**: Are you self-employed?
6. **family_history**: Do you have a family history of mental illness?
7. **treatment**: Have you sought treatment for a mental health condition?
8. **work_interfere**: If you have a mental health condition, do you feel that it interferes with your work?
9. **no_employees**: How many employees does your company or organization have?
10. **remote_work**: Do you work remotely (outside of an office) at least 50% of the time?
11. **tech_company**: Is your employer primarily a tech company/organization?
12. **benefits**: Does your employer provide mental health benefits?
13. **care_options**: Do you know the options for mental health care your employer provides?
14. **wellness_program**: Has your employer ever discussed mental health as part of an employee wellness program?
15. **seek_help**: Does your employer provide resources to learn more about mental health issues and how to seek help?
16. **anonymity**: Is your anonymity protected if you choose to take advantage of mental health or substance abuse treatment resources?
17. **leave**: How easy is it for you to take medical leave for a mental health condition?
18. **mentalhealthconsequence**: Do you think that discussing a mental health issue with your employer would have negative consequences?
19. **physhealthconsequence**: Do you think that discussing a physical health issue with your employer would have negative consequences?
20. **coworkers**: Would you be willing to discuss a mental health issue with your coworkers?
21. **supervisor**: Would you be willing to discuss a mental health issue with your direct supervisor(s)?
22. **mentalhealthinterview**: Would you bring up a mental health issue with a potential employer in an interview?
23. **physhealthinterview**: Would you bring up a physical health issue with a potential employer in an interview?
24. **mentalvsphysical**: Do you feel that your employer takes mental health as seriously as physical health?
25. **obs_consequence**: Have you heard of or observed negative consequences for coworkers with mental health conditions in your workplace?
26. **comments**: Any additional notes or comments

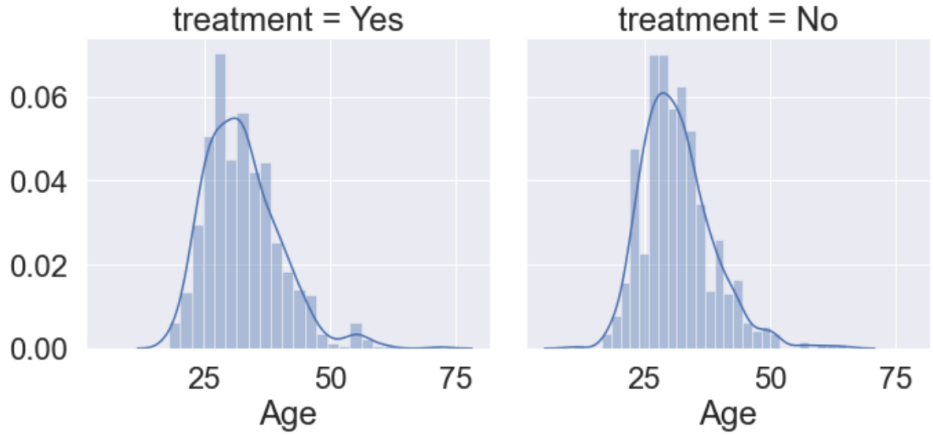
# 3. **Exploratory Data Analysis (EDA)**

**Data Cleaning**

**Without cleaning, the data will introduce noise in the model**

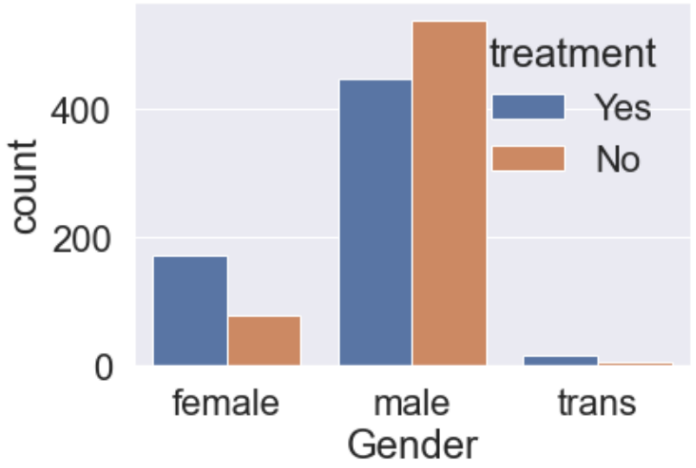
**Remove error**




**Cleaning categorical data**

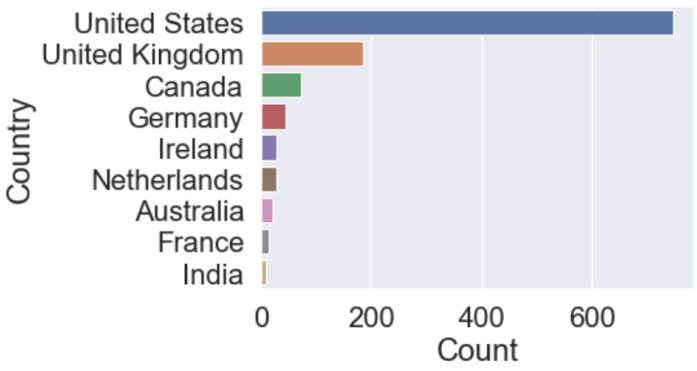
```
array(['female', 'm', 'male', 'male-ish', 'maile', 'trans-female',
       'cis female', 'f', 'something kinda male?', 'cis male', 'woman',
       'mal', 'male (cis)', 'queer/she/they', 'non-binary', 'femake',
       'make', 'nah', 'enby', 'fluid', 'genderqueer', 'female ',
       'androgyne', 'agender', 'cis-female/femme', 'guy (-ish) ^_^',
       'male leaning androgynous', 'male ', 'man', 'trans woman', 'msle',
       'neuter', 'female (trans)', 'queer', 'female (cis)', 'mail',
       'malr', 'femail', 'cis man',
       'ostensibly male, unsure what that really means'], dtype=object)
```

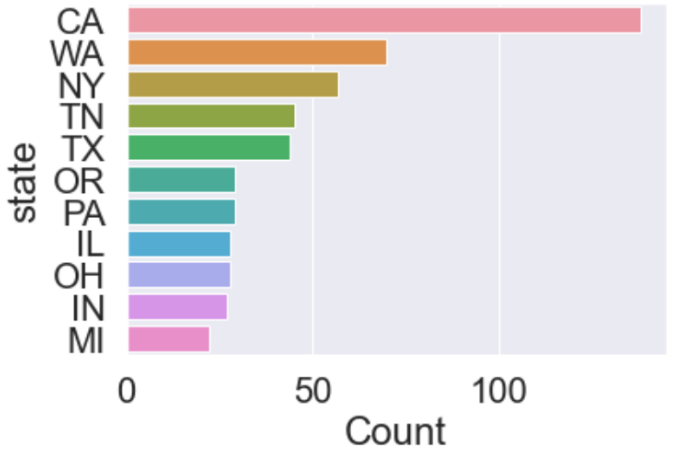


# 3. **Exploratory Data Analysis (EDA)**

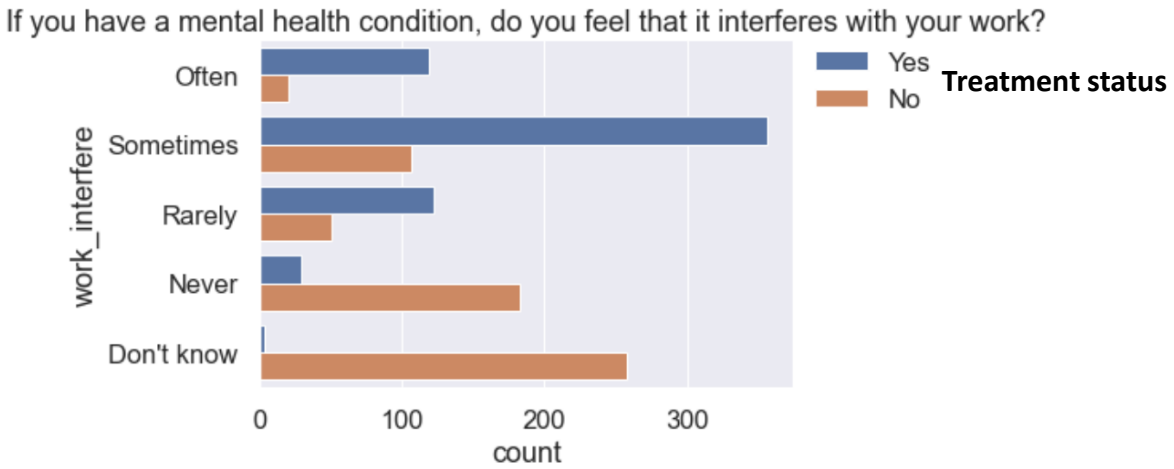
**Data Cleaning**

**Remove redundant features**



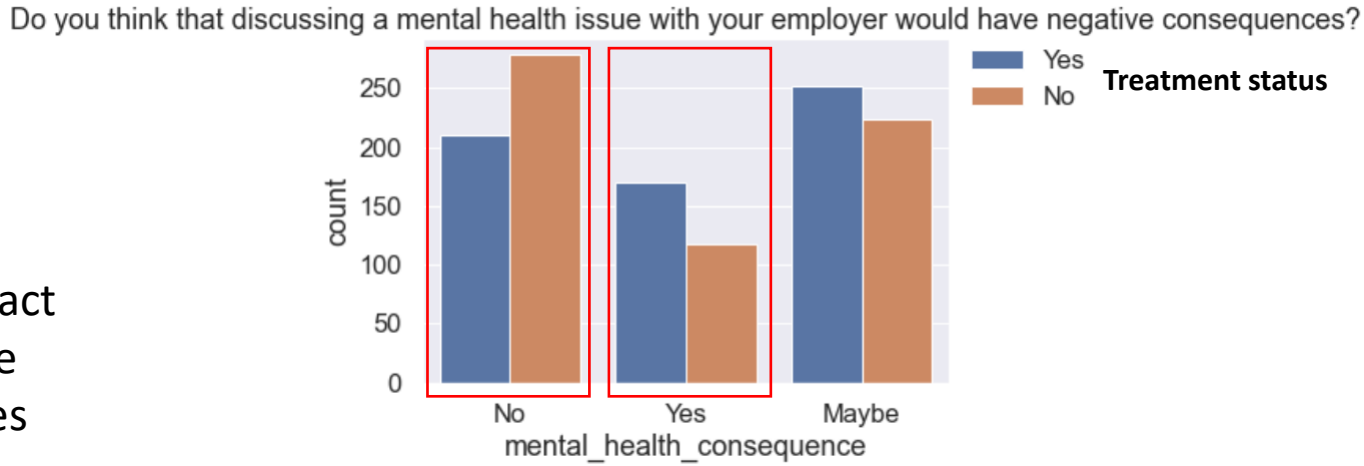

**Filling the hole**



# 3. **Exploratory Data Analysis (EDA)**

**Data visualization**

Mental health issues impact career development more than physical health issues



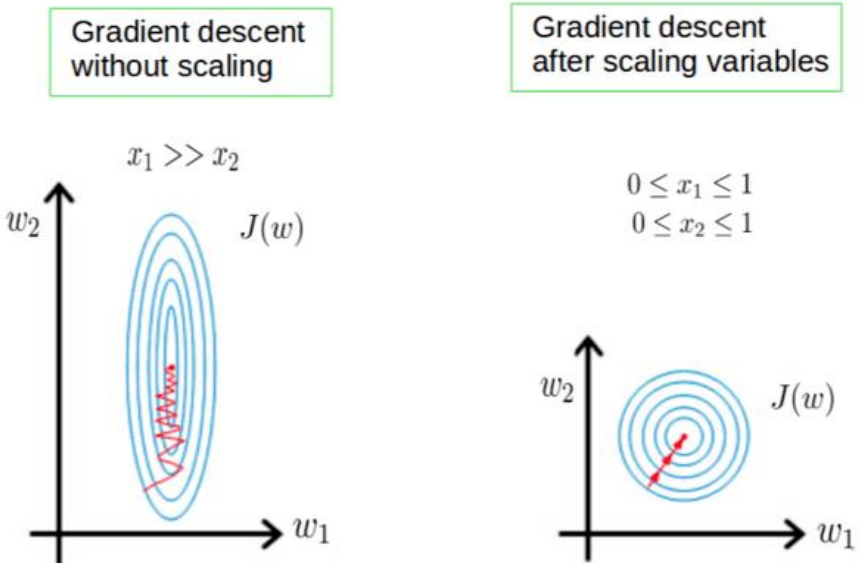

# 3. **Exploratory Data Analysis (EDA)**

## Feature engineering

- **Translate Categories to Numerical Variables**

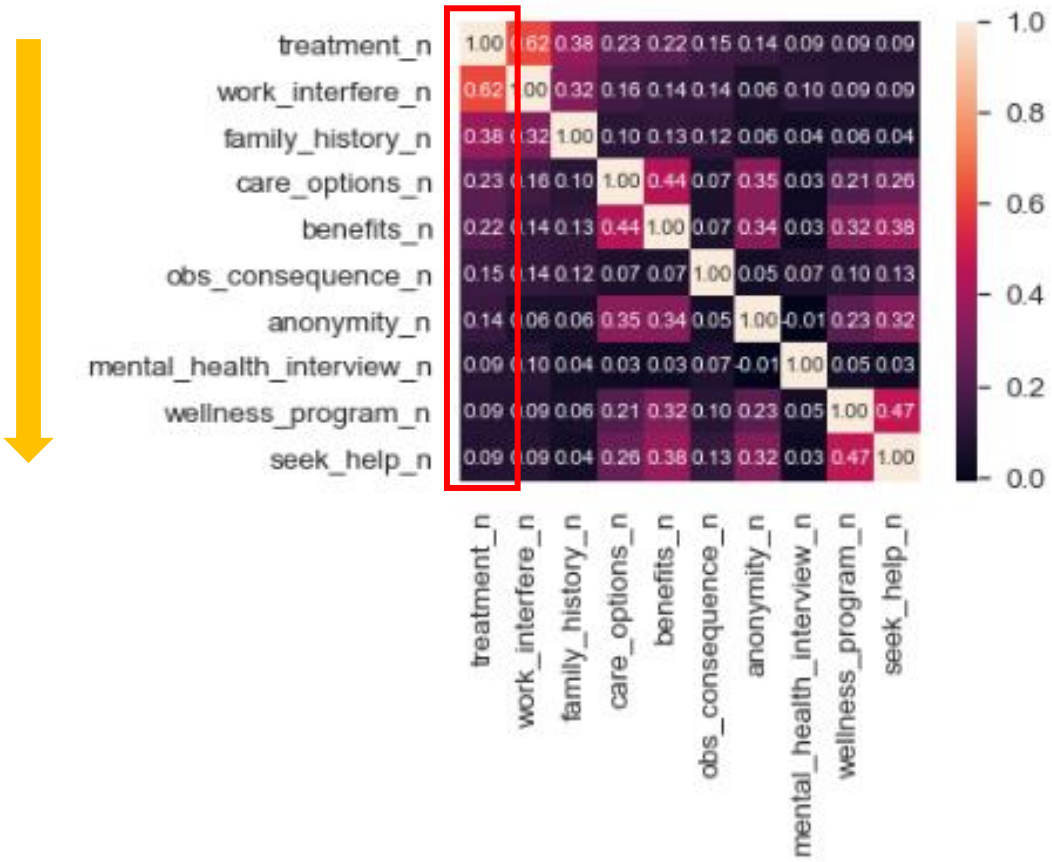
| Original Encoding | Ordinal Encoding |
|---|---|
| Poor | 1 |
| Good | 2 |
| Very Good | 3 |
| Excellent | 4 |

- **Scaling**



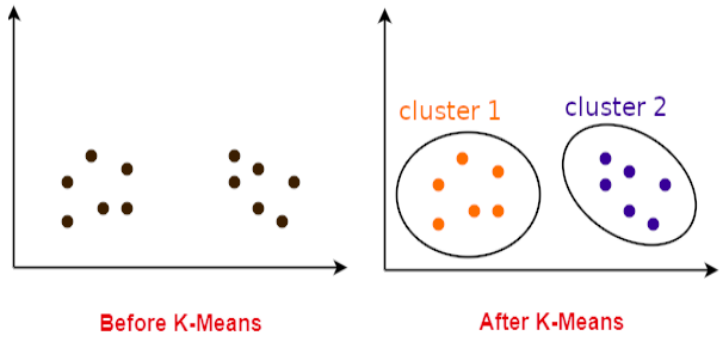
# 3. **Exploratory Data Analysis (EDA)**

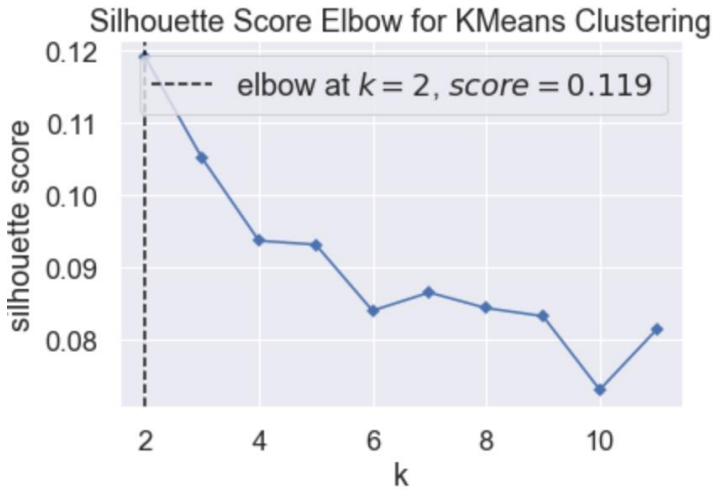
## Correlation matrix

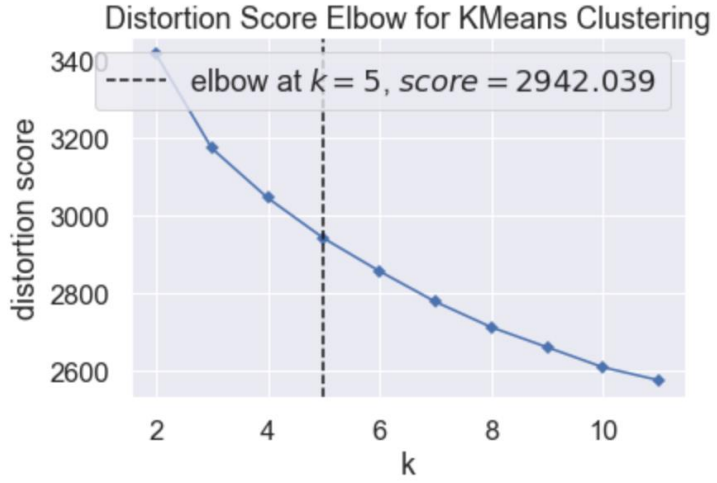


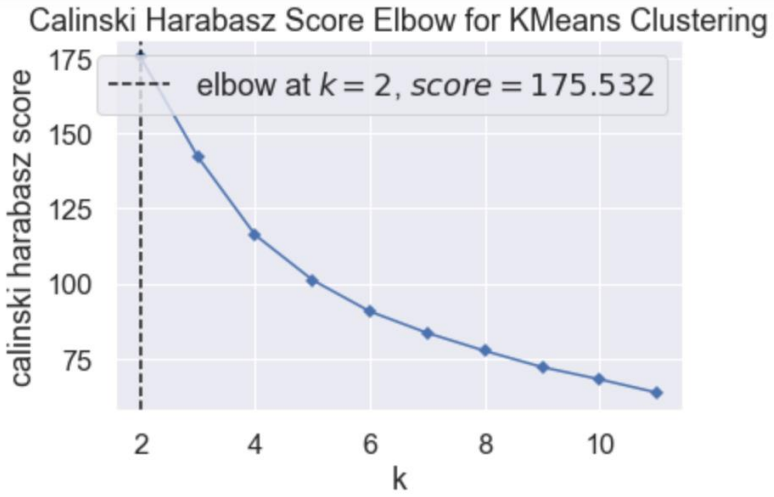
# 4. Clustering & Optimal Clusters

**K-Means clustering**



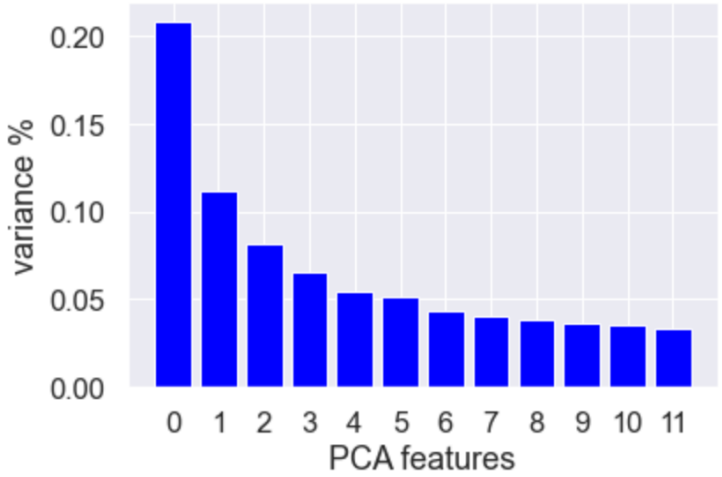



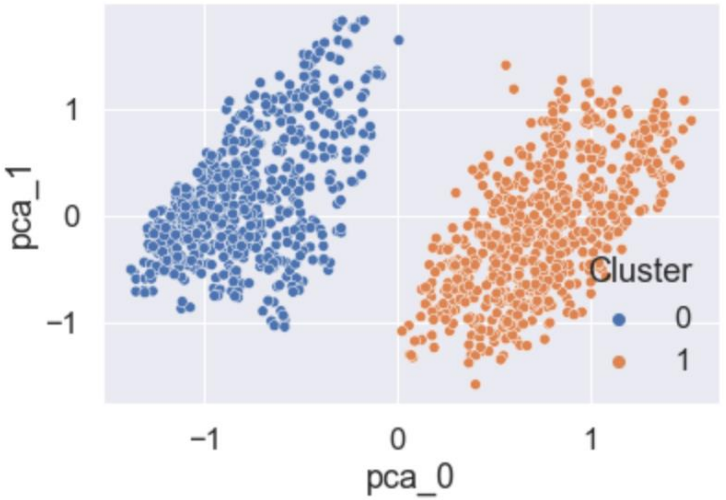



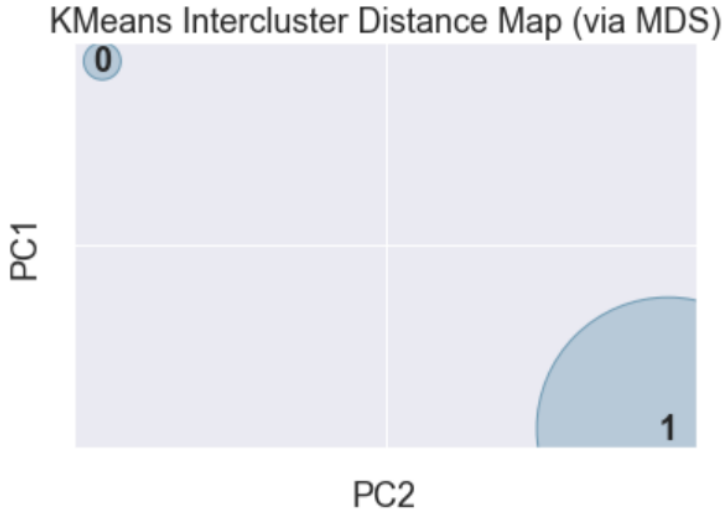



# 4. Clustering & Optimal Clusters

**Principal component analysis (PCA)**

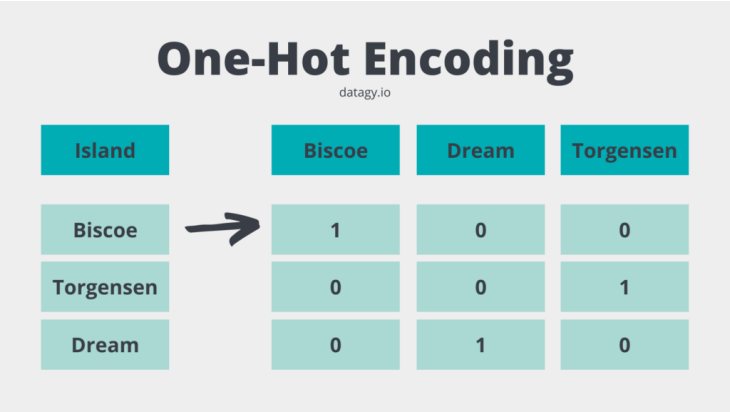


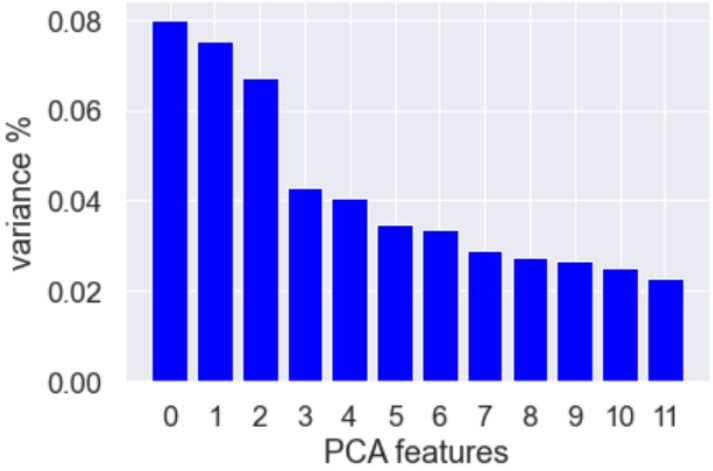



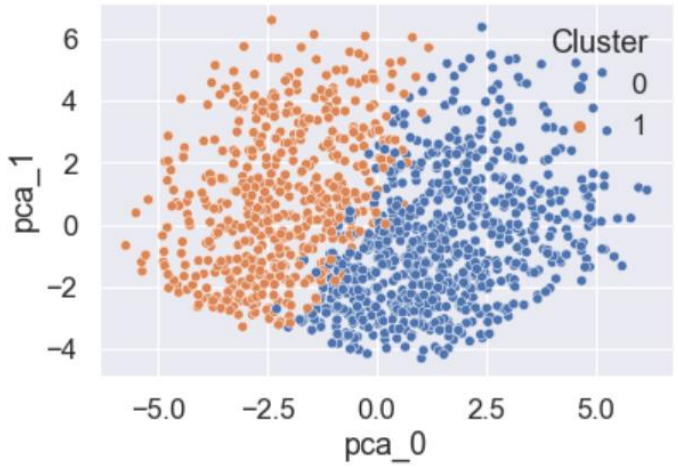
# 4. Clustering & Optimal Clusters

**K-Means clustering with one-hot encoding**



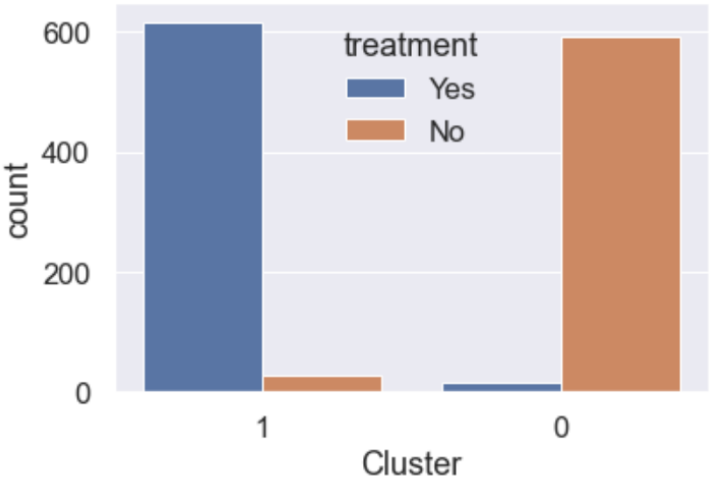





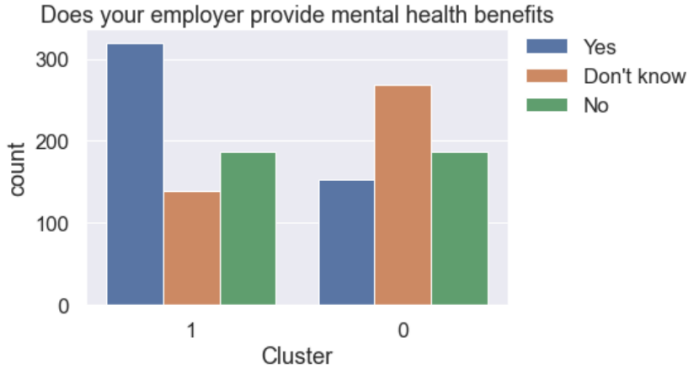


# 4. Clustering & Optimal Clusters

**Cluster interpretation: Cluster 1**





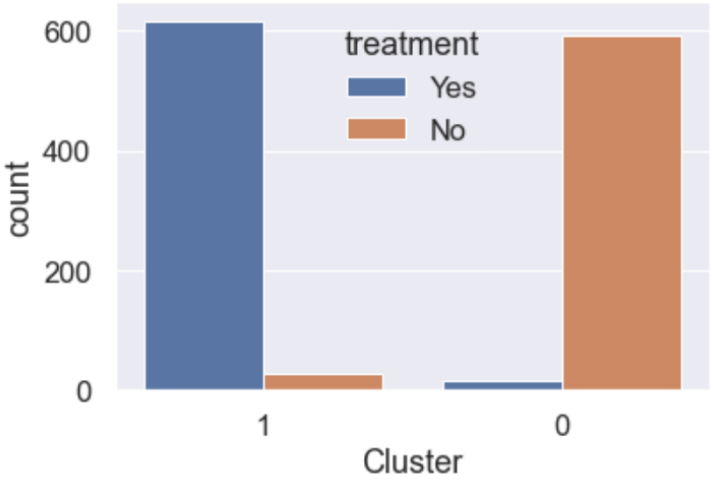



**Cluster 1: mostly the people who seek treatment**
**cluster 0: mostly the people who don't seek treatment**


**The support for them and their psychological behavior**

# 4. Clustering & Optimal Clusters

**Cluster interpretation Cluster 0**




**Cluster 1: mostly the people who seek treatment**
**cluster 0: mostly the people who don't seek treatment**

**The support for them and their psychological behavior**



# 5. Business Insights & Recommendation

**Business Insight**

**For people who have already sought mental health treatment, they don't think mental health is taken as seriously as the physical health.**

**Better health care plans and human support**

**For people who haven’t sought mental health treatment, they may feel the inclusion of mental health issues is not good enough**

**Workplan mental health education**

# 5. Business Insights & Recommendation

## Next step

**Data:**
**limitation:**
1. **Only 1200 data points**
2. **Limited features**
3. **Not a good representation of the demographics**

**Solution:**
1. **Additional feature (feeling, psychological behavior, mental health conditions)**
2. **Demographic dataset of people in Tech**

## Scale up

**Strategy:**
1. **From people in tech to general employee**
2. **From North America to global**

**Technology (if 100 times the dataset, computation efficiency):**
1. **Sampling**
2. **Parallel processing and modeling**
3. **CPU to GPU**
4. **Cloud-based deployment**

# Acknowledgement

**Thank you very much for your help and support!!!!**

**Elnaz Alipour, Brian Mahoney, Patryk Skowron, Niloofar Jalali, & Daniel Reilly**

**Chelsey Rodier & Honor Sargent**