



Carnegie Mellon University

# IFDA- Third Progress Report

---

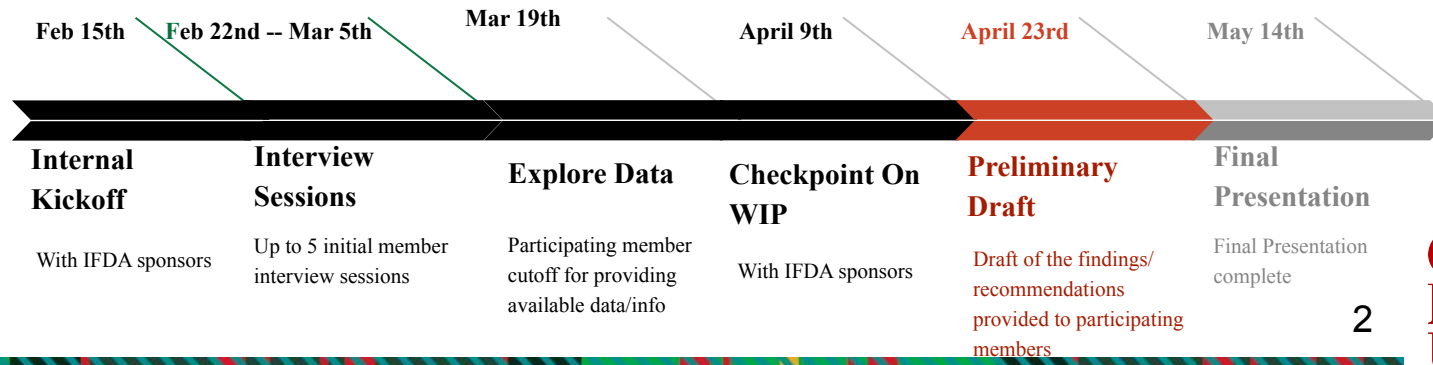
*Team: Malik Khan, Echo Luan, Lanyi Xu, Yanxi Zhou, Xiaofan Zhu  
4/12/2021*

*Client Point of Contact: Annika Stensson*

*Faculty Advisors: Jamie McGovern, Brian Junker*

# Introduction:

- IFDA members are facing challenges in recruiting warehouse and driver positions.
- **Objective:** Determine pain points and relevant information using internal and public data to strategize a recruitment and retention improvement plan for foodservice distributors.
  - Validate the hypothesis that competition for qualified candidates has been increasing, including from eCommerce companies
  - Propose a roadmap to attract more job applicants and improve retention
- Held semi-structured interviews with five IFDA-member companies to understand the varying perspectives on recruitment for warehouse and truck driver roles

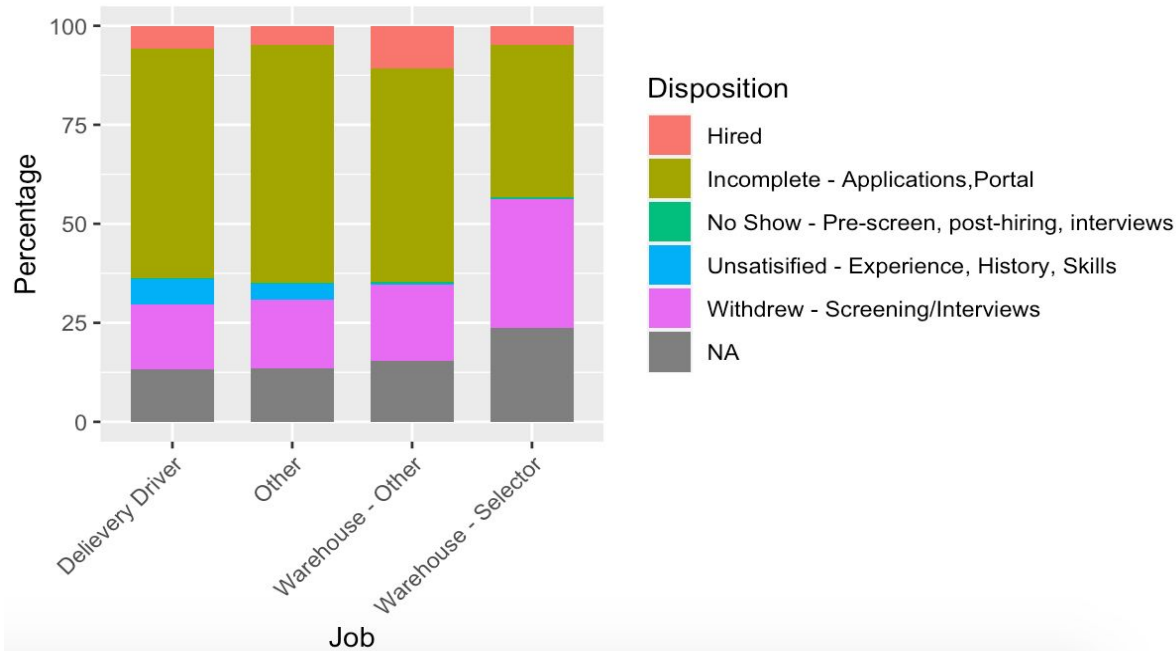


# Data:

- Bureau of Labor Statistics (BLS)
  - Sectors: Wholesale trade (Non-durable goods), Food & Beverage stores, Transportation & Warehousing
  - Data collected (from 2017 - 2019):
    - *Employment, Employment RSE, Hourly Wage, Annual Wage, Interquartile Ranges for Hourly & Annual Wage*
- Client Data (Currently all 5 clients)
  - Employee Data
  - Job Data
  - Applicant Data
  - Requisition Data
- Qualitative Data
  - Interviews with all five IFDA-member clients
  - Documents, benefits packages, incentive plans

	Employee Data?	Applicant Data?	Job Data?	Req Data?	Candidate Sourcing Data?
Client1	Y (All)	Y (7/20/2019 - 1/10/2020)	Y	Derived from the applicant data, not sure if there is just a set of ongoing open reqs	N
Client2	Y	Y (After 10/19/18)	N	Y	N
Client3	Y	N	Y- But Annual	N - need to see job description from the website	N
Client4	Y - Annual	N	N	N	N
Client5	Y - only some turnover data	N	Y	Y	N

# Data:



- Majority of applicants leave application incomplete
- No sourcing data provided by clients, hard to address incomplete applications (Roadmap)

# Data:

- Merged Applicant Data ( combined 2 companies data):

Position	Merged Position	Date.Applied	Disposition	Merged Disposition
Selector, Module	Warehouse - Selector	2018-11-01	PS Sched. - W/D Prior to PSMore Qualified Candidate Selected (E	Withdraw - Screening/Interviews
Driver, Chain Delivery	Delievery Driver	2018-11-01	TA Review - Not Selected (EM)More Qualified Candidate Selecte	Incomplete - Applications,Portal
Driver, Take Along - CDL	Delievery Driver	2018-11-01	PS Sched. - W/D Prior to PSFuture Candidate - PS*	Withdraw - Screening/Interviews
Driver, Take Along - CDL	Delievery Driver	2018-11-01	Incomplete	Incomplete - Applications,Portal
Warehouse Selector	Warehouse - Selector	2018-11-01	TA Review - Not Selected (EM)More Qualified Candidate Selecte	Incomplete - Applications,Portal
Warehouse Selector	Warehouse - Selector	2018-11-01	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Passive	Withdraw - Screening/Interviews
Warehouse Selector	Warehouse - Selector	2018-11-01	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Passive	Withdraw - Screening/Interviews
2nd Shift Selector/Packer	Warehouse - Selector	2018-11-01	TA Review - Not Selected (EM)More Qualified Candidate Selecte	Incomplete - Applications,Portal
2nd Shift Selector/Packer	Warehouse - Selector	2018-11-01	Self-Withdrew (Portal)Incomplete Profile/Application*	Incomplete - Applications,Portal
Warehouse Receiving Superviso Other		2018-11-01	Self-Withdrew (Portal)	Incomplete - Applications,Portal

- Different companies use different values for Position and Disposition
- Over 300 unique job positions to group and normalize
- Merged over 50,000 observations

# Data:

- Merged Employee Data (combined 3 companies data):

Job.Title	Department.Name	Date.of.Hire	Term.Date	Hourly.Rate	Race.Code	Gender	Full.Part.Time	Shift
Selector, Module	Warehouse - Shipping	4/29/2019	7/14/2019	18	W	F	F	N
Selector, Module	Warehouse - Shipping	4/22/2019	6/11/2019	18	W	M	F	N
Selector, Module	Warehouse - Shipping	6/3/2019	#N/A	20	W	M	F	N
Selector, Module	Warehouse - Shipping	6/3/2019	12/16/2019	16.35	B	M	P	N
Selector, Module	Warehouse - Shipping	6/10/2019	#N/A	19	W	M	F	N
Selector, Module	Warehouse - Shipping	6/24/2019	#N/A	17.3	W	M	P	N
Selector, Module	Warehouse - Shipping	7/1/2019	#N/A	18.55	A	M	F	N
Selector, Module	Warehouse - Shipping	6/17/2019	9/15/2019	18	W	M	F	N
Forklift	Warehouse - Shipping	6/10/2019	9/25/2019	12	W	M	P	N
Selector, Module	Warehouse - Shipping	6/24/2019	1/27/2020	19.45	W	M	F	N

Is.Rehire	Tenure.to.Today	Tenure.Range	Termed?	Tenure.to.Termed.Date.Range
#N/A	#N/A	#N/A	Yes - Termed	c. 90-119 Days
#N/A	#N/A	#N/A	Yes - Termed	a. <45 Days
#N/A	#N/A	#N/A	Yes - Termed	a. <45 Days
#N/A	#N/A	#N/A	Yes - Termed	b. 45-89 Days
#N/A	#N/A	#N/A	Yes - Termed	b. 45-89 Days
#N/A	644	d. 120+ Days	No	#N/A
#N/A	#N/A	#N/A	Yes - Termed	d. 120+ Days
#N/A	637	d. 120+ Days	No	#N/A
#N/A	623	d. 120+ Days	No	#N/A

- Filter out the relevant variables each of those companies track
- Tenure.to.Today: Days("2021/03/08", Hire.date)
- Tenure.to.Termed.Date.Range: Days(Term.date, Hire.date)
  - 4 levels

# Methods:

- **Compare public data with client data from five client companies**
  - Turnover rate, Hire rate
- **Merge client data based on variable mappings**
  - Job title: CDL & non-CDL delivery driver, warehouse selector, other warehouse workers, other workers
  - Application disposition: Withdrew - Screening/Interviews; Unsatisfied - Experience, History, Skills; No Show - Pre-screen, post-hiring, interviews; Incomplete - Applications, Portal; Hired
- **Conduct statistical analysis on individual client data and merged dataset**
  - Predict employee tenure with multiple regression models and decision tree
  - Predict candidate hiring and withdrawal with logistic regression and tree models
- **Provide needs assessment and roadmap**
  - Identify important variables for recruitment analytics and give recommendations on data tracking and the granularity of data
  - Propose data analysis methods for variables we suggest tracking

# Methods -- Variable Mapping Example (Job)

Merged Variable: Job	Value to Map to:	Client1 Values to Map - Job	Client2 Values to Map - Job
	Delivery Driver	CDL Van Driver	**Class A Driver Trainer - Sacramento**
		Chain Delivery Driver ( 2 of 2 )	**Class A Truck Drivers Needed - Reno**
		Chain Delivery Driver ( 2 of 3 )	**Class A Truck Drivers Needed - Simi Valley**
		Chain Delivery Driver (1 of 3 )	**Express Delivery Driver - Sacramento**
		Chain Delivery Driver (2 of 2)	**Route Delivery / Truck Driver - Class A - Sacramento**
		Chain Delivery Driver (2 of 3)	**Route Delivery Driver - Class A - LA County**
		Chain Delivery Driver (2 of 4)	**Route Delivery Driver - Class A - Benicia**
		Chain Delivery Driver (3 of 4)	**Route Delivery Driver - Class A - Fresno **
		Chain Delivery Driver (4 of 4)	**Route Delivery Driver - Class A - Gilroy**
		Chain Delivery Driver 1 of 2	**Route Delivery Driver - Class A - Ontario**
		Chain Delivery Driver 1/3	**Route Delivery Driver - Class A - Reno **
		Chain Delivery Driver 2 of 2	**Route Delivery Driver - Class A - Reno**
		Chain Delivery Driver 2/3	**Route Delivery Driver - Class A - Sacramento**
		Chain Delivery Driver 3/3	**Route Delivery Driver - Class A - Simi Valley**
		Driver Take Along CDL	**Route Delivery Driver / Truck Driver - Class A - Sacramento**
		Driver, Chain Delivery	**Route Driver Trainee - Class A Permit - Benicia**
		Driver, Chain Delivery (1 out 2)	**Shuttle Driver - Class A Driver w/doubles - Benicia**
		Driver, Chain Delivery (2 out 2)	**Shuttle Driver - Class A Driver w/doubles - Norwalk**
		Driver, Chain Delivery (2 out of 3)	**Shuttle Driver - Class A Driver w/doubles - Reno**
		Driver, Chain Delivery (OLD Req FWD Process)	**Shuttle Driver - Simi Valley**
		Driver, Chain Delivery 1 of 3	**Shuttle Drivers - Gilroy**
		Driver, Chain Delivery 1 of 6	*Route Delivery Driver - Class A - LA County**
		Driver, Chain Delivery 2 of 3	**Yard Assistant - Hostler - Class A Driver - Ontario**
		Driver, Chain Delivery 2 of 6	



# Methods -- Variable Mapping Example (Disposition)

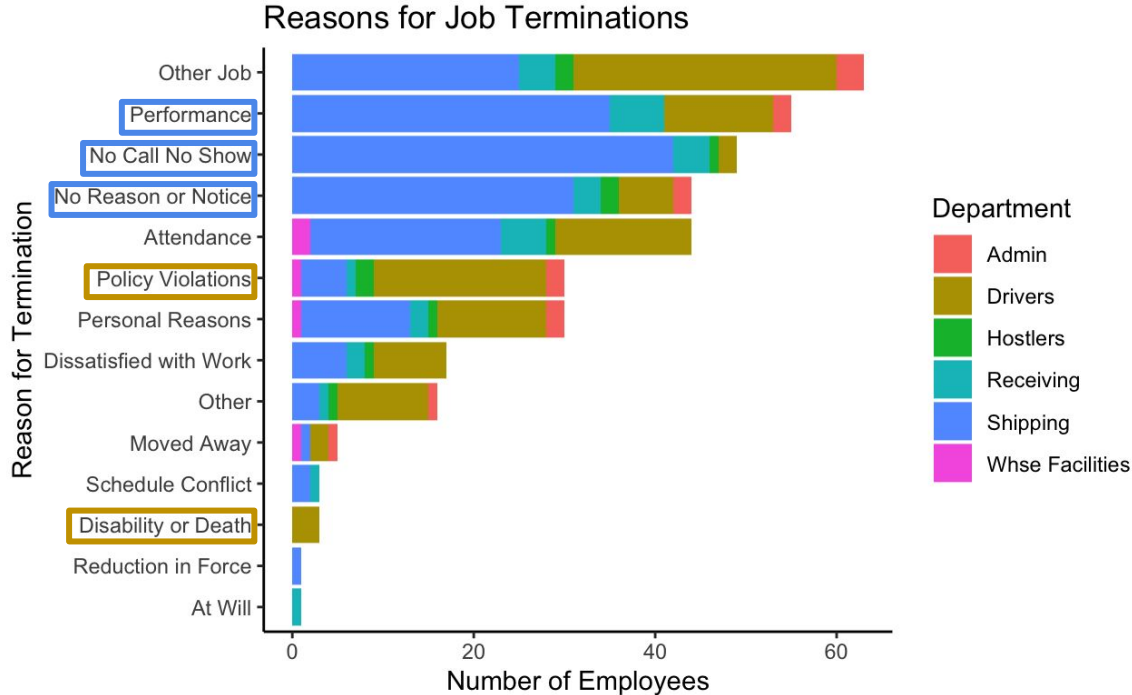
Merge Values:	Client1-StatusSubjectConcat	Client2 Values to Map
Withdraw - Screening/Interviews	Team Int. Sched. - W/D Prior to Int	Background Post- Offer - Withdraw Other Job Offer
	Team Int. Sched. - W/D Prior to IntUnsatisfactory MVR*	Background Pre-Offer - Withdraw Other Job Offer
	Team Int. Sched. - W/D Prior to IntQualified - No Remaining Openings	Initial Review-Withdraw-Hours
	Team Int. Sched. - W/D Prior to IntNot Eligible for Rehire*	Initial Review-Withdraw-Other Job Offer
	Team Int. Sched. - W/D Prior to IntMore Qualified Candidate Selected (Internals and other Personal Noti	Initial Review-Withdraw-Salary
	Team Int. Sched. - W/D Prior to IntMore Qualified Candidate Selected (External)*	Interview-Reject-Hours
	Team Int. Sched. - W/D Prior to IntMore Qualified Candidate Selected	Interview-Reject-Not Interested in Job
	Team Int. Sched. - W/D Prior to IntMisrepresented Application Information*	Interview-Reject-Other Job Offer
	Team Int. Sched. - W/D Prior to IntFuture Candidate - PS*	Interview-Reject-Salary
	Team Int. Sched. - W/D Prior to IntFuture Candidate - 1st Int*	Phone Screen-Reject-Hours
	Team Int. Sched. - W/D Prior to IntDoes Not Meet Minimum Requirements - External*	Phone Screen-Reject-Not Interested in Job
	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Passive notification*	Phone Screen-Reject-Salary
	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Passive notification	Phone Screening-Reject-Not Interested In Job
	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Active notification*	Phone Screening-Reject-Salary
	Team Int. Sched. - W/D Prior to IntCandidate withdrew - Active notification	Reviewed-Reject-Hours
	Team Int. Sched. - W/D Prior to IntAccepted Another Position Within GFS*	Withdraw - prefer not to say
	TA Screen Complete - Not SelectedCandidate withdrew - Passive notification*	
	TA Screen Complete - Not SelectedCandidate withdrew - Passive notification	
	TA Screen Complete - Not SelectedCandidate withdrew - Active notification*	
	TA Screen Complete - Not SelectedCandidate withdrew - Active notification	
	TA Screen Complete - Not Selected (Manual Email)Candidate withdrew - Passive notification*	
	TA Screen Complete - Not Selected (Manual Email)Candidate withdrew - Passive notification	
	TA Screen Complete - Not Selected (Manual Email)Candidate withdrew - Active notification*	

# Economics Data - Description

- **Job openings** are the number of job openings on the last business day of the month.
- The job openings rate is the number of job openings on the last business day of the month as a percent of total employment plus job openings.
- **Layoffs** and discharges are the number of layoffs and discharges during the entire month.
- The layoffs and discharges rate is the number of layoffs and discharges during the entire month as a percent of total employment

# Results: EDA

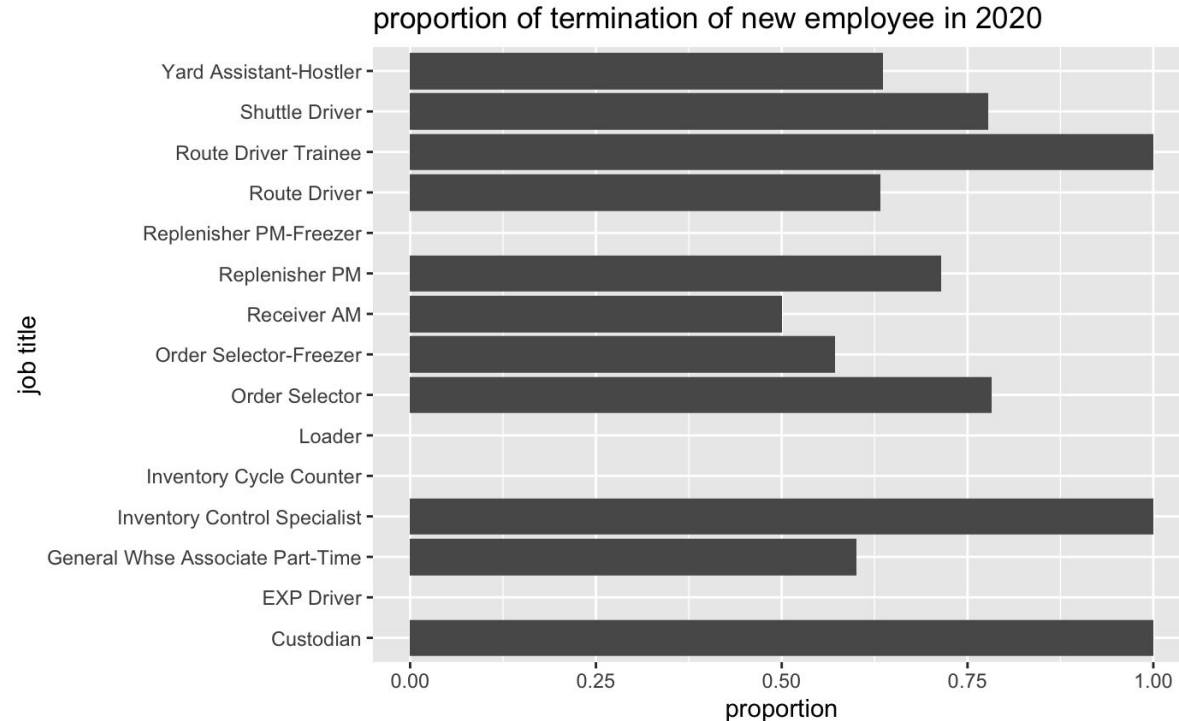
## Client 1 - Reasons for Termination



- **Shipping-dominated Reasons:** Performance, No Call No Show, No Reason or Notice
- **Drivers-dominated Reasons:** Policy Violations, Disability or Death
- More detailed investigations into No Call No Show and No Reason or Notice would be beneficial.

# Results: EDA

## Client 1 - New Hires Termination Rate by Job Title

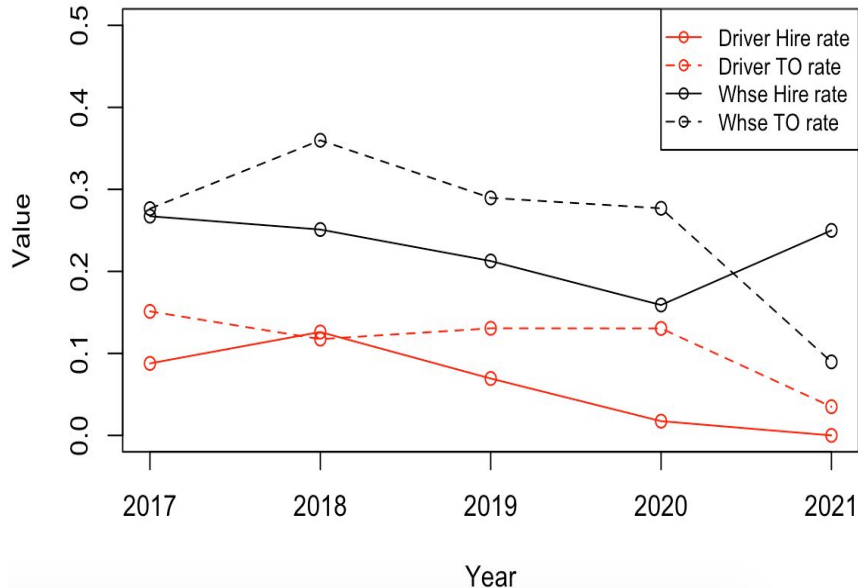


- Many new employees leave within one year. Retention problem is actually one part of recruitment problem.
- The Company may should change their way of hiring people.

# Results: EDA

## Client 2 - Turnover and Hire Rate vs. Year

Hire and Turnover Rate



- Turnover rate = Number of people left in year  $x$  / Number of total employees at that year
- Hire rate = Number of people hired in year  $x$  / Number of total employees at that year
- From 2017 -- 2021
- Variables Used: Term.Date, Hire.Date

# Results: Some important variables

- Source of hiring
- Detailed reason for leaving, rejection, coming back
- Reason for termination
- Time to fill specific requisition
  - Requisition open date/close date
  - Which requisition is nearly close to be filled
- Duration before termination
- Frequency of feedback
  - Candidate experience surveys
- Number of applicants per opening
- Cost for hire
- Offer acceptance rate: among the candidates who received the offer, how many received the offer?
- Application withdrawal rate
  - Explore the reasons behind that
- Quality of employee
  - Leave in one year

# Discussion

- Many terminations of employees are voluntary
  - Including no call no show, we want to explore the more detailed reasons behind that
- Retention problem of the company is actually a part of recruitment problem
  - Companies may need to consider changing their way of hiring
- Limitation:
  - All the clients have very different formats of datasets
  - Many important variables are not tracked by all of our clients, such as reasons for termination
  - Thus, we will build a roadmap for our clients, including variables that are important to track
  - Document relevant metrics provided by client data and methods for insightful visualizations

## Next Steps:

- Prepare outline of roadmap for data to track
- Continue identifying common metrics of comparison between clients' data
- Extract comparison metrics from public data and client data
- Document findings



# Thank you

# Appendix



# Data

## Time Series Line Graphs

- # of Job Openings (BLS)
  - Sept 2020 - Jan 2021
- # of Layoffs (BLS)
  - Sept 2020 - Jan 2021

## Bar Plots

- 

## Scatter Plots

- Client #2
  - Hourly rate vs. age
  - Hourly rate vs. duration (# of months stayed at the company)