

# Email Marketing Report

Yongtao Ding

# THANK YOU!

# Who am I?

- Data-driven
- Well-versed in Quantitative Data Analysis, Statistical Analysis, Python, SQL, Machine Learning
- Passion in turning data into actionable insights
- Diversified Backgrounds:
  - Bachelors in Computer Science
  - Masters in Innovation and Management
- Data Science Consultant at Sensible Spreader Technologies(part-time)

# Agenda

**Major Conclusion:** maximize profit through figuring out which type of email is most profitable and reducing unsubscribe rate by predictive analytics

- Dataset Overview
- Business Objectives
- Data Preprocessing/Preparation
- Email Performance Analysis
- In-depth Analysis
- Conclusions
- Agile Business Development - Predictive Analytics
- Questions

# Dataset Overview

- members: demographic and geographic info
- emails : all emails sent during September 2012
- email\_responses: results/actions from those sends

# Dataset Overview – members.csv

member_id	date	email_domain	first_name	city	state	zip	degree_level	hs_or_ged_year	pcp_score	keyword
234	5/3/10 22:03	yahoo.com	Marcetta	Flint	MI	48504	HS	2009	0.318068	walmart jobs
1929	5/4/10 9:58	gmail.com	amy	Wilson	NC	27893	HS	2002	0.299836	bank teller career
1949	5/4/10 10:00	gmail.com	meia	Taylor	MI	48180	HS	2002	0.282951	general labor

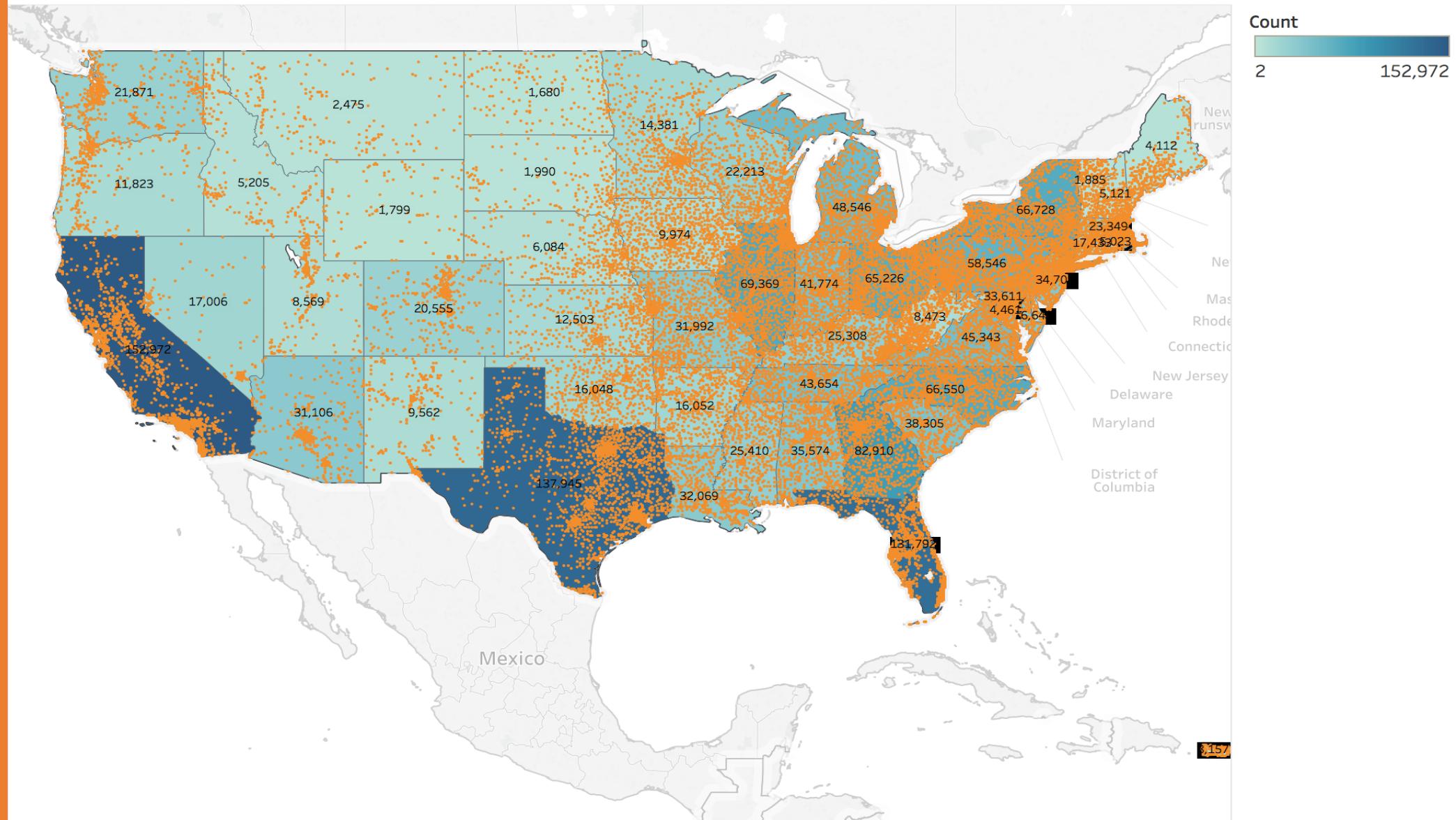
**1.6M**  
Total Members

**11**  
Features

**05/03/2010 - 10/01/2012**  
Joined Time Interval



## Geo-Distribution



Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). For pane Latitude (generated) (2): Details are shown for Zip. For pane Latitude (generated): Color shows Count. Details are shown for State. The view is filtered on State, which keeps 64 of 64 members.

# Dataset Overview – emails.tsv

**9.6M**

Total Sends

**1.9M**

Unique Members

**4**

Columns

**4**

Email Types/Clusters

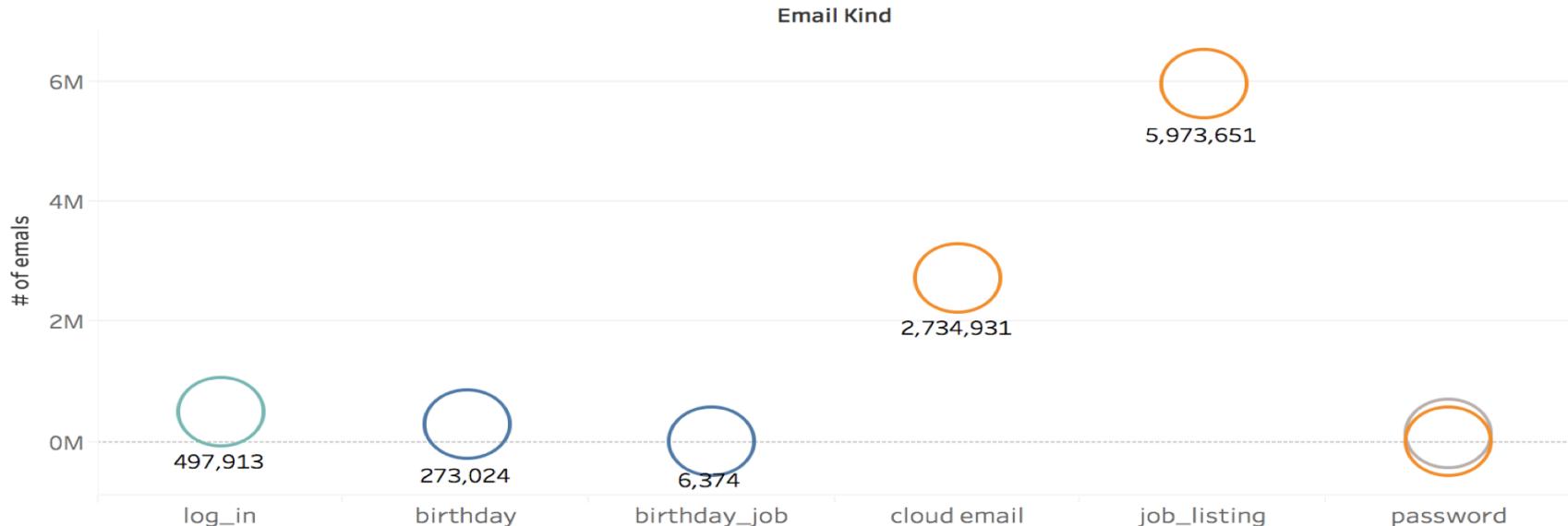
**6**

Email Kinds

**Sep 2012**

Time Interval

## email\_by\_category



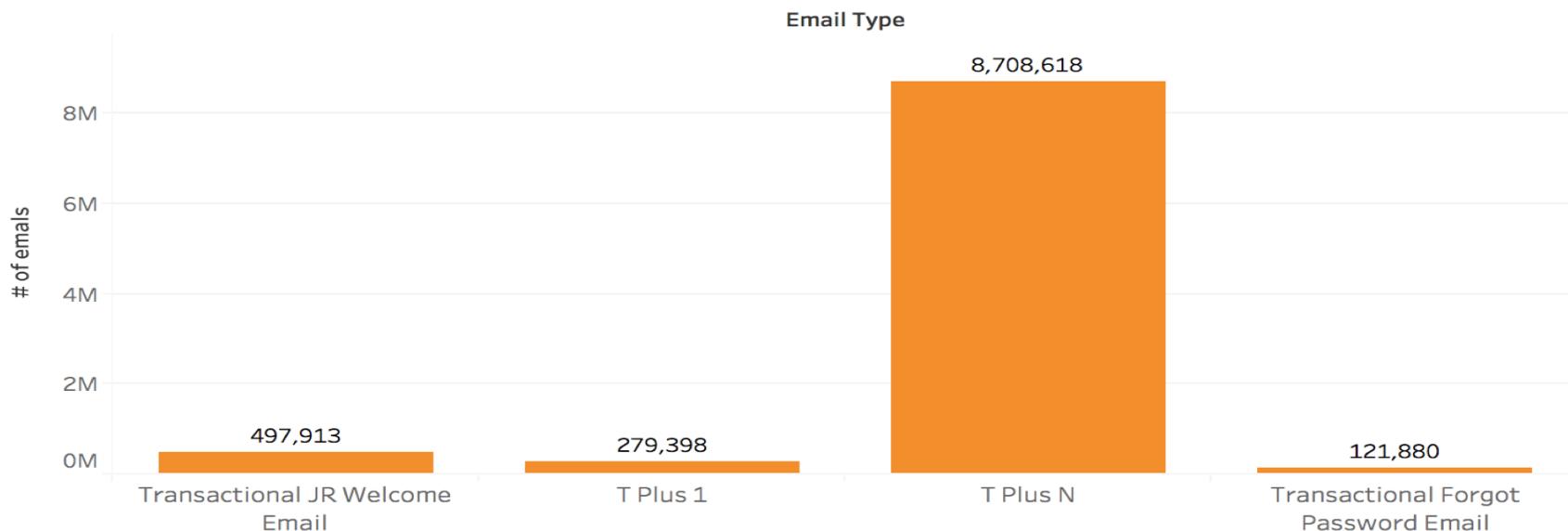
### Email Type

- T Plus 1
- T Plus N
- Transactional Forgot ..
- Transactional JR Welc..

### Email Type

- Transactional JR Wel..
- T Plus 1
- T Plus N
- Transactional Forgot ..

## email\_type



# Dataset Overview – email\_responses.tsv

**1.6M**

Total Actions  
(open/click/unsub)

**7.97%**

Unique Open Rate

**3.45%**

CTR

**43.25%**

Click to Open

**1.04%**

Unsub Rate

**20K**

Total Unsubscribe



# of unique members who  
unsubscribed divided by total  
# of members

# Business Objectives

- Maximize profit through identifying which type of emails is most profitable

**\$0.40**

Per 1000 emails sent

**\$0.12**

Per click

- Metrics used to measure performance:

**Open/Click/Unsub Rate**

**Gross Margin/Profit/ROI**

# Data Preprocessing/Preparation

- Remove **399K** duplicates in email\_responses dataset
- Remove **12** unstructured members in members dataset
- Apply regular expression to extract potential info from column [email\_type]
  - **6** Email kind
  - Days Joined
  - **3** email campaigns
- Timestamp transformation
- Discretize columns [Days Joined] [Sent Hour]
- Concatenate emails and email responses

# Data Preprocessing/Preparation

Emails  
sample:

email_id	email_send_time	email_type	email_variant	member_id
205673937	9/1/12 4:30	T plus N	job_alert_s1_v1:tplus35_age22+	14151340

Email response  
sample:

email_id	email_response_time	action
205673937	9/1/12 4:50	open
205673937	9/1/12 4:50	click

Merged dataset  
sample:

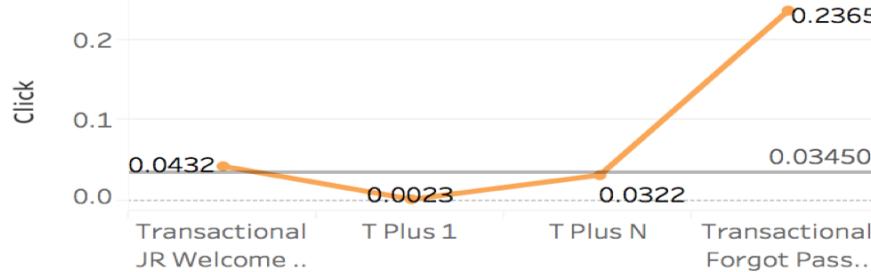
email_id	email_type	member_id	open_time	open	click_time	click	unsub_time	unsub	email_kind	opened_before	age22	age35	category_days_joined	date	weekday	category_hour
205673937	3	14151340	9/1/12 4:50	1	9/1/12 4:51	1	NaN	0	job_listing	0	1	0	(24.133, 48.267]	9/1/12	Saturday	(-0.023, 5.75]
205569995	1	14802253	NaN	0	NaN	0	NaN	0	log_in	NaN	NaN	NaN	NaN	9/1/12	Saturday	(-0.023, 5.75]

# Email Performance Analysis

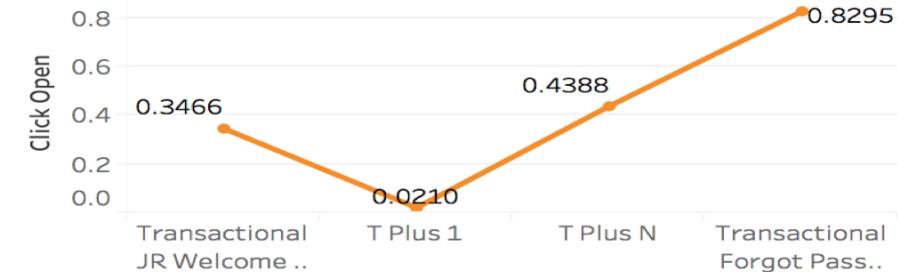
- Open/Click/Unsub Rates
  - by Email Type
  - by Email Kind
  - by Email Kind & Timing
  - by Weekday
  - by Campaign
  - by Campaign & Email Kind
  - by Campaign & Joined Days

## Rate By Email Type

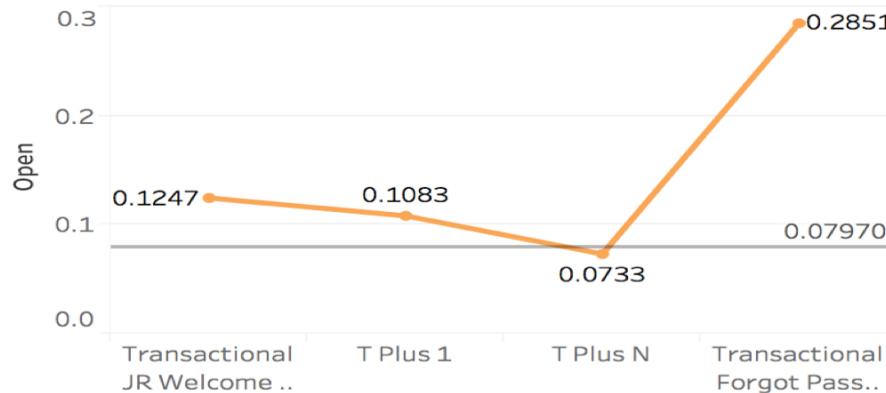
ClickRate



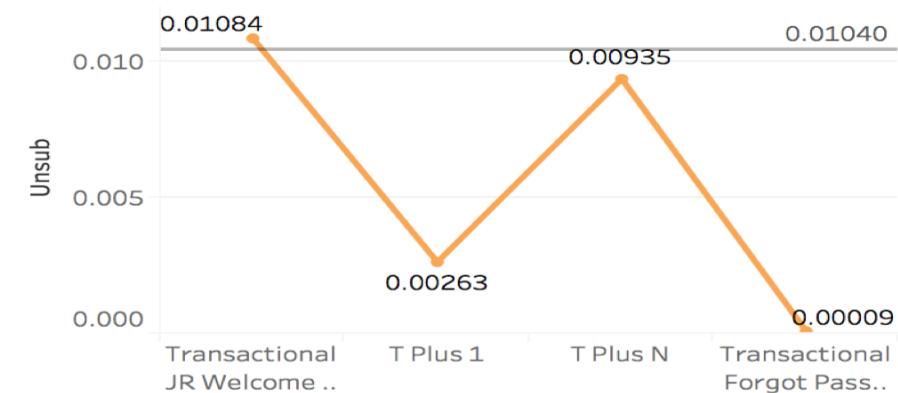
Click\_Open



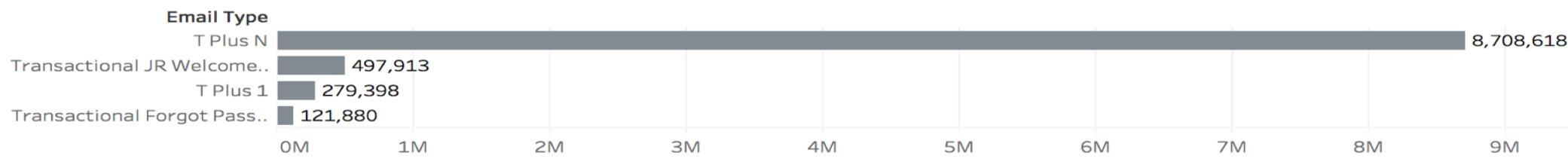
OpenRate



UnsubRate



# of emails



The screenshot shows a welcome email from Jobcase. At the top, it says "Thanks and Congrats!" and has a "My Profile >" button. Below that is a banner with many small user profile pictures. A "Benefit Alert:" section greets the recipient, Sofia. It states: "As a member of JobsRadar, you now have access to all [Jobcase's](#) new features." It includes a blue "Confirm Email >" button and the text "Start receiving my benefits immediately." A "What's Jobcase?" section explains the platform as "the fastest growing social media site where America's Workforce can support and help one another." It lists "Includes the following:":
 

- Apply to jobs with [one click](#)
- Access to [company reviews](#)
- Shared experience from other [members](#)

 There is a "Tour Site >" button. The footer contains a welcome message: "Welcome to the Jobcase community, 40 million strong and growing!" and "—Your Jobcase Team".

Your Jobcase profile was originally created by you when you registered as a member of JobsRadar on 2015-04-22 13:36:52.0. JobsRadar has been powered by Jobcase technology since 2009.

This is an email to help you get the most out of Jobcase  
 Have questions? Email the Jobcase team at [info@jobcase.com](mailto:info@jobcase.com)

[One-Click Unsub](#)

This email was sent to [sofia3rd023@gmail.com](mailto:sofia3rd023@gmail.com)

[Unsubscribe](#) or update your [marketing preferences](#)

© 2015 Jobcase | 201 Broadway St, 7th Floor | Cambridge, MA | 02139 | [jobcase.com](http://jobcase.com)

# Welcome Email(Activation)

**1.084%**

Unsub Rate

>

**1.04%**

Total Unsub Rate

## Review:

- Redundant content
- Distractions

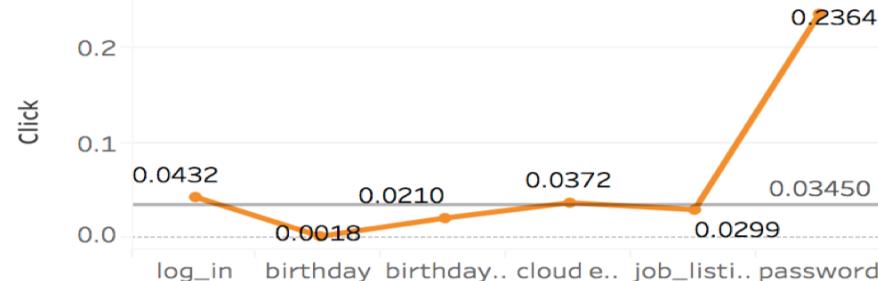
## Improvement:

- Remove all irrelevant elements
- A call out box – like A colored box with a simple CTA



## Rate by Email Kind

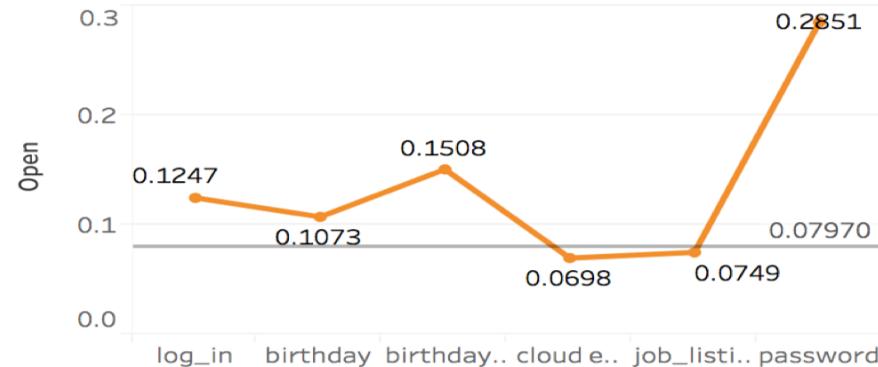
ClickRate



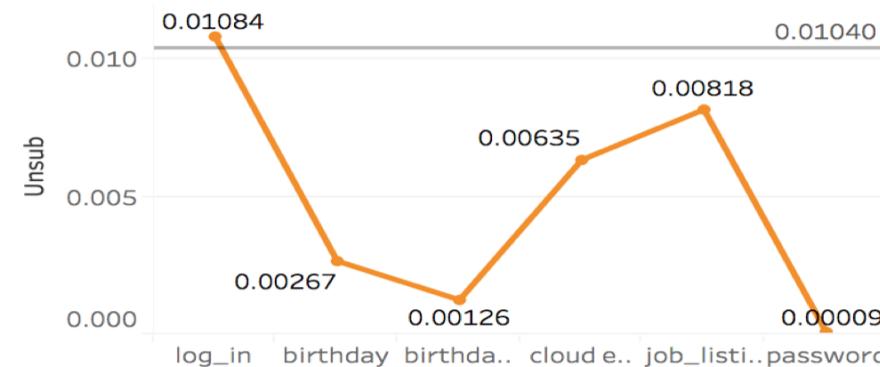
Click\_Open



OpenRate

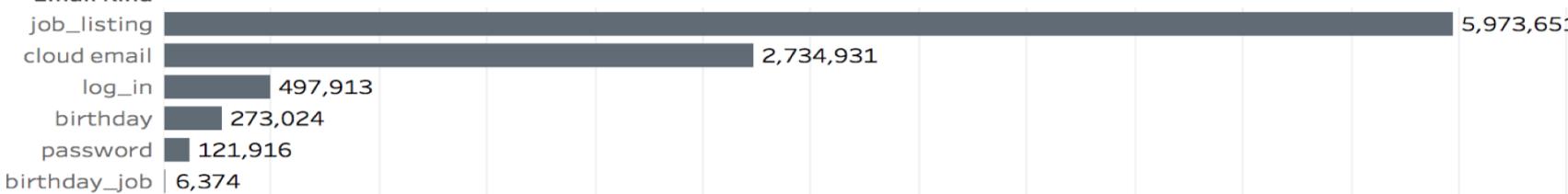


UnsubRate



# of emails

Email Kind



# of emails

The screenshot shows the Jobcase mobile application interface. At the top, there's a header with the Jobcase logo, a user profile placeholder for 'Sofia', and a background image of a crowd. Below this, a section titled 'Jobs you might like, Sofia:' lists four job postings with 'View' buttons:

- Coca Cola Near Cambridge, MA
- Nursing Assistants Near Cambridge, MA
- DHL Near Cambridge, MA
- Ticket Agent Near Cambridge, MA

Below this is a section titled 'Save the jobs you like:' which includes instructions on how to save a job, a 'Save job' button, and a 'Go' button to add the job to saved. It also encourages users to upload their resume and provides a 'View All Jobs' button.

At the bottom, social media links for Facebook, Twitter, and YouTube are provided, along with a footer containing unsubscribe information and a copyright notice.

## Job Alert Email

**2.99%**

Click Rate



**3.45%**

Average Click Rate

**39.8%**

Click to Open



**53.3%**

Click to Open  
(Conversation Email)

Ideas:

- Personalisation: name, job title etc.
- Relevance: create value-added, engaging content that meet subscriber's need



 jobcase™

**Conversations**

[My Profile >](#)

Here's what Jobcasers are talking about today.  
[Join in on the conversation!](#)

**Recommended for you:**

**How do I quit?** Upvote 

Garrett Camacho  
I got accepted to culinary school, but how do I tell my boss that? I've never quit anything before. [Read replies >](#)

**Does the job market value veteran experience?** Upvote 

Sam Dillion  
How do I best take advantage of my experiences? [Read more >](#)



**Why aren't fast-food jobs paying more money for more hours?** Upvote 

Anonymous [Read more >](#)

[Start A Conversation >](#)

This is an email to help you get the most out of Jobcase  
Have questions? Email the Jobcase team at [info@jobcase.com](mailto:info@jobcase.com)

[One-Click Unsub](#)

This email was sent to sofia3rd023@gmail.com  
[Unsubscribe](#) or update your [marketing preferences](#)  
 © 2015 Jobcase | 201 Broadway St, 7th Floor | Cambridge, MA | 02139 | [jobcase.com](http://jobcase.com)

## Conversation Email

### Ideas:

- Create eye-catching deliverables to excite recipients in 1 second.



# Rate by Email\_Kind & Timing

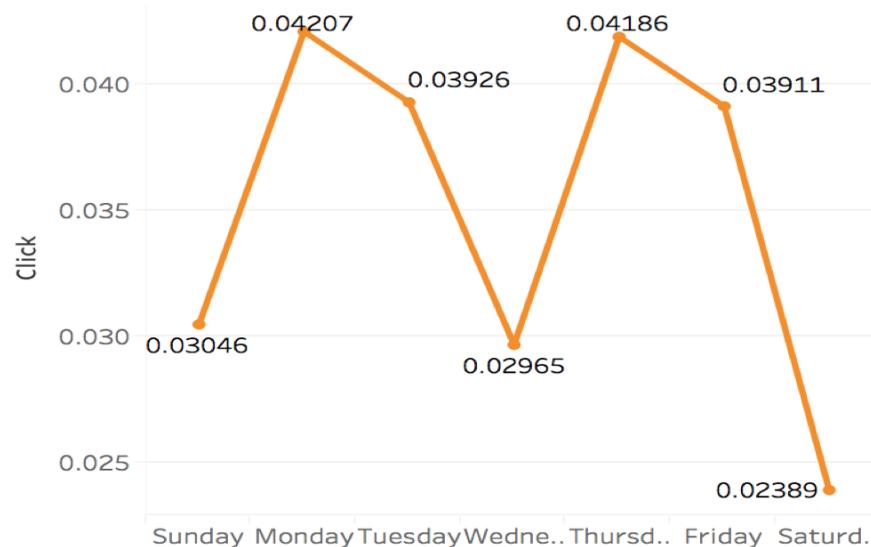
email_kind	category_hour	click	open	click_open	number
birthday	(5.75, 11.5]	0.001838666	0.107345874	0.017128429	273024
birthday_job	(5.75, 11.5]	0.021022906	0.150768748	0.139438085	6374
cloud email	(-0.023, 5.75]	0.033113369	0.066488045	0.498034923	1373856
cloud email	(5.75, 11.5]	0.041326158	0.073070183	0.565568001	1361075
job_listing	(-0.023, 5.75]	0.031422032	0.073900586	0.425193276	3875179
job_listing	(5.75, 11.5]	0.026981537	0.07683829	0.351147027	2098472
log_in	(-0.023, 5.75]	0.08094971	0.184146569	0.439593909	5349
log_in	(5.75, 11.5]	0.05945414	0.145028738	0.409947304	95519
log_in	(11.5, 17.25]	0.040982021	0.119472677	0.343024216	253355
log_in	(17.25, 23.0]	0.035026794	0.11833113	0.296006587	143690

Takeaways:

- Conversation/cloud emails sent during 6am-12pm have higher click rate than 12am-6am
- Job alert emails sent during 12am to 6am have higher click rate than 6am-12pm
- Activation/log\_in emails sent during 12am-6am have the highest CTR, but the cardinality is small

## Rate by Weekday

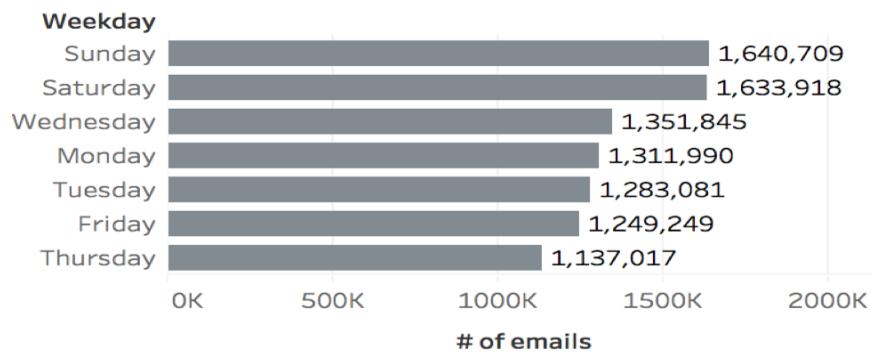
ClickRate



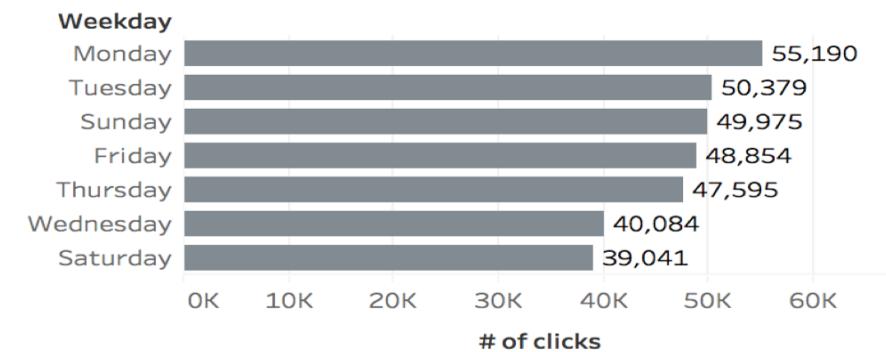
Click\_Open



# of emails



# of clicks

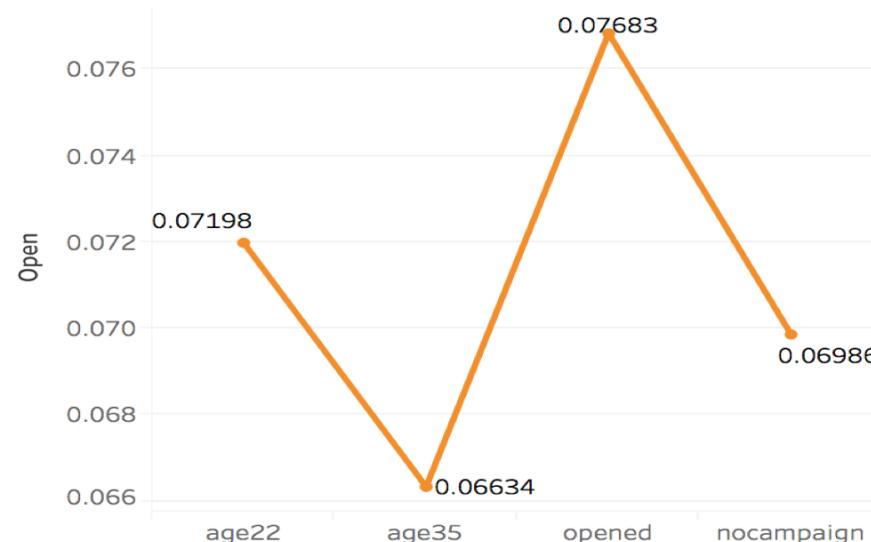


## Rate by Campaign

ClickRate



OpenRate



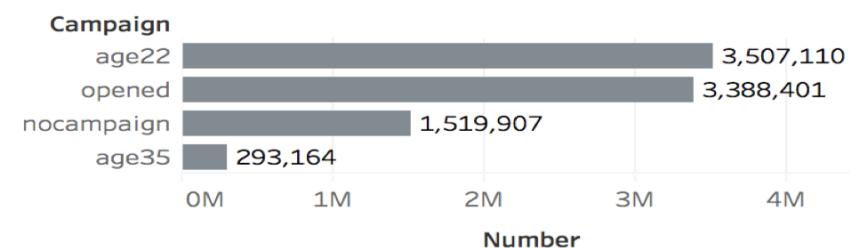
Campaign

- ✓ age22
- ✓ age35
- ✓ nocampaign
- ✓ opened

Click\_Open

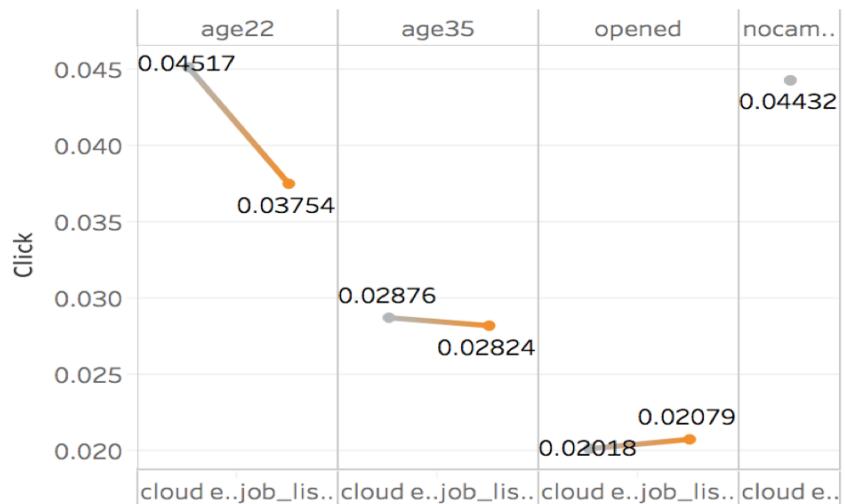


# of emails

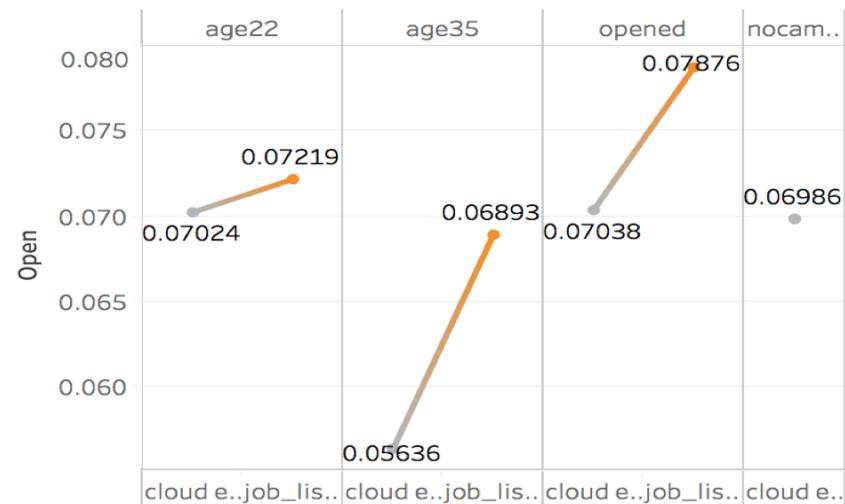


# Rate by Campaign&Email Kind

ClickRate



OpenRate

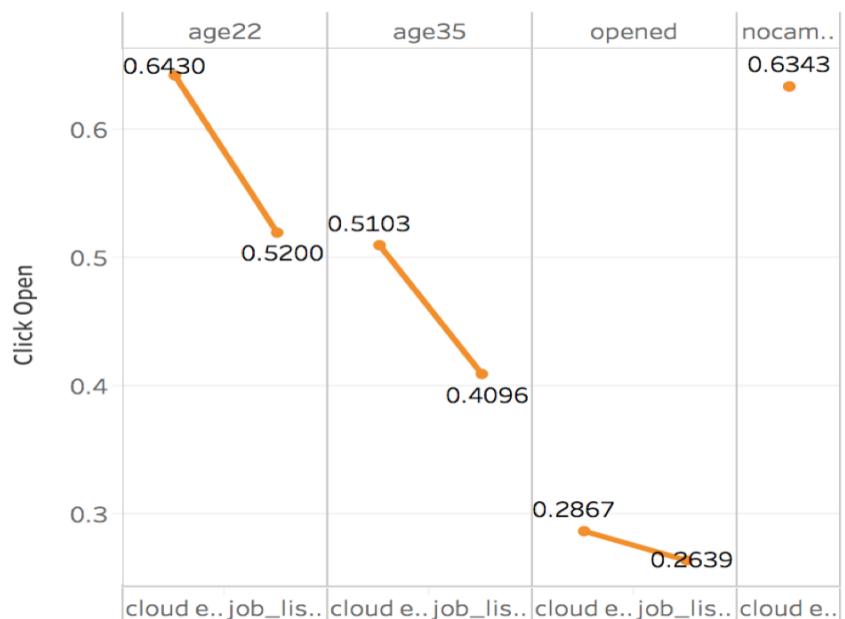


Email Kind  
 cloud\_email  
 job\_listing

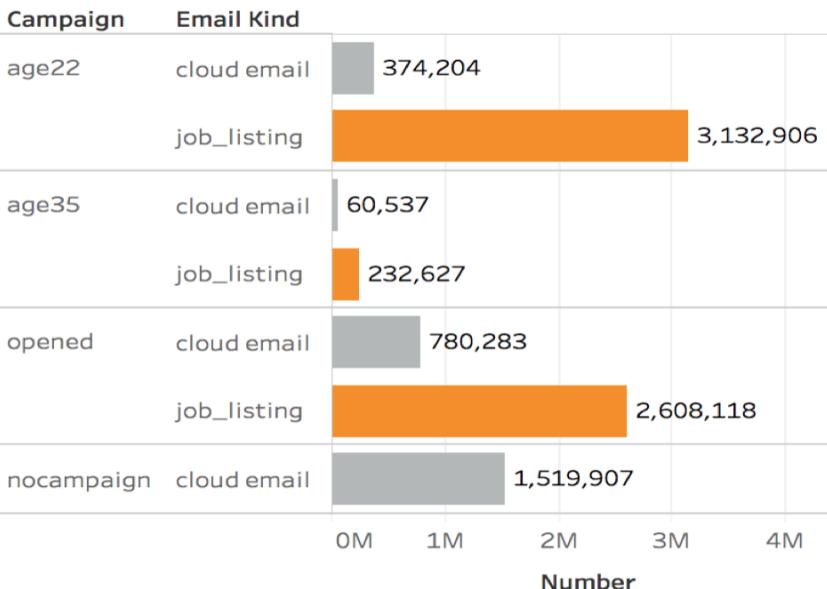
Campaign  
 age22  
 age35  
 nocampaign  
 opened

Email Kind  
 cloud\_email  
 job\_listing

Click\_Open



# of emails



# Rate by Campaign & Joined\_days

Campaign	category_days_joined	open	click	click_open	# of emails
Opened_before	(-0.362, 24.133]	0.0920384	0.03751001	0.40754741	342042
Opened_before	(24.133, 48.267]	0.07135348	0.02177131	0.30511907	429005
Opened_before	(48.267, 72.4]	0.09370964	0.0250895	0.26773656	230734
Opened_before	(72.4, 96.533]	0.08770666	0.02098239	0.23923368	355298
Opened_before	(96.533, 120.667]	0.08053124	0.01876101	0.23296566	279196
Opened_before	(120.667, 144.8]	0.07977015	0.01900022	0.23818708	259997
Opened_before	(144.8, 168.933]	0.07373379	0.01798711	0.24394665	314225
Opened_before	(168.933, 193.067]	0.06835789	0.01668714	0.24411437	196978
Opened_before	(193.067, 217.2]	0.06740362	0.0163182	0.24209682	277359
Opened_before	(217.2, 241.333]	0.06697261	0.01616124	0.24131122	226839
Opened_before	(241.333, 265.467]	0.06958149	0.01653767	0.23767343	183339
Opened_before	(265.467, 289.6]	0.06472367	0.01481946	0.228965	82999
Opened_before	(289.6, 313.733]	0.06357669	0.01427022	0.22445681	87595
Opened_before	(313.733, 337.867]	0.06506521	0.01458726	0.22419443	56282
Opened_before	(337.867, 362.0]	0.06544585	0.01356126	0.20721342	66513
age35	(24.133, 48.267]	0.063785	0.027397	0.429517	125563
age35	(48.267, 72.4]	0.068251	0.029057	0.425737	167601
age22	(-0.362, 24.133]	0.075305	0.043367	0.575895	2413905
age22	(24.133, 48.267]	0.064649	0.027276	0.421903	1093205
nocampaign	(-0.362, 24.133]	0.071416	0.046549	0.651807	1335574
nocampaign	(24.133, 48.267]	0.058611	0.028128	0.479919	184369

# In-depth Analysis

**9.6M**

Total Sends

**\$35788**

Total Revenue

**0.3M**

Available Clicks(remove  
unsub/password clicks)

**\$0.12**

Per click

**8.34x**

ROI

**\$3830**

Total Cost

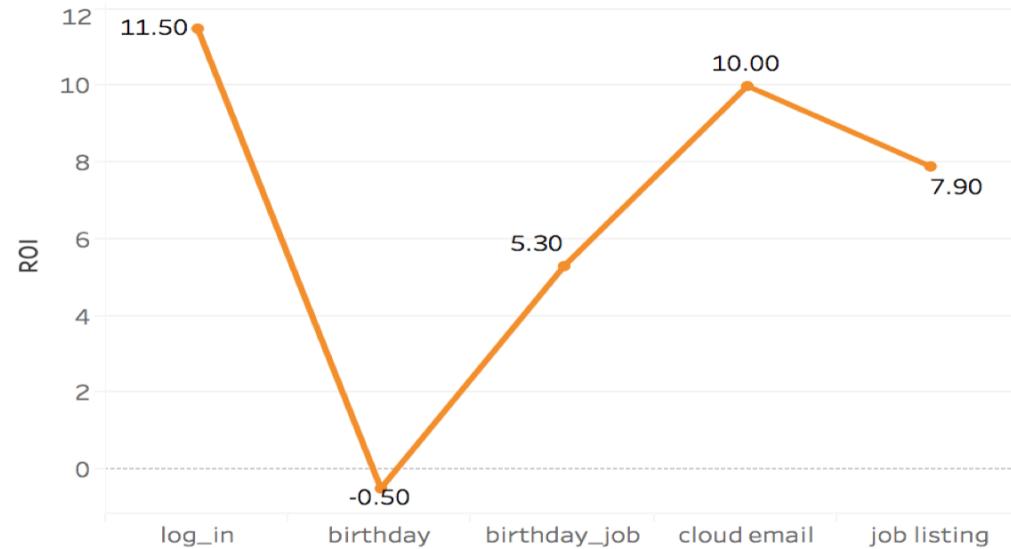
**\$31958**

Gross Margin

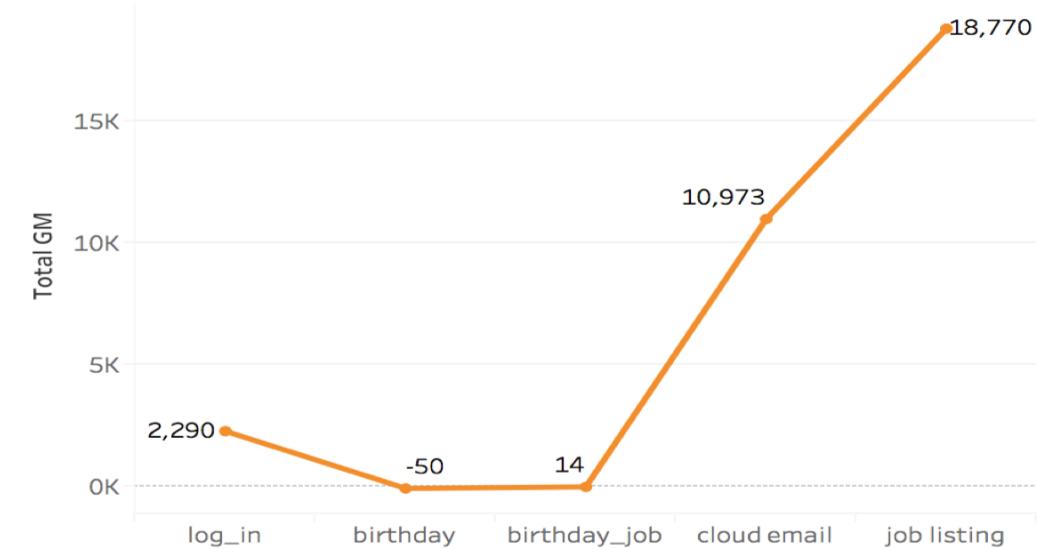


## Profit\_email\_kind

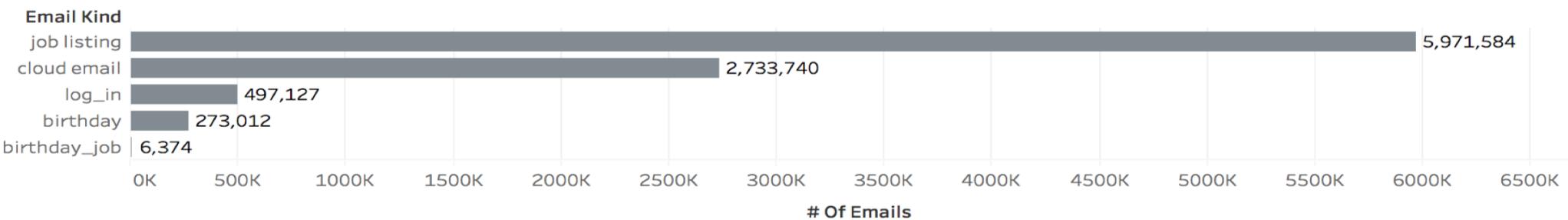
ROI\_email\_kind



GM\_email\_kind

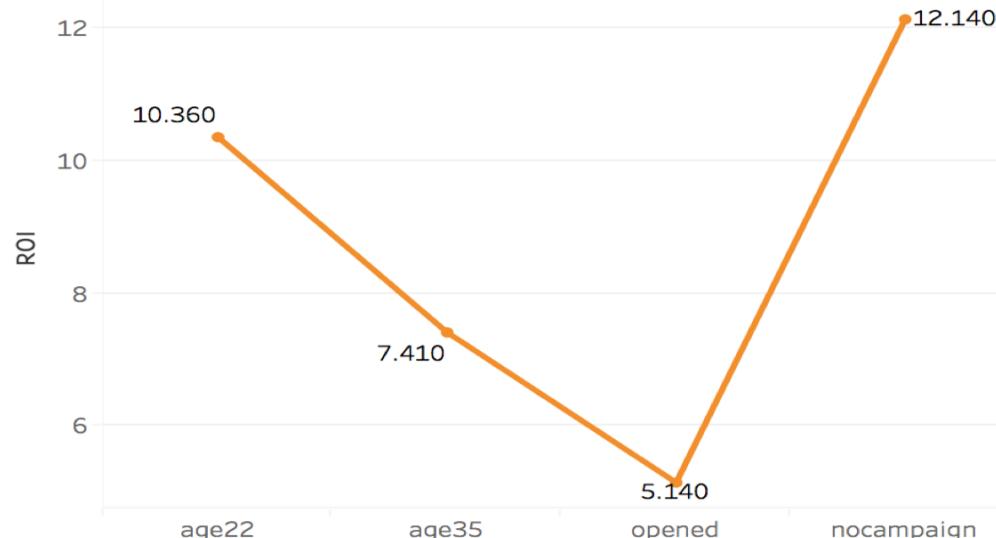


# of emails

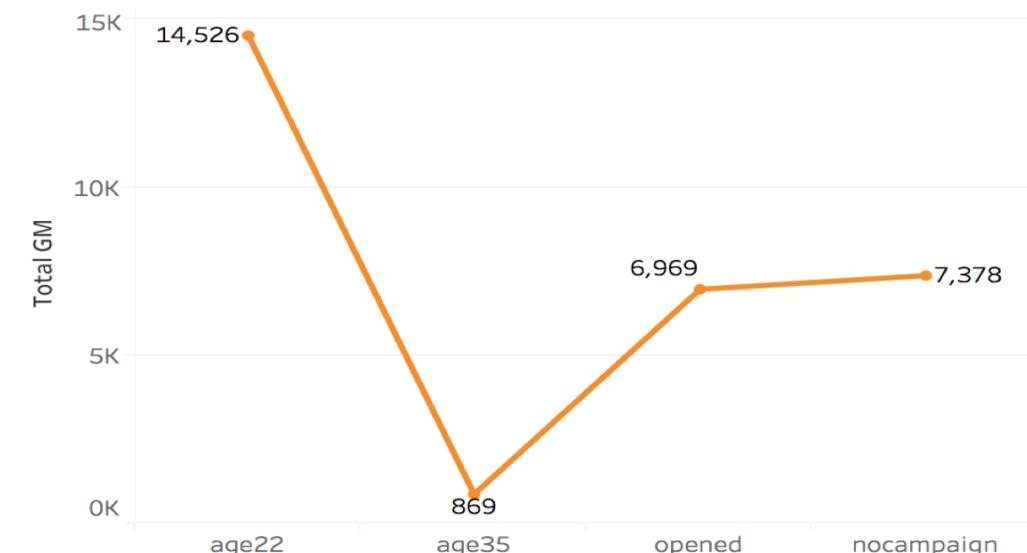


## Profit\_campaign

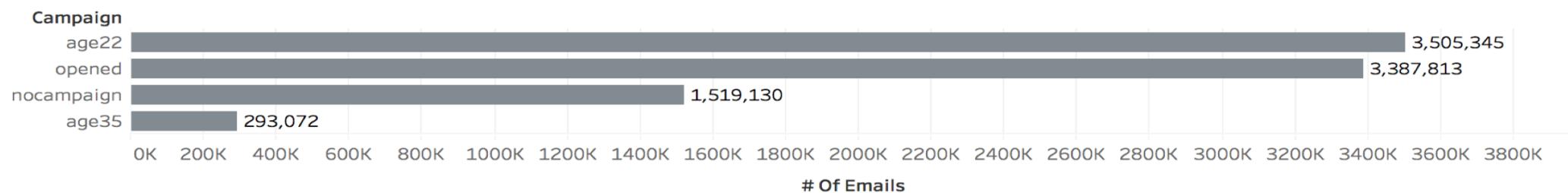
ROI\_campaign



Total GM\_campaign

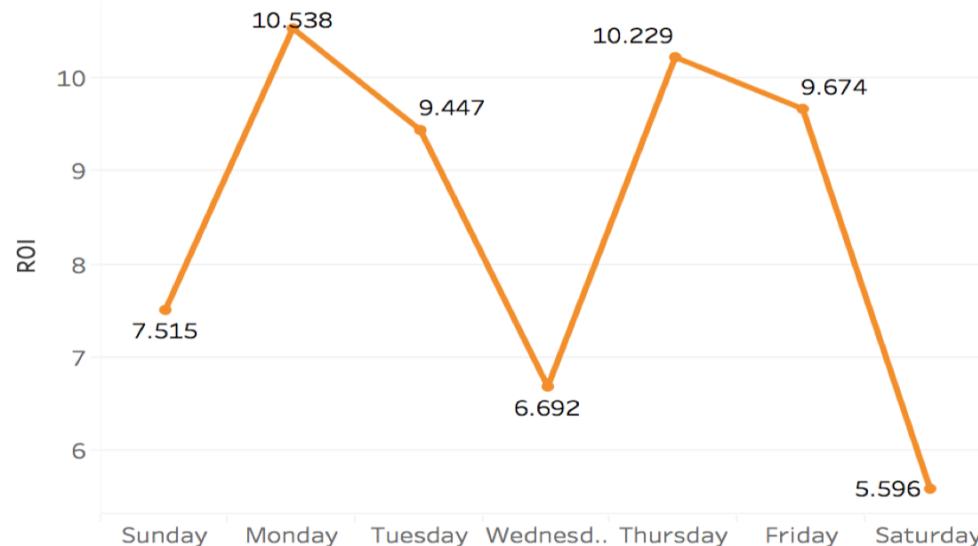


# of emails

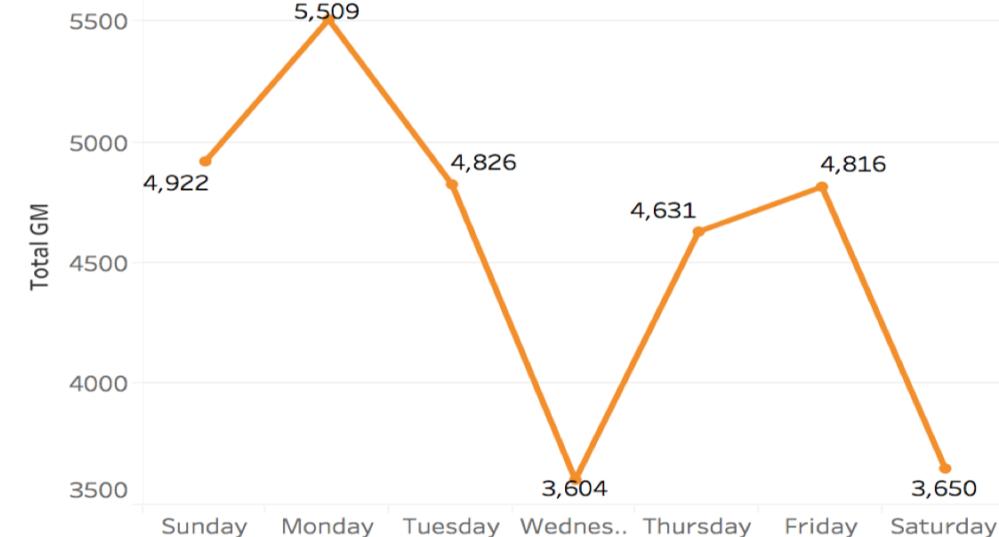


## Profit\_weekday

ROI\_weekday

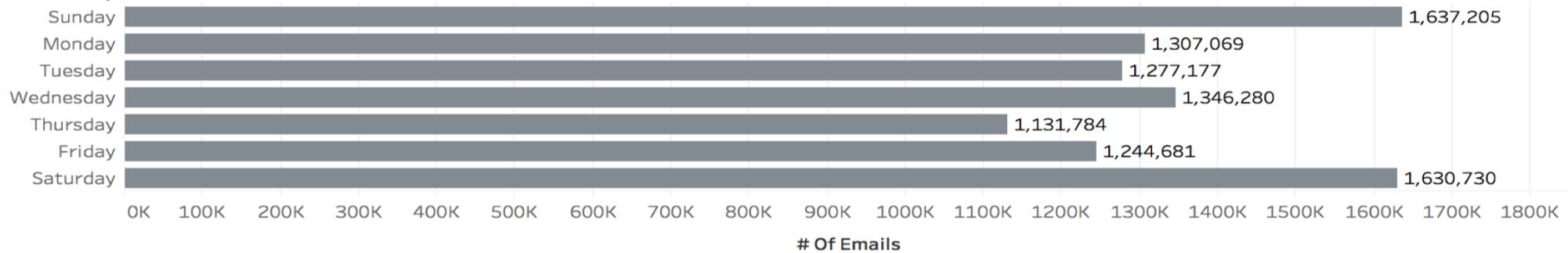


Total GM\_weekday

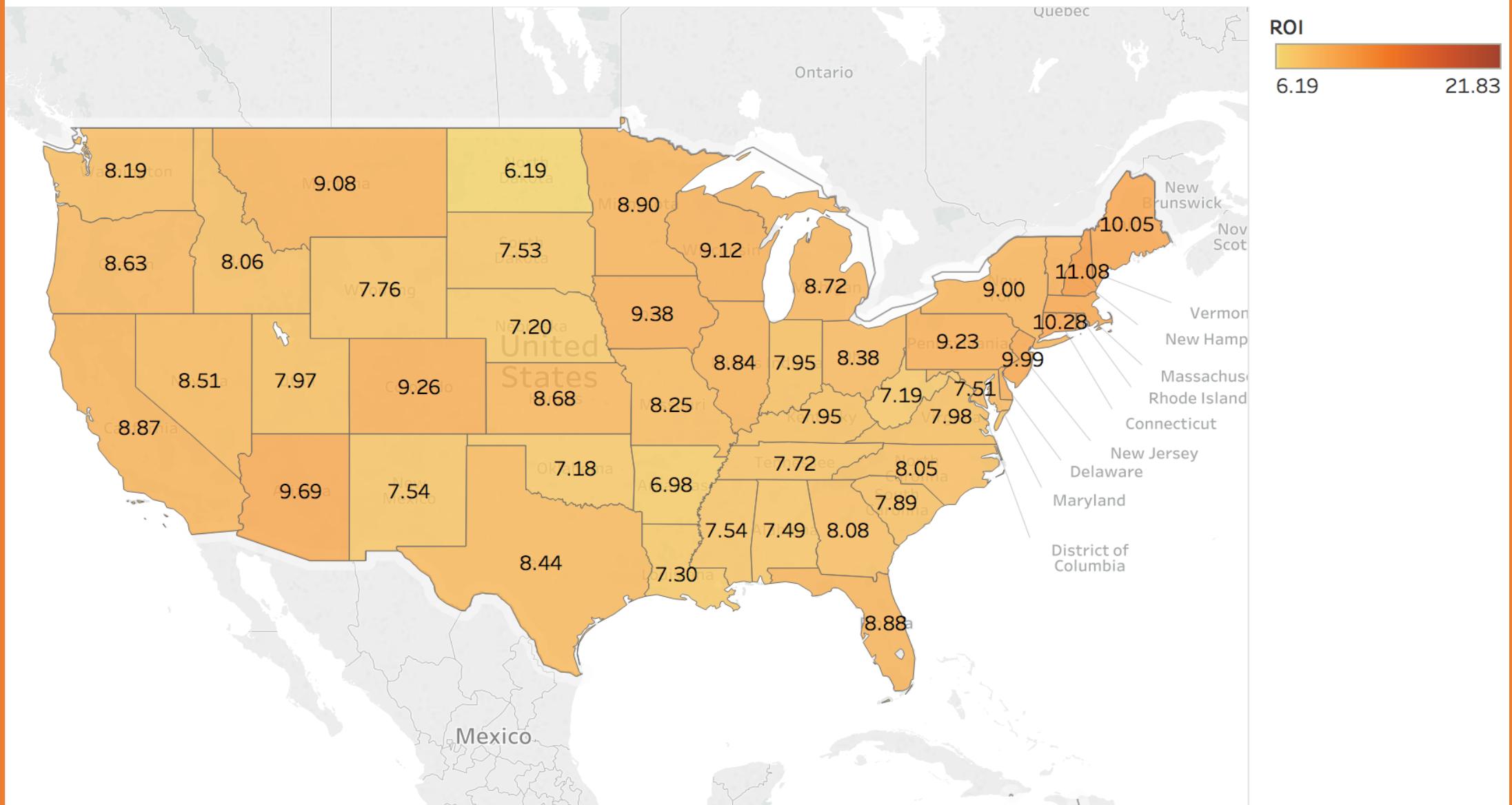


# of emails

Weekday



# Geo-ROI



Map based on Longitude (generated) and Latitude (generated). Color shows sum of ROI. Details are shown for State. The view is filtered on State, which keeps 56 of 56 members.

# Conclusions

- **A/B testing:** Welcome Email has the highest open rate and click rate. Use A/B testing, multivariate testing to update the content and design of welcome emails to increase email engagement
- **Personalization:** Customize Job Alert emails and provide value-added offer that meets recipient's need
- **Timing:** Find the optimal frequency and timing to send the emails
- **Most Profitable Campaigns:** Age22+ campaign is more profitable than the other two, but still performs worse than nocampaign. (conversation email generates same value as job alert email )
- **Geo:** CA, TX and FL are the TOP 3 states with the largest group of members and generate highest profit, but eastern US has a higher density and higher ROI indicator than western US.

# Agile Predictive Analytics on Email Marketing

**1.9M**  
Total Members



**20K**  
Members Lost  
per Month



**Predictive  
Model**



Forecast whether the email might interest the recipient to open it up

**9.6M**  
Total Sends



**3.45%**  
CTR



Run better targeted email campaign and CTR goes up

# Age22 Email Campaign Prediction

**Aim:** Build up a predictive model to forecast whether the sent email will be opened by the member for age22 email campaign

**Metric:** Accuracy = # of correct predictions / # of total predictions

# Age22 Email Campaign Prediction

## Data Cleaning/Aggregation:

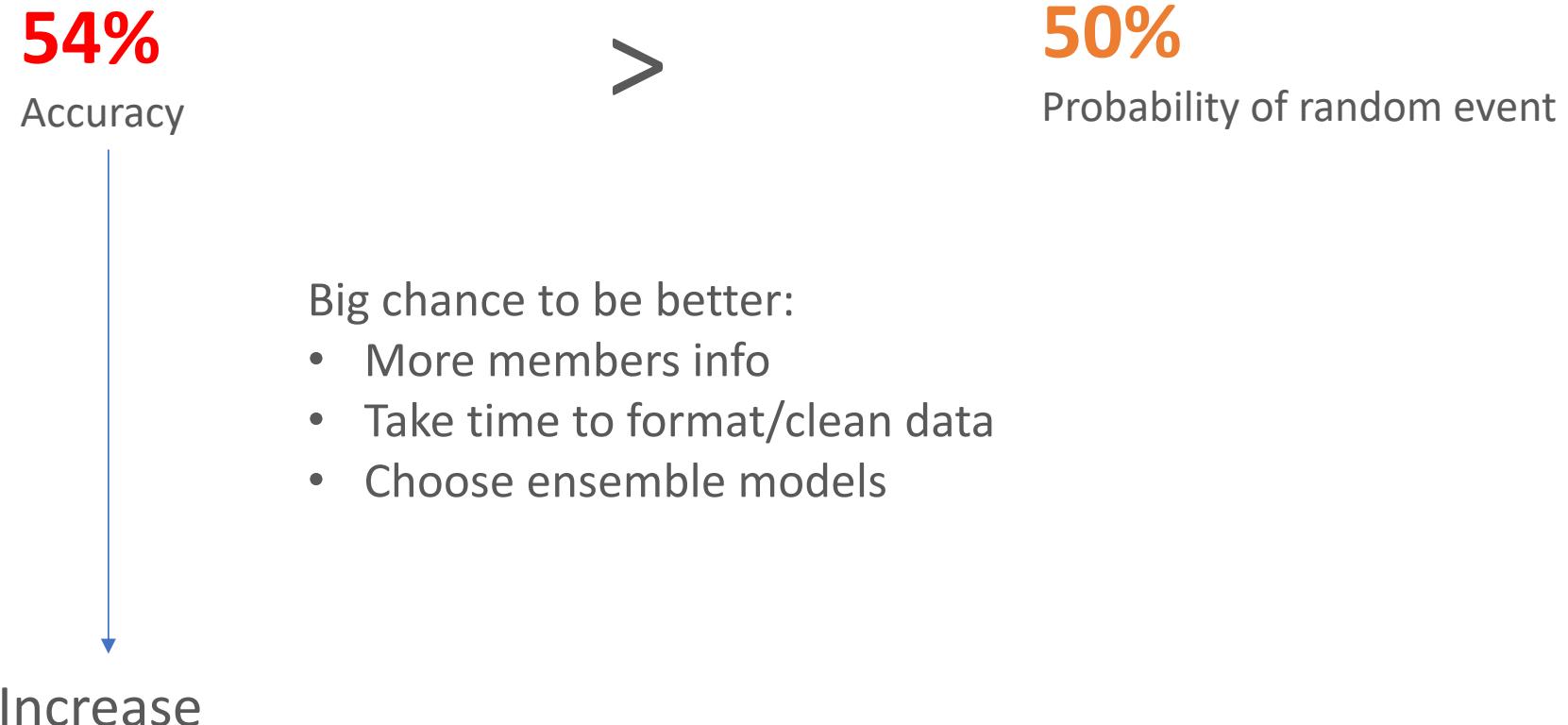
- Aggregate available prediction dataset containing **59K** members through combining three original datasets
- Extract **9** available features that might impact on whether the member will open the email
- Map all text columns to numbers, for instance, ‘weekday’
- Data normalization, for instance, ‘hs\_or\_ged\_year’

member_id	open	email_kind	category_days_joined	weekday	category_hour	opened_before	age35	state	degree_level	hs_or_ged_year
14776905	0	0	0	5	0	0	0	IN	GED	0.162026832
14769641	0	0	0	5	0	0	0	OH	HS	-0.176208462

# Age22 Email Campaign Prediction

- Down sample majority class to balance the number of open and not open
- Split the whole dataset into training set, validation set and test set
- Trained a k-Nearest Neighborhood model based on the training set, tuning hyper-parameter to improve the performance of the model
- Cross-validated model and got a final accuracy which is **54%**

# Age22 Email Campaign Prediction



# Agile Predictive Analytics on Email Marketing



Email marketing list  
got segmented by  
marketers

Apply ML, AI to transfer  
uncertainties to  
probability and utilize  
predictive power to  
support decision-making

Deliver ‘real time’  
customized emails

# Questions

# THANK YOU!

