

SMT202

Final Project

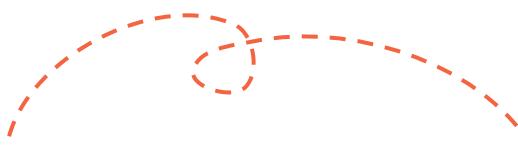
Presentation

G1 Group 4

Macro: BBB Precinct

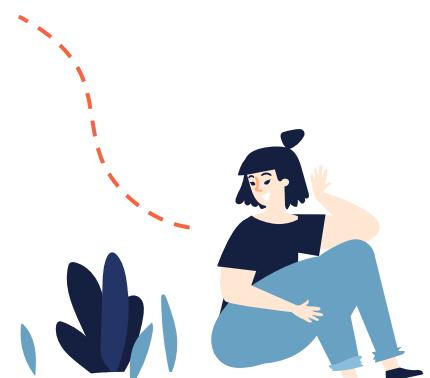
Date: 6 April
2020





Pitch Video

Let's watch it again!



Pitch Video



Table of Content

- **Background**
- **Crawl Data Analysis**
 - Twitter
 - Reddit
 - Articles from Government
- **Survey Results Analysis**
 - Demographic Features
- **Empathy Map & Root Cause Analysis**
- **Basic Literature and Similar Solutions**
- **Blue Ocean Strategy**
- **Proposed Solution**
 - Details
 - Application of Thinking Hats
- **Machine Learning Model**
 - Decision Tree
- **Virtualization**
 - QR Code
 - Measuring Success
 - Assumptions
 - Limitations
- **Conclusion**
- **Key References**
- **Appendices**





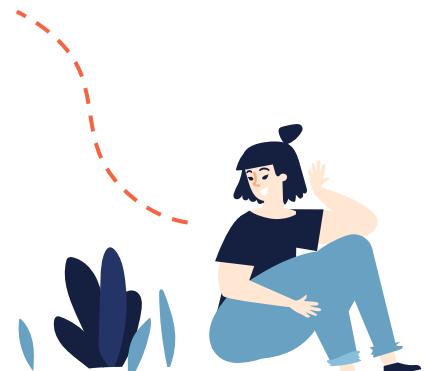
Problem Statement

We want to improve the mental
wellness of citizens in Singapore.





Why is this problem worth exploring?





Problem Analysis Overview



1 in 7 Singaporeans have experienced a mental disorder.

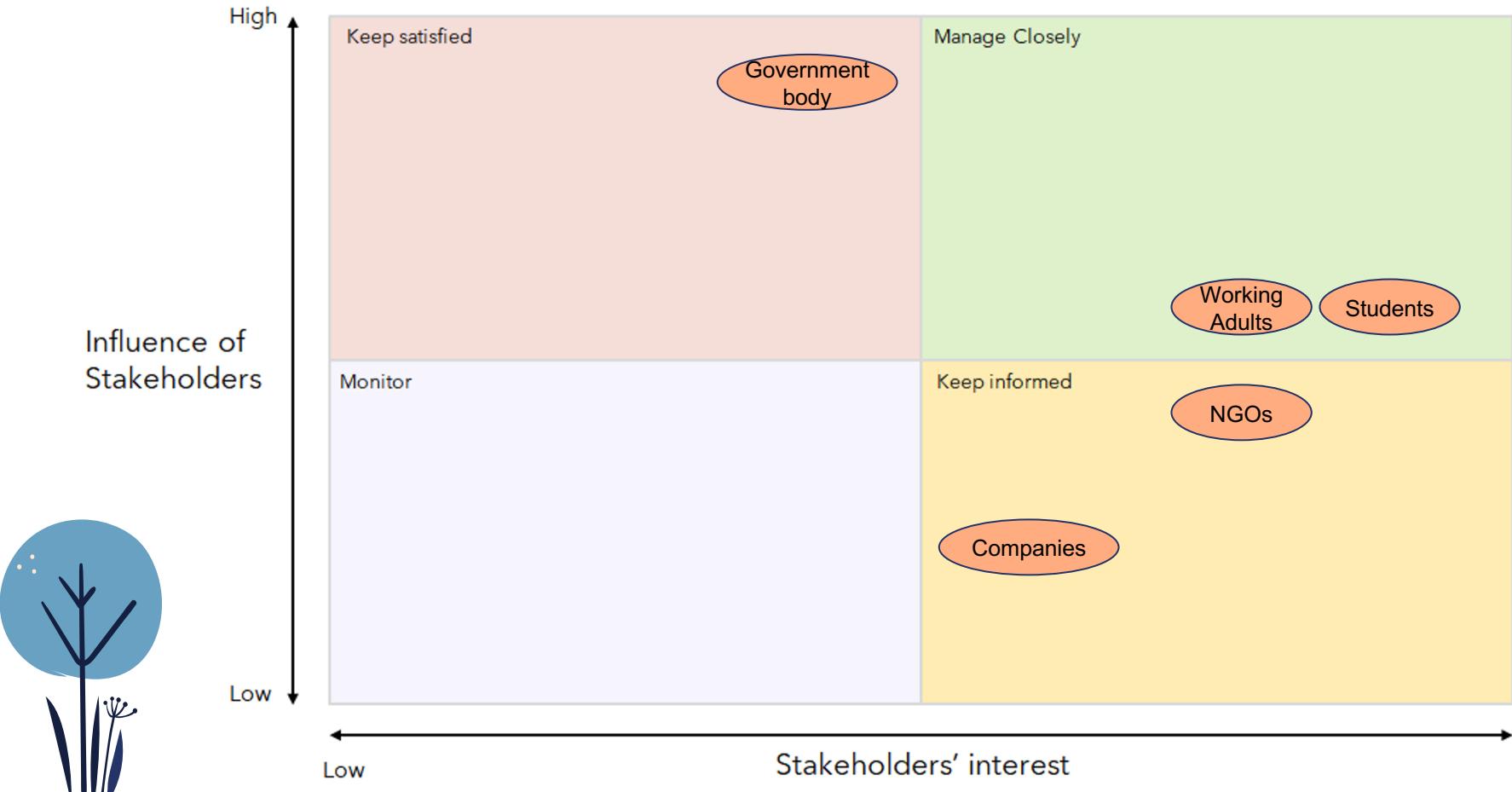


92% of working Singaporeans are feeling stressed.

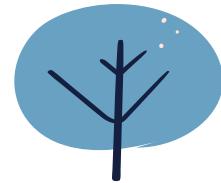


For every suicide, **at least 6 suicide survivors** are left behind.

Stakeholder Mapping



How are we listening to them?



Data Modelling Overview



Stakeholders



Students

- Twitter
- Reddit



Working Adults

- Twitter
- Reddit



Government Bodies/NGOs

- Official Publications
- Web Articles

Data Usage Breakdown



3,878 Tweets



1,210 threads
12,665 comments



Government Bodies/NGOs

192 Articles or Websites



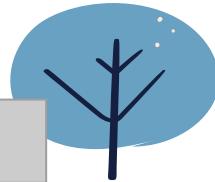
Survey Findings

106 Responses



SCAN ME!

Why do we need their voices?



| Stakeholder | Reasons |
|-----------------|---|
| Students | They are our main beneficiaries who stand to gain in our solution. |
| Working Adults | |
| Government Body | They are people who can devise, pass, and enforce laws and regulations that may either fulfill the goals of our solution or directly cancel them out. |
| NGOs | They are organizations who are close to or care for our beneficiaries. They could also be organizations who offer services directly to them. |
| Companies | They are organizations who care enough about our cause that they are willing to work to influence its outcome |

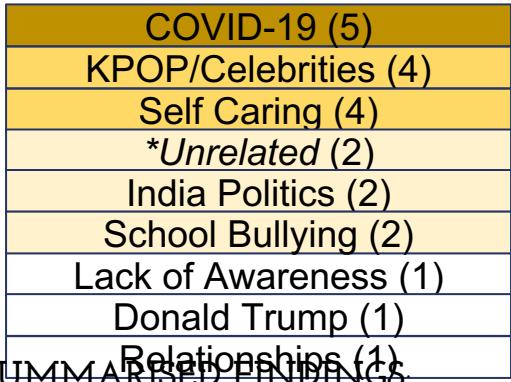


Data Results Analysis

Twitter

1. Network Analysis

- 'Girvan-Newman' Algorithm
- Found **24** Communities with 20 or more users
- ~**9** Community Topics

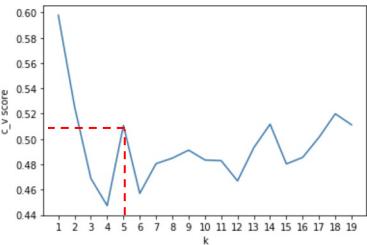


SUMMARISED FINDINGS:

- 1) Citizens' expressions are **negatively charged** on-going issues
- 2) **Shared topics of interests** bring people together **appearance**
- 3) Citizens are occupied by **current affairs and entertainment news**
- 4) People **form emotional attachments** to topics
- 5) **Bullying** and **suicides** are still
- 6) Some are **conscious of self-**
- 7) Some trying to be more positive by promoting resilience at work & home; highlighting

2. Topic Modelling

- Topics, k = 5



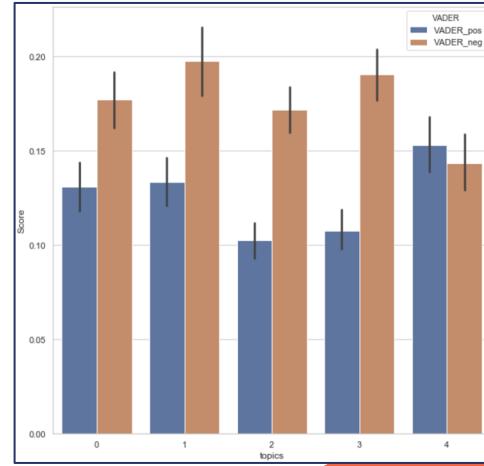
0. Bullying & Suicide
1. Loneliness & Love
2. COVID-19's impact on life
3. Personal Appearances
4. Workplace, Home & Family

Scope of Collection

- Geolocation: Singapore
- Period: 10th - 17th March 2020
- Using `tweepy.Cursor` allowed us to pull "> 100" at one go

3. Sentiment Analysis

- Valence Aware Dictionary and sEntiment Reasoner (VADER)



5) **Bullying** and **suicides** are still

6) Some are **conscious of self-**

7) Some trying to be more positive by promoting resilience at work & home; highlighting

Data Results Analysis Reddit

1. Topic Modelling

- ‘**GenSim**’ Library
- Performed on all **12,665 Comments**
- Topics, $k = 3$

2. Sentiment Analysis

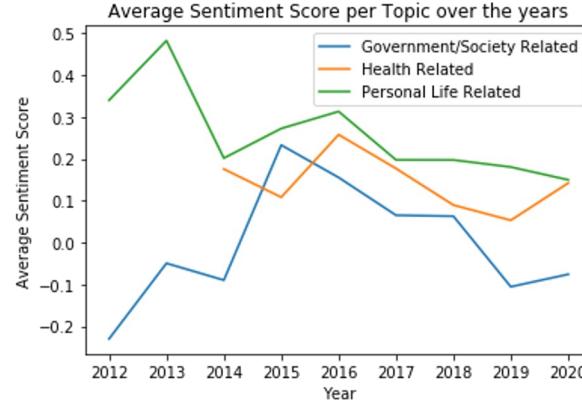
- ‘**NLTK**’ Library
- Recent increase in Sentiment for Government/Society & Health related Topics
- Recent decrease in personal related topics

SUMMARISED FINDINGS:

- 1) People sharing on their **personal life** such as discussing what had happened in school or work-related issues
- 2) People sharing their views on **government or society** such as Singapore’s 2017 Budget for Mental Wellness
- 3) People sharing how to **improve** mental wellness such as advising on whether to go for consultations
- 4) **Recent increase of sentiments** in government/society & health related topics

Scope of Collection

- Sub-reddit: r/singapore



Health Related

SMT202 G1 Group 4



Personal Life Related

SMT202 G1 Group 4



Government / Society Related

SMT202 G1 Group 4

Data Results Analysis Government Bodies and NGOs

Topic Modelling

- 'GenSim' Library
- Performed on all **192**
- Topics, k = 3



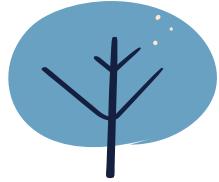
SUMMARISED FINDINGS:

- 1) Government is **investing** or making **budgets** on **infrastructures** or **initiatives such as Singapore's 2017 Budget for Mental Wellness**
- 2) Government/NGOs are **raising awareness** among schools and healthcare such as MOE & MOH setting up lessons
- 3) Government is implementing **policies** to **improve Singaporean's mental wellness**

Scope of Collection

- Stakeholders: 'moh','ministry of health','imh','institute of mental health','hpb','health promotion board','moe','ministry of education','mof','ministry of finance','silver ribbon'

Survey Results Analysis



Data Collection Target Respondents:

1. SMU Undergraduates
2. Non-SMU Undergraduates
3. Working Adults



Survey Results Analysis



48.8%

I find mental wellness strongly important.



82.9%

I find it **important/strongly important** to talking to someone when I face personal struggles.

What are some types of initiatives that would entice you to come down to SMU Connexion and participate?



SMU undergraduates

Interesting Insights

"Listening to the outliers"

Potential alternatives that could improve the mental wellness of Singaporeans?

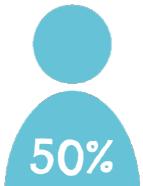
Remove the **stigma** of mental illness and be brave to share & talk about it



Handing out discount coupons, pet festivals, playing music at MRTs



Survey Results Analysis



50%

I find mental wellness strongly important.

* Remaining 50% finds it important

I find it important/strongly important to talking to someone when I face personal struggles.



72%

What are some types of initiatives that would entice you to come down to SMU Connexion and participate?



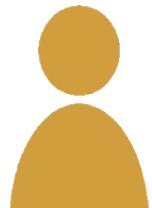
Non-SMU undergraduates

Interesting Insights

"Listening to the outliers"

Potential alternatives that could improve the mental wellness of Singaporeans?

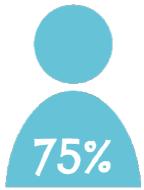
Conduct Self-awareness classes in community centres where such classes educate people to be more aware of mental illness and how to handle them.



Slow down pace in life and take a break, put away the emphasis on results, by joining family bonding activities



Survey Results Analysis



75%

I find mental wellness strongly important.

* Remaining 25% finds it important



75%

I find it **important/strongly important** to talking to someone when I face personal struggles.

What are some types of initiatives that would entice you to come down to SMU Connexion and participate?



Working Adults

Interesting Findings

"Listening to the outliers"

Potential alternatives that could improve the mental wellness of Singaporeans?

More can be done to raise public awareness in mental wellness....may be a campaign e.g. something like Purple Parade?



Social exercise classes e.g. Zumba
Interest groups for expansion of social groups and skills



Survey Results Analysis

Interesting Insights

SMU Undergraduates

- Misconception between mental wellness and mental illness
- Stigma on mental illness
- Importance to raise awareness on mental wellness

Non-SMU Undergraduates

- Prefer to have self-awareness classes in community centre
- Educate how to handle mental illness and raise awareness of them
- Encourage joining family bonding activities and slow the pace of their lives

Working Adults

- More can be done to raise awareness on Mental Wellness
- In the format similar to Purple Parade
- Focus on expansion of social groups and skills

CONSOLIDATED FINDINGS

WHO

- 1) Undergraduates/Students
- 2) Working Adults
- 3) Government Bodies
- 4) NGOs
- 5) Companies

GOAL

- 1) Learn how to take care of their mental health
- 2) Learn to practise self-care
- 3) Slow down the pace of living to relax
- 4) Avenues to practice mental wellness

NEED TO DO

- SAY**
- 1) Remove stigma of mental illnesses
 - 2) Make use of incentives like coupons
 - 3) Raise awareness of mental wellness and self-care
 - 4) Promote expansion of social groups and skills
 - 5) Humans are perfect companion
 - 6) Obstacles against self-care are lack of time and prioritising work/studies over personal mental health
 - 7) Working adults want objective opinions whilst Non-Working Adults want emotional support
 - 8) Angry at Indian Politics
 - 9) Sad from relationships
 - 10) Troubled of COVID-19
 - 11) Speak up on bullying and suicides
 - 12) Advises people on how to manage mental wellness
 - 13) Have lots of troubles with their personal life

PAINS

- 1) Not many outlets/avenues to practice mental wellness
- 2) Stigma on mental issues in local society

GAINS

- 1) Increase awareness of mental wellness
- 2) Build a supportive community
- 3) Have avenues to seek opinions & perspectives

DO

- 1) Exercise at least 2x a week
- 2) Meditate
- 3) Talk to someone/friends
- 4) Sleep
- 5) Join activities with family

- SEE**
- 1) Government making initiatives to improve mental wellness
 - 2) Lots of discussion on Singaporean's news like Monica Baey
 - 3) Recognizes the importance of mental wellness in Singapore
 - 4) Lack of mental wellness initiatives
 - 5) Reads up KPOP news
 - 6) Reads up self-care tweets

- HEAR**
- 1) Importance of mental wellness
 - 2) Stigma of mental illness (Misconception of mental wellness and mental illness)
 - 3) Important to speak to someone to seek opinions and advice
 - 4) Useful to gain perspective and seek guidance on personal struggles



Scan or click [here](#) to look into our analysis!

LEGEND
Black - All Blue - Twitter
Red - Reddit Purple - Survey
Green - Government Bodies/ NGO

Consolidated Root Cause Analysis





Basic Literature / Similar Solutions

Who else is out there?

Basic Literatures



Existing Solutions

Fitness Activities

"Participation in **low to moderate intensity** aerobic activity has previously revealed the **greatest mental health benefits** for exercise participants" (Babyak et al., 2000; Cox, Thomas, Hunton, & Donahue, 2004)

"Had **1.49 fewer days** of poor mental health in the past month than individuals who did not exercise" (Chekroud, 2018)

Events: AIA GLOW FESTIVAL

Human-Animal Interaction

There are both **direct and indirect** benefits on our interaction with animals to mental health

"Brings about social interaction and working in teams to care for animals fostered **a sense of belonging**" (Jau, 2014)

"Passionate caring linked to every human's inclination to work **towards self-actualisation**" (Jau, 2014)

Events: Pawsibility, Healing Paws

Chatbots

They provision "**Ecological momentary interventions**" (**EMIs**) for users.

"momentary health treatments provided via hand-held mobile technologies that **deliver psychological interventions** while people are engaged in their **typical routines** in their everyday life" (Heron & Smyth, 2010)

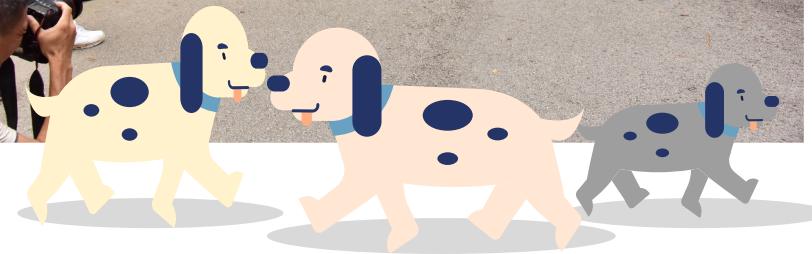
Part of a family of mental health apps (MHapps)

Woof-a-thon

Organized by Singapore Heart Foundation

Purpose:

- Opportunity for dog-lovers to get together and promote the cardiovascular benefits of walking your dog.
- Studies have shown that pet ownership, in particular dogs, help to reduce the risk of heart diseases, as dog owners are more likely to engage in walking and physical activities.



GoodWoof



Organized by Duke and Duchess of Richmond

Purpose:

- Started because of owner's personal experience with dogs in helping his mental wellbeing
- James Middleton attributes a great deal of his mental health and wellbeing to his dogs





Blue Ocean Strategy



Creating and capturing
uncontested market space

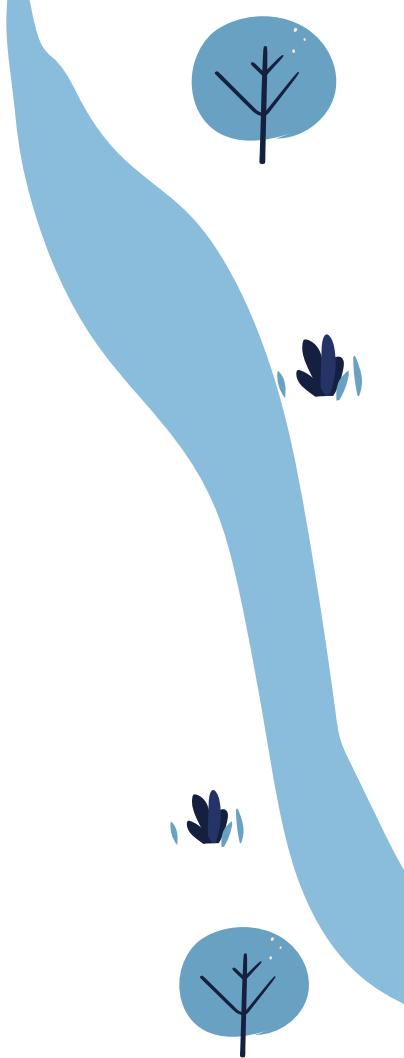
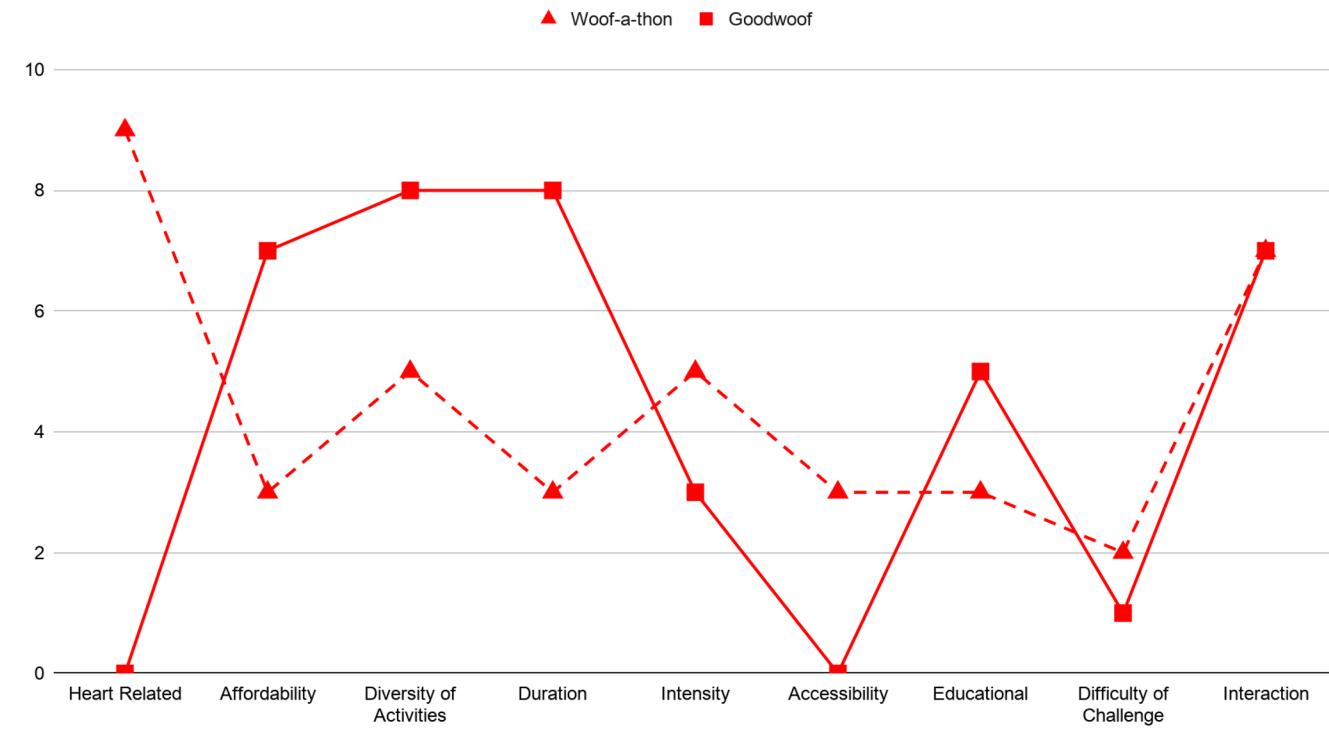
Blue Ocean Strategy: Factors



| Competitors | Pros | Cons |
|-------------|---|--|
| Goodwoof | <p><u>Diversity of activities</u></p> <ul style="list-style-type: none">- Many activities for dogs <p><u>Difficulty of activities</u></p> <ul style="list-style-type: none">- The activities are not challenging <p><u>Intensity of activities</u></p> <ul style="list-style-type: none">- Low intensity activities <p><u>Educational</u></p> <ul style="list-style-type: none">- Educational talks on how to enhance a dog's mental wellness but not on a person's mental wellness | <p><u>Duration</u></p> <ul style="list-style-type: none">- A 2 day event <p><u>Accessibility</u></p> <ul style="list-style-type: none">- Not accessible, there are no other points of interest nearby <p><u>Affordability</u></p> <ul style="list-style-type: none">- An adult ticket costs about 30.80SGD (19.50EURO) <p><u>Human Interaction</u></p> <ul style="list-style-type: none">- Some but not a lot of interaction with other humans |
| Woofathon | <p><u>Difficulty of activities</u></p> <ul style="list-style-type: none">- There are 2 types of run available and other activities that are not difficult <p><u>Duration</u></p> <ul style="list-style-type: none">- A 4 hour event <p><u>Affordability</u></p> <ul style="list-style-type: none">- 15SGD per person <p><u>Educational</u></p> <ul style="list-style-type: none">- Educational talks available | <p><u>Diversity of activities</u></p> <ul style="list-style-type: none">- The main event is the walkathon with a dog <p><u>Intensity of activities</u></p> <ul style="list-style-type: none">- Involves a 2.5km walk <p><u>Accessibility</u></p> <ul style="list-style-type: none">- The event is held in Punggol which is not very accessible <p><u>Human Interaction</u></p> <ul style="list-style-type: none">- Some but not a lot of interaction with other humans |

Blue Ocean Strategy Diagram

Woof-a-thon and Goodwoof



Proposed Solution



The illustration shows a woman with dark hair and glasses, wearing a brown t-shirt and blue shorts, playing with a small white dog with black spots. They are on a light blue path surrounded by a pink curved border. The background features stylized trees and plants in shades of blue and green.

The PAW-sitivity Race™

"Did someone mention dogs?"

The PAW-sitivity Race™

~~"An Amazing Race sprinkled with Dogs and Purpose: Mental Wellness Gains"~~

- Participants unwind and boost their mental wellness
- Educate participants on struggles of mental wellness
- Guide participants on how they can practise self-care
- Raise public awareness on Mental Wellness issues in Singapore
- Event is also open up to people interested in interacting with pets and people



The PAW-sitivity Race™

Target Group:

DETAILS

- ANYONE, specifically for students and working adults

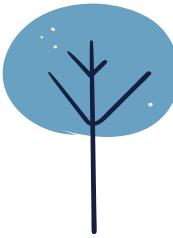
- * Participants are encouraged to bring their dog if they own one, else it's also O.K.!!

Location:

- SMU Connexion Building, SMU Green
- Fort Canning Park

Approximate Date and Time:

- June, on the weekend (Saturday/ Sunday)
- 3 - 7pm



"SAY WHAT? TELL US MORE!"



The PAW-sitivity Race™

DETAILS

Activities:

- Based on the interesting findings from doing Topic Modelling on Reddit and Twitter data

Examples:

1. K-POP
2. School/ Work
3. Personal Health
4. Government
5. Relationship
6. Awareness



An example:

The government booth will be a BINGO board game where each square represents a question on the government's efforts to improve mental wellness.

i.e. “Does Singapore Association of Mental Health have regular CCA days to instill mental wellness?”

Participants can only “occupy the box” if they answer correctly. Of course, they can use their phones to find the answer 😊

After forming a line, the station master would educate participants and wrap up learnings.

“COOLIOS! We’re gonna learn so much!”



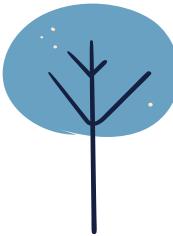
The PAW-sitivity Race™

Human Resources: DETAILS

SMU Peer Helpers

- Lead the team in the activities
 - Educate participants on the struggles of mental wellness
 - Counsel someone when necessary
-
- SMU People for Animal Welfare (PAW)/ SPCA
 - Gather people of shared interest of dogs
 - Educate people on the steps for handling dogs with care

 - SMU Mentoring Circle
 - Reach out to mentors to raise awareness of event



"Terrific"



APPLYING THINKING HATS

YELLOW

(Positive View)

1. Our solution is **highly inhabitant-centric; almost citizen obsessed** 😊
2. The raising of awareness caters to the views of **98%** of our respondents who believe raising **awareness on this topic** is a step closer to improving the nation's mental wellness.
3. Participants will **learn about issues** that have sensitively impacted the mental wellness of some individuals in our society
4. Participants will **learn how to self-care** in their seasons of mental unwellness
5. It's a **data-driven** planning of activities



RED

(Emotional)

1. Although **98%** of our respondents agree that mental wellness is important, small group of people are still unwilling to share their thoughts about mental wellness
 - **10%** of our respondents do not feel good talk to someone
 - **6%** of our respondents do not find it important talking to someone.

"I am not necessarily comfortable sharing my feelings with others" - SMU Student

WHITE

(Data Information)

1. **68%** of our respondents practice self-care 2 or more times a week
2. Dog-walking and mental wellbeing have a positive correlation from research (Westgarth, 2017)
3. **98%** of our respondents indicated that exercising would improve their mental wellness.
4. **70%** of our respondents identified humans as their perfect companion and 2nd most preferred is pets



GREEN

(Creative Thinking)

1. Using dogs as a means to bring various ages of people can **lower the "communicative barriers"** of our participants; creating **room for better quality conversations**
2. Incorporating **fun & educational elements** to encourage **human-to-human interactions** and improving Singaporeans' mental wellness at the same time.



The PAW-sitivity

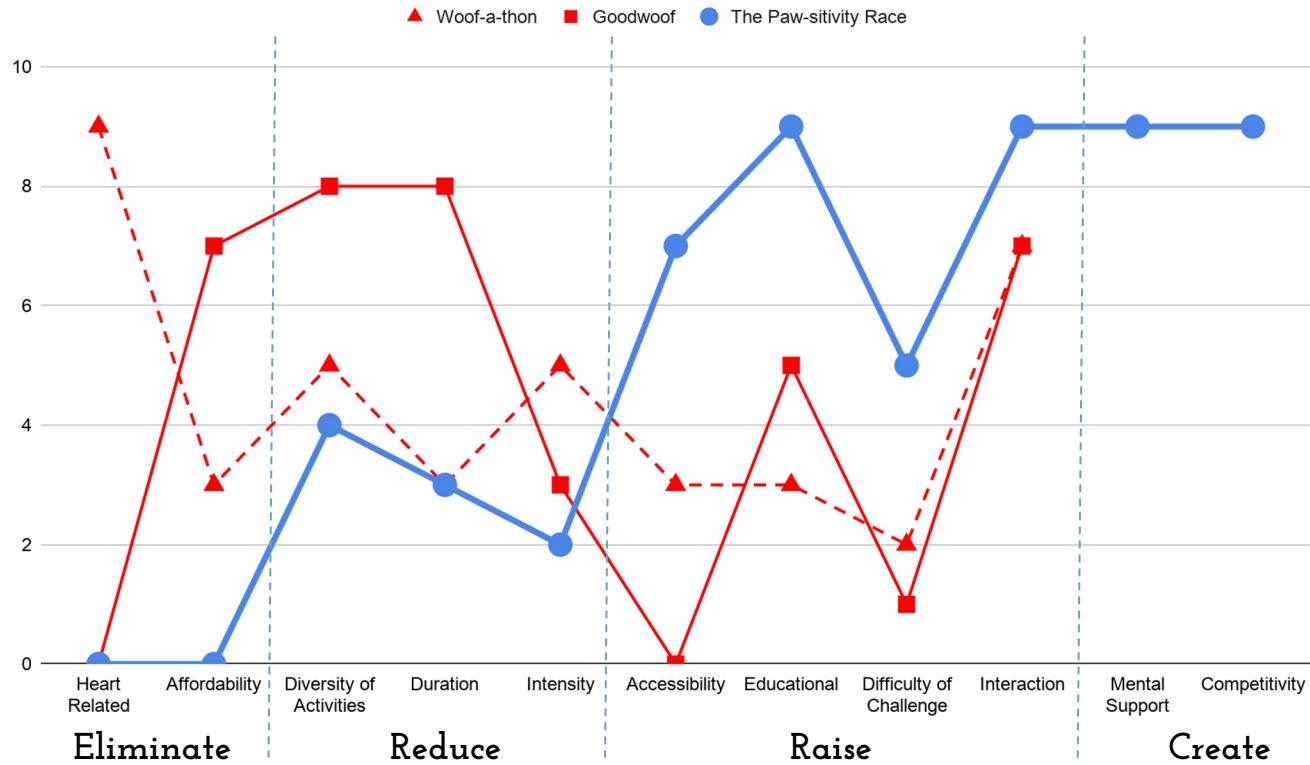
Race™

BLACK
(Logical Negative)

| Activity Domain | Potential Hazards | Control Measures |
|---|---|---|
| RISK ASSESSMENT | | |
| Event Regulations | Government issues fine / Get sued for negligent conduct in public space | 1) Dogs in a public space must be leashed and properly supervised 2) Certain dogs must be muzzled for safety of people and other pets. |
| Budget | Without sponsors, our event needs to collect participation fees , and face limited resources to have a bigger event | 1) Secure sponsors who support the cause: Non-Animal: Singapore Association of Mental Health, MCCY, ActiveSG Animal: SPCA, Vanillapup, Wholesome Paws, Nutro, Woofalicious |
| Weather on the day | If rain: outdoor events will face disruption , thunderstorms makes the dog handling tougher If haze: Unsafe to hold events for fear of health complications of participants with existing medical histories | 1) Propose to hold in June where rainfall has lesser occurrences 2) Hold events indoors 3) Ensure that Connexion building can still manage animals indoors 4) Monitor weather news for 2 weeks run up to event |
| Team Design | Participants would mishandle dogs on that day, fecal matter of dogs will be irresponsibly left behind , poor dynamics of team affects the experience for team | 1) Each team will have 2 dog handlers and 2 trained counsellors (either SMU Peer Helper or adult). All 4 will be first aid trained and be given safety briefs. |
| Safety - for Human and Pets <i>(More information can be found in our appendix)</i> | Dog bites, heat exhaustion of human participants, participants allergic to pets , dehydration | 1) Conduct event from 3 to 7pm to avoid heat 2) Have regular water points at each Game Station 3) Implement a system where participants can fall out at Game |

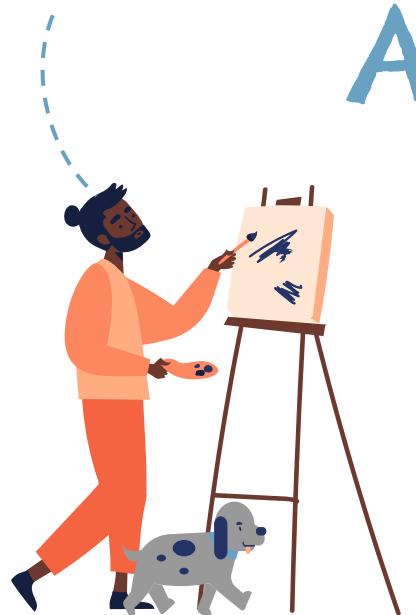
Blue Ocean Strategy Diagram

Woof-a-thon, Goodwoof and The Paw-sitivity Race

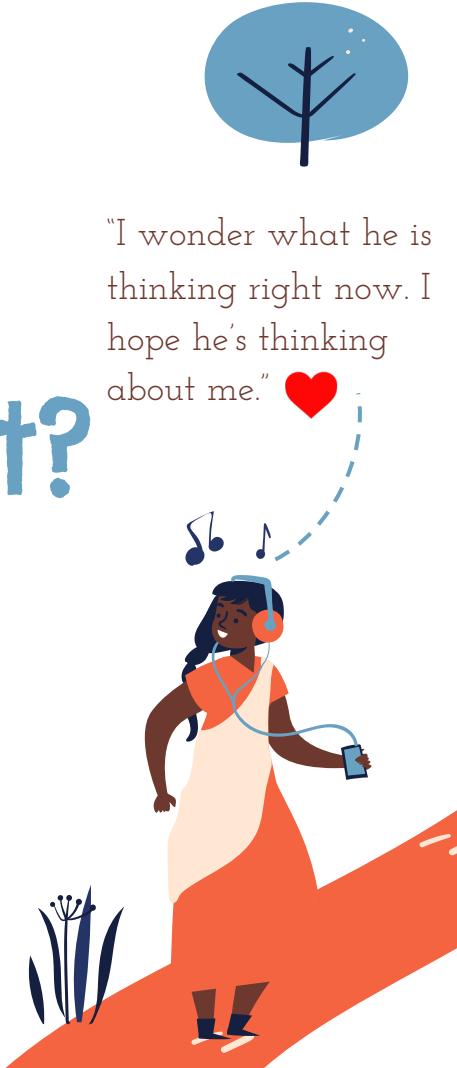




"I wonder will people actually come to our event? What are their characteristics?"

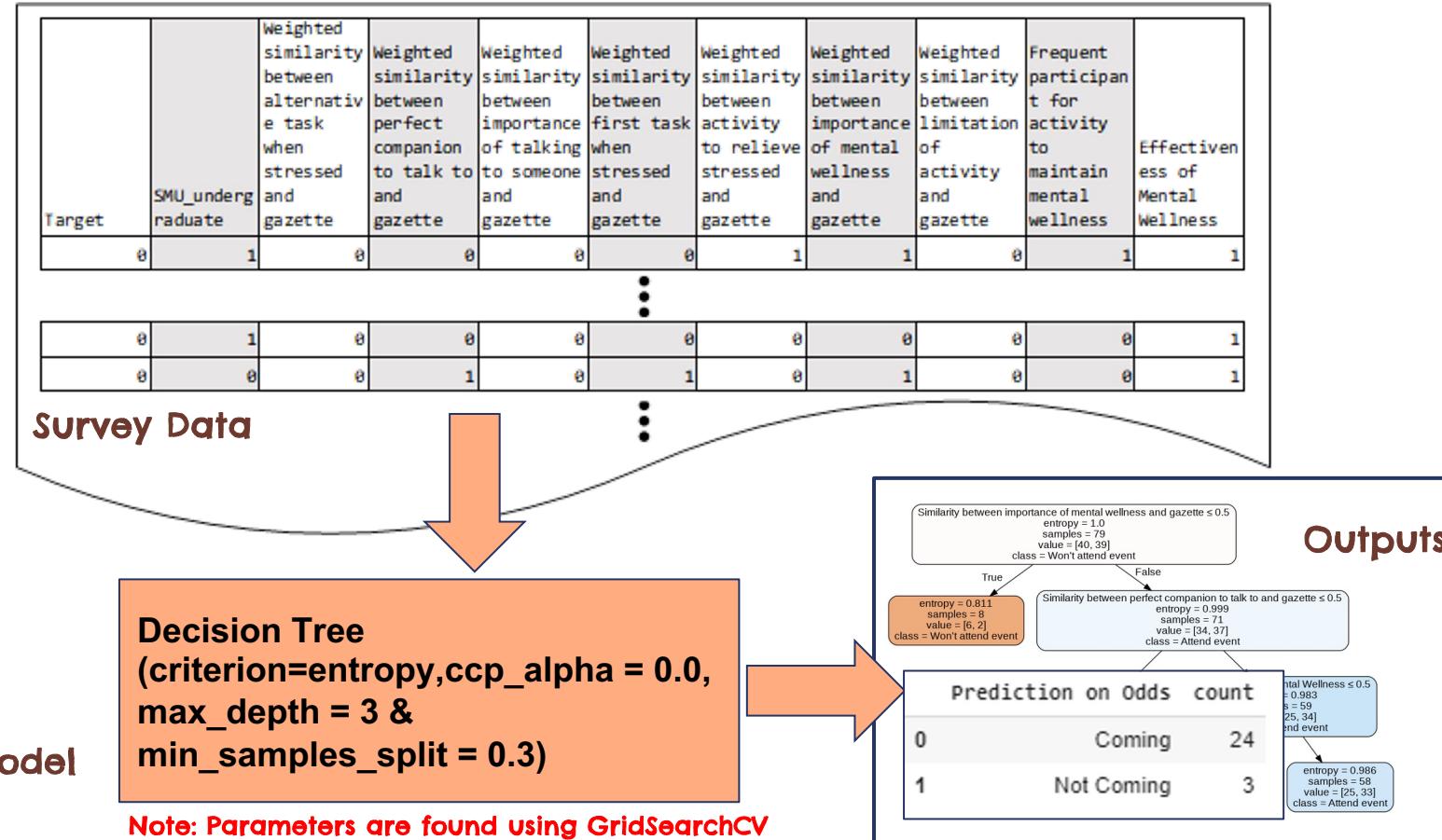


Will People Attend our Event? Who are they?



"I wonder what he is thinking right now. I hope he's thinking about me." 

Algorithm Details (Overview)



Algorithm Details (Data Wrangling)

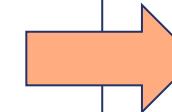
On average, how many times in a week do you roughly participate in the previously stated things you do to manage your personal mental wellness?

- None
- 1 time

What is your perfect idea of a companion?

- A Pet
- Human
- Music Instrument(s)
- Animated Objects

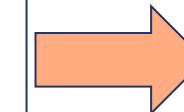
| | |
|-------------------------------------|----|
| Human | 74 |
| A Pet | 14 |
| Music Instrument(s) | 6 |
| God | 3 |
| Artificial Intelligence - Chat Bots | 2 |
| All of the above | 2 |
| | 1 |



| | |
|---|----|
| 1 | 73 |
| 0 | 33 |

How important does it mean to you to talk to someone whenever you face personal struggles?

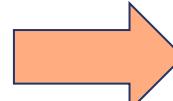
- Strongly Not Important Not Important Slightly Not Important Slightly Important Important Strongly Important
- -
 -
 -
 -
 -



| | |
|---|----|
| 1 | 99 |
| 0 | 7 |

Would you ever visit a counselling centre for personal help?

- Yes
- No



| | |
|---|----|
| 1 | 76 |
| 0 | 30 |

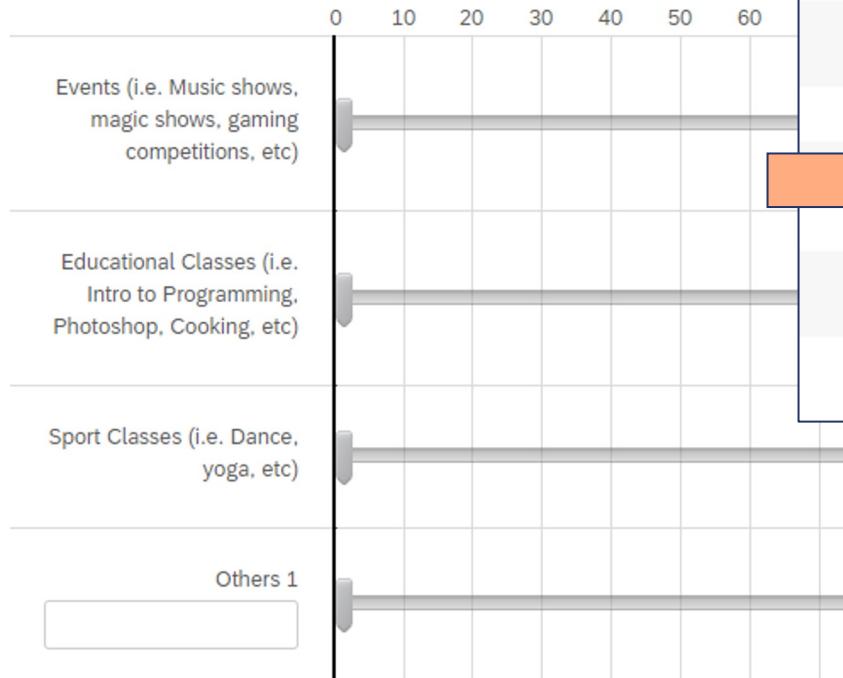
- Reason: To make the data less sparse

Algorithm Details (Feature Engineering)

The SMU Connexion building aims to be a hub in the Bras-Basah Bugis together, and creates social value for you and me.

What are some types of initiatives that would entice you to come down a

Note: The sum of value must sum to 100.



| | events_target | education_events_target | sport_event_target | final_target |
|--|---------------|-------------------------|--------------------|--------------|
| Events (i.e. Music shows, magic shows, gaming competitions, etc) | 1 | 0 | 0 | 0 |
| Educational Classes (i.e. Intro to Programming, Photoshop, Cooking, etc) | 1 | 1 | 0 | 1 |
| Sport Classes (i.e. Dance, yoga, etc) | 1 | 1 | 0 | 1 |
| Others 1 | 0 | 1 | 0 | 0 |

Reason: Did not have any questions which can be our target variable except for this question

Algorithm Details (Output)

The figure illustrates a decision tree model for predicting event attendance. The root node is a box containing the following information:

- Weighted Similarity between importance of mental wellness and gazette ≤ 0.5
- entropy = 1.0
- samples = 79
- value = [40, 39]
- class = Won't attend event

This root node branches into two paths:

- True Path (Orange Box):**
 - entropy = 0.811
 - samples = 8
 - value = [6, 2]
 - class = Won't attend event
- False Path (Blue Box):**
 - Weighted Similarity between perfect companion to talk to and gazette ≤ 0.5
 - entropy = 0.999
 - samples = 71
 - value = [34, 37]
 - class = Attend event

The False Path further branches into two more nodes:

- Orange Box (Left):**
 - entropy = 0.811
 - samples = 12
 - value = [9, 3]
 - class = Won't attend event
- Blue Box (Right):**
 - Effectiveness of Mental Wellness ≤ 0.5
 - entropy = 0.983
 - samples = 59
 - value = [25, 34]
 - class = Attend event

The Blue Box (Right) leads to two final leaf nodes:

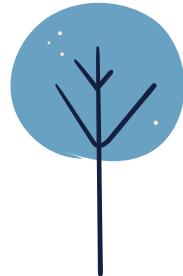
- Blue Box (Bottom Left):**
 - entropy = 0.0
 - samples = 1
 - value = [0, 1]
 - class = Attend event
- Blue Box (Bottom Right):**
 - entropy = 0.986
 - samples = 58
 - value = [25, 33]
 - class = Attend event

A large orange arrow points from the bottom right towards a summary table:

| Prediction on Odds | count |
|--------------------|-------|
| Coming | 24 |
| Not Coming | 3 |

Virtualization

Wonder what do PAW-sitivity
Race looks like?





Go to:

<https://edu.cospaces.io/Studio/Space/WC8Rb8son7SoXRTJ>

Navigate the
virtualization



Measuring Event Success



"Hold up! Mind suggesting how to **track** my event's performance?



01 Have an event hashtag

- Can perform **opinion mining**, and **topic modelling** on people's voices about events

02 Build Website w Google Analytics

- Enables you to record every user's interaction and path within your website!

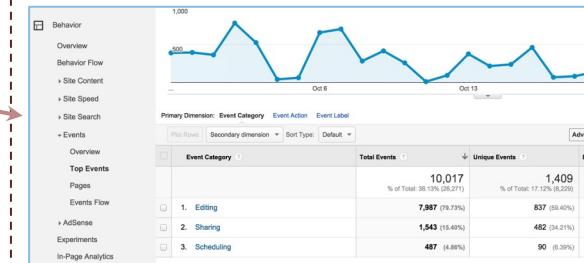
03 Post Event Surveys

- Metrics like **Net Promoter Score (NPS)** are crucial at determining event's success
- Offers an avenue for **analytical assessment**
- **Incentives:** Coupon vouchers by a sponsor!
- **Channels:** Online surveys, email

"thanks #paw-sivity for preparing me to self-care"

"#paw-sivity finally an event that raises urgency for mental wellness"

"#paw-sivity what a race it was! Full of woof, full of rest"





Limitations of Proposed Solution

1

Lack of Proper Survey Response

Most of the open-ended text are short. Usually ranging from 10 to 15 words.

3

Religious Practice Preference

Some people prefer to pray to improve their mental wellness instead of doing activities or go events

2

Misconception of Mental Wellness

People tend to associate mental wellness with mental illness

4

Lack of insights from certain stakeholders

Unable to reach out to government bodies and Mrs Wong Kwok Leong Student Wellness Centre for an interview



Conclusion

- Conversations on the importance of mental wellness have sprung forth from within our team and friends.
- As citizens recognize its importance as well, we truly hope that our proposed solution would contribute to it and the impacts which existing mental wellness campaigns have started.
- Creating societal value lies not only in the event itself, but in the events that come after.
- With that, we thank all peer helpers and citizens on their efforts to promote mental wellness in our little red dot – Singapore.





Scan or click [here](#)
to dive further
into our analysis!!



Scan this to go into
our virtualization!!

Thank You

Any Questions?





Key References

Accenture. (2019). Empowering 8 Billion Minds Enabling Better Mental Health for All via the Ethical Adoption of Technologies. Retrieved 16 February 2020, from
http://www3.weforum.org/docs/WEF_Future%20Council_Mental_Health_and_Tech_Report.pdf

Are You Too Stressed to Be Productive? Or Not Stressed Enough?. (2016). Harvard Business Review. Retrieved 27 January 2020, from <https://hbr.org/2016/04/are-you-too-stressed-to-be-productive-or-not-stressed-enough>

Benefits and limitations of cognitive behavioral therapy treatment. (2020). UKEssays.com. Retrieved 16 February 2020, from <https://www.ukessays.com/essays/psychology/benefits-and-limitations-of-cognitive-behavioral-therapy-treatment-psychology-essay.php>

Chekroud et al. (2018) Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: a cross-sectional study. Retrieved 20 February 2020, from:
<https://www.sciencedirect.com/science/article/abs/pii/S221503661830227X>

David, D., Cristea, I., & Hofmann, S. (2018). Why Cognitive Behavioral Therapy Is the Current Gold Standard of Psychotherapy. *Frontiers In Psychiatry*, 9. doi:10.3389/fpsyg.2018.00004



Key References

- Demers, N. (2013). THE RELATIONSHIP BETWEEN EXERCISE AND MENTAL HEALTH IN COLLEGE STUDENTS. Retrieved 20 February 2020, from
<https://library.ndsu.edu/bitstream/handle/10365/27187/The%20Relationship%20Between%20Exercise%20and%20Mental%20Health%20in%20College%20Students.pdf?sequence=1&isAllowed=y>
- Ecological momentary interventions: smartphones for digital mental health. (2017). National Elf Service. Retrieved 20 February 2020, from <https://www.nationalelfservice.net/treatment/digital-health/ecological-momentary-interventions-smartphones-have-changed-everything-and-heres-how-digital-mental-health-might-begin-to-catch-up/>
- Ghandeharioun, A. (2019). EMMA: An Emotion-Aware Wellbeing Chatbot. Retrieved 16 February 2020, from
<https://arxiv.org/pdf/1812.11423.pdf>
- GOH, T. (2019). Singapore spends \$3.1 billion on stress-related illnesses annually: Study. The Straits Times. Retrieved 27 January 2020, from <https://www.straitstimes.com/singapore/health/singapore-spends-31-billion-on-stress-related-illnesses-annually-study?login=true&close=true>



Key References

Hofmann, S., Asnaani, A., Vonk, I., Sawyer, A., & Fang, A. (2012). The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-analyses. *Cognitive Therapy And Research*, 36(5), 427-440. doi:10.1007/s10608-012-9476-1

How Urban Planning Can Support Mental Health. (2020). Retrieved 27 January 2020, from
<https://www.citylab.com/design/2016/12/how-to-support-mental-health-through-urban-planning/510833/>

Jaime Rosenberg (2019). Mental Health Issues On the Rise Among Adolescents, Young Adults. Retrieved 13 February 2020, from <https://www.ajmc.com/focus-of-the-week/mental-health-issues-on-the-rise-among-adolescents-young-adults>

Jau, J. (2014). Human - animal interaction and the benefits to mental health: A phenomenological study. Retrieved 20 February 2020, from
https://ro.ecu.edu.au/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=2486&context=theses_hons

Lim, S. (2019). A whopping 92% of working Singaporeans are stressed – and women are prioritising families over themselves, study finds. Retrieved 27 January 2020, from <https://www.businessinsider.sg/a-whopping-92-of-working-singaporeans-are-stressed-and-women-are-prioritising-families-over-themselves-study-finds/>



Key References

Nadarzynski, T., Miles, O., Cowie, A., & Ridge, D. (2019). Acceptability of artificial intelligence (AI)-led chatbot services in healthcare: A mixed-methods study. *DIGITAL HEALTH*, 5, 205520761987180. doi:10.1177/2055207619871808

Physical and Biological Factors. Retrieved 17 February 2020, from <https://www.sanemag.com/basics/mental-health/physical-biological-factors>

Schönfeld, P., Brailovskaia, J., Bieda, A., Zhang, X., & Margraf, J. (2016). The effects of daily stress on positive and negative mental health: Mediation through self-efficacy. *International Journal Of Clinical And Health Psychology*, 16(1), 1-10. doi: 10.1016/j.ijchp.2015.08.005

Suicide Facts and Figures | Samaritans of Singapore (SOS) Suicide Facts and Figures | Samaritans of Singapore (SOS). (2020). Retrieved 20 February 2020, from <https://www.sos.org.sg/learn-about-suicide/quick-facts>

Urban Redevelopment Authority. (2020). Retrieved 27 January 2020, from
<https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Regional-Highlights/Central-Area/Downtown>

Urban Redevelopment Authority. (2020). Retrieved 27 January 2020, from
<https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Themes/Liveable-and-Inclusive-Communities>

Appendices

(For more information)

Mental Wellness Key Terms (96)



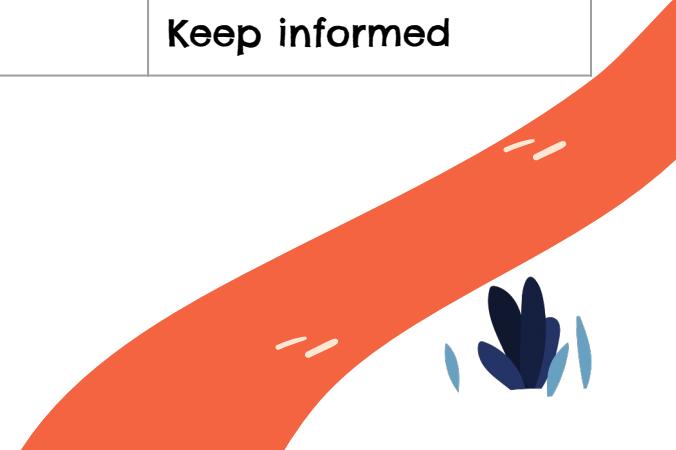
| | | | | | | | | | |
|----------------|----------------|-------------------------|---------------------------|----------------------------|-------------------------|-------------------------|-------------|---------------|-----------------|
| stress | despair | burden | love for oneself | healthy thoughts | no money | self actualization | bullying | psychology | spirituality |
| pressure | antidepressant | worthlessness | self care | excellent mental health | articulating thoughts | positive mindset | self-being | contentment | depress |
| mental tension | burnout | anxiety | good social relationships | too much work | emotional wellbeing | always reach out | anger | struggle | serenity |
| mental strain | emptiness | worry | emotional regulations | understanding surroundings | practice care | therapy | undepressed | bipolar | warmth |
| counsellor | overworked | insomnia | apprehension | social anxiety | level of stress | sleep deprivation | peace | counselling | dissatisfaction |
| insecurities | frustration | depression | distress | mental health | unsound mind | mentally unwell | crazy | disorder | unanxious |
| self-care | tired | suicide | panic | mental illness | pressuring environments | coping mechanism | stigma | meditation | |
| sanity | depressed | samaritans of singapore | hyperventilation | able to cope | well being | social stigma | imh | psychological | |
| messy | sad | sos | helpless | social wellbeing | stress management | able to manage emotions | insane | resilience | |
| lonely | dejected | die | hyperventilate | get help | treat yourself | mood swings | stress-free | confusion | |



Stakeholder Mapping (Might hide)



| Stakeholder | Level of influence | Level of interest | Priority of Engagement |
|-----------------|--------------------|-------------------|------------------------|
| Government Body | High | Moderate | Keep satisfied |
| Students | Moderate | High | Manage Closely |
| Working Adults | Moderate | High | Manage Closely |
| NGOs | Moderate | High | Keep informed |
| Companies | Low | Moderate | Keep informed |



Methodology to Listen

| Stakeholder | How? | Why? | Types of Analysis Adopted |
|---------------------------|------------------------------------|--|--|
| Students & Working Adults | Twitter API | Twitter provides a wide spectrum of public opinion on topics. Besides opinions, 'retweeting', 'replying' and 'following' other twitter users also means we can identify communities in the network of tweets. These features makes crawling twitter a highly ideal platform at listening to what's out there | <ol style="list-style-type: none">1. Network Analysis (using NetworkX)2. Topic Modelling (using GenSim)3. Sentiment Analysis (Valence Aware Dictionary and sEntiment Reasoner) |
| Students & Working Adults | Reddit API - r/singapore subreddit | Lots of uncensored & anonymous opinions or thoughts which are shared. Furthermore, a research paper has shown that it is possible to track mental wellness discussion over Reddit as it has provided them some meaningful insights. | <ol style="list-style-type: none">1. Temporal Analysis2. Topic Modelling (using GenSim)3. Sentiment Analysis (Valence Aware Dictionary and sEntiment Reasoner) |

Methodology to Listen

| Stakeholder | How? | Why? | Types of Analysis Adopted |
|---------------------------|------------------|---|--|
| Government Body & NGOs | Google Query API | To understand what are the laws, regulations or initiatives that are already devised, passed, and enforced. This will let us understand the boundary of our solution and what other values can we further create to improve Singapore's mental wellness | Topic Modelling (using GenSim) |
| Students & Working Adults | Survey | By conducting the survey, we were able to ask specific questions regarding mental wellness and sieve out the relevance and importance of mental wellness. In addition we are also able to gather the public's general interest on what sort of solution would be suitable to improve their mental wellness. | <ol style="list-style-type: none">1. Text Analysis (using Word Cloud)2. Machine Learning Approach (Using Decision Tree) |

Network Analysis Findings (I)

Community 5 - "Awareness of Issues"

Tweets: 176 (Largest Community)

Topic 0: $0.054 * \text{"anyone"} + 0.037 * \text{"never"} + 0.037 * \text{"true"} + 0.037 * \text{"lie"} + 0.037 * \text{"depressed"} + 0.036 * \text{"fun"} + 0.036 * \text{"bored"} + 0.036 * \text{"till"} + 0.031 * \text{"personal"} + 0.031 * \text{"nobody"}$

Topic 1: $0.121 * \text{"love"} + 0.066 * \text{"always"} + 0.064 * \text{"keep"} + 0.062 * \text{"wan"} + 0.060 * \text{"mental"} + 0.060 * \text{"ta"} + 0.060 * \text{"illness"} + 0.034 * \text{"lookout"} + 0.033 * \text{"everything"} + 0.033 * \text{"please"}$

Some tweets:

- "if you wanna love me you gotta love my mental illness too",
- "One day you're everything. The next, you're nothing. Don't expect to be of constant importance to anyone.",
- "It's fun till you get bored and depressed"
- "Always please keep a lookout for your most jovial, normal looking friends. Whom always say everything is fine."
- "deep deep depression bro"
- "Taught and raised to never burden anyone else with my personal problems but the true rationality lies in this: nobody can truly..."

Notes:

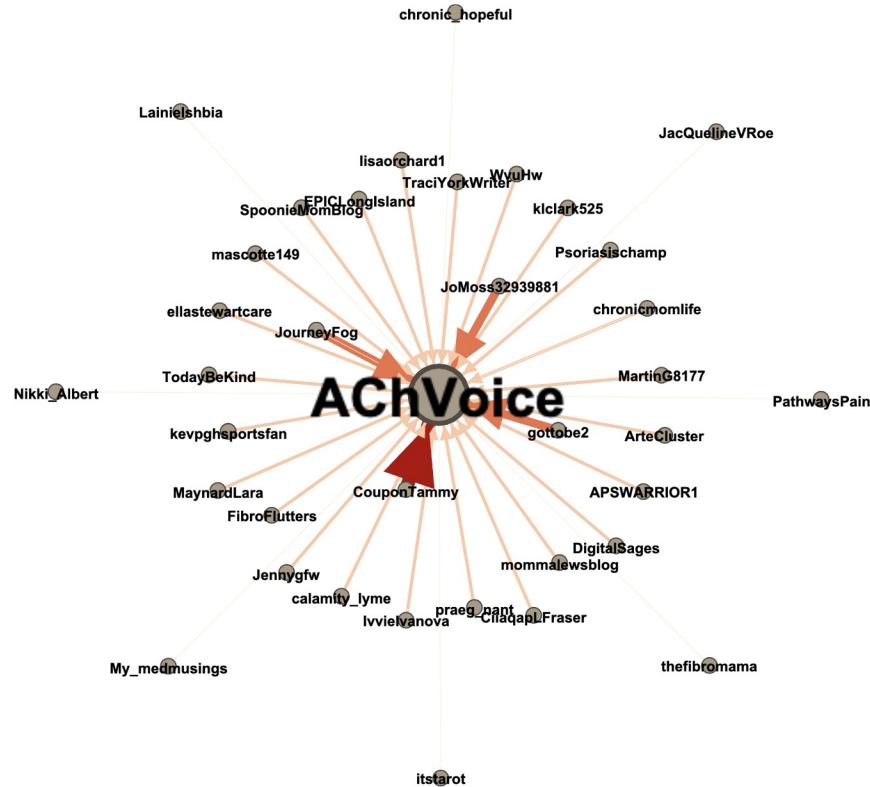
- **Size of nodes:** Betweenness Centrality¹ (@Daraljoshua is the most important user for this community)
- **Demographic:** High in-degree nodes are users from the Indian race; suggests an Indian community of users who share the same topic
- @Daraljoshua has the 2nd highest Betweenness Centrality node amongst all nodes from our data pull



¹ Betweenness Centrality is the measure of how often a node is the bridge between other nodes

Network Analysis Findings (II)

Community 7 - “A voice of self-caring”



Tweets: 46

Topic 0: 0.032*"maybe" + 0.032*"daily" + 0.026*"know" + 0.026*"body" + 0.026*"tired" + 0.026*"depressed" + 0.026*"sad" + 0.026*"fighting" + 0.026*"exhausted" + 0.017*"constantly"

Topic 1: 0.039*"and..." + 0.036*"selfcare" + 0.034*"picture" + 0.034*"le" + 0.034*"magazine" + 0.034*"energy" + 0.034*"becomes" + 0.034*"painted" + 0.034*"limited" + 0.034*"glamorous"

Some tweets:

- "I want to share what #microyoga is, how micro #yoga helps me as a mama with #chronicpain, #fatigue and #insomnia and tiny children and how you can use the tools too"
- "Firstly, know this: You are loved. You are not a #burden. This is not your fault. You are beautifully unique for a reason."
- "When your energy and #mobility are limited, #selfcare becomes a lot less glamorous than the picture painted in magazines and..."

Notes:

- **Most outer nodes:** Directed interactions beginning from @AChVoice (A Chronic Voice) user.
- **Middle and inner nodes:** Directed interactions from other users to @AChVoice.
- **Thickness of edge:** Count of Retweets or replies
- **Size of nodes:** Betweenness Centrality¹ (@AChVoice is the most important user for this community)
- **@AChVoice has the highest Betweenness Centrality** node amongst all nodes from our data pull

¹Betweenness Centrality is the measure of how often a node is the bridge between other nodes

Network Analysis Findings (III)

Observation from the following selected Communities:

Community 0 (COVID-19):

0: 0.112*"find" + 0.112*"type" + 0.112*"t..." + 0.112*"lot" + 0.112*"ableist" + 0.112*"right" + 0.112*"exactly" + 0.112*"rhetoric" + 0.013*"take" + 0.013*"distract"
1: 0.147*"take" + 0.088*"mental" + 0.088*"health" + 0.088*"socialdistancing" + 0.088*"care" + 0.088*"break" + 0.088*"sure" + 0.088*"distract" + 0.030*"rhetoric" + 0.030*"exactly"

In the midst of covid-19, there seems to be evidence that people agree with @NabaNaseer that the presence of covid-19 has its effects on mental wellness. Partly attributed to the stresses of getting it, as well as the social distancing.

Community 1 (Sensitive to K-Pop):

CommunityID: 1

0: 0.123*"fucking" + 0.113*"want" + 0.113*"happening" + 0.113*"dont" + 0.113*"life" + 0.103*"only..." + 0.015*"useless" + 0.015*"feel" + 0.015*"thing" + 0.015*"good"
1: 0.051*"ago" + 0.051*"taeyeon" + 0.051*"hence" + 0.051*"spin" + 0.051*"made" + 0.051*"fan" + 0.051*"tonight" + 0.051*"instead" + 0.051*"skill" + 0.051*"since"

This community is highly shaped by the Korean Pop Star community.. Languages used are very strong, which further emphasise how this community has it's mental wellness highly tied to the news of pop stars

Community 3 (Relationship issues):

0: 0.093*"look" + 0.093*"even" + 0.093*"u" + 0.093*"lol" + 0.093*"pretty" + 0.093*"struggle" + 0.032*"tired" + 0.031*"sick" + 0.022*"putting" + 0.022*"straight"
1: 0.055*"suka" + 0.055*"build" + 0.055*"senang" + 0.055*"islam" + 0.055*"wedding" + 0.055*"unne..." + 0.055*"stigma" + 0.055*"ikut" + 0.055*"part" + 0.055*"big"

Found a community of users who tend to agree with a couple of strong voices that echo sentiments of displeasure on people. Issues likely revolve relationships because it's always an emotional tie to partners, contains weddings, and ideas of looking pretty.

Community 4 (Indian Govt, with COVID 19 issues) (Neg):

0: 0.086*"government" + 0.086*"provide" + 0.086*"want" + 0.086*"mask" + 0.086*"taxpayer" + 0.086*"on..." + 0.086*"money" + 0.086*"sanitizers" + 0.086*"shaheenbagh" + 0.086*"spent"
1: 0.056*"fight" + 0.056*"india" + 0.043*"ancient" + 0.043*"medical" + 0.043*"harvard" + 0.043*"pranayama" + 0.043*"breath" + 0.043*"covid-..." + 0.043*"school" + 0.043*"blog"

Found a community that's retweeting issues related to the Indian government. Instances of depression related articles are observed - peer pressure, social anxiety. However, as is noticed on other communities, the community is in discussion on topics related to covid-19 as well.

Network Analysis Findings (III)

Community 5 (Awareness issues):

0: 0.054**"anyone" + 0.037**"never" + 0.037**"true" + 0.037**"lie" + 0.037**"depressed" + 0.036**"fun" + 0.036**"bored" + 0.036**"til" + 0.031**"personal" + 0.031**"nobody"
1: 0.121**"love" + 0.066**"always" + 0.064**"keep" + 0.062**"wan" + 0.060**"mental" + 0.060**"ta" + 0.060**"illness" + 0.034**"lookout" + 0.033**"everything" + 0.033**"please"

A similar kind of community to 3, but with lesser relation to relationships. It has tweets with regards to awareness on this issue.

Community 6 (News Channel Community):

0: 0.039**"school" + 0.035**"student" + 0.033**"bullying" + 0.033**"toh" + 0.033**"incident" + 0.033**"mee" + 0.031**"principal" + 0.029**"disciplined" + 0.029**"differentiates" + 0.029**"covid-19"
1: 0.047**"10" + 0.043**"coronavirus" + 0.033**"die" + 0.030**"uk" + 0.020**"year" + 0.019**"taunted" + 0.019**"schoolmate" + 0.019**"ugly" + 0.019**"fat" + 0.019**"—"

This community, as it's high in degree centrality nodes are news channels, reflect the current social issues that the world is facing - COVID 19. Perhaps the recency of news that is pulled means other topics are also retweeted (tho not reflective of the community here) on bullying.

Community 7 (A voice of self-caring):

CommunityID: 7

0: 0.032**"maybe" + 0.032**"daily" + 0.026**"know" + 0.026**"body" + 0.026**"tired" + 0.026**"depressed" + 0.026**"sad" + 0.026**"fighting" + 0.026**"exhausted" + 0.017**"constantly"
1: 0.039**"and..." + 0.036**"selfcare" + 0.034**"picture" + 0.034**"le" + 0.034**"magazine" + 0.034**"energy" + 0.034**"becomes" + 0.034**"painted" + 0.034**"limited" + 0.034**"glamorous"

A high in degree central node by the alias of @AChVoice had me deep diving. This user articulates #chronicillness from various #perspectives. This is a community that raises topics that promotes encouragement in the face of things that would impact one's mental wellness.

Community 8 (K-Pop - with a retweeting topic on just insomnia):

CommunityID: 8

0: 0.199**"new" + 0.199**"stanned" + 0.199**"yea" + 0.040**"ever" + 0.040**"never" + 0.040**"chart" + 0.040**"shak..." + 0.040**"today" + 0.040**"thought" + 0.040**"lisakko"
1: 0.104**"lisa" + 0.104**"dreamcatcher" + 0.104**"lisakko" + 0.104**"thought" + 0.104**"today" + 0.104**"chart" + 0.104**"never" + 0.104**"ever" + 0.075**"shak..." + 0.045**"shaking"

This topic is about a group of followers who are continuously retweeting a KPOP celebrity over a photo that describes "things with insomnia". While raising a word that has some relation to mental wellness, there was no "concern" about this topic. Primarily, it focuses on the "come-together" of 2 famous KPOP celebrities.

Network Analysis Findings (III)

Community 9 (A Muslim Advocate who promotes mental wellness by trusting in their god):

CommunityID: 9

0: 0.085**"many" + 0.085**"stressed" + 0.085**"stress" + 0.085**"forward" + 0.085**"yet" + 0.085**"want" + 0.085**"drive" + 0.085**"ppl" + 0.085**"m..." + 0.029**"caring"
1: 0.108**"feeling" + 0.108**"protect" + 0.108**"lot" + 0.108**"enough" + 0.108**"ending" + 0.108**"mindful" + 0.108**"risk" + 0.108**"caring" + 0.015**"m..." + 0.015**"ppl"

This community, continually retweets a user with alias @mizi_wahid. He is an author who published a book on religious faith - highlighting to trust in their god. People who retweet are likely those who endorse/agree. Hence, it's likely that this is a community of users who place faith as an importance in their lives.

Community 11 (Angst and Rage over lost life and politics in INdia):

CommunityID: 11

0: 0.037**"degree" + 0.030**"self" + 0.023**"state" + 0.023**"mp" + 0.023**"peacefully" + 0.023**"bound" + 0.023**"15" + 0.023**"year" + 0.023**"respect" + 0.023**"respnbl"
1: 0.023**"nallah" + 0.023**"zombie" + 0.023**"wound" + 0.023**"gruesome" + 0.023**"found" + 0.023**"12" + 0.023**"stab" + 0.023**"aspect" + 0.023**"sucking" + 0.023**"murder"

This community expresses anger and injustice in the lost of one person's life - an IB officer - and the politics tied to the indian government.

Community 12 (News of school bullying):

CommunityID: 12

0: 0.046**"worked" + 0.046**"reeking" + 0.046**"insecurity" + 0.046**"hidden" + 0.046**"validation" + 0.046**"self" + 0.046**"profile" + 0.046**"justification" + 0.046**"way" + 0.046**"as"
1: 0.036**"bully" + 0.028**"kneel" + 0.028**"apologise" + 0.028**"funeral" + 0.028**"commits" + 0.028**"teen" + 0.028**"suicide" + 0.028**"sia" + 0.020**"barça" + 0.020**"best"

This community expresses a network of tweets about the news of bullying. The facts here belong to issues from Malaysia and Singapore.

Community 13 (A set of tweets related to America's Donald Trump and issues about COVID-19)

CommunityID: 13

0: 0.031**"system" + 0.026**"u" + 0.021**"end" + 0.018**"even" + 0.016**"saying" + 0.014**"lot" + 0.014**"eye" + 0.014**"cheap" + 0.014**"expensive" + 0.014**"bit"
1: 0.025**"psychological" + 0.023**"abuse" + 0.023**"melania" + 0.023**"anyways" + 0.023**"emotional" + 0.023**"probably" + 0.023**"plenty" + 0.023**"honest" + 0.023**"get" + 0.018**"insomnia"

Network Analysis Findings (III)

Community 14 (celebrity):

CommunityID: 14

0: 0.067*"beijing" + 0.067*"everyone" + 0.067*"hope" + 0.067*"protection" + 0.067*"take" + 0.067*"stay" + 0.067*"safe" + 0.067*"home" + 0.067*"personal" + 0.067*"continue"
1: 0.067*"self-quarantined" + 0.067*"care" + 0.067*"good" + 0.067*"healthy" + 0.067*"currently" + 0.067*"continue" + 0.067*"personal" + 0.067*"home" + 0.067*"safe" + 0.067*"stay"

This is a community that is retweeting on the safe returns of a celebrity in the face of COVID 19

Community 15 (Unrelated):

CommunityID: 15

0: 0.071*"part" + 0.071*"admin" + 0.071*"reportedly" + 0.071*"purchase" + 0.071*"pressure" + 0.071*"weapon" + 0.071*"jakarta" + 0.071*"compelled" + 0.071*"russia" + 0.071*"plan"
1: 0.071*"drop" + 0.071*"trump" + 0.071*"prc" + 0.071*"abo..." + 0.071*"plan" + 0.071*"russia" + 0.071*"compelled" + 0.071*"jakarta" + 0.071*"weapon" + 0.071*"pressure"

Not related to mental wellness

Community 16 (Multi-faceted topics mentioned within this community):

CommunityID: 16

0: 0.030*"video" + 0.025*"part" + 0.022*"overcome" + 0.020*"personality" + 0.019*"ad" + 0.017*"click" + 0.017*"infj" + 0.017*"enfp" + 0.017*"naturally" + 0.017*"depression"
1: 0.035*"coronavirus" + 0.035*"die" + 0.032*"left" + 0.032*"overwhelmed" + 0.032*"will" + 0.032*"italian" + 0.032*"country" + 0.032*"heartbreaking" + 0.032*"80" + 0.019*"click"

Contents include COVID-19, therapy, spiritual wellness.

Community 17 (Unrelated):

CommunityID: 17

0: 0.172*"plz" + 0.156*"gst" + 0.156*"launch" + 0.156*"2.0" + 0.156*"taxation" + 0.156*"issue" + 0.001*"loss" + 0.001*"report" + 0.001*"business" + 0.001*"thanks"
1: 0.047*"hindu" + 0.040*"caused" + 0.040*"hidden" + 0.040*"crucial" + 0.040*"risk" + 0.040*"nature" + 0.040*"thanks" + 0.040*"business" + 0.040*"report" + 0.040*"loss"

This is a spam community.

Network Analysis Findings (III)

Community 18 (a genuine community that openly shares and retweets one another on topics related to mental wellness)

CommunityID: 18

0: 0.010**"anger" + 0.008**"entire" + 0.008**"sad" + 0.008**"towards" + 0.007**"continue" + 0.007**"die" + 0.007**"meet" + 0.007**"race" + 0.007**"holding" + 0.007**"choice"
1: 0.019**"work" + 0.013**"co" + 0.008**"sun" + 0.008**"around" + 0.007**"lol" + 0.007**"health" + 0.007**"bet" + 0.007**"mental" + 0.007**"online" + 0.007**"hub"

Community 20 (celebrity):

CommunityID: 20

0: 0.193**"he..." + 0.033**"fight" + 0.033**"🤣wonho" + 0.033**"😭🙏❤️" + 0.033**"work" + 0.033**"bullying" + 0.033**"time" + 0.033**"chaotic" + 0.033**"think" + 0.033**"🤣"
1: 0.084**"support" + 0.076**"x" + 0.044**"reinstatement" + 0.044**"wonhois..." + 0.044**"monsta" + 0.036**"reply" + 0.028**"mbbs" + 0.028**"u" + 0.020**"mx7" + 0.020**"close"

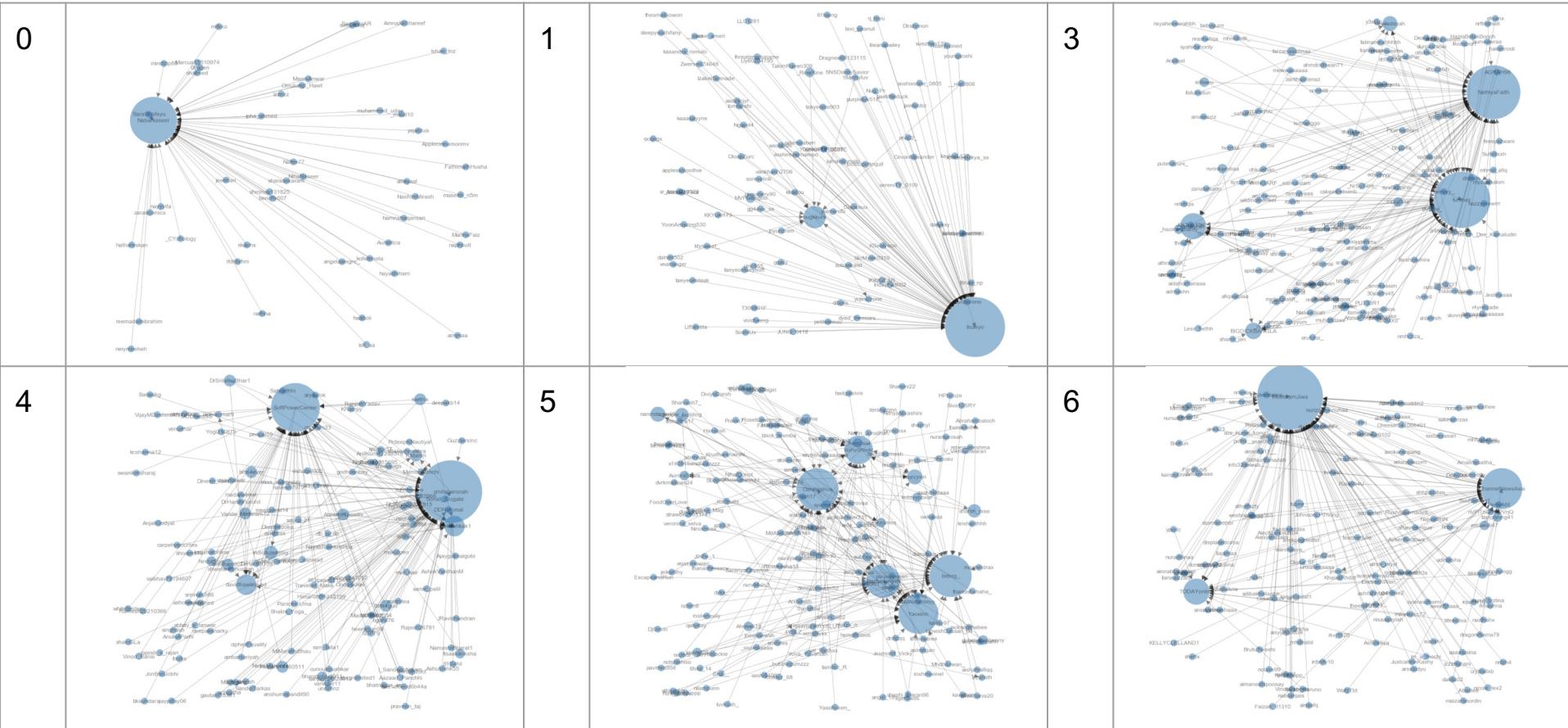
A community that is unrelated to mental depression, but about a celebrity. Another spam community.

Community 21 (An individual that's promoting mental wellness by affirming how others can switch their mindsets):

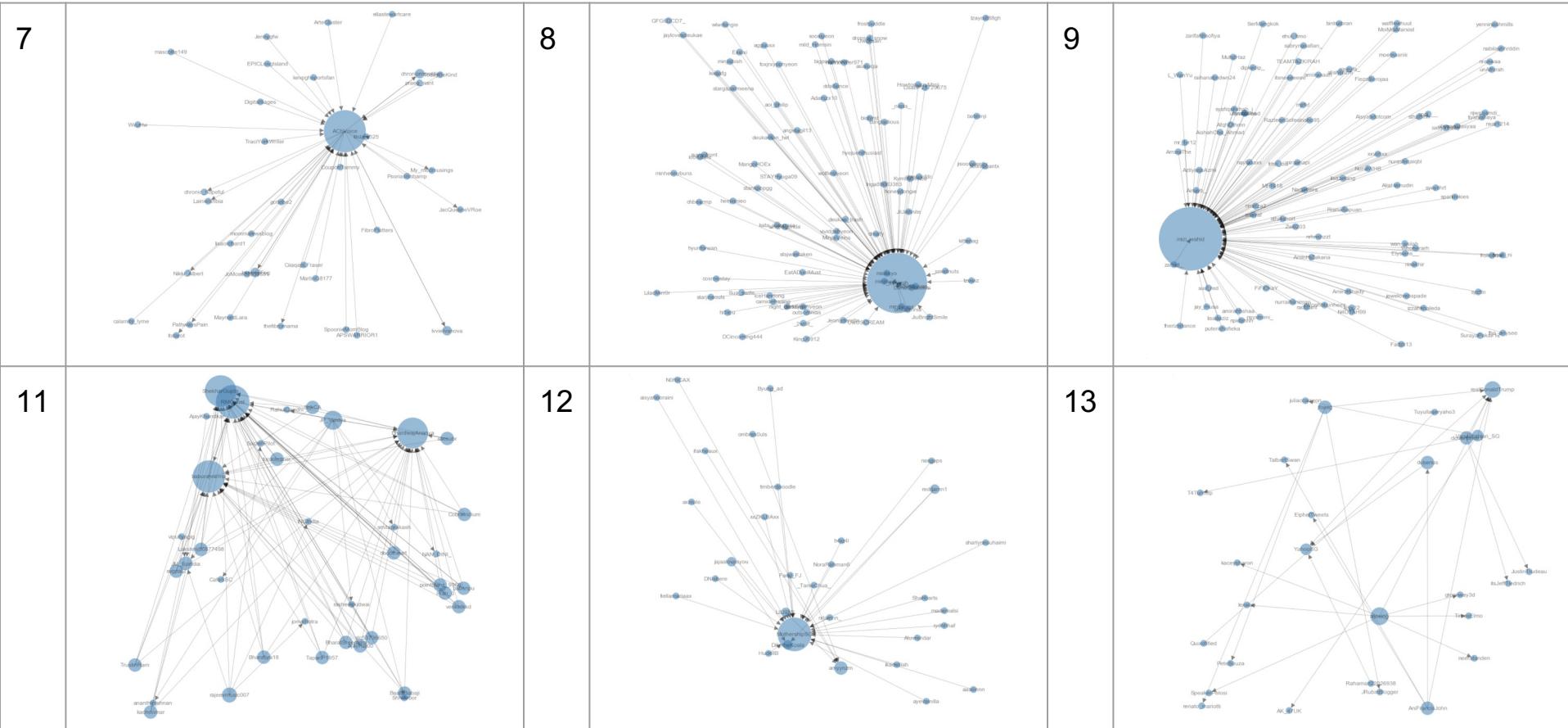
CommunityID: 21

0: 0.231**"young..." + 0.067**"despair" + 0.038**"♡" + 0.037**"missing" + 0.037**"slam" + 0.037**"tuesgetherforever" + 0.037**"find" + 0.037**"soon" + 0.037**"slip" + 0.037**"door"
1: 0.086**"helpless" + 0.086**"mentality" + 0.086**"switch" + 0.086**"healing" + 0.086**"broken" + 0.086**"growing" + 0.086**"watch" + 0.086**"life" + 0.086**"fast" + 0.071**"changes..."

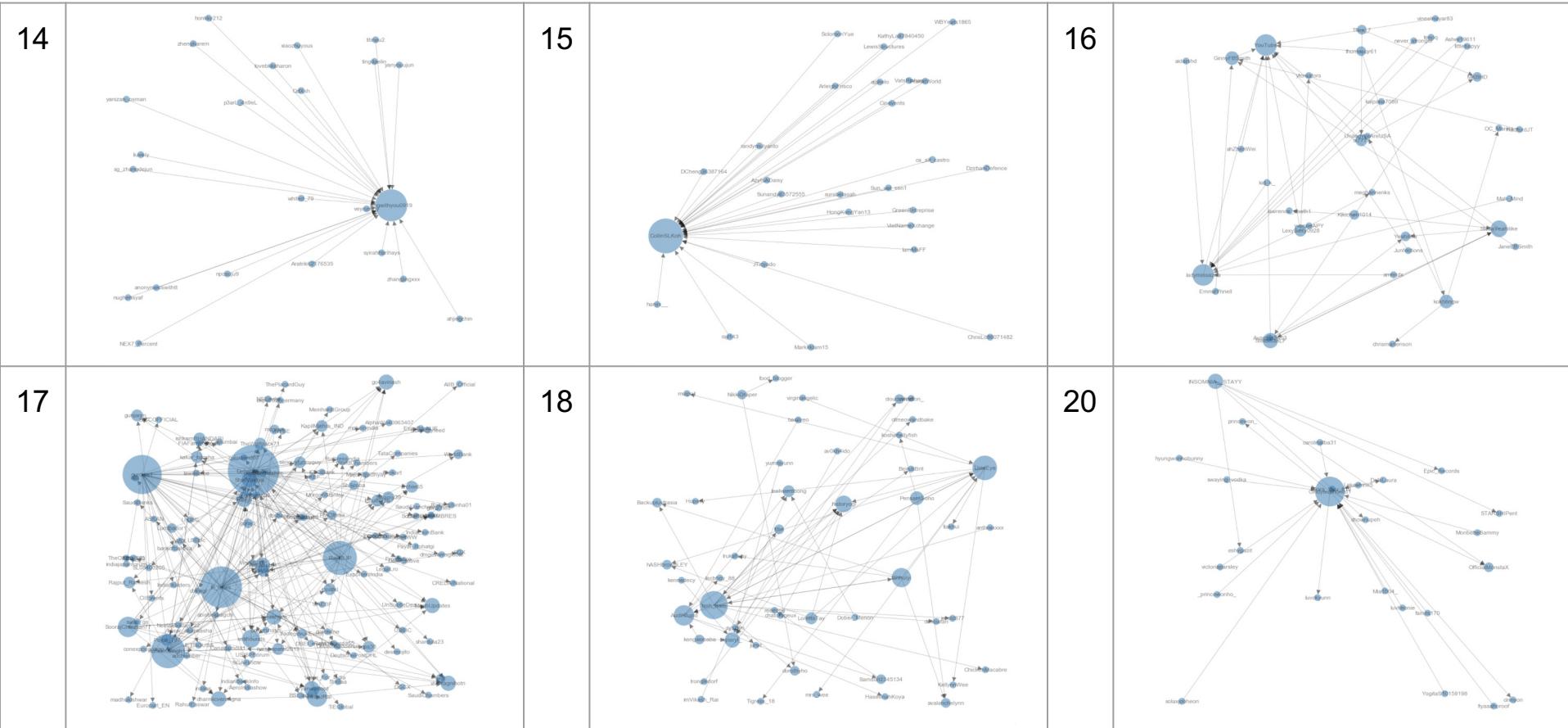
Network Analysis Findings (IV)



Network Analysis Findings (IV)

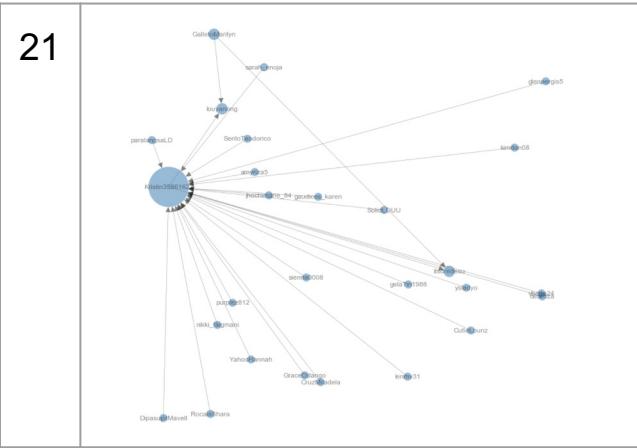


Network Analysis Findings (IV)



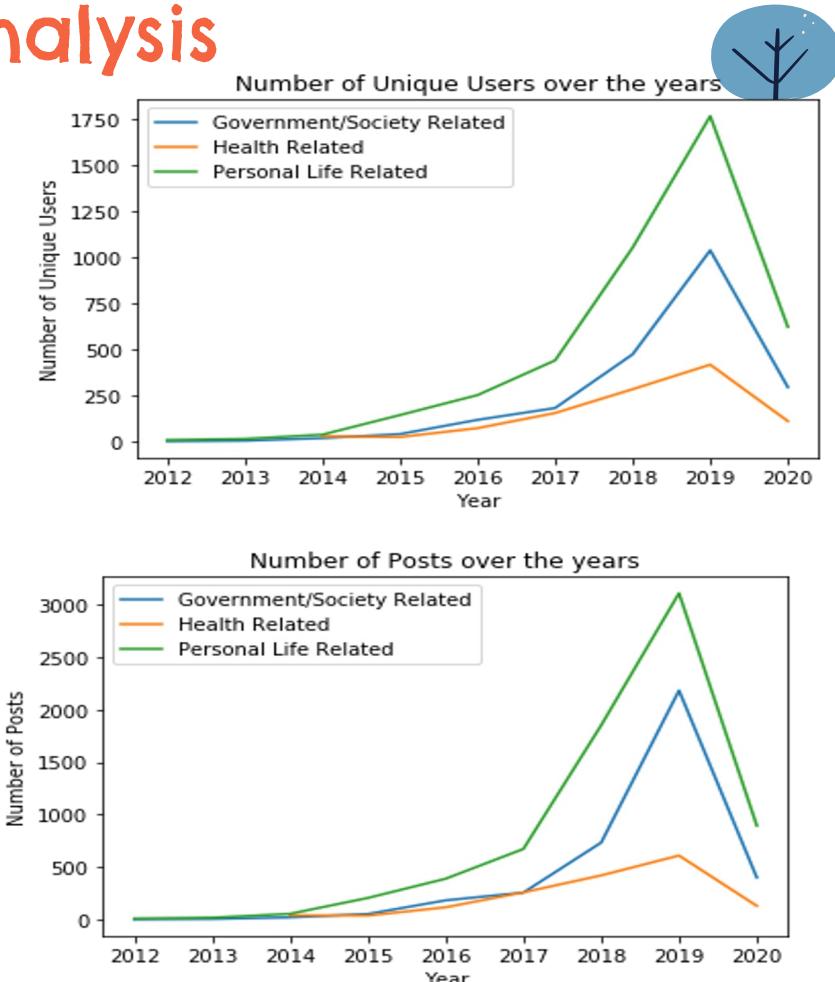
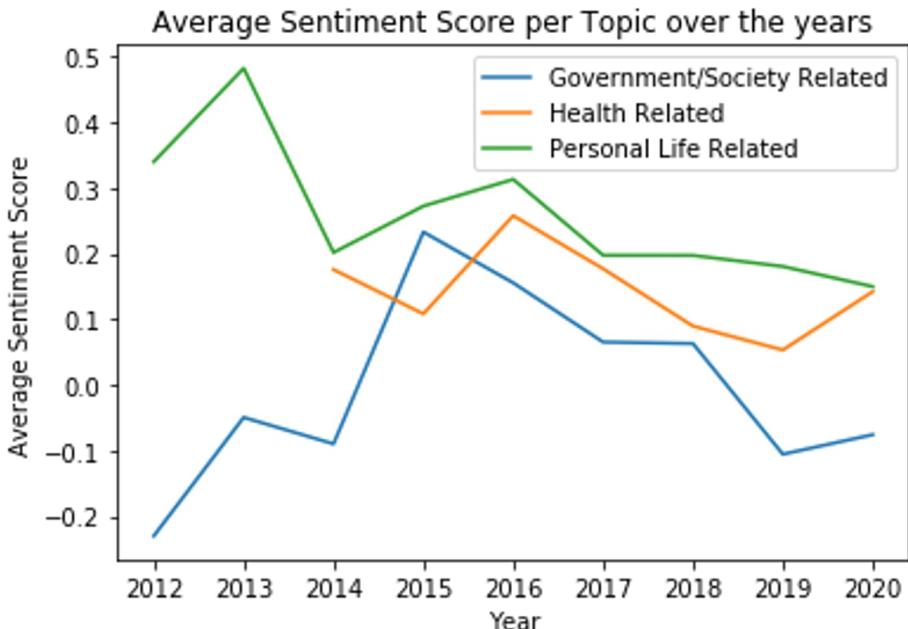
Network Analysis Findings (IV)

21



Crawling Data Results Analysis

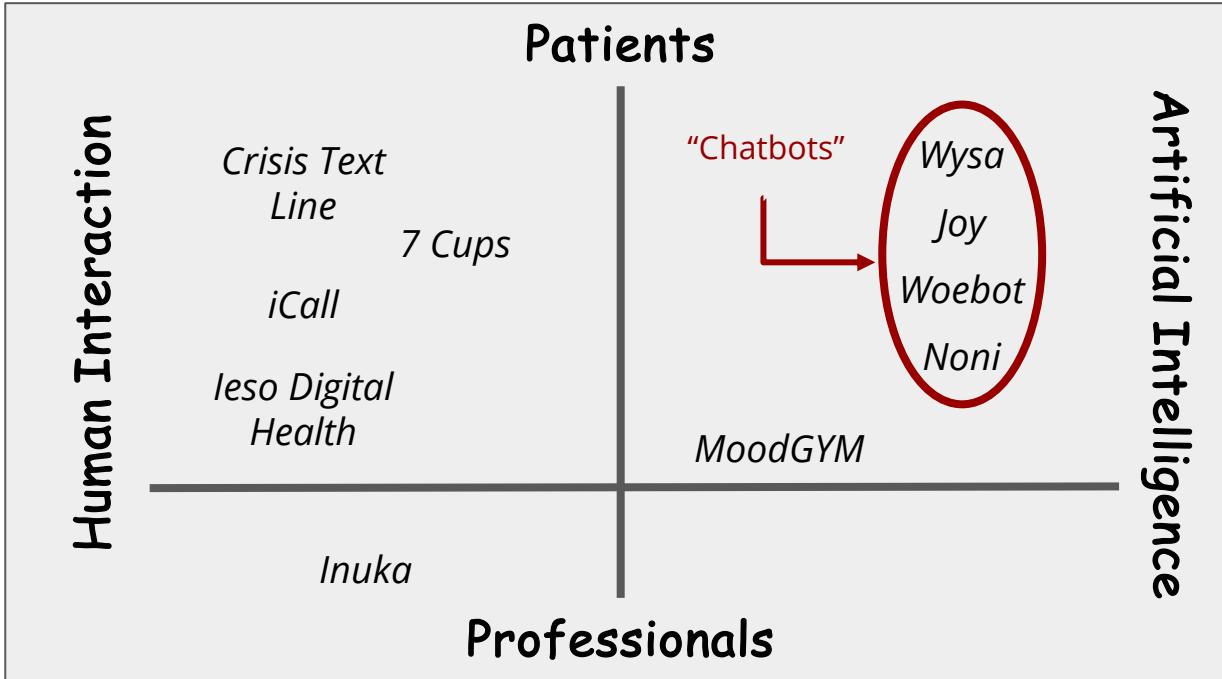
Reddit



Basic Literatures



ii) Matchmaking Mental Health with Technology



Both technology and mental healthcare already **co-exist** with significant *investments and outlook*.

- Global digital health market = ~\$118B
- Mental Tech Start Up funding **tripled** across 2014-2019
- 65% of UK workers open to technology *managing* own mental health
- Examples of technology:
 - i) Mobile Technology
 - ii) Internet Technology
 - iii) Artificial Intelligence

Basic Literatures

iii) Exploring Chatbots

They provision “**Ecological momentary interventions**” (EMIs) for users.

“momentary health treatments provided via hand-held mobile technologies that deliver psychological interventions while people are engaged in their typical routines in their everyday life” (Heron & Smyth, 2010)

Features: “personalizing interventions towards user preferences”, “using sensor data to derive *timing* of interventions”, “on-the-go interventions”

Part of a family of **mental health apps** (**MHapps**)



Chatbot Market Perception

(not on Singapore Market)
n = 215

| | | | | | |
|-----|---|-----|---------------------------------------|-----|---|
| 6% | Heard of Chatbots | 3% | Used Chatbots | 67% | Would use Chatbots within 12 months |
| 78% | Use Chatbots to seek health info | 67% | Use Chatbots to seek info of symptoms | 39% | Use Chatbots to seek results of medical tests |
| 61% | Comfortable outlining symptoms to Chatbot | 73% | Prefer F2F with doctor about health | 32% | Did not find it strange talking to Chatbot |

Basic Literatures



iv) Classes of Interventions

Cognitive Behavioral Therapy (CBT): A type of psychotherapeutic treatment that helps patients understand the thoughts and feelings that influence behaviors.

Strengths

- A widely studied form of psychotherapy
- Strong evidence-base across various treatments
- Robust support was observed when tailored to children

Limitations

- Requires consistency from users end due to its structured nature of treatment
- May not address the underlying causes
- When patient cannot control emotion, adaptive cognition becomes difficult

Structured Association Technique (SAT): Uses visual stimuli obtained by viewing images to quickly identify unrecognized real feelings and desires by functioning associations, inspiration, and intuition.

Strengths

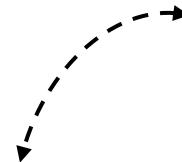
- Achieves effectiveness in one-time uses
- Yet, can be repeatedly used on daily basis

Limitations

- Not widely explored

The PAW-sitivity Race™

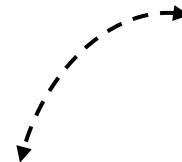
BLACK
(Logical Negative)



| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|---|---|----------|------------|----------------------------------|---|
| Regulations Are there any regulations for hosting dog events such as ours? | Might be penalized by the government. Might be sued for negligent conduct of pets in a public environment | 7 | 6 | 42 | <p>1) Dogs in a public space must be leashed and properly supervised and controlled. In addition, certain dogs will need to be muzzled for the safety of people and other pets.</p> <p>2) Apply <u>natural flea and tick prevention</u> on your dog before heading down</p> <p>3) Clean poop, avoid the damage and endangerment of properties; toilet trained</p> <p>4) If bringing your own animals, be prepared to train and practice walking your dog 2 weeks before</p> |
| Budget Who can we target for sponsorships? | Without sponsors, our event may require the need to collect participation fees, and face limited resources to have a bigger event | 7 | 8 | 56 | <p>Non-Animal Related Sponsors</p> <ul style="list-style-type: none"> - Singapore Association for Mental Health (SAMH) - Singapore Management University (SMU) - Health Promotion Board (HPB) - Ministry of Culture, Community and Youth - ActiveSG - Google, Deloitte, Johnson & Johnson <p>Animal Related Sponsors</p> <ul style="list-style-type: none"> - Society for the Prevention of Cruelty to Animals (SPCA) - Animal and Veterinary Service - Vanillapup - Wholesome Paws - Woofalicious - Pet Lovers Centre - Nutro |

The PAW-sitivity Race™

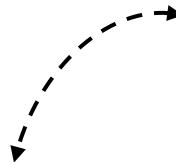
BLACK
(Logical Negative)



| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|--|--|----------|------------|----------------------------------|---|
| Weather What are the wet weather plans, if any? | If begins to rain heavily, outdoor events will be cancelled due to the inconvenience of mobility. Dogs might be afraid of thunderstorms, which makes them behave wildly that might put untrained users at risk of safety. | 3 | 5 | 15 | <p>There are two approximate monsoon seasons in Singapore: Northeast Monsoon Season (December-March) and the Southwest Monsoon Season (June-September).</p> <p>In a heartbeat, we propose holding our event in the shared breaks of SMU and pre-university schools - June holidays!</p> <p>However, in the event of rain, we'll take the party inside!</p> <p>Reasons:</p> <ul style="list-style-type: none"> 1) Dogs might be afraid of thunderstorms, so best bring inside 2) Can't proceed with an outdoor event in the rain <p>Wet Weather Plans:</p> |
| Weather What if there's a haze? | The air outdoors would risk participants, especially asthmatic patients | 3 | 2 | 6 | <p>We would work closely with the NEA guidelines to monitor the weather and news about haze related issues prior to the week.</p> <p>If haze persists, we propose cancelling the event.</p> <p>However, if haze were to appear for the first time in that season, we propose shifting our activities indoor.</p> |

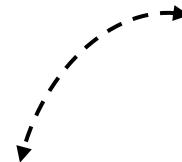
The PAW-sitivity Race™

BLACK
(Logical Negative)



| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|--|---|----------|------------|----------------------------------|---|
| Team Design What if there's a team with no one who proficiently knows how to walk a pet? | Participants might accidentally mishandle the pets being loaned to them. Participants may not know how to clean up the faecal matters of dogs. | 5 | 8 | 40 | Our team proposes that each team be included 2 dog handlers (each team would have 2 dogs), and 2 trained counsellors (either student or adult), on top of the normal count of participants. One of the 2 trained counsellors would be placed in charge of the group. Our team recognizes that dog handlers can ensure that the event continues to run smoothly with minimal disruption between stations. At the same time, having a trained counsellor maximises the chances that our participants get to be educated on the issues of mental wellness either during station activities or normal conversations. |
| Team Design Is there someone trained to facilitate any mental wellness discussion that takes place in the event? | Someone might hold a strong view against an issue of mental wellness. In the process, with no mediator who is familiar with mental wellness topics, it might disrupt the dynamics and enjoyment of other participants in a group. | 5 | 8 | 40 | |

The PAW-sitivity Race™

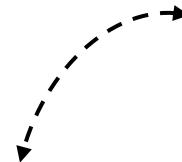


| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|---|---|----------|------------|----------------------------------|---|
| No shared interest Main organizer, who we are pitching to, does not like dogs.. How leh? | Our event may not have its buy-in which means we cannot put forth such a proposal. | 10 | 2 | 20 | <p>Who doesn't love dogs? But jokes aside, we have data points to indicate that dogs have a good correlation with mental wellness.</p> <p>From our basic literature in the mid term presentation, we have supporting evidences that exercising and human-animal interaction have positive impacts on mental wellness.</p> <p>Specifically, for dogs, there is significant improvement in well-being when individuals spend at least 20 minutes with dogs - https://www.mdpi.com/1660-4601/14/5/483/pdf.</p> |
| Human Safety What if a dog bites? | If someone gets hurt, be it bitten by a dog or trips and has an abrasion, the lack of a trained medic might make the pain more contaminated, risking the safety of that victim. | 6 | 2 | 12 | <p>As mentioned, putting a dog-trained personnel should ensure mishandles and misbehaviours. That said, we'll be sure to only work with suppliers (SMU PAW) to only provide play-friendly dogs.</p> <p>However, as we can't eliminate the chances of such an incident, we would ensure that all trained counsellors are first aid trained.</p> |

The PAW-sitivity Race™

| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|--|---|----------|------------|----------------------------------|---|
| What if got heat exhaustion? | Participant faints in the middle of stations | 9 | 4 | 36 | <p>We aim to conduct our event in the time periods of 3-7pm. This avoids the high temperatures at noon time.</p> <p>We would also have regular water breaks for both pets and human participants.</p> <p>In the event that someone faints, we would evacuate them to the nearest hospital - Raffles Hospital Accident & Emergency</p> |
| Participant has no more water in their bottles | Participants may become dehydrated | 5 | 5 | 25 | Each station would have supplies of water / refreshment drinks |
| Participants, unknowingly, become allergic to pets | Participants may get random rashes or shortness of breaths, sneezing | 3 | 5 | 15 | Participants can fall out at the permission of the trained counsellor who is placed in charge of the group. Will raise it clearly that event involves handling dogs too. |
| Uneven flooring | Participants may trip and hurt themselves | 1 | 6 | 6 | <p>Nothing much we can do, but continually emphasise caution over each participant.</p> <p>In the event someone trips and hurts themselves, the first aid trained counsellor would be able to attend.</p> |
| Unwell participants | An unwell participant might have her or his condition exacerbated due to the heat of the day. Participants face a cramp. | 2 | 5 | 10 | We would have each participant sign a declaratory form that has them informing the organisers that they are healthy. Should they be unwell, we can still keep them within the vicinity of Connexion where they can interact with other educational materials/posters. |
| Pet Safety What if the dog is not feeling well? | Pet might not face early enough treatment which puts itself in a riskier position to recover from | 3 | 4 | 12 | If pets are suddenly unwell, as per the dog-trained personnel's advice, we would leave the pet at a station and proceed on with the race. |

The PAW-sitivity Race™



| Activity Domain Element | Potential Hazards | Severity | Likelihood | Risk Total (Risk *Likelihood) | Control Measures |
|--|--|----------|------------|----------------------------------|--|
| Noise Pollution Will it be too noisy? | The outburst of noise could disrupt the activities of other fellow citizens being in a park - i.e. meditation, yoga, nearby religious activities | 1 | 6 | 6 | Ensure that park adherence is met |
| Disabled persons coming down What if someone disabled turns up and wishes to participate? | Disabled persons might be turned away which could stir the wrong message that mental wellness is only for abled people. | 1 | 1 | 1 | Event would be publicised as an "amazing race". However, we would make the Connexion building a platform that can educate users on the importance of mental wellness. |
| Car Park Where to park? | Participants might park somewhere far away and this could create a less than optimal participant experience, or create unnecessary friction | 1 | 6 | 6 | Our event will have a registration link for interested participants. To those who have indicated interest, we will regularly send them updates such as the details of the event. |
| Families How can parents manage children in this event? | Children might not have enough p | 1 | 10 | 10 | We will provide kid-friendly zones where kids can entertain themselves with - i.e. a ball pit. |

Blue Ocean Strategy:

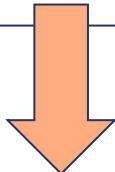
Comparison Matrix

| Key Points | Our Solution score | Goodwoof | Woofathon |
|-------------------------|--------------------|----------|-----------|
| Heart related | 0 | 0 | 9 |
| Affordability | 0 | 7 | 3 |
| Difficulty of Challenge | 5 | 1 | 2 |
| Duration | 3 | 8 | 3 |
| Intensity | 2 | 3 | 5 |
| Accessibility | 7 | 0 | 3 |
| Educational | 9 | 5 | 3 |
| Diversity of Activities | 4 | 8 | 5 |
| Human Interaction | 9 | 7 | 7 |

Algorithm Details (Data Wrangling)

On average, how many times in a week do you roughly participate in the previously stated things you do to manage your personal mental wellness?

- None
- 1 time
- 2 times
- 3 to 4 times
- 5 times or more



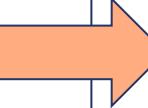
| | |
|---|----|
| 1 | 73 |
| 0 | 33 |

- 0 refers to people who are inactive at their activity to manage mental wellness (None & 1 time)
- 1 refers to people who are active at their activity to manage mental wellness (2 times and above)
- Reason: We believe that a person who does activity to manage mental wellness more frequently (2 times and above) are more likely to join our event

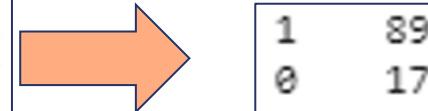
Algorithm Details (Data Wrangling)

What is your perfect idea of a companion?

- A Pet
- Human
- Music Instrument(s)
- Animated Objects
- Artificial Intelligence - Chat Bots
- Others, please specify.



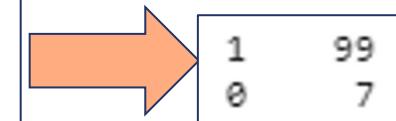
| | |
|-------------------------------------|----|
| Human | 74 |
| A Pet | 14 |
| Music Instrument(s) | 6 |
| God | 3 |
| Artificial Intelligence - Chat Bots | 2 |
| All of the above | 2 |
| Animated Objects | 1 |
| Personal | 1 |
| Comfortable Space | 1 |
| Drama | 1 |



- 0 refers to people who do not prefer humans and pets as perfect companion
- 1 refers to people who prefer humans and pets as perfect companion
- Reason: To make the data less sparse

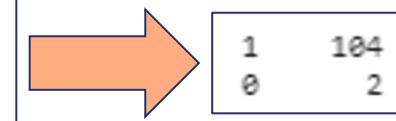
Algorithm Details (Data Wrangling)

How important does it mean to you to talk to someone whenever you face personal struggles?



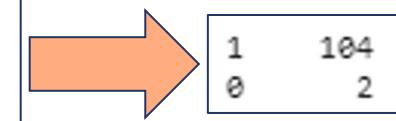
| | |
|---|----|
| 1 | 99 |
| 0 | 7 |

How important is mental wellness to you?



| | |
|---|-----|
| 1 | 104 |
| 0 | 2 |

How effective do you find them?



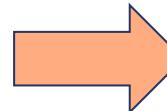
| | |
|---|-----|
| 1 | 104 |
| 0 | 2 |

- 0 refers to Unimportant/Ineffective
- 1 refers to Important/Effective
- Reason: To make the data less sparse

Algorithm Details (Data Wrangling)

Would you ever visit a counselling centre for personal help?

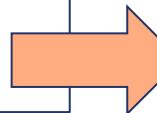
- Yes
- No



| | |
|---|----|
| 1 | 76 |
| 0 | 30 |

If you have to visit a counselling centre for personal help, would you tell your friends?

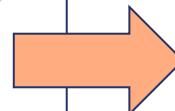
- Yes
- No



| | |
|---|----|
| 1 | 56 |
| 0 | 50 |

Have you heard of the SMU Connexion building?

- Yes
- No



| | |
|---|----|
| 0 | 61 |
| 1 | 45 |

Reason: Integer Encoding, so that we can reduce the number of features to we one-hot encode.

Do you face any limitations when it comes to participating in those previously stated activities? If yes, what are some limitations?

i.e. not enough tennis courts, not having enough friends, not having enough money, etc

- No
- Yes, please share some limitations.

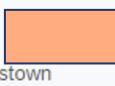


| | |
|---|----|
| 0 | 67 |
| 1 | 39 |

Algorithm Details (Data Wrangling)

Which part of Singapore district do you live in? (Choose 1)

- District 01 - Raffles Place, Marina, Cecil
- District 02 - Tanjong Pager, Chinatown
- District 03 - Tiong Bahru, Alexandra, Queenstown
- District 04 - Mount Faber, Telok Blangah, Harbourfront
- District 05 - Buona Vista, Pasir Panjang, Clementi
- District 06 - Clarke Quay, City Hall
- District 07 - Bugis, Beach Road, Golden Mile
- District 08 - Little India, Farrer Park
- District 09 - Orchard Road, River Valley
- District 10 - Bukit Timah, Holland, Balmoral
- District 11 - Novena, Newton, Thomson
- District 12 - Toa Payoh, Serangoon, Balestier
- District 13 - Macpherson, Braddell
- District 14 - Geylang, Paya Lebar, Sims
- District 15 - Joo Chiat, Marina Parade, Katong
- District 16 - Bedok, Upper East Coast, Siglap
- District 17 - Changi, Flora, Loyang
- District 18 - Tampines, Pasir Ris



| | |
|---|----|
| District 19 - Punggol, Sengkang, Serangoon Gardens | 21 |
| District 18 - Tampines, Pasir Ris | 13 |
| District 12 - Toa Payoh, Serangoon, Balestier | 9 |
| District 23 - Choa Chu Kang, Diary Farm, Hillview, Bukit Panjang, Bukit Batok | 8 |
| District 27 - Sembawang, Yishun, Admiralty | 7 |
| District 16 - Bedok, Upper East Coast, Siglap | 6 |
| District 25 - Woodlands, Admiralty | 6 |
| District 10 - Bukit Timah, Holland, Balmoral | 5 |
| District 20 - Ang Mo Kio, Bishan, Thomson | 5 |
| District 14 - Geylang, Paya Lebar, Sims | 4 |
| District 03 - Tiong Bahru, Alexandra, Queenstown | 3 |
| District 05 - Buona Vista, Pasir Panjang, Clementi | 3 |
| District 13 - Macpherson, Braddell | 3 |
| District 04 - Mount Faber, Telok Blangah, Harbourfront | 3 |
| District 11 - Novena, Newton, Thomson | 2 |
| District 15 - Joo Chiat, Marina Parade, Katong | 2 |
| District 22 - Boon Lay, Jurong, Tuas | 2 |
| District 08 - Little India, Farrer Park | 2 |
| District 21 - Upper Bukit Timah, Ulu Pandan, Clementi Park | 1 |
| District 17 - Changi, Flora, Loyang | 1 |

0 69
1 37



- 0 refers to not staying near SMU District
- 1 refers to staying near SMU District
- Information obtained here
- Reason: People staying closer to SMU, might consider coming

Algorithm Details (Data Wrangling)

What is your age?

10 - 14

15 - 19

20 - 24

25 - 29

30 - 34

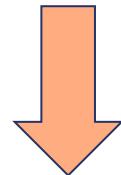
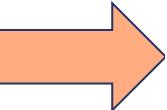
35 - 39

40 - 44

45 - 49

50 and above

| | |
|--------------|----|
| 20 - 24 | 47 |
| 15-19 | 25 |
| 25 - 29 | 12 |
| 50 and above | 9 |
| 45 - 49 | 5 |
| 40 - 44 | 5 |
| 30 - 34 | 3 |



| | |
|---|----|
| 1 | 72 |
| 0 | 34 |

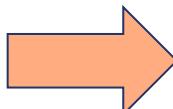
- 0 refers to 25 and above
- 1 refers to 24 and below
- Reason: To make the data less sparse

Algorithm Details (Data Wrangling)

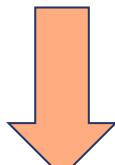
What is your estimated monthly household income per capita?

Monthly Household Income per Capita = (Total Monthly Income of n Family Members) / (n Family Members)

- Less than or equals to \$1000
- \$1001 to \$2999
- \$3000 to \$4999
- \$5000 to \$6999
- \$7000 to \$8999
- \$9000 to \$10999
- \$11000 to \$12999
- \$13000 to \$14999
- More than or equals to \$15000
- Prefer not to disclose



| | |
|--------------------------------|----|
| \$1001 to \$2999 | 30 |
| Prefer not to disclose | 27 |
| \$3000 to \$4999 | 12 |
| More than or equals to \$15000 | 10 |
| Less than or equals to \$1000 | 9 |
| \$7000 to \$8999 | 6 |
| \$13000 to \$14999 | 3 |
| \$11000 to \$12999 | 3 |
| \$5000 to \$6999 | 3 |
| \$9000 to \$10999 | 3 |



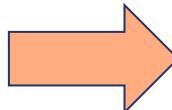
| | |
|------------------------|----|
| \$0.01 to \$2999 | 39 |
| Prefer not to disclose | 27 |
| \$3000 to \$8999 | 21 |
| More than \$9000 | 19 |

- Reason: To make the data less sparse

Algorithm Details (Data Wrangling)

What is your gender?

- Male
- Female

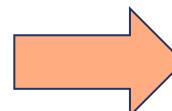


| | |
|---|----|
| 0 | 80 |
| 1 | 26 |

- **Reason:** Integer Encoding, so that we can reduce the number of features to we one-hot encode.

What is your ethnic group?

- Indian
- Malay
- Chinese
- Others, please specify.



| | |
|-----------|----|
| Chinese | 95 |
| Malay | 6 |
| Indian | 2 |
| Caucasian | 1 |
| Burmese | 1 |
| Eurasian | 1 |
| .. | .. |

- **Reason:** To make the data less sparse

Algorithm Details (Feature Engineering)

The SMU Connexion building aims to be a hub in the Bras-Basah Bugis Precinct that brings people together, and creates social value for you and me.

What are some types of initiatives that would entice you to come down and participate?

Note: The sum of value must sum to 100.



Reason: Did not have any questions which can be our target variable except for this question

Algorithm Details (Feature Engineering)

Event Category includes (1) Events, (2) Education Events & (3) Sports Events

events's median: 32.5
entertainment_events's proportion which is more than median: 50.0%

education_events's median: 35.0
education_events's proportion which is more than median: 49.056603773584904%

sport_event's median: 24.5
sport_event's proportion which is more than median: 50.0%

*For each event category,
If user score more than median
score,
event category target = 1.
Else, event category target = 0*

*If total score of event category target >= 2, final target =
1
Else, final target = 0*

| events_target | education_events_target | sport_event_target | final_target |
|---------------|-------------------------|--------------------|--------------|
| 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| ... | ... | ... | ... |
| 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |

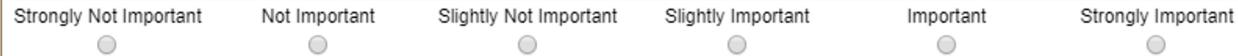
Algorithm Details (Feature Engineering)

| cleaned_importance_mental_wellness_reason | cleaned_mental_wellness_causes | cleaned_activity_mental_wellness |
|---|---|---|
| healthy state mind depends mentally determine ... | much stress exam surveying student project | exercise play game |
| cannot function | stress | break look device |
| person need mentally motivate thrive | society peer family pressure school get job co... | exercise netflix chill sex warm shower hang fr... |
| wont commit suicide | academic peer job | drama movie marathon |
| course sanity important | stress people get hereditary | meditate |
| ... | ... | ... |
| believe important part health whole neglect | improper bad management inability manage emoti... | take mindful feeling practice care object make... |
| believe mental wellness really important espec... | think possible range stress emotional stress w... | take sometime sit alone alway noise away hustl... |
| mood people child motivation work | stress colleague hear disappointment negative ... | walk good cup coffee sit window simply star pa... |
| felt long hope others good state mind want help | school family trouble | try talk friend rant |
| one mood behaviour | stress lack love object traumatic | clean |

For the open-ended questions, we create our own gazette and did a similarity match between the respondents' responses and our gazette using Fuzzy Wuzzy algorithm. The higher the similarity score would mean that they are similar in the traits we are targeting for our solution

Algorithm Details (Final Inputs)

How important is mental wellness to you?



Please share why.

For questions like the one on the left where there is a MCQ followed by an open-ended, since they are related, we combined these features together by multiplying the similarity score with the corresponding data wrangling feature.

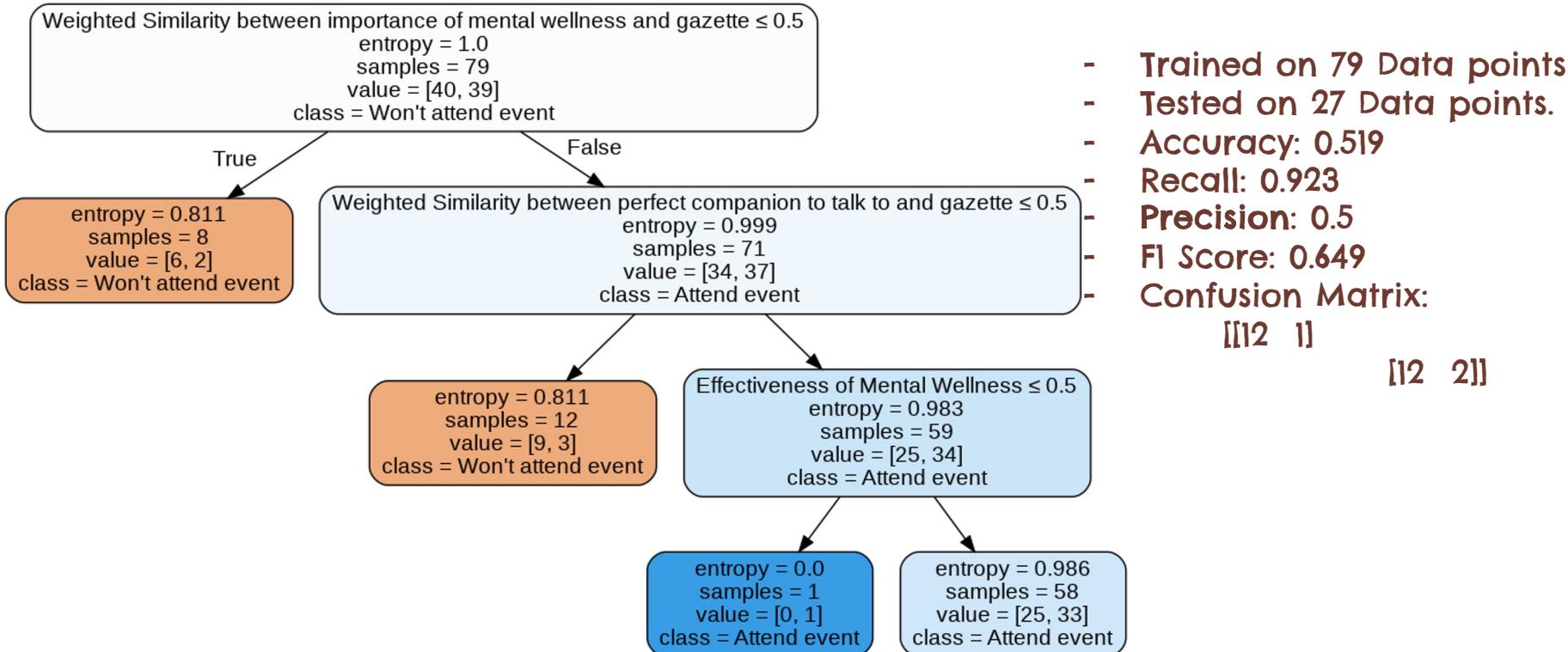
$$\text{Weighted Similarity Score} = \text{Similarity Score of Open Ended Question} \times \text{Binary Variable of Likert Question or MCQ (If applicable)}$$

Algorithm Details (Feature Engineering)

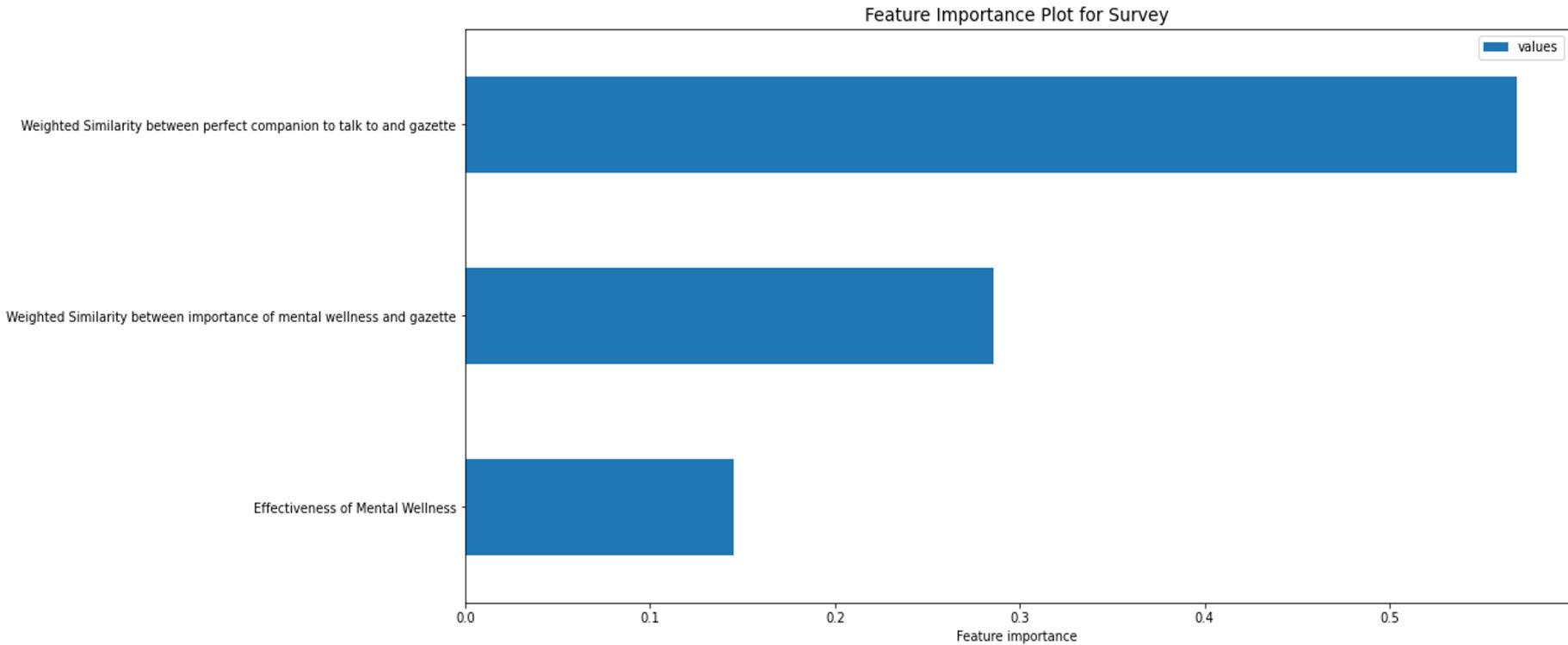
| Target | SMU_undergraduate | Weighted similarity between alternative task when stressed and gazette | Weighted similarity between perfect companion to talk to and gazette | Weighted similarity between importance of talking to someone and gazette | Weighted similarity between first task when stressed and gazette | Weighted similarity between activity to relieve stress and gazette | Weighted similarity between importance of mental wellness and gazette | Weighted similarity between limitation of activity and gazette | Frequent participant for activity to maintain mental wellness | Effectiveness of Mental Wellness |
|--------|-------------------|--|--|--|--|--|---|--|---|----------------------------------|
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| • | | | | | | | | | | |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| • | | | | | | | | | | |

This is the list of inputs that we will use for our classification model.

Algorithm Details (Output)

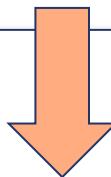


Algorithm Details (Output)



Algorithm Details (Output)

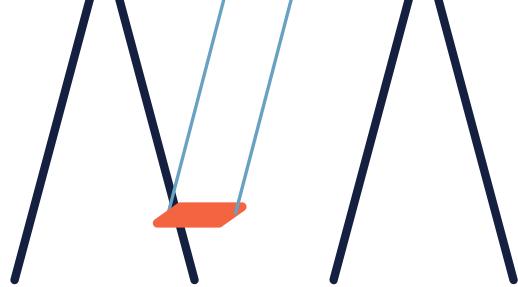
| | Similarity between perfect companion to talk to and gazette | Similarity between importance of mental wellness and gazette | Effectiveness of Mental Wellness | Not Coming % | Coming % | Odds of coming | Prediction on Odds |
|---|---|--|----------------------------------|--------------|----------|----------------|--------------------|
| 0 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 1 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 2 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 3 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 4 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 5 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 6 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |
| 7 | 1 | 1 | 1 | 0.431034 | 0.568966 | 1.320000 | Coming |



| | Prediction on Odds | count |
|---|--------------------|-------|
| 0 | Coming | 24 |
| 1 | Not Coming | 3 |

$$\text{Odds of Coming} = \frac{\text{Probability of Coming}}{\text{Probability of Not Coming}}$$

If *Odds of Coming* ≥ 1 , predict respondent is coming.
Else, predict respondent is not coming.



Implementation

Main venue: SMU Connexion

- The race will subsequently take teams around Fort Canning Park which is spacious and distant from nearby residential areas.
- Should there be no urban restrictions, our team envisions expanding the race and taking dogs beyond Fort Canning and into the urban areas of the BBB Precinct.



Boundary of Proposed Solution

- Raising the importance of mental wellness to people, especially to the students and working adults who are feeling stressed in the daily school or work life
- Educate them to handle personal struggles better and encourage more human interaction

