Proposal #1: Mapping the Gut-Brain Axis

Background:

The gut-brain axis is a complex system that involves a myriad of pathways connecting various regions of the body. The goal of our company is to harness these pathways in order to pave way for novel therapeutics that can bypass the blood brain barrier in order to affect brain behavior. We are particularly interested in a specific group of cells in the gut called enteroendocrine cells (EECs) that comprise onyl ~1% of cells in the gut, yet play a functional role in virtually all gut functions. These cells are thought to communicate directly to the brain through the vagus nerve, whose primary projection to the brain is the nucleus of the solitary tract (NST). Combining single cell sequencing, functional imaging, chemogenetics, optogenetics, polypharmacology and more, we are investigating how we can use gut-restricted molecules to stimulate these EECs in order to produce significant behavioral results (in areas including metabolism, neural disorders, mood disorders, etc).

Though our platform is all-encompassing, we are comprised of subprograms all with different specialities and areas of focus. Though in concept we understand the circuitry and certain pathways of interest have been identified, we do not yet have a comprehensive visualization of cell types in the gut, vagus, and brainstem, their connections, receptor relations, and possible indirect pathways that could be playing a role in communication. Though the amount of data massive, i enable to provide this visualization .

*Disclaimer: my job at this company in no way involves data visualization or design--though I have been asked to do some design work in the early days of the company so we had visuals for potential investors, my work now is exclusively experimental. Our CEO and others have remarked about the need for a visual like this, but I don't have time at work to do it, and haven't had the will to tackle it in my free time.

Questions:

- Can we elucidate both canonical gut-brain pathways as well as those found experimentally in our hands (and collaborators' hands)?
- What receptors have we been overlooking that could potentially be a good candidate for stimulation?

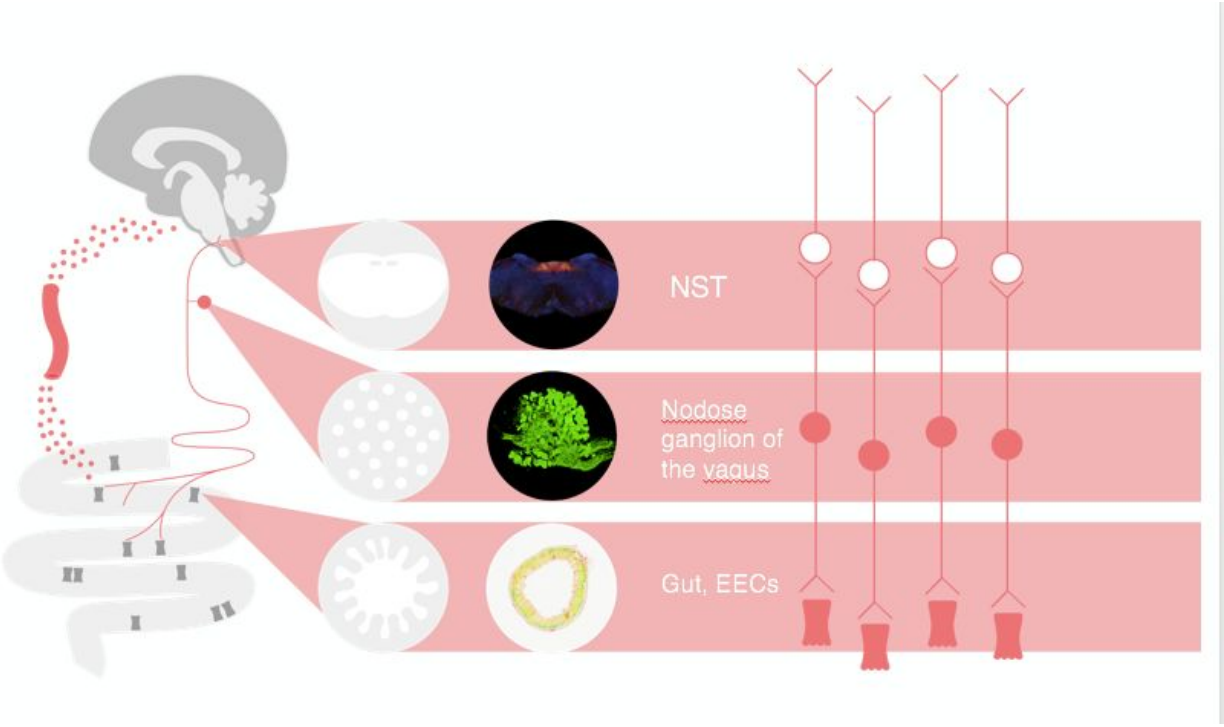
Data Sources:

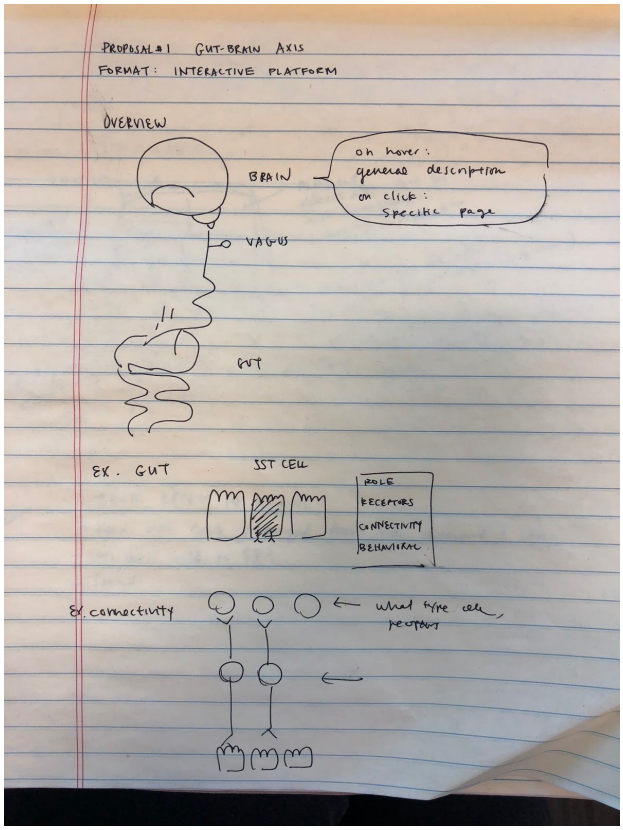
In house (proprietary)

References:

https://www.ebi.ac.uk/gwas/

Sketch:


NST
Nodose ganglion of the vagus
Gut, EECs


PROPOSAL #1 GUT-BRAIN AXIS
FORMAT: INTERACTIVE PLATFORM
OVERVIEW
BRAIN
on hover: general description
on click: specific page
VAGUS
GUT
EX. GUT
SST CELL
ROLE
RECEPTORS
CONNECTIVITY
BEHAVIORAL
EX. connectivity
what type cell, receptors

Proposal #2: The tech effect: macro & micro lens

Background:

Though the bay area in California has always been a hub for tech (Silicon Valley), it has changed drastically in the last decade due to the recent surge in the new wave of the tech industry. Growing up there since the 90s, and now frequently flying back to visit family and friends, this change can be tangibly felt just by observation only--there is no need to read articles or watch the news that talk about the unmanageable traffic, skyrocketing of housing prices, etc. Just as in any area getting gentrified, there are consequences and benefits to the rapid growth of a city. SF is a special case, as its growth is inseparable with the growth of the modern tech industry, and can be a "model case" for all future tech cities waiting to happen (Boston, Austin, etc.) Rather than forming an opinion on the overall positives/negatives of tech, I wanted to tell a story on the effect of tech on the macroscopic level (effects on the city and population) and microscopic level (within the phone, laptop).

Questions:

- Is the tech industry creating jobs for SF residents, or primarily for those out of state? Is it helping the economy overall?
- Has the homelessness crisis in SF increased since the insurgence of tech?
- How have housing prices altered the influx/eflux of people through the city?
- How has the demographic of SF changed? Has primary occupation of these demographics changed? What demographic are tech jobs helping most?
- How does social media make you feel?
- How often do you use it? How often are you on laptop/phone vs in nature/engaging with outside world?
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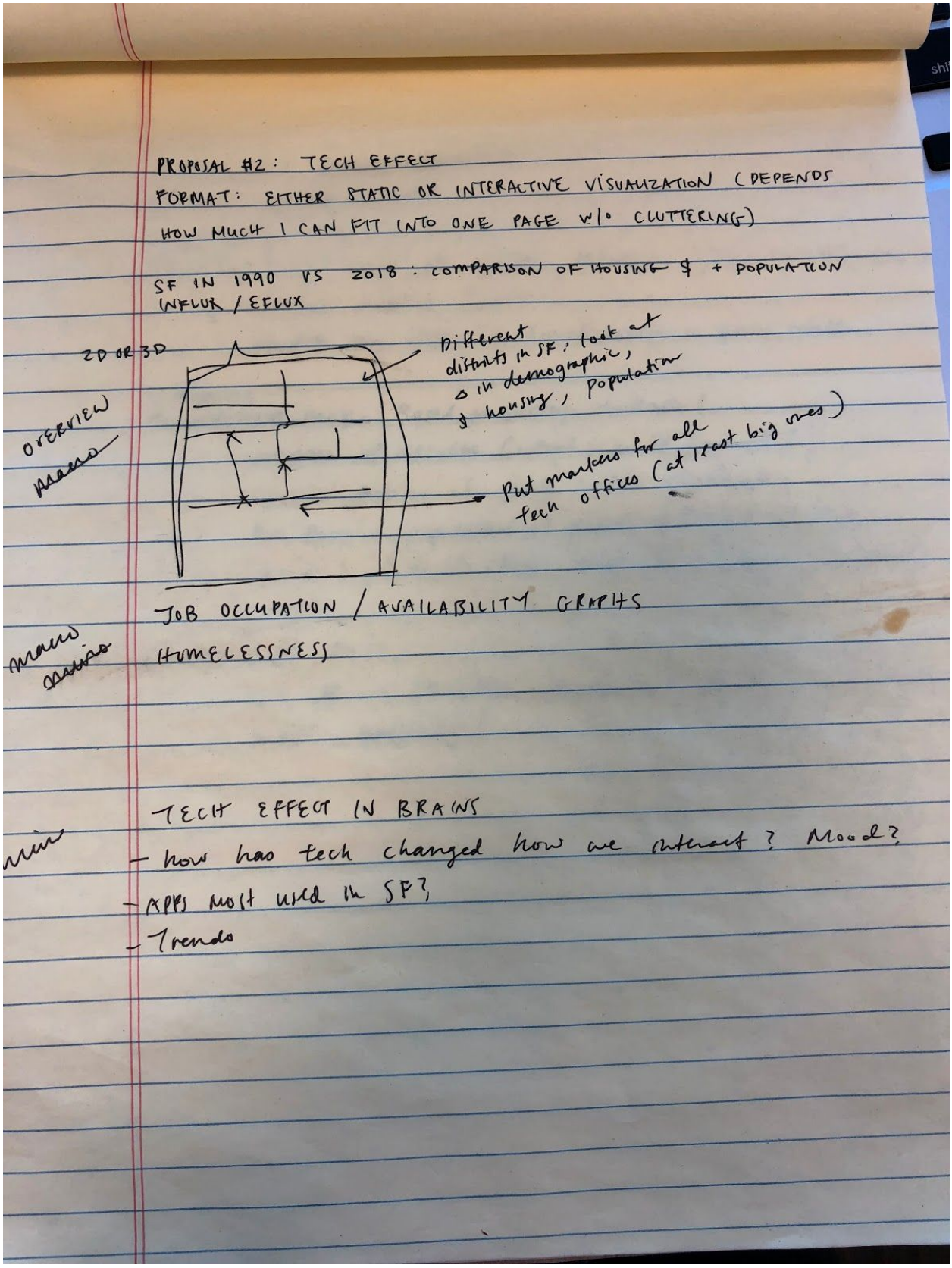
Data Sources:

Home values in city of interest across years: https://www.zillow.com/research/data/
Census data 2000, 2010 (and 2016 estimates):
https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
Tech company data: https://angel.co/companies?locations[]=1681-Silicon+Valley
Survey (for qualitative data)

References:

http://www.urbandisplacement.org/sites/default/files/images/sf_final.pdf
https://www.ft.com/content/262e2b2c-d423-11e7-8c9a-d9c0a5c8d5c9
http://hsh.sfgov.org/wp-content/uploads/2017/06/2017-SF-Point-in-Time-Count-General-FINAL-6.21.17.pdf
https://journals.sagepub.com/doi/abs/10.1177/0146167214557007?journalCode=pspc
https://www.multivu.com/players/English/8294451-cigna-us-loneliness-survey/docs/IndexReport_1524069371598-173525450.pdf

Sketch:


PROPOSAL #2: TECH EFFECT
FORMAT: EITHER STATIC OR INTERACTIVE VISUALIZATION (DEPENDS HOW MUCH I CAN FIT INTO ONE PAGE W/O CLUTTERING)
SF IN 1990 VS 2018: COMPARISON OF HOUSING $ + POPULATION INFLUX / EFLUX
2D OR 3D
OVERVIEW
different districts in SF; look at Δ in demographic, $ housing, population
Put markers for all tech offices (at least big ones)
JOB OCCUPATION / AVAILABILITY GRAPHS
HOMELESSNESS
TECH EFFECT IN BRAINS
- how has tech changed how we interact? Mood?
- APPS most used in SF?
- Trends

Proposal #3: Human connection, empathy, and intimacy in the digital age

Background:

Though most of its basis lies in qualitative data (and my ability to obtain it), I have always wanted to do a study on human connection and intimacy. Humans are inherently social beings--as modern technology has advanced, we have introduced a method of communication and connectivity, a method of socializing that did not exist before. It allows us both to be constantly connected, to know what others are doing and saying around us. Yet, we ourselves are not part of that experience. A crucial aspect of socializing--direct engagement in a meaningful manner--is not there. How has that affected us as a population? How can we incorporate more engagement into our lives? How can we use this digital technology to reverse this isolation effect?

My personal perspective on these matters stem from a few experiences. First, when I am backpacking (usually on my own or with one other person) and staying at hostels, I most often make very deep connections with fellow travelers very fast. Being put in a situation where 1) everything is new and foreign 2) you are with a group of people who are predisposed to being open 3) conversation most often skips normal small talk 4) you experience together, allows very intimate connections to form in a short period of time. Second, at Burning Man, which in more ways than one could be substantially more stimulating and jarring than traveling, we see an unprecedented level of openness, connection, and intimacy in an extremely short period of time (ten days). My camp facilitated "human connection" through touch, movement, gaze (yoga, dance, authentic relating, meditation, etc). Through these workshops and dances, I found that intimacy can arise merely through physical engagement (intentional) with another person; through sharing of feelings and emotions without fear of vulnerability; through really putting that person at the center of your attention.

A big question for me and many others is this: how do we bring this level of connection, empathy, and intimacy back to the default world? Burning Man is a temporary phenomenon in a "simulation" of a "better world". Traveling for extended periods of time is a luxury only afforded to a few. In daily life, what exactly makes people fulfilled? Happy? Lonely? Does the act of telling this story, of being vulnerable, facilitate connection? Is direct physical presence/contact necessary? How can we use digital media and tech to remedy some of the isolation it causes?

Questions:

- Does loneliness change based on occupation/how often your occupation requires you to interact with people?
- How can we harness digital technology to mediate meaningful social interaction?
- Does contentedness stem from social engagement, or "meaningful" social engagement?
- Also see above in background

Data Sources:

- Amazon Mechanical Turk
- Survey
- World Happiness Data: http://worldhappiness.report/ed/2018/

References:

https://www.npr.org/sections/health-shots/2018/05/01/606588504/americans-are-a-lonely-lot-and-young-people-bear-the-heaviest-burden

https://journals.sagepub.com/doi/10.1177/2167702617723376
https://s.tech.cornell.edu/assets/papers/anonymity-intimacy-disclosure.pdf
https://s3.amazonaws.com/happiness-report/2018/WHR_web.pdf
https://drive.google.com/file/d/1pXuvtM065ZYDGBVzo-mTcXgTotGTnbEX/view

Sketch: