



NATIONAL BROADBAND TOOL

Empowering Policymakers to Close the Digital Divide

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Q&A

Broadband's Importance in Society



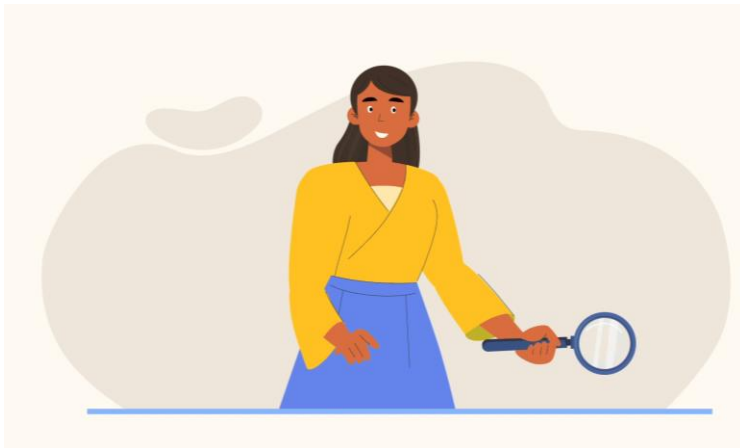
Boosts Economic Growth



Enhances Educational Access



Supports Healthcare Advancements



Expands Employment Opportunities

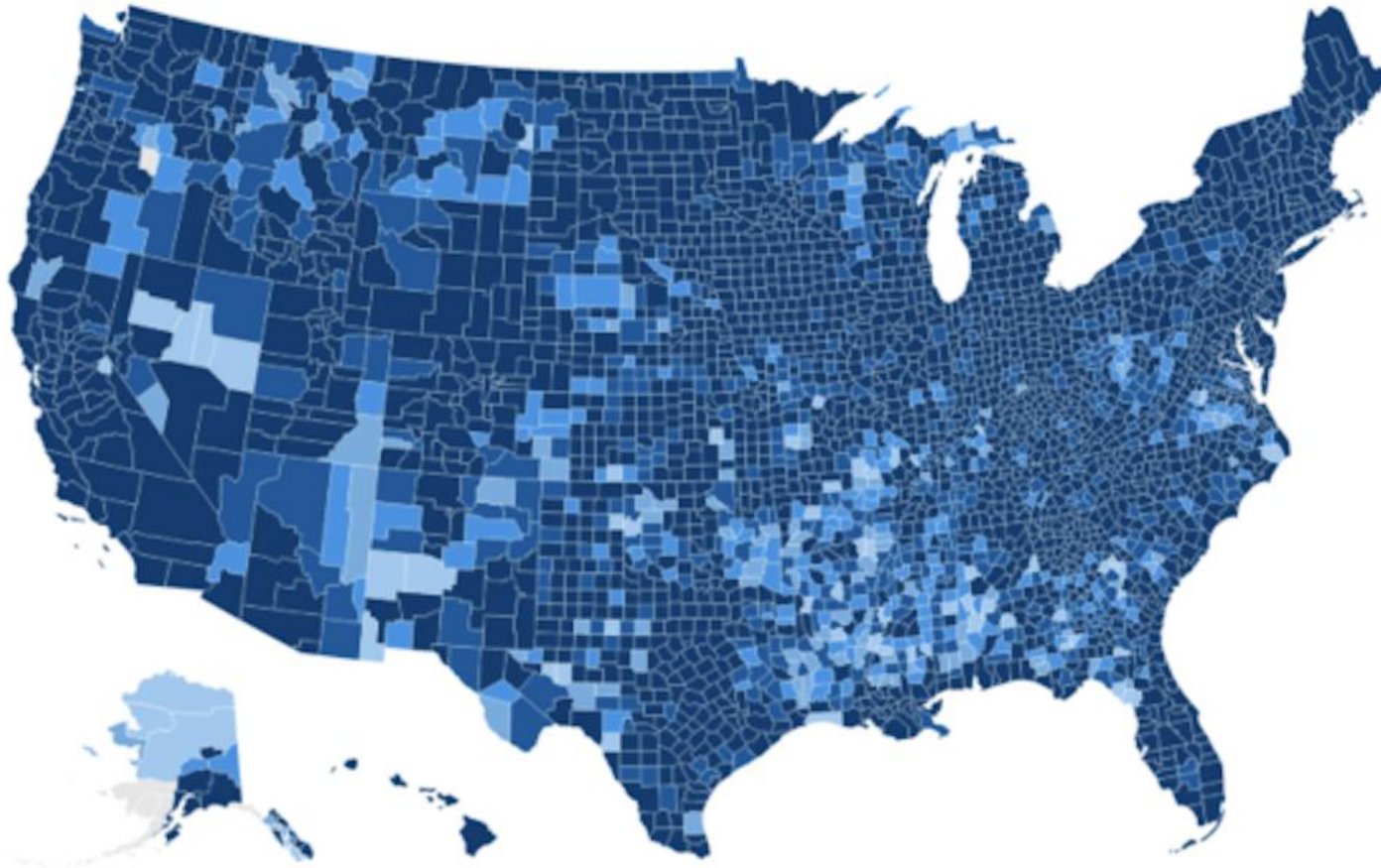
Strengthens Social Connectivity

Current Landscape of High-Speed Broadband Access in the USA

According to the Federal
Communications Commission (FCC),

~14.5M

people DON'T have access to
internet at broadband speeds



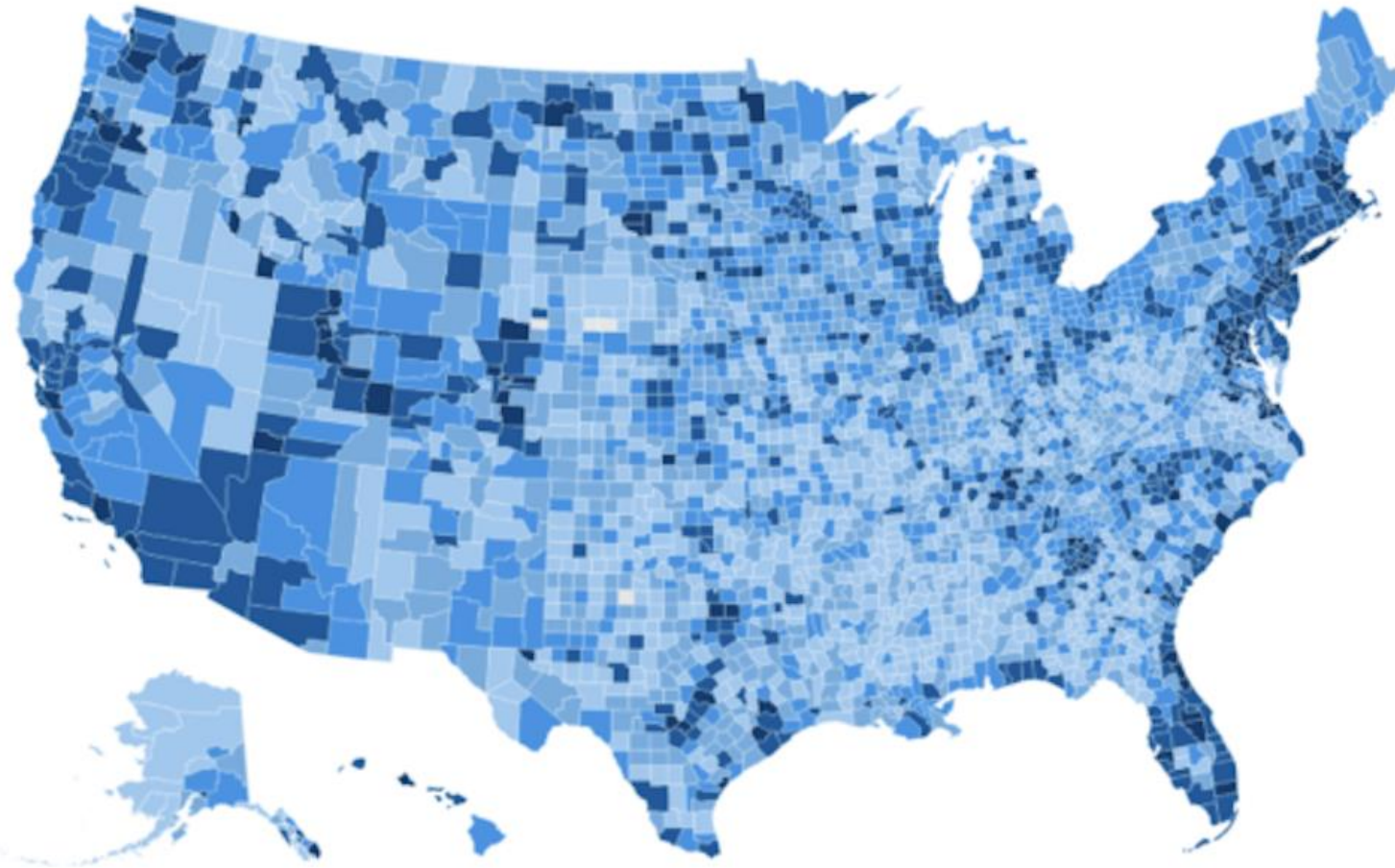
* FCC Broadband has or "could" provide greater than or equal to 25 Mbps / 3 Mbps

Current Landscape of High-Speed Broadband Access in the USA

....but according to Microsoft,

~120.4M

people DON'T have access to
internet at broadband speeds



Broadband
usage**



** Broadband speeds greater than or equal to 25 Mbps

Nationwide Broadband: A Strategic Leap Forward

Infrastructure Investment and Jobs Act - The Bipartisan Infrastructure Deal

NOVEMBER 15, 2021

~\$65B fund into high-speed internet efforts through 7 federal programs aiming to modernize and upgrade the country's infrastructure and ensure **everyone in America has access to Internet service**



Biden-Harris Administration Announces Over \$42 Billion to Connect Everyone in America to Affordable, Reliable, High-Speed Internet

JUNE 26, 2023

- Varied awards in the **\$27M to \$3.3B** range
- **19 states** exceed **\$1B** allocations
- **Goal** : Universal Access by **2030**



US Ignite: Bridging the Digital Divide



COMMUNITIES



BUSINESSES



LOCAL GOVERNMENTS



FOUNDATIONS & FEDERAL AGENCIES



A **non-profit** organization founded in **2012** based in **Washington DC** with a mission

To forge private-public partnerships that accelerate the adoption of advanced technologies, catalyzing smart infrastructure and socio-economic growth in the United States

Addressing the Rural Broadband Challenge



Challenge

Identifying potential **broadband infrastructure investment opportunities** in broadband deserts with **promising socio-economic growth** trajectories



Our Solution

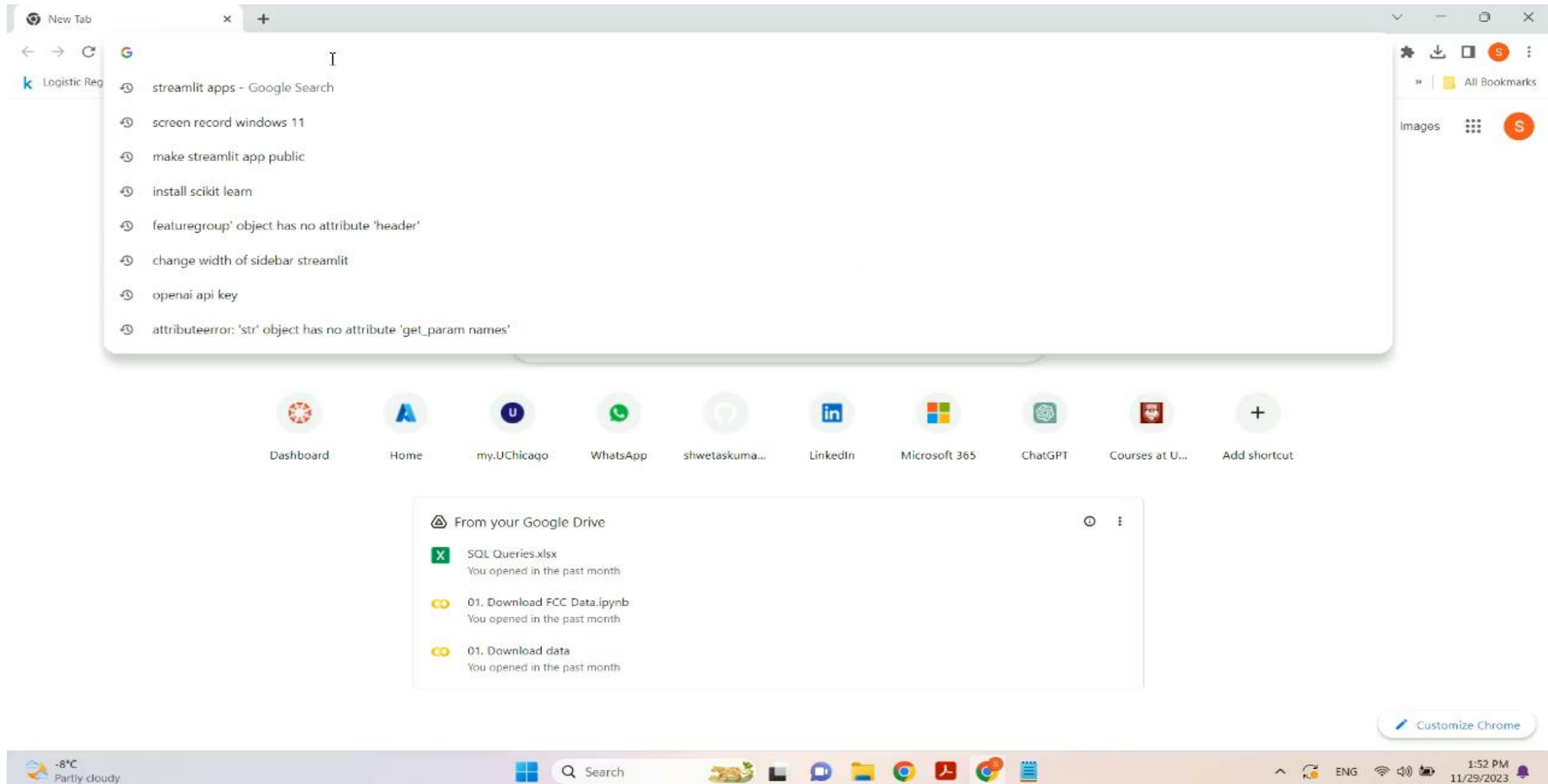
A **National Broadband Tool** with interactive maps and charts to visualize and analyze the **transformative impact of high-speed internet access**



Outcome

Assisting community leaders in developing a **compelling proposal to secure grant funding** by effectively **highlighting the benefits** of investing in broadband infrastructure

DASHBOARD DEMO



DATA SUMMARY



2017 - 2021

50 states

16 territories

84,414 census tracts



CENSUS BUREAU – AMERICAN COMMUNITY SURVEY

Demographics

- Gender
- Age
- Veteran Status
- Disability Status

Education

- High School
- Bachelors
- Masters
- No degree obtained

Employment Status

- Employed
- Not Employed

Median Income

- Less than \$20k
- \$20k - \$75k
- \$75k+

Broadband Access

- Internet subscriptions by households
- Type of connections:
 - Broadband
 - Other + satellite
 - No Internet



FEDERAL COMMUNICATIONS COMMISSION (FCC)

Internet Provider Filings

- Connection Type : **Broadband, Satellite, Other**
- Number of connections with download speed **at least 25 Mbps**
- Number of connections with download speed **less than 25 Mbps**

Area Shape Files

- Geospatial Census Data Representation

DATA HANDLING

DATA CHALLENGES

Using vast volumes of data sourced from open-access datasets submitted by **Internet Service Providers (ISPs) to the FCC every six months**, combined with **ACS Census Data** to support broadband policy & investment decision-making and helping policymakers direct funding and programmatic investments to communities most impacted by the digital divide.

Exclusion Criteria

Omitted non-residential census sectors such as recreational zones, commercial areas, and woodlands.

Handling Missing Data

Substituted absent data points with zero to align with the standardized format of the data presentation on the portal.

Improved Column Labels

Updated to reflect their true definitions, originally labeled with Census Data codes such as **B01003_001E** = **“Total Population”**.

DATA PREPROCESSING

Broadband Connections

$$\text{Digital Index} = \frac{\# \text{ broadband subscriptions} \times \# \text{ connections at least 25mbps}}{\text{total \# of connections}} \div \text{total broadband connections available}$$

Population, Income, Employment and Education Statistics

Captured demographic details as a **percentage of total population**, encompassing *gender, age, education, and income brackets*.

Rural Areas

An area is tagged as **rural*** if it contains *less than 2,000 housing units* & has *population less than 5,000*.

Shape Files

Converted shape files to **GeoJSON** format for building maps.

MODELLING I – PREDICTING SOCIOECONOMIC GROWTH

AIM

To determine potential growth in socio-economic status (across target variables) on account of increased broadband access

MODEL

XGBoost Regression With Random Search using Cross Validation

INPUT PARAMETERS

- **Demographics** – Gender, Age, Veteran Status, Disability
- **2 Yr. Lagged Dependent Variables for Causality** - Education, Employment, Income
- % of broadband connections **at least 25 mbps**
- % of broadband connections **less than 25 mbps**
- % type of connection - **Broadband, Other, No internet**

TARGET VARIABLES



EDUCATION



EMPLOYMENT



INCOME

MODELLING II – IDENTIFYING DEMOGRAPHIC CLUSTERS

AIM

Identifying demographically similar census tracts to help make well-informed decisions regarding investments in broadband infrastructure

MODEL

STATE : ALABAMA | COUNTY : Marengo | TRACT – 01091973400 | Digital Index - 0.54

K-Means Clustering

Population	Male	Female	White	Black	Asian	Native	Pacific	Other	Multi-Race	Under 25yrs	Over 25yrs	Seniors	Veterans	Non-Veterans	Disabled status below 65 yrs	Disabled status above 65 yrs
3688	50.41	49.59	73.21	20.44	2.79	0.24	0	0	3.31	22.97	48.02	29.01	11.5	71.12	16.7	16.92

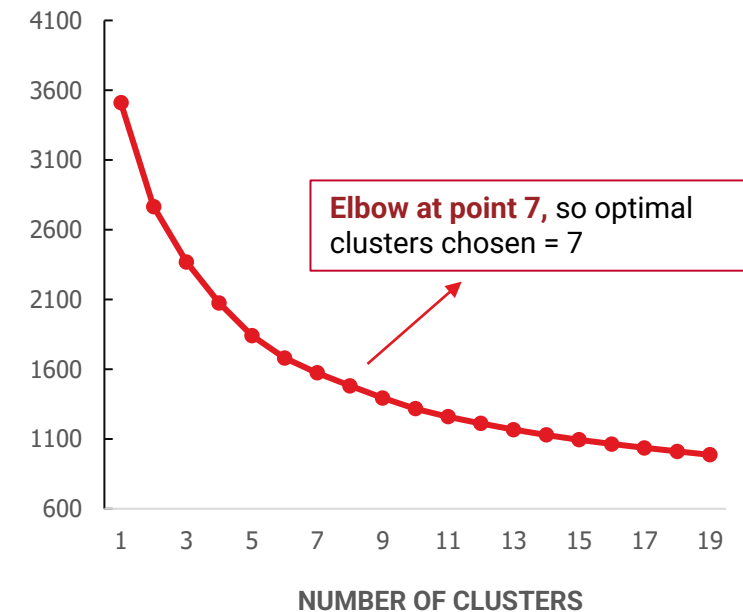
OUTPUT

tract_code	county	Population	Male	Female	Veterans	Non-Veterans	Disabled status below 65 yrs	Disabled status above 65 yrs	Digital Index
04013612700	Maricopa County	2273	52.05	47.95	7.74	76.2	4.75	6.03	1
19079960500	Hamilton County	1939	47.5	52.5	6.29	73.23	7.99	4.13	1
27111960500	Otter Tail County	5668	47.64	52.36	5.42	70.43	7.2	8.27	1
35001000112	Bernalillo County	2040	49.31	50.69	10.34	71.81	4.66	6.27	1
38067950500	Pembina County	1390	51.8	48.2	6.83	72.66	5.04	5.32	1

...

Digital Index higher than selected tract

Elbow Method for Optimal K-Means Clusters



MODELLING III – NATIONAL BROADBAND GPT

AIM

To assist policymakers in understanding the statistics of their census tract & create grant proposals for broadband infrastructure grants.

TRAINED DATA

Sample Grant Proposal

Use this sample grant proposal to help you in the process of preparing your own request for funding. Check with your state department of education to see if they require a certain format in their request for proposal (RFP). Many foundations also have specific requirements.

This sample grant proposal contains:

- Sample Cover Letter
- Sample Cover Page
- Sample Grant Proposal
- Sample Letter Format Grant Proposal for Foundations

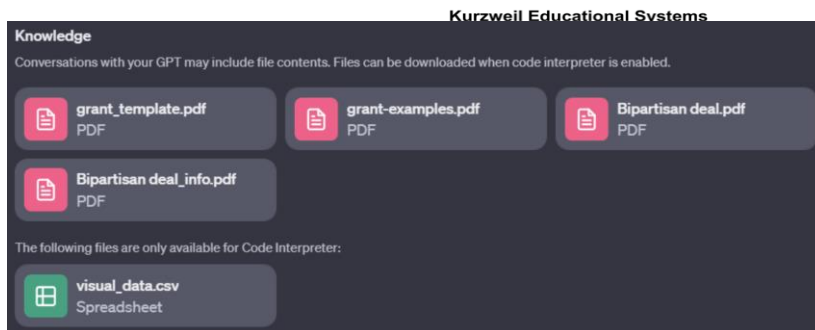
SAMPLE PROMPTS

Hi, please help me design a grant proposal for my tract {tract code}. I am a public official, could you help in retrieving the required information to build a grant proposal and build a draft proposal.

Considering the number of broadband connections, do we satisfy the requirements for the act?

Could you provide more information on this tract relevant to applying for high-speed broadband access?

Whom should we approach for further steps to help improve our tract's digital index?



Our Solution in Action – National Broadband Tool

ALABAMA

Select a County

Marengo County

Select a Census Tract

01091973400

Check the potential growth in Income, Employment and Education Score by increasing the Digital Index by x%.

Select a % Increase in the Digital Index



Predict

The predicted growth in Income, Employment and Education Score over next 2 years is shown below.

	Current Score	Predicted Score	Growth/Drop %
Income	63.47	67.03	3.56%
Employment	46.10	45.09	-1.01%
Education	42.77	47.36	4.59%

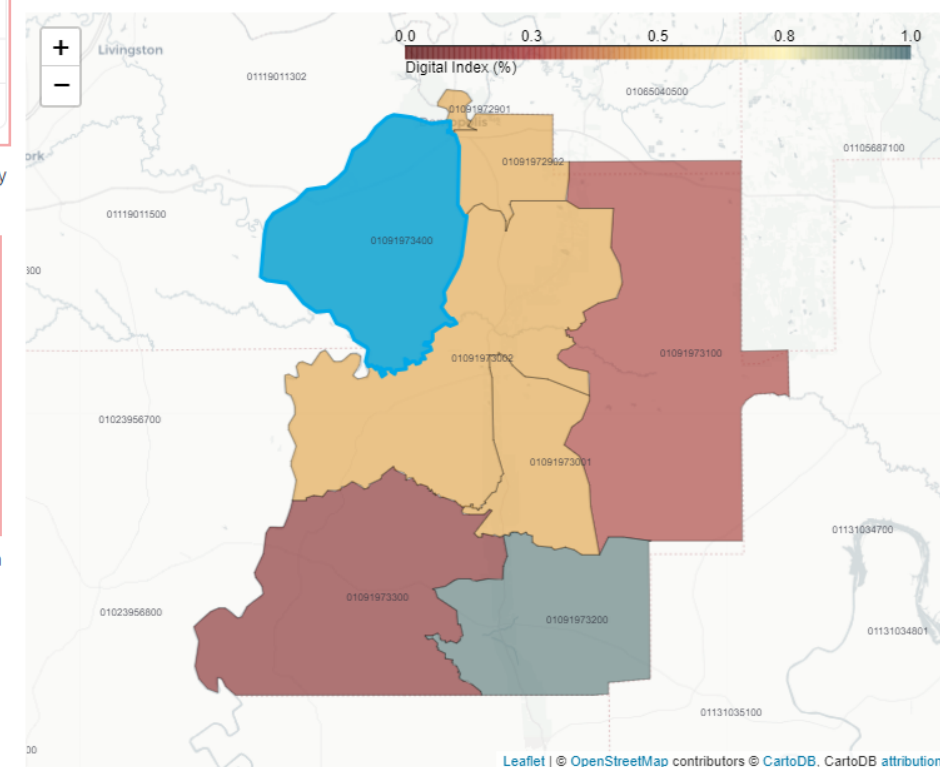
In evaluating a census tract for broadband investment, we'll benchmark it against the top five demographically similar tracts with higher socio-economic scores to gauge potential gains.

tract_code	county_name	connections_above25	income_score	employment_score	education_score
04013612700	Maricopa County	1	94.9	48.04	56.66
19079960500	Hamilton County	1	76	51.16	45.27
27111960500	Otter Tail County	1	70.82	49.14	48.09
35001000112	Bernalillo County	1	78.87	50.29	51.51
38067950500	Pembina County	1	75.35	50.14	47.17

Based on the provided scores and comparison with the top performing tracts, the current tract appears to be a suitable candidate for potential broadband investment. The predicted scores indicate room for growth and improvement. Investing in broadband infrastructure in this tract may support and accelerate socio-economic development aligning with positive growth trends seen in similar demographic clusters.

Chat with NBT.AI to build your grant proposal!

The Digital Index quantifies broadband access by the share of connections above 25 Mbps on a scale from 0 to 1; areas with values near 0, shown in darker red, are priority zones for network enhancements due to their limited high-speed connectivity.



Census Tract	County	Population	Male	Female	White	Black	Asian	Native	Pacific	Other	25+ yrs old without graduating high school	Without an internet subscription, broadband of any type	Households without a desktop or laptop	Digital Index	% of people not using internet at b
01091973400	Marengo County	3,688	50.41	49.59	73.21	20.44	2.79	0.24	0	0	5.17	14.39	11.12	0.54	

Our Solution in Action – LLM Generated Proposal Inputs



National Broadband GPT

This GPT helps public officials in understanding the statistics of their tract code & create grant proposals for broadband infrastructure act. Find more Information here:

<https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/06/fact-sheet-the-bipartisan-infrastructure-deal/>

Hi, please help me design a grant proposal for my trac...

Considering the number of broadband connections, d...



Message National Broadband GPT...



ChatGPT can make mistakes. Consider checking important information.

Let's proceed to create a draft of the grant proposal. [1]

Grant Proposal Draft for Tract 01091973400

Project Abstract

The "Community Advancement Initiative" aims to significantly improve the quality of life in Tract 01091973400 through targeted interventions in income, employment, and education sectors. The current and predicted data for these areas indicates a pressing need for strategic investments and programs. This initiative seeks to bridge gaps, foster growth, and create sustainable development in these key domains.

Statement of Need

The tract has shown mixed trends in the key areas of income, employment, and education. While there's a predicted increase in income (3.56%) and education (4.59%), employment is expected to decline (-1.01%). These statistics underscore the need for a comprehensive strategy to bolster economic stability and educational opportunities while countering the downward trend in employment.

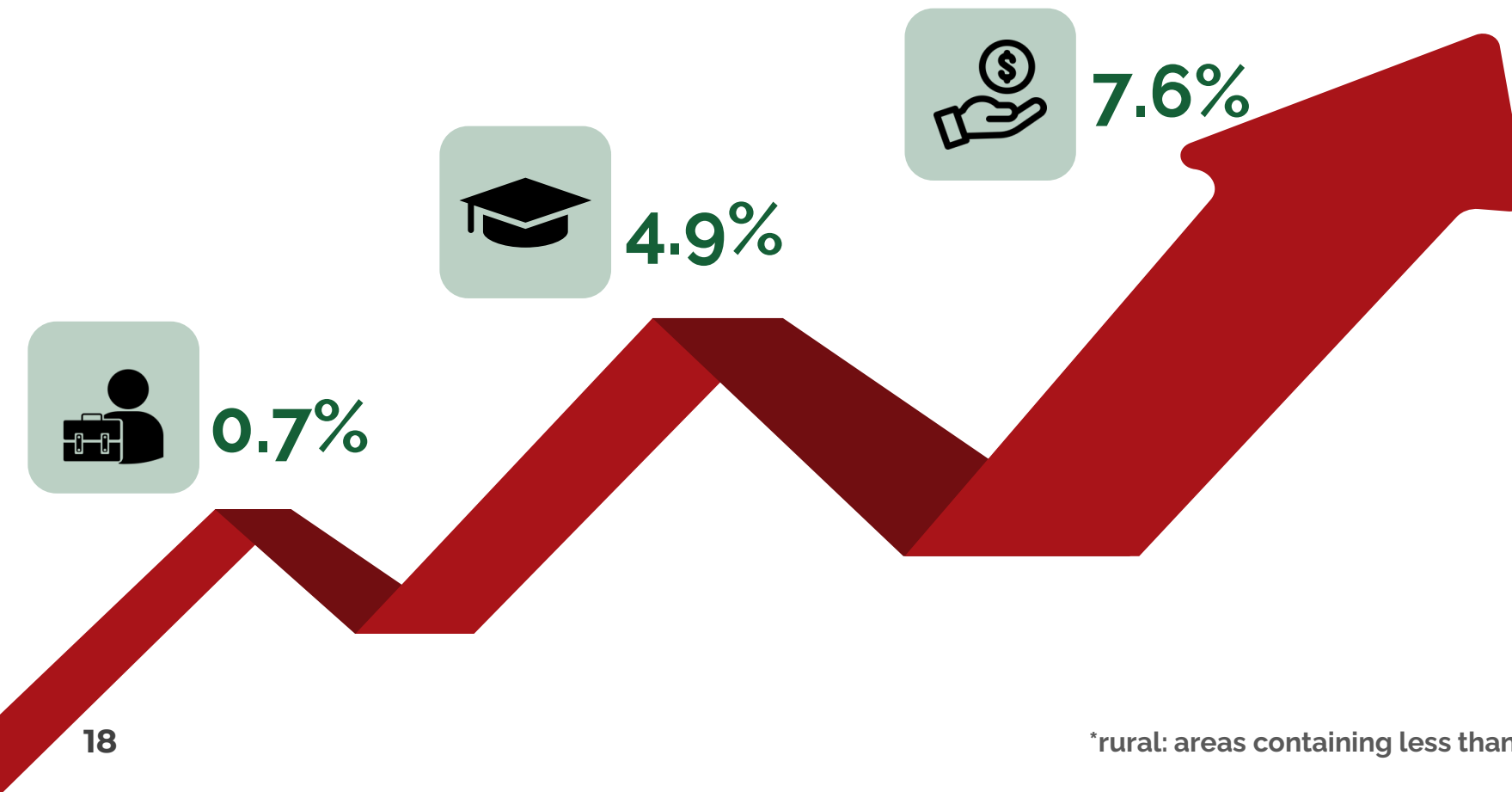
Program Description

The program will consist of three primary components:

1. **Economic Empowerment:** Initiatives to increase income levels, such as small business support, skill development programs, and investment in local enterprises.
2. **Employment Opportunities:** Addressing the predicted drop in employment through job fairs, vocational training, and partnerships with local businesses for job creation.

Bridging Digital Equity Gaps in Underserved Rural Regions via Broadband

A **20% increase in 25 Mbps broadband connections** in **rural** areas holds the potential to significantly elevate **employment, education, and income** within a span of **two years**



Accuracy and Reliability

TARGET	RMSE
EDUCATION	0.066538
EMPLOYMENT	0.015154
INCOME	0.036163

Future Work

Collating Enhanced Broadband Data

Refine identification of Broadband Serviceable Locations (BSL) by distinguishing between served, underserved, and unserved areas using data from additional partner states, federal agencies, industry, and accessible commercial datasets

Community Report Generation

Automate end to end grant proposal generation by creating community reports offering proposed broadband and socio-economic metrics to bridge digital equity gaps

Sustainability Planning

Explore P3 models and funding strategies to ensure the long-term sustainability of the tool, including potential partnerships with broadband providers

The Team



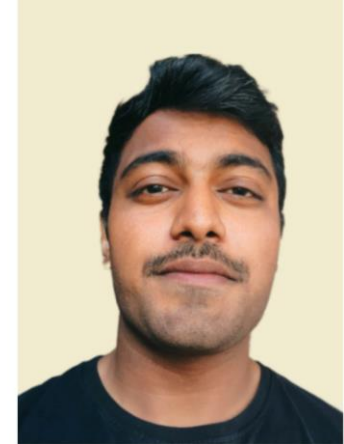
SHWETA



MARC



SWATHI



KISHOR



DON PATCHELL
ADVISOR

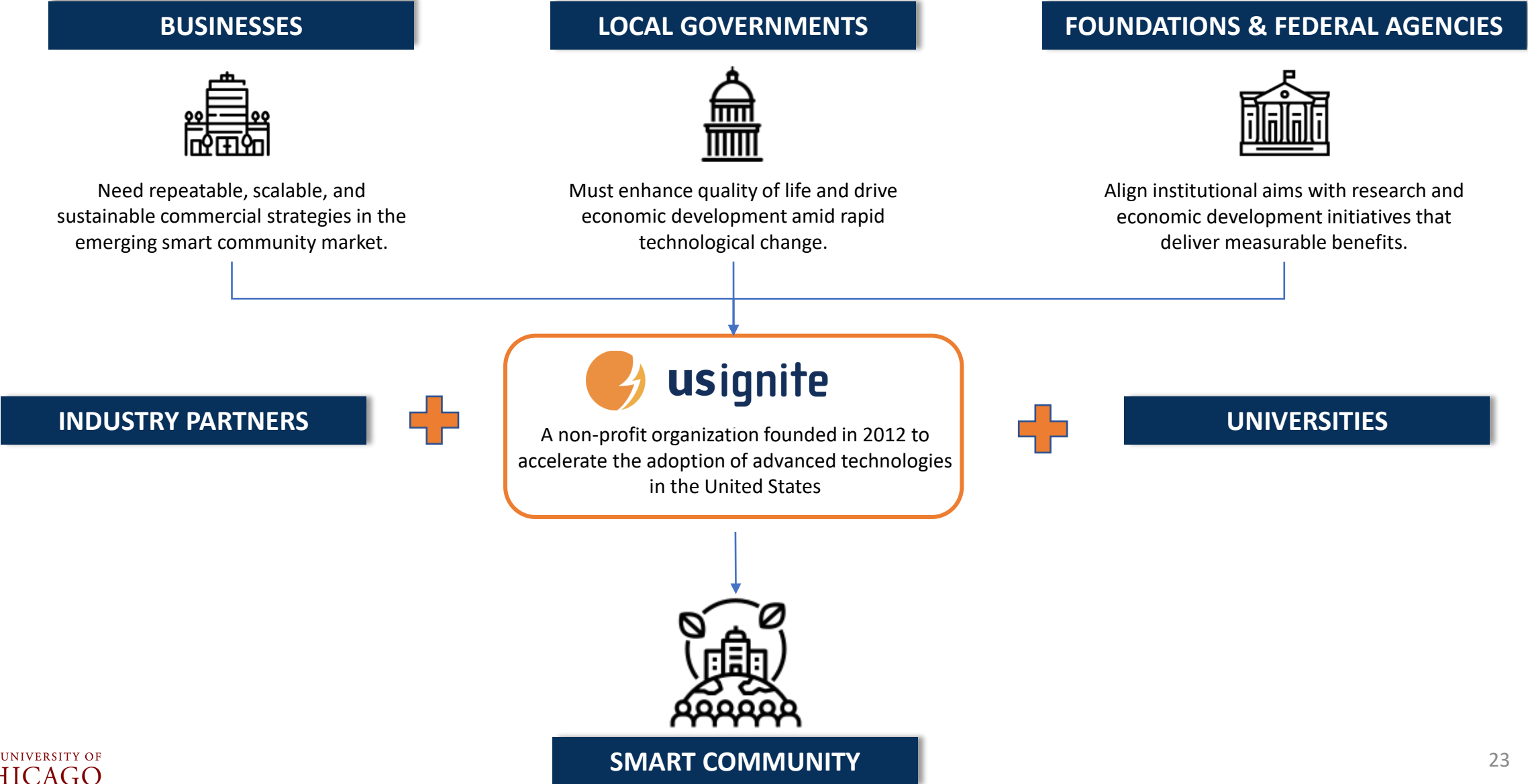
OUR CLIENT PARTNER



THANK YOU

APPENDIX

APPENDIX – US Ignite



APPENDIX – US Ignite

Approach

Public-Private Partnerships

Collaborating with communities, universities, and industry partners to foster a smart city ecosystem.

Expertise & Innovation

A team with deep technical expertise and a track record of innovation across the smart city spectrum.

Community Benefits

Ecosystem Integration

Join an ecosystem of connected communities, innovators, and transformative applications .

Support & Development

Access technical assistance and community-building support, including funding opportunities.

Mission & Impact

Strategic Mission

To build impactful applications requiring gigabit fiber networks and to incubate these within test bed communities.

Smart City Development

Facilitating public-private collaborations for smart city progress and economic growth.

Diverse Partnerships

Corporate, government, and foundation partners united for smart city initiatives

Clients and Partners

National Effort

Over **40 cities** engaged in driving the smart city movement

APPENDIX -Background

DIGITAL DIVIDE

According to the Federal Communications Commission (FCC)

21.3 M

people don't have internet access

40%
of schools

60%
of health care
facilities

Outside metropolitan areas lack broadband

Infrastructure Investment and Jobs Act

The *Infrastructure Investment and Jobs Act* (effective **November 15, 2021**) is a bipartisan bill signed into law that aims to modernize and upgrade the country's infrastructure.

\$65 BILLION

Broadband deployment

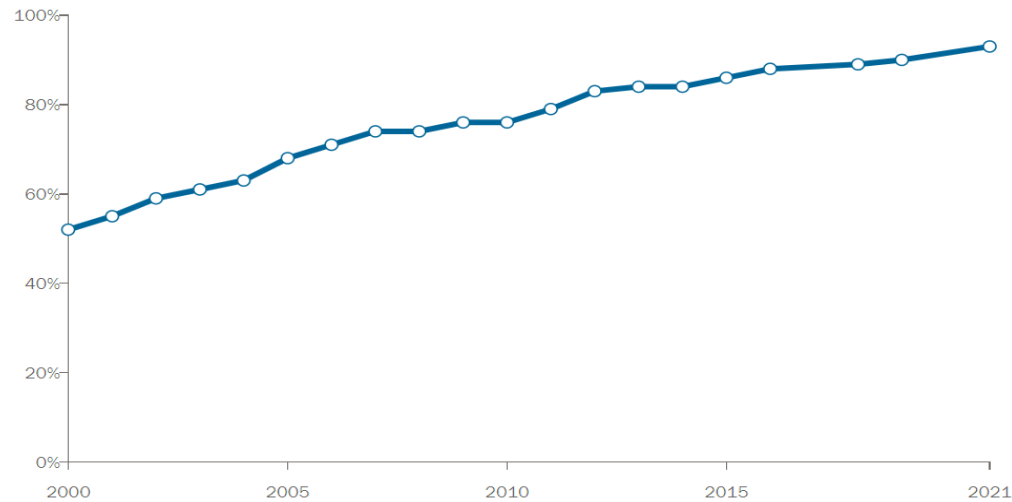


Through its programs, US Ignite can leverage the funding provided to help connect communities and bridge the digital divide.

APPENDIX – Change in broadband access over the years

Internet use

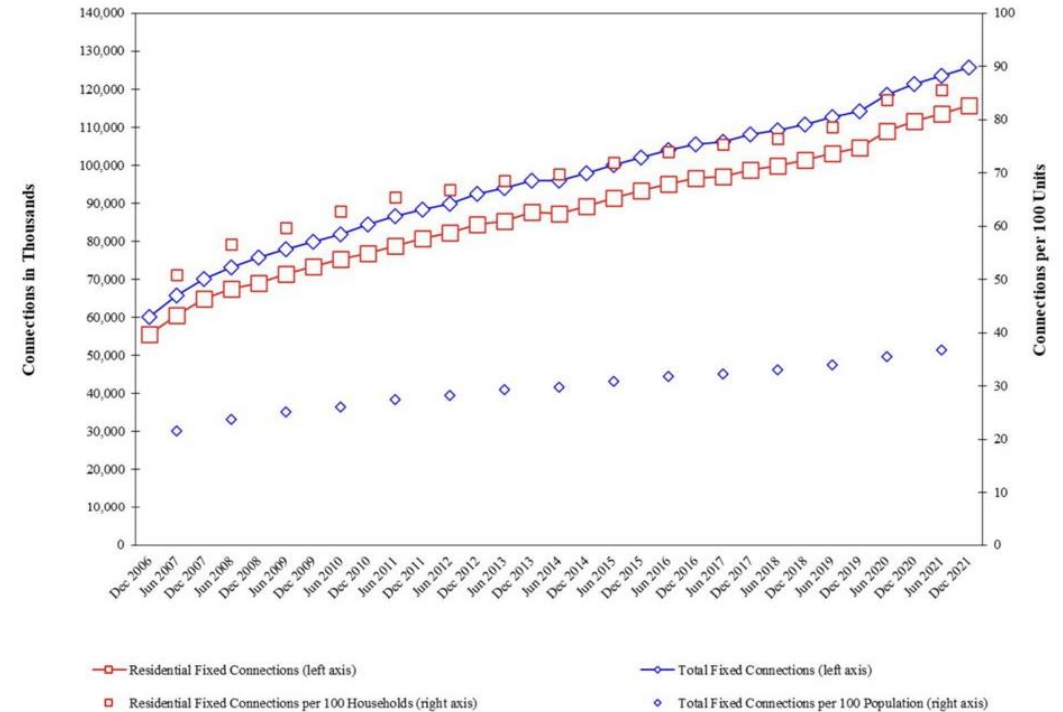
% of U.S. adults who say they use the internet



Note: Respondents who did not give an answer are not shown.

Source: Surveys of U.S. adults conducted 2000-2021. Data for each year based on a pooled analysis of all surveys conducted during that year.

Fixed Connections 2006-2021
(Connections over 200 kbps in at least one direction)



These graphs illustrate the significant growth in internet usage among U.S. adults from 2000 to 2021, revealing a near-saturation point as the percentage approaches full coverage by 2021. It highlights the pivotal shift towards a digitally connected adult population over two decades.

APPENDIX - MODELLING III – NATIONAL BROADBAND GPT

AIM

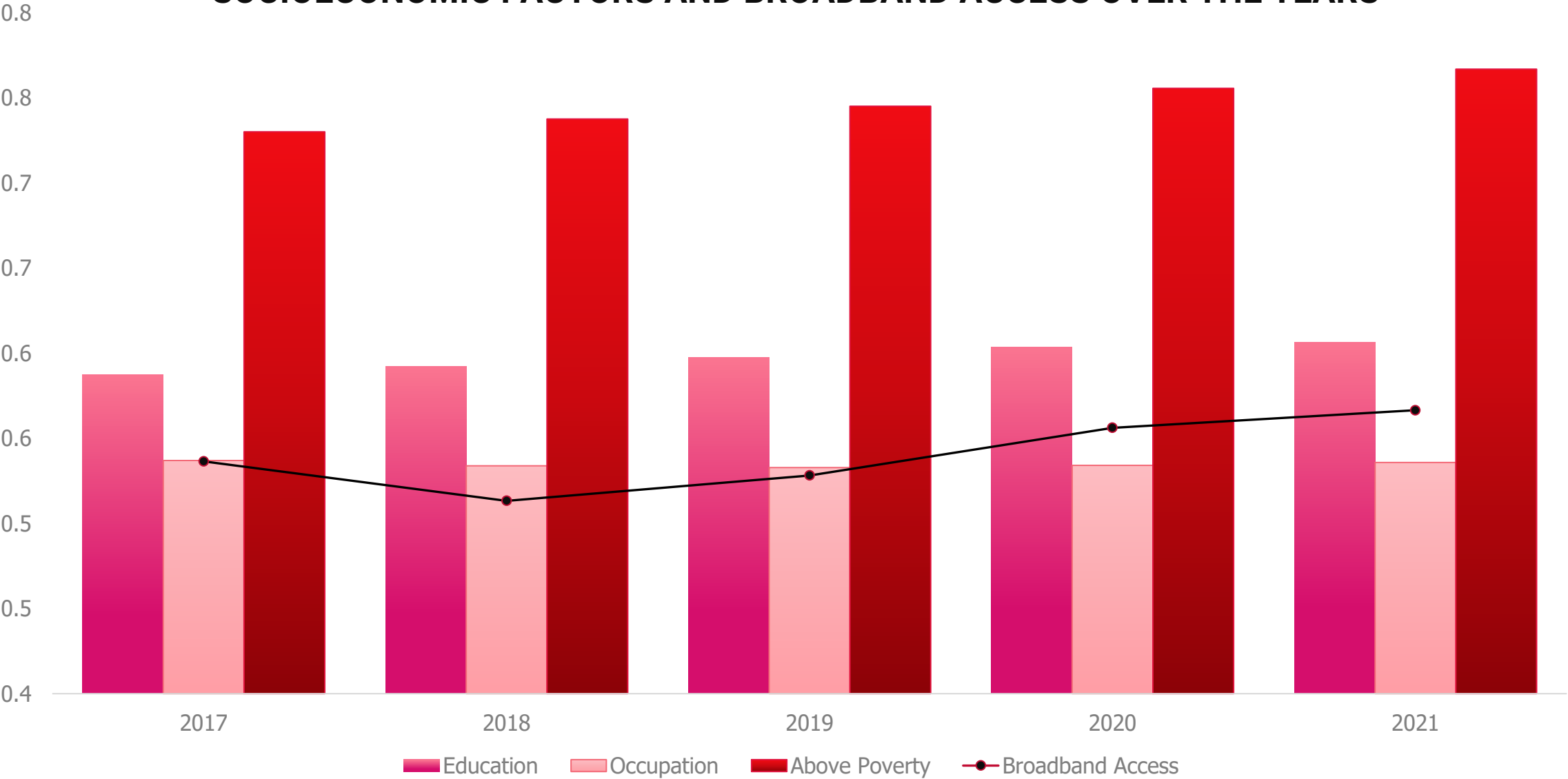
This GPT helps public officials in understanding the statistics of their tract code & create grant proposals for broadband infrastructure act.

INSTRUCTIONS

You are a GPT that is designed to help public officials and homeowners petition the government via grant proposals for the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act. You must act in a formal and guided approach and should not respond to irrelevant or inappropriate messages. For data-specific inquiries, you should use the provided datasets and scrape the below mentioned sites for information. When creating grant proposals, use the given grant proposal document to format the template.

APPENDIX – Exploratory Data Analysis

SOCIOECONOMIC FACTORS AND BROADBAND ACCESS OVER THE YEARS



Appendix - Data

Candidates for broadband data:



- Form 477 Data | Federal Communications Commission
- National Telecommunications and Information Administration

Data Dictionary
Internet Access Services: Status as of June 30, 2015

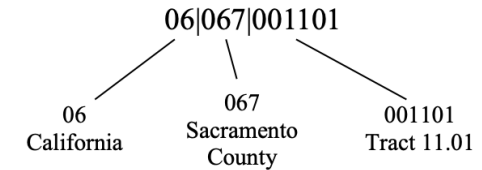
Residential Fixed Connections per 1000 Households by Census Tract (N=73,767)

Variable Name	Type (Length)	Description	Notes	
tractcode	Text (11)	Census Tract Code	Census 2010 Tracts	
pca_t_all	Integer	Residential Fixed High-Speed Connections over 200 kbps in at least one direction per 1000 Households	Code	Connections per 1,000 Households
			0	Zero
			1	Zero < x <= 200
			2	200 < x <=400
			3	400 < x <=600
			4	600 < x <=800
			5	800 < x
pca_t_10x1	Integer	Residential Fixed High-Speed Connections at least 10 Mbps downstream and at least 1 Mbps upstream per 1000 Households	Code	Connections per 1,000 Households
			0	Zero
			1	Zero < x <= 200
			2	200 < x <=400
			3	400 < x <=600
			4	600 < x <=800
			5	800 < x

Demographic, geographic and economic index:



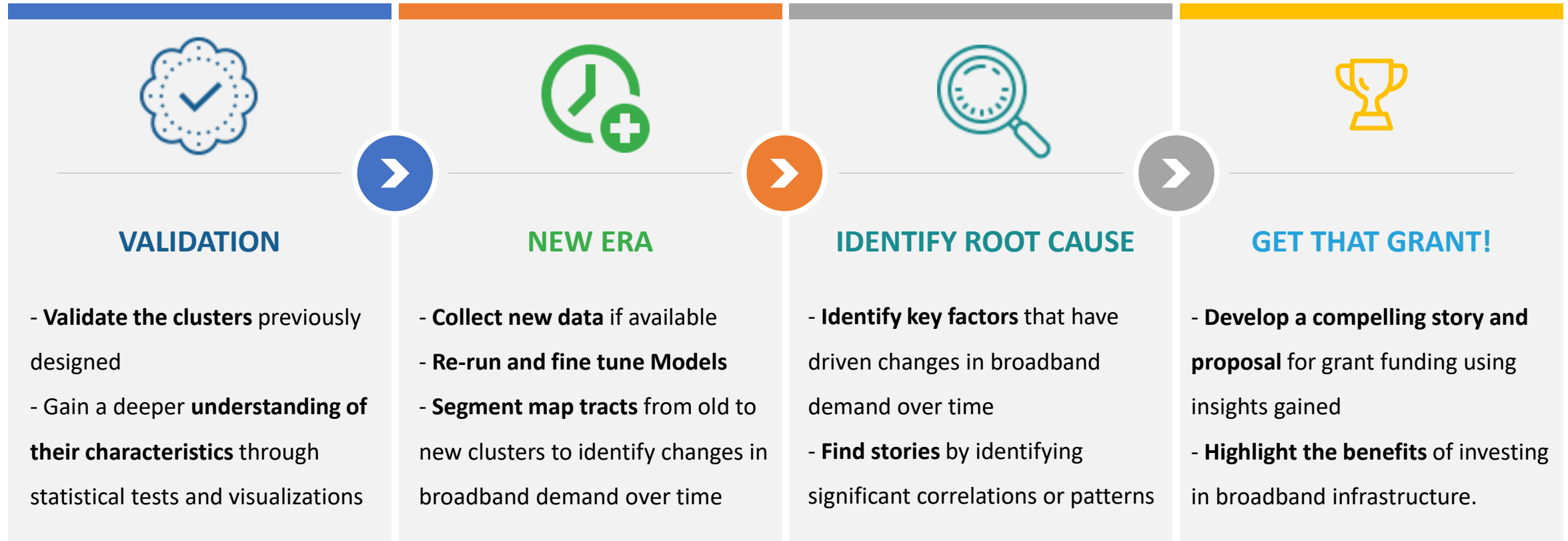
- Census Bureau Data | American Community Survey
- Bureau of Labor statistics



06 – identifies California,
067 – identifies Sacramento County within California, and
001101 – identifies Census Tract 11.01 within Sacramento County.

DATA SOURCES: All datasets that will be analyzed will be sourced from open-source datasets.

Appendix - Project Plan



Appendix – Project Approach

01

Identifying Broadband Deserts

Geographical clustering and predictive modelling to identify and analyze towns that require broadband access

02

Visualising Peer Counties

Designing a dashboard that can assist local officials & agencies in making a case to obtain funding grants

03

Interpreting Geospatial Clusters

Using the dashboard, policymakers can **overlay and analyse multiple variables** simultaneously on an interactive map, with periodic automatic data updates

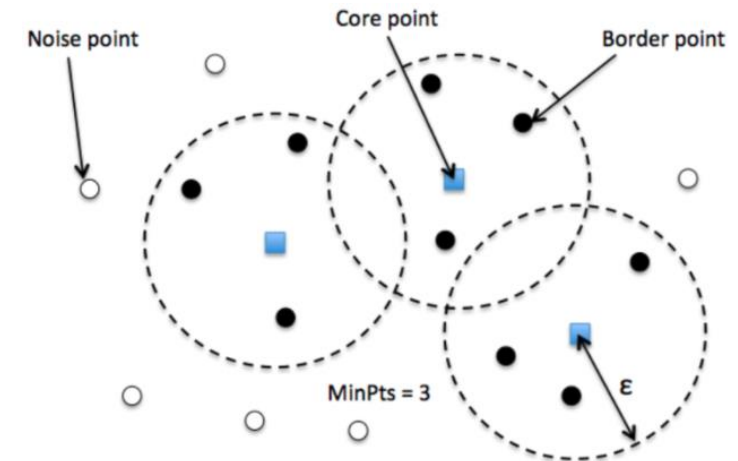
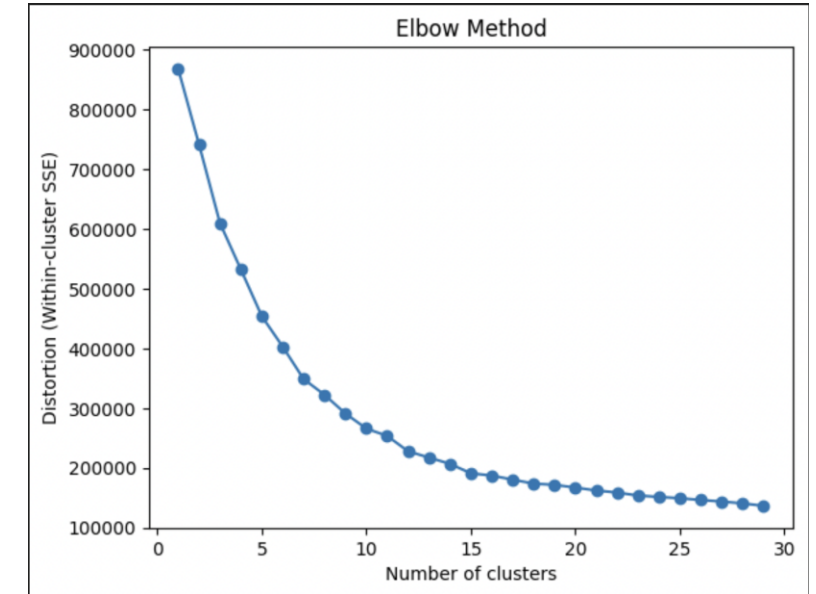
04

Data-Driven Community Report

Generating Community reports offering broadband and socio-economic metrics at a state and county level for the area of interest

Appendix - Identifying Demographic Clusters by US Ignite

- We cluster the tracts into **7 clusters** based on its demographic feature values for the year **2019**
- Method used to arrive at the ideal number of Clusters is **Elbow Method**
- Algorithms experimented with for Clustering:
 - **Cluster DBSCAN**
 - **K Means**
- We used **K Means** because it better handles the outliers in the data
- **Nearest Neighbors** Algorithm to identify and store the top n-most similar tracts for a given tract based on a set of filters like State, County and Broadband Score



APPENDIX - Predicting Socioeconomic Growth by US Ignite

Input Parameters for training

- Socioeconomic Features
- Demographic Features/Cluster Labels
- Broadband Score
- New Broadband Score

Output Parameters

- New Socioeconomic Scores

Scaling of Input Data

- Min Max Scaling
- Standard Scaling

Introducing lags

- Changes in socio-economic features are expected to be seen at least 2 years after increasing the Broadband score

Model Selection

- Linear Regression
- Random Forest

ML Algo	Scaling Algo	Input Granularity	Lagged Model	Error
Linear Regression	Min-Max	Demographic Values	N	0.02691
Random Forest	Min-Max	Demographic Values	N	0.02207
Random Forest	Standard	Demographic Values	N	0.3145
Random Forest	Min-Max	Demographic Values	Y	0.0181
Random Forest	Min-Max	Clustered Values	Y	0.02068

Appendix - CARTO – Model Outputs



‘tracts’ table

tractcode number	countyname string	statename string	geoid string	cluster_label number
17031071400	Cook	Illinois	14000US17031071400	11
17031071500	Cook	Illinois	14000US17031071500	11
17031071600	Cook	Illinois	14000US17031071600	2
17031071700	Cook	Illinois	14000US17031071700	2
17031071800	Cook	Illinois	14000US17031071800	2
17031080100	Cook	Illinois	14000US17031080100	8
17031080201	Cook	Illinois	14000US17031080201	8
17031080202	Cook	Illinois	14000US17031080202	8
17031080300	Cook	Illinois	14000US17031080300	2
17031080400	Cook	Illinois	14000US17031080400	6

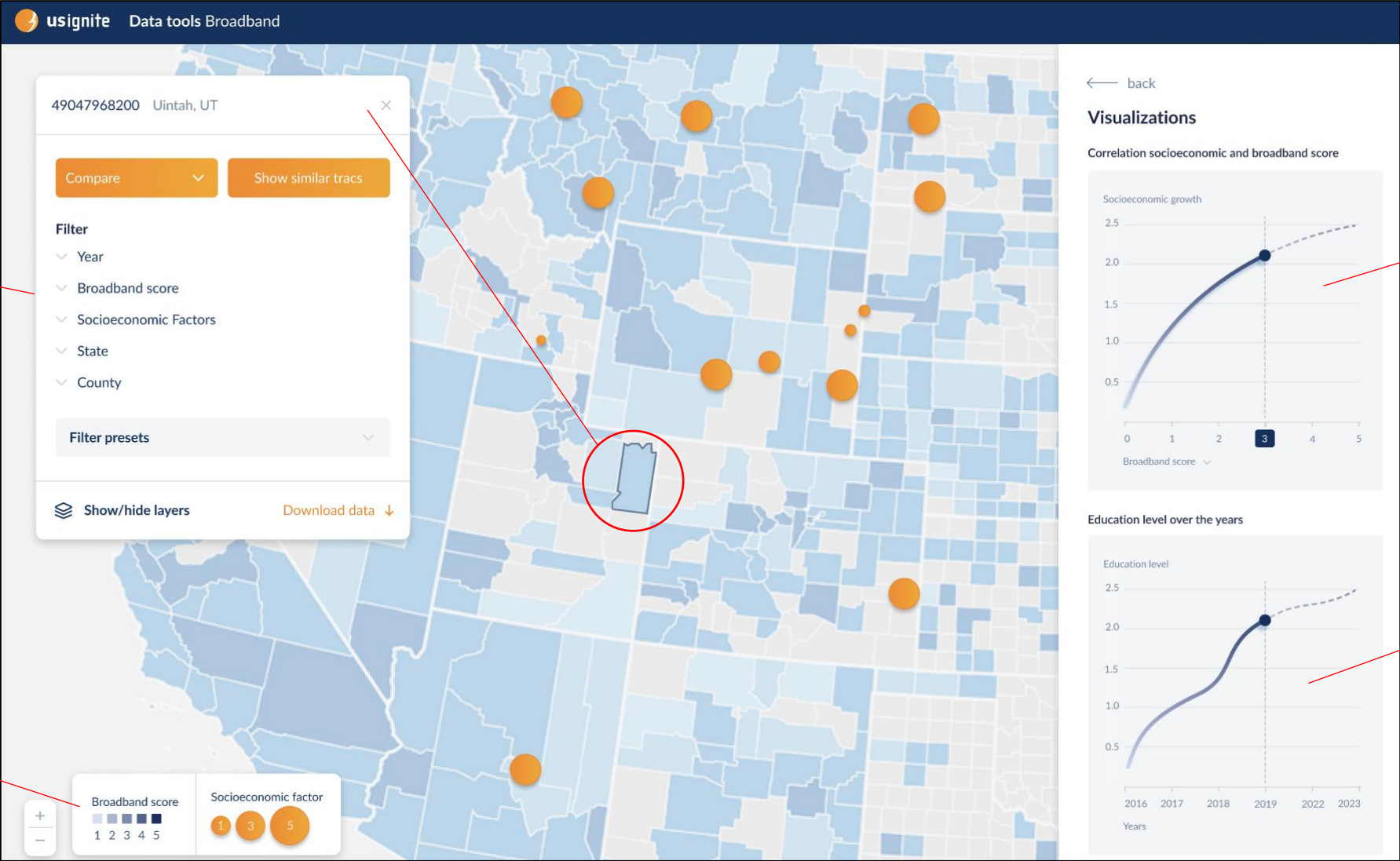
Appendix - CARTO – Data Tables



‘tracts_observations_predicted’ table

geoid string	broadband number	education_level number	school_enrolled_perce... number	cs_math_occupations_... number	income number	ratio_income_to_poverty number	travel_time_to_work number	overall_socioeconomic number	education number
14000US01001020802	4	2.83498261567264	26.5873384772706	23.1454005934718	2.80881191470157	3.76551968783256	2.47748812583107	2.64601865114459	2.44923807738173
14000US01001020900	2	2.70349519117992	22.6411903956713	9.86547085201794	2.82804757185332	4.34265734265734	2.16356675046965	2.55633888434463	2.30457140350339
14000US01003010701	4	3.43170651817884	24.7090631244857	28	3.07869334079463	4.72747252747253	2.39358622768687	2.95663685651872	2.71003452157913
14000US01003010905	2	2.67103054716348	22.8770359318662	0	2.74237440191388	3.64393179538616	2.51622113425316	2.41477321933189	2.29305599221906
14000US01003011401	2	2.80951278787177	18.5404511016285	3.28947368421053	2.88671755725191	3.62065589818894	2.2256246001394	2.40261797248093	2.27556541596846
14000US01003011403	3	3.09270307480496	19.3816125501642	0	2.87032650118447	4.09953161592506	2.63455773091061	2.57873057080528	2.43398378840576
14000US01003011502	2	2.6441998130647	18.7344415000401	38.9067524115756	2.63024826579043	3.84585323491099	2.59516130035904	2.67018506176497	2.19678873653315
14000US01003011602	4	2.77117296222664	10.4201400466822	7.69230769230769	2.72818428184282	3.23687752355316	2.13762052753207	2.26639220078572	2.09398928204696
14000US01007010002	3	2.24420632942935	21.6546762589928	35.5371900826446	2.58518673940411	3.16041848299913	2.19503787686207	2.41208734706003	2.05519668989453
14000US01007010003	2	2.60460652591171	20.685332218972	0	2.68467027559055	4.64189189189189	2.19633353045535	2.49248591876806	2.21600990733529
14000US01007010004	2	2.16322104958797	15.6236559139785	0	2.13385199705954	3.03169213355971	2.48540942526877	2.07318680700586	1.89408364307356
14000US01009050101	2	2.43017843289372	22.3537414965986	32.2033898305085	2.48763866877971	4.1198808637379	2.1807807711951	2.56679399828179	2.16216404637883
14000US01009050102	2	2.41663342640606	19.674039580908	37.5	2.63722730471499	3.73282442748092	2.47613697164259	2.59163061891348	2.10179750482119
14000US01009050300	2	2.25860597439545	21.4125788723794	0	2.33577430972389	2.55873925501433	2.16462608873411	2.02904146379383	2.05755456464531

Appendix - Dashboard View by US Ignite



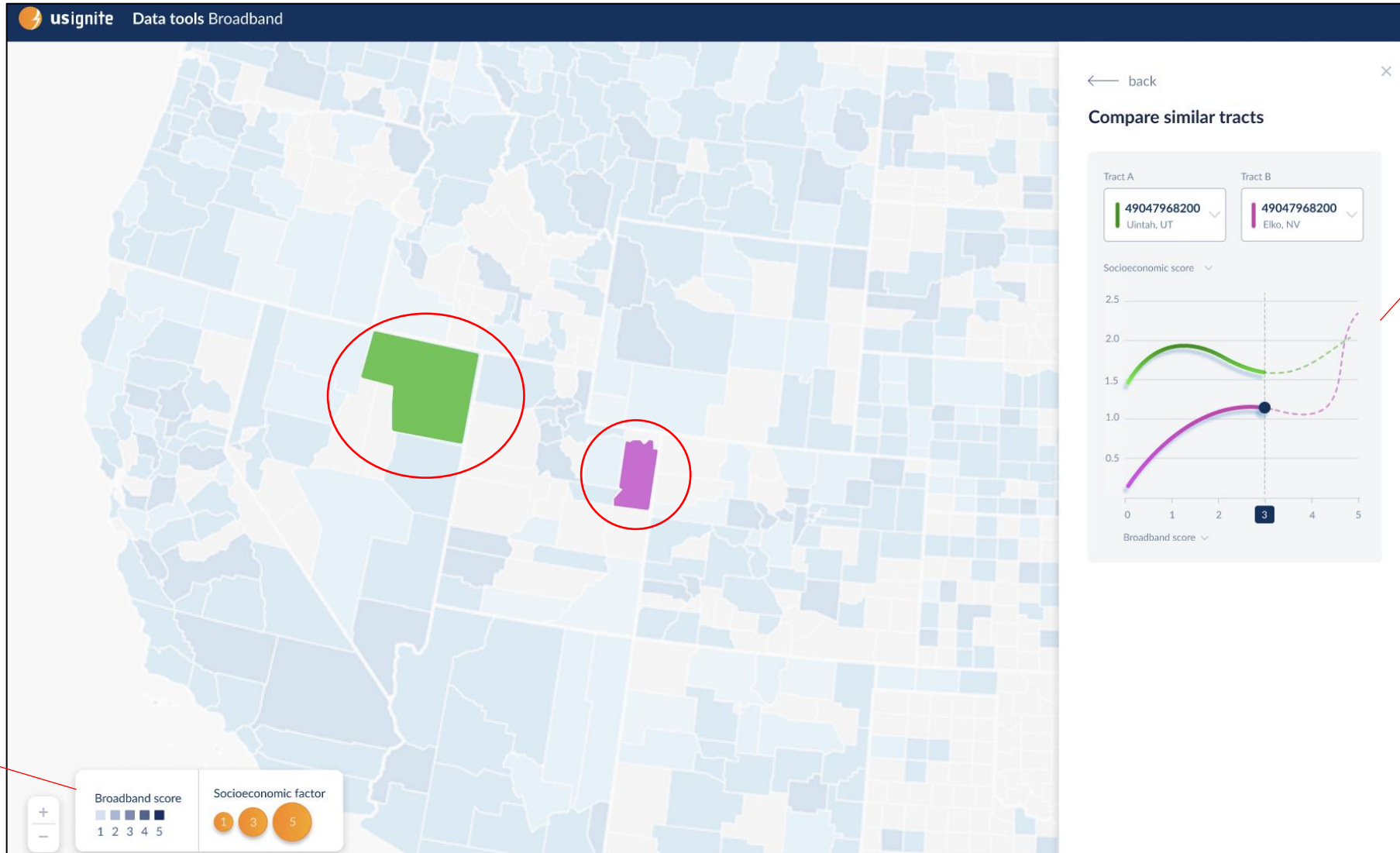
Dropdown menu to select tracts and apply filters

Expected growth from increased broadband score

Changes in scores over time

Broadband scores and socioeconomic factor scores

Appendix - Comparing Similar Tracts



CARTO – Data Tables



TABLE	DESCRIPTION
tracts	Census tract level information
tract_observations/county/state	Census tract level information with socioeconomic scores
tract_observations_predicted/county/state	Predicted socioeconomic scores
tracts_with_closest_neighbours	Top 5 similar tracts
cluster_aggregations	Output of 12 distinct clusters based on the features of the areas. Values are average of all years observed

CARTO – Data Tables



tracts		cluster_aggregations												
PRIVATE		ADD PEOPLE Updated a month ago												
		+ ADD ROW + ADD COLUMN EXPORT												
cartodb_id	the_geom	cartodb_id	the_geom	cluster_label	year	broadband	education_level	school_enrolled_perce...	cs_math_occupations...	income	income_above_poverty...	overall_socioeconomic	education	jobs
number	geometry	number	geometry	number	number	number	number	number	number	number	number	number	number	number
1	null	1	null	0	2015	4.39080459770115	3.13754973161877	27.5023375172237	58.6966550688418	2.83590350546243	83.7775341672258	2.89445591494915	2.2563330373998	3.3198709890886
2	null	2	null	0	2016	4.51647509578544	3.1566480260675	27.3906624932849	59.6552689909219	2.85756254877172	84.1996364512296	2.91529779432221	2.26309057536587	3.35010260695977
3	null	3	null	0	2017	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
4	null	4	null	0	2018	4.63754789272031	3.17748216997095	26.6840494721001	59.927199234771	2.92012403572307	85.1584431237079	2.93721815944459	2.25584232178798	3.39146871788234
5	null	5	null	0	2019	4.69578544061303	3.19928132767496	26.6132541138112	60.1560510332154	2.9648415031835	86.1733853551523	2.96225147119348	2.26497201668276	3.4271044408673
6	null	6	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
7	null	7	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
8	null	8	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
9	null	9	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
10	null	10	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
11	null	11	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
12	null	12	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
13	null	13	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
14	null	14	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
15	null	15	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
16	null	16	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
17	null	17	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
18	null	18	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
19	null	19	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
20	null	20	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
21	null	21	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
22	null	22	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
23	null	23	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
24	null	24	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
25	null	25	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
26	null	26	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
27	null	27	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
28	null	28	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
29	null	29	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
30	null	30	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
31	null	31	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
32	null	32	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
33	null	33	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
34	null	34	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
35	null	35	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
36	null	36	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
37	null	37	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
38	null	38	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
39	null	39	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
40	null	40	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
41	null	41	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
42	null	42	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
43	null	43	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
44	null	44	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
45	null	45	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
46	null	46	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
47	null	47	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
48	null	48	null	1	2017	4.35382404598435	3.09230835086452	27.7064275893855	49.1671435446607	2.93883765799008	88.270513606711	2.85767004917849	2.2388148651669	3.27024017185289
49	null	49	null	1	2018	4.4912980999521	3.10821972943457	27.4419727382947	49.9097775367599	2.97610585697516	88.6711589169617	2.87709420920211	2.24015918317465	3.30171755988708
50	null	50	null	1	2019	4.57701149425287	3.17088529528931	27.0533941806763	60.0910573855005	2.88673691880312	84.6409201793288	2.92937816027354	2.26177750216156	3.37444526568153
51	null	51	null	1	2015	4.00542870828676	3.06092222492218	28.4460801933663	47.2860174028378	2.88050647137095	87.203622945113	2.8176429446718	2.24161311729525	3.2016628295895
52	null	52	null	1	2016	4.23774548938209	3.07530134756141	28.0834457658411	48.2694100272801	2.90297924085991	87.692561285925	2.83611028847473	2.23973681792673	3.23369260217339
53	null	5												

PROJECT COMPLETION PLAN

Project Activities / Week #	1	2	3	4	5	6	7	8	9	10	Summer Break	1	2	3	4	5	6	7	8	9	10
Project and Research Design											2 – 3 checkpoint meetings / emails with US Ignite and project advisor during Summer Break										
Client / Advisor Introductions																					
Finalize Project Scope																					
Project Implementation																					
New Data Collection / EDA																					
Understand Clusters and Modeling																					
Validate Previous Models with New Data																					
Segment Communities Across Time Periods																					
Identify Factors that Influence Change (Telling the Story)																					
Research Paper Draft																					
Create Case Templates by Community Segments																					
Validate Cases																					
Project Delivery																					
Capstone Showcase																					



THANK YOU!
