

# Columbus Urban Structure

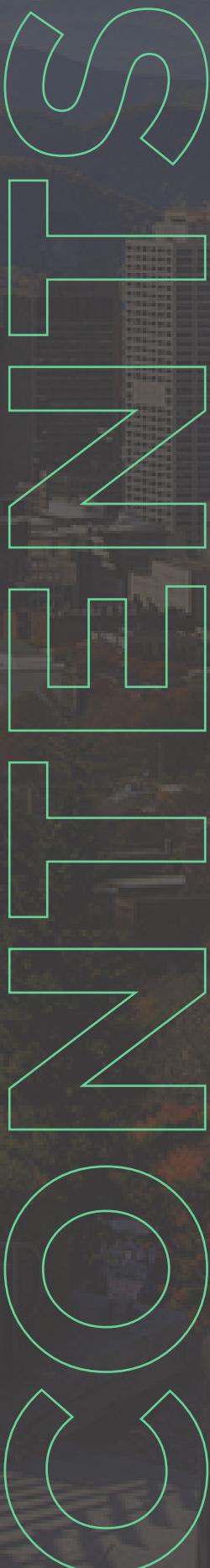
Project Documentation

**VCD**

Savannah

**CSE**

Robert  
Andres  
Pei-yuan  
Zhenyang



- Team members and roles**
- Team project statement**
- User flows for the interactive system**
- Concept prototype**
- Visualization Sprints**
- Style guide**
- Final visualization results**
- User Guide**
- Links to software + In-line doc. + Data**
- User testing plan + results**
- Insights + Improvements**
- Team member's contribution**
- Sources**



**CSE**

**Pei-yuan**

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Website Framework  
Graphs / Plots  
Data Analysis

**CSE**

**Zhenyang**

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Maps  
Website Framework  
UI Updates from Edits  
Time Based maps

**CSE**

**Robert**

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Data Sorting/Filtering  
Search functionality

**CSE**

**Andres**

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User Test Assist  
Time Based Maps  
Side bar info on interactive Map

**VCD**

**Savannah**

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User Test Assist  
User test analysis  
Documentation  
Presentation  
Visual Prototype  
UI Edits

# PROBLEM STATEMENT

## CONTEXT

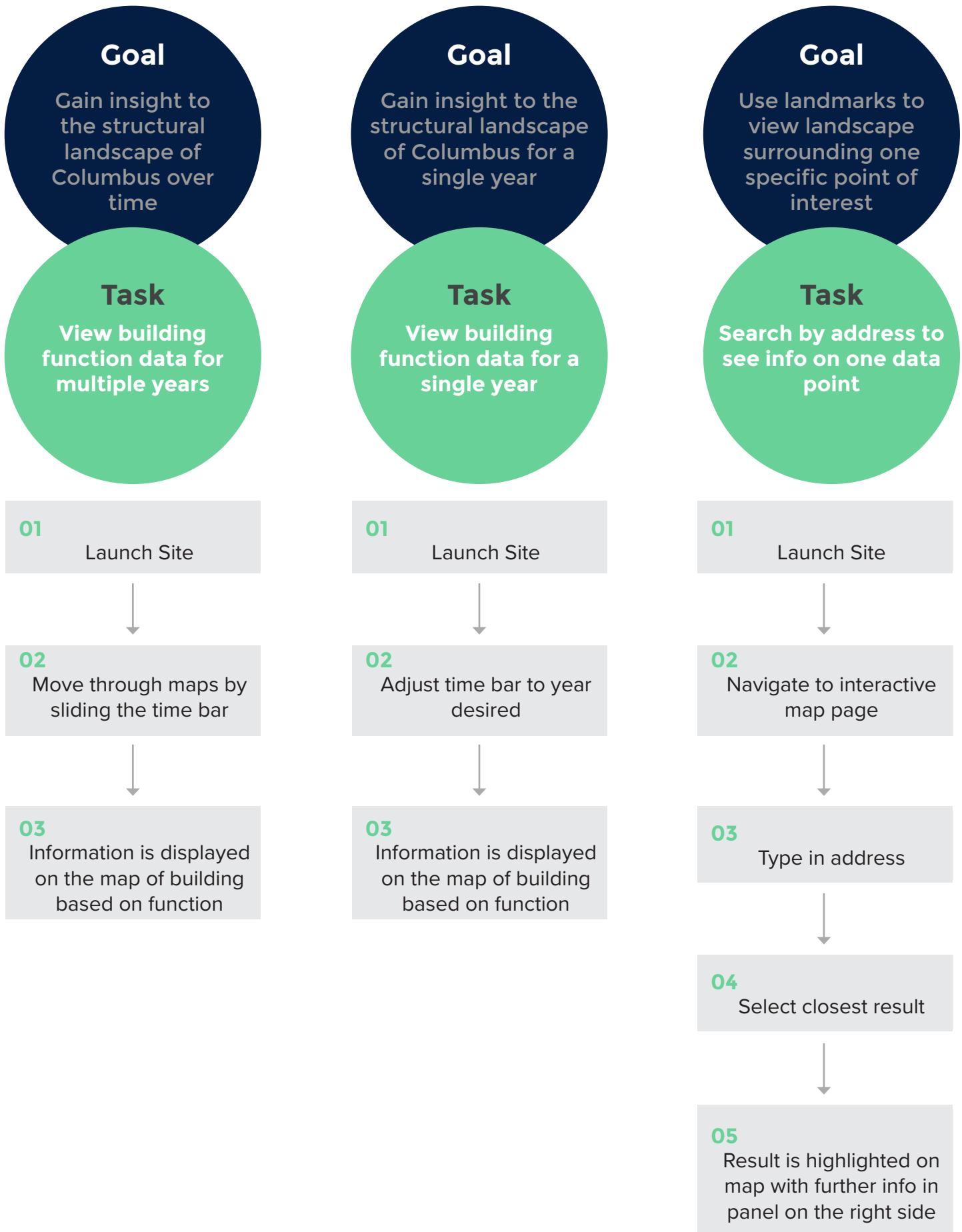
The city of Columbus is constantly evolving and growing with new areas being developed and old neighborhoods being revitalized.

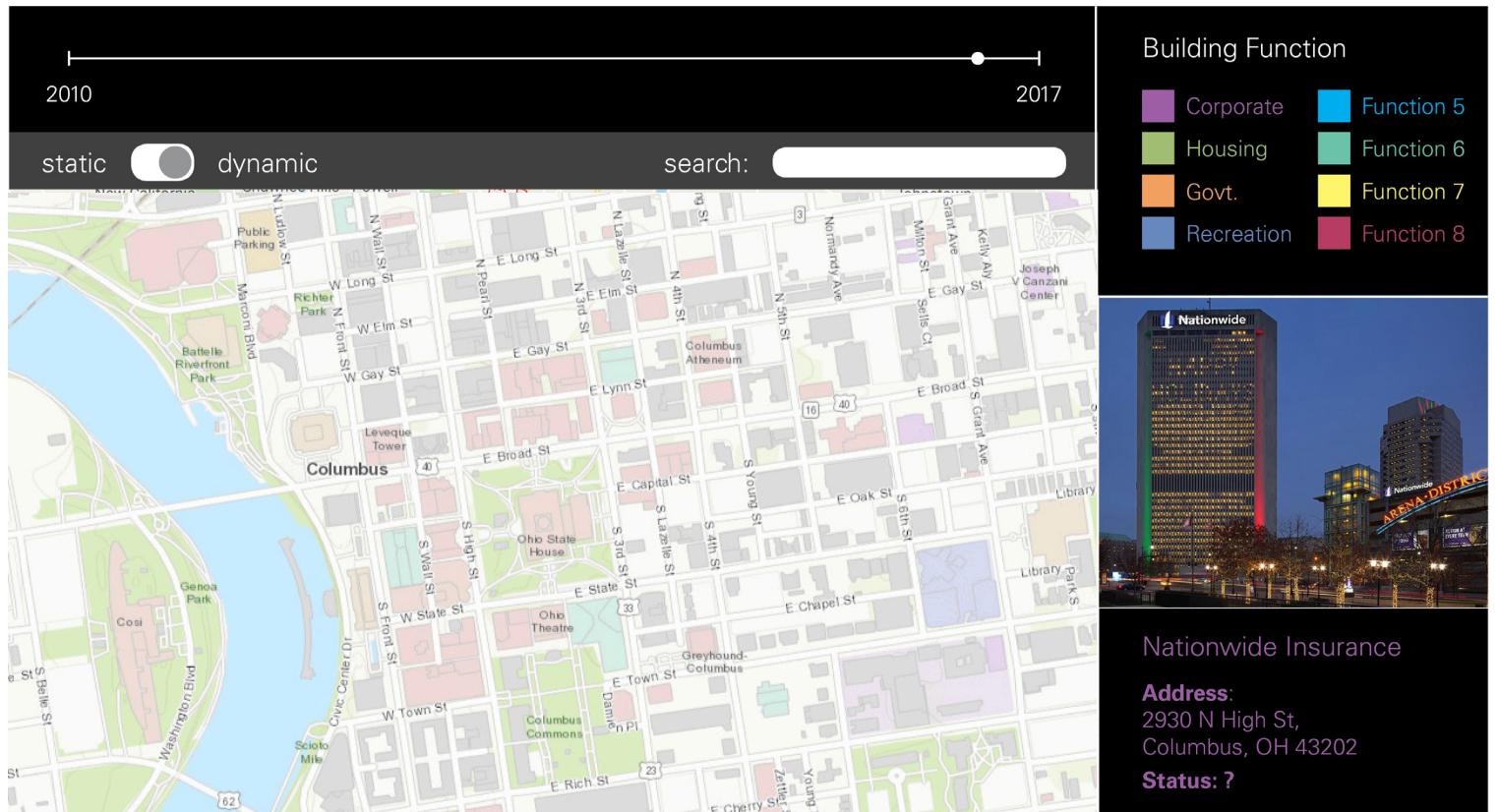
## INFORMATION

We hope to uncover more information by analyzing key aspects of the city's urban structure such as building function.

## PURPOSE

By visualizing this influx of growth and development, through the analysis of these key aspects, we can better understand city planning priorities, aerial patterns in structural development, and how the needs of the city have changed over time.





# Prototype

Although we had originally only planned to have one robust map based visualization, we eventually split it into 2 maps. One shows data over time and the other gives a zoomed out, holistic view of all of the data with multiple interactive elements.

# Sprint Backlog

Visualization Sprints

## Forecast & Tasks

IP

Done

### Brainstorm Ideas & Develop Problem Statement

- 01 What topic are we focusing on?
- 02 Establish a problem we can visualize
- 03 Write a formal problem statement



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### Prototype Solution

- 01 Discuss various solutions - All
- 02 Visualize Solution (Rough Sketch) - All
- 03 Create Static Visual Prototype - Savannah



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### Begin Developing Solution

- 01 Site Framework -Zhenyang
- 02 Display Data -Pei-Yuan
- 03 Time Based Animation-Andres
- 04 Interactive Map-CSE
- 05 Search Functionality - Rob
- 06 Search Result Descriptions - Andres
- 07 Legends - Savannah
- 08 UI Updates - Savannah
- 09 UI Edits from Updates - Pei-Yuan/Zhenyang



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### Project Documentation - Savannah

- 01 Info Compiling
- 02 Layout
- 03 Input Information



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### User Testing & Updates - Andres/Savannah

- 01 Develop User Testing Plan
- 02 De-Brief Questionnaire
- 03 Test application and record observations
- 04 Update application or list insights



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### Create Presentation - Savannah

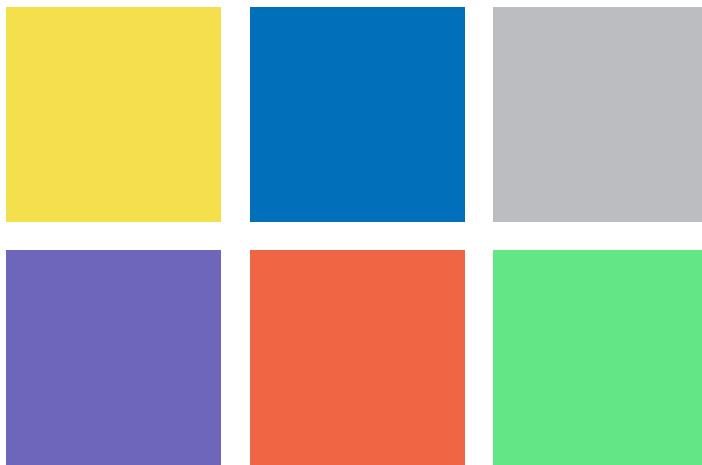
- 01 Info Compiling
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- 01 Info Compiling
- 02 Layout
- 03 Input Information

## Color Palette

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## Typography

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# Header

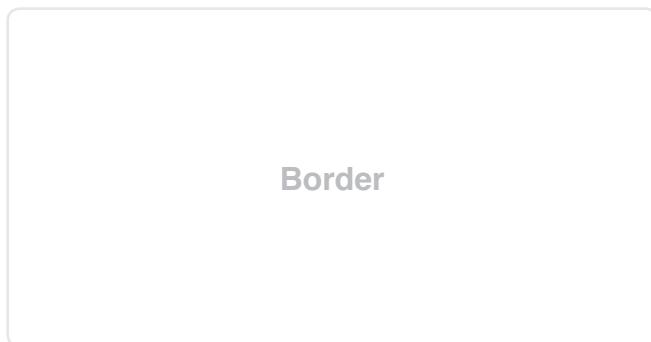
## Nav Bar / Sub Header

### Label

This is for the body copy. Its proxima nova regular at 12 pt size with 14.4 leading in black.

## Page Elements

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Border

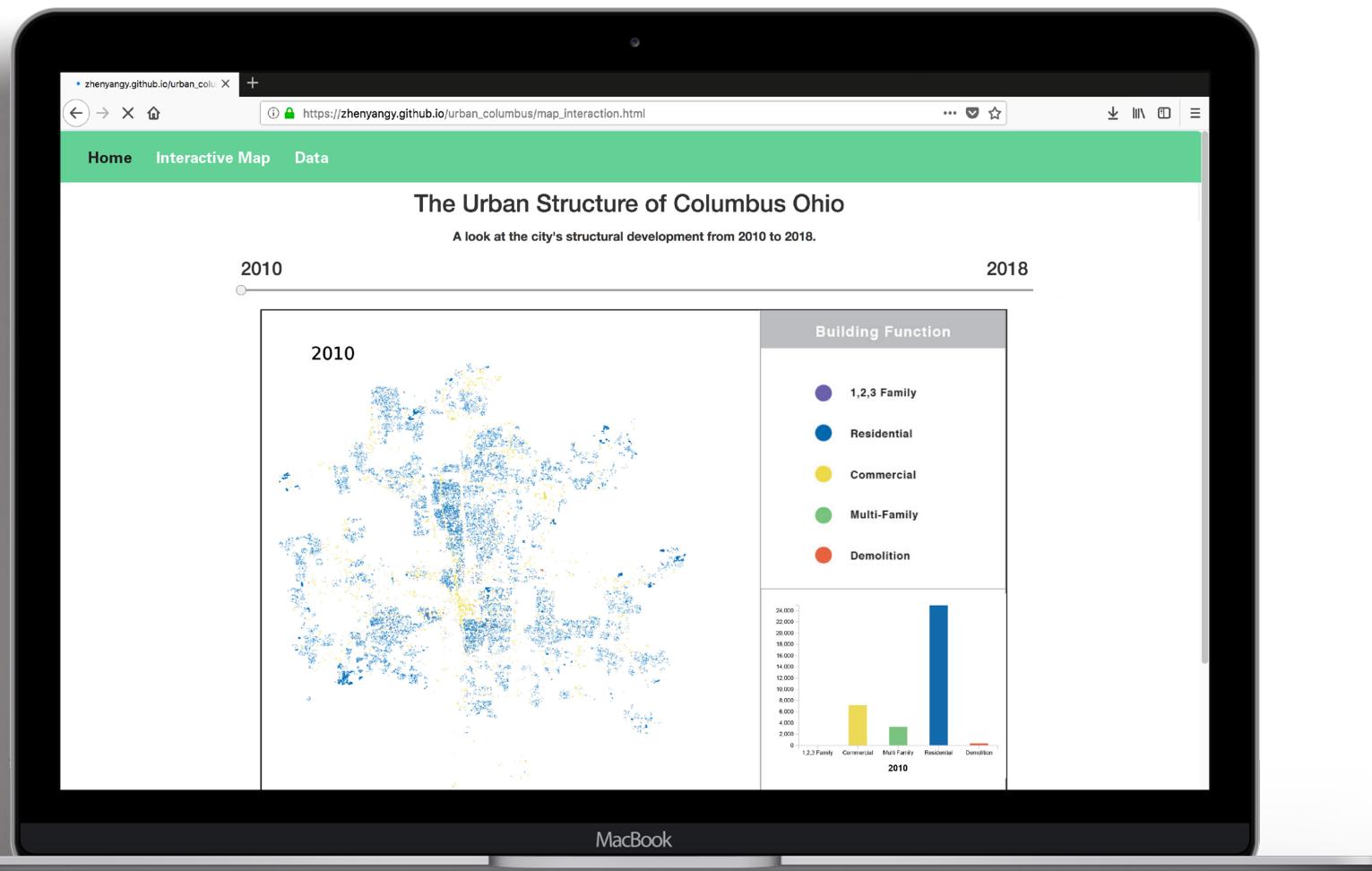
The screenshot shows a web browser window with four tabs open, all titled "zhenyang.github.io/urban\_columbus". The active tab displays the main page of the visualization. The header includes navigation links for "City of Columbus", "Interactive Map", and "Data Analysis". The main content features a large, stylized white outline of the Columbus city skyline against a dark background with blurred city lights. Below the skyline, the text "Columbus Urban Structure" is displayed in a large, bold, light green font. A subtitle in a smaller white font reads: "The city of Columbus is constantly evolving and growing, with new areas being developed and old neighborhoods being revitalized."

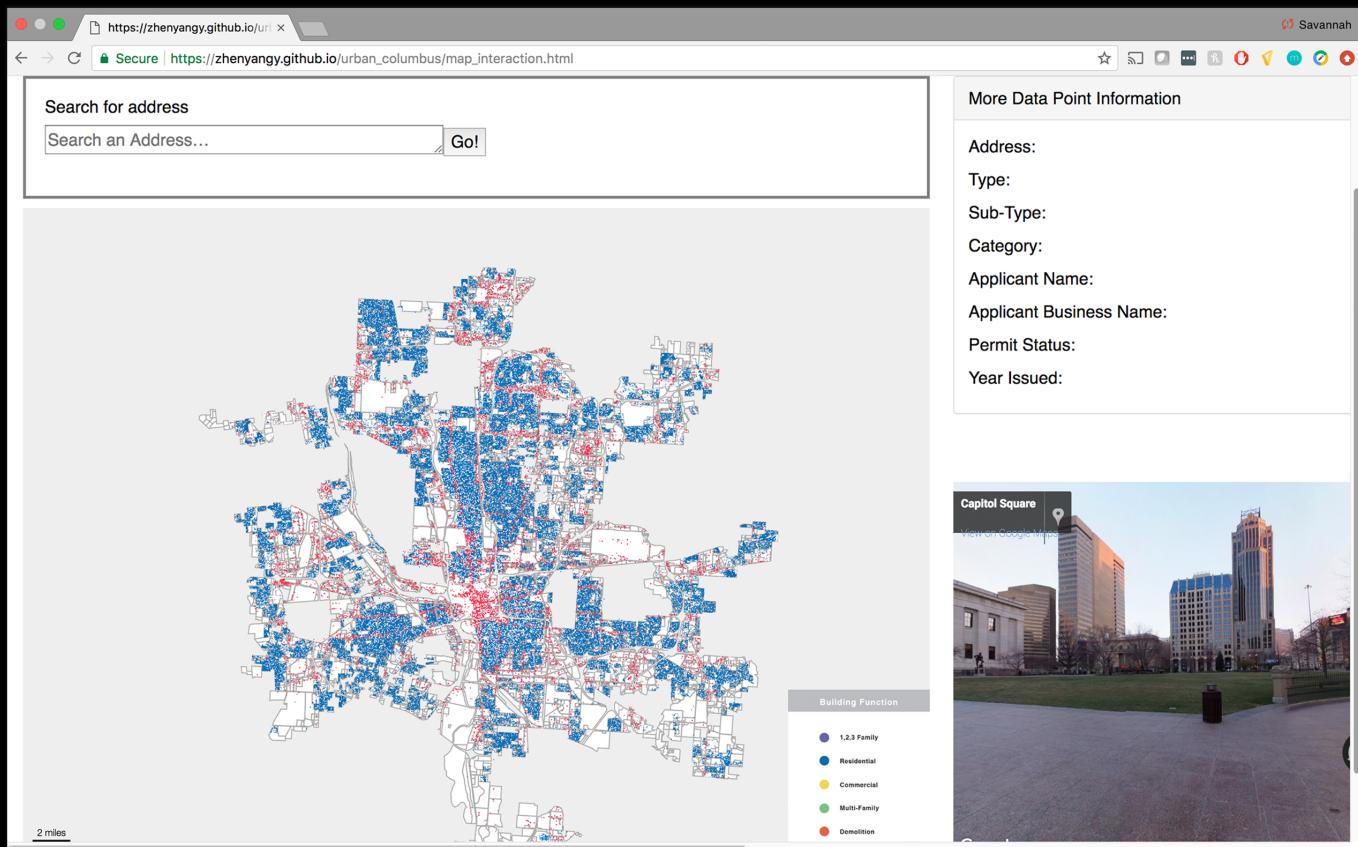


**Our Goal**

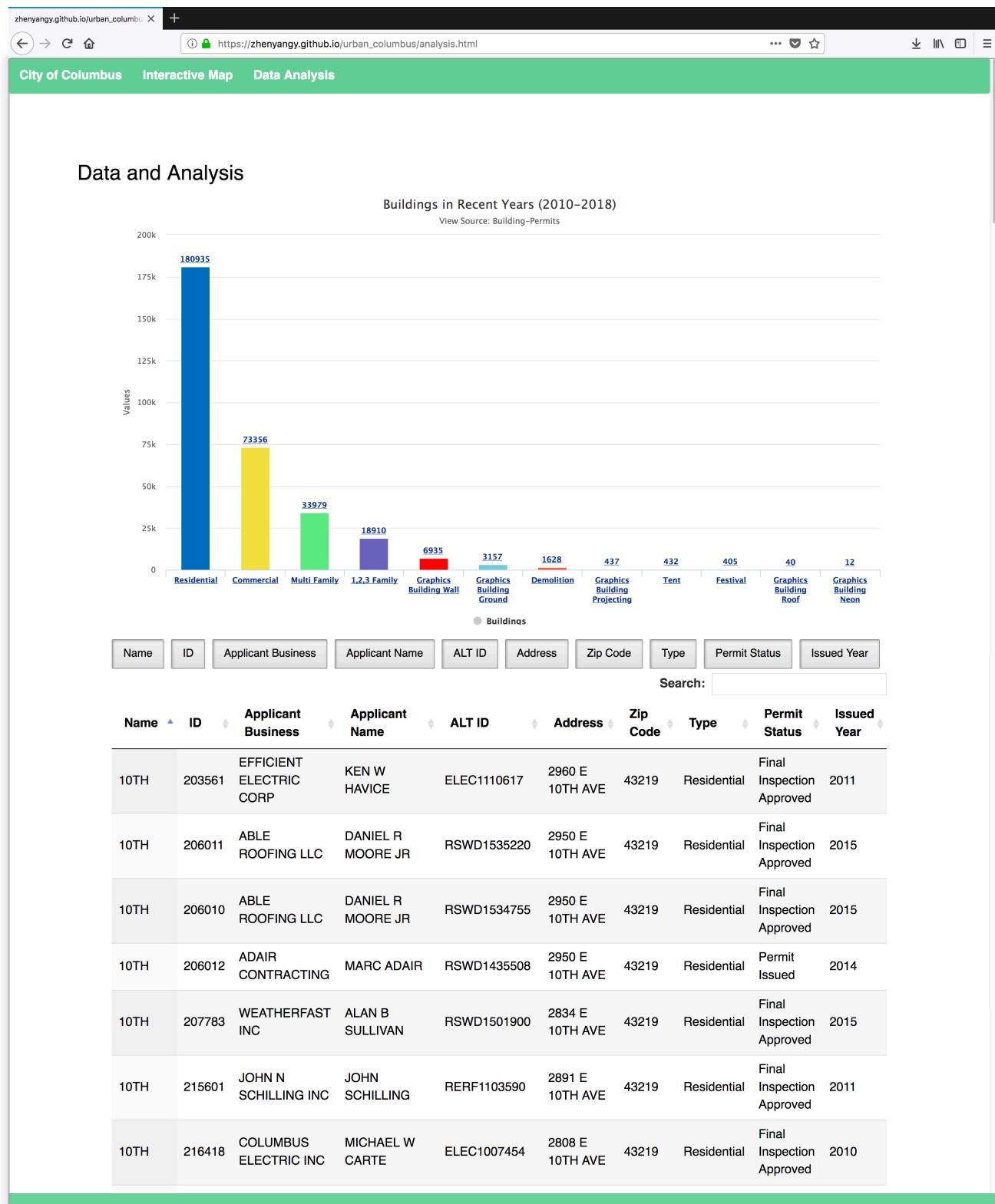
By visualizing this influx of growth and development, through the analysis of these key aspects, we can better understand city planning priorities, aerial patterns in structural development, and how the needs of the city have changed over time.

# TIME BASED MAP





# Interactive Map



\*This page was included at the request of Dr. Shen. It includes some data that we did not use in our final interactive system but he wanted it included for reference purposes. The table at the bottom allows you to look up more info on Columbus Building Permits.

User can slide the time bar to get a dynamic look at how the urban landscape (based on building function) has changed over time.

Legend indicating what the colored dots represent according to the permit data found on the city's website.

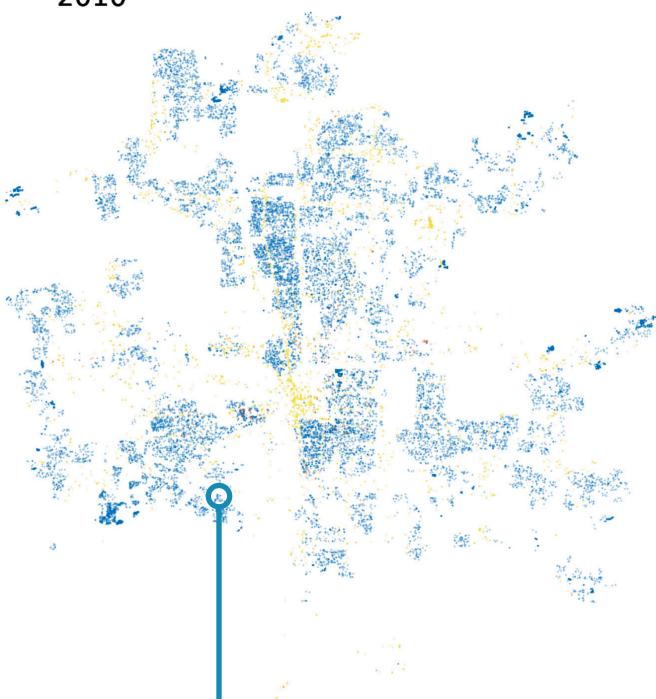
## The Urban Structure of Columbus Ohio

A look at the city's structural development from 2010 to 2018.

2010

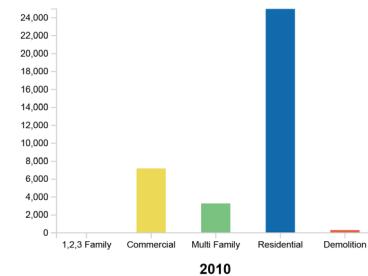
2018

2010



### Building Function

- 1,2,3 Family
- Residential
- Commercial
- Multi-Family
- Demolition

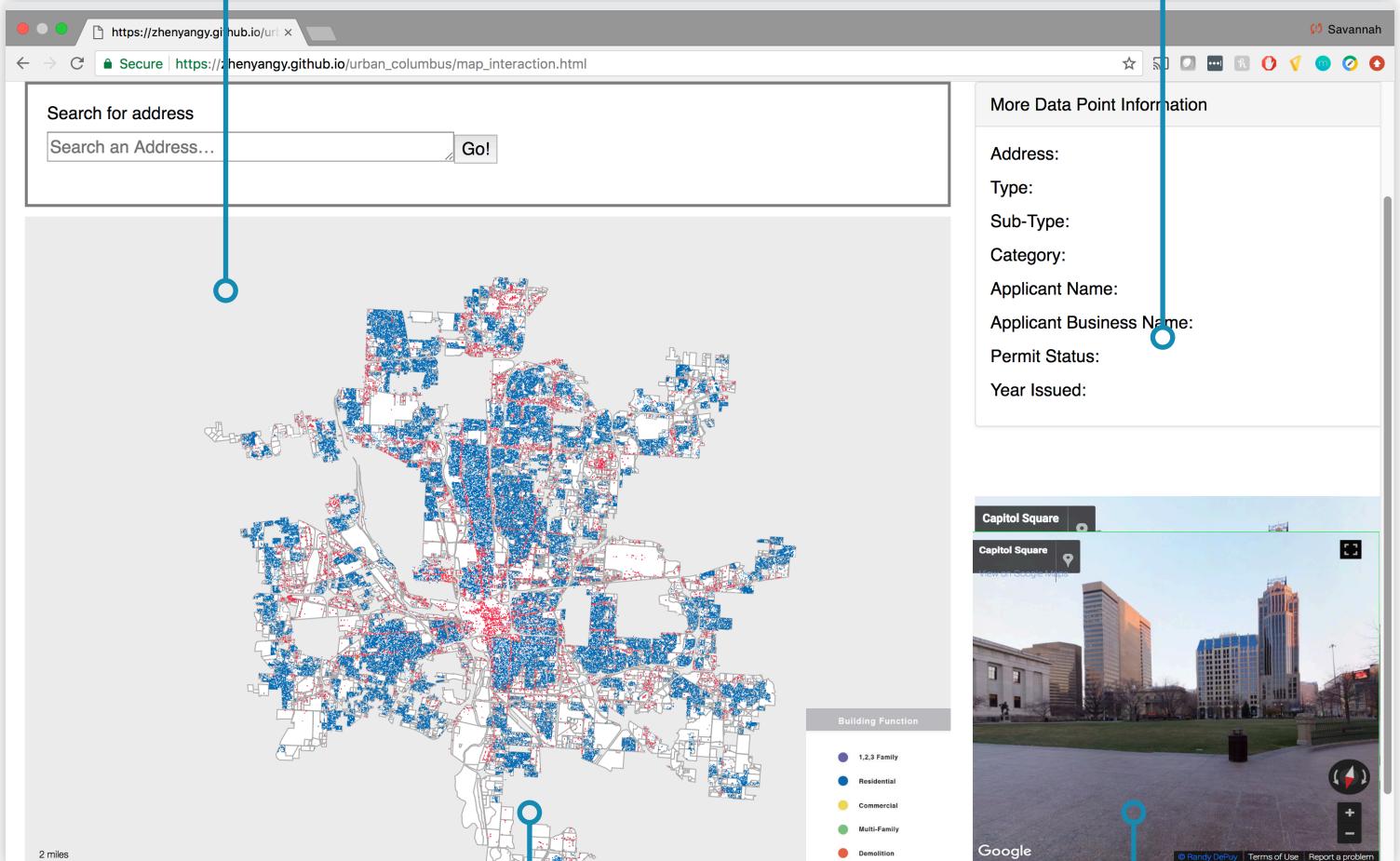


Colored dots correspond with the type of building or "building function" located there.

Individual bar charts representing date for each year will change as you slide the time bar along with the map.

User can search for a specific location to view data for that area. As the user inputs the location the top 3 results from the data will be displayed and the user can select one and see it highlighted within the map.

Extra information relevant to the users search will show up here.



This map aggregates all data from 2010-2018 to give the user a broad, holistic view of the data. User can click points on the map to get more information as well as an alternative for searching for a location using the search bar.

An image from Google maps will be displayed for the location selected.



# Software Link to GitHub Repository

[https://github.com/zhenyangy/urban\\_columbus](https://github.com/zhenyangy/urban_columbus)

OR TRY THIS

[https://zhenyangy.github.io/urban\\_columbus/index](https://zhenyangy.github.io/urban_columbus/index)

## FURTHER DOCUMENTATION ON SITE INTERACTION

[https://github.com/zhenyangy/urban\\_columbus/blob/master/README.md](https://github.com/zhenyangy/urban_columbus/blob/master/README.md)

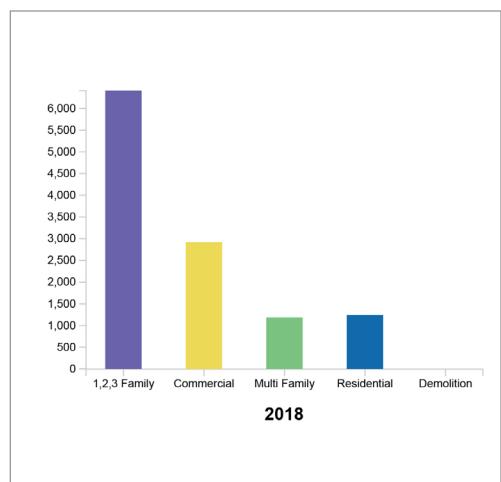
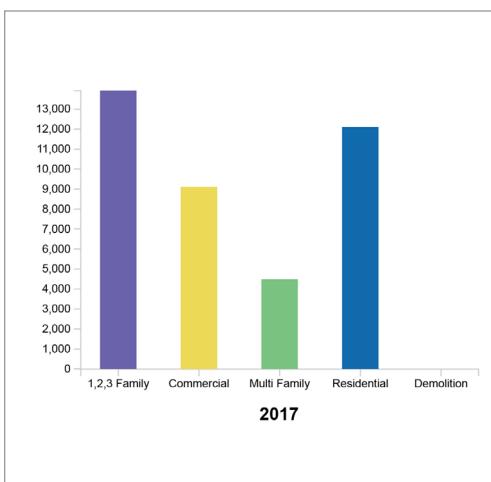
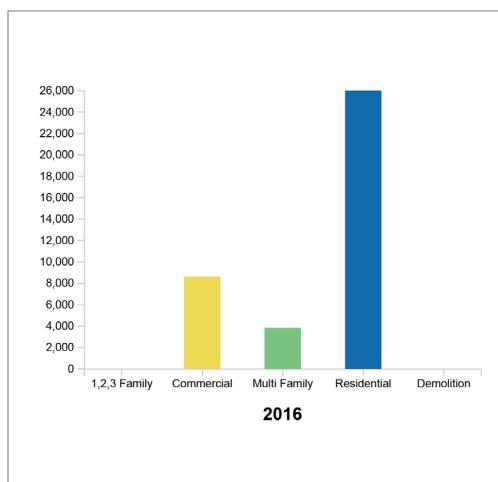
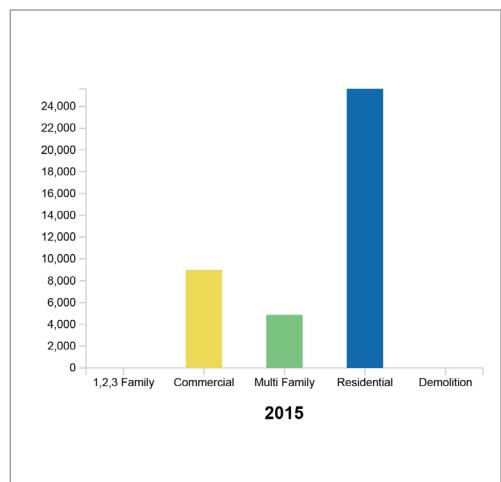
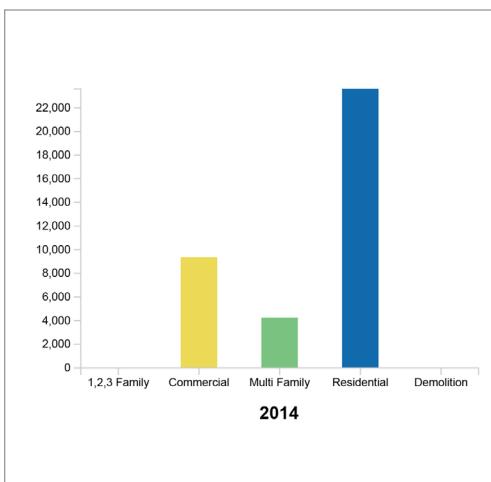
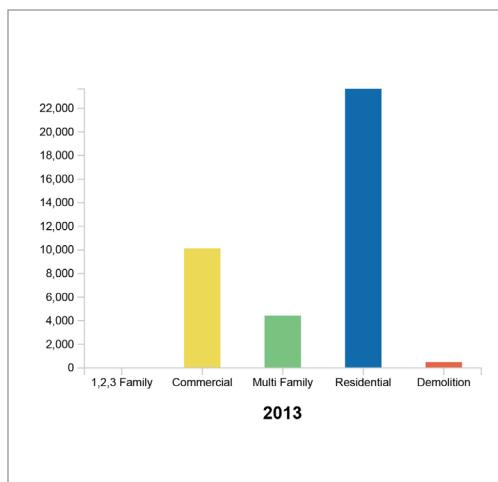
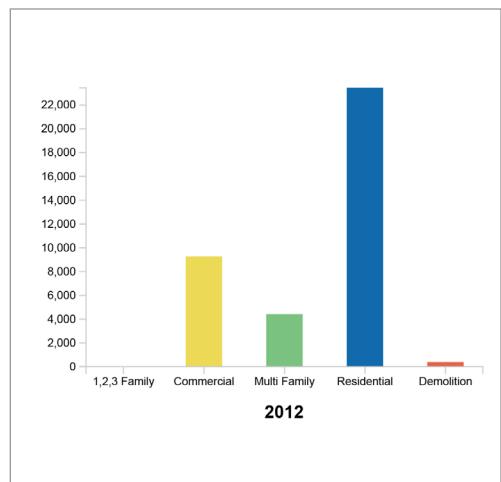
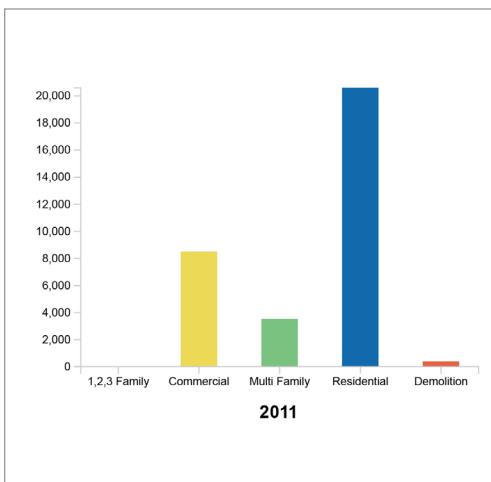
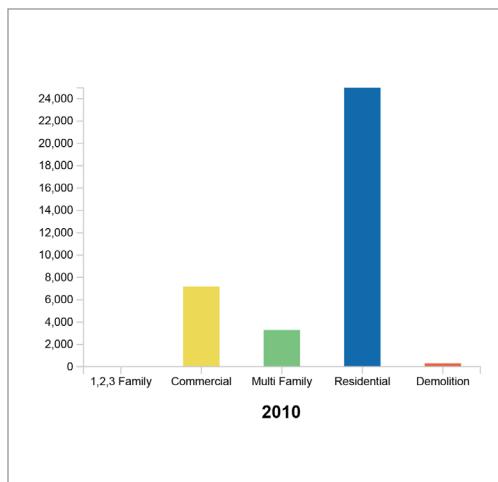
# Data

Link to csv : <https://drive.google.com/file/d/1nvGa99CD55fvsiu8GOUtAbbFRTzFi2ty/view?usp=sharing>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC					
1	◆X◆	Y	OBJECTID	B1.PERID1	B1.PERID2	B1.PERID3	B1.ALTID	B1.PARCEL	B1.HSE_NBR	B1_UNIT_ST	B1_STR_DIR	B1_STR_NA1	B1_STR_SUF	B1_STR_LSN	APPLICANT	APPLICANT	B1.PER.GR1	B1.PER.TY1	B1.PER.SUE	B1.PER.CAT1	B1.GENERAL_T	B1.PERMIT_ST	B1.SOFT	G3.VALUE_1	ISSUED_DT	ISSUED_YE	LAST_STAT	POI_NA					
2	-83.1568	39.97884	709	17CAP	0	00001	EMLSR1716	5.6E+08	5658			ALLIANCE	WAY	5658	ALLIAJAI	DALE	NC	OHIO	Building	1.2.3 Family	MEP	Electrical	1.2.3 Family	Final Inspection	Approved	0	2017-08-29	2017	2017-09-11	00000.00			
3	-83.1744	40.06304	878	16101	0	2483	ELC160907	10295215	5772			PASSAGE	CDR	5772	PASSA	ROMANOFF	MATTHEW	E	Building	1.2.3 Family	Final Inspect	0	0	2016-02-22	2016	2016-03-11	00000.00						
4	-83.0909	39.92729	492	15103	0	8868	ELC153322	5.7E+08	3535			CLIME	RD	3535	CLIME	HARRY	GR	GREGORY	V	Building	Commercial	Repair	Repairs	Electrical	1.2.3 Family	Final Inspect	0	0	2015-10-20	2015	2015-10-23	00000.00	
5	-83.0093	39.95488	209	15102	0	3291	ELC153371	10254985	1	1840		MIRANOVA	PL	5835	MIRANO	TRAIL	AMERICAN	CHRISTOPH	E	Building	Multi Family	Major Altera	Electrical	1.2.3 Family	Final Inspect	0	0	2015-10-29	2015	2015-10-29	00000.00		
6	-83.176	40.06341	282	15101	0	16943	ELC153322	10275261	5835			TRAIL	CREDR	5835	TRAIL	AMERICAN	STEPHEN	S	Building	Residential	New Constr	Environment	1.2.3 Family	Final Inspect	1906	0	2015-11-10	2015	2016-01-23	00000.00			
7	-83.1746	40.06354	302	15101	0	17189	ELC153371	10295278	578			TRAIL	CREDR	5785	TRAIL	EXACT	ELI	TON	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-08-27	2015	2016-02-04	00000.00			
8	-83.9328	39.93714	993	15102	0	2548	MLD152777	10246854	2345			VILLAGE	A1DR	2345	VILLAI	NEW	VILLAR	ROBERT	L	Building	Multi Family	New Constr	Structure	Multi Family	Certificate of	7790	380000	2015-10-29	2015	2016-07-07	00000.00		
9	-83.176	40.06341	286	15101	0	15958	ELC153396	10275261	5835			TRAIL	CREDR	5835	TRAIL	A	1 ADVAN	KEVIN	MCG	Building	Residential	New Constr	Fuel Gas P	1.2.3 Family	Final Inspect	0	0	2015-10-26	2015	2016-02-03	00000.00		
10	-83.1744	40.06304	876	16101	0	1103	FLU160201	10295215	5772			PASSAGE	CDR	5772	PASSA	TRAIL	A	1 ADVAN	KEVIN	MCG	Building	Residential	New Constr	Fuel Gas P	1.2.3 Family	Final Inspect	0	0	2016-01-25	2016	2016-04-06	00000.00	
11	-83.1121	39.98889	364	15103	0	840	PLMB150300	5.6E+08	1708			ARLINGTON	LN	1708	ARLIN	LIMBACH	C	RONALD	G	Building	Commercial	New Constr	Plumbing	Commercial	Permit Issue	0	0	2015-02-05	2015	2015-02-05	00000.00		
12	-83.176	40.06335	443	15101	0	14267	ENAR153222	10295238	5865			TRAIL	CREDR	5865	TRAIL	AMERICAN	STEPHEN	F	Building	Residential	New Constr	Environment	1.2.3 Family	Final Inspect	0	0	2015-09-25	2015	2016-01-27	00000.00			
13	-83.0176	40.041	90	16103	0	7052	FSUP18273	10072054	3870		N	HIGH	ST	3870	N	HIGH	ST	Building	Commercial	New Constr	Fire Supp	Commercial	Final Inspection	Approved	0	2017-01-03	2017	2017-02-13	00000.00				
14	-82.9324	39.93758	907	15102	0	3872	PLMB150409	10246854	2326			VILLAGE	A1DR	2326	VILLAI	K & D	PLUM	DAVID	R	Building	Multi Family	New Constr	Plumbing	Multi Family	Final Inspect	15558	0	2015-12-04	2015	2016-10-25	00000.00		
15	-83.176	40.06341	283	15101	0	6309	RBLD151545	10275261	5835			TRAIL	CREDR	5835	TRAIL	PULTE	KEITH	TON	Building	Residential	New Constr	Structure	1.2.3 Family	Certificate of	1906	174770	2015-05-20	2015	2016-05-10	00000.00			
16	-82.9931	40.14485	632	15103	0	5879	FSUP152386	3.18E+13	106			POLARIS	PKWY	5879	POLARIS	PKWY	PKWY	PKWY	Building	Commercial	Major Altera	Fire Supp	Commercial	Final Inspect	0	0	2015-07-30	2015	2016-09-07	00000.00			
17	-82.9931	40.14485	630	15103	0	9193	FAIR153765	3.18E+13	1069			POLARIS	PKWY	5879	POLARIS	HITECH	L	DAVID	K	TC	Building	Commercial	Major Altera	Fuel Gas	1.2.3 Family	Final Inspection	Approved	0	2015-11-05	2015	2016-11-23	00000.00	
18	-83.1757	40.06344	300	15101	0	15156	PLMB153342	10264536	5823			TRAIL	CREDR	5823	TRAIL	A	1 ADVAN	KEVIN	MCG	Building	Residential	New Constr	Plumbing	1.2.3 Family	Final Inspect	2428	0	2015-10-13	2015	2016-02-04	00000.00		
19	-82.9324	39.93734	962	15102	0	3551	PLMB153371	10246854	2333			VILLAGE	A1DR	2333	VILLAI	K & D	PLUM	DAVID	R	Building	Multi Family	New Constr	Plumbing	Multi Family	Permit Issue	0	0	2015-11-17	2015	2016-02-15	15350.00		
20	-82.9961	40.03142	171	15103	0	9098	PLMB153725	1025725	696		E	NORTH	BROADWAY	696	E	NORTH	BROADWAY	Building	Commercial	New Constr	Plumbing	Commercial	Final Inspect	0	0	2015-11-03	2015	2015-12-15	00000.00				
21	-83.176	40.06335	447	15101	0	15922	ELC153398	10295238	5865			TRAIL	CREDR	5865	TRAIL	EXACT	ELI	TON	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-10-20	2015	2016-01-22	00000.00			
22	-82.9961	40.03142	174	15103	0	9022	ELC153398	1025725	696		E	NORTH	BROADWAY	696	E	NORTH	HUSH	ELEC	KEITH	M	H	Building	Commercial	Major Altera	Electrical	1.2.3 Family	Final Inspect	0	0	2015-10-30	2015	2015-12-20	00000.00
23	-83.1746	40.06354	306	15101	0	16938	ENAR153829	10295278	5785			TRAIL	CREDR	5785	TRAIL	AMERICAN	STEPHEN	S	Building	Residential	New Constr	Environment	1.2.3 Family	Final Inspect	2272	0	2015-11-10	2015	2016-02-03	00000.00			
24	-83.1563	39.97894	688	15101	0	9815	ENAR152222	5.6E+08	5650			ALLIANCE	WAY	5650	ALLIAJ	AMERICAN	STEPHEN	F	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-07-13	2015	2015-09-11	00000.00			
25	-83.1777	40.06207	314	15101	0	5082	ELC151151	10291751	5903	4		WINBERRY	DR	5903	WINBE	ROMANOFF	MATTHEW	E	Building	Residential	New Constr	Plumbing	1.2.3 Family	Final Inspect	0	0	2015-07-27	2015	2015-07-07	00000.00			
26	-83.1746	40.06354	307	15101	0	15305	PLMB153342	10295238	5785			TRAIL	CREDR	5785	TRAIL	A	1 ADVAN	KEVIN	MCG	Building	Residential	New Constr	Plumbing	1.2.3 Family	Final Inspect	0	0	2015-10-15	2015	2016-02-03	00000.00		
27	-82.9961	40.03142	173	15103	0	9123	PRFR153777	1025725	696		E	NORTH	BROADWAY	696	E	NORTH	WENTER	JE	STEPHEN	E	Building	Commercial	New Constr	Product Ref	Commercial	Final Inspect	0	0	2015-11-17	2015	2016-02-15	15350.00	
28	-82.9786	40.14546	69	14103	0	9034	CBLD143404	3.18E+13	1540			POLARS	PKWY	5815	POLARIS	CONSTR	STEPHEN	E	Building	Commercial	New Constr	Structural	Commercial	Certificate of	2800	500000	2015-03-28	2015	2015-06-01	00000.00			
29	-83.1563	39.97894	697	15101	0	7573	RBLD151729	5.6E+08	5650			ALLIANCE	WAY	5650	ALLIAJ	PULTE	KEITH	TON	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-10-20	2015	2016-01-22	00000.00			
30	-83.176	40.06341	285	15101	0	7243	ELC151854	10275261	5835			TRAIL	CREDR	5835	TRAIL	POWER	SOL	GERHARD	E	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-06-01	2015	2015-06-07	00000.00		
31	-83.1561	39.97975	750	15101	0	4349	ELC150999	5.6E+08	5639			BATTLE	CR WAY	5639	BATTLE	CR	TON	TON	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-04-13	2015	2015-06-07	00000.00			
32	-82.9922	39.96308	116	15103	0	2959	ELC151006	10041332	684			OAK	ST	684	OAK	ST AC	ELEGOT	ADAM S	C	Building	Commercial	Major Altera	Electrical	1.2.3 Family	Final Inspect	0	0	2015-04-17	2015	2015-06-27	00000.00		
33	-83.1553	39.97913	712	15101	0	2408	ELC150933	5.6E+08	5634			ALLIANCE	WAY	5634	5634	ALLIAJ	POWER	SOL	GERHARD	E	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-02-27	2015	2015-03-04	00000.00	
34	-82.9922	39.96308	115	15103	0	2164	WNDH150708	10041332	684			OAK	ST	684	OAK	ST	49	PARSON	Building	Commercial	Minor Altera	Window Rep.	Commercial	Final Inspect	100	3000	2015-03-24	2015	2015-06-07	00000.00			
35	-83.177	40.06208	325	15101	0	5090	EREF151151	10219753	5639	2		WINBERRY	DR	5639	5639	EREF	TON	TON	TON	Building	Residential	New Constr	Electrical	1.2.3 Family	Final Inspect	0	0	2015-04-24	2015	2015-06-29	29700.00		
36	-83.1746	40.06354	304	15101	0	17853	FRST154017	10295278	5786			TRAIL	CREDR	5786	TRAIL	MS	DISTRIB	TON	L	Building	Residential	New Constr	Fireplace St.	1.2.3 Family	Final Inspect	0	0	2015-11-25	2015	2016-02-07	00000.00		
37	-83.1121	39.98898	382	14103	0	10738	FAIR144026	5.6E+08	1708			ARLINGATE	LN	1708	ARLIN	TYCO	INT	RECK	HAYE	Building	Residential	New Constr	Fire Alarm	Commercial	Final Inspection	Approved	0	0	2015-01-01	2015	2015-05-17	00000.00	
38	-83.0907	39.95748	466	14103	0	10820	INTR143988	10212224	154		N	WILSON	RD	154	154	WILSON	SL	ARCHIT	LEON	SAMF	Building	Commercial	Major Altera	Interior Rev.</td									

# Visualized Data

Data on building function by year



\* Example View. For full data set use link below.

Link to chart images and xlsx files :

<https://drive.google.com/drive/folders/1hmoLb3jSVI9vP5vF8QAfjIgNmUyT7FLK?usp=sharing&open?id=1hmoLb3jSVI9vP5vF8QAfjIgNmUyT7FLK>

## TASKS FOR THE USER

**What's your first impression?**

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**Can you tell what is being shown? Explain...**

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**Find your address and list the 3 nearest structural types to where you live**

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**Explain how the urban structure has changed over time.**

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**Give an example of one conclusion you can draw by looking at the urban structure of Columbus for the year 2015.**

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**A DEBRIEFING QUESTIONNAIRE WAS GIVEN AT THE END OF TESTING FOR FURTHER INSIGHT**

Link to De-Brief Form for Reference:

<https://drive.Google.com/file/d/1diPopvWqTMHKCPNmAKWvpRZUioOvYzwj/view?usp=sharing>

## FIRST IMPRESSIONS

### What's your first impression?

- Slow load times
- Map needs key for Columbus
- Somewhat Unresponsive & Slow
- UI could be more polished
- Confused about what clicking the dots vs the colored regions does
- Clicking the dot gives data on the buildings but moves the map way off
- Site needs more introduction, maybe a splash page

### Can you tell what is being shown?

- The interactive map is clear
- The time series is less clear
- Building types in Columbus
- Location and type of buildings in Columbus
- Property boundaries and permits

## TASKS

### Find your address and list the 3 nearest structural types to where you live.

### Explain how the urban structure has changed over time.

### Give an example of one conclusion you can draw by looking at the urban structure of Columbus for the year 2015.

- Only 2 out of 5 were able to complete this task due to issues with functionality and load times
- More people have begun living South East of downtown.
- Commercial increase until 2013
- Big drop in residential in 2017
- Most categories of functions stay consistent
- Very few trends in relation to time
- The functionality broke during test (N/A)
- N/A
- Unable to tell w/o legend
- Needs a legend
- There are concentrated pockets of commercial buildings that seem clustered together
- Mostly residential

## Results from Usability Test Debrief

On a scale of 1 to 5 how much do you agree / disagree with the following statements?

1 - Strongly Disagree • 2 - Disagree • 3 - Neutral • 4 - Agree • 5 - Strongly Agree

(IE) : Interactive Experience

This (IE) was easy to use.	2 2 2 4 3	This (IE) was exactly what I thought it would be	3 3 5 2 4
<b>2.6/5 avg.</b>		<b>3.4/5 avg.</b>	
This (IE) was informative.	2 2 2 2 3	This (IE) was designed well	2 3 3 4 2
<b>2.2/5 avg.</b>		<b>2.8/5 avg.</b>	
The tasks given to me were easy to complete	3 2 3 4 3	This (IE) was visually appealing	4 3 5 3 2
<b>3/5 avg.</b>		<b>3.4/5 avg.</b>	
The set up of the (IE) was straightforward	3 2 3 5 4	This (IE) was organized well	3 4 5 4 3
<b>3.4/5 avg.</b>		<b>3.8/5 avg.</b>	
Was the information presented in a clear and concise way that was easy to understand? Why or why not?		If you could change one thing about this Experience, what would it be and why?	
<ul style="list-style-type: none"> <li>• Needs consistency with color</li> <li>• Yes</li> <li>• No, difficult to interpret</li> <li>• No needs functionality added to map</li> <li>• Needs more context</li> </ul>		<ul style="list-style-type: none"> <li>• Quicker load times and adding charts/ graphs to map page</li> <li>• Make the UI faster and more responsive</li> <li>• Add a legend</li> <li>• More info on what is going on more explanation</li> <li>• Showing the data analysis alongside the maps</li> </ul>	
<b>What did you like most?</b>		<b>What did you like the least?</b>	
<ul style="list-style-type: none"> <li>• Clean animation on pie charts</li> <li>• Clean graphics</li> <li>• Pie charts within pie charts</li> <li>• The pie charts looked nice</li> <li>• The data</li> </ul>		<ul style="list-style-type: none"> <li>• The back button on the pie charts</li> <li>• No zoom on the maps</li> <li>• The interactive map is buggy</li> <li>• Clunky controls and lack of context</li> <li>• Animation wasn't working</li> </ul>	

**Based on the user test feedback, here are some of the changes we would make and what an improved version might look like...**

Note: CSE students have until Monday to edit code so some of the following changes may be reflected in newer updated versions that will be pushed to the GitHub account that I provided a link to on the software page. Some changes were able to be made before documentation was submitted.

# Home Page [ Top ]

(added in final version)

Home   Interactive Map   Data

# Columbus Urban Structure

The city of Columbus is constantly evolving and growing, with new areas being developed and old neighborhoods being revitalized.

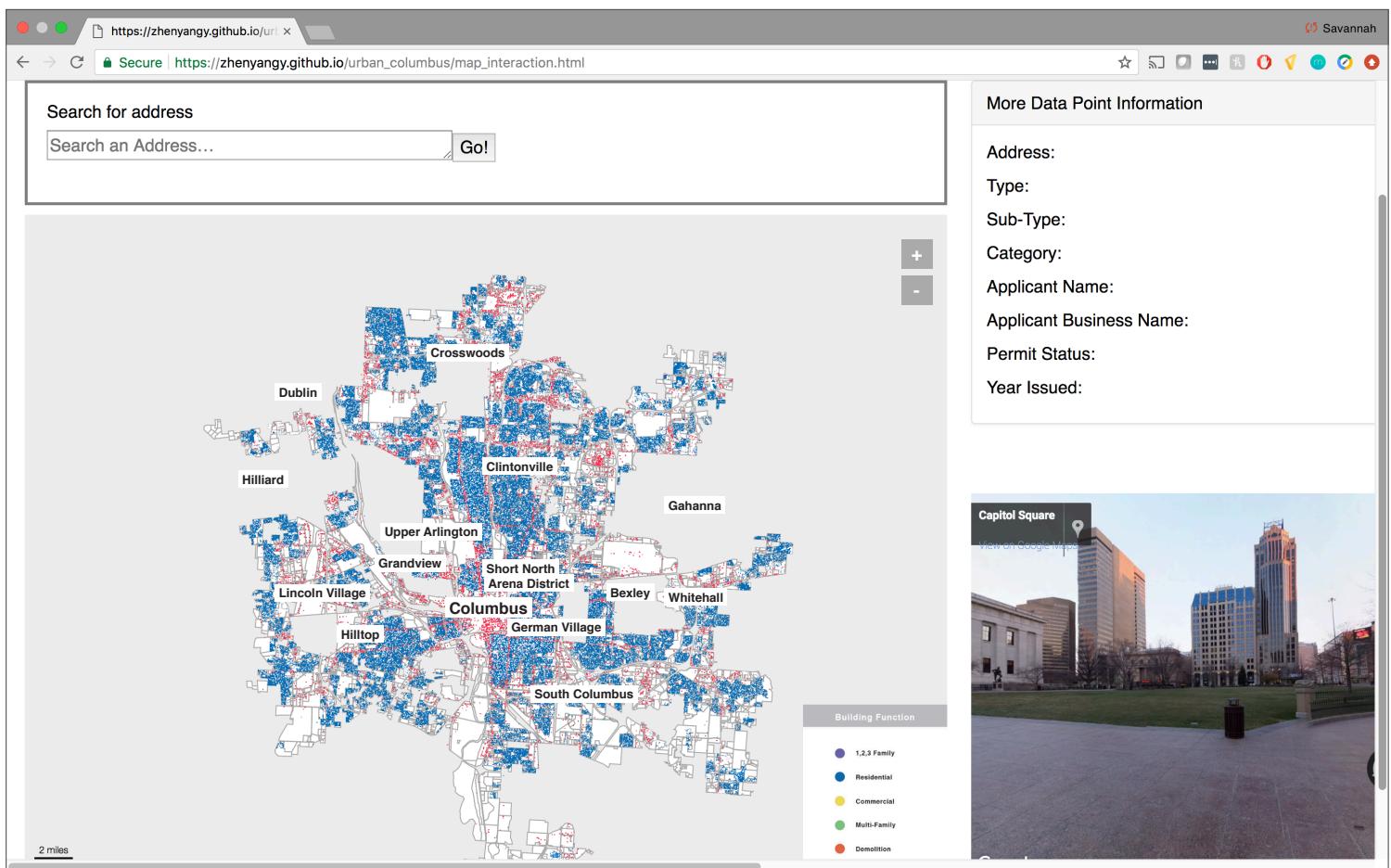


## Our Goal

By visualizing this influx of growth and development, through the analysis of these key aspects, we can better understand city planning priorities, aerial patterns in structural development, and how the needs of the city have changed over time.

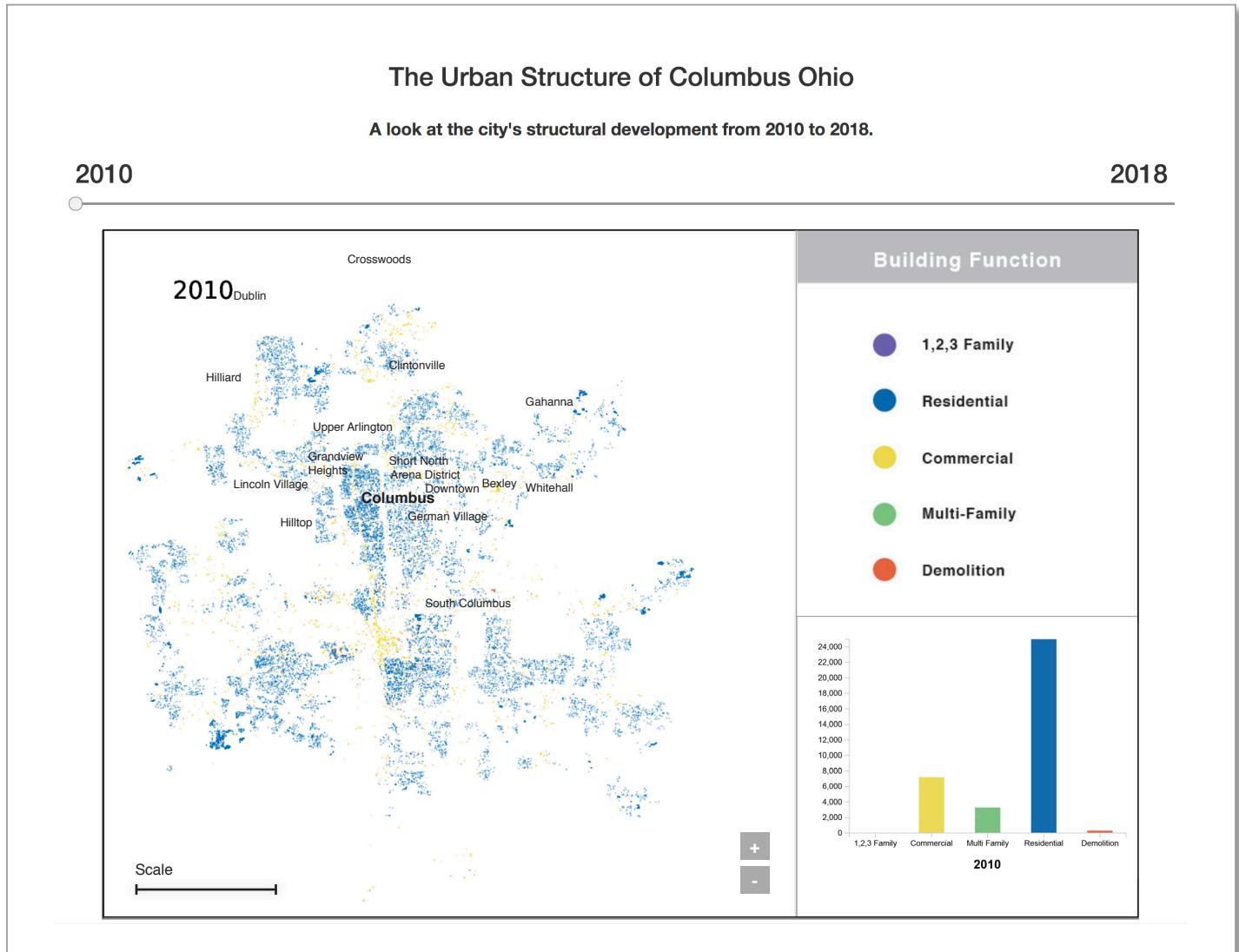
Adding a splash page for context and further explanation to set the scene for the data and information we are displaying

# Interactive map



- Add labels to map for reference
- Have the ability to zoom on your own
- Based on the “year issued” for the selected search result there could be a way to also show the rest of the data for only that year and hide the data from all combined years to reduce clutter. Showing all data from all years combined along with highlighting the search result can be misleading to someone who’s interested in one specific site from one specific year.

# Time Based Animation



- Add labels to map for reference
- Add buttons to zoom in and out

**CSE****Robert**

Rob was in charge of carrying our the search functionality on the interactive map page. This involved data sorting and filtering out top results based on user input. He also played a leading role in the initial conception and visualization of the idea.

**CSE****Andres**

Andres assisted in the initial conception and visualization of the idea. He worked a lot on the time based map animation found on the home page. He wrote scripts for high volume data extraction/ sorting. He helped with the panel on the interactive map page that displays info when a user clicks a point or searches a location. Andre played a large roll in the user testing as well.

**CSE****Pei-yuan**

Pei-Yuan assisted in the initial conception and visualization of the idea. His built the site framework and UI. He added in the Google maps view on the interactive map page and did the charts and graphs on the data analysis page as well. He also helped with a lot of the UI edits later on.

**CSE****Zhenyang**

Zhenyang assisted in the initial conception and visualization of the idea. He helped with the edits for the UI of the site where our info is displayed. He also created the map for the interactive map page with the hover effects. He also assisted in data extraction and sorting. Zhenyang also helped write the code for the time based map. He also put a lot of effort into integrating the search bar with the map application.

**VCD****Savannah**

I was in charge of creating the digital static prototype based on in class brainstorming. I created both the documentation and presentation as well. I also helped create visual assets such as the legend, splash page, and individual bar charts for the time based animation. Andre and I worked as a team to carry out user testing towards the end. I also helped in making improvements to the UI.

**COMBINED EFFORT**

<b>Savannah</b>	<b>20%</b>
<b>Robert</b>	<b>20%</b>
<b>Andres</b>	<b>20%</b>
<b>Pei-yuan</b>	<b>20%</b>
<b>Zhenyang</b>	<b>20%</b>
<b>TOTAL</b>	<b>100%</b>

# SOURCES

## Documentation Sources:

Photo by Nathan Anderson on Unsplash

Photo by oxana v on Unsplash

Photo by Tim Trad on Unsplash

Photo by Charles Koh on Unsplash

## Project Sources:

GitHub

Open Street

HighCharts

Google Maps API

Columbus City Public Building Records

<http://data-columbus.opendata.arcgis.com/datasets?sort=name>

## Building Permits:

<http://data-columbus.opendata.arcgis.com/datasets/building-permits>

Google map api for geolocation

<https://developers.google.com/maps/documentation/geolocation/intro>