



SEATTLE COLLISION RESEARCH TOOL

COLLIDIUM

WE ARE DEVELOPING FIVE USE CASES FOR OUR TARGETED USERS

Our targeted users:



Cyril City Planner



Carol Community Activist



Mandy Municipal Politician

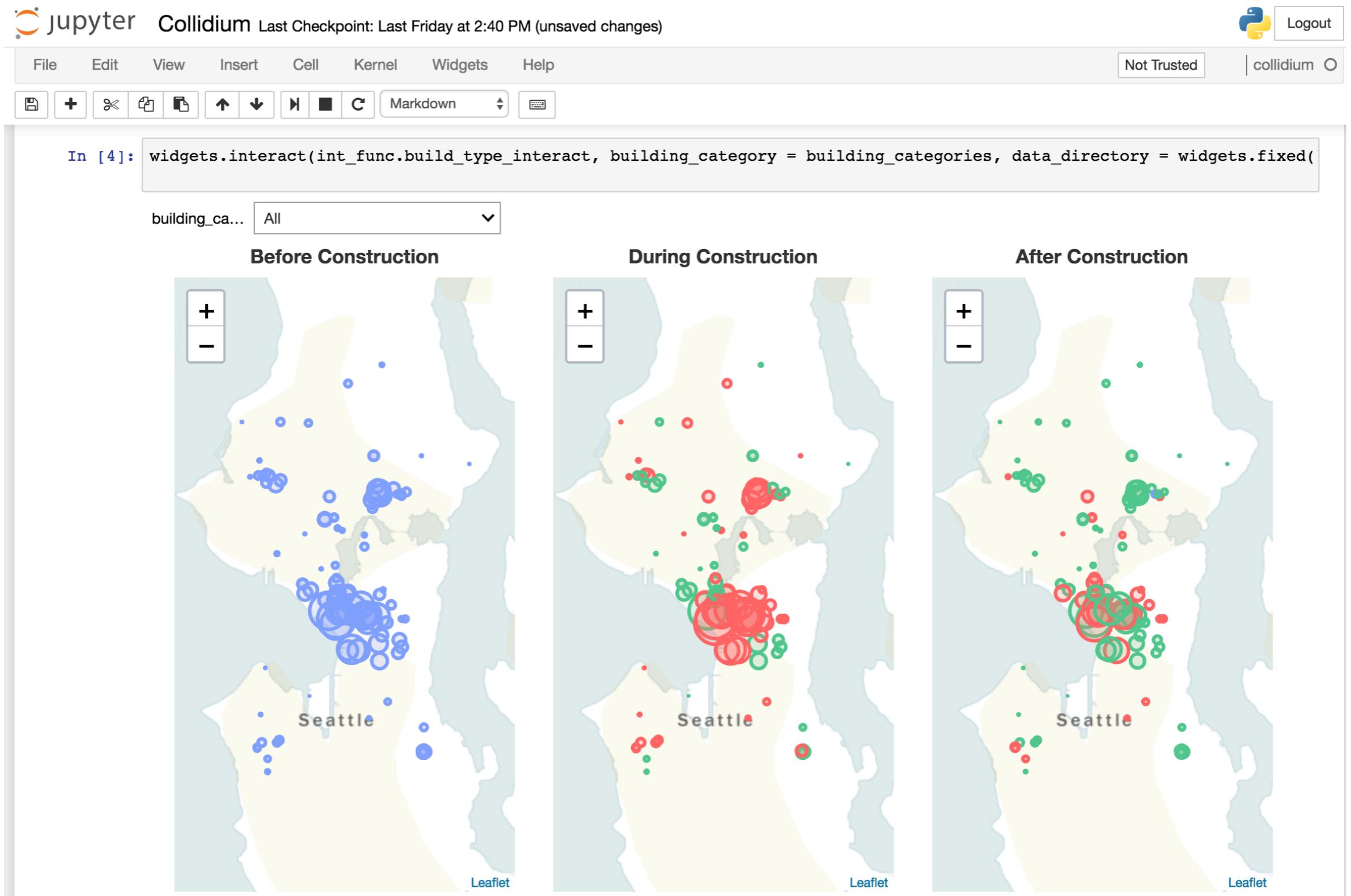
- ▶ Each of these users wants information to help them support their agenda. Their priorities are:
 - ▶ Information is presented in a way that is easy to interpret
 - ▶ They can select options to focus on the questions that are most interesting to them

USE CASES

- ▶ Each of our use cases allows users to see visualizations of data that is filtered in different ways. These include:
 - ▶ **Time frame of construction:** “I want to see how collisions increased around buildings built in 2016”
 - ▶ **Building type:** “I want to see how multifamily construction affects collisions. Now I just want to look at commercial construction”
 - ▶ **Accident victims:** “I only want to see accidents that involve pedestrians or cyclists”
 - ▶ **Accident severity:** “I only care about accidents with injuries”
 - ▶ **Distance between collision and construction:** “I am interested in accidents that were directly adjacent to new construction” or “I want to see how accidents change up to a quarter mile from the new building.”

COLLIDIUM: SEATTLE COLLISION RESEARCH TOOL

DEMO



ENVIRONMENT

- Compatible with Python 3.5 or later
- Users can use minimal environment or pip install package requirements
- Package Dependencies
 - pandas
 - numpy
 - branca
 - folium
 - ipywidgets
 - geopy
 - ipython

```
In [1]: import branca
import csv
import datetime
import folium
import sqlite3
import ipywidgets as widgets
import numpy as np
import pandas as pd
import draw_markers
import interactions_functionality as int_func
from query_class import CollidiumQuery
```

SEATTLE OPEN DATA PORTAL

[Open Data Program](#)[TechTalk Blog](#)[Public Records Requests](#)[Other City Data](#) ▾[Sign In](#)

Welcome to the City of Seattle Open Data portal, where we make data generated by the City openly available to the public.

Search



City Business

Includes City Fleet, City Council, wage data



Community

Includes Neighborhoods, Community organizations, and Equity initiatives data



Education

Includes Education and related Social Services data



Finance

Includes data on City Financial operations



Land Base

Includes GIS layers



Permitting

Includes Building, Electrical, Trade and other permit types



Public Safety

Includes 911 data, Police, Fire and other public safety agencies



Transportation

Includes data on public transit in Seattle

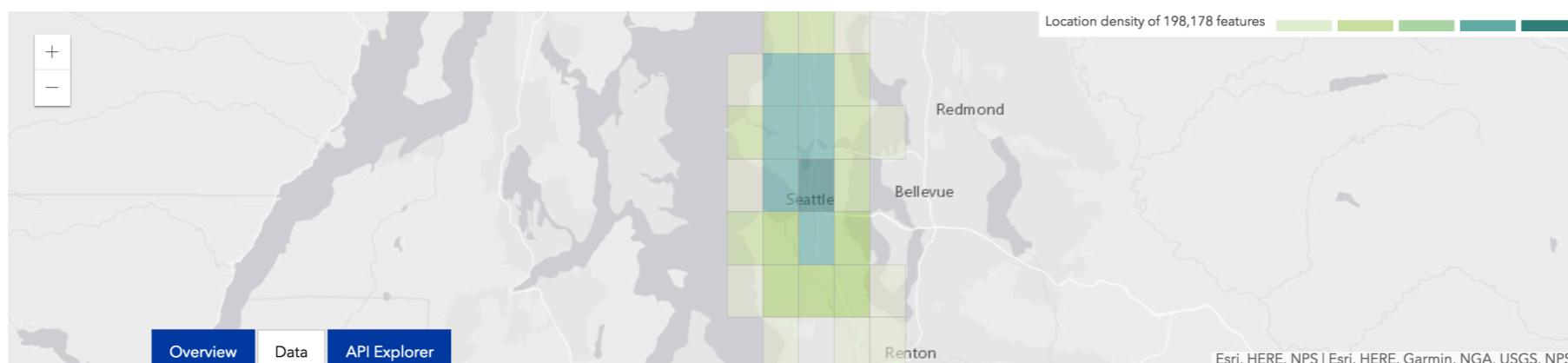
BUILDING PERMIT DATASET

- ▶ Contains information on 60,000 building permits (2014-2018)
- ▶ Collidium only uses permit values greater than \$1 million (440 buildings)

PermitNu :	PermitClass :	PermitClassMapp :	PermitTypeMapp :	PermitTypeDes :	Description
6183686-CN	Single Family/Duplex	Residential	Building	Addition/Alteration	Construct detached garage porch addition and alterations to
6103233-CN	Single Family/Duplex	Residential	Building	Addition/Alteration	Construct 2-story addition and alter existing single family res
6206946-CN	Single Family/Duplex	Residential	Building	New	Establish Use as Single Family Residence, Construct Single Fa
6385013-CN	Single Family/Duplex	Residential	Building	Addition/Alteration	Alterations to existing single family residence, new covered c
6512823-CN	Commercial	Non-Residential	Building	Addition/Alteration	Construct interior alterations to the Great NW Soup Compan
6234242-CN	N/A	N/A	Building		Seattle City Light project - Replace existing buried cable pow
6235644-CN	Commercial	Non-Residential	Building	Addition/Alteration	CLOSED AS INCOMPLETE - EXPIRED PERMIT. Construct altera
6448014-CN	Commercial	Non-Residential	Building	Addition/Alteration	Interior remodel to convert (E) office uses to electronic data
6100927-DM	Single Family/Duplex	Residential	Demolition		DEMOLISH SINGLE FAMILY RESIDENCE ****APPLICATION TO
6636584-CN	Commercial	Non-Residential	Building	Addition/Alteration	TENANT IMPROVEMENTS TO THE CENTRAL PORTION OF LEV

COLLISIONS DATASET

- ▶ Contains information on nearly 200,000 collisions from 2003-2018
- ▶ Filtered for collisions occurring 2013 or later, occurring within 1,500 feet and one year of an active building permit



Collisions

Showing 1 to 10 of 198,178

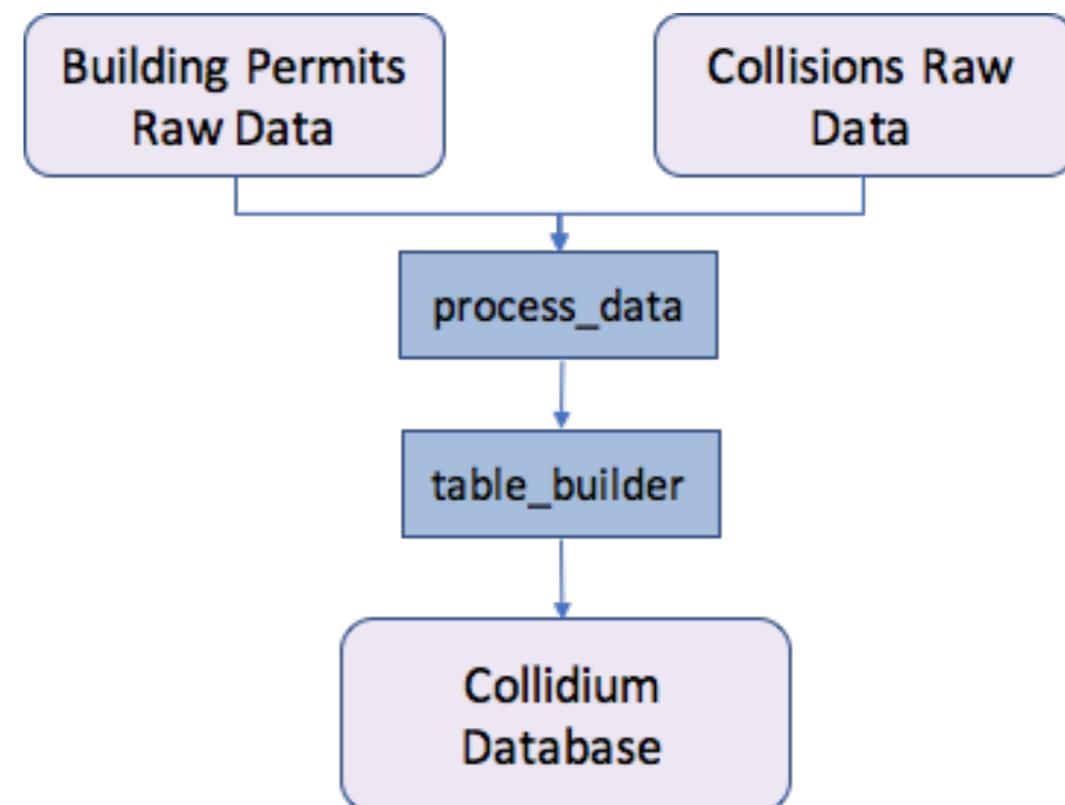
Hint: Click on ▼ to filter columns.

▼ Incident Date and Time	▼ JUNCTIONTYPE	▼ SDOT Collision Code	▼ SDOT Collision Description	▼ Collision due to Inattention	▼ Dr
4/3/2018 7:51:00 AM	Mid-Block (not related to intersec...)	11	MOTOR VEHICLE STRUCK MOTO...		N
4/22/2018	Mid-Block (not related to intersec...)	14	MOTOR VEHICLE STRUCK MOTO...		
3/31/2018 4:46:00 PM	Mid-Block (not related to intersec...)	26	MOTOR VEHICLE STRUCK OBJE...		N
4/2/2018 12:20:00 PM	Mid-Block (not related to intersec...)	11	MOTOR VEHICLE STRUCK MOTO...		N
4/6/2018 8:55:00 AM	Mid-Block (not related to intersec...)	14	MOTOR VEHICLE STRUCK MOTO...	Y	N
4/19/2018	Mid-Block (not related to intersec...)	14	MOTOR VEHICLE STRUCK MOTO...		

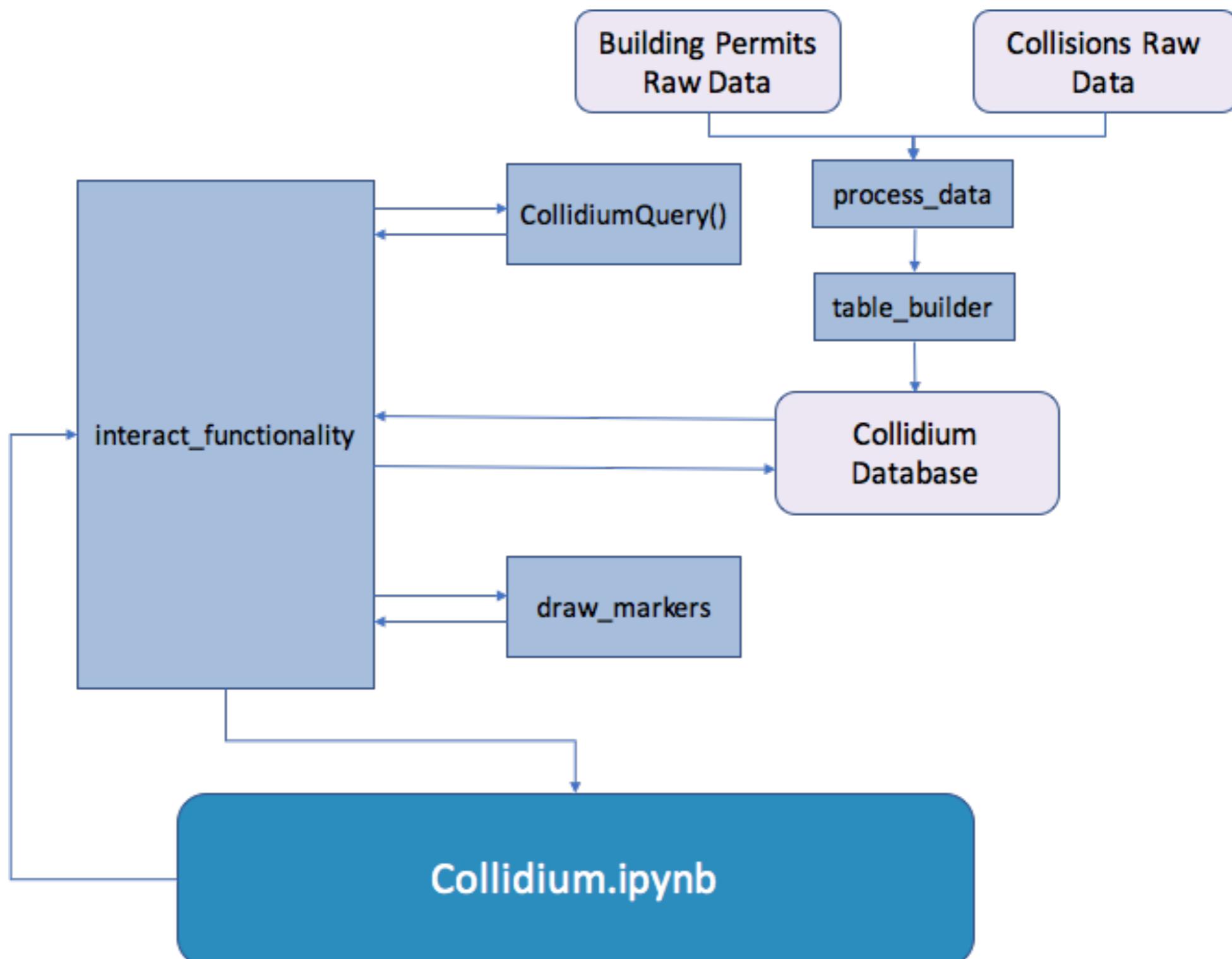
COLLIDIUM DATABASE

- ▶ **Collidium Database Construction**
 1. Estimate distances between collisions and building permits
 2. Link together collisions and building permits based on criteria
 3. Convert into database, access with SQLite queries when interacting with Folium maps.

PROJECT COMPONENTS



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PROJECT STRUCTURE

- ▶ Started with Shablon template.
- ▶ Packaged database is ready to use but we also included the code to generate it. (Build code is segregated to prevent accidental run).
- ▶ The main user interface notebook is called Collidium and located in the project directory.
- ▶ Doc subfolder includes all presentations and design documents.
- ▶ Examples contains a pointer to the main Jupyter interface.
- ▶ Environment, Travis files, License (MIT), and README are in root directory.

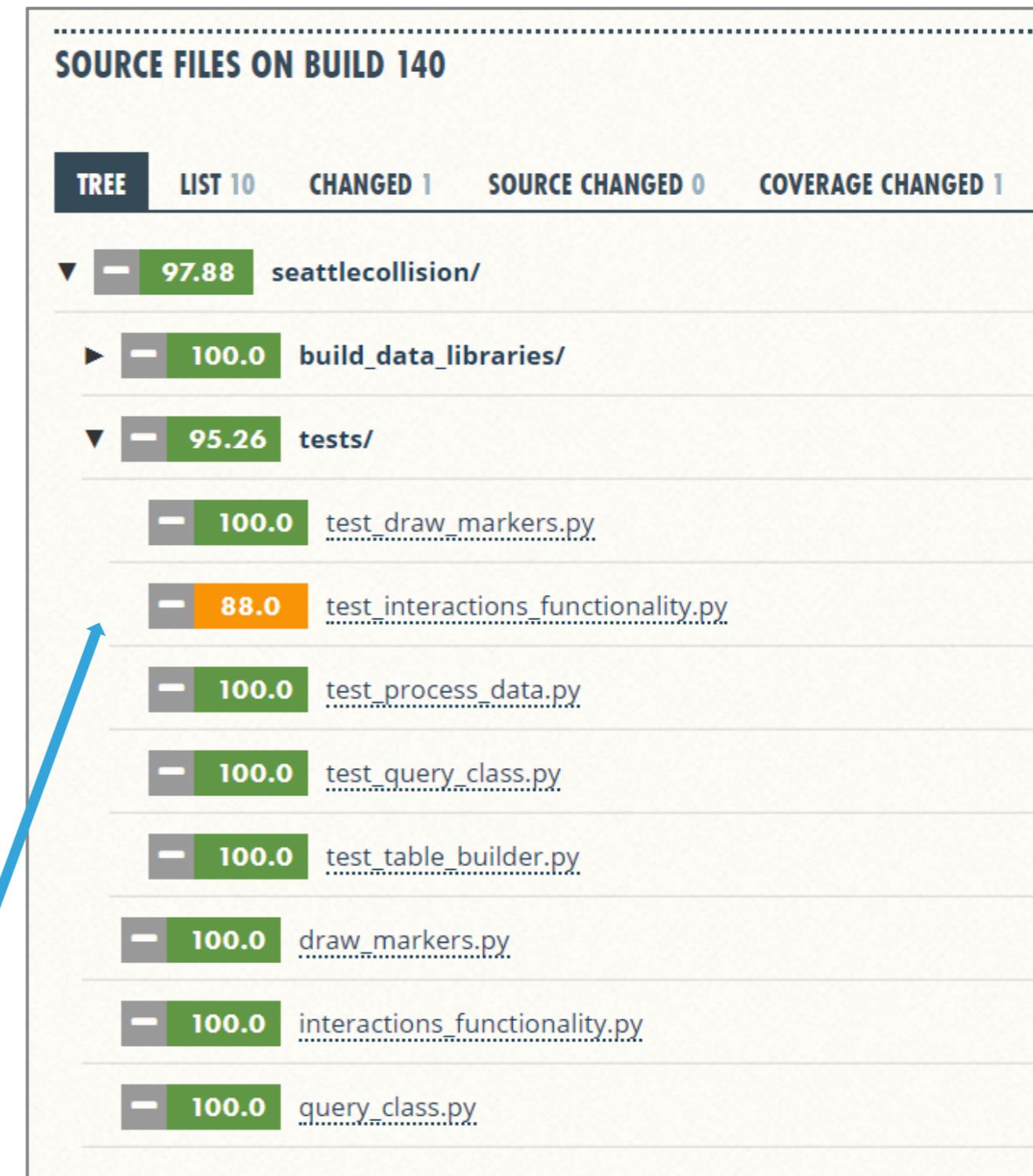
```
seattlecollision/
  |- seattlecollision/
    |- build_data_libraries/
      |- _build_database_script.py
      |- process_data.py
      |- table_builder.py
    |- data/
      |- raw_data/
        |- raw_buildings_input.csv
        |- raw_collision_input.csv
      |- Collidium.db
      |- Test_Data_For_Draw_Markers.csv
      |- buildings.csv
      |- collidium_data.csv
      |- collisions.csv
    |- tests/
      |- test_draw_markers.py
      |- test_interactions_functionality.py
      |- test_process_data.py
      |- test_table_builder.py
    |- Collidium.ipynb
    |- __init__.py
    |- draw_markers.py
    |- interaction_functionality.py
    |- query_class.py
  |- doc/
    |- Tech Review Presentation.pdf
    |- finalpresentation.pdf
    |- functionaldesign.md
    |- Component_design.md
    |- project_structure.png
  |- examples/
    |- Shortcut to Collidium Notebook.md
  |- .coveragerc
  |- .travis.yml
  |- LICENSE
  |- README.md
  |- collidium_env.yml
  |- requirements.txt
```

PROJECT STRUCTURE – CONTINUOUS INTEGRATION

build passing coverage 98%

- ▶ Pylint/PEP8
- ▶ Unittest Coverage
- ▶ Dependency Checks
 - ▶ Interface requires Python 3.5+
 - ▶ Deprecated method warnings, e.g.: distance calc vincenty
- ▶ Annoyance: coveralls checks test modules for coverage

User Interface Smoke Tests - otherwise 100%



LESSONS LEARNED

- ▶ Folium is an excellent mapping package, but making custom visualizations can be overly complex
- ▶ Preprocess data as much as possible, on the fly data processing slows things down
- ▶ Deeper understanding of test-driven design
- ▶ Using Git for collaboration (Git Issues)
- ▶ Travis hangs for a long time when you have lots of commits close together and time-extensive testing (Use [skip ci] in commit message)

FUTURE WORK

- ▶ Interactive, details on demand for specific buildings
- ▶ Explore other types of visualizations to convey changes in collision types
- ▶ Use of statistics to better address the research question, e.g. statistical significance of increase/decrease in collisions, etc.
- ▶ More widget control/styling, adding multiple selects (which is supported by CollidiumQuery)
- ▶ More object-oriented project structure
- ▶ Generalize CollidiumQuery args using dictionary structure

THANK YOU!

