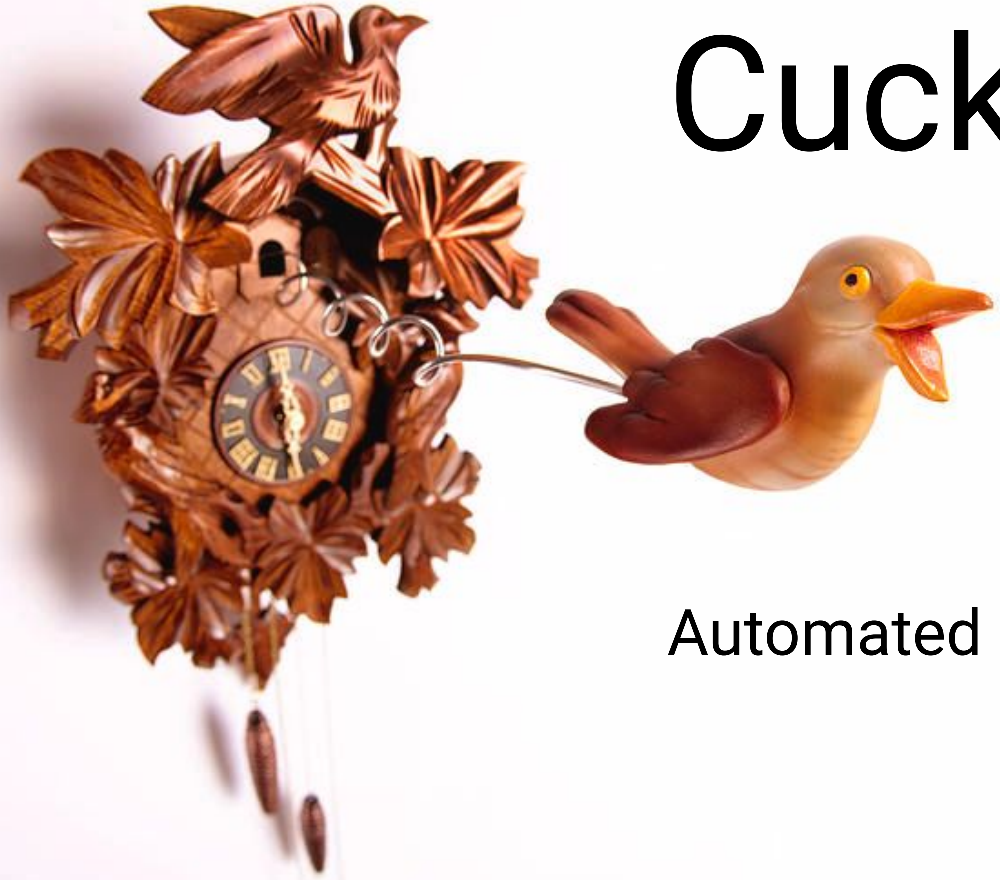

Cuckoo!

Automated Outlier Analysis for Revit

TT Hackathon - 2021

Our Team!

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Problem definition

Uncaught errors in models cost real $$

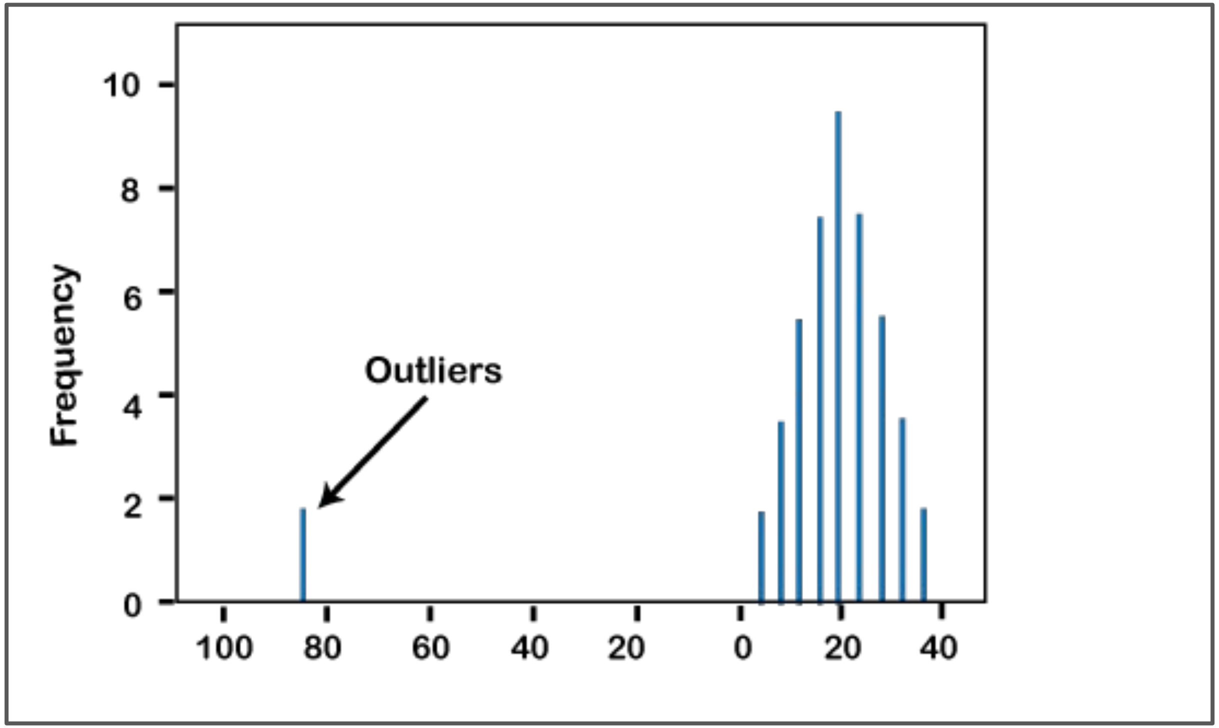
Q: How do you identify when some feature is likely to be an error?

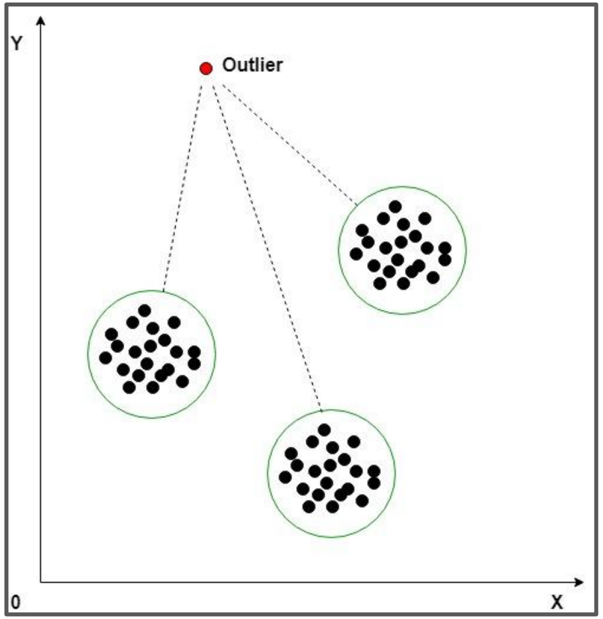
(without hard-coding a huge set of rules)

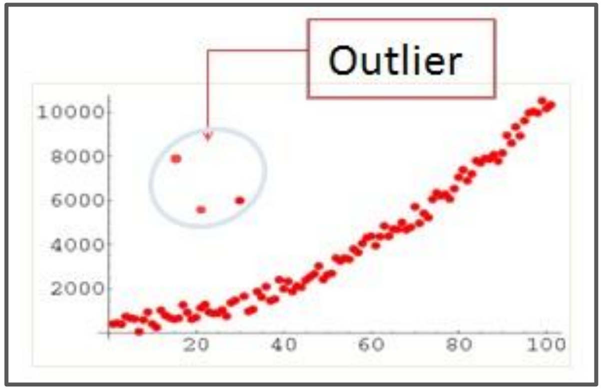
What is an outlier?

In statistics, an **outlier** is a data point that differs significantly from other observations.[1][2] An outlier may be due to variability in the measurement or it may indicate experimental error; the latter are sometimes excluded from the data set.[3] An outlier can cause serious problems in statistical analyses.

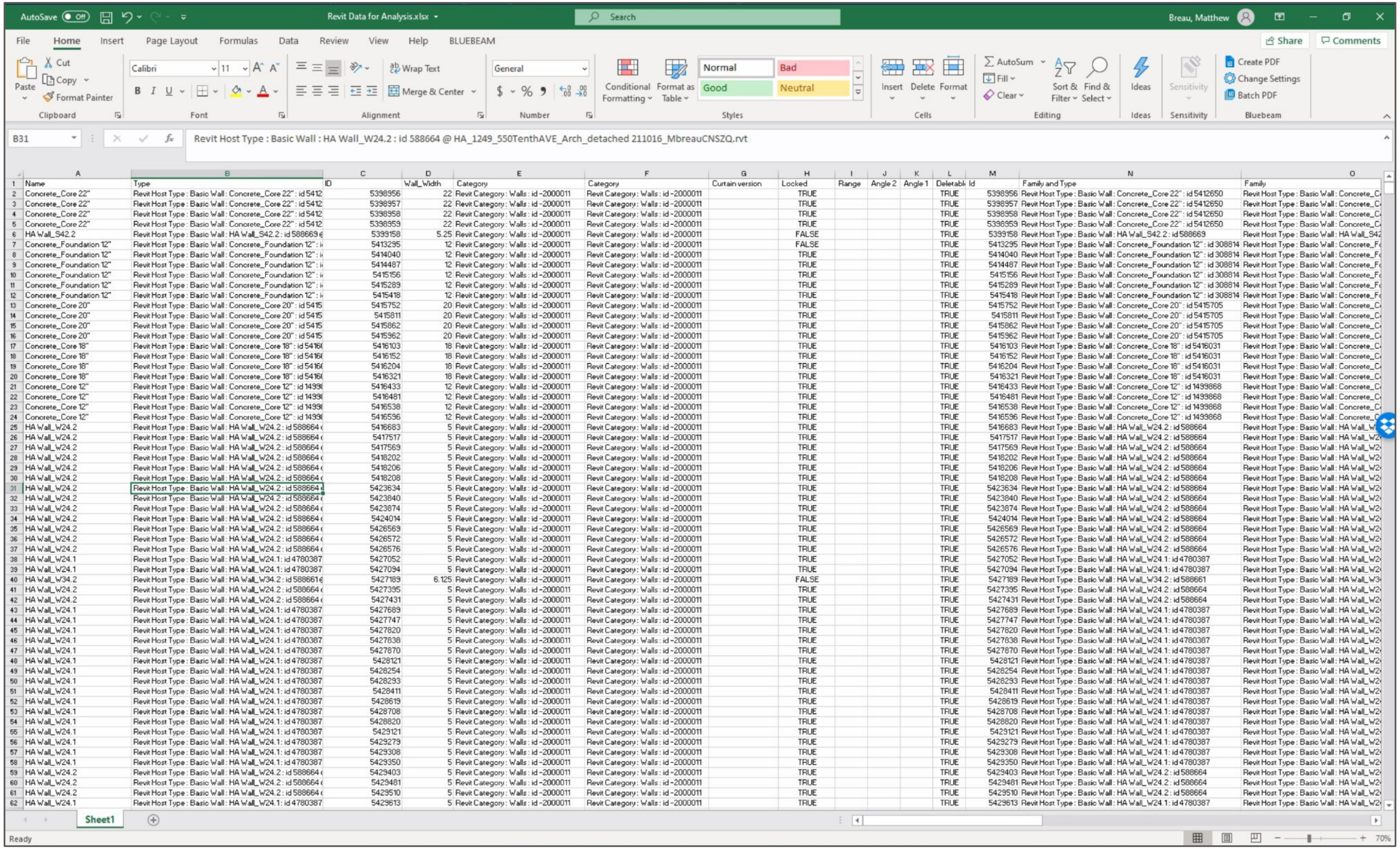
What is an outlier?







Outliers can be hard to spot



Revit Data for Analysis.xlsx

B31 — Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664 @ HA_1249_550TenthAVE_Arch_detached 211016_MbreauCNSZQ.rvt

1	Name	Type	ID	Wall_Width	Category	Category	Curtain version	Locked	Range	Angle 2	Angle 1	Deletabl	Id	Family and Type	Family
2	Concrete_Core 22"	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412	5398956	22	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5398956	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412650	Revit Host Type : Basic Wall : Concrete_C
3	Concrete_Core 22"	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412	5398957	22	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5398957	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412650	Revit Host Type : Basic Wall : Concrete_C
4	Concrete_Core 22"	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412	5398958	22	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5398958	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412650	Revit Host Type : Basic Wall : Concrete_C
5	Concrete_Core 22"	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412	5398959	22	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5398959	Revit Host Type : Basic Wall : Concrete_Core 22" : id 5412650	Revit Host Type : Basic Wall : Concrete_C
6	HA Wall_S42.2	Revit Host Type : Basic Wall : HA Wall_S42.2 : id 588669 @	5399158	5.25	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		FALSE				TRUE	5399158	Revit Host Type : Basic Wall : HA Wall_S42.2 : id 588669	Revit Host Type : Basic Wall : HA Wall_S42
7	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5413295	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		FALSE				TRUE	5413295	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
8	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5414040	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5414040	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
9	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5414487	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5414487	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
10	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5415156	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415156	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
11	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5415289	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415289	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
12	Concrete_Foundation 12"	Revit Host Type : Basic Wall : Concrete_Foundation 12" : i	5415418	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415418	Revit Host Type : Basic Wall : Concrete_Foundation 12" : id 308814	Revit Host Type : Basic Wall : Concrete_F
13	Concrete_Core 20"	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415	5415752	20	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415752	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415705	Revit Host Type : Basic Wall : Concrete_C
14	Concrete_Core 20"	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415	5415811	20	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415811	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415705	Revit Host Type : Basic Wall : Concrete_C
15	Concrete_Core 20"	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415	5415862	20	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5415862	Revit Host Type : Basic Wall : Concrete_Core 20" : id 5415705	Revit Host Type : Basic Wall : Concrete_C
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17	Concrete_Core 18"	Revit Host Type : Basic Wall : Concrete_Core 18" : id 5416	5416103	18	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5416103	Revit Host Type : Basic Wall : Concrete_Core 18" : id 5416031	Revit Host Type : Basic Wall : Concrete_C
18	Concrete_Core 18"	Revit Host Type : Basic Wall : Concrete_Core 18" : id 5416	5416152	18	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5416152	Revit Host Type : Basic Wall : Concrete_Core 18" : id 5416031	Revit Host Type : Basic Wall : Concrete_C
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21	Concrete_Core 12"	Revit Host Type : Basic Wall : Concrete_Core 12" : id 1499	5416433	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5416433	Revit Host Type : Basic Wall : Concrete_Core 12" : id 1499868	Revit Host Type : Basic Wall : Concrete_C
22	Concrete_Core 12"	Revit Host Type : Basic Wall : Concrete_Core 12" : id 1499	5416481	12	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5416481	Revit Host Type : Basic Wall : Concrete_Core 12" : id 1499868	Revit Host Type : Basic Wall : Concrete_C
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26	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5417517	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5417517	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
27	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5417569	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5417569	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
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31	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5423634	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5423634	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
32	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5423840	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5423840	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
33	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5423874	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5423874	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
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35	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5426569	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5426569	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
36	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5426572	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5426572	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
37	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5426576	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5426576	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
38	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427052	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427052	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
39	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427094	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427094	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
40	HA Wall_W34.2	Revit Host Type : Basic Wall : HA Wall_W34.2 : id 588661 @	5427189	6.125	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		FALSE				TRUE	5427189	Revit Host Type : Basic Wall : HA Wall_W34.2 : id 588661	Revit Host Type : Basic Wall : HA Wall_W3
41	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5427395	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427395	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
42	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5427431	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427431	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
43	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427689	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427689	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
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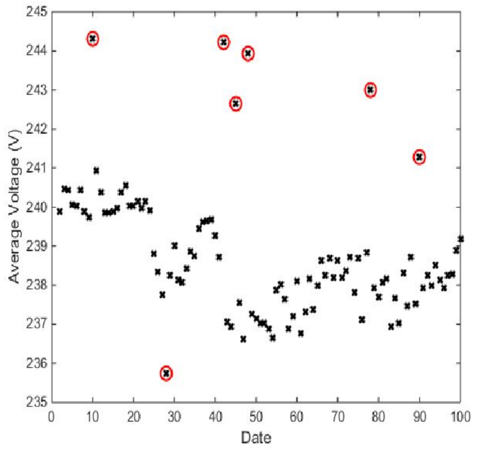
45	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427820	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427820	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
46	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427838	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427838	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
47	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5427870	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5427870	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
48	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428121	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428121	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
49	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428254	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428254	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
50	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428293	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428293	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
51	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428411	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428411	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
52	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428619	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428619	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
53	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428708	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428708	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
54	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5428820	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5428820	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
55	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5429121	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429121	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
56	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5429279	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429279	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
57	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5429308	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429308	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
58	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5429350	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429350	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2
59	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5429403	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429403	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
60	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5429481	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429481	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
61	HA Wall_W24.2	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	5429510	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429510	Revit Host Type : Basic Wall : HA Wall_W24.2 : id 588664	Revit Host Type : Basic Wall : HA Wall_W2
62	HA Wall_W24.1	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	5429613	5	Revit Category : Walls : id -2000011	Revit Category : Walls : id -2000011		TRUE				TRUE	5429613	Revit Host Type : Basic Wall : HA Wall_W24.1 : id 4780387	Revit Host Type : Basic Wall : HA Wall_W2

Sheet1

Ready

Outliers are bad for Machine Learning



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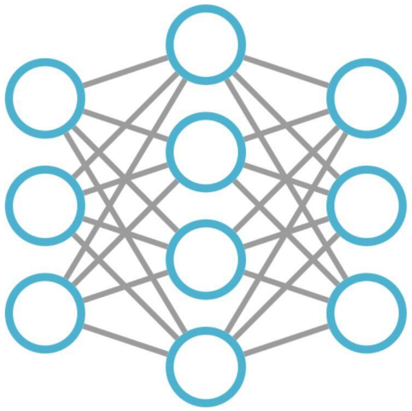

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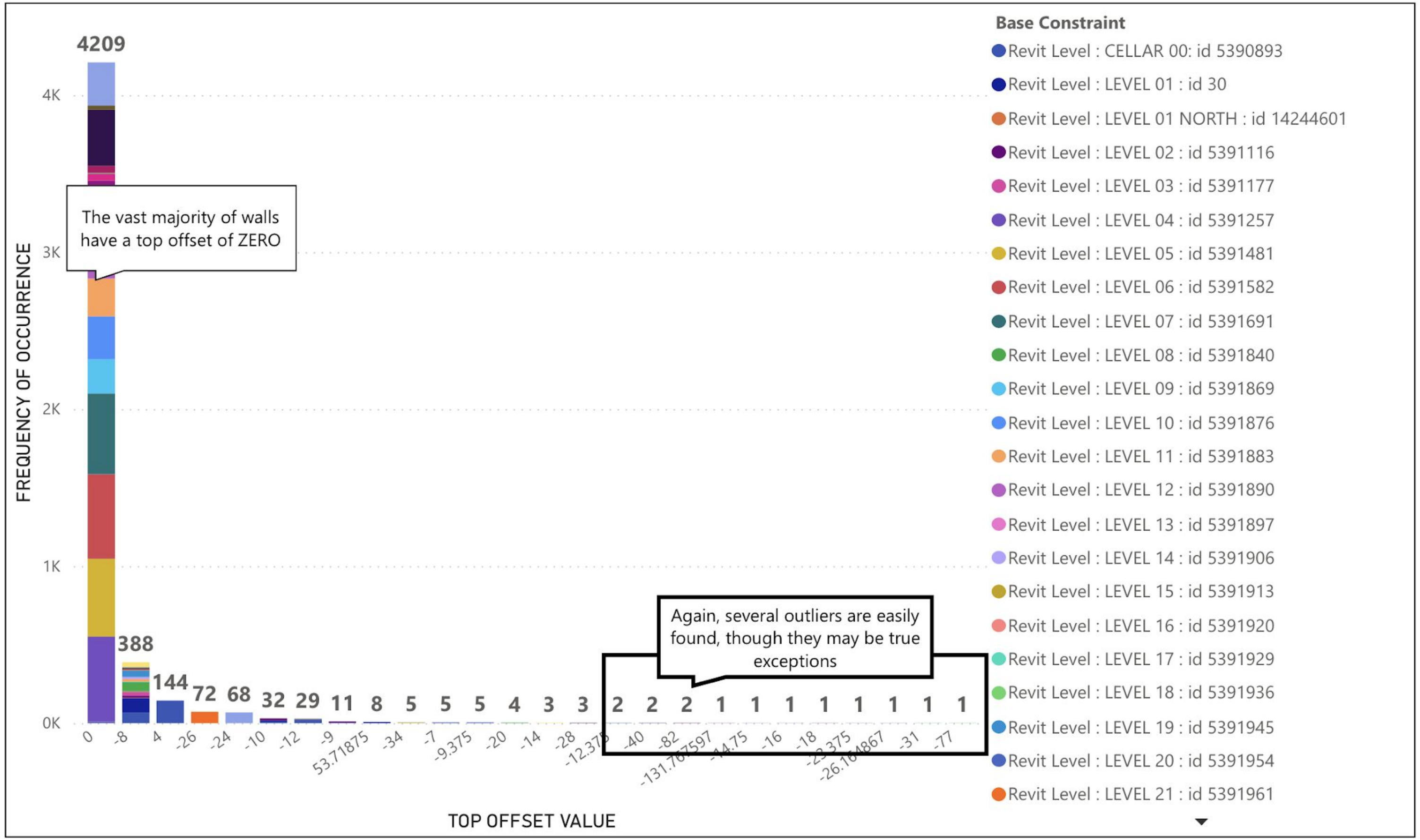
Outliers: TOP OFFSET (each column represents a top offset value, the height of the column shows the qty of walls with that value)



Top Offset

- ■ Select all
- ■ 0
- ■ -10
- ■ -12
- ■ -12.375
- ■ -131.767597
- ■ -14
- ■ -14.75
- ■ -16
- ■ -18
- ■ -20
- ■ -23.375

10014421

10075257

10075473

10387611

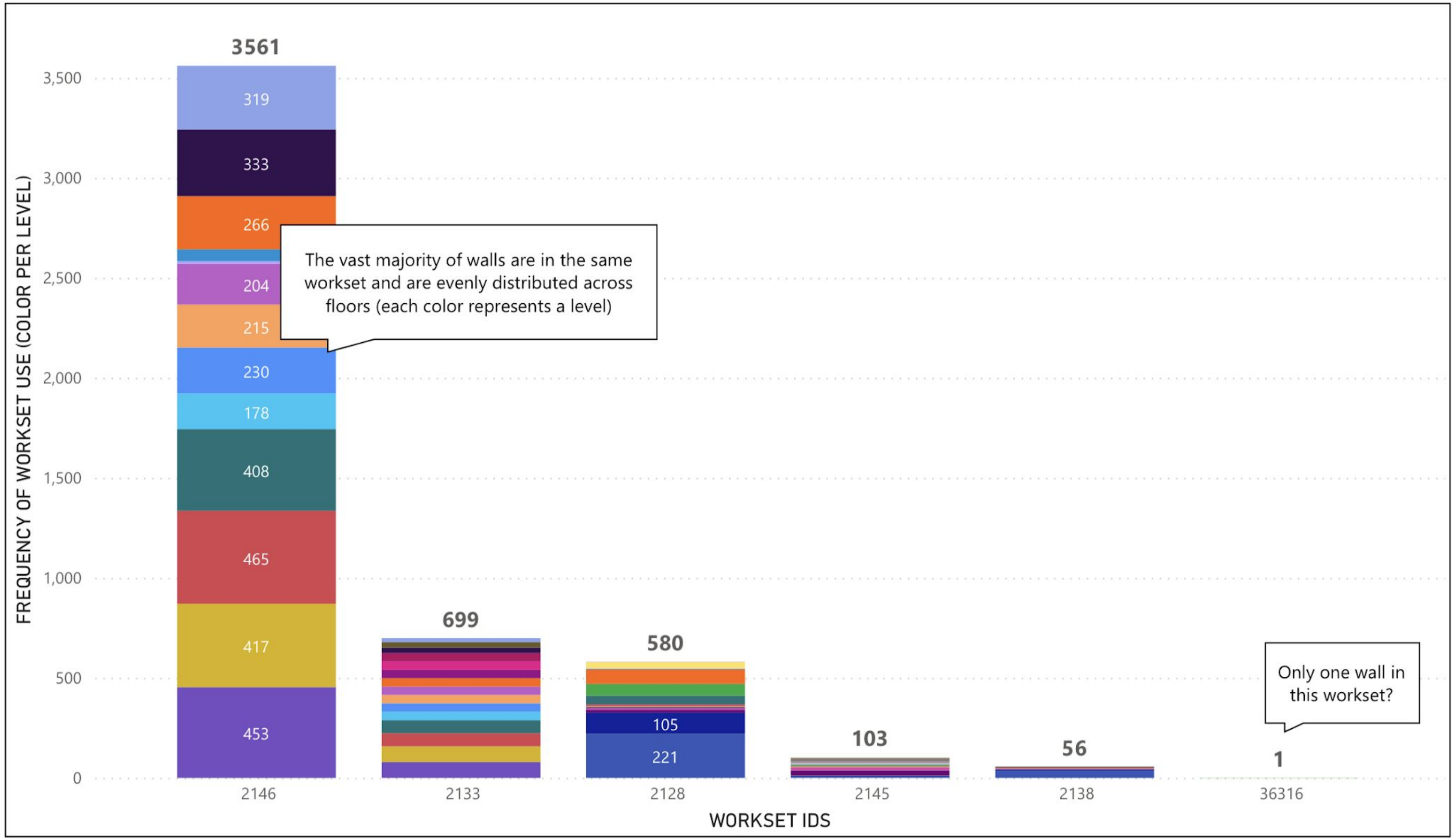
10387612

10387613

10387614

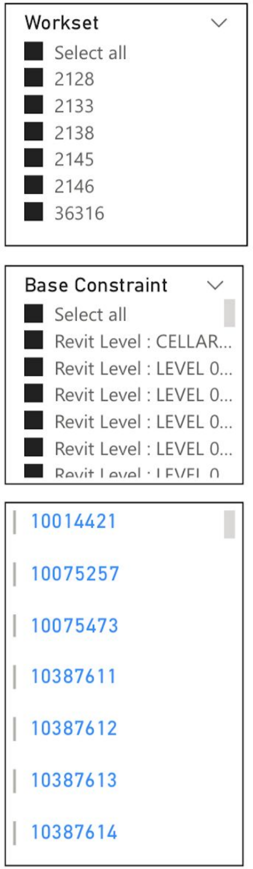
10388017

Outliers: WORKSET USAGE (each column represents a workset, height shows number of walls in that workset)



The vast majority of walls are in the same workset and are evenly distributed across floors (each color represents a level)

Only one wall in this workset?



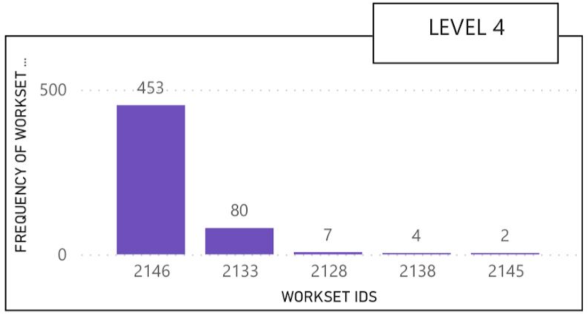
Workset
- ■ Select all
- ■ 2128
- ■ 2133
- ■ 2138
- ■ 2145
- ■ 2146
- ■ 36316

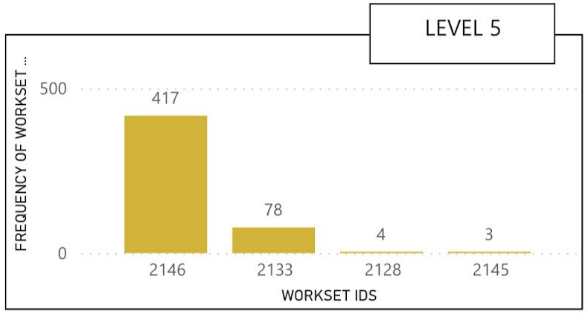
Base Constraint
- ■ Select all
- ■ Revit Level : CELLAR...
- ■ Revit Level : LEVEL 0...
- ■ Revit Level : LEVEL 0...
- ■ Revit Level : LEVEL 0...
- ■ Revit Level : LEVEL 0...
- ■ Revit Level : LEVEL 0

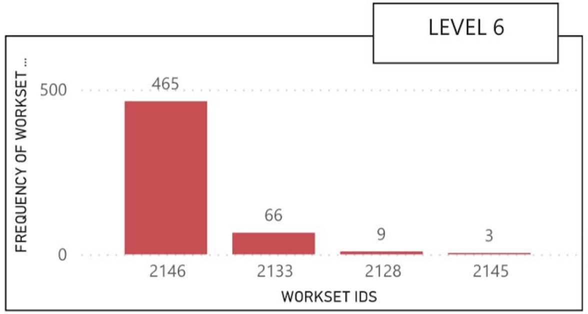
10014421
10075257
10075473
10387611
10387612
10387613
10387614

Outliers: NUMBER OF WORKSETS IN USE BY LEVEL (each column represents a workset)

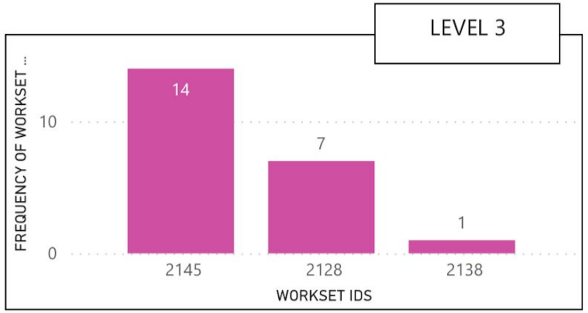
the "four column type"

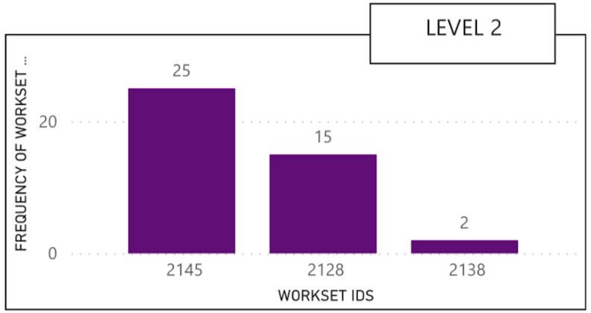


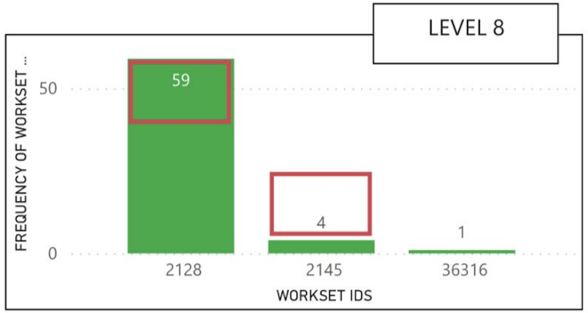


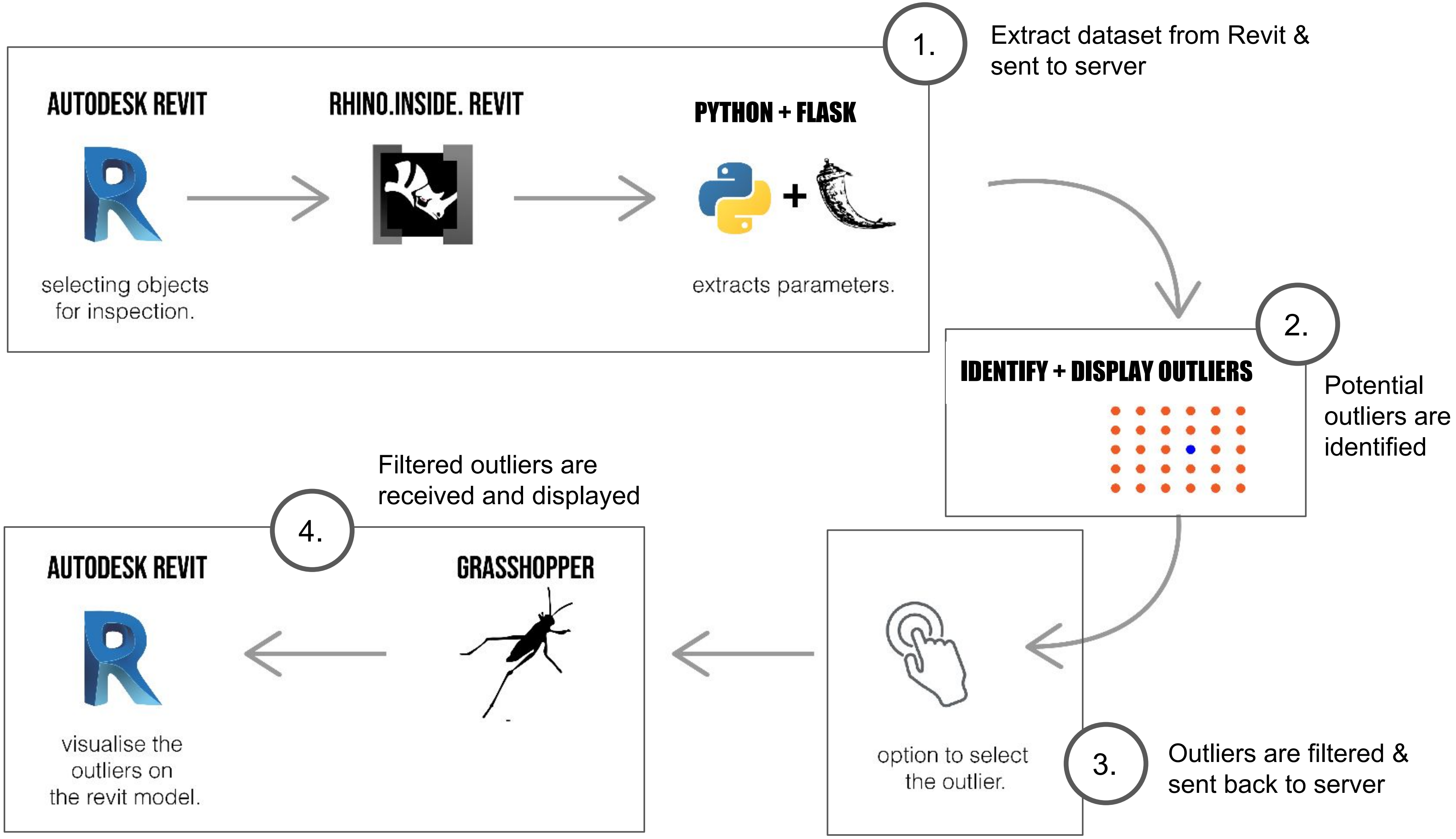


the "three column type"








1.
Extract dataset from Revit & sent to server
AUTODESK REVIT
selecting objects for inspection.
RHINO.INSIDE. REVIT
PYTHON + FLASK
extracts parameters.
2.
IDENTIFY + DISPLAY OUTLIERS
Potential outliers are identified
3.
option to select the outlier.
Outliers are filtered & sent back to server
4.
Filtered outliers are received and displayed
AUTODESK REVIT
GRASSHOPPER
visualise the outliers on the revit model.

1. Extract data from Revit

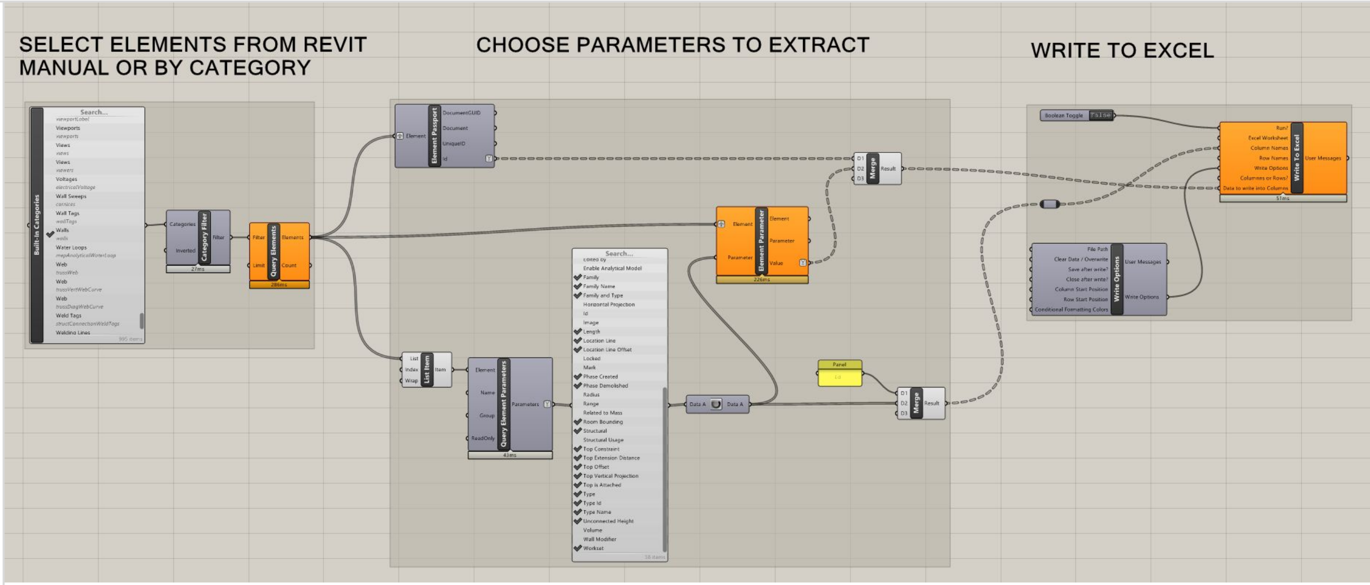
Revit Model

↓

Rhino.Inside
(Use grasshopper with Revit)

↓

Hops to Flask
(Send a stream of data to a flask server)



2. Identify possible outliers

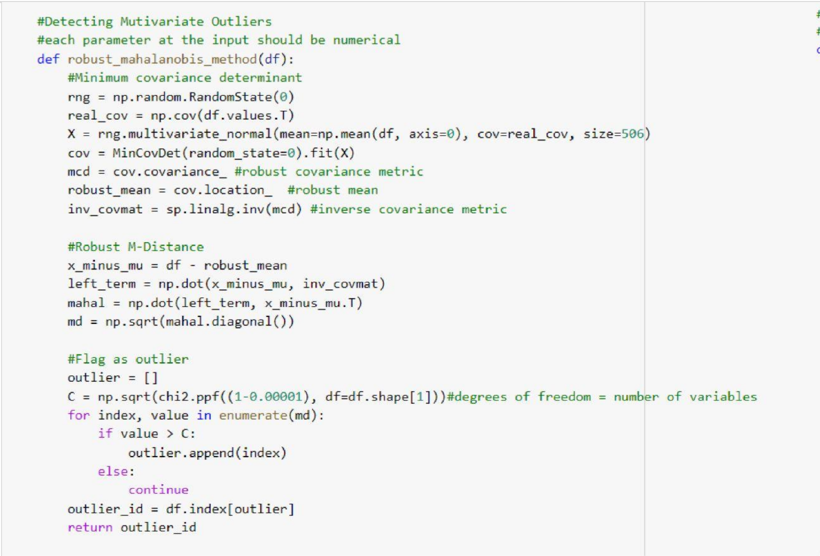
Flask Server
(Call server to access JSON)

↓

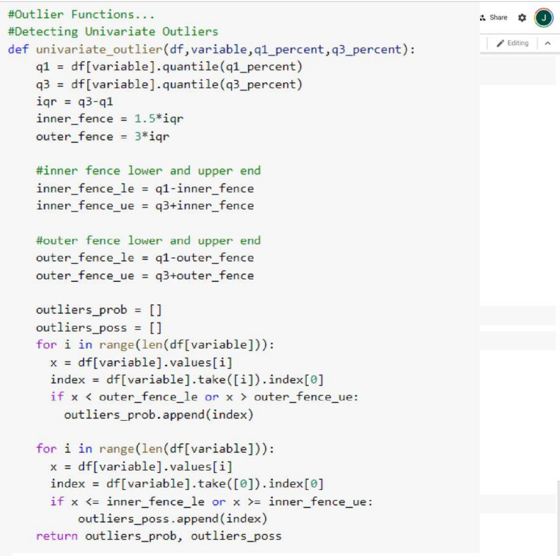
SK Learn
(Univariate outliers, Mahalanobis, Box Plot, Scatter Plot)

↓

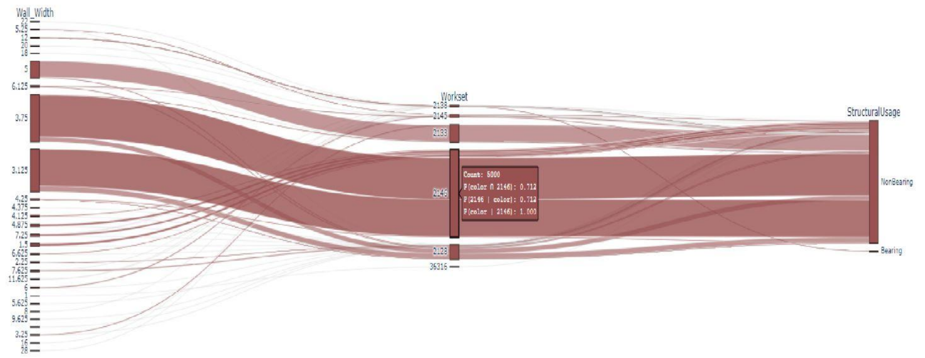
Flask Server
(Send list of ids to server)



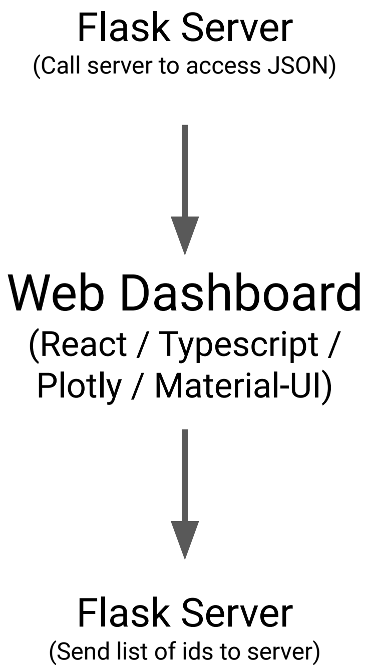
```
#Detecting Mutivariate Outliers
#each parameter at the input should be numerical
def robust_mahalanobis_method(df):
    #Minimum covariance determinant
    rng = np.random.RandomState(0)
    real_cov = np.cov(df.values.T)
    X = rng.multivariate_normal(mean=np.mean(df, axis=0), cov=real_cov, size=506)
    cov = MinCovDet(random_state=0).fit(X)
    mcd = cov.covariance_ #robust covariance metric
    robust_mean = cov.location_  #robust mean
    inv_covmat = sp.linalg.inv(mcd) #inverse covariance metric

    #Robust M-Distance
    x_minus_mu = df - robust_mean
    left_term = np.dot(x_minus_mu, inv_covmat)
    mahal = np.dot(left_term, x_minus_mu.T)
    md = np.sqrt(mahal.diagonal())

    #Flag as outlier
    outlier = []
    C = np.sqrt(chi2.ppf((1-0.00001), df=df.shape[1]))#degrees of freedom = number of variables
    for index, value in enumerate(md):
        if value > C:
            outlier.append(index)
        else:
            continue
    outlier_id = df.index[outlier]
    return outlier_id
```



```
#Outlier Functions...
#Detecting Univariate Outliers
def univariate_outlier(df,variable,q1_percent,q3_percent):
    q1 = df[variable].quantile(q1_percent)
    q3 = df[variable].quantile(q3_percent)
    iqr = q3-q1
    inner_fence = 1.5*iqr
    outer_fence = 3*iqr

    #inner fence lower and upper end
    inner_fence_le = q1-inner_fence
    inner_fence_ue = q3+inner_fence

    #outer fence lower and upper end
    outer_fence_le = q1-outer_fence
    outer_fence_ue = q3+outer_fence

    outliers_prob = []
    outliers_poss = []
    for i in range(len(df[variable])):
      x = df[variable].values[i]
      index = df[variable].take([i]).index[0]
      if x < outer_fence_le or x > outer_fence_ue:
        outliers_prob.append(index)

    for i in range(len(df[variable])):
      x = df[variable].values[i]
      index = df[variable].take([0]).index[0]
      if x <= inner_fence_le or x >= inner_fence_ue:
          outliers_poss.append(index)
    return outliers_prob, outliers_poss
```



3. Visualize, Explore, and Select Outliers


Flask Server
(Call server to access JSON)
Web Dashboard
(React / Typescript / Plotly / Material-UI)
Flask Server
(Send list of ids to server)

4. View outliers in Revit

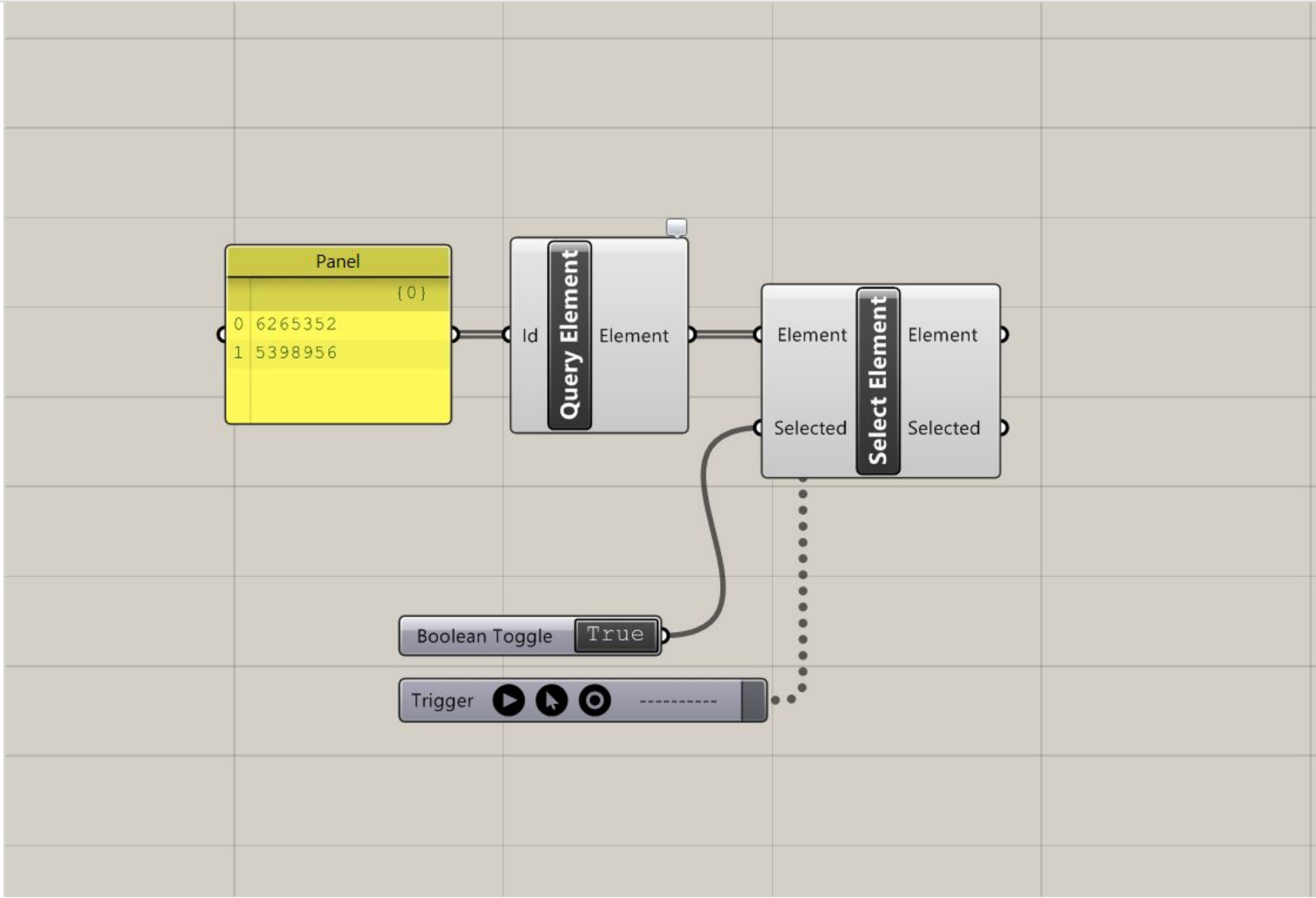
Flask Server
(Call server to access JSON)

↓

Rhino.Inside / Hops
(Get selected ids)

↓

Revit
(Visualize selected elements)



4. View outliers in Revit

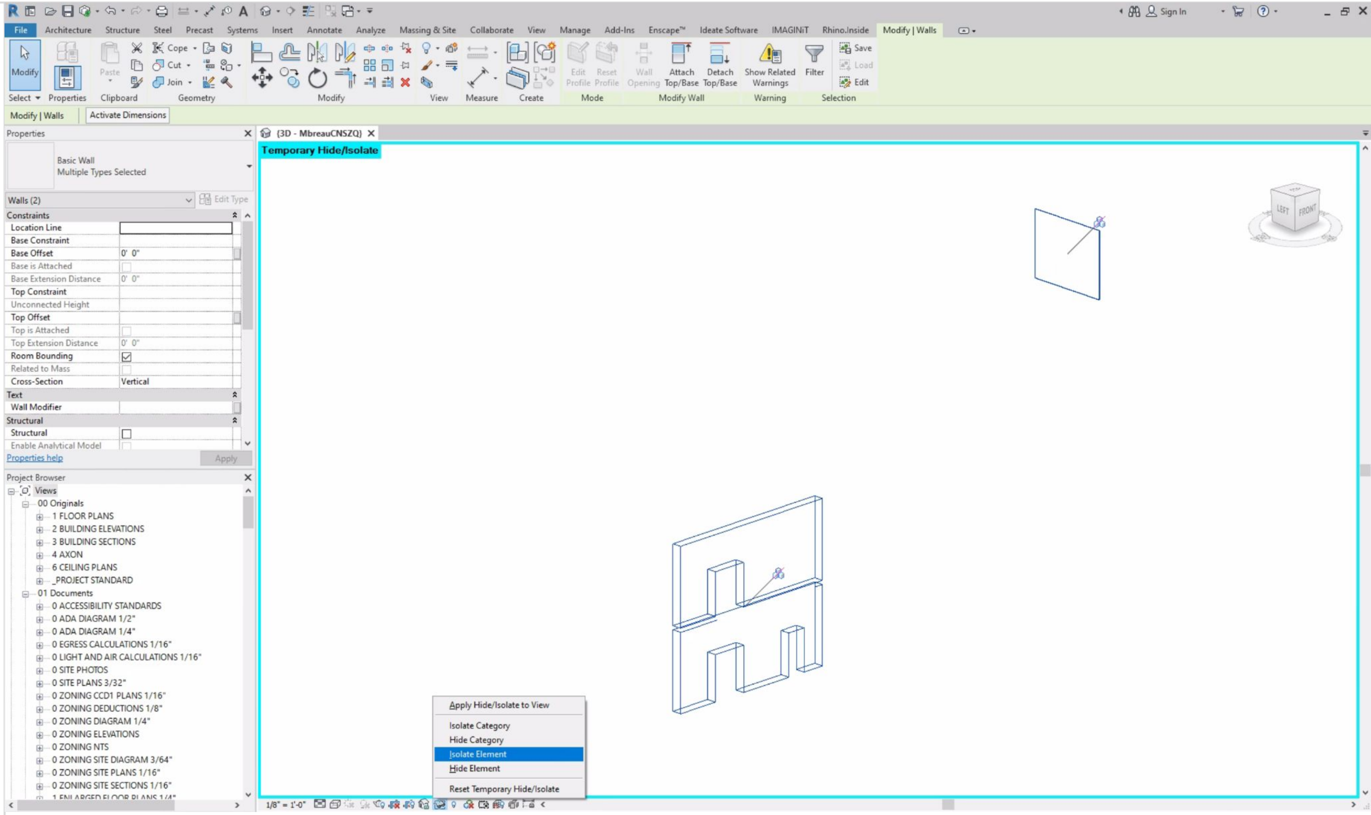
Flask Server
(Call server to access JSON)

↓

Rhino.Inside / Hops
(Get selected ids)

↓

Revit
(Visualize selected elements)



Properties

Basic Wall
Multiple Types Selected

Walls (2) | Edit Type

Constraints	
Location Line	
Base Constraint	
Base Offset	0' 0"
Base is Attached	☐
Base Extension Distance	0' 0"
Top Constraint	
Unconnected Height	
Top Offset	
Top is Attached	☐
Top Extension Distance	0' 0"
Room Bounding	☑
Related to Mass	☐
Cross-Section	Vertical
Text	
Wall Modifier	
Structural	
Structural	☐
Enable Analytical Model	☐

Properties help | Apply

Project Browser

- Views
  - 00 Originals
    - 1 FLOOR PLANS
    - 2 BUILDING ELEVATIONS
    - 3 BUILDING SECTIONS
    - 4 AXON
    - 6 CEILING PLANS
    - _PROJECT STANDARD
  - 01 Documents
    - 0 ACCESSIBILITY STANDARDS
    - 0 ADA DIAGRAM 1/2"
    - 0 ADA DIAGRAM 1/4"
    - 0 EGRESS CALCULATIONS 1/16"
    - 0 LIGHT AND AIR CALCULATIONS 1/16"
    - 0 SITE PHOTOS
    - 0 SITE PLANS 3/32"
    - 0 ZONING CCD1 PLANS 1/16"
    - 0 ZONING DEDUCTIONS 1/8"
    - 0 ZONING DIAGRAM 1/4"
    - 0 ZONING ELEVATIONS
    - 0 ZONING NTS
    - 0 ZONING SITE DIAGRAM 3/64"
    - 0 ZONING SITE PLANS 1/16"
    - 0 ZONING SITE SECTIONS 1/16"
    - 1 ENLARGED FLOOR PLANS 1/4"

Future Development

- **Use Hops instead of Excel for data export**
  Automate export/ analysis procedure

- **Automatic highlighting in Revit**
  Hops should return IDs into Grasshopper so the user does not need to copy & paste

- **“Remember” User’s Input**
  Once the user has confirmed that a particular parameter on a particular element its not an outlier, that element/ parameter would not be flagged as an outlier again

- **Recipes**
  Learn from experience which parameters are likely to be worthwhile to cross-reference, and prioritize these for new projects.

- **Automatic recognition of meta-patterns**
  Implement multi-variable regressions

Thanks!

https://github.com/jperaino/cuckoo

PRESENTATION PITCH CONCEPT OUTLINE (for discussion)

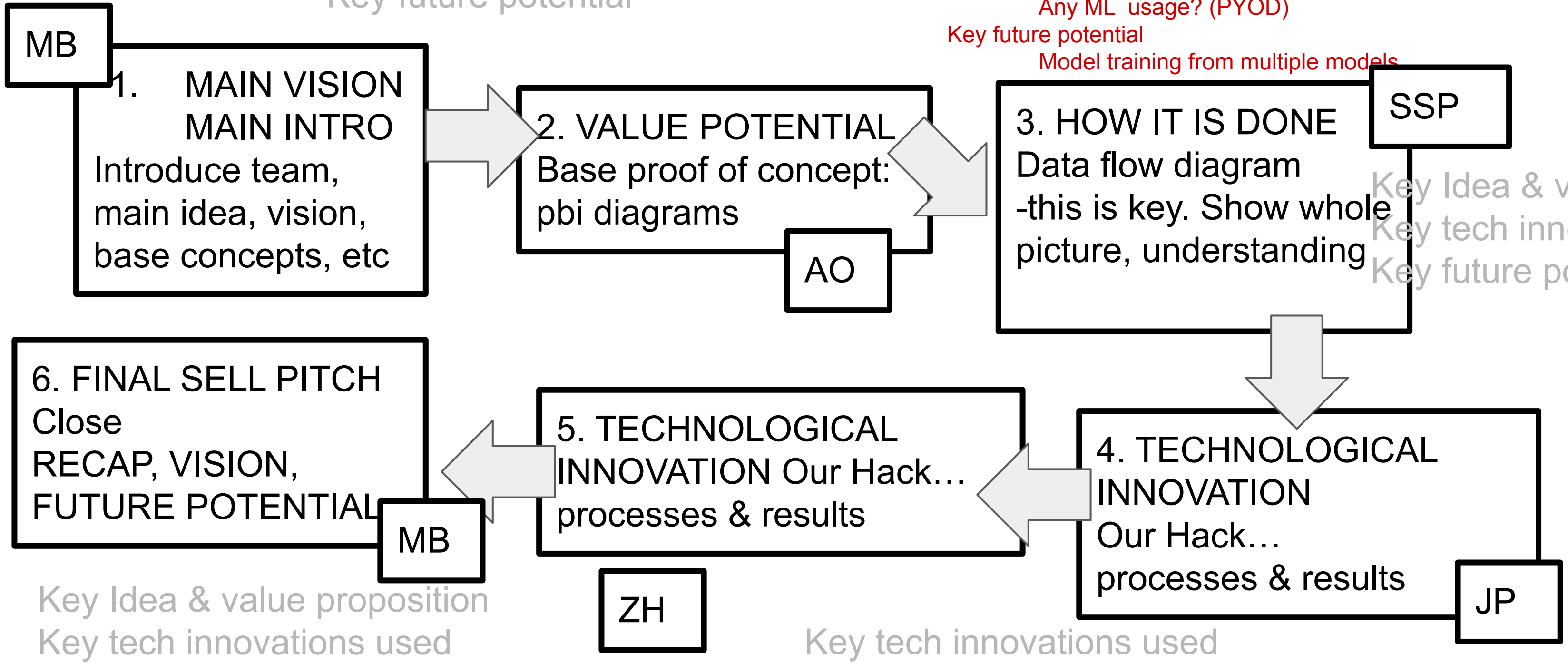
Clearly Identify:

Key Idea & value proposition
- Real problem. Own the "non-flashy"
- NOTHING existed before saturday
- Errors & Omissions are a real problem. (RFIs, litigation)
  - Specific uses: data consistency in naming, wrong family use, i. . Incorrect size
- We understand not all "outliers" are mistakes. Filtering is key (enter ML)

Key tech innovations used (NEED TO HIT THIS… what are they????)
- Identify open source libraries used
- Any ML usage? (PYOD)

Key future potential
- Model training from multiple models

Key Idea & value proposition
Key future potential



MB

1. MAIN VISION
MAIN INTRO
Introduce team, main idea, vision, base concepts, etc

2. VALUE POTENTIAL
Base proof of concept: pbi diagrams

AO

3. HOW IT IS DONE
Data flow diagram
-this is key. Show whole picture, understanding

SSP

Key Idea & value propositio
Key tech innovations used
Key future potential

4. TECHNOLOGICAL INNOVATION
Our Hack…
processes & results

JP

Key tech innovations used

5. TECHNOLOGICAL INNOVATION Our Hack…
processes & results

ZH

6. FINAL SELL PITCH
Close
RECAP, VISION, FUTURE POTENTIAL

MB

Key Idea & value proposition
Key tech innovations used
Key future potential