

SUPPLEMENTAL MATERIAL DETAIL

- **Spreadsheet Navigation Study: Quiz Tasks**
 - describes the tasks used during the quiz phase of the user study.
- **Supplementary Materials Participant Packet for Spreadsheet Navigation Evaluation Study**
 - describes three surveys conducted during the study.
- **Supplementary Materials Spreadsheet Navigation Evaluation Study Protocol**
 - describes the study protocol.
- **Screenshots of different stages of NOAH's design process with explanations**

Spreadsheet Navigation Study: Quiz Tasks

The document lists the set of tasks participants will complete during the quiz phase. One dataset is used per session. The order of the datasets is alternated between consecutive participants.

Birdstrikes Dataset:

1. Organize the data by *State*. How many flights that had damages (*damage* = 1) originated from *Florida*?
2. How many flights in the currently visible spreadsheet window have damages?
3. How many flights that had damages (*damage* = 1) originated from *California*?
4. Which state between Florida and California has more flights with damages?
5. Find the state with the most birdstrike occurrences.
6. Organize the data by Altitude. What is the average cost of damages for altitude bin 0-450?

Airbnb Dataset:

1. Organize the data by City. How many listings in Chicago are available more than 60 days/year, i.e., *availability* > 60?
2. How many listings in the currently visible spreadsheet window have *availability* > 60?
3. How many listings in Santa Cruz are available more than 60 days/year, i.e., *availability* > 60?
4. Which city between *Chicago* and *Santa Cruz* has more listings available for more than 60 days?
5. Find the city that has the highest number of listings available more than 60 days.
6. Organize the data by availability. How many listings are rented as “Entire home/apt” for the availability bin 340-365?

Spreadsheet Navigation Evaluation Study: Participant Packet

Summary of Packet Contents

The participant packet contains three sets of survey questions: one pre-recruitment survey and two copies of the after-task survey that was provided during the quiz phase. The packet also contains a handout explaining the different features of NOAH.

The pre-recruitment survey must be completed by anyone who is interested to participate in the study.

The after-task survey is administered twice, after the participant has completed the tasks in each session of the quiz phase.

The handout contains screenshots of how to use the different features of NOAH.

The **Spreadsheet Navigation Evaluation Study: Interview Protocol** provides detailed instructions about when to conduct each of the after-task surveys and when to provide the handout to the participants.

Note: Any participant satisfying the inclusion criteria is recruited. Therefore, we are including the pre-recruitment survey as part of the participant packet.

Note: All three surveys (the pre-recruitment survey, two after-task surveys) are conducted on separate Google Forms. The response to each form is automatically saved in a Google Sheet. Each row in the spreadsheet corresponds to one participant's response. The columns correspond to the questions in the survey.

Pre-recruitment Survey

1. Name: _____
2. Email Address: _____
3. Gender
 Male Female Other
4. Age: _____
5. What is your occupation? If "student", please mention your major.
6. Please rate your experience with spreadsheet tools below on a scale of 1 to 5 (1- "no experience at all", 5- "expert spreadsheet user").

Microsoft Excel
Google Sheets
Apple Numbers
LibreOffice Calc
Calc XLS
Airtable
7. Please rate your frequency of using spreadsheet tools for the tasks below on a scale of 1 to 5 (1- "Very rarely", 5- "Very frequently")

Maintaining lists (e.g., names, addresses or other data)
Tracking data (e.g., budgets, sales, inventories)
Analyzing data (e.g., financial data, experiments)
Determining trends and making projections (e.g., statistical model)
Evaluating alternatives(e.g., compare multiple options)
Other
8. Which of the following Spreadsheet operations are you familiar with? Please check all that apply.

Filter
Sort
COUNT
COUNTIF
SUM
SUBTOTAL
Pivot Table
Conditional Formatting
None of the Above
Other: _____

End of Survey

After-Task Survey

Participant #: _____

1. Please rate your degree of agreement with the following statements on a scale of 1 to 7 (1 = strongly disagree, 2 = disagree, 3 = moderately disagree, 4 = neutral, 5 = moderately agree, 6 = agree, 7 =strongly agree).
 - a. Overall, I am satisfied with how easy it is to use this system
 - b. It was simple to use this system
 - c. I can effectively complete my work using this system
 - d. I am able to complete my work quickly using this system
 - e. I am able to efficiently complete my work using this system
 - f. I feel comfortable using this system
 - g. It was easy to learn to use this system
 - h. I believe I became productive quickly using this system
 - i. It is easy to find the information I needed
 - j. The information provided for the system is easy to understand
 - k. The information is effective in helping me complete the tasks and scenarios
 - l. The organization of information on the system screens is clear
 - m. The interface of this system is pleasant
 - n. I like using the interface of this system
 - o. Overall, I am satisfied with this system
2. List three most negative aspect(s) of the tool.
3. List three most positive aspect(s) of the tool.

End of Survey

Spreadsheet Navigation Evaluation Study Protocol

The study protocol contains instructions on how to conduct each step of the study, scripts to be used to communicate each step to the participants, and additional notes for a number of steps, e.g., key points to remember.

Study Protocol

Step 1: Welcome the participant and thank them for participating in the study. First, briefly explain the purpose of the study.

Thank you for participating in our study. In this study, you will perform several spreadsheet tasks on two different tools: Excel and NOAH. NOAH is an interface designed on top spreadsheets for exploring and analyzing data. Our aim is to identify the differences in performing different spreadsheet tasks using both tools in terms of completion time, task accuracy, and ease of use.

Step 2: Provide a brief overview of the all the phases of the study.

The study consists of five phases. First, we will show you a video demo of the tool NOAH explaining its features. Next, there will be a warm up session where you will use NOAH on a dataset. Then, we will move on to a quiz phase where you will perform several tasks on two different datasets. For one dataset, you will use EXCEL and for another dataset you will use NOAH. After completing the tasks on each dataset, you will complete a short survey regarding your experience in using the tools. Finally, there will be a short interview on your overall impression about both the tools.

Step 3: Provide the participant the consent form and ask them them read the form and to agree.

Before we move on to the study, please read through the consent form, and sign if you agree.

Note: remind the participants that if they agree to recording the audio of the interview phase, select “yes” for the field in the form asking for consent. Also, remind the participants that if they agree to capturing the recording of the quiz phase using a screen capture tool, select “yes” for the field in the form asking for consent.

Step 4: Introduce the video demo of NOAH to the participants.

Now, let's see a video demonstration of NOAH. Here, we will explain different features of NOAH and how to use those features.

Note: After the demo ends, ask the participants if they have any question regarding the demo.

Step 5: Open the browser and launch NOAH so that participants can explore different features of NOAH for 10 minutes.

Before moving on to the quiz phase, you have 10 minutes to use NOAH and familiarize yourself with the tool. You will explore a datasets of all the flights across United States for the month of January 2019, the same dataset that was used in the video demonstration.

Step 5: Provide a brief overview of the quiz phase to the participants.

Now let's move on to the quiz phase. The quiz phase has two sessions: in the first session, you will use Excel/NOAH to complete six tasks on one dataset, and in the second session, you will use EXCEL/NOAH to complete six tasks on another dataset. After each session you will complete a short survey regarding your experience in using the tool. Note that, for any tasks in Excel, you are free to surf the web and find the solution (in case you forget the appropriate operation to use). For the tasks in NOAH, you can refer to the printed handout.

Note: Since the order of the tools are alternated between every two participants, mention the appropriate tool name for each session. For the handout, please refer to **Spreadsheet Navigation Study: Participant Packet**. For the quiz questions, please refer to **Spreadsheet Navigation Study: Quiz Tasks**.

Step 5: Open the selected dataset using the designated tool in one computer screen and launch the quiz system in another computer screen. Launch the screen capture tool for video recording.

Note: A dual-monitor system is used for the study. Since the order of the datasets is alternated between consecutive participants, open the appropriate dataset in each session.

Step 6a: Briefly explain to the participants how to use the quiz system.

First please submit your participant no. to the quiz system. Once you click “start”, the first quiz session will begin. A question will appear on the screen. Use Excel/NOAH to explore the dataset and find your answer. Submit your answer in the “text field” below the question in the quiz system. Click “next” to see the next question. Remember the tasks are timed. So, please submit your responses as soon as you obtain an answer. You can’t modify your answer once you click “submit”.

Step 6b: After the first session ends, open the browser to conduct the after-task survey (the second survey in the **Spreadsheet Navigation Study: Participant Packet**).

Please provide your participant no. in the survey form and them complete the survey.

Step 7a: Start the next session of the quiz phase.

Note: Again remind participants that the quiz tasks are timed.

Step 7b: After the second session ends, open the browser to conduct the after-task survey (the second survey in the **Spreadsheet Navigation Study: Participant Packet**).

Please provide your participant no. in the survey form and them complete the survey.

Step 8: Conduct the semi-structured interview.

Now, we will move on to the final phase of the study where I’ll ask you a few questions regarding your impression about both the tools.

1. *Between NOAH and Excel, which one did you prefer for (a) looking up a specific city or state and (b) navigating from one city or state to another?*
2. *For all of the tasks except one, you had to use different spreadsheet formula to find your answers.*
 - a. *What were the advantages or disadvantages of NOAH in issuing a spreadsheet formula and finding the answer?*
 - b. *What were the advantages or disadvantages of EXCEL in issuing a spreadsheet formula and finding the answer?*
3. *Can you think of any scenarios where you might prefer EXCEL over NOAH or vice versa? Please explain.*

4. *For the second task in both the sessions, you had to find out how many visible rows in the current screen satisfied the condition of the COUNTIF formula. Was the data highlight feature in NOAH helpful in identifying the rows satisfying the condition compared to Excel? Why or why not?*
5. *Do you think the bin customization feature to redefine the bins created by NOAH can be helpful? Why or why not?*

NOAH: Design Iterations

In this document, we present how the NOAH's interface evolved as iterated through multiple designs and introduced new features or redesigned existing ones. We only present the key design evolutions.

Iteration 1: Design of the overview (Binned vs Tree Representation)

We contemplated two representations of the overview (a) a zoomable bins, and (b) a collapsible tree.

Binned Representation: The binned representation groups sorted data into collections of bins. Users can click a bin; the corresponding data is displayed in the spreadsheet and user's current focus is highlighted. Users can zoom into a bin by clicking the "+" symbol at the top right and zoom out of the current level of granularity by clicking the "-" symbol.

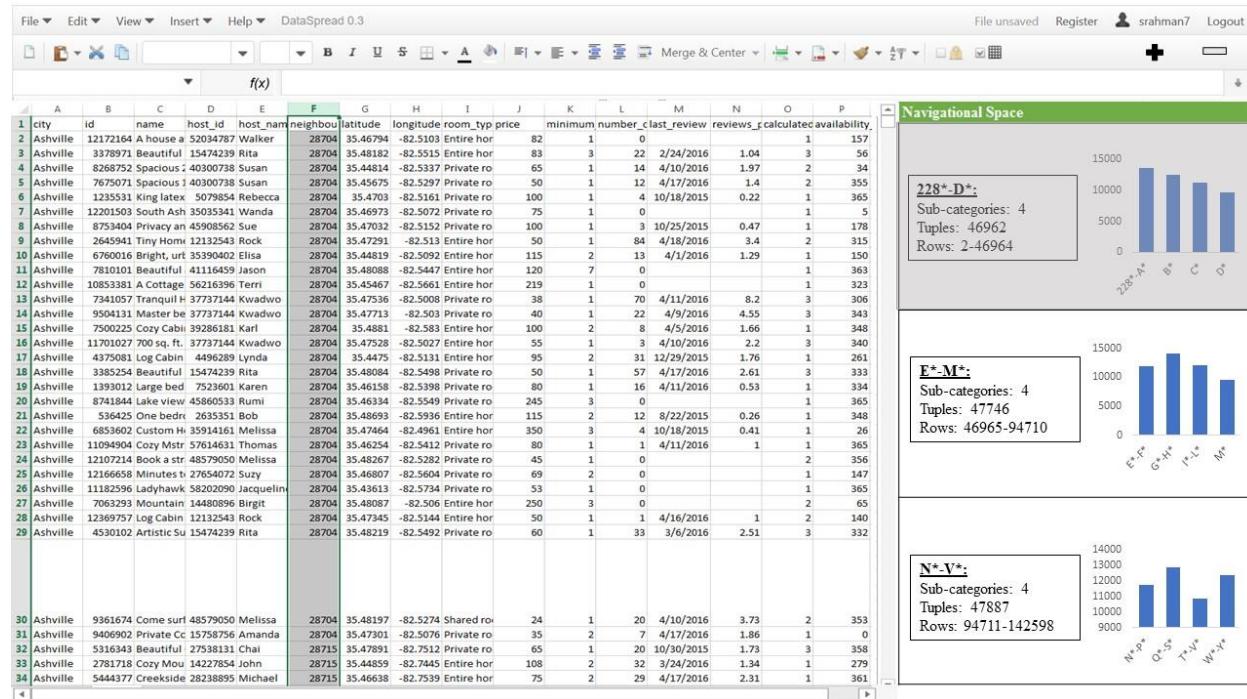


Fig. Binned overview on the right

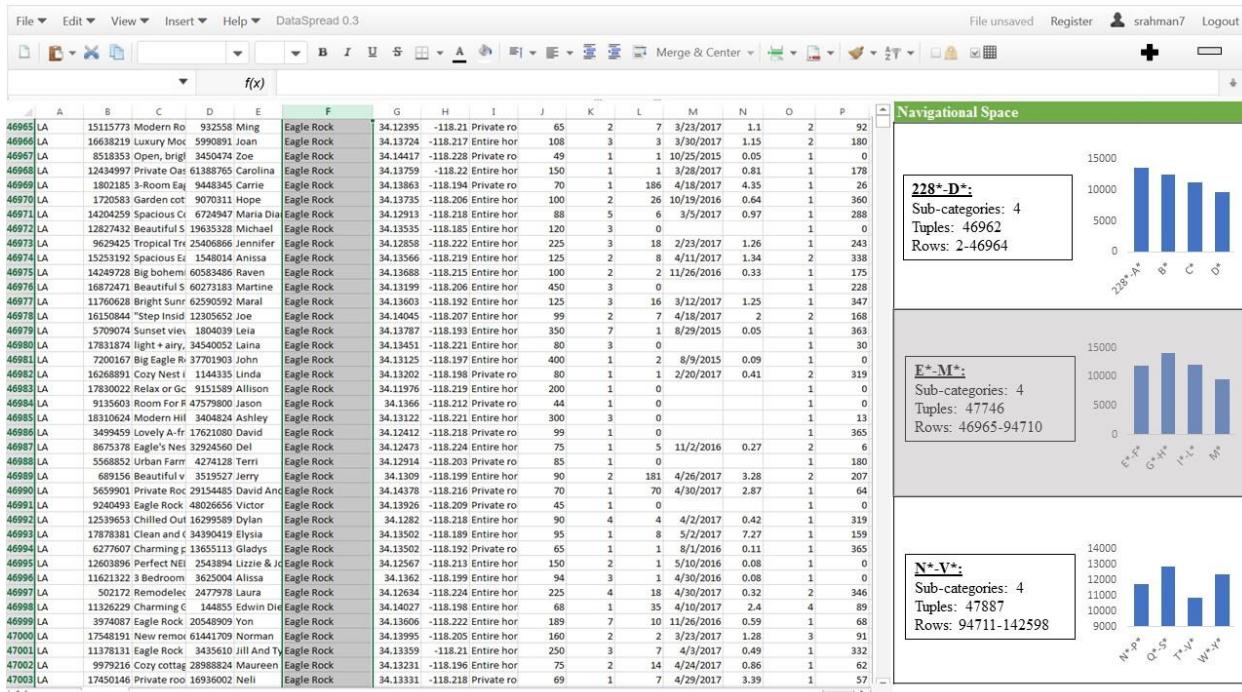


Fig. Click operation and show users current focus

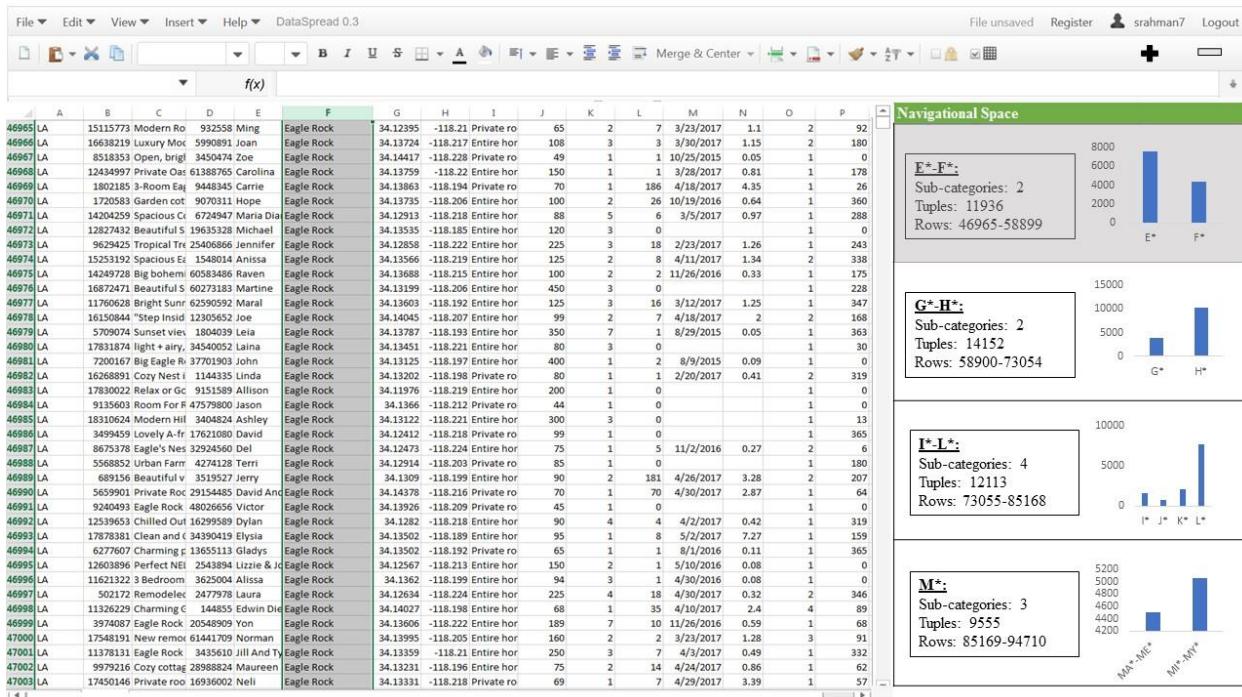


Fig. Zoom In

Tree Representation: The tree representation constructs a multi-level tree on the data, much like B-trees in databases. The topmost level is displayed by default. Users can click a node; the corresponding data is displayed in the spreadsheet and user's current focus is highlighted. Users can expand a node by clicking the “+” symbol on the node and collapse a node by clicking the “-” symbol.

Fig. Tree Representation and showing focus

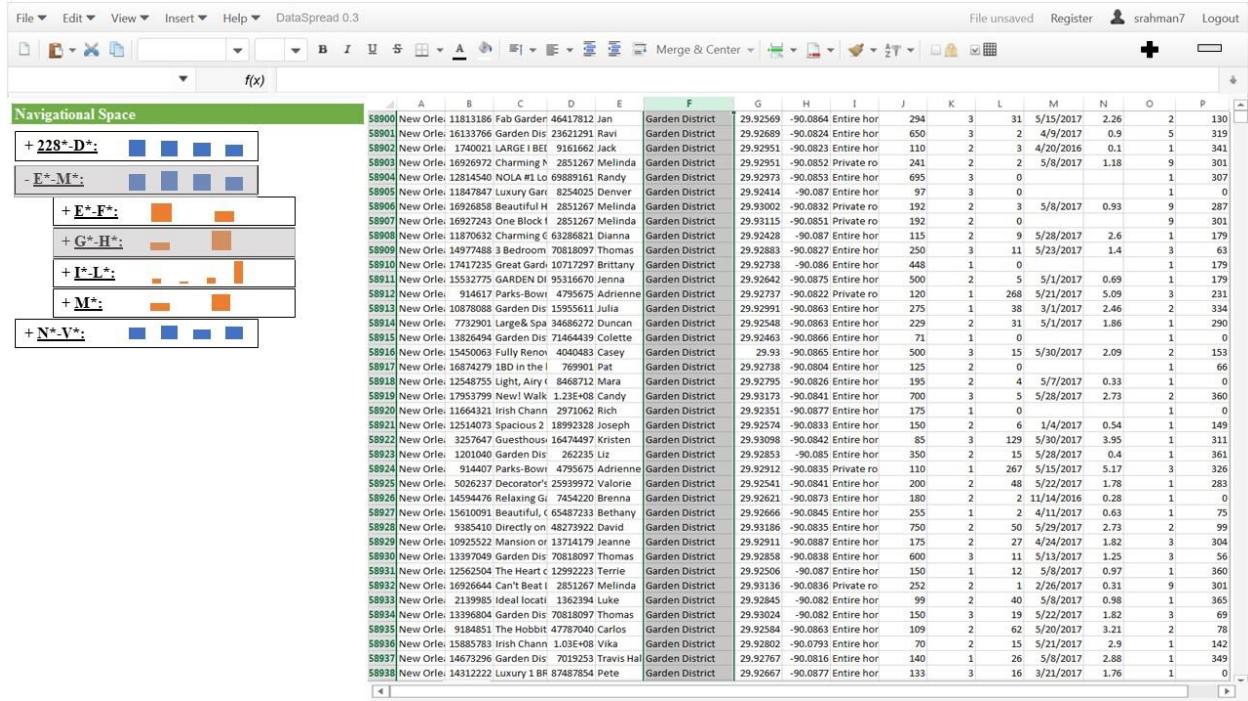


Fig. Collapsing node G-H

Takeaways: The tree representation looks cluttered compared to the binned representation. However, the tree representation captures user's navigation path. So we decided to show users current path within each bin of the binned representation.

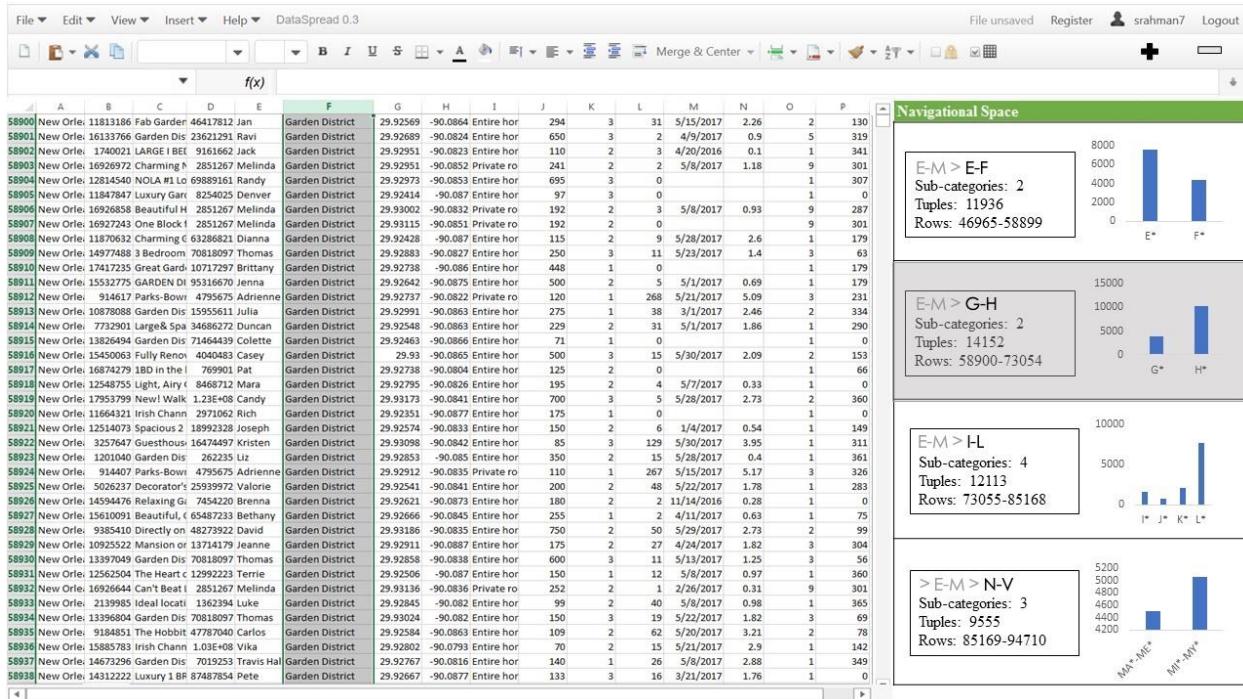


Fig. Provide Context by Showing Breadcrumbs within bins

Iteration 2: Supporting Formula

As we iterated over the overview, we realized we extend its capabilities further---we can help users issue spreadsheet formula via the overview without having to steer the data. The initial design was that the user would click CTRL and left click on any bin, which will (a) select an empty cell in the spreadsheet and populate the corresponding region reference on the formula bar. User can then type in their desired function.

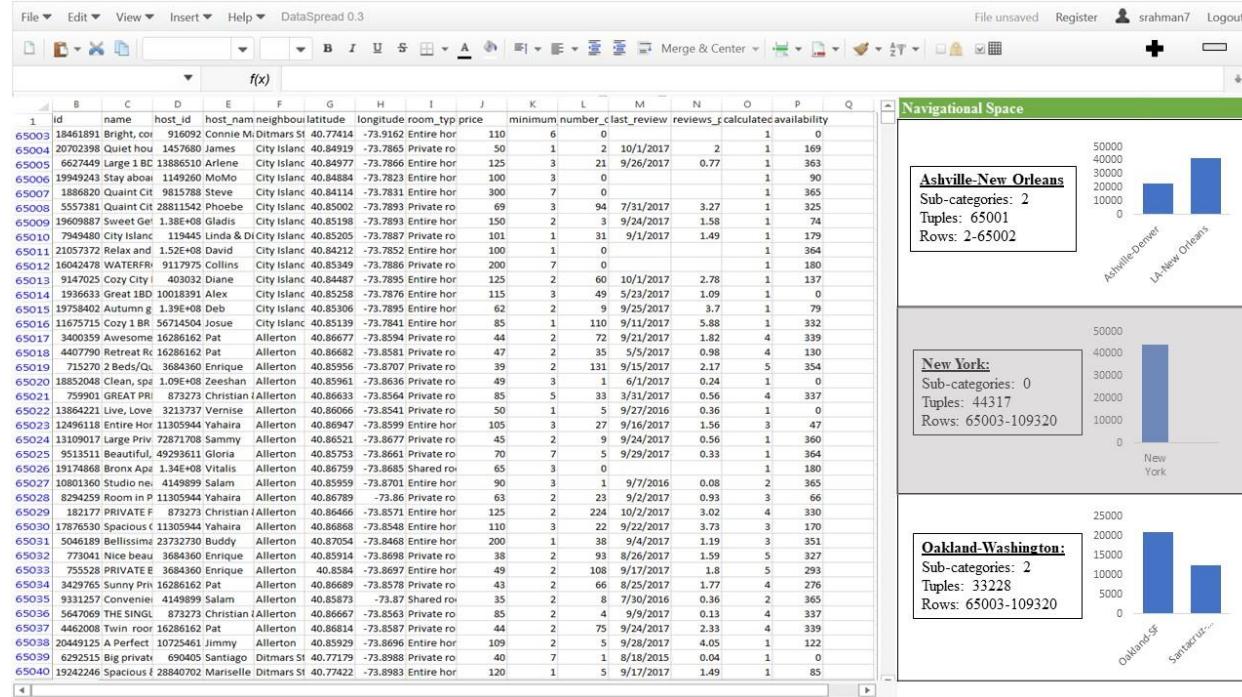


Fig. CTRL + bin selection

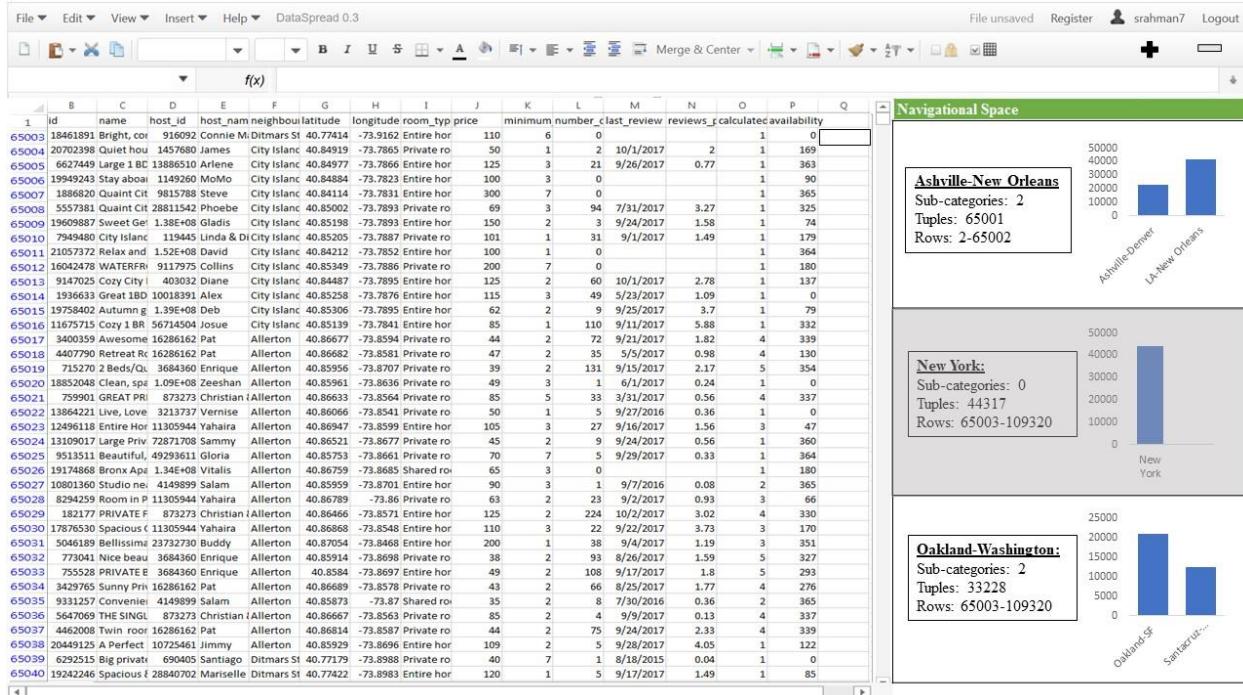


Fig. Spreadsheet cell automatically selected where result of the formula is displayed

We made one additional design change at this point: after reviewing eye-tracking research, we found that the optimal placement on the overview is on the left of the screen.

The screenshot shows a spreadsheet application window titled "DataSpread". At the top, there is a menu bar with "Files", "Edit", "View", "Insert", and "Help" dropdowns, along with a user profile icon. Below the menu is a toolbar with a "FX" button. The main area is a grid with columns labeled A through I and rows numbered 1 through 13. Column A contains "Country", column B contains "State", column C contains "City", column D contains "Listing", and column E contains "Price". Rows 2 through 13 show various data points, such as row 2 having a value of 78 in column E and row 13 having a value of 105 in column E. To the left of the grid, there is a vertical blue sidebar with the text "Start Navigating Here".

	A	B	C	D	E	F	G	H	I
1	Country	State	City	Listing	Price				
2					78				
3					102				
4					390				
5					40				
6					99				
7					540				
8					28				
9					65				
10					120				
11					88				
12					43				
13					105				

Fig. Placement of Overview: to the left of the screen

Iteration 3: Introducing Hierarchical Columns

There are several issues with the previous approach: (a) the interactions are cumbersome and (b) the cell where results are displayed is not noticeable and placed out of context. Therefore, our initial idea was to create a hierarchical column within the spreadsheet that will display the formula results. Each cell in the column corresponds to a bin in the overview and spans the spreadsheet region that bin corresponds to. As users perform zoom operation on the overview, the hierarchical column is automatically updated to reflect the overview.

The screenshot shows a spreadsheet interface with a toolbar at the top and a main data grid below. On the left, there is a vertical sidebar divided into three colored sections: A-G (blue), H-N (light blue), and O-Z (cyan). The main data grid has columns labeled A through I and rows numbered 1 through 13K. Cell E1 contains the value "Price". A context menu is open over cell F1, listing "Insert Column" and "Insert Hier Co." (Hierarchical Column).

	A	B	C	D	E	F	G	H	I
1	Country	State	City	Listing	Price				
2					78				
3					102				
4					390				
5K					40				
6					99				
7					540				
8k					28				
9					65				
10					120				
11					88				
12					43				
13K					105				

Fig. User right clicks, the context menu displays the hierarchical column creation option

DataSpread

Files ▾ Edit ▾ View ▾ Insert ▾ Help ▾

A-G

H-N

O-Z

FX

	A	B	C	D	E	F	G	H	I
1	Country	State	City	Listing	Price	Hier Co. Avg Price			
2					78				
3					102				
4					390	180			
5K					40				
6					99				
7					540	210			
8k					28				
9					65				
10					120				
11					88	140			
12					43				
13K					105				

Fig. Display hierarchical column

DataSpread

Files ▾ Edit ▾ View ▾ Insert ▾ Help ▾

A-G

H-N

M-N

O-Z

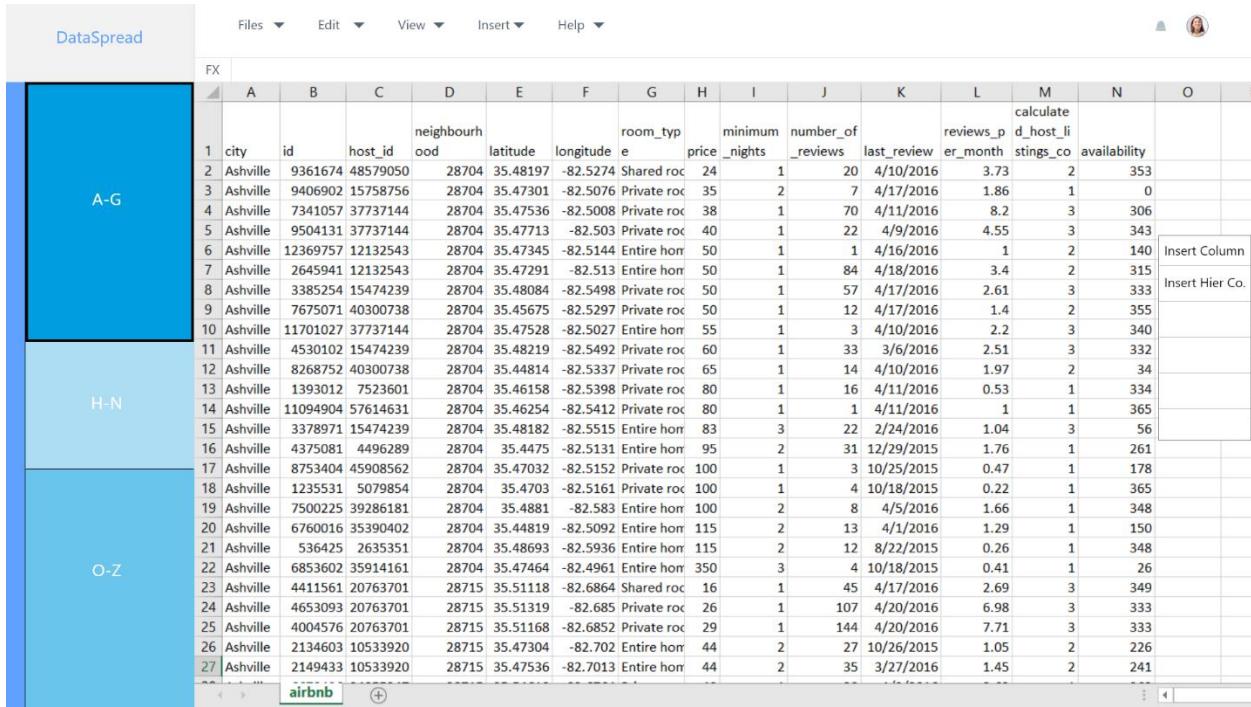
FX

	A	B	C	D	E	F	G	H	I
1	Country	State	City	Listing	Price	Hier Co. Avg Price			
2					78				
3					102				
4					390	180			
5K					40				
6					99	210>80			
7					540	210>120			
8k					28	210>10			
9					65				
10					120				
11					88				
12					43				
13K					105				

Fig. Change in granularity changes hierarchical column

Iteration 4a: Introducing Aggregate Columns in the Overview

There are several issues with the hierarchical column: (a) difficult to relate to the overview, and (b) if the dataset is large, the column would not be completely visible showing only 1 cell in the worst case---the visual continuity problem is not addressed. Therefore, we decided to put an “aggregate column” instead alongside the overview.



The screenshot shows a spreadsheet application window titled "DataSpread". The menu bar includes "Files", "Edit", "View", "Insert", and "Help". The toolbar has icons for copy, paste, and search. The main area displays a table with the following columns:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	city	id	host_id	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_month	calculated_host_listings_count	availability		
2	Ashville	9361674	48579050	28704	35.48197	-82.5274	Shared room	24	1	20	4/10/2016	3.73	2	353		
3	Ashville	9406902	15758756	28704	35.47301	-82.5076	Private room	35	2	7	4/17/2016	1.86	1	0		
4	Ashville	7341057	37737144	28704	35.47536	-82.5008	Private room	38	1	70	4/11/2016	8.2	3	306		
5	Ashville	9504131	37737144	28704	35.47713	-82.503	Private room	40	1	22	4/9/2016	4.55	3	343		
6	Ashville	12369757	12132543	28704	35.47345	-82.5144	Entire home	50	1	1	4/16/2016	1	2	140		
7	Ashville	2645941	12132543	28704	35.47291	-82.513	Entire home	50	1	84	4/18/2016	3.4	2	315		
8	Ashville	3385254	15474239	28704	35.48084	-82.5498	Private room	50	1	57	4/17/2016	2.61	3	333		
9	Ashville	7675071	40300738	28704	35.45675	-82.5297	Private room	50	1	12	4/17/2016	1.4	2	355		
10	Ashville	11701027	37737144	28704	35.47528	-82.5027	Entire home	55	1	3	4/10/2016	2.2	3	340		
11	Ashville	4530102	15474239	28704	35.48219	-82.5492	Private room	60	1	33	3/6/2016	2.51	3	332		
12	Ashville	8268752	40300738	28704	35.44814	-82.5337	Private room	65	1	14	4/10/2016	1.97	2	34		
13	Ashville	1393012	7523601	28704	35.46158	-82.5398	Private room	80	1	16	4/11/2016	0.53	1	334		
14	Ashville	11094904	57614631	28704	35.46254	-82.5412	Private room	80	1	1	4/11/2016	1	1	365		
15	Ashville	3378971	15474239	28704	35.48182	-82.5515	Entire home	83	3	22	2/24/2016	1.04	3	56		
16	Ashville	4375081	4496289	28704	35.4475	-82.5131	Entire home	95	2	31	12/29/2015	1.76	1	261		
17	Ashville	8753404	45908562	28704	35.47032	-82.5152	Private room	100	1	3	10/25/2015	0.47	1	178		
18	Ashville	1235531	5079854	28704	35.4703	-82.5161	Private room	100	1	4	10/18/2015	0.22	1	365		
19	Ashville	7500225	39286181	28704	35.4881	-82.583	Entire home	100	2	8	4/5/2016	1.66	1	348		
20	Ashville	6760016	35390402	28704	35.44819	-82.5092	Entire home	115	2	13	4/1/2016	1.29	1	150		
21	Ashville	536425	2635351	28704	35.48693	-82.5936	Entire home	115	2	12	8/22/2015	0.26	1	348		
22	Ashville	6853602	35914161	28704	35.47464	-82.4961	Entire home	350	3	4	10/18/2015	0.41	1	26		
23	Ashville	4411561	20763701	28715	35.51118	-82.6864	Shared room	16	1	45	4/17/2016	2.69	3	349		
24	Ashville	4653093	20763701	28715	35.51319	-82.685	Private room	26	1	107	4/20/2016	6.98	3	333		
25	Ashville	4004576	20763701	28715	35.51168	-82.6852	Private room	29	1	144	4/20/2016	7.71	3	333		
26	Ashville	2134603	10533920	28715	35.47304	-82.702	Entire home	44	2	27	10/26/2015	1.05	2	226		
27	Ashville	2149433	10533920	28715	35.47536	-82.7013	Entire home	44	2	35	3/27/2016	1.45	2	241		

The interface includes a toolbar at the top with "File", "Edit", "View", "Insert", and "Help" menus, and a status bar at the bottom showing "airbnb" and a date range from "4/1/2016" to "4/30/2016". A blue sidebar on the left is labeled "A-G", "H-N", and "O-Z". A context menu is open over the last few rows of the table, with options like "Insert Column" and "Insert Hier Co.". The status bar also shows "4" at the bottom right.

Fig. Create hierarchical column

Fig. Populate function in the formula bar

Screenshot of DataSpread showing a spreadsheet with a formula bar at the top. The formula bar displays the function `= AVG(H2:H25505)`. The spreadsheet has columns labeled A through O. A secondary column H, titled 'H-Price', is populated with values from the formula. The first row contains the formula `= AVG(H2:H25505)` in cell H1. Rows 2 through 27 contain data for the city of Asheville. The data includes fields like city, id, host_id, neighbourhood, latitude, longitude, room_type, price, minimum_nights, number_of_reviews, last_review, reviews_per_month, calculated_host_listings_count, and availability.

Fig. Display Aggregate column

Screenshot of DataSpread showing a spreadsheet with a formula bar at the top. The formula bar displays the function `= AVG(H2:H25505)`. The spreadsheet has columns labeled A through O. A secondary column H, titled 'H-Price', is populated with values from the formula. The first row contains the formula `= AVG(H2:H25505)` in cell H1. Rows 2 through 27 contain data for the city of Asheville. The data includes fields like city, id, host_id, neighbourhood, latitude, longitude, room_type, price, minimum_nights, number_of_reviews, last_review, reviews_per_month, calculated_host_listings_count, and availability.

Iteration 4b: Aggregate Column Formula Issuance

The interactions for issuing aggregate column is still cumbersome. We change the interactions for creating an aggregate column to how users create pivot tables in Excel---users are not required to explicitly type any formula, rather select appropriate formula from a drop-down menu, and provide necessary formula parameters to a web form. This way NOAH maintains the semantics of existing spreadsheet tools.

The screenshot shows an Excel spreadsheet titled "airbnb - Excel". The data consists of 27 rows of Airbnb listing information. The columns include: city, id, host_id, neighbourhood, hood, latitude, longitude, room_type, price, minimum_nights, number_of_reviews, last_review, reviews_per_month, calculated_host_listings_count, and availability_365. The rows are numbered 1 to 27. The first row is a header. The second row starts with "Ashville". The third row starts with "Burbank". The fourth row starts with "Chicago". The fifth row starts with "Danville". The sixth row starts with "El Paso". The seventh row starts with "Fort Worth". The eighth row starts with "Green Bay". The ninth row starts with "Hamburg". The right side of the screen features two panels: "Select All" and "Summarize Value by". The "Select All" panel includes checkboxes for City (A), host_id (B), Neighbourhood (D), Latitude (E), Longitude (F), Price (H), and Availability (I). The "Summarize Value by" panel includes checkboxes for Sum, Count, Average, Max, Min, StdDev, Var, and Varp. The status bar at the bottom indicates the user is "ENG" and the time is "8:43 PM 5/4/2018".

Fig. Interactions for creating aggregate columns

Iteration 4c: Enhancing Aggregate Columns Visually

Besides raw text, we also provide the users the freedom to view the results as charts as shown below. To compare the values of the aggregate column entries, we experimented two alternatives: (a) show how one entry varies from the previous one via arrows, (b) show value bars, and (c) by color. We use (b) for raw text mode and (c) for chart representation mode.

City	Avg. Price	A	B	C	D	E	F
Ashville to Boston	\$122.20	1 city	id	host_id	host_name	neighbourhood	latitude
Ashville	1075 Chicago	16189546	381547	Aiorina	Albany Park	41.96546808	
Austin	1076 Chicago	11408784	58496148	Christopher	Albany Park	41.96532293	
Boston	1077 Chicago	4907692	22632675	Mary And Don	Albany Park	41.96534917	
	1078 Chicago	16396651	36093710	Leo	Armour Square	41.84824705	
	1079 Chicago	15336071	38459530	Max	Armour Square	41.84599819	
	1080 Chicago	7874576	41503184	Cote	Austin	41.88541919	
	1081 Chicago	15550886	10822854	Sam	Avondale	41.93409149	
	1082 Chicago	13639494	4409207	Ali	Avondale	41.94056464	
	1083 Chicago	4589379	11108717	Chris	Avondale	41.935238	
	1084 Chicago	6967498	36300208	Maria	Avondale	41.93306482	
	1085 Chicago	8286958	28172807	Sadie Rose And Patrick	Avondale	41.93402012	
	1086 Chicago	15042217	67750362	Catalina	Avondale	41.93308166	
	1087 Chicago	7803642	29398307	Sarah	Avondale	41.94075928	
	1088 Chicago	6480445	28172807	Sadie Rose And Patrick	Avondale	41.93520806	
	1089 Chicago	6225044	17609136	Hanna	Avondale	41.93337041	
	1090 Chicago	14578426	19069769	Brad	Avondale	41.93436519	
	1091 Chicago	6185146	30699423	Heidi	Avondale	41.93710831	
	1092 Chicago	5638991	473410	Brian..And Bruce, The Coonhound	Avondale	41.94114847	
	1093 Chicago	14967050	39256853	Mirsada	Belmont Cragin	41.92417652	
	1094 Chicago	12866661	70348169	James	Beverly	41.69966552	
	1095 Chicago	14518982	89704746	Hannah	Bridgeport	41.83871122	
	1096 Chicago	18360284	120304172	Linda	Bridgeport	41.83864744	
	1097 Chicago	3581087	3582499	Rae	Bridgeport	41.83896649	
	1098 Chicago	13765939	48200362	Zhanna & Danny	Bridgeport	41.84144044	
	1099 Chicago	15360311	82947829	Gina	Bridgeport	41.84426817	
	1100 Chicago	3912315	3582499	Rae	Bridgeport	41.8356249	
	1101 Chicago	12823231	1006155	Mejai Kai	Douglas	41.82983047	
	1102 Chicago	14949548	49859277	Terry	Douglas	41.82597221	
	1103 Chicago	18210752	11310621	Shawn	Douglas	41.84445657	
	1104 Chicago	17778004	17691391	Jenna	Douglas	41.83893393	
	1105 Chicago	9133069	12613718	Matthew & Miranda	Douglas	41.83181146	
	1106 Chicago	10834971	21572445	Sean	Dunning	41.9426721	
	1107 Chicago	16371980	93385835	Qing	East Garfield Park	41.87562248	
	1108 ...						

Fig. Chart mode: arrow-based comparison

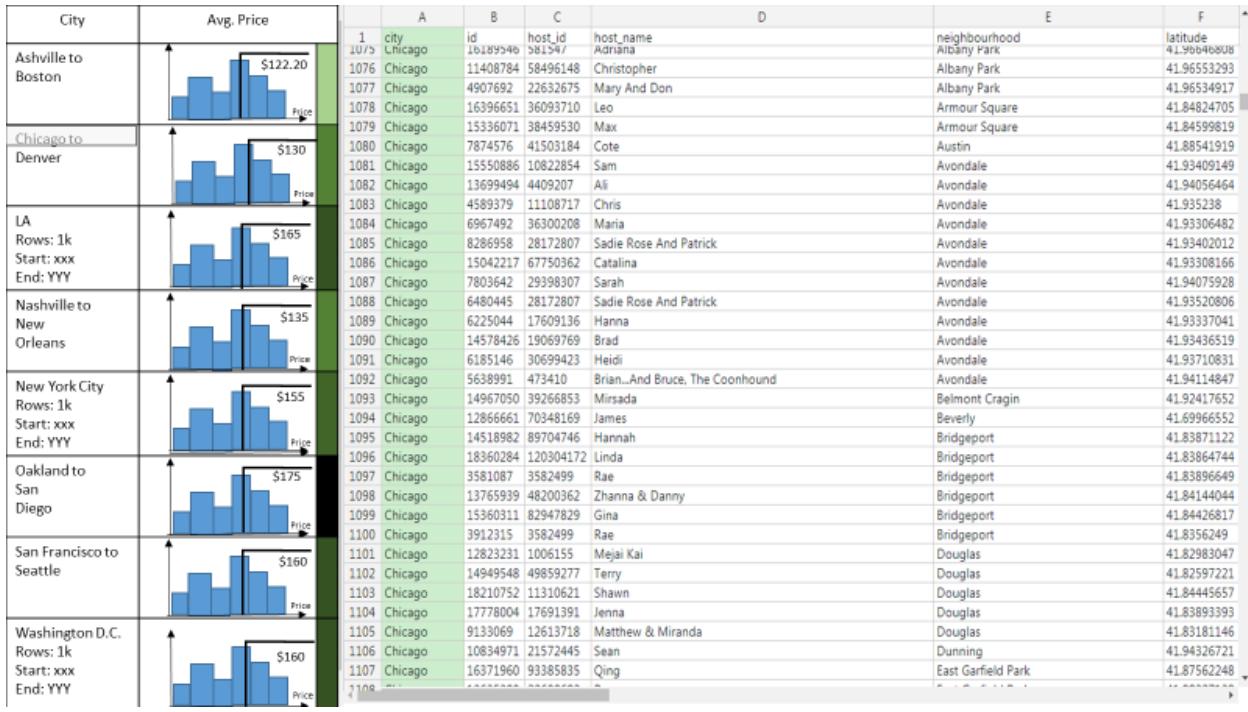


Fig. Chart mode: color-based comparison

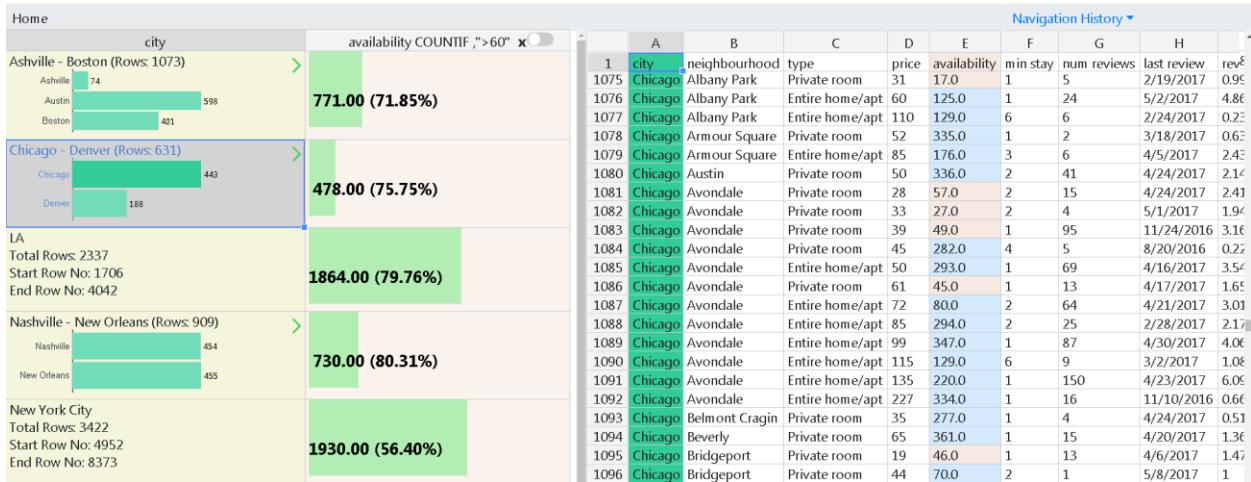


Fig. Text mode: show value bar

Iteration 6b: Customization Following an Order

Splitting a bin

Price	A	B	C	D	E	F
	1 city	id	host_id	host_name	neighbourhood	latitude
0-50	1075 Chicago	16189546	581547	Adriana	Albany Park	41.96046808
	1076 Chicago	11408784	58496148	Christopher	Albany Park	41.96553293
	1077 Chicago	4907692	22632675	Mary And Don	Albany Park	41.96534917
51-100	1078 Chicago	16396651	36093710	Leo	Armour Square	41.84824705
	1079 Chicago	15336071	38459530	Max	Armour Square	41.84599819
	1080 Chicago	7874576	41503184	Cote	Austin	41.88541919
	1081 Chicago	15550886	10822854	Sam	Avondale	41.93409149
101-150	1082 Chicago	13699494	4409207	Alli	Avondale	41.94056464
	1083 Chicago	4589379	11108717	Chris	Avondale	41.935238
	1084 Chicago	6967492	36300208	Maria	Avondale	41.93306482
	1085 Chicago	8286958	28172807	Sadie Rose And Patrick	Avondale	41.93402012
	1086 Chicago	15042217	6750362	Catalina	Avondale	41.93308166
151-180	1087 Chicago	7803642	29398307	Sarah	Avondale	41.94075928
	1088 Chicago	6480445	28172807	Sadie Rose And Patrick	Avondale	41.93520806
	1089 Chicago	6225044	17609136	Hanna	Avondale	41.93337041
	1090 Chicago	14578426	19069769	Brad	Avondale	41.93436519
	1091 Chicago	6185146	30699423	Heidi	Avondale	41.93710831
181-300	1092 Chicago	5638991	473410	Brian...And Bruce, The Coonhound	Avondale	41.94114847
	1093 Chicago	14967050	39266853	Mirsada	Belmont Cragin	41.92417652
	1094 Chicago	12866661	70348169	James	Beverly	41.69966552
	1095 Chicago	14518982	89704746	Hannah	Bridgeport	41.83871122
	1096 Chicago	18360284	120304172	Linda	Bridgeport	41.83864744
	1097 Chicago	3581087	3582499	Rae	Bridgeport	41.83896649
	1098 Chicago	13765939	48200362	Zhanna & Danny	Bridgeport	41.84144044
301-600		15360311	82947829	Gina	Bridgeport	41.84426817
		3912315	3582499	Rae	Bridgeport	41.8356249
		12823231	1006155	Mejai Kai	Douglas	41.82983047
		14949548	49859277	Terry	Douglas	41.82597221
		18210752	11310621	Shawn	Douglas	41.84445657
		17778004	17691391	Jenna	Douglas	41.83893393
601-1500		9133069	12613718	Matthew & Miranda	Douglas	41.83181146
		10834971	21572445	Sean	Dunning	41.94326721
		16371960	93385835	Qing	East Garfield Park	41.87562248
		1108	1108	1108	1108	1108

Fig. Split a bin

Iteration 6b: Concept of Bin Boundaries

The interaction for customizing the bins was cumbersome. We decided to update the split menu to display the boundaries of the bins which users can update, split or merge to create new bins.

Splitting a bin

Price	A	B	C	D	E	F	Redefine Bucket Boundaries
1	city	id	host_id	host_name	neighbourhood	latitude	
1075	Chicago	18189946	381947	Adriana	Albany Park	41.9940819	
1076	Chicago	11408784	58496148	Christopher	Albany Park	41.96553293	
1077	Chicago	4907692	22632675	Mary And Don	Albany Park	41.96534917	
1078	Chicago	16396551	36093710	Leo	Armour Square	41.84824705	
1079	Chicago	15336071	38459530	Max	Armour Square	41.84599819	
1080	Chicago	7874576	41503184	Cote	Austin	41.88541919	
1081	Chicago	15550886	10822854	Sam	Avondale	41.9409149	
1082	Chicago	13699494	4409207	All	Avondale	41.94056464	
1083	Chicago	4589379	11108717	Chris	Avondale	41.935238	
1084	Chicago	6967492	36302020	Maria	Avondale	41.9306482	
1085	Chicago	8286959	2812807	Sadie Rose And Patrick	Avondale	41.93402012	
1086	Chicago	15042217	67750962	Catalina	Avondale	41.93308166	
1087	Chicago	7803642	29398307	Sarah	Avondale	41.94075928	
1088	Chicago	6480445	28172807	Sadie Rose And Patrick	Avondale	41.93520806	
1089	Chicago	6225044	17609136	Hanna	Avondale	41.93337041	
1090	Chicago	14578426	19069769	Brad	Avondale	41.93436519	
1091	Chicago	6185146	30699423	Heidi	Avondale	41.93710831	
1092	Chicago	5638991	473410	Brian..And Bruce, The Coonhound	Avondale	41.94114847	
1093	Chicago	14967050	39266853	Miranda	Belmont Cragin	41.92417652	
1094	Chicago	12866661	70348169	James	Beverly	41.69966552	
1095	Chicago	14518582	89704748	Hannah	Bridgeport	41.83871122	
1096	Chicago	18360284	120304172	Linda	Bridgeport	41.8364744	
1097	Chicago	3581087	3582499	Rae	Bridgeport	41.83896649	
1098	Chicago	13765939	48200362	Zhanna & Danny	Bridgeport	41.84144044	
1099	Chicago	15360311	82947829	Gina	Bridgeport	41.84426817	
1100	Chicago	3912315	3582499	Rae	Bridgeport	41.8356249	
1101	Chicago	12823231	1006155	Mejai Kai	Douglas	41.82983047	
1102	Chicago	14949548	49859277	Terry	Douglas	41.82597221	
1103	Chicago	18210752	11310621	Shawn	Douglas	41.84445657	
1104	Chicago	17778004	17691391	Jenna	Douglas	41.83893393	
1105	Chicago	9133069	12613718	Matthew & Miranda	Douglas	41.83181146	
1106	Chicago	10834971	21572445	Sean	Dunning	41.9426721	
1107	Chicago	16371960	93385835	Qing	East Garfield Park	41.87562248	
1108	Chicago	17110606	11310621	Shawn	East Garfield Park	41.87562248	

The Current NOAH Interface

e. Breadcrumb

city	availability COUNTIF .">60"
Ashville - Boston (Rows: 1073)	771.00
Ashville	74
Austin	598
Boston	401
Chicago - Denver (Rows: 631)	478.00
Chicago	443
Denver	188
LA	1864.00
Total Rows: 2337	
Start Row No: 1706	
End Row No: 4042	
Nashville - New Orleans (Rows: 909)	
Nashville	454
New Orleans	455

a. Overview

b. Aggregate Column

f. Current focus

g. Cells corresponding to navigation and aggregation attribute are highlighted

c. Spreadsheet

d. History

1	1	31	3/6/2016
2	2	14	1/26/2016
3	3	34	4/18/2016
4	4	138	4/10/2016
5	5	227	4/6/2016
6	6	97	4/7/2016
7	7	85	3/29/2016
8	8	3	4/11/2016
9	9	1	4/11/2016
10	10	123	4/11/2016
11	11	1	4/11/2016
12	12	25	11/1/2015
13	13	46	4/17/2016
14	14	104	4/16/2016
15	15	1	4/11/2016
16	16	42	11/1/2015
17	17		
18	18		
19	19		
20	20		

Navigation History ▾

- Home > Chicago - Denver
- Home > Nashville - New Orleans
- Home > Ashville - Boston

Navigation History ▾

- Home > Chicago - Denver
- Home > Nashville - New Orleans
- Home > Ashville - Boston