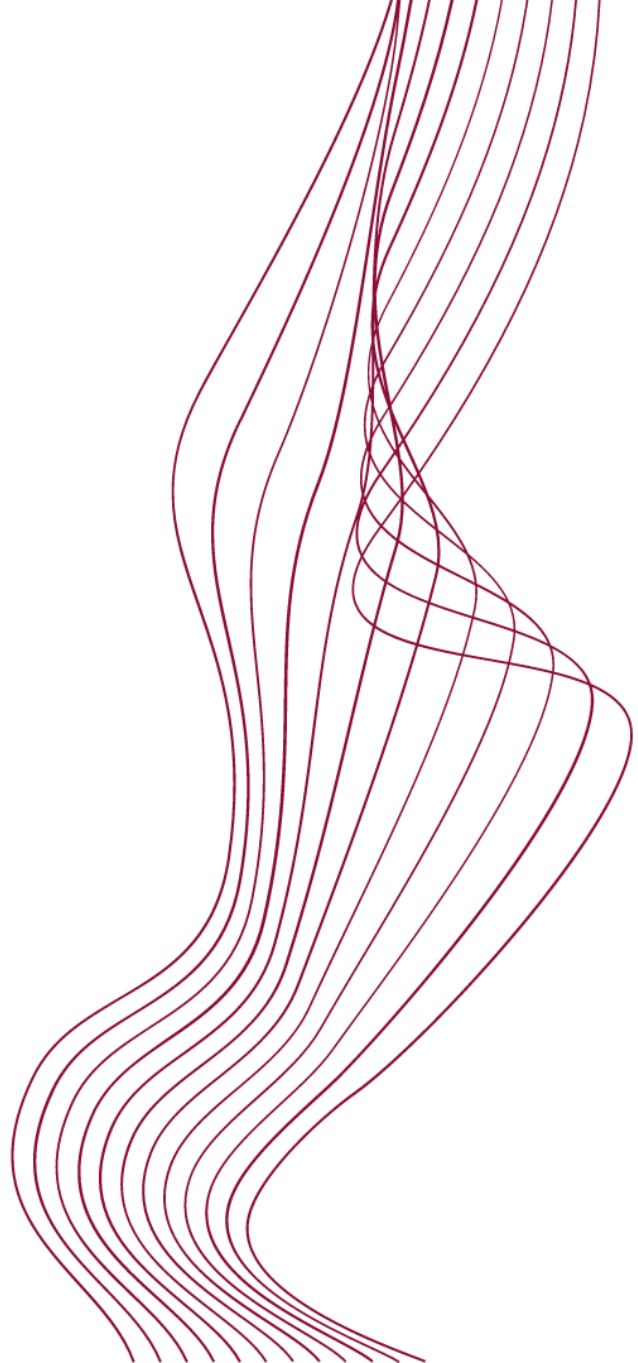
Business Intelligence with Kibana

January 2024

Agenda

1) About this course
2) What is Kibana?
3) Visualizing data in Kibana
4) Creating a dashboard



About this Course 📜

What will you learn?

On completion of this course participants will:

- Be able to do basic data exploration in Kibana in order to develop a strong understanding of internal data
- Be able to create data visualisations and dashboards

Please feel free to ask questions as we go 😀

- The best way to learn is by practising and trying things on your own and in groups
- Share knowledge in groups and learn from each other

This is an introductory course

We will suggest additional resources including online courses and reading which you can use to further develop your Kibana skills.

The skills you learn today will be able to be adapted to visualize the data used in your own organization.

Kibana training course overview

Day 1: Welcome to Kibana

- About this course
- What is Kibana?
- Visualizing data in Kibana
- Creating a dashboard

Day 2: Building a dashboard

- Recap: Creating data visualizations and dashboards
- Group exercise

Session breakdown: Day 1

Session 1

- Course introduction
- What is Kibana?
- Setting up Kibana
- Introduction to data visualizations

Session 2 💻

- Data visualization framework in Kibana
- Intro to data for day 1: Rwanda property data
- Time series data

Session 3 💻

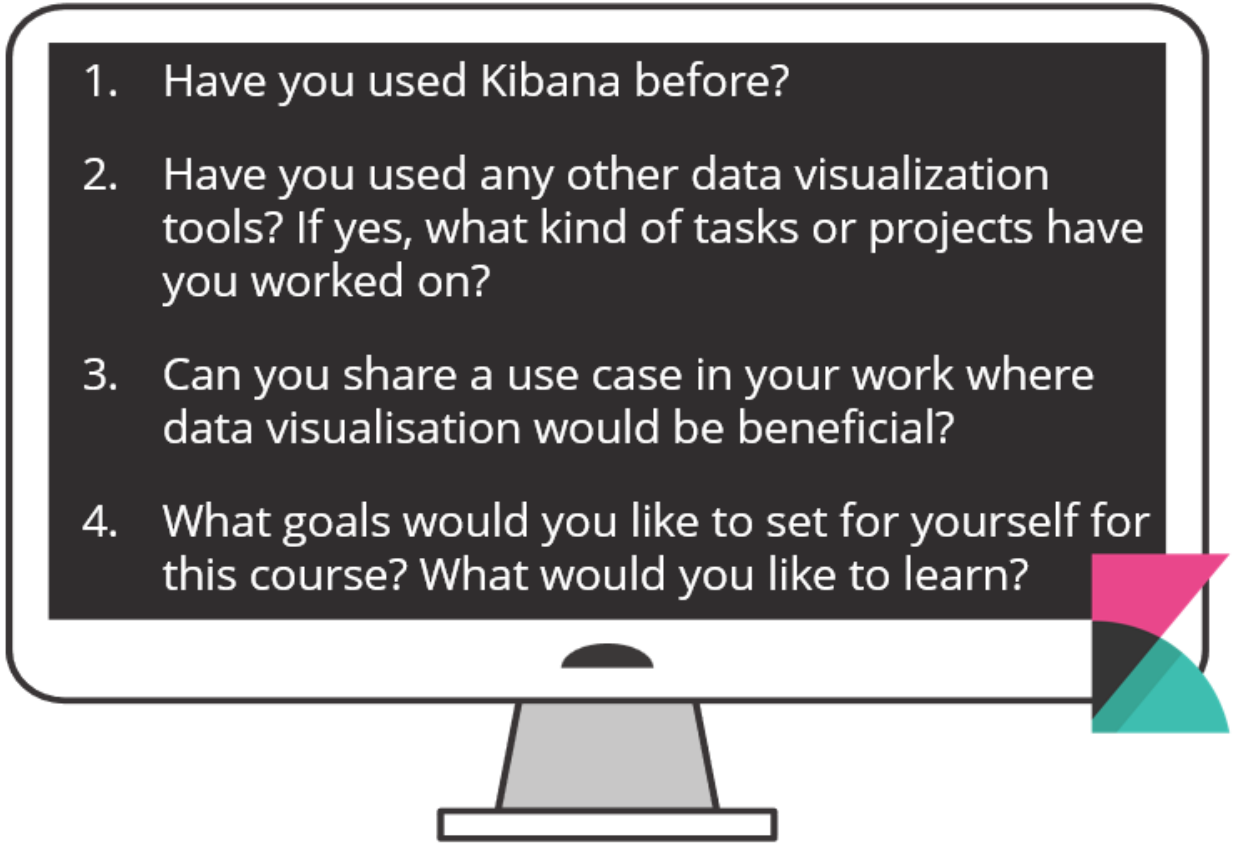
- Creating data visualisations in Kibana: data table, bar and line chart, pie chart, metrics annd maps

Session 4 💻

- Creating data visualisations in Kibana (cont.)
- Visualisation add-ons
- Intro to dashboard

Introductions 👋

Data visualizations and data usage



Terminology: Kibana and Data Visualisations 📈

What is the point of data visualization?

Interpretation Challenge

Total kg consumed at lunch	**1268945**	**998435**	**13005176**

Total kg consumed at lunch	**1,268,945,854**	**998,435,742**	**13,005,176,888**

Total kg consumed at lunch

Hanjo ***Aviva*** ***James***

What is data visualisation?

Data visualization is the representation of information and data using charts, graphs, maps, and other visual tools, which can help to better understand data relationships and develop data-driven insights in a way that is easy to understand

What is Kibana?

Kibana is a programme that is part of the ELK stack, which is a software stack. The ELK stack includes three programming components, namely Elasticsearch, Logstash and Kibana.

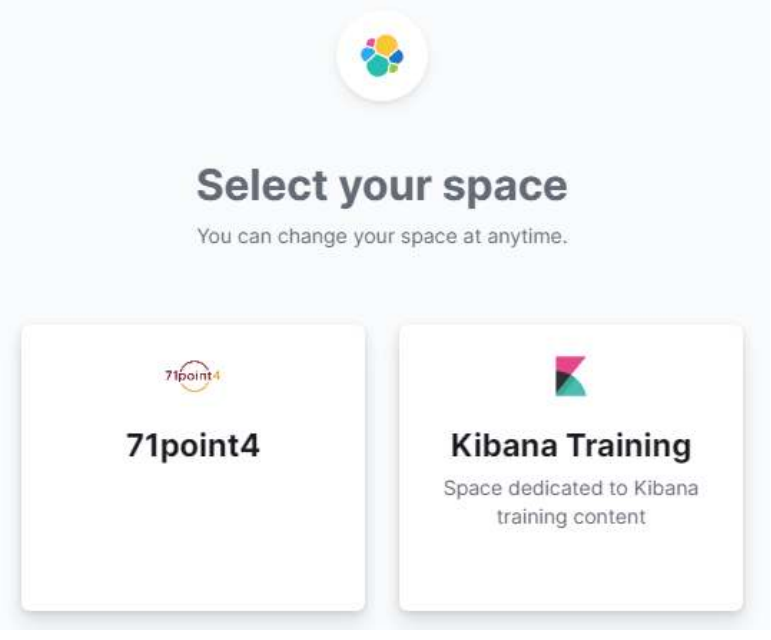
Elasticsearch is an open-source analytics and search engine

Logstash is an open-source data ingestion tool that allows you to collect data from a variety of sources, transform it, and send it to your desired destination

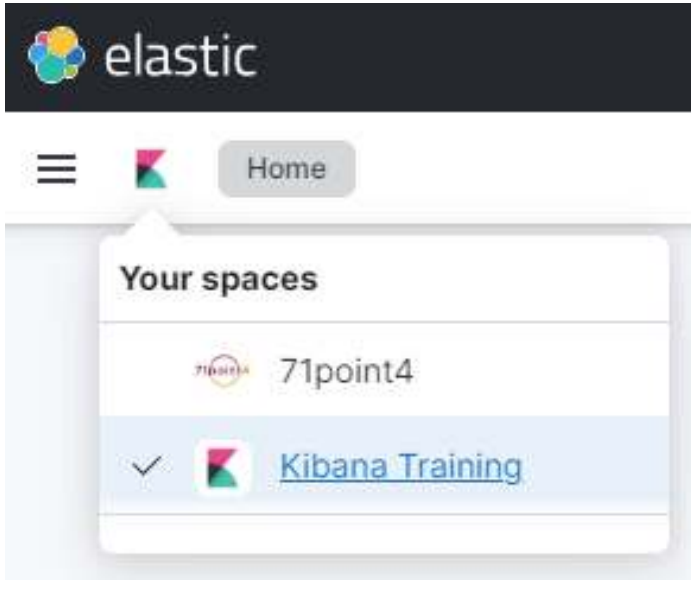
Kibana is an open-source data visualization and exploration tool that is used to analyse and visualize data stored in Elasticsearch. It allows users to create and share dynamic visualizations and dashboards that can be used to monitor and analyse large sets of data in real time

Navigate your way around Kibana: Spaces

A **Space** in Kibana is created to organize and access data specific to projects or teams. Any visualizations that are saved within a space can be accessed and edited by other users within the space



Navigate to your spaces in the top left-hand corner of the Kibana window

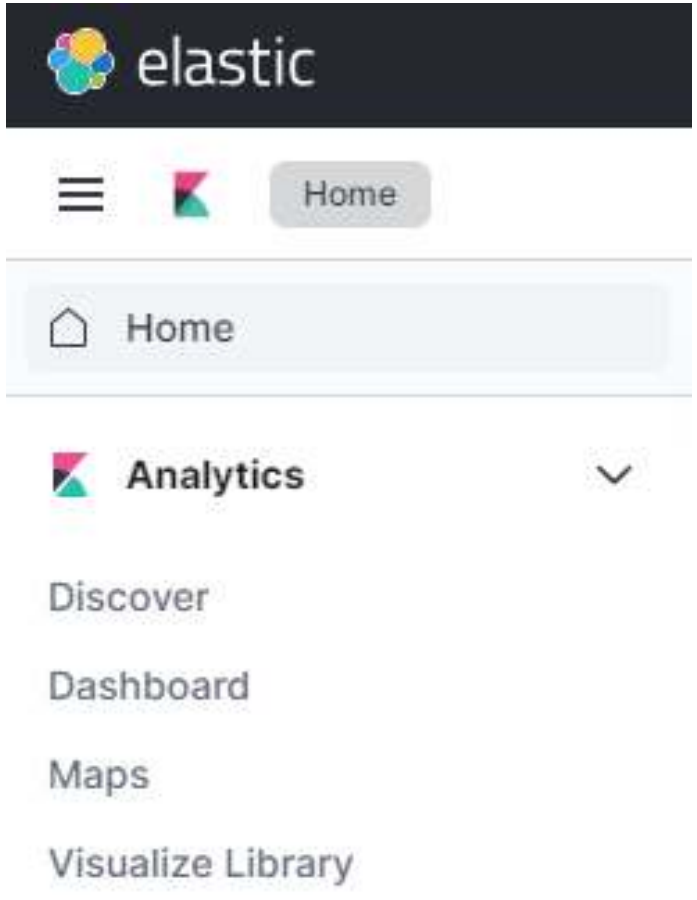


Navigate your way around Kibana: Analytics App

The Analytics app contains the tools that you can use to visualize and analyse data in Kibana. The tools that we focus on using in this course are:

- **Discover:** playground for running ad hoc queries on your data. Convenient shortcuts to filter documents and learn more about the data that you have
- **Visualize library:** create and manage data visualizations, e.g. bar charts, pie charts, line charts, data table, maps etc.
- **Dashboard:** create, manage and display data visualisations in a easy-to-use dashboard

> A **dashboard** is an orchestration of visualizations typically displaying related data (i.e. from the same source or relating to a specific theme). Dashboards are useful for presenting information in an easily digestible format for different users



Data terminology used in Kibana

- An **index** is a collection of information. *Think of an index as a table in a relational database*
- A **document** is a single observation stored in an index. *Think of a document as a row or observation in a database table*
- A **field** is a specific attribute or dimension of a document. *Think of a field as a column in a database table*
  Field types: Date, keyword, number, string, text

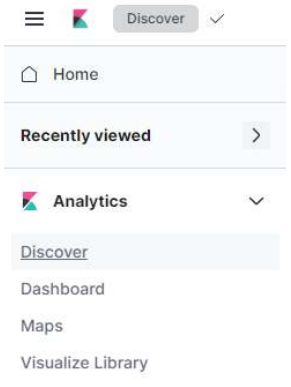
> **Note:** `.keyword` fields are properly indexed fields, which are optimised for use in aggregations

Kibana requires a **data view** to tell it which Elasticsearch data you want to access, and whether the data is time-based. A data view can point to one or more Elasticsearch indices.

Discover app

The **Discover app** allows you to explore and interact with data stored in Elasticsearch

- Navigate to the `Discover` app



- Select the `rwanda-property` data view from the dropdown menu in the top-left corner

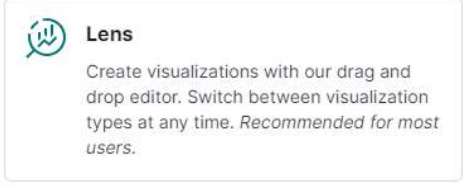
- View available fields
- View each document in data view

Data visualization tools in Kibana

In this course, we will create data visualizations using Kibana's **Lens tool**. This is a user-friendly tool used to create highly tailored visualizations to suit specific data analysis requirements. The classic visualise library (aggregation-based tool) can also be used to create visualisations.

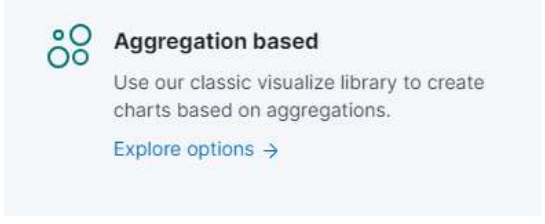
Lens app

- Offers a user-friendly and intuitive interface for creating visualizations
- Drag-and-drop approach allowing you to quickly build visualizations without extensive knowledge of aggregations
- Instant preview and real-time updates of visualizations



Aggregation based

- Provide more advanced and fine-grained control over the data analysis and visualisation process
- Support for complex aggregations and scripting
- The Lens tool covers all basic features of data visualisation, but the aggregation based tool may be useful to add more nuance to your visualisations in the future



Setting up Kibana

Log in to Kibana with the details provided

- Can you navigate to the **Analytics** app?
- Can you navigate to **Discover**?
- Which data views do you have access to? How many documents are included in the `rwanda-property` data view? Which fields can you identify in the `rwanda-property` data view?
- Can you navigate to the **Visualize library**?
- Can you navigate to the **Dashboard** section?

10:00

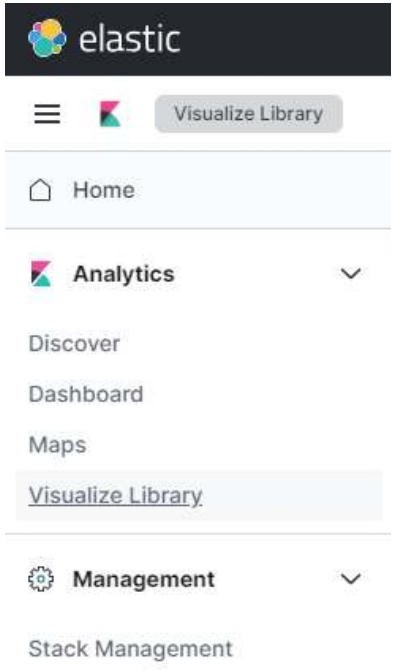
💻 *How to create data visualizations in Kibana?*

Creating Data Visualisations 💻

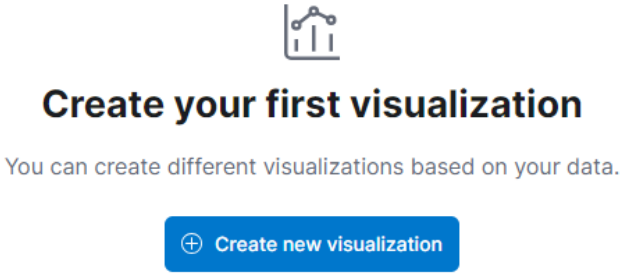
Creating Data Visualisations 💻

How to create data visualizations in Kibana

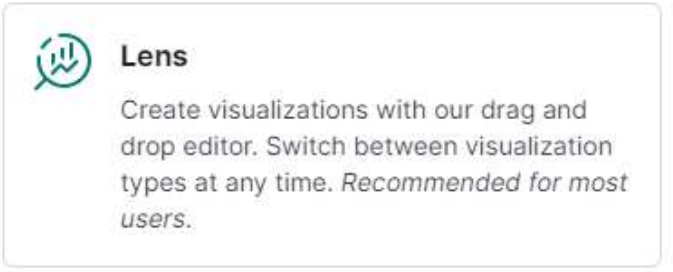
- Log into Kibana
- Click on the menu icon
- Go to Analytics app
- Select `Visualize Library`



- Click on the `Create new visualization` button



- Select `Lens`



Data terminology used in Kibana

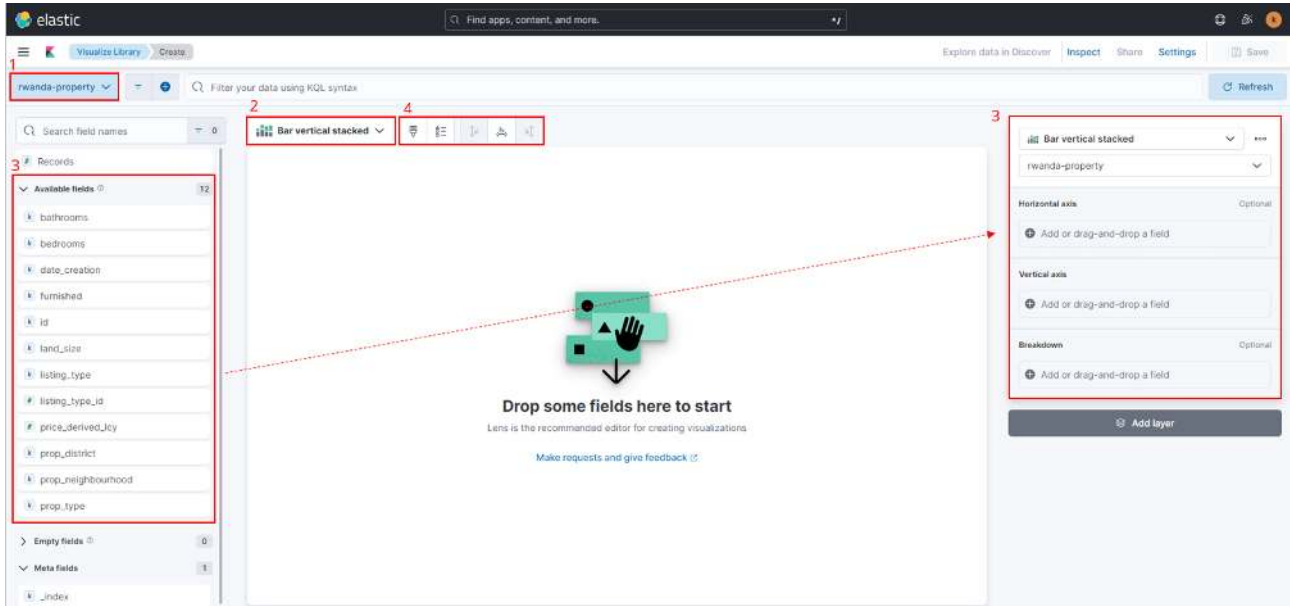
📉 Components of visualisations

- **Metrics** are the numerical values or calculations that provide quantitative information about your data
  Examples: Sum, average, maximum, minimum, cardinality, etc.
- **Functions (Aggregations)** are operations that help summarize and analyze data by grouping, calculating, or summarizing values. Different functions will be available for different visualisation types.
  Examples: Filters, Intervals, Top Values
- **Breakdown (Buckets)** are used to segment or group your data into subsets based on specific criteria. They help you organize and categorize data for analysis
- **Filters** allow you to narrow down the scope of your data by specifying certain conditions. Filters help you to focus on specific subsets of data enabling you to perform targeted analysis

How to create data visualizations in Lens

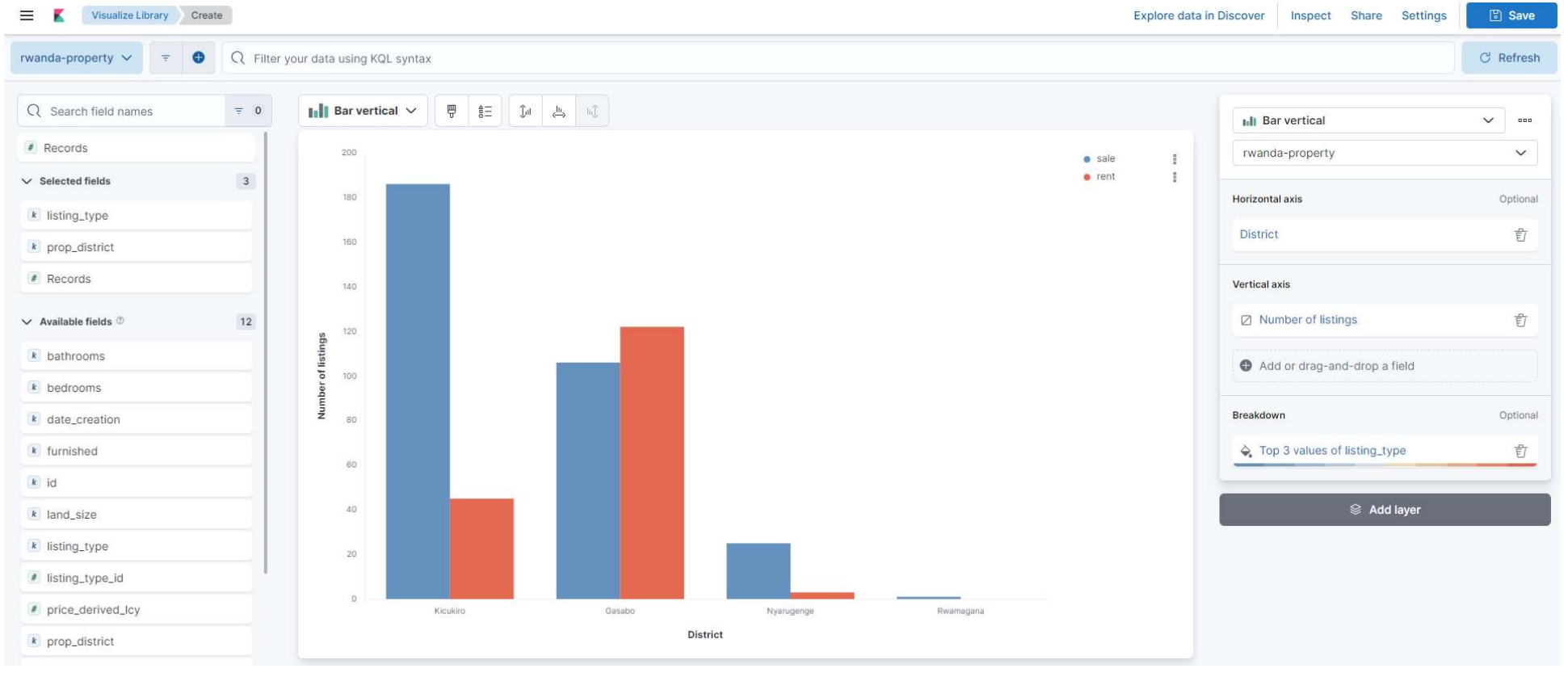
1. Select a **data view**
2. Choose an appropriate **visualization type**. Lens will automatically suggest suitable visualization options based on the fields chosen
3. Drag and drop available **fields** onto the control panel to create a visualization
4. Customize the visualization: labels, colours, axis settings, etc.
5. Preview and refine: As you make changes to the visualization, it will update in real-time
6. Save visualisation

✱ You can also filter or add layers to your visualisation



Lens app example

It is important to have the visualisation that you want in mind before starting. This makes it easier to achieve exactly what you want to show the user through your visualisation.



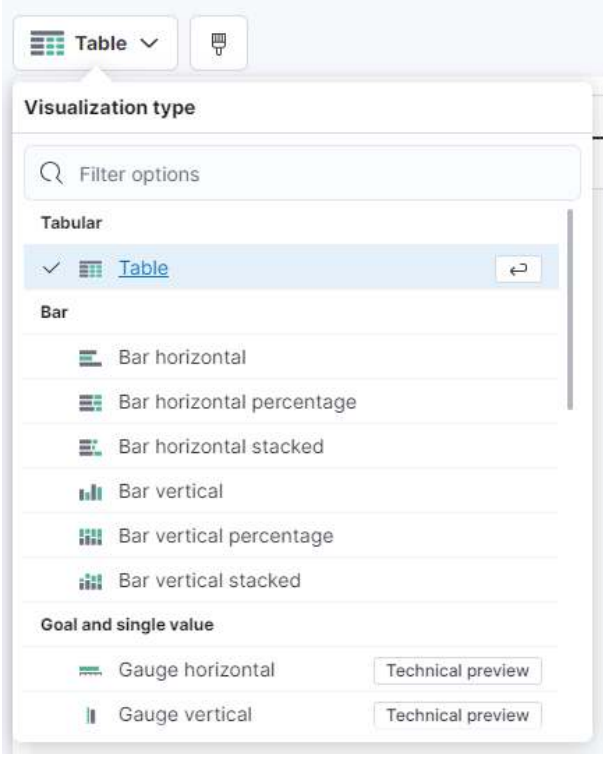
Visualisation types in Kibana

The focus of today's training is on creating the following visualisation types in Kibana:

- **Tabular:** Data table
- **Bar, line and area:** Horizontal bar (classic, percentage and stacked), vertical bar (classic, percentage and stacked), area (classic, percentage and stacked), line
- **Goal and single value:** Legacy metric, metric
- **Proportion:** Donut, pie

Other visualisation types in Kibana:

- **Magnitude:** Heat map
- **Maps:** Region map
- **Goal and single value:** Gauge (horizontal and vertical)
- **Proportion:** Mosaic, treemap, waffle



🔢 Data visualizations are used to create dashboards

Data for visualizations: Day 1

Day 1: Sample of property listings in Rwanda 🔢

Rwanda property listings 📄

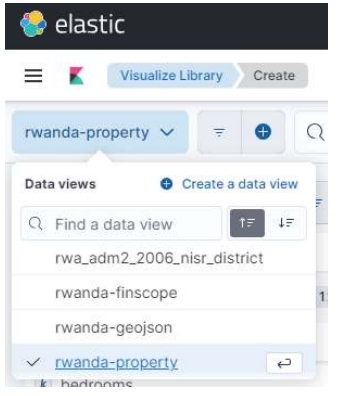
The sample of property listings was scraped from adverts showing properties for sale and for rent in Rwanda.

The data includes information on property type, area, number of bedrooms and bathrooms, whether the unit is furnished or not, the price of the listing and other information about the property advertised.

Sample description: A total of 488 property listings are included in the data, which were listed between 2019 and 2021.

Data view 📒

We will use the `rwanda-property` data view.



📅 Timestamp field: `date-creation`

💻 Explore data view in Discover

Time Series data 

Adding data with time stamp

Time stamp fields contain information about the time when an event or document was created, modified or occurred. Timestamp fields are crucial for time-based analysis, allowing you to visualize data over specific time intervals.

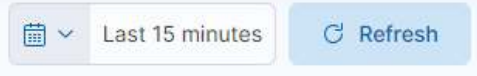
Timestamp field in the `rwanda-property` data view:

- `date_creation`: Date when the property advert was first listed online.

Time filter

The **timestamp field** is used in conjunction with the **time filter**. The **time filter** allows you to focus on a specific time range when the data view contains a timestamp field. The **time filter** will show in Lens when you use a timestamp field in a visualisation.

The **default time filter** is set to the *Last 15 minutes* in Kibana.

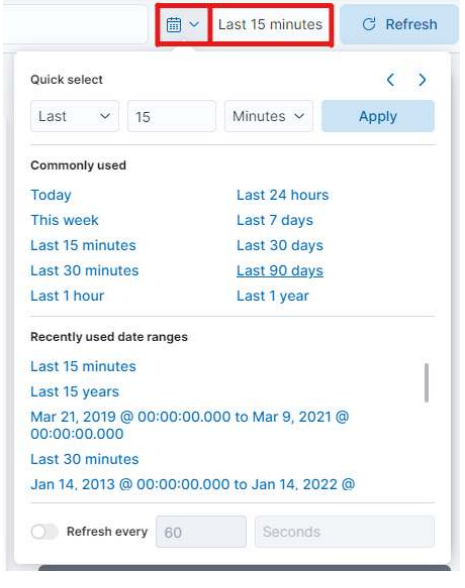


✱ **Note:** The time filter that you set will carry through to all the visualizations and dashboards that you are viewing

💻 *Demonstrate use of time filter in Kibana*

Adjust time filter

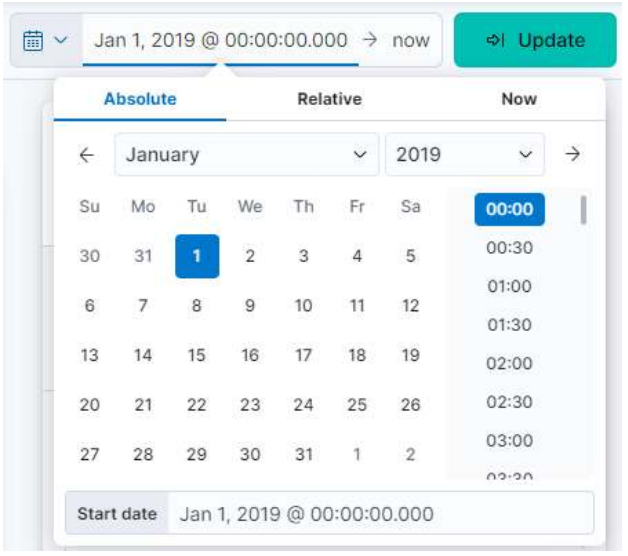
- Click on the 📅 **calendar dropdown menu** in the top-right corner
  - Choose from the quick select options OR
  - Change the start and end time by clicking on the displayed time range



Time filter

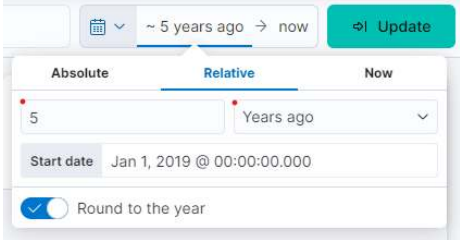
Adjust time filter: change start and end times

- **Absolute:** Select exact date for start and end of time period

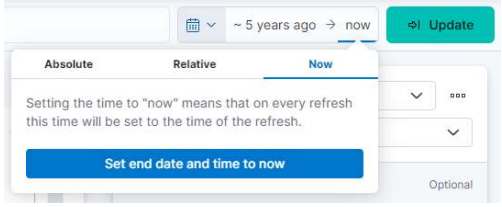


✱ Click `Update` once you have made your selection in the time filter

- **Relative:** Select time period relative to a start date
  - Select a number and relative time option from dropdown menu. **Note:** Kibana will display the start date when you select the relative time period



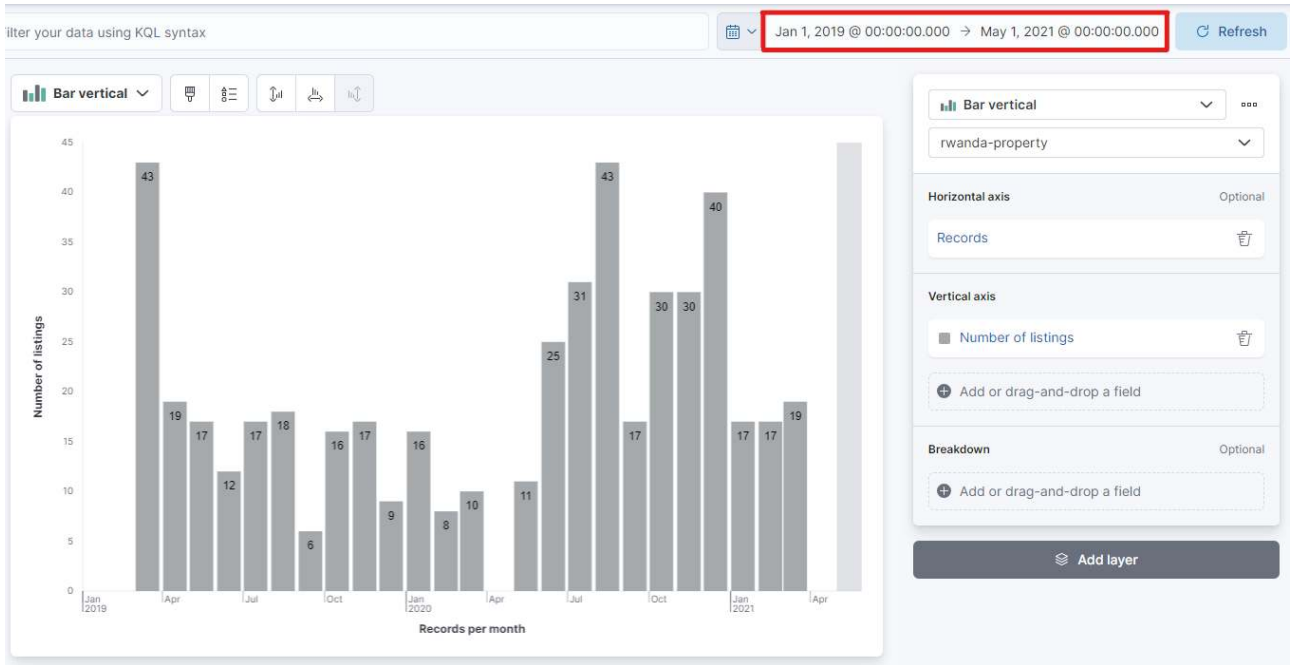
- **Now:** Set start or end time to current time and day, which will automatically adjust. This is useful if data is regularly updated



Explore Rwanda property data view: time filter

The `date-creation` field in the `rwanda-property` data view spans from March 2019 to March 2021. To view the full range of data, we will need to set the time filter to cover that whole time period. It is useful to set the time filter beyond the boundaries of the data to ensure that you capture all of the data:

- Absolute start date: 1 January 2019 @ 00:00:00
- Absolute end date: 1 May 2022 @ 00:00:00
- *OR set:* Relative start time: Last 6 years
- End time: `Now`



Visualisation examples in Lens 📈

Data table

💻 *Navigate to Lens*

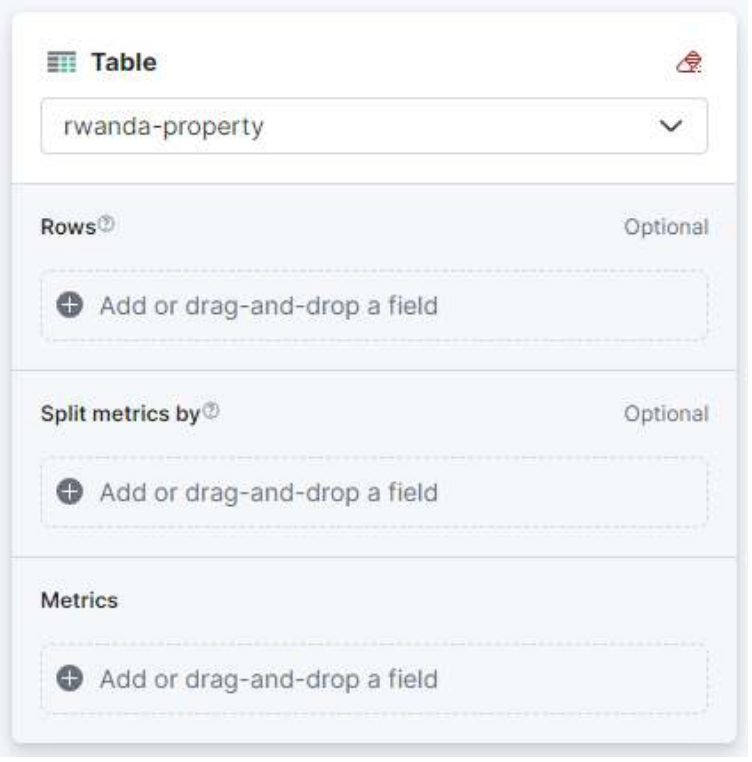
Create visualisation: Data table

Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Table**

Layer settings of data table:

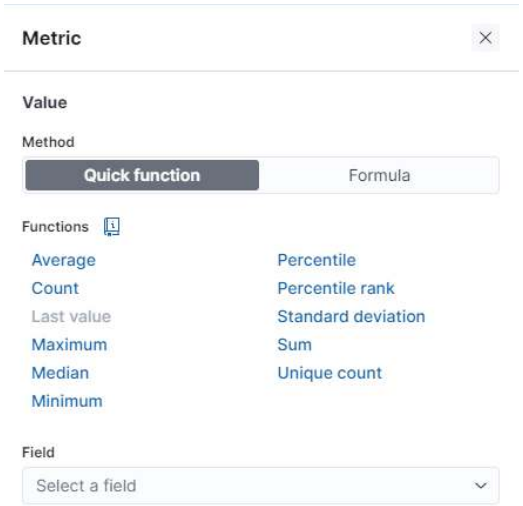
- **Metrics:** Values displayed in the table, determined by calculations performed on numeric fields
- **Rows:** Split metrics by the field values in the rows of the table
- **Split metrics by**: Split metric columns by field (*not recommended using, unless have a binary field or a field with few values*)



Data Table: Metrics

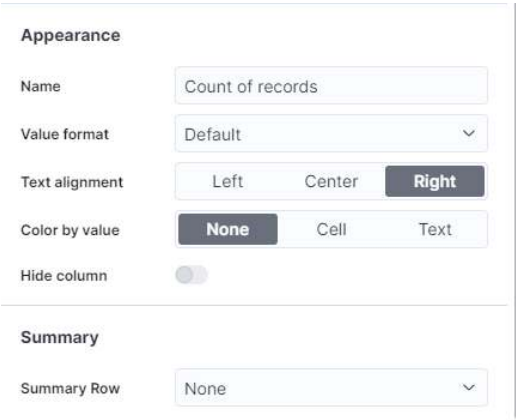
> `Metrics` are the values that are displyed in a visualisation, determined by calculations performed on numeric fields

- Apply a **quick function** or **formula** to the available fields
- **Quick functions** allow you to calculate summary statistics on numeric fields, e.g. count, average, maximum, median, minimum, sum, unique count, etc. **Note:** `count` can be used on any field type.



Edit the appearance of the metric:

- Edit the **metric name** to change the metric label
- Change the **text alignment**
- You can also add a **summary row**, which will calculate a summary value over the column



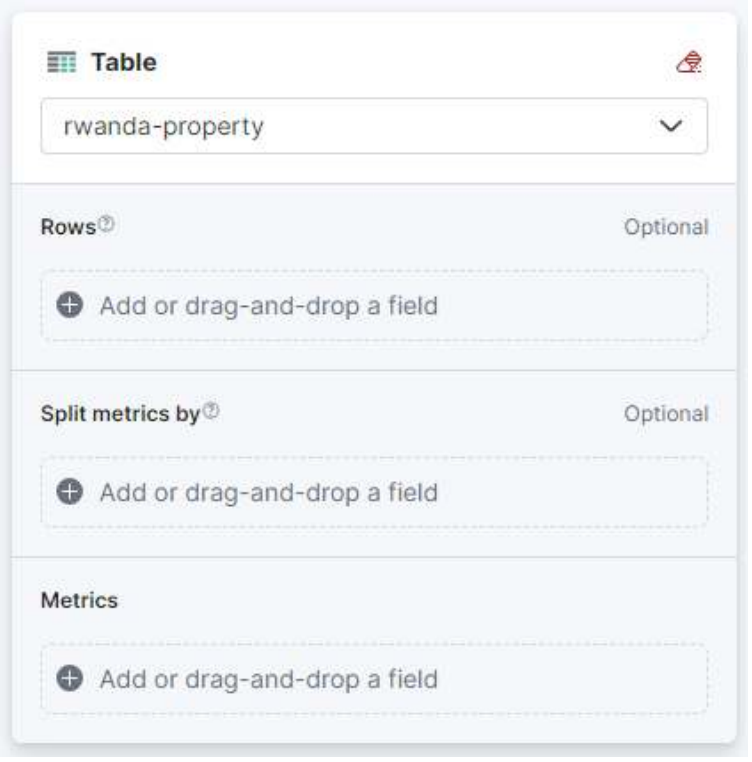
Data Table: Rows

`Rows` will split the table rows by the values of a field

There are three available functions to apply to fields to split the rows:

1. **Top values**: Splits by the top values of a specific field ranked by the chosen metric
2. **Filters**: Divides values into predefined subsets
3. **Intervals**: Buckets values along defined numeric ranges

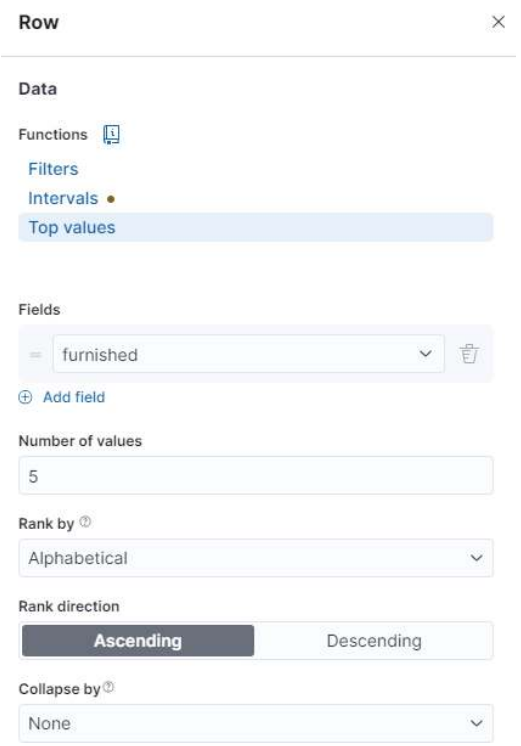
✳ You can also split the metrics over the columns, but this is best used for a variables with fewer field values, e.g. binary fields



Data Table: Row Functions

> **1. Top values:** Split rows by top values of selected field

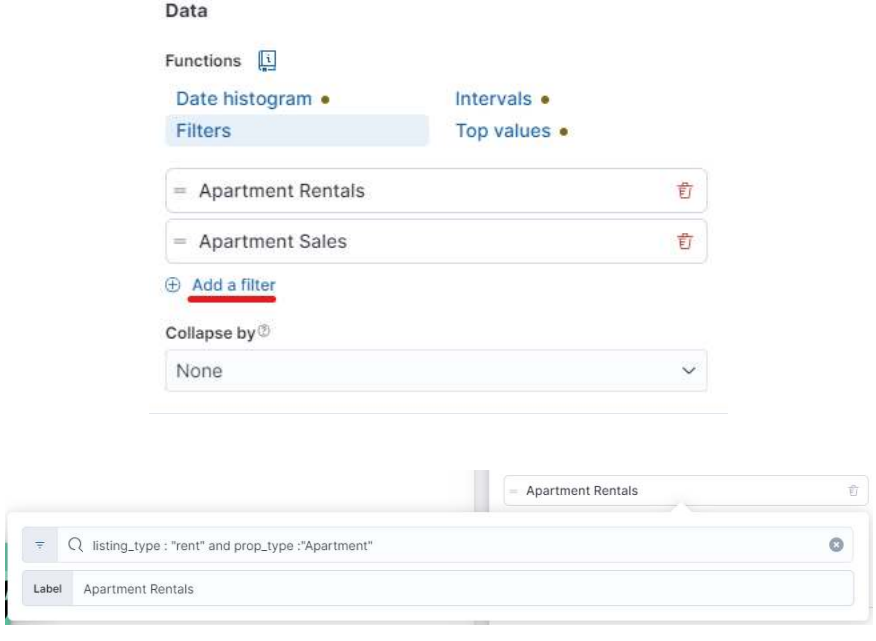
1. Select field to split rows by (or multiple fields)
2. Change the **number of values** to display all field values across rows. If the *number of values* is less than the number of field values, the remaining field values will be grouped into an **Other** category
3. Select a **function** to rank the values:
   -- Order by metric selected
   -- Order alphabetically
   -- Rarity
   -- Order by custom metric
4. Select rank direction
5. Edit appearance of rows, i.e. row name, alignment, etc.



Data Table: Row Functions

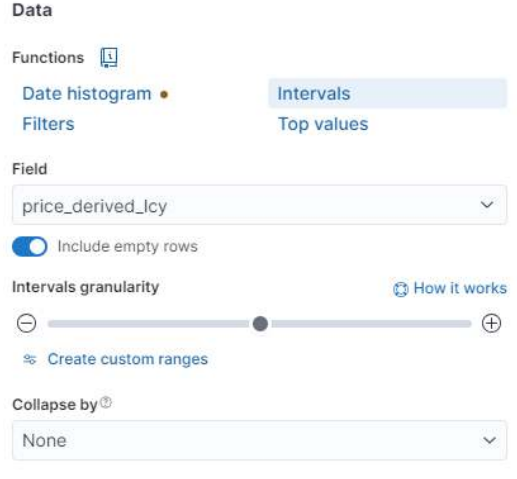
> **2. Filters:** Split rows by assigned subsets of field values

- Add filters on field values using KQL syntax
  Note: The filters function can be used to group multiple field values into one row



> **3. Intervals:** Buckets values along defined numeric ranges

- Kibana will bucket field values at a given level of granularity. You can also add custom ranges to group field values
  Note: The intervals function can only be used on numeric fields



Data Table: Examples

Create visualizations using the Data Table:

1) Number of listings per district

- **Add metric:** Average land size of listings per district
- **Add metric:** Total price of listings per district

2) Number of listings per property type

- **Add metric:** Average land size of listings per property type
- **Add metric:** Total price of listings per property type

10:00

Data Table: Results

PROPERTY INFO PER DISTRICT

District	Number of properties	Average land size (m2)	Total price RWF million
Kicukiro	231	1,059	8,702
Gasabo	228	1,012	6,127
Nyarugenge	28	421	565
Rwamagana	1	435	29
	488	**2,927**	**15,423**

PROPERTY INFO PER PROP TYPE

Property Type	Number of properties	Average land size (m2)	Total price RWF million
House	262	578	9,620
Land	150	1,404	5,375
Apartment	76	341	428
	488	**2,322**	**15,423**

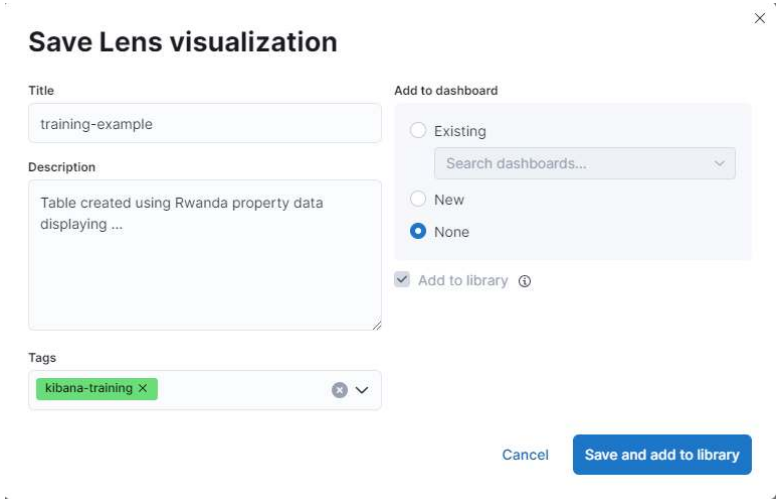
💻 *Save data visualization to visualize library*

Save visualisation to Visualize Library 

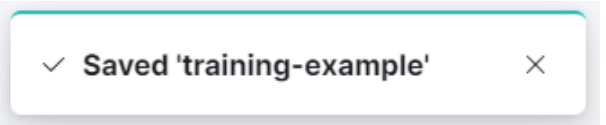
Save data visualization to visualize library

1. Click `Save` when you are finished creating your visualization
2. Fill details into *Save* window:

- **Title:** Standardize the visualization title to easily identify what it displays **NB: Add your name to the title of the visualization**
- **Description:** Add a useful description to the visualization
- **Save to Visualize library:** Select `None` under the **Add to dashboard** selection pane, which will automatically select the `Add to library` option. The visualization will be saved to the `Visualize library`
- **Tags:** Add a tag to the visualization, e.g. category of visualization, what is it being created for



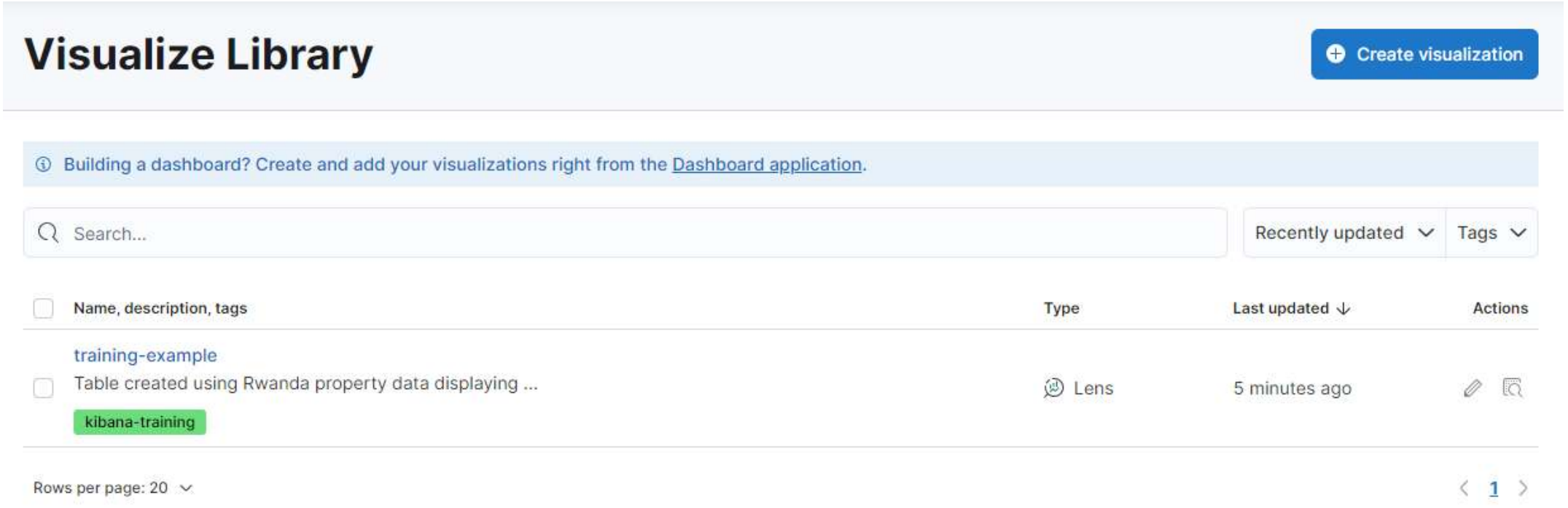
- Click `Save and add to library`



- You will get a pop-up in the bottom-right corner confirming that you have successfully saved the visualization

Visualize library

The saved data visualization should now appear in the `Visualize library` with its title, description, tag, the type of visualization created and when the visualization was last updated



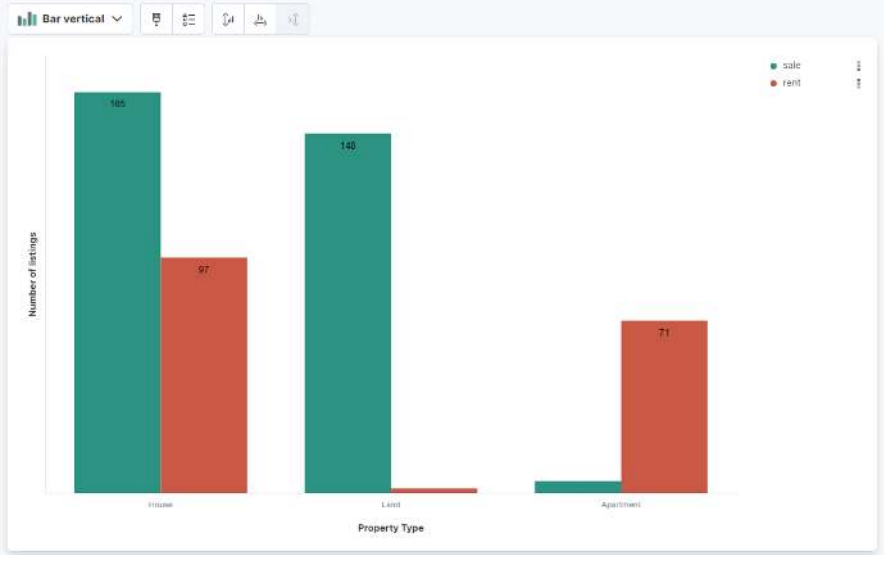
Bar and Line charts 📈

💻 *Navigate to Lens*

Bar and line charts

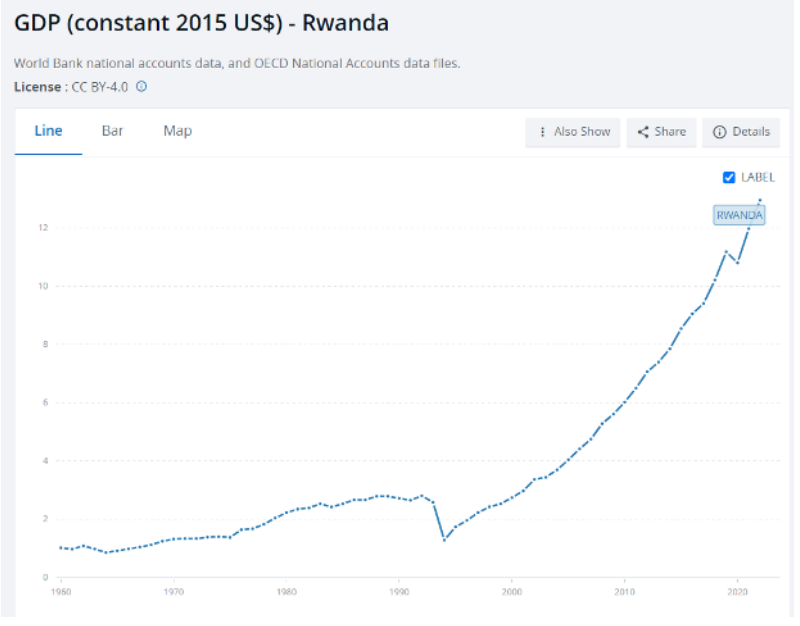
Bar charts

- Used for comparing values across different categories or groups



Line charts

- Used for comparing values over time



Create visualisation: Bar and line charts

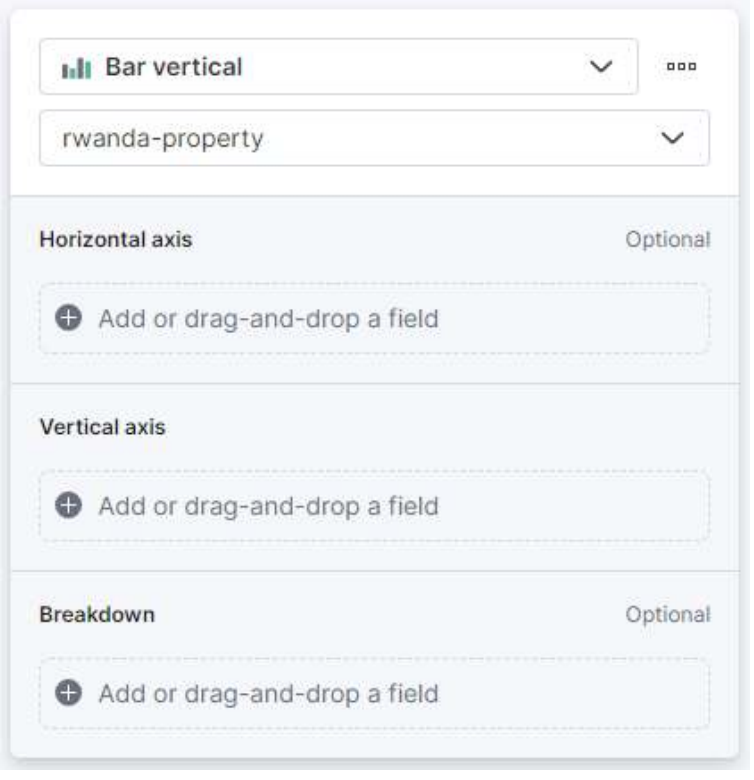
Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Bar or line chart**

Layer settings of vertical bar and line charts:

📈 Bar vertical or line:

- **Vertical axis (*y-axis*)**: Select a function and quantitative field to display values for each field value displayed on the horizontal axis
- **Horizontal axis (*x-axis*)**: Select field for the field values that you want to compare based on either the top values of a field, intervals over a numeric field or filters on a field.

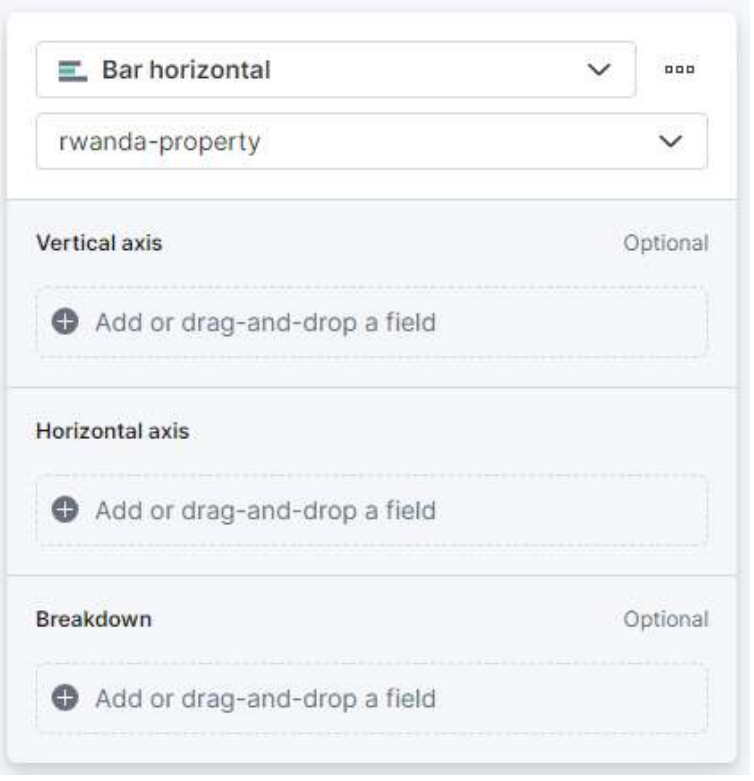


✳ Vertical bar and line charts have the same layer settings, whereas the position of the axes of the horizontal bar chart will be rotated 90 degrees clockwise

Create visualisation: Bar and line charts

Bar horizontal: (*Bar vertical rotated 90 degrees clockwise*)

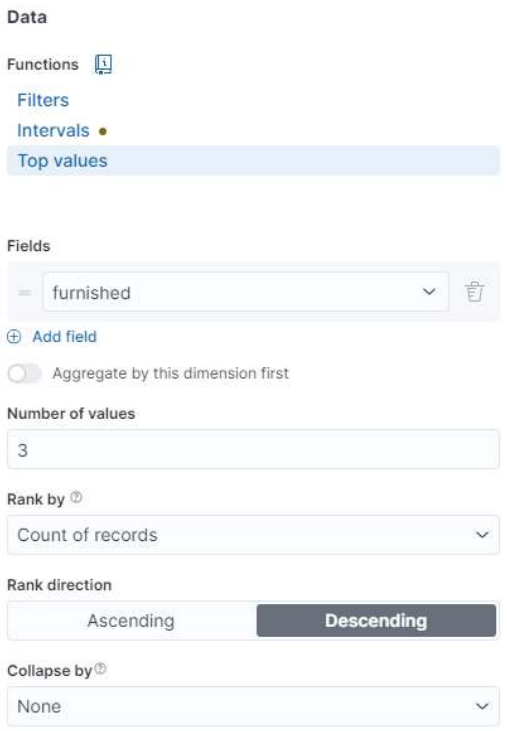
- **Vertical axis (*x-axis*)**: Select field for the categories or groups that you want to compare based on either the top values of a field, intervals over a numeric field or filters on a field.
- **Horizontal axis (*y-axis*)**: Select a function and quantitative field to display values for each category or group displayed on the horizontal axis



Create visualisation: Bar and line charts

Breakdown: Split each bar by values of a chosen field, based on the top values, filtered field values or value intervals.

- **Top values**: Divides bars by the top values of a specific field ranked by the chosen metric
- **Filters**: Divides values displayed on bars into predefined subsets. This is useful to group field values into defined groups
- **Intervals**: Buckets values along defined numeric ranges



Example: Bar chart

> Create a **vertical bar chart** showing the number of listings per property type, split by listing type

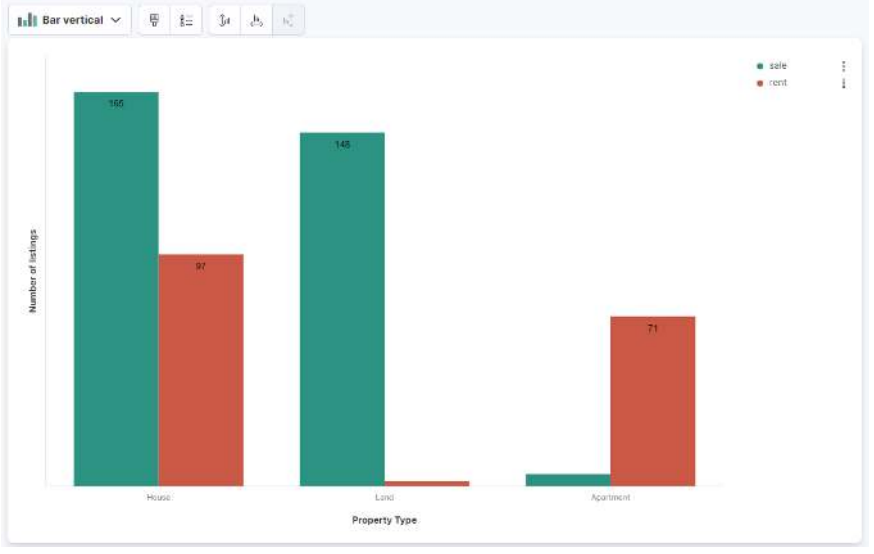
05:00

Example: Bar chart

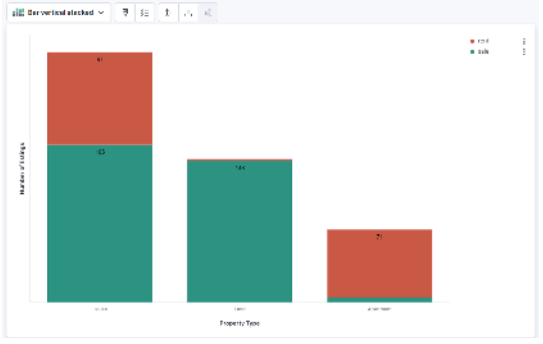
> Create a **vertical bar chart** showing the number of listings per property type, split by listing type

You can display bar charts either as a:

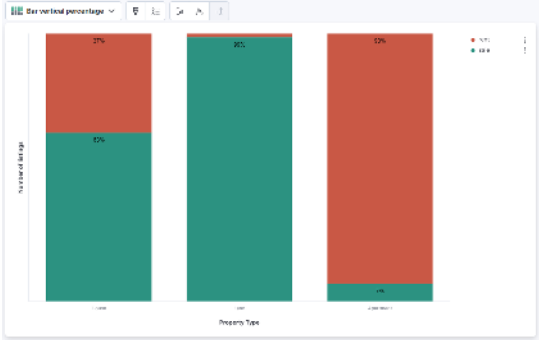
1) **Standard bar chart**



2) **Stacked bar chart**

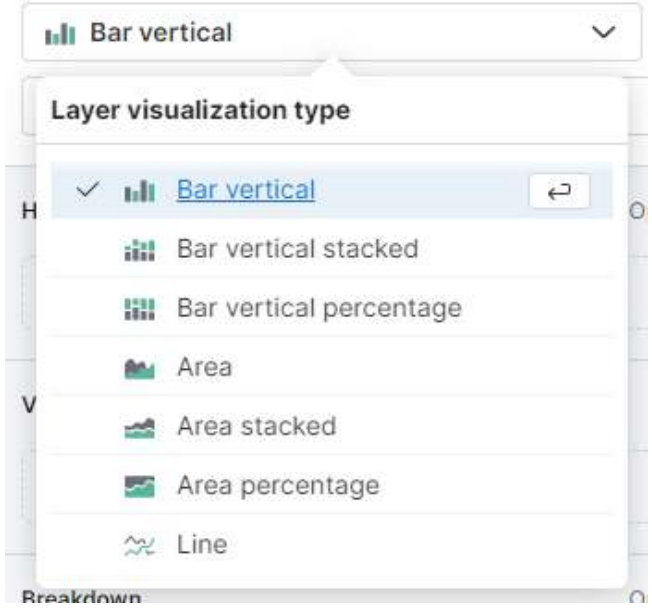


3) **Percentage bar chart**



Create visualisation: Bar and line charts

✳ Quickly switch between visualisation types by clicking on the visualisation type at the top of the layer settings panel. Available options will display in the dropdown menu based on comparable visualisation types to create



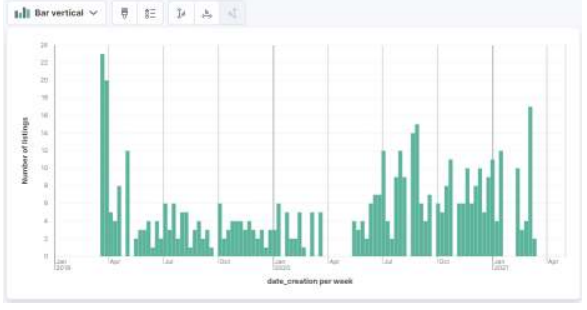
Create visualisation: Date Histogram

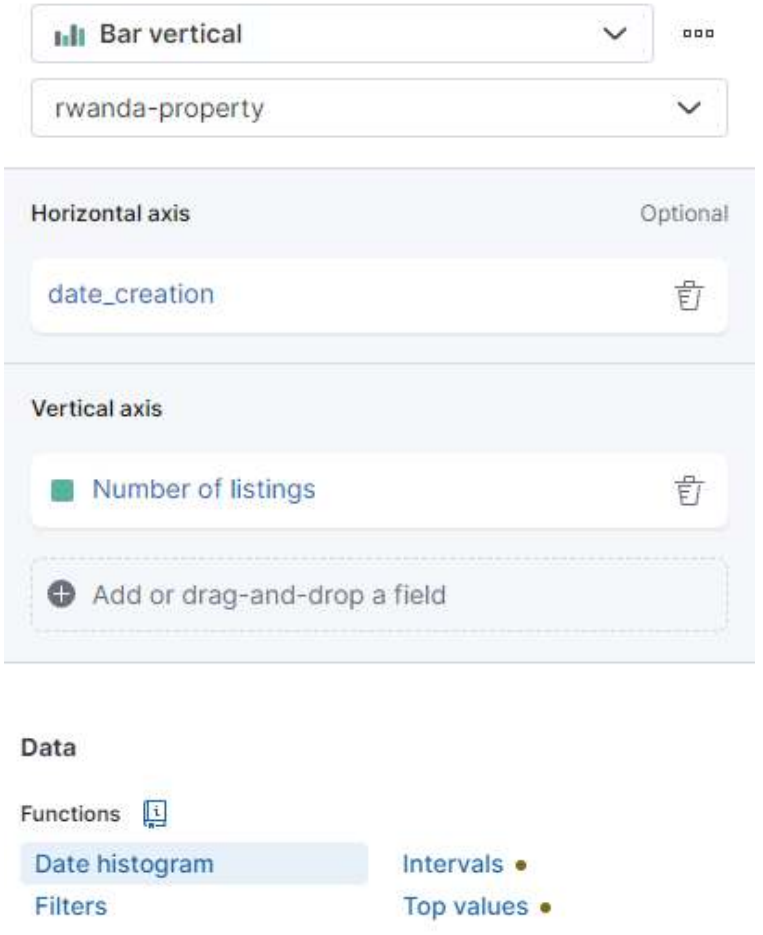
Create a histogram of data over time

Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Horizontal bar**

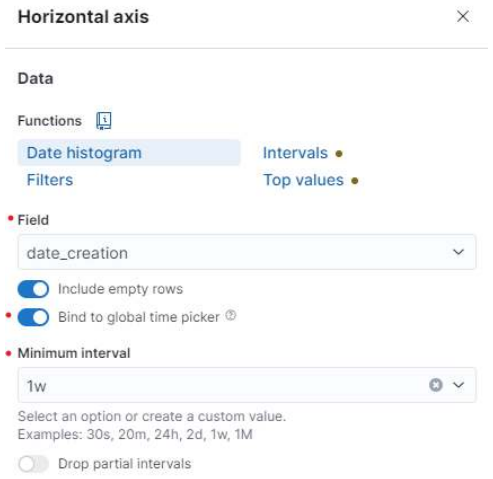
- **Horizontal axis (x-axis):** Select the `date histogram` function over a *timestamp variable*, e.g. `date_creation`
- **Vertical axis (y-axis):** Select a function and quantitative field to display values for each date



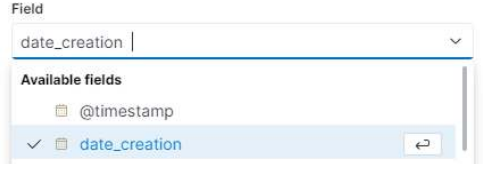


Create visualisation: Date Histogram

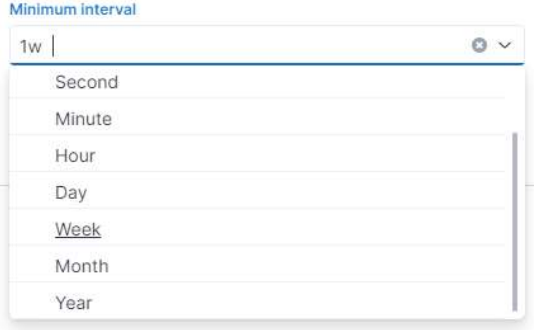
Horizontal axis settings:



- Select the **Date histogram** function
- Select a **timestamp field**



- Adjust the **minimum interval**: This will determine over what time interval the data is grouped. Kibana will automatically group the data per week.



- Make sure your time filter is correct. You can also deselect the *Bind to global time picker* option. This will ensure that all your data is displayed in the chart

Core Principles of Data Visualisation 📈

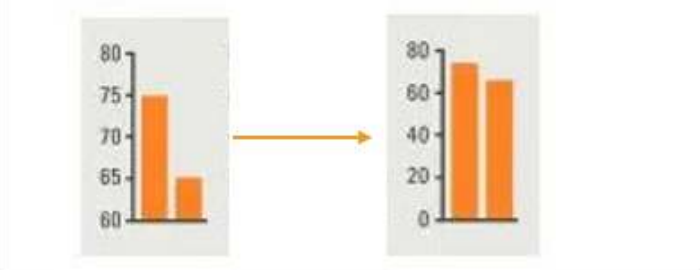
Core Principles of Data Visualisation

Avoid 3D

Using 3D when you do not have a third variable will usually distort the perception of the data and should thus be avoided

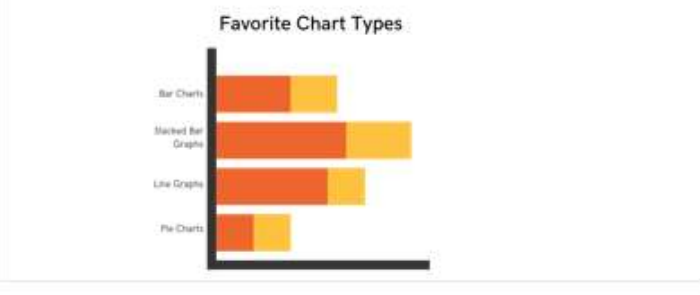
Start bar and column charts at zero

Bar and column charts that do not start at zero overemphasize the differences between the values which can bias the perception of the data



Make labels easy to read

Rotate bar and column charts to make the labels horizontal. Make labels clear, concise and easy for your reader to understand

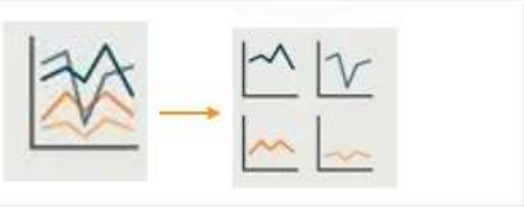


Source: Data Visualisation Cheatsheet

Core Principles of Data Visualisation

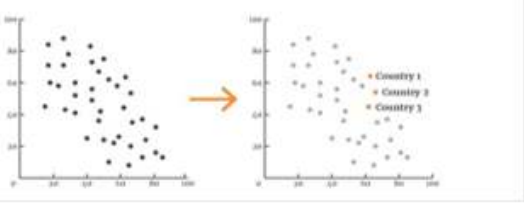
Try small multiples

Breaking up a complicated chart into smaller chunks can be an effective way to visualize your data and make it simple enough for your audience to understand



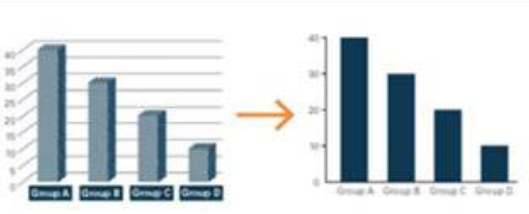
Show the data

The data is the most important part of the graph and should be presented in the clearest way possible. This does not mean that all the data should be shown – **emphasize what is important through layout, colour and data labels**



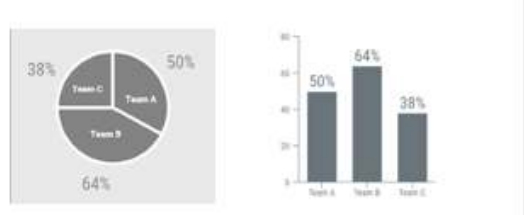
Reduce the clutter

Remove unnecessary or distracting visual elements to improve effectiveness. No dark or heavy gridlines, remove redundant tick marks, labels or text. Do not have unnecessary pictures or icons and avoid gradients and unnecessary dimensions.



Use the right chart

Bar charts are usually better than pie charts for comparisons because it is easier to discern the length of bars rather than the size of segments. Pie charts are good for showing parts of a whole when there are a small number of segments, and their differences are distinct

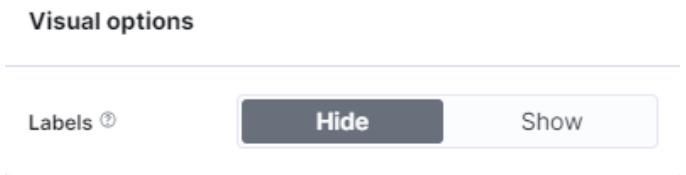


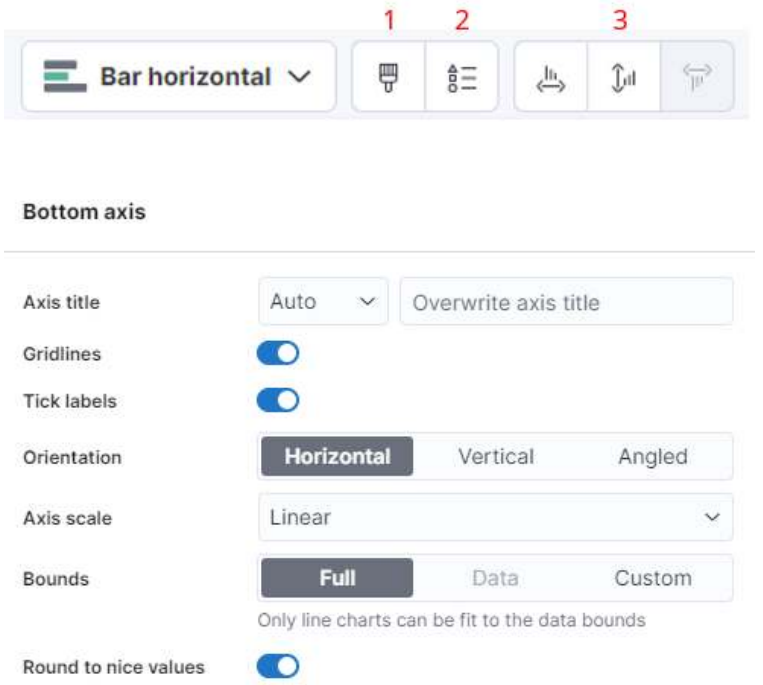
Source: Data Visualisation Cheatsheet

Create visualisation: Bar and line charts

Edit appearance of visualisation

1. Visual options: Show or hide labels on bars
2. Legend options: Change display options, position and alignment of legend and legend labels
3. Axis settings: Edit axis title, gridlines, tick labels, label orientation of axes. Options available for bottom, left and top axis, if applicable





✳ Move horizontal axis to top to read values and axis title easily

Bar and line chart: Examples

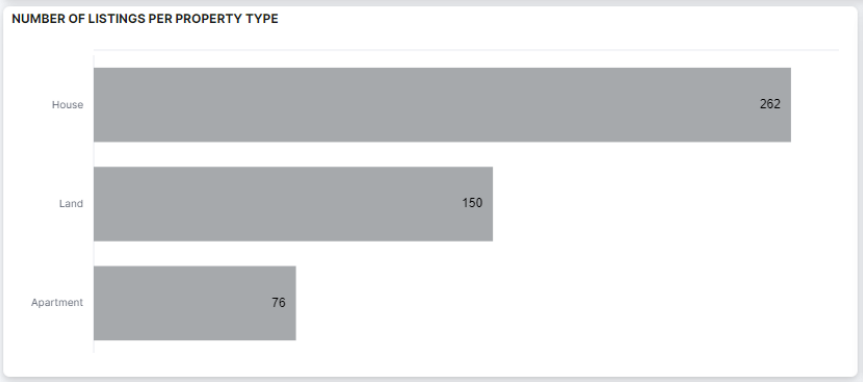
Create visualizations using bar chart:

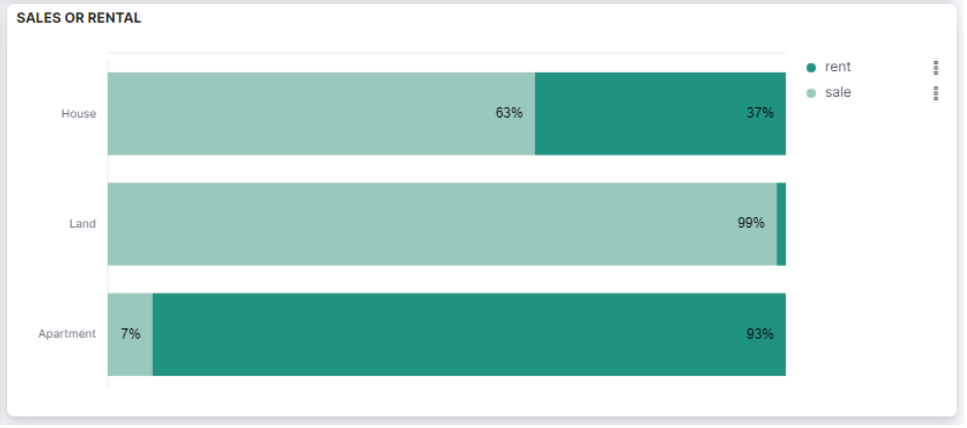
- **Percentage horizontal bar:** Number of listings per property type split by listing type
- **Vertical bar:** Number of listings by grouped price (*intervals function*)
- **Vertical bar:** Number of listings over time (*date histogram function*)

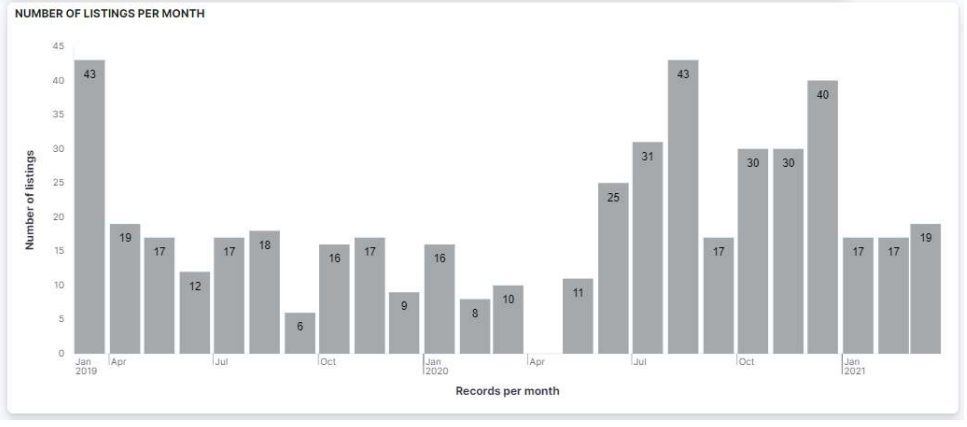
20:00

💻 *Save data visualization to visualize library*

Bar Chart: Results

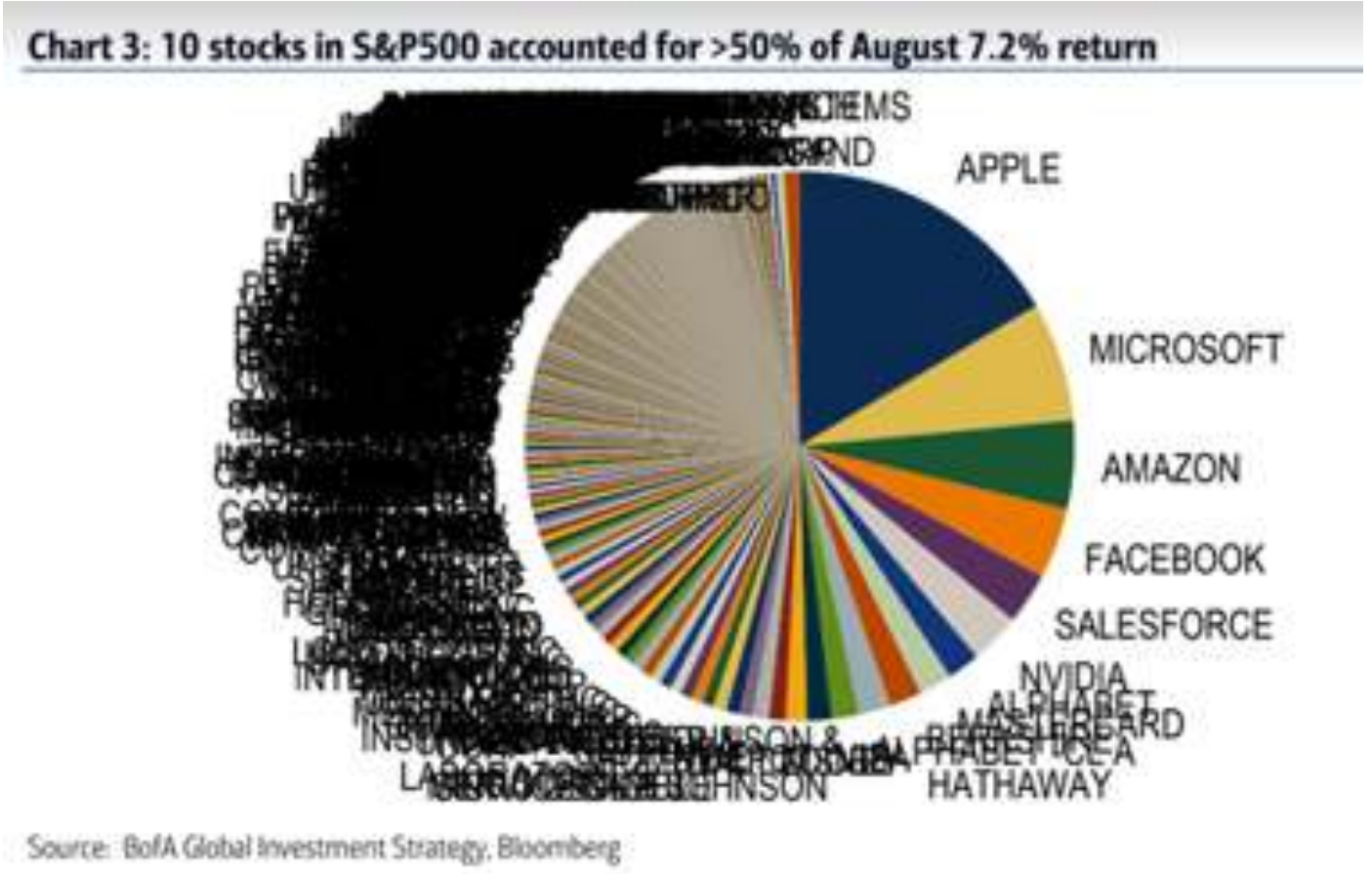






Proportion (Pie) ●

This is bad



- A pie chart should **never** have more than 3 categories

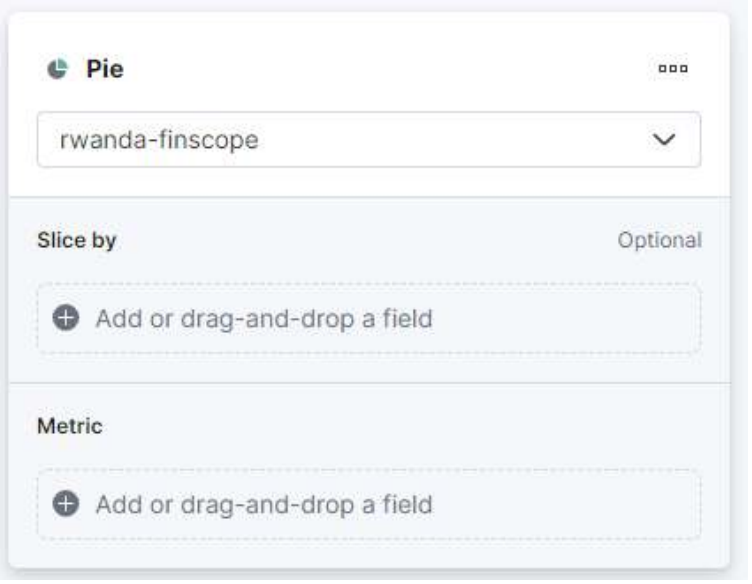
Create visualisation: Proportion (Pie)

Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Pie or donut chart**

Pie and donut charts have the same layer settings:

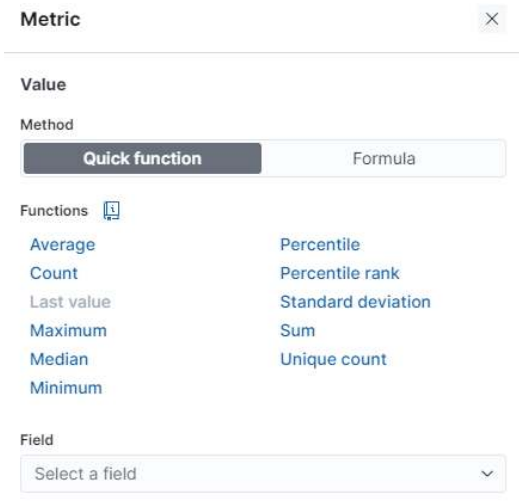
- **Metric:** Values displayed on the pie chart, determined by calculations performed on numeric fields
- **Slice by:** Slice metrics by top values of a selected field, or on filtered field values, or field value intervals



Pie or donut: Metrics

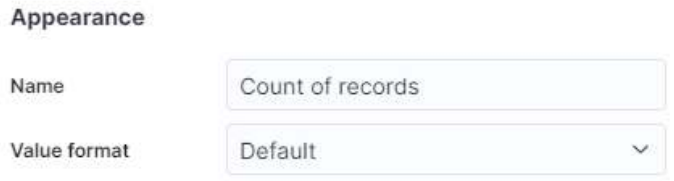
> `Metrics` are the values that are displyed in a pie or donut chart, determined by calculations performed on numeric fields

- Apply a **quick function** or **formula** to the available fields



Edit the appearance of the metric:

- Edit the **metric name** to change the slice label

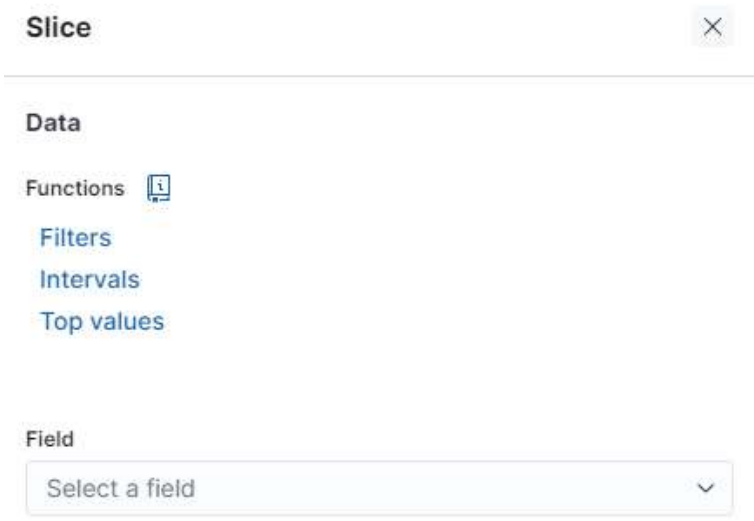


Pie or donut chart: Slice by

Slice by will slice the pie or donut chart by selected field values

There are three available functions to apply to fields to slice the chart:

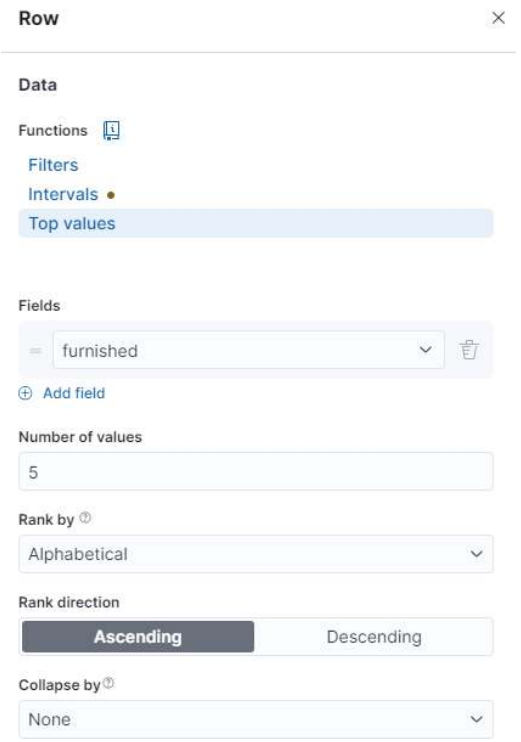
1. **Top values**: Splits by the top values of a specific field ranked by the chosen metric
2. **Filters**: Divides values into predefined subsets
3. **Intervals**: Buckets values along defined numeric ranges



Pie or donut chart: Slice by

> **Top values:** Slice by top values of selected field

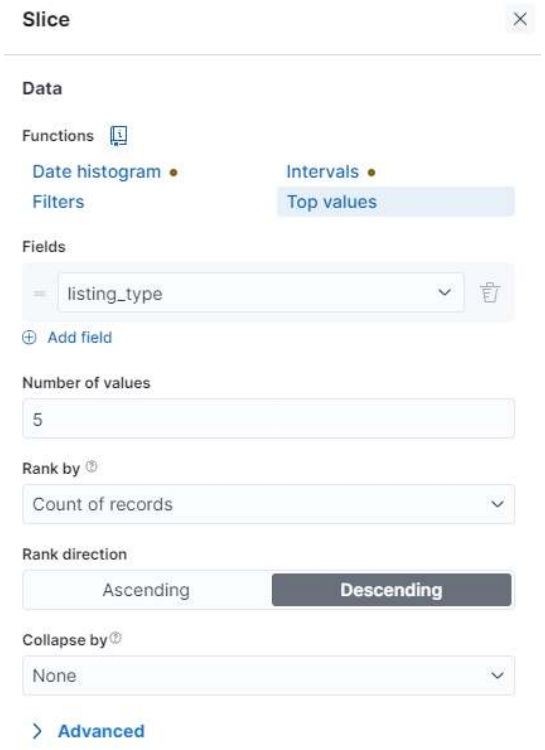
1. Select a field to slice chart by
2. Increase the number of fields displayed to display all field values in the chart. **Note:** If *Number of values* is less than the number of field values, the remaining field values will be grouped into an *Other* category
3. Select a function to rank the options by:
   -- Metric selected
   -- Alphabetical
   -- Rarity
   -- Custom metric to order by
4. Select rank direction
5. Edit the appearance of the rows



Pie or donut chart: Slice by

> **Filters:** Slice by assigned subsets of field values

- Add filters on field values using KQL syntax
  Note: The filters function can be used to group multiple field values into slice

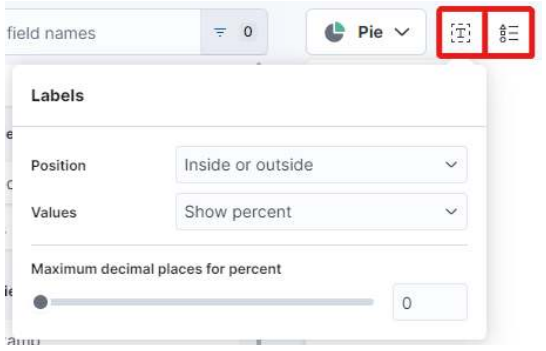


Pie or donut chart: Visual options

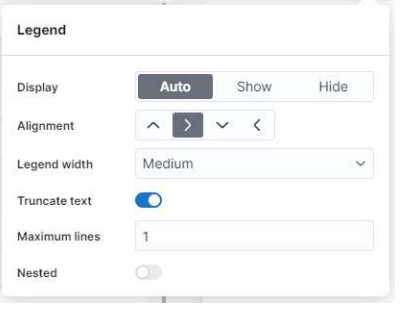
Edit colour palette in **Slice by** settings:

Edit visual options above visualisation:

- Label options



- Legend options



Pie or Donut: Examples

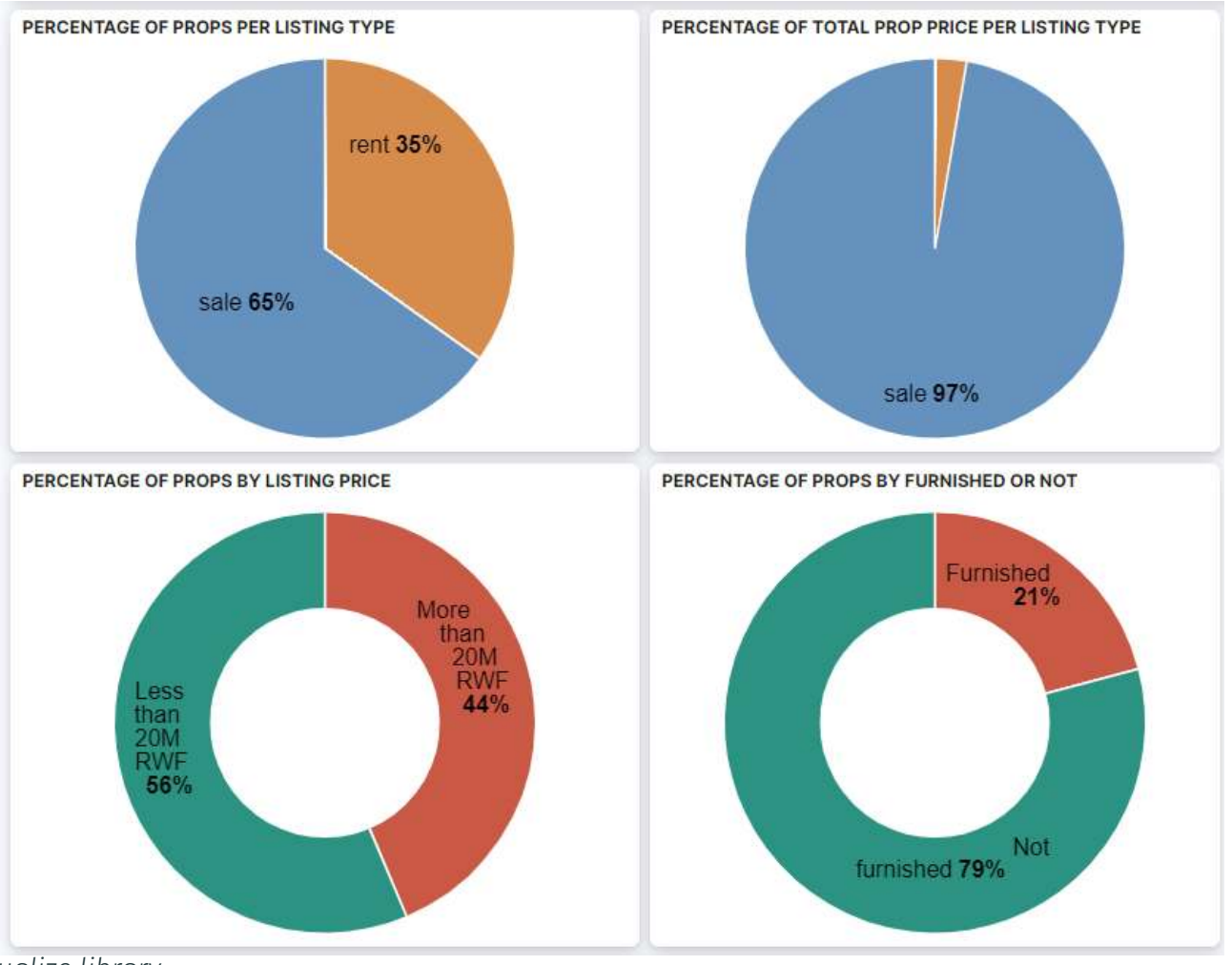
Create visualizations using the pie or donut chart:

- Percentage of listings per listing type
- Percentage of total price of listings per listing type
- Percentage of listings by whether listing is furnished or not: use the *filters* function to rename the field values of the `furnished` field
- Percentage of listings by price: use the *intervals* function to slice at 20M RWF threshold showing percentage of listings valued at less than 20M RWF vs. percentage of listings valued at greater than or equal to 20M RWF

10:00

💻 *Save data visualization to visualize library*

Pie or Donut: Results



Save data visualization to visualize library

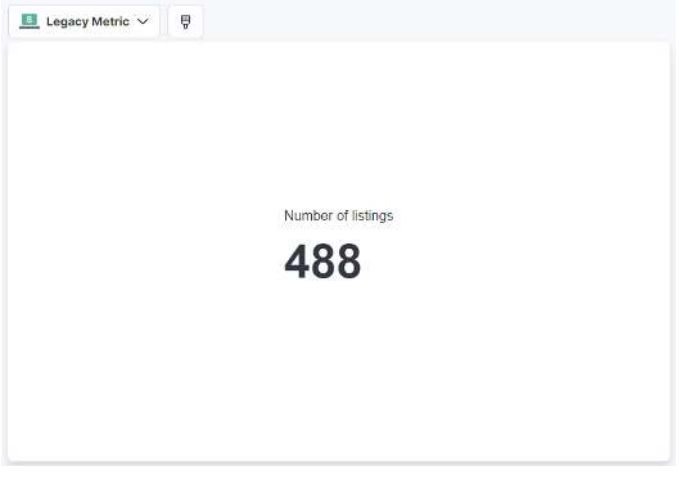
Metric (Single Value)

Create visualisation: Metric

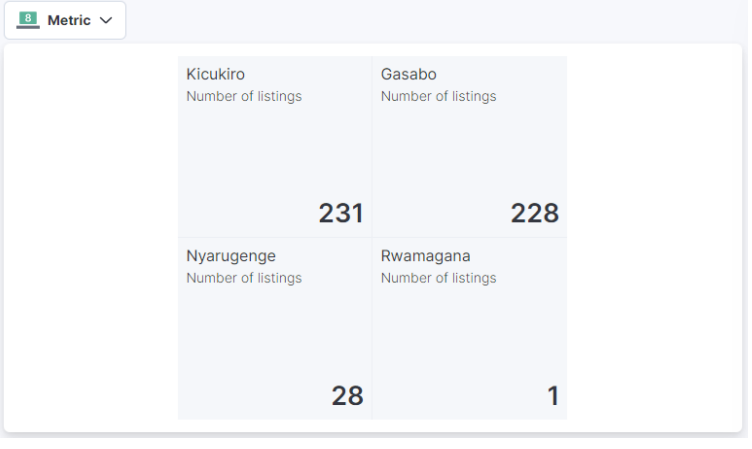
Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Metric or Legacy Metric**

Legacy Metric



Metric

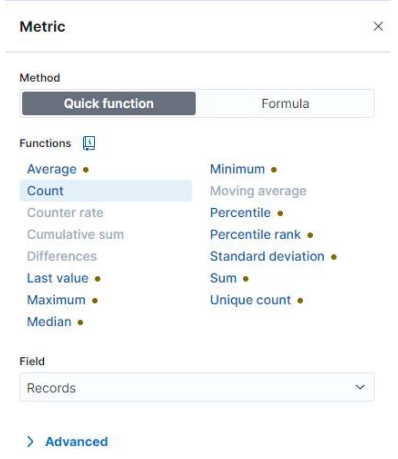


Create visualisation: Legacy Metric

Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Legacy Metric**

Metric: Apply a **quick function** or **formula** to the available fields to display a given metric

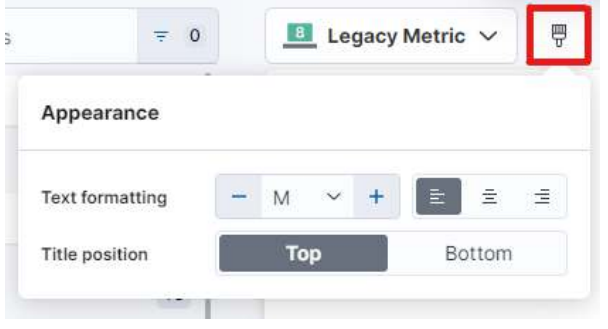


Save visualisation to Visualize Library

Visual options: Edit the appearance of the Metric

- Edit metric labels

- Edit text formatting of metrics



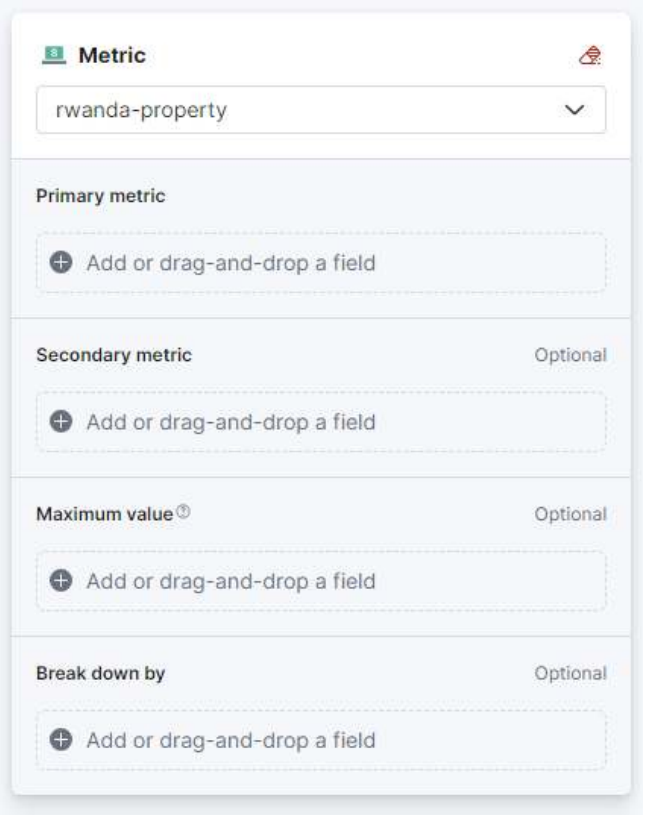
Create visualisation: Metric

Data view and visualisation type selection

1. Select data view: `rwanda-property`
2. Select visualisation type: **Metric**

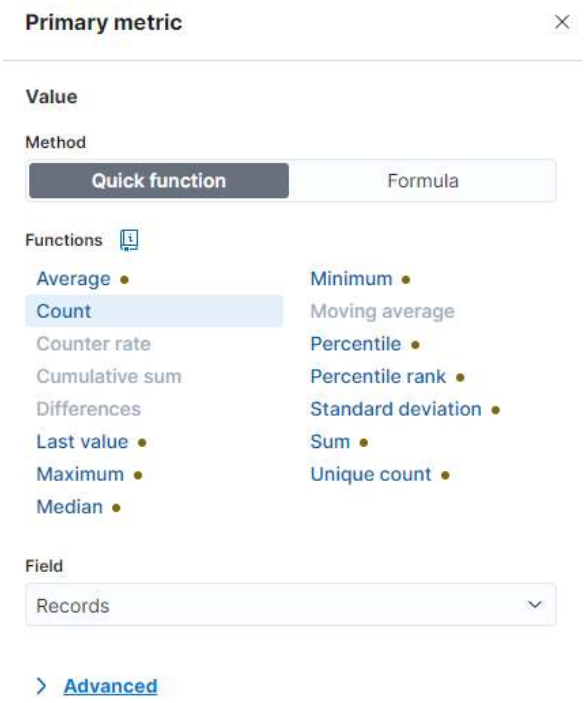
Layer settings of Metric:

- **Primary and secondary metric:** Values displayed determined by calculations performed on numeric fields. You can add a primary and secondary metric to each block
- **Breakdown by:** Split metrics in visualisation by field values.



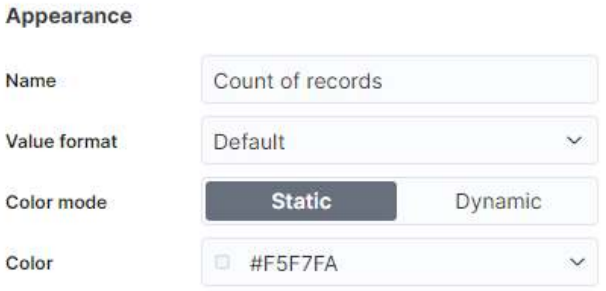
Create visualisation: Metric

Primary and secondary metrics: Apply a **quick function** or **formula** to numeric fields



Edit the appearance of the Metric:

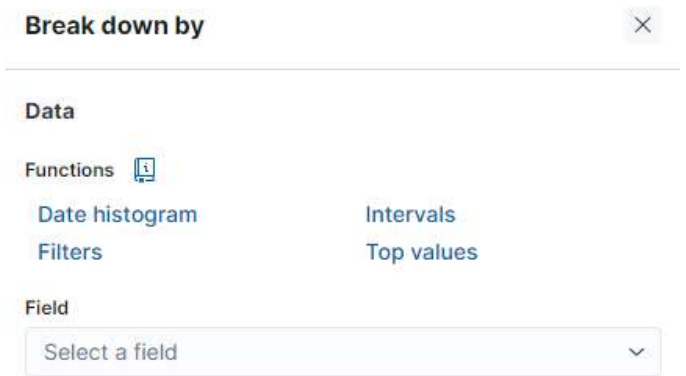
- Change the name of the metric
- Change the colour mode and colour of the metric



Create visualisation: Metric breakdown

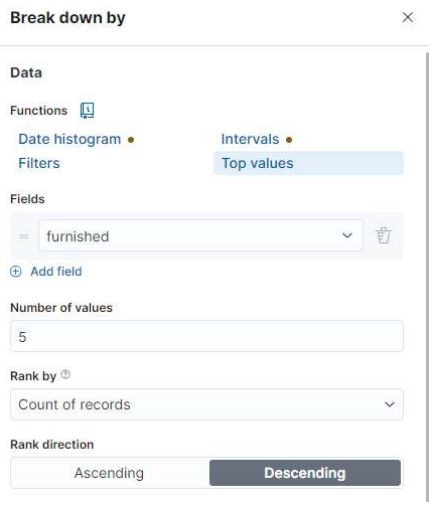
There are three available functions to apply to split metrics:

1. **Top values**: Splits by the top values of a specific field ranked by the chosen metric
2. **Filters**: Divides values into predefined subsets
3. **Intervals**: Buckets values along defined numeric ranges



> **Top values:** Splits by the top values of a specific field ranked by the chosen metric

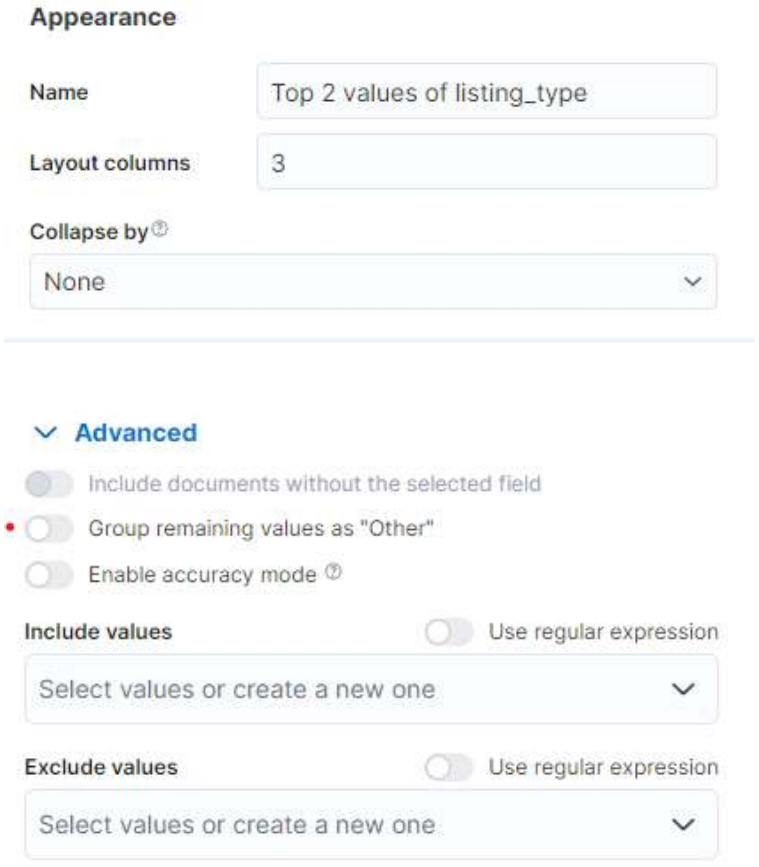
- Select **field** to breakdown by
- Change **number of values** displayed in Metric visualisation
- Rank by a metric, alphabetical or custom metric



Create visualisation: Metric visual options

Appearance of Metrics:

1. Adjust the **number of values** to display based on the number of field values - try set the number of values to the exact number of field values
2. Adjust the number of **layout columns**
3. Under Advanced settings, deselect the ***Group remaining other values as "Other"*** to only display available field values



Metric: Examples

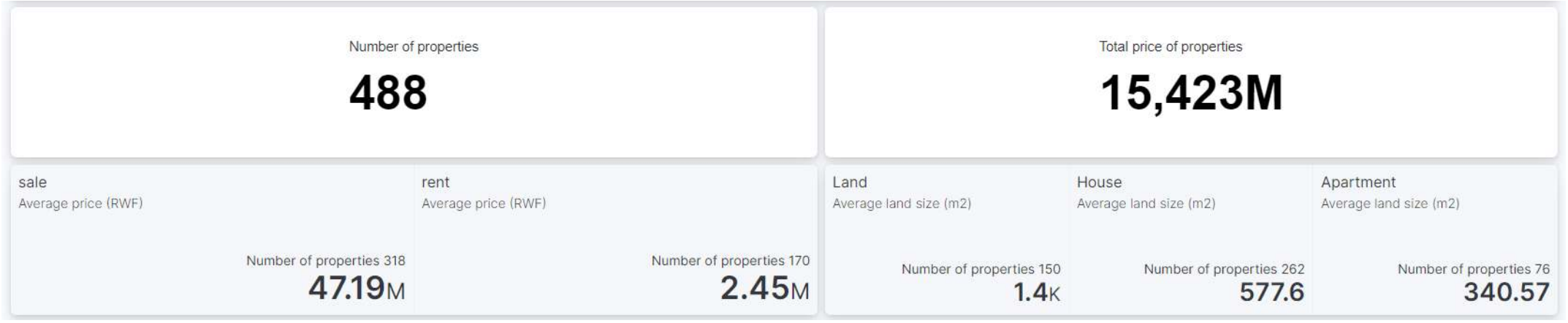
Create visualizations using Metrics:

- **Legacy metric:** Number of listings
- **Legacy metric:** Total price of listings
- **Metric:** Number of listings split by listing type, with average price of listings per listing type
- **Metric:** Number of listings split by property type, with average size of listings per property type

10:00

💻 *Save data visualization to visualize library*

Metric: Results



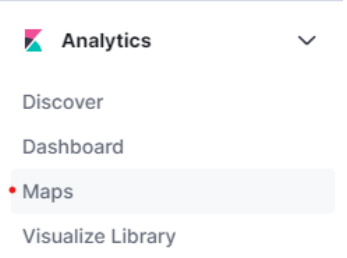
Save data visualization to visualize library

Maps 

Maps

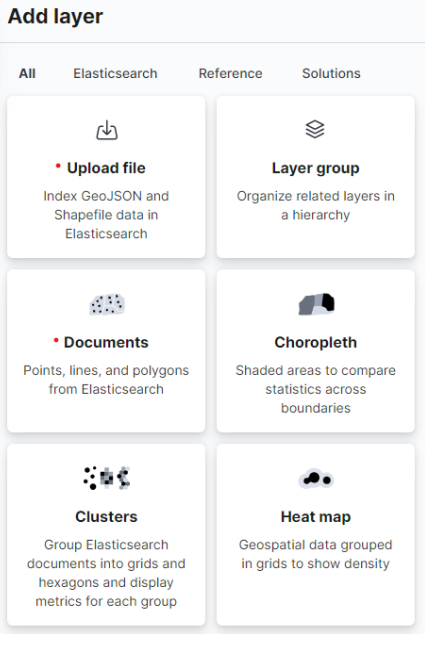
The **maps** app allows you to build maps with multiple layers and indices:

- Upload shapefiles
- Map geospatial data uploaded to Kibana within your data views
- Embed maps in dashboards



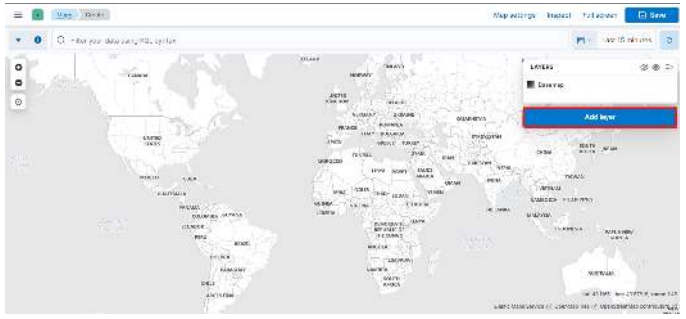
Map layer options 🌍

- **Upload file:** Index shapefile data in Elasticsearch. Once the shapefile has been uploaded to Kibana, you can join a data view on the geographic field
- **Documents:** Points, lines, and polygons from Elasticsearch
- **Clusters:** Group Elasticsearch documents into grids and hexagons and display metrics for each group
- **Heat map:** Geospatial data grouped in grids to show density
- **Point to point:** Aggregated data paths between the source and destination

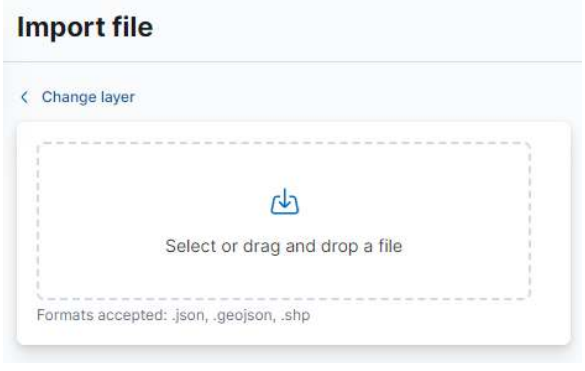


Maps

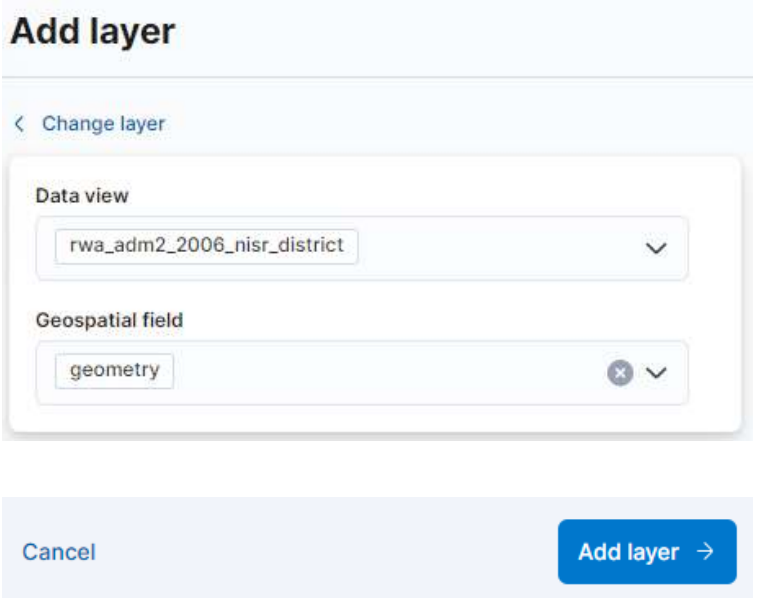
Create a map in Kibana by adding layers:



1) Select `Upload file` to upload **shapefile** as an index on Kibana. Create data view with shapefile index.



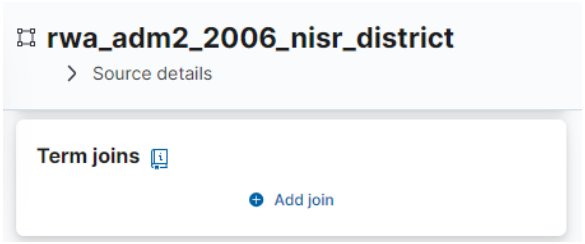
2) Add `Documents` layer to map with existing shapefile data view. The geospatial field in the shapefile data view will be selected automatically allowing you to map the data.



✱ Specific Kibana privileges are needed to upload an index. Users without writing privileges can use the data view once created.

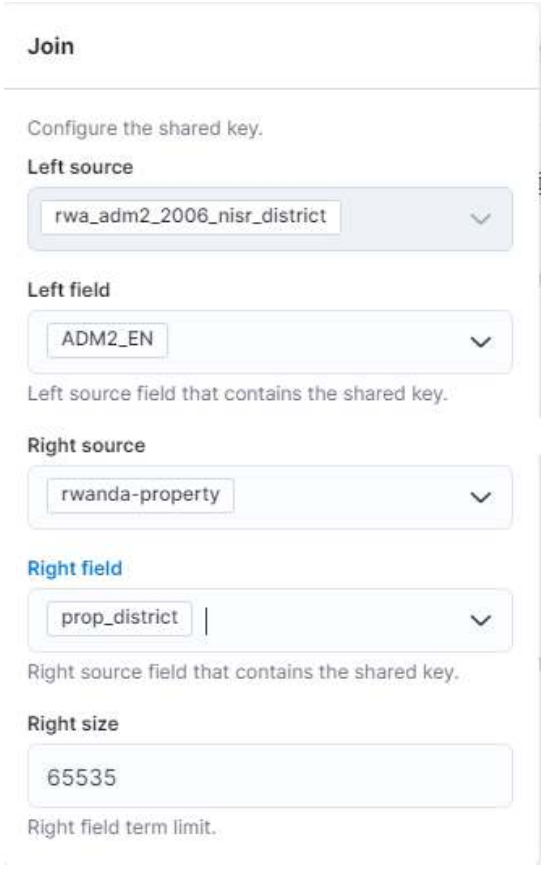
Maps: Join

`Add join` to shapefile data view



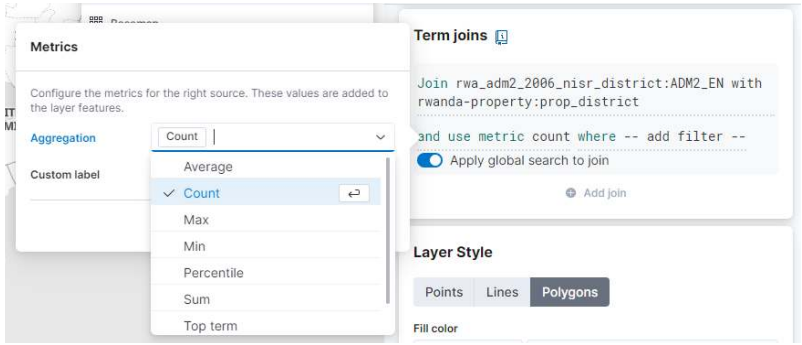
- Select `left source` for join: Shapefile data view
- Select `left field` to join on
- Select `right source` for join: data view with geographic field
- Select `right field` to join to left field

✳ Ensure that geographic field values match to values in shapefile in order to successfully join the two data views

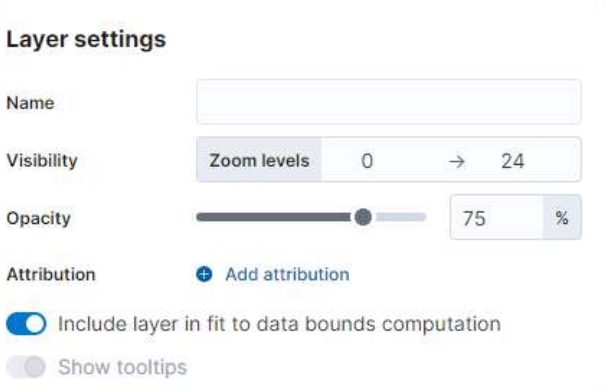


Maps: Metric and display

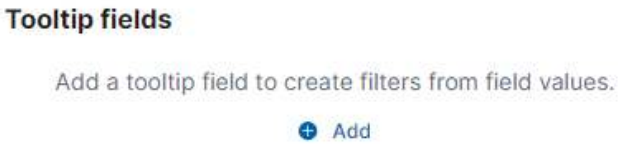
- Select **metric** to display on map per geographic field value



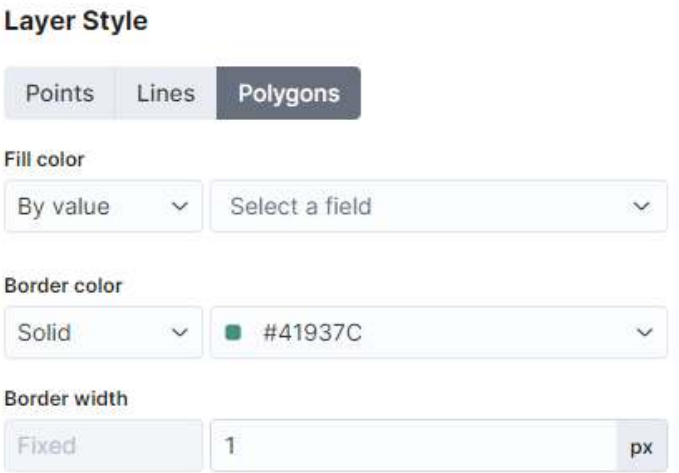
- Adjust **map aesthetics** and display options



- *Add tooltip field to display on map*



- *Adjust layer style and colours*

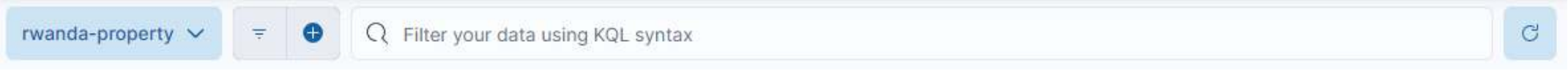


Visualisation Add-ons 

Filters

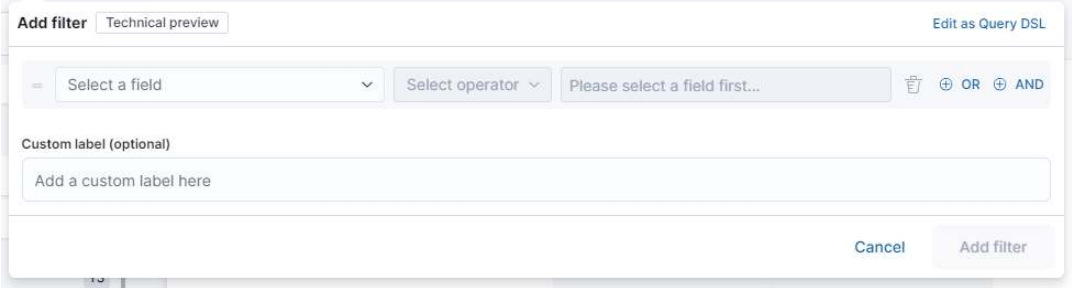
> **Adding a filter:** narrowing down the documents that are used within data visualizations
> *Examples:* Only rentals, only sales, property type is land

How to add a filter?



- Click on the `+` to add a filter
- Select the `field` on which to set the filter
  Note: Select the `.keyword` field
- Select the operator applicable for the filter
  Examples: is (equals), exists in, is not
- Select the field values to filter on
- Click on `Add filter` to apply the filter to the visualization

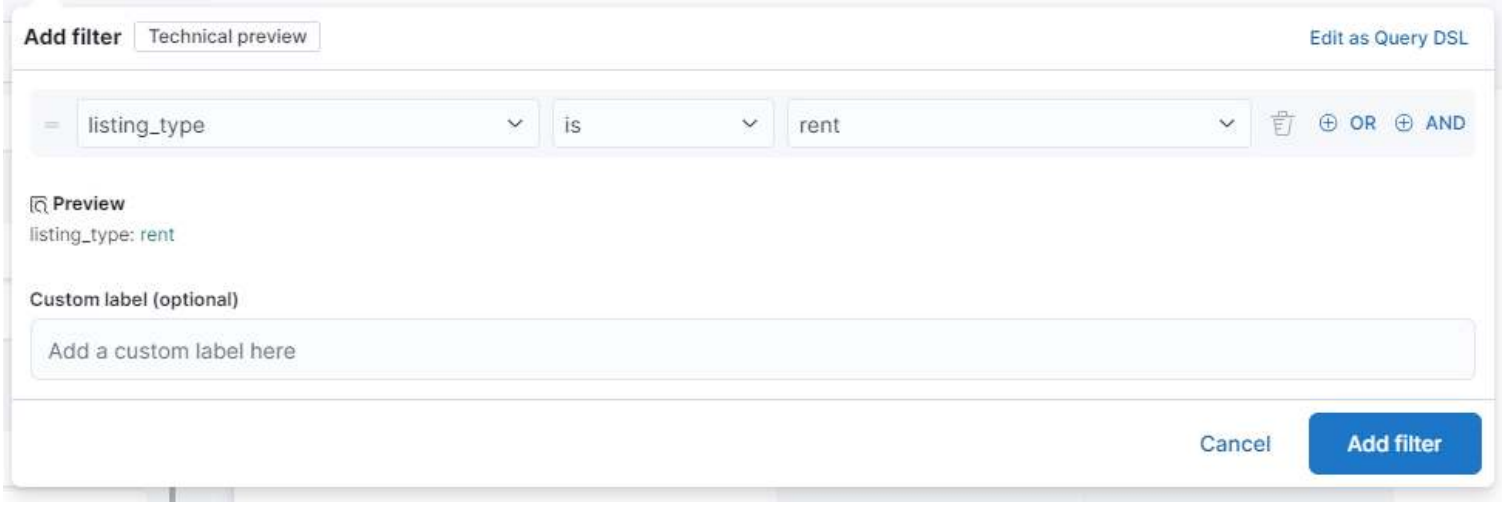
Note: To remove a filter, click on the `x` button next to the filter tag



> `.keyword` fields are properly indexed fields, which allow you to select field options to filter on from a dropdown list optimizing them for use in filtering and aggregation

Filter example

> Rental property listings



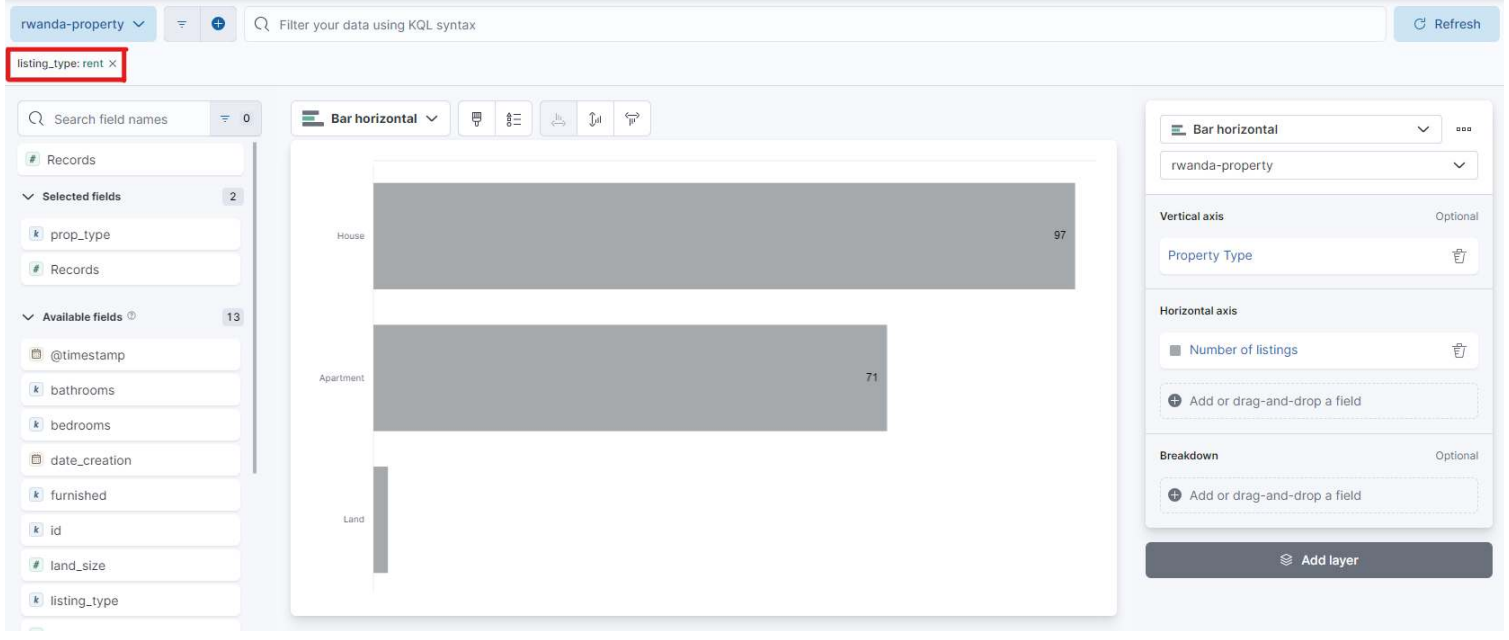
Adding additional filter statements with Boolean operators:

- Click on the `+ OR` or `+ AND` to add an additional filter statement to the initial filter statement
- Select the field, operator and field value for each additional filter statement

> **Note:** It is useful to leave the filter label as is. The default label describes the field, operator and field value chosen for the filter

Filter example results

The bar chart below now shows results only for *rental properties*. Added filters are displayed in the top panel above the data visualization.



KQL and Filters

Kibana Query Language (KQL) can be used to write short and concise queries to filter documents in visualisations and dashboards.
You can run free text searches for a field, e.g. prop-type, price, size, etc.
OR **Run field value searches:** e.g. {field name}{operator}{value}.
KQL can also be used to build a filter statement using the following operators:

- Equals operator: `:`
- Range operators: `>, ⩾, <, ⩽`
- Boolean operators: `AND, OR, NOT`
- Wild cards can be used to search for field existence within data as denoted by `*`

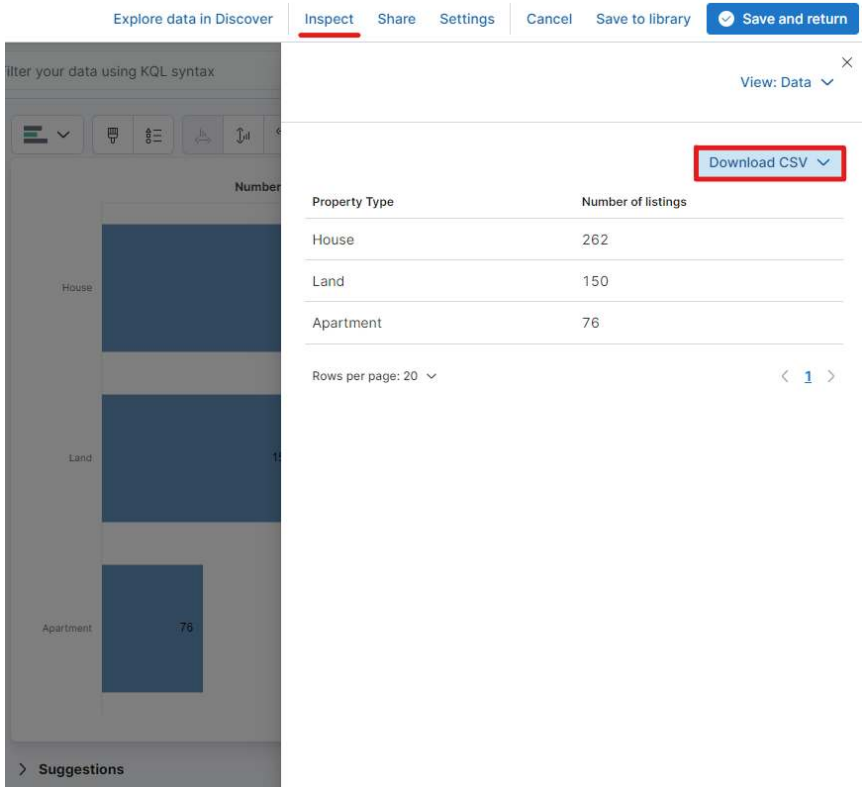
> `.keyword` fields are properly indexed fields, which are optimised for use in aggregations

You can use `.keyword` variables to easily construct KQL statements to filter on dashboards or visualisations.

Inspect

You can download a CSV of the data you have captured in a visualization by clicking on `Inspect` in the top right corner

- Download a raw CSV file of the data table



Additional resources

Kibana:

- Kibana software overview
- Kibana guide from Elastic
- Kibana plugins: advanced
- Data visualization with Kibana - Udemy course

Data Visualisation:

- Fundamentals of Data Visualisation

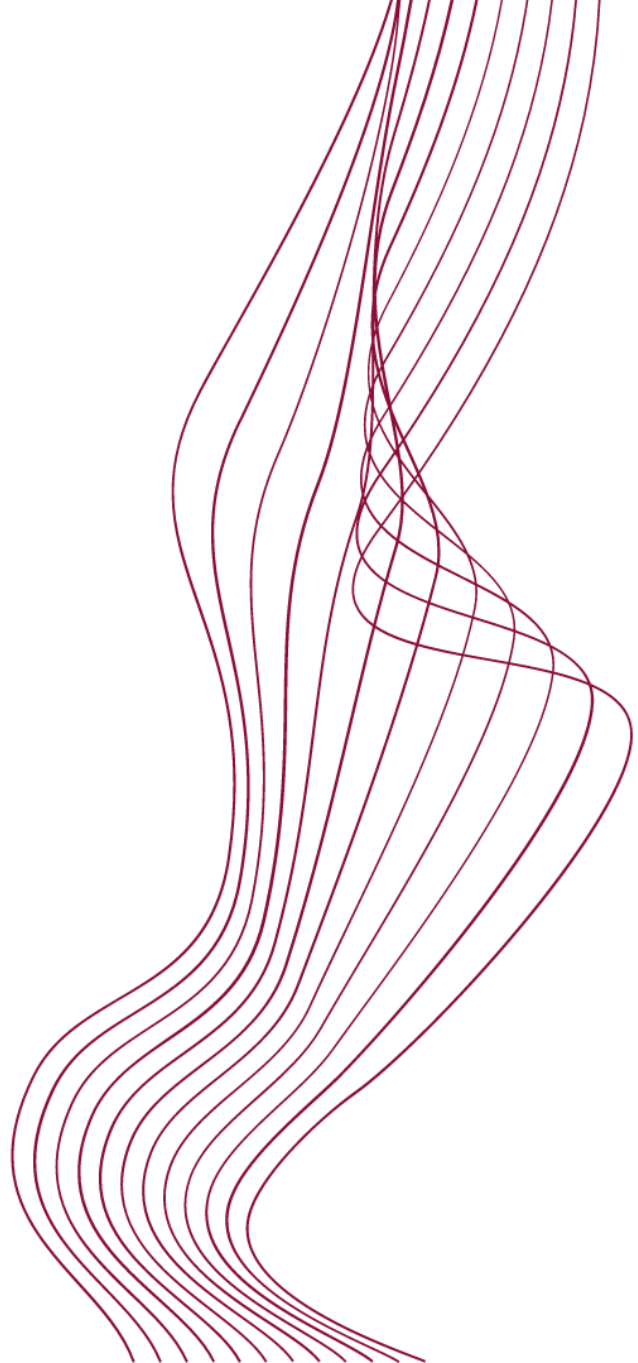
If you are ever stuck, ChatGPT and Google are your friends 😉

Business Intelligence with Kibana

January 2024

Agenda

1) Recap: Data visualizations and dashboards
2) Group exercise



Day 1: Recap

Session 1

- Course introduction
- What is Kibana?
- Setting up Kibana
- Introduction to data visualizations

Session 2 💻

- Data visualization framework in Kibana
- Intro to data for day 1: Rwanda property data
- Time series data

Session 3 💻

- Creating data visualisations in Kibana: data table, bar and line chart, pie chart, metrics annd maps

Session 4 💻

- Creating data visualisations in Kibana (cont.)
- Visualisation add-ons
- Intro to dashboard

Session breakdown: Day 2

Session 1

- Recap: Creating data visualizations in Kibana
- Maps
- Visualisation Add-ons

Session 2 💻

- How to create a dashboard in Kibana
- Create dashboard using Rwanda property visualisations
- Introduction to eSoko data

Session 3 💻

- **Group exercise:** Create own dashboards with data visualizations using eSoko data

Session 4 💻 & 🗣

- **Group exercise:** Present dashboards to group

Course objectives

Aim: **Enable organizations to explore and analyze their own data in Kibana**

Skills to learn in Kibana:

- Basic data exploration
- Creating data visualizations
- Creating dashboards using data visualizations

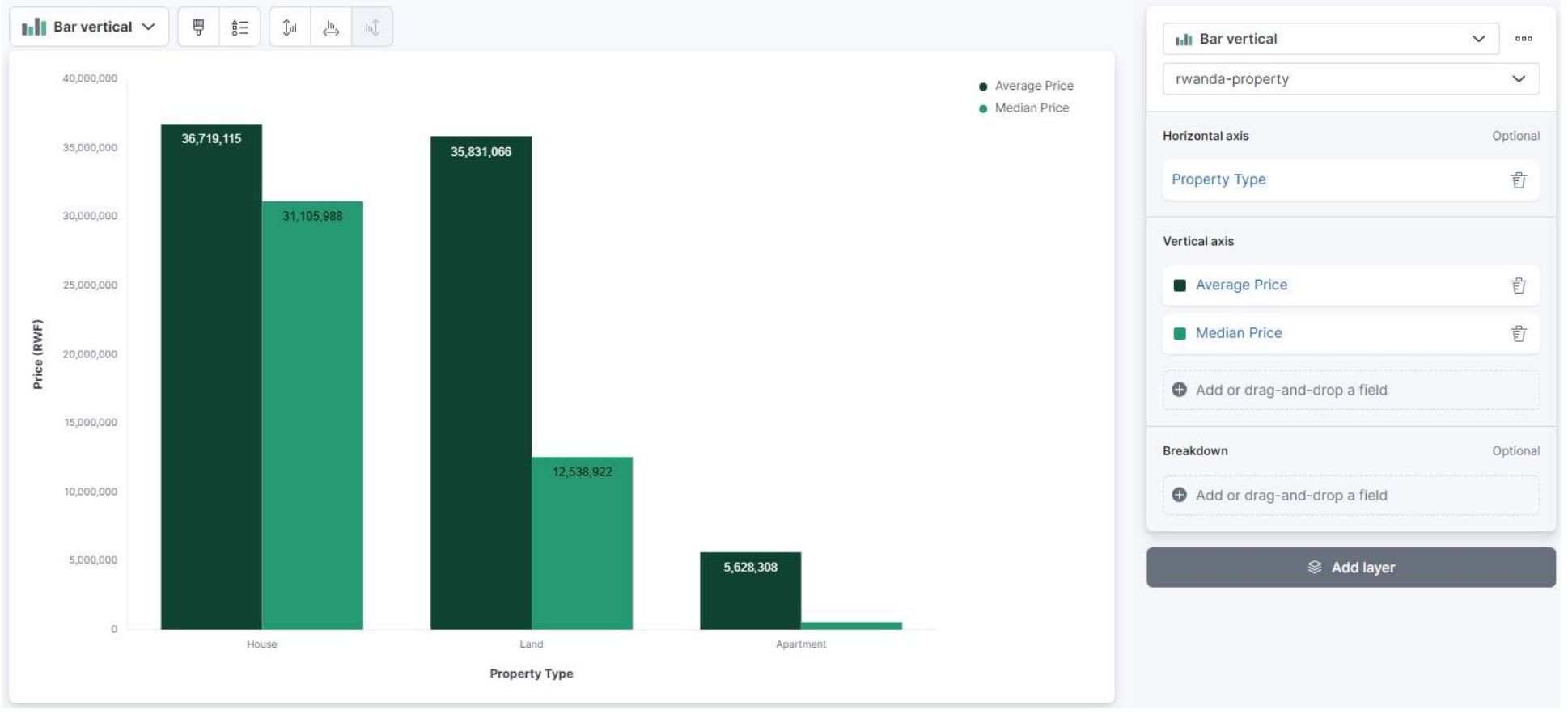
Please feel free to ask questions as we go 😀

- The best way to learn is by practising and trying things on your own and in groups
- Share knowledge in groups and learn from each other

RECAP: Creating Data Visualisations 📈

Add multiple metrics to visualisations

Add additional metrics to a bar chart to show more information about the categories chosen on your x-axis



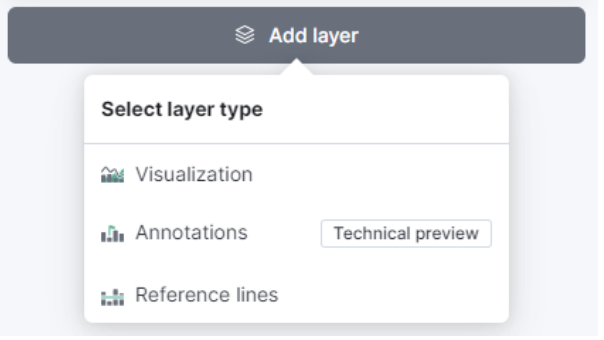
Add layers to charts

Add additional layers to visualisations created in Lens:

- Add another **visualisation** to chart. *Similar to creating a combo chart in Excel*. Remember to keep the axes the same when adding an additional visualisation layer in Lens.
  ✳ This feature is useful for bar and line charts to add an aggregated / total chart and then additionally have a split chart on the same axes

- Add **reference lines** to chart along y-axis (value axis)

- Add **annotations** to chart - dependent on having a timestamp variable in data view

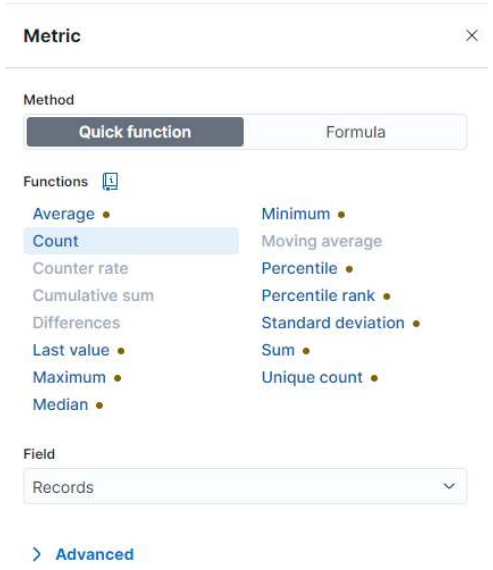


Formulae in Kibana

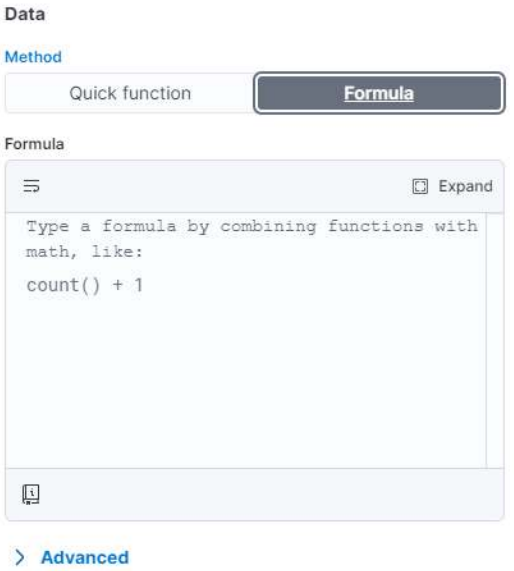
> Functions and formulae in Kibana allow you to derive meaningful metrics from your data.

To calculate a metric in Kibana, you can either select:

- **Quick function** over a field, e.g. average, sum, count, max, min, etc. OR
- **Formula** over a field, e.g. latest_value, differences, overall_sum, etc.



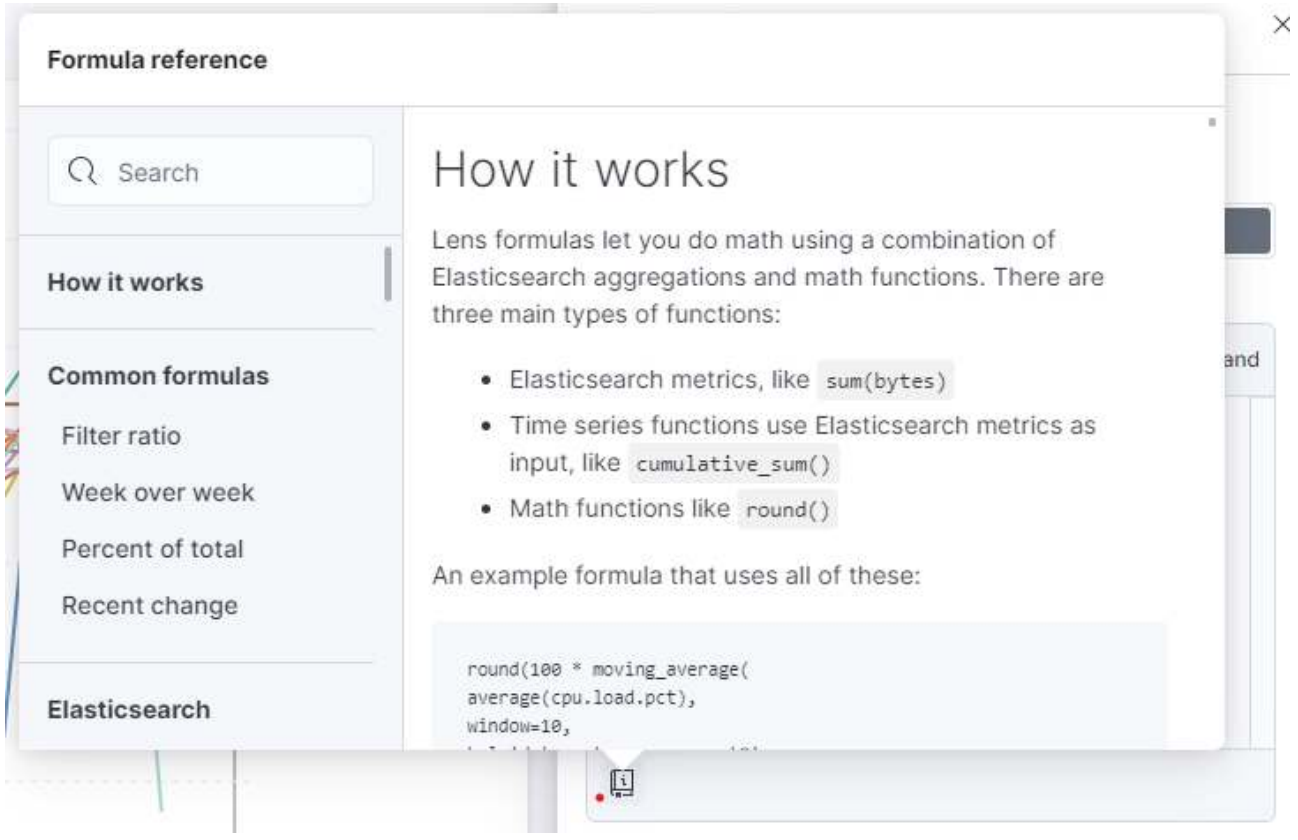
You can build simple or complex formulae in Kibana with the available fields:



71point4 cenfri Hanjo Odendaal (hanjo@71point4.com)

Formulae in Kibana

Explore how formulae can be used to build metrics tailored to your specific analysis requirements:



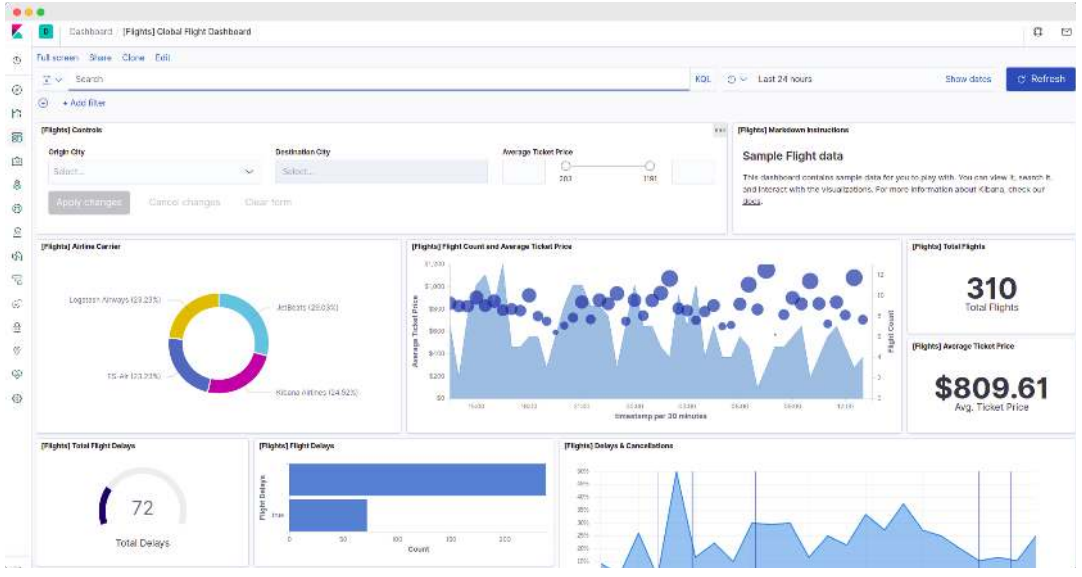
Create a dashboard 

Dashboards

Dashboards typically display related data (i.e. from the same source). Kibana allows you to:

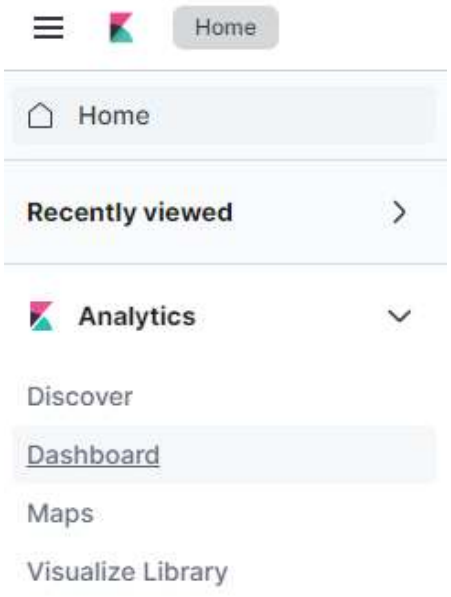
- Build dashboards based on data visualizations saved in the `Visualize library` or create visualizations specifically for the dashboard
- Control the data displayed in dashboards using **filters**
- Navigate between dashboards with **drilldowns**

> **Note:** useful to limit the number of visualizations included in one dashboard for the best user experience.

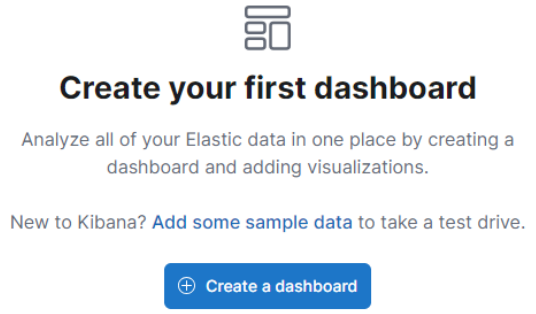


How to create a dashboard

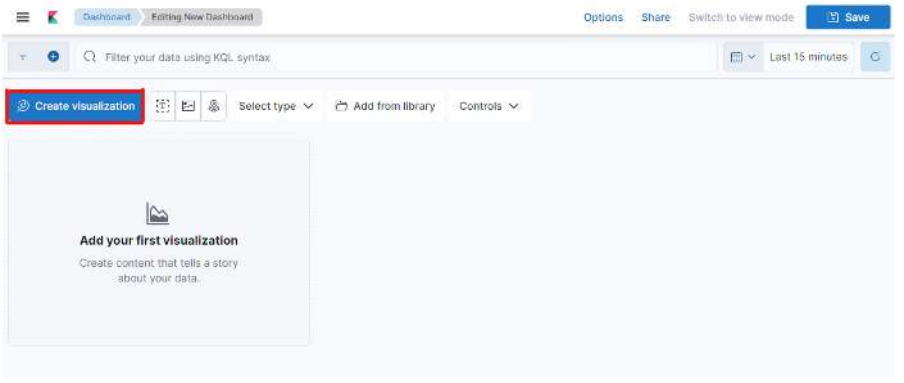
- Go to `Dashboard` sections in the Analytics app



- Click on `Create a dashboard`



- Create and add visualisations to dashboard



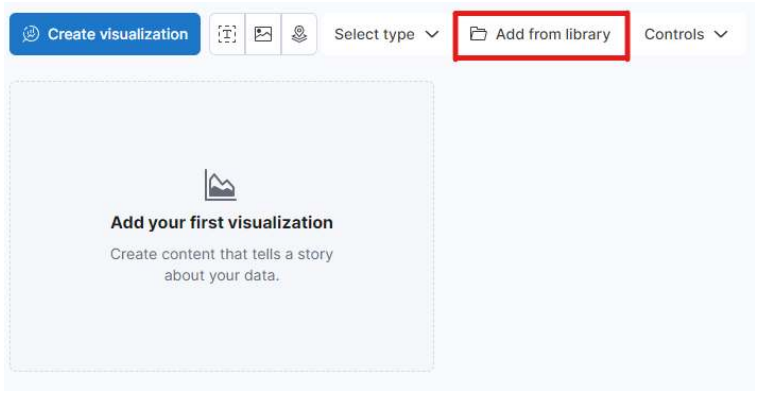
Add data visualizations to a dashboard 📈

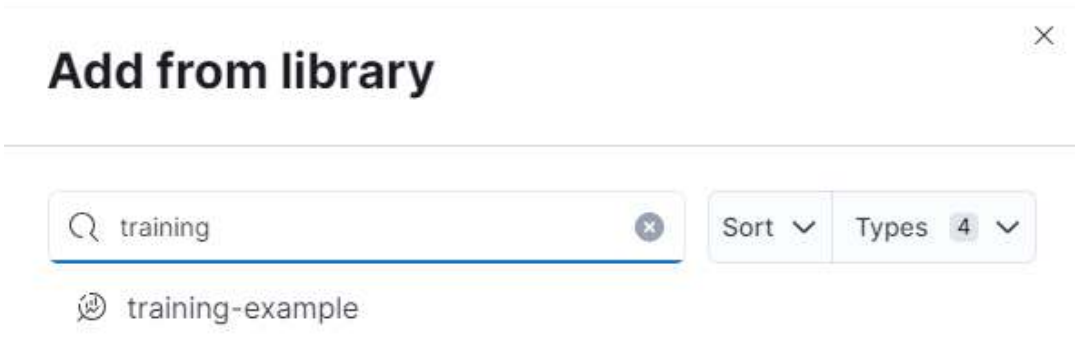
1) Import an existing visualization

To add a data visualization to a dashboard, you must be in **edit mode**

Once you have created a dashboard,

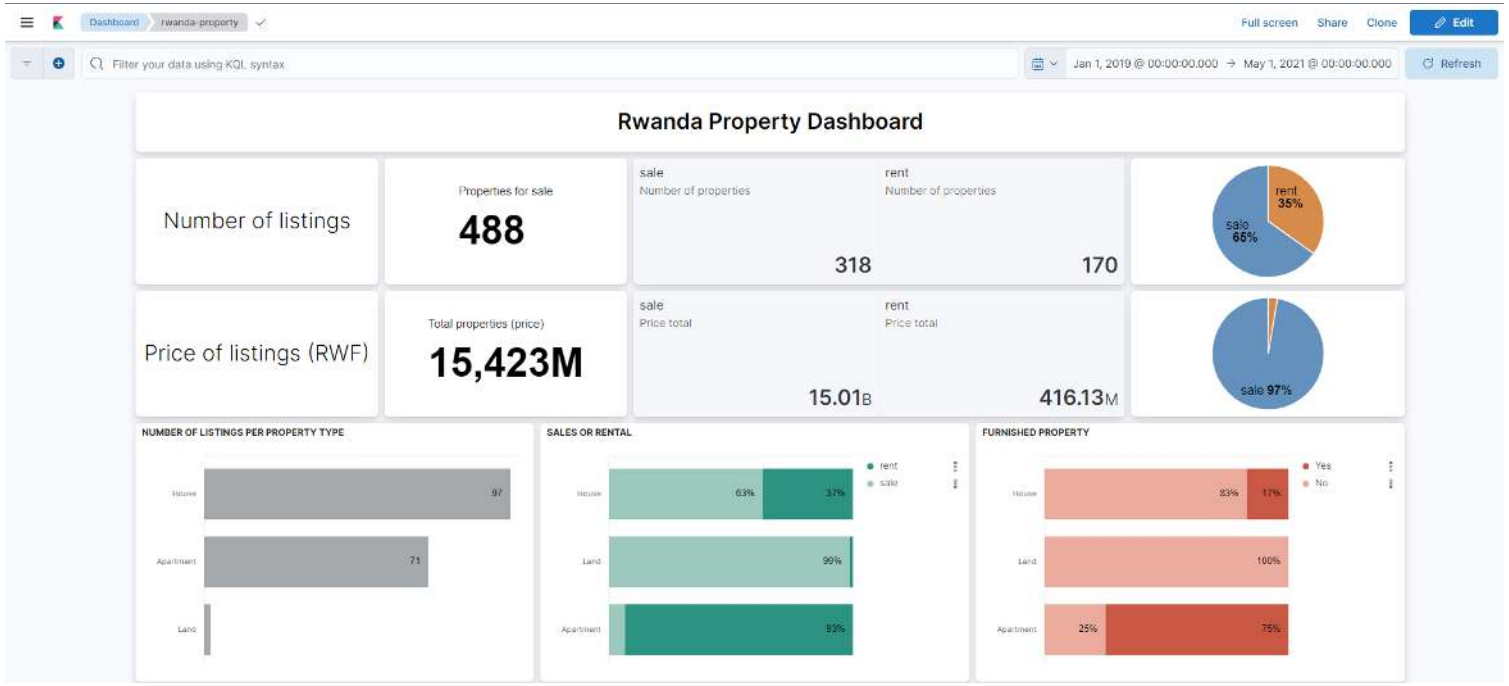
- Select `Add from library`
- Select the existing data visualizations saved in the `Visualize library` to add to a dashboard
- The data visualization will be added to the dashboard where you can move, edit and resize the visualization





Results

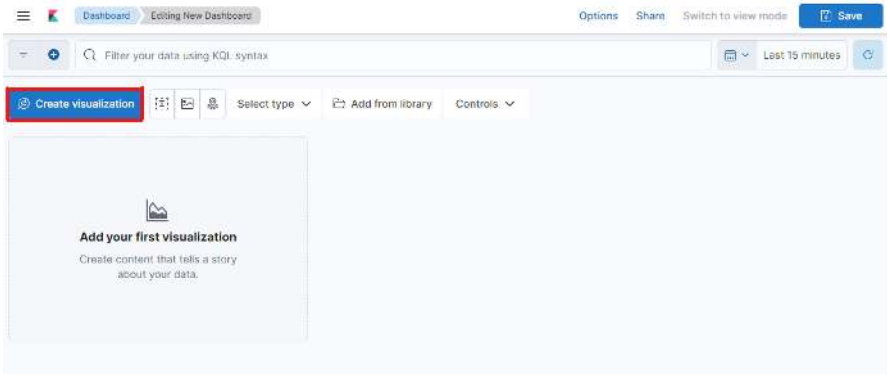
The results below show the existing data visualizations added to a dashboard



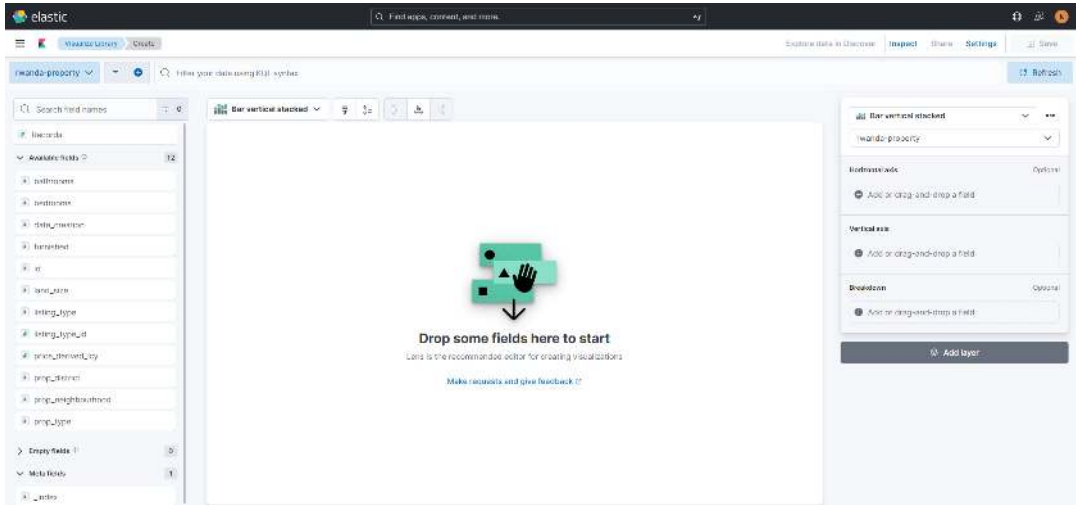
2) Add new visualization to dashboard

Lens

- Navigate to the **Lens** app by selecting `Create visualization` from within a dashboard



- Configure the visualization: select the desired data source, define the chart type, specify the fields and metrics you want to include in the visualization



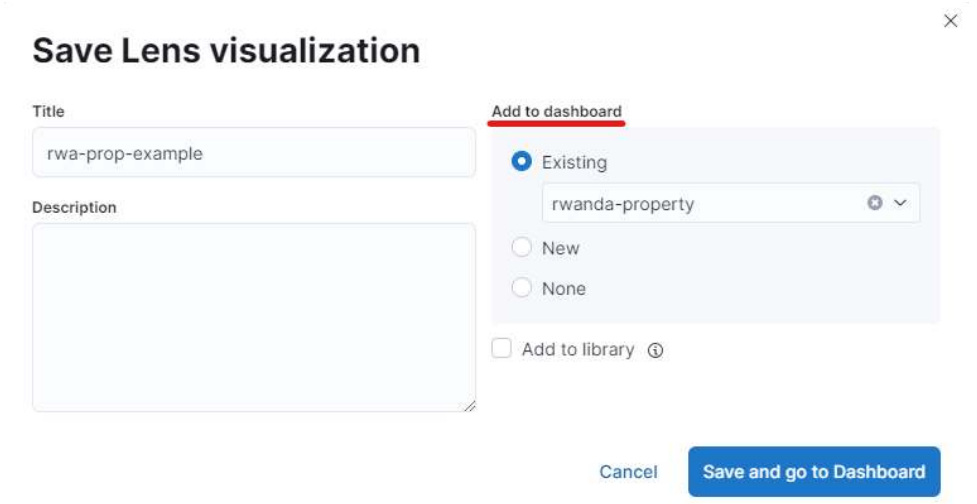
- Customize the visualization: Use the options available in the Lens app to customize the appearance, labels, axes, filters, and other aspects of the visualization
- Save the visualization

💻 Lens app demonstration

3) Save data visualization directly to dashboard

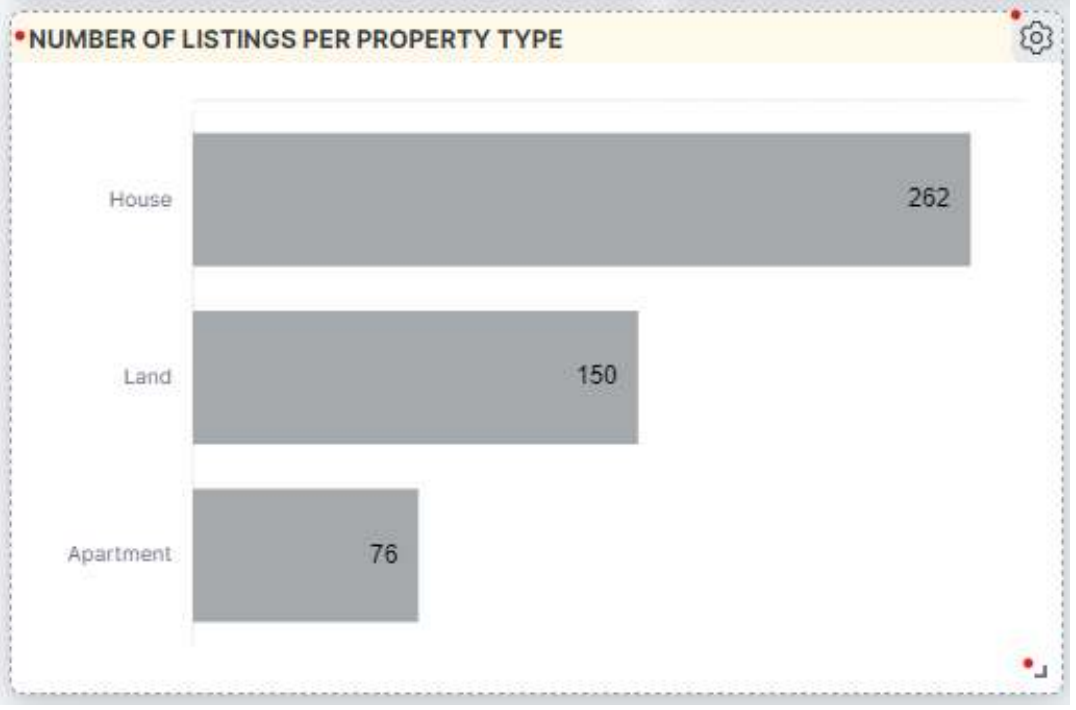
You can save a data visualization that you are working on in the `Visualize library` directly to a dashboard

- Navigate to the `Visualize library`
- Create a new visualization
- Select `Save` data visualization
  - Save visualization to an **Existing** dashboard OR
  - Save visualization to a **New** dashboard
- The visualization will then be saved to a dashboard and to the `Visualize library`



Editing a dashboard: edit mode

- **Resize visualizations**: arrow in the bottom right corner of the visualizations
- **Move visualizations**: click and drag the visualization from its panel title as highlighted in yellow
- **Rename and show/hide panel title**: click on the panel title. A pop-up window will be displayed with renaming options
- **Edit visualization**: Click on the menu gear in the top-right corner and select `Edit visualization`. This will take you to the `Visualize library` where you can edit and save the visualization

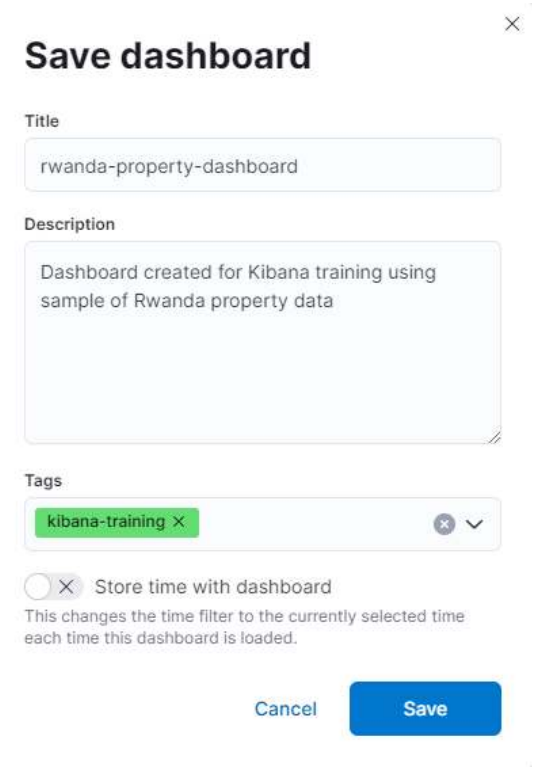


Save dashboard

Click `Save` to save added visualizations and changes made in **edit mode** to a dashboard. Add a:

- **Title:** Standardize the titling of dashboards to include the data view and dashboard description
- **Description**
- **Tag:** Useful to categorize dashboards
- **Store time with dashboard:** Save time filter with dashboard

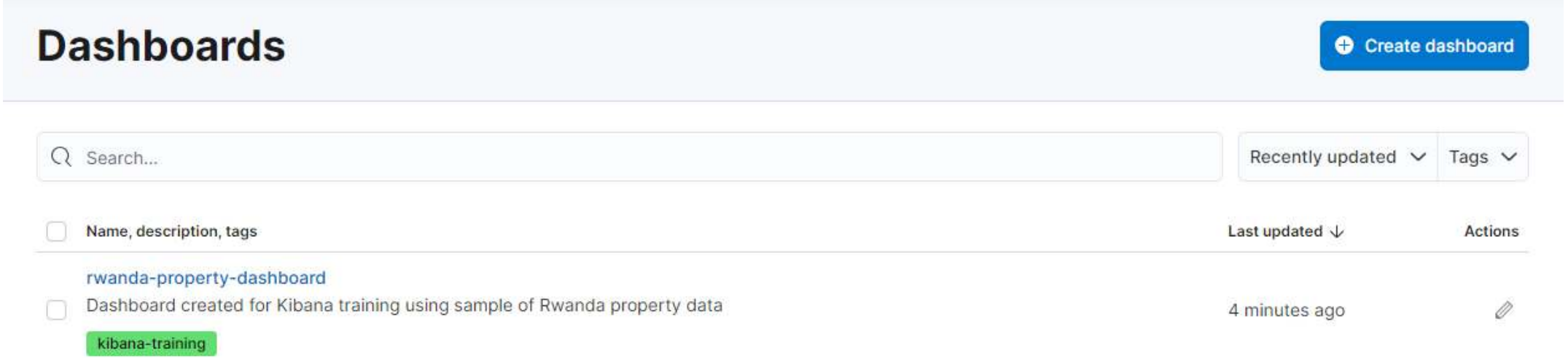
Note: Kibana will track *unsaved changes* on a dashboard. It is important to save a dashboard while you are editing it. If you want to re-save a dashboard, you can click `Save as` and save another copy of the dashboard or overwrite an existing copy of a dashboard



> Click **Switch to view mode** to view dashboard without editing options

Dashboard

The saved dashboard should now appear in the `Dashboard app` with its title, description, tag and when the dashboard was last updated



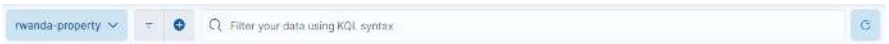
Applying filters to a dashboard

Interactivity in dashboards: filters

A dashboard filter will narrow down the displayed data in all the data visualizations included in the dashboard

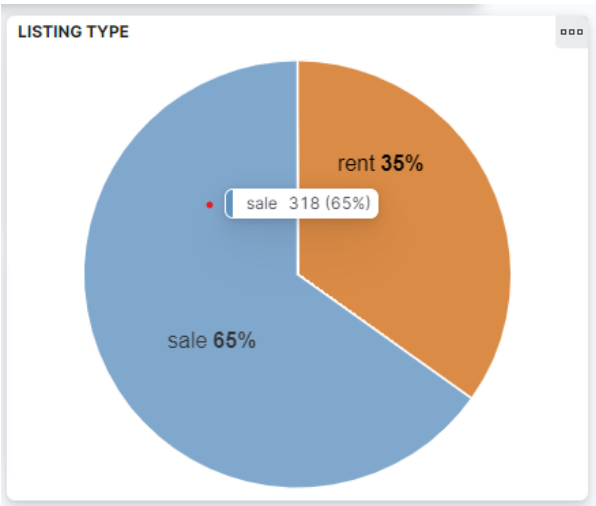
1) Using the Filter bar

- Click the `+` in the filter bar at the top of the dashboard
- Configure the filter: Select the field on which you want to apply the filter. Choose the appropriate comparison operators, such as "is", "is not", "contains", etc. Finally, enter the filter value or range that you want to include or exclude
- Click `Apply` to apply the filter to the dashboard
- You can add multiple filters to a dashboard by repeating the steps outlined above, furthering narrowing down the displayed data



2) Using a data point in a visualization

- If you click on a data point in a data visualization, such as a bar of a bar chart, or a slice of a pie chart, Kibana will create a filter on that data point
  Example: if you click on the male segment of a pie chart, Kibana will apply a filter where gender is "Male"

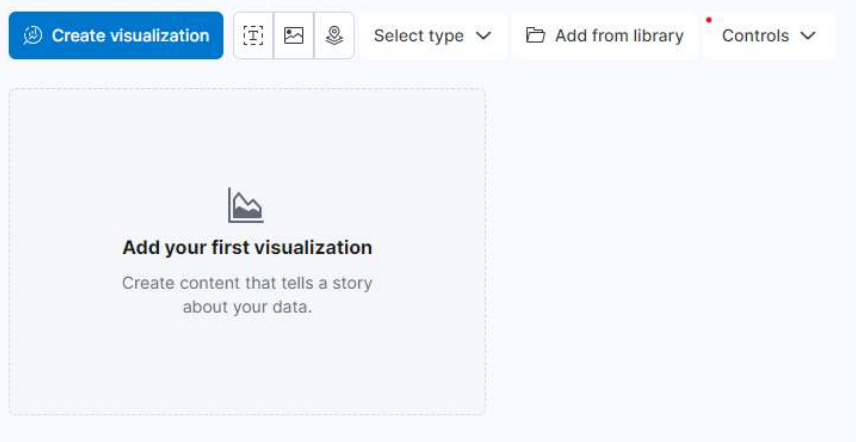


Interactivity in dashboards: filters

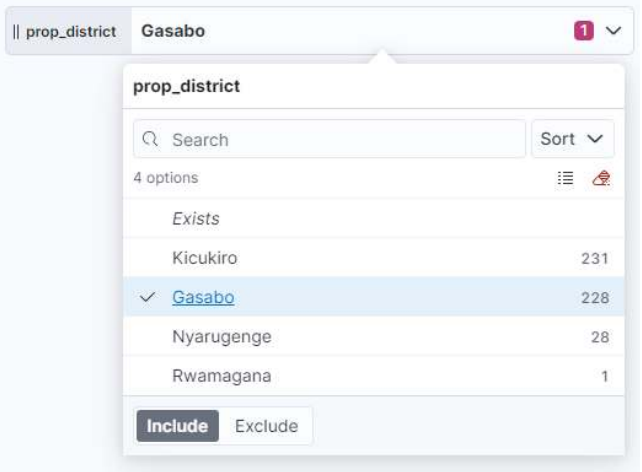
3) Filter dashboard data with controls

> Controls are interactive panels you add to your dashboards to filter and display only the data you want to explore

- Click on `Controls` and then `Add control`
- From the **Data view** dropdown, select the data view with the field you want to appear in the **Control**
- In the **field** list, select the field with the documents you want to filter. **Note:**
  - A **string field** will create an *Options list*
  - A **number field** will create a *Range slider*
- Click on field values in control to apply a filter. The eraser will clear selected field values



Options list control example:

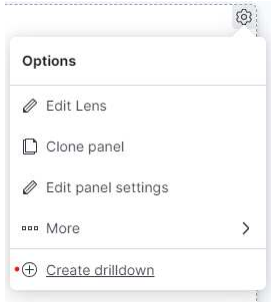


Interactivity in dashboards: drilldowns

Drilldowns allow you to customize interactive behaviour while keeping the context of the interaction
Examples: Navigating to a dashboard or an external URL

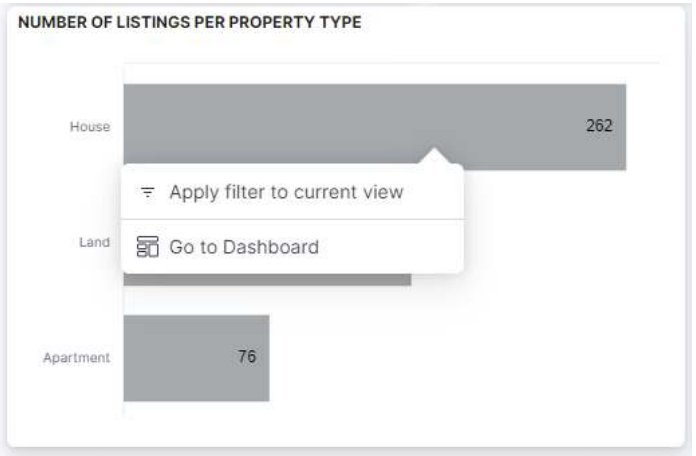
Dashboard drilldowns:

- Open an existing dashboard in edit mode
- Click on menu gear of a specific visualization - select `Create drilldown`



Note: When you click on a data point to apply a filter on the visualization with a drilldown, you will get an option to either apply filter to the dashboard or to navigate to the destination dashboard of the drilldown

- Click `Go to dashboard`
  - Give the drilldown a name
  - From the **choose a destination dropdown**, select destination dashboard for the drilldown
  - Choose which details to retain in drilldown
  - Click `Create drilldown`
- Save the dashboard



Adding markdown text to dashboard

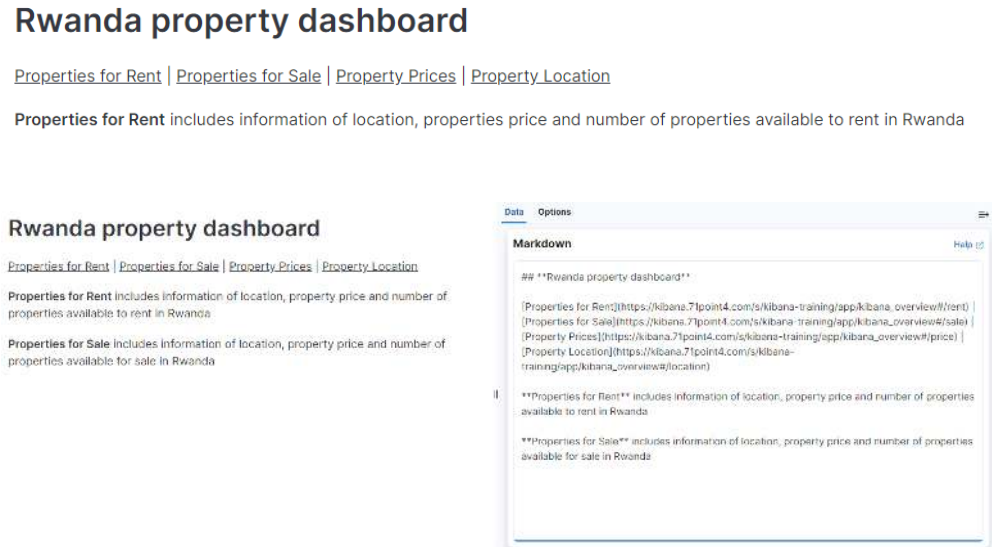
Create a text panel on your dashboard

- Click on the **text tool**
- Create text in markdown and add links to the text

Useful markdown syntax:

```
## Heading
__Bold__
_Italics_
[Link](insert link URL)
```

- Text panel allows you to easily navigate between dashboards - click on linked dashboards



✳ You can also use the TSVB visualisation tool to create customisable buttons and links using markdown and CSS code. Read more here: Navigation bar for Kibana

Day 2: eSoko data

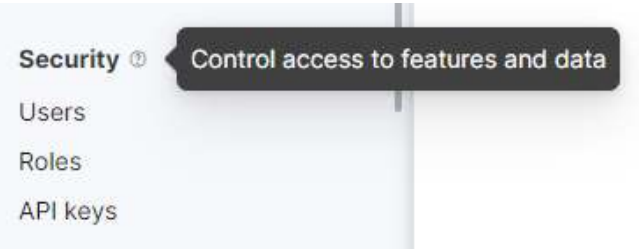
- Launched in 2008
- Commodity price database at MinAgri
- Provides market prices over SMS to smallholder farmers
- Provides a powerful data collection and digitalization tools, biometric profiling, analytics and communication services
- Services such as digital credit, insurance, payments and transaction services

Source: eSoko: Who We Are

Upload data to Kibana 📁

Access Control in Kibana

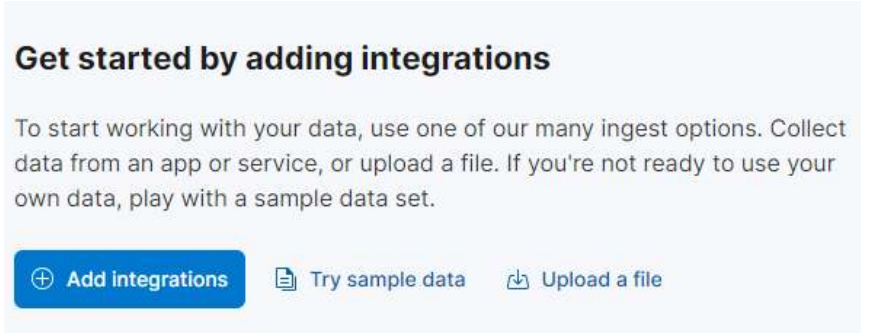
- **Users:** View, create and manage user accounts
- **Roles:** Kibana has role-based access control to manage user permissions. Each user is assigned a role, and roles define what actions users can perform.
- **Privileges:** Associated with roles. When you create or edit a role, you can define the specific privileges that users with that roles will have. These privileges include access to specific indices and data views across spaces.
- **Spaces:** Allow you to organize and segregate dashboards, visualisations and other saved objects.

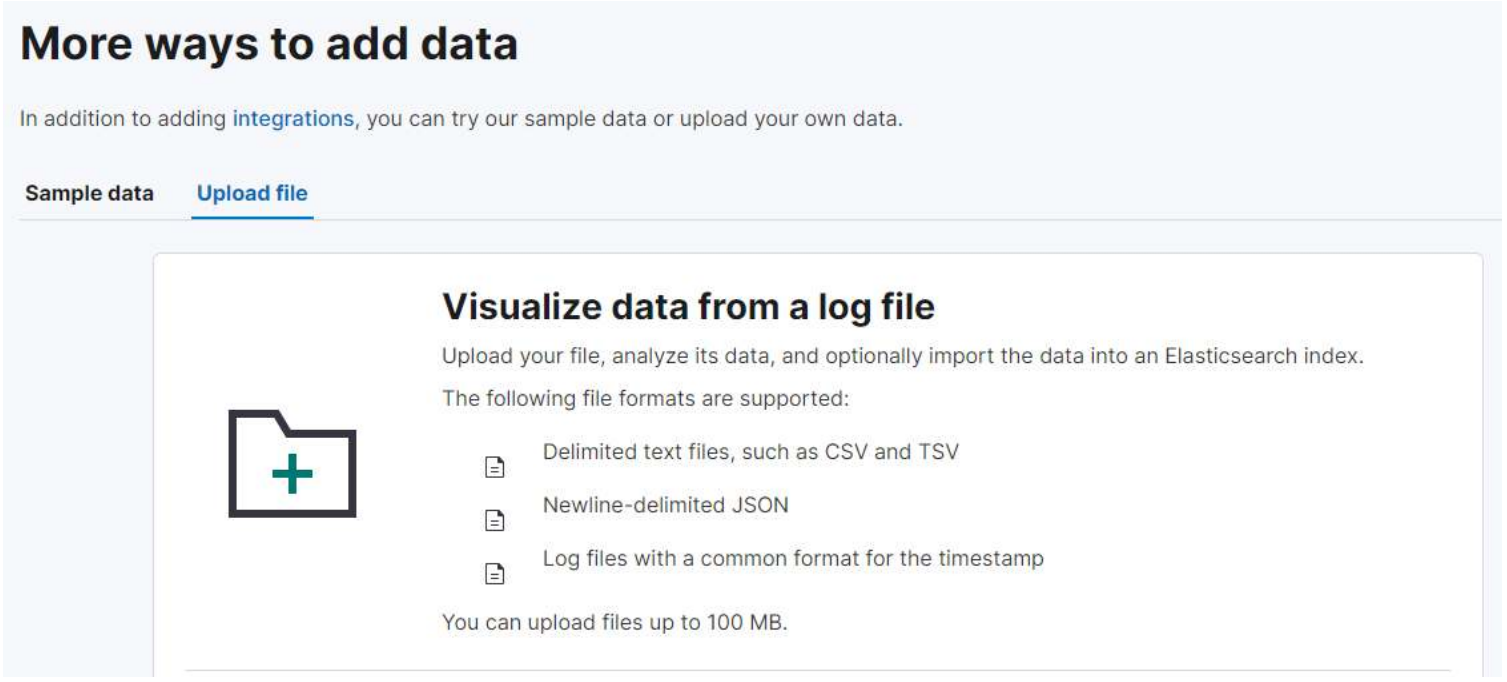


✳ Creating an index and data view in Kibana requires a role with specific privileges. Within your institutions, you can ensure that roles are configured with the necessary permissions for index access, data exploration, and visualisation/dashboard creation

💻 *Demonstrate roles and privileges created for Kibana training*

Upload data to Kibana





eSoko data

The **eSoko data** contains information on commodity prices collected in different markets in Rwanda. Fields in the data include information on:

- **Commodity name** and **commodity code** in eSoko system
- **Market price** of commodity (3 prices collected) and **average market price** across the three prices collected
- **Wholesale price** of commodity (3 prices collected) and **average whole price** across the three prices collected
- **Total farmgate price** of commodity (3 prices collected) and **average farmgate price** across the three prices collected
- **Market** at which price was collected (as well as corresponding province and district of market)
- **Date** when the price was collected

Price definitions:

- **Market price:** Selling (current) price of commodity when bought or sold at market
- **Wholesale price:** Price charged for commodity sold in bulk to distributors
- **Farmgate price:** Market value of commodity minus the selling costs (i.e. transport and marketing)

Discover app

Explore eSoko data view in Discover:

- How many available fields are there?
- What is the timestamp field?
- How many documents are there in the data view?
- What time period does this data cover?
- How many commodities are included in the data?
- Which commodity has the most records?

Group exercise 📈

Group exercise

Create linking dashboards in Kibana:

1. Showcase **commodity prices** across different markets in Rwanda
2. Showcase commodity price **trends** over time

✳️ Use appropriate visualisation types to display information on **Market Price, Wholesale Price** of different commodities on your dashboard

45:00

Data visualization with Kibana: Wrap up

Aim: **Enable data exploration and analysis of data in Kibana**

Skills learnt in Kibana:

- Data exploration and visualisation skills
- Creating data visualizations with various visualisation types
- Creating meaningful dashboards using data visualizations