Causality Link Software-as-a-Service Documentation

Last Updated: September 2023

The objective of Causality Link Software-as-a-Service ("SaaS") is to provide decision makers, analysts and researchers with a toolkit to explore the knowledge extracted from millions of news articles in a "wisdom of crowds" manner. Users can explore the past and future performance of countries, companies and industries.

The knowledge available in the SaaS application is based on a licensed worldwide collection of news articles written in 27 languages over the last 9 years coming in at a rate of 50,000 new articles each day. The first source in this collection comes from Moody's, which is an aggregator and distributor of 8,000 worldwide newspapers. The second source is MT Newswires which is a publisher of financial news. This set of content covers the full range of newsworthy topics relevant to markets.

The knowledge extracted is composed of a "Signal" and "Model", each of which apply across the country, company and industry categories.

The "Signal" is scored on a scale of 0-100 and measures the positive trend percentage ("PTP") for each indicator.

- A PTP of 0 indicates all authors are saying that the KPI is decreasing.
- A PTP of 100 indicates all authors are saying the KPI is increasing.
- A PTP of 50 indicates an evenly split consensus.

Each indicator is based on a Key Performance Indicator ("KPI") with additional descriptors providing the context in which the KPI was found. These descriptors take the form of a Location, Company, Product, Industry.

The "Model" is a representation, either in a graph or table, that displays the Causal Links (or relationships) between indicators. An example of a causal link is the relationship between USA-Interest Rate and USA-Inflation Rate.

The rest of this document describes the usage of the Causality Link SaaS software.

1. **The upper bar**

All the top panels which we will describe contain an upper bar that enables navigation between them.

The left part of the bar enables the user to toggle between the Dashboard panel ("Trending), the Portfolio panel, the Texts panel ("Analysis") and the Novelty Report panel. We are describing each of these panels in this document.
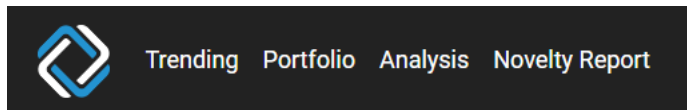
The right part of the bar gives access to a search mechanism, this documentation, and a pull-down menu for user customization.
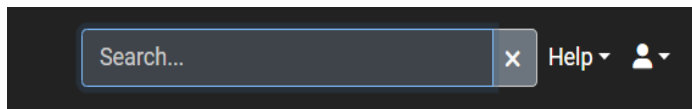
The search mechanism works for Locations, Industries and Companies, and gives access for the selected item to four specific panels (Signal, Indicators, Model and Events) related to the searched entity. These panels are described in this document.

Note that these specific panels apply to specific levels in the ontology, and the system will automatically position the selection to the appropriate level. For example, these panels only work at the country level, so if you type "Paris" the system will suggest you "France" or if you type "Salt Lake City", the system will suggest "USA". If you type a ticker symbol, the system will suggest the public companies using this ticker symbol, and if you type the name of a product like "PS4" or "ES8", it will suggest the name of the lowest level listed company manufacturing this product (here "Sony" or "NIO").

The user customization pull-down menu gives access to Favorites, the Time Machine, User parameters and the ability to Logout. These customization features are described in the Appendix part of this documentation.

2. Dashboard – Default Landing Page

a. Top Indicators

    i. This report is intended to serve as a daily summary of what is being discussed in the day's news. The five donut charts follow the five key concepts modeled in the Causality Link ontology.

    ii. To drill into any concept and to find articles about that topic, click on any part of the donut chart, or make the selection within the five drop-down boxes below the donut charts. To reset, press the "X" to the right of the drop-down boxes.

    iii. To adjust the time period, change the dropdown and select between "Forecasts", "Past and Present" or "Any Timeframe".

    iv. To access the source text from which the signal was extracted, click the article title in the text table below the drop-down boxes.

    v. To filter the donut chart and associated articles to only the companies within a portfolio, press the "star" in the top right corner and select the portfolio.

    vi. To export a spreadsheet with the sentence mentions, including the Location, Indicator, Industry, Company, and Mention, click the download button.
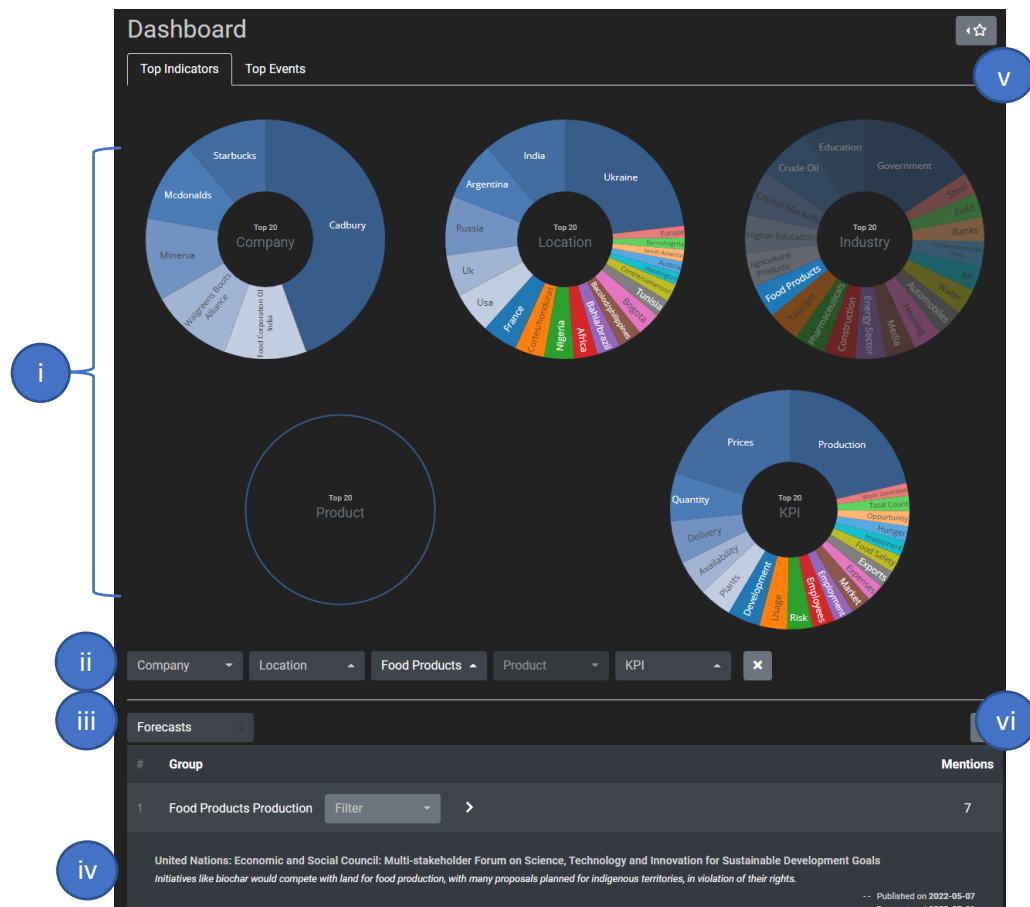
b. Top Events
   i. This report is intended to serve as a daily summary of the <u>events</u> being discussed in the day's news. The six donut charts summarize the event metadata modeled in the Causality Link ontology.
   ii. To drill into any event parameter, click on any part of the donut chart, or make the selection in the drop-down boxes below the donut charts. To reset, press the "X" to the right of the drop-down boxes.
   iii. To adjust the time period, change the dropdown and select between "Forecasts", "Past and Present" or "Any Timeframe".
   iv. To access the source text from which the signal was extracted, click the article title in the text table below the drop downs boxes.
   v. To filter the donut chart and associated articles to only the companies within a portfolio, press the "star" in the top right corner and select the portfolio.
   vi. To export a spreadsheet with the sentence mentions, including the Type of Event, the Industry (or Segment), the Location and Person, click the download button.

3. **Portfolio**
   a. <u>Default Portfolio</u>
      i. The Default Portfolio is a prepopulated list of 20 companies that are commonly in the news and operate in a variety of sectors.
      ii. Model: To access the Causality Link Causal Model for the company, click the ⬚. More information for the Causal Model described below.
      iii. Signal: To access the Causality Link Signal for the company, click the ⬚. More information for the Signal described below.
      iv. Indicators or Events: To access the Causality Link Indicators or Events for the company, click the ⬚ or ⬚.
      v. Recent Mentions: Over the last 7 days, the total number of mentions of indicators of the company, by day. Selecting a bar will select the corresponding day.
      vi. Recent Topics: The KPIs most frequently mentioned during the selected day, initialized as of today. Selecting a KPI will open a new panel corresponding to the quotes of the day including that KPI or one of its descendants, as well as the title of the article in which they were found and the attribution of the article.
      vii. Stock statistics are provided, delayed up to 15 minutes.
      viii. Portfolio: To view another portfolio, or build a new portfolio select the ⬚.
      ix. Alerts: To change whether daily email alerts will be sent to you for the companies listed within each portfolio, select the ⬚.

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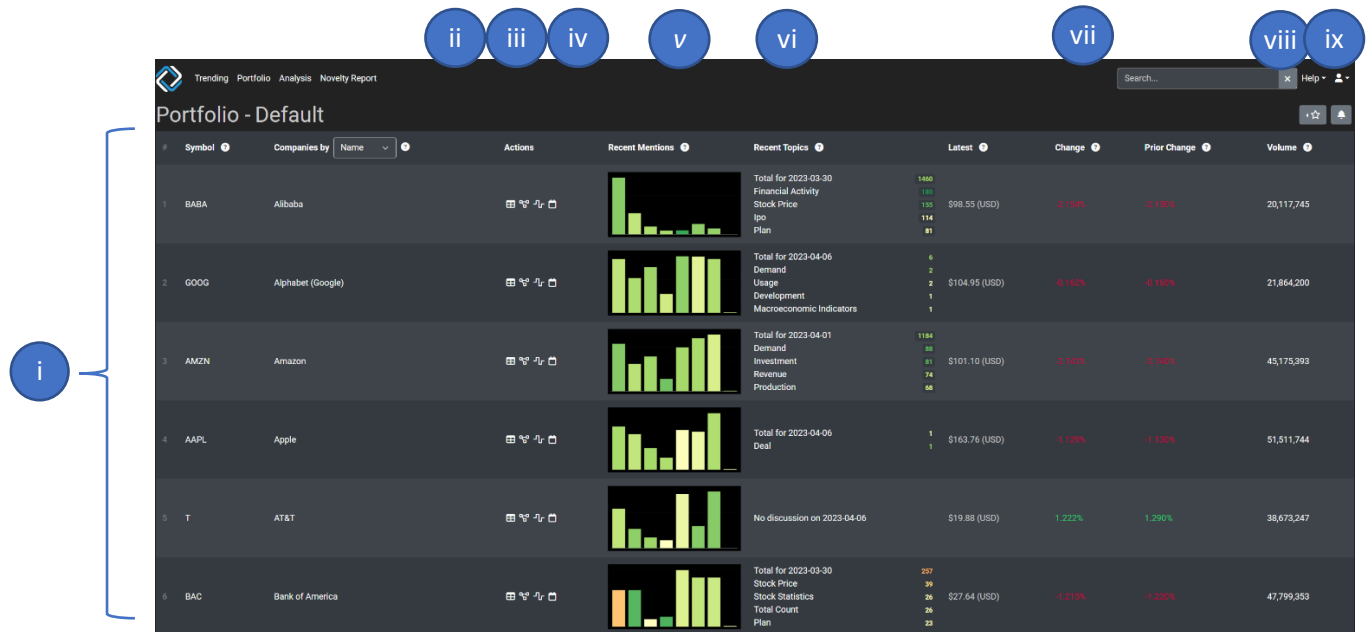
b. <u>Creating a New Portfolio</u>
- Click on the Star button, then "+ New Portfolio", then enter a name, then click the newly named portfolio.
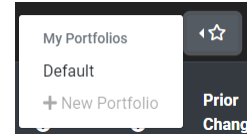
- To add equities to the new portfolio, click the "+" sign on the left side of the page. The search function allows Companies to be added based on the Company name (Goldman Sachs), possible synonyms (Goldman) or Ticker Symbol (GS). Industries and Countries can also be added to a portfolio to monitor their activity. It is also possible to add companies in bulk by selecting the "Or click here to add in bulk" option.
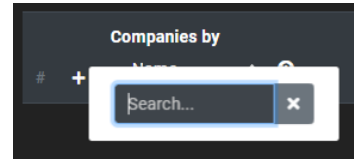
c. <u>Email alerts</u>
- Click on the Bell button to access the blank alerts panel:
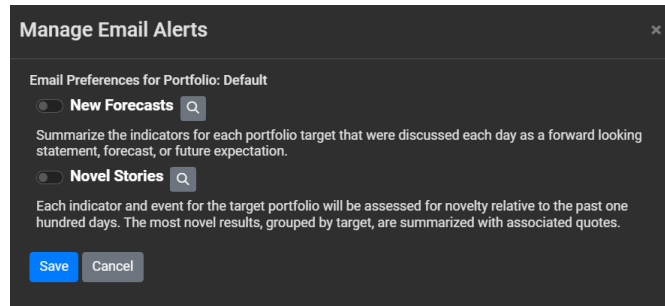
- You can then either focus on forecasts for indicators/trends or also add events, by toggling the New Forecasts of Novel Stories.

- If you select New Forecasts, you will be able to modify a few parameters in the query, the only compulsory one being the Min Mentions. If you set it low (1 or 2) you will have more alerts and more errors. Above (that is 3 or 4) seems to be the sweet spot, and above again (5 or more) is restricted to the major news.

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- If you select Novel Stories, you will receive an email on new indicators, trends and events based on their novelty, that is the percentage of similar mentions in the last 2 days vs the last 100 days, with a minimum of 20%.
- If you are not interested in all the KPIs or Events that are available, it is possible to select a subset of them in the "Novelty Report" panel and save this selection as a named filter. This name should be selected in the pull-down menu of "Saved KPI Selection" or "Saved Event Selection".
- Email alerts are generated daily to the email of the user right after 12 am UTC.

4. Analysis: accessing the full texts of the corpus

Licensed SaaS users have the right to browse through the corpus of texts licensed by Causality Link.


The numbers in grey indicate the number of indicators detected, green is for trends, blue for causal links and orange for events.

The search bar enables keyword search across the corpus, while the star icon gives access to a pull-down menu of portfolio which can be used to filter the articles.

For more customization, one can open the modal window bar on the upper left side of the window: ⬌.

This opens a temporary panel which will let the user select the publishers, authors, or languages of choice, as well as specify some time window for the searched texts.

That panel can either be pinned (or unpinned) using the [pin button] button or closed using the right bar to that panel [◁].
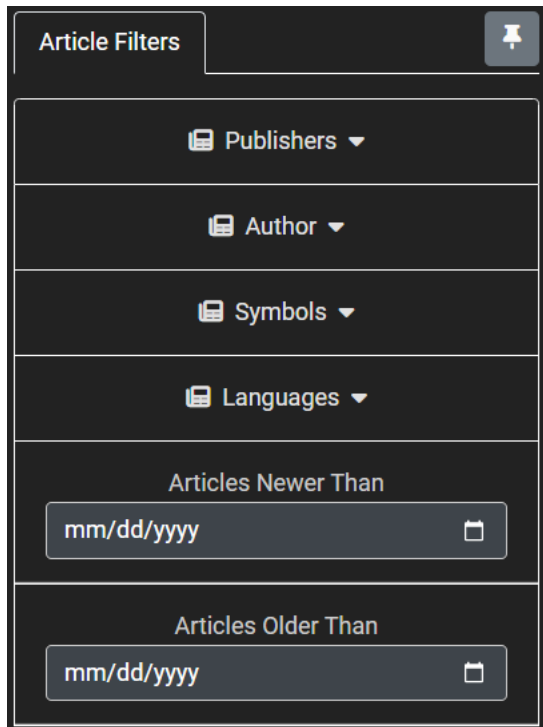
Symbols refer to ticker symbols or company names and enable filtering texts to only those who contain a recognized reference to the selected companies.

5. Novelty Report and Alerts

a. To generate a set of documents using the "Novelty Report", one has first to select a portfolio as the current portfolio, otherwise the "Default" portfolio will be used.

b. The configuration panel is used to choose the number of past days (up to 7) scanned for relevant documents as well as to filter on all mentions or just the ones that correspond to a forecast.

c. Once the desired changes in the configuration panel are done, the "Run Query" button triggers a query to the data lake to refresh the results.

d. Any selection below the line will have an instant effect on the panel. For example, increasing the Minimum Novelty will tighten the filtered results to just the most novel ones, selecting or unselecting the "Causal Links", "Events" or "Indicators" toggle will filter mentions containing these detections. It is also possible to select the top KPIs of the Novelty Report by selecting them in the KPI selector. Multiple selections are authorized and selecting a high level KPI is equivalent to selecting all the lower-level ones. However, they can be unselected individually.

e. The main topics are the companies, industries or countries that were in the portfolio, and which are the current context of the detections.

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f.   The texts correspond to the transformation by a LLM of the quotes resulting from the Novelty filtering. The Novelty Score is the percentage of relevant detected mentions in the N past days over the mentions of the same display KPI tree + Target detected in the past 100 days. If N is 1, and the mention is detected at the same frequency every day in the past 100 days, the Novelty Score will be 0.01. However, if that detection never happened in the past 100 days but for today, the Novelty Score will be 1.00.

g.   The quotes are available by selecting "Show Quotes" and the full texts from which they were extracted are available when "Read" is selected.

h.   It is possible to save such KPI or Events selections as reusable Novelty Report filters using the button in the upper right part of the window.

6. Entity specific panels

Four panels are dedicated to single entities among companies, industries, and countries. For each entity, these panels correspond to the detected indicators events, trends, and causal links. The main way to access these panels is to type the name of the entity in the upper right "Search" bar.

Once in any of these four panels, a second top bar appears below the initial one.

The left part of that bar enables the selection of any one of the four panels by clicking on any of the four icons, representing, from left to right: Indicators, Causal Links, Trend Signal (over 18 months), Events:
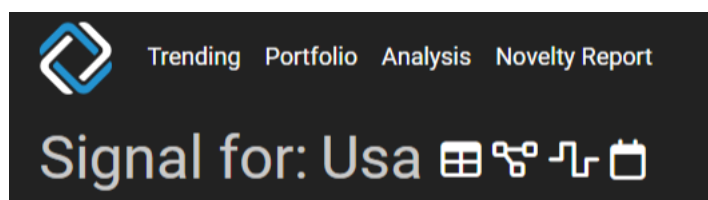
The right part of that bar contains a fixed part and a variable part. The fixed part is the "Toggle Filters" button whose action is explained in the Appendix.

The Events and the Causal Links panels only contain this part.

The Trends Signal panel adds the button "Reset Charts" which resets the parameters of the charts at their default value.
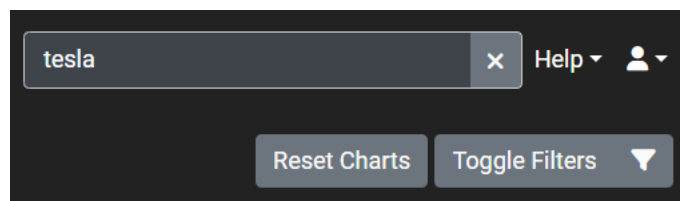
The Indicators panel adds the "View Headlines" button which opens a panel containing a summary of the news containing at least one detection of a KPI for the selected entity.

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6.1 Entity Indicators

For simplicity, we will here use a company as the entity, but the panel is unchanged for any industry or country.

This panel provides a summary for the most discussed key performance indicators for an Entity.

a. To change the sorting, change the "Indicators by" drop-down in the first column or press the column header on which to sort. Select the name of any indicator to view the drivers of that indicator (see 6.1.1).
b. Recent Mentions: The number of mentions of the indicator in the last 7 days.
c. Recently Discussed: The KPIs most recently discussed in the last 7 days.
d. Causal Links: The number of causal statements citing a driver of the indicator
e. Forecast: The Positive Trend Percentage, or PTP, that measures the percentage of forecasted trends that are upward. >50% represents a bullish forecast, <50% represents a bearish forecast, 50% represents a split consensus. Selecting the slide bar will open another panel explaining the evolution of this indicator in the past 18 months (see 6.1.2).
f. When pressed, this button will show a graph for each of the KPIs of a company that compares the KPI history vs the stock price of that company. It is not operating for countries and industries.

#	Indicators by (Causal Links)	Recent Mentions	Recently Discussed	Causal Links	Forecast
1	Intel Production	438	Production 334 Supply Chain 53 Plants 37	341	86
2	Intel Revenue	170	Sales Volume 50 Sales 41 Deliveries 35	232	79
3	Intel Demand	125	Demand 40 New Orders 23 Customer Demand 20	176	98
4	Intel Profit	71	Results 36 Profit 15 Net Income 7	159	64
5	Intel Employment	65	Employees 37 Employment 20 Productivity 7	136	75
6	Intel Market	92	Market 86 Addressable Market 6	120	60
7	Intel Assets	207	Intellectual Property 130 Patent 35 Properties 27	83	50
8	Intel Risk	56	Risk 50 Risk Mitigation 5 Security Risk 1	80	33
9	Intel Investment	119	Investment 114 Capex 5	79	96
10	Intel Expenses	92	Expenses 92	75	70

Indicators of: Intel   Toggle Filters

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6.1.1 Drivers of Indicator

This page is intended to serve as a tabular causal model for the selected Indicator (target).

a. The score at the top of the page is the forecasted Positive Trend Percentage for the target indicator (Intel Profit on the screenshot below) for the current date.
b. To change the grouping mechanism, change the "Drivers grouped by" drop-down.
c. To change the sorting, change the "Then ordered by" drop-down.
d. Recent Mentions: The number of references to this indicator in the past seven days. You can click this number to see all the source text.
e. Forecast: The forecasted PTP for that indicator. To reveal underlying data and source texts that were leveraged to create this statistic, press the Forecast bar (more on this below).
f. Relationship: The Positive Relationship Percentage. A negative score reflects a negative relationship, a positive score reflects a positive relationship. The white box shows the recent range of the relationship. To reveal underlying data and source text that were leveraged to create this statistic, press the Relationship bar (more on this below).
g. Last Quoted: Refers to the date when the causal relationship was last mentioned.

6.1.2   Trends Signal over time

Upon selection of any Indicator Forecast slide bar, an embedded panel will expand to display the monthly evolution of that forecast over the past 18 months. That panel can have three different formats for this evolution and the orange arrow shows how to select the desired display format.

 e-1 displays the monthly number of positive trends (green) and negative trends (red).

e-2 displays the trends over time for the selection and applies a statistical significance. Taller bars mean that the signal is less significant. Shorter bars mean that the signal is more significant.

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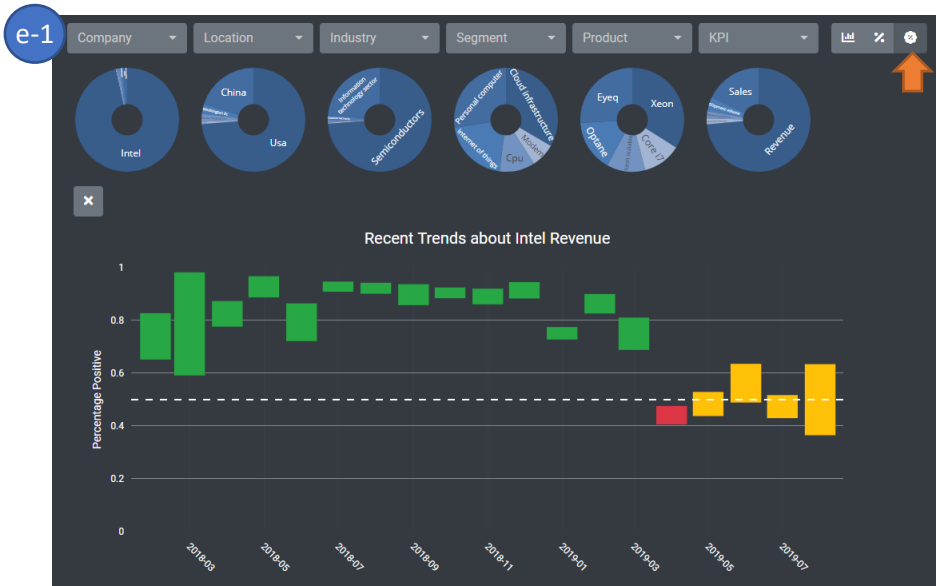
e-3 displays the monthly evolution of the total number of mentions for the indicator.
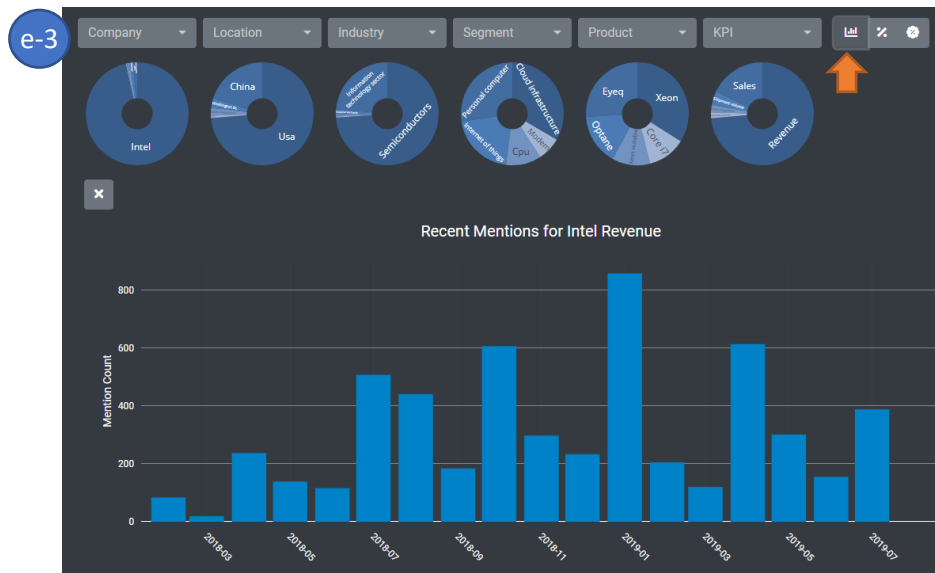
For each of these three formats, it is possible to filter the detections and their count by using the pie charts above the bar charts or the associated pull-down menus.

Selecting any of the bars gives access to the underlying quotes and selecting any of them give access to the full text.

It is also possible to download the displayed mentions in a spreadsheet for further treatment.

6.1.3 Causal Links over time

Selecting a "Relationship" slider (see 6.1.1) will expand in place a new panel which displays the individual detections of that causal relationship over time.

f-1: This scatter plot charts each mention of the relationship with the corresponding strength (y-axis) over time (x-axis).

f-2: To change the date range, change the window on the x-axis.

f-3: To navigate to the source text, click on the text.

f-4: To go to the Reader for quick scan of all selected texts, click on "Read Articles" button.

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6.2 Causal Model

The Causal Model is intended to serve as a graphic representation of the major drivers acting upon an entity: company, industry or country.
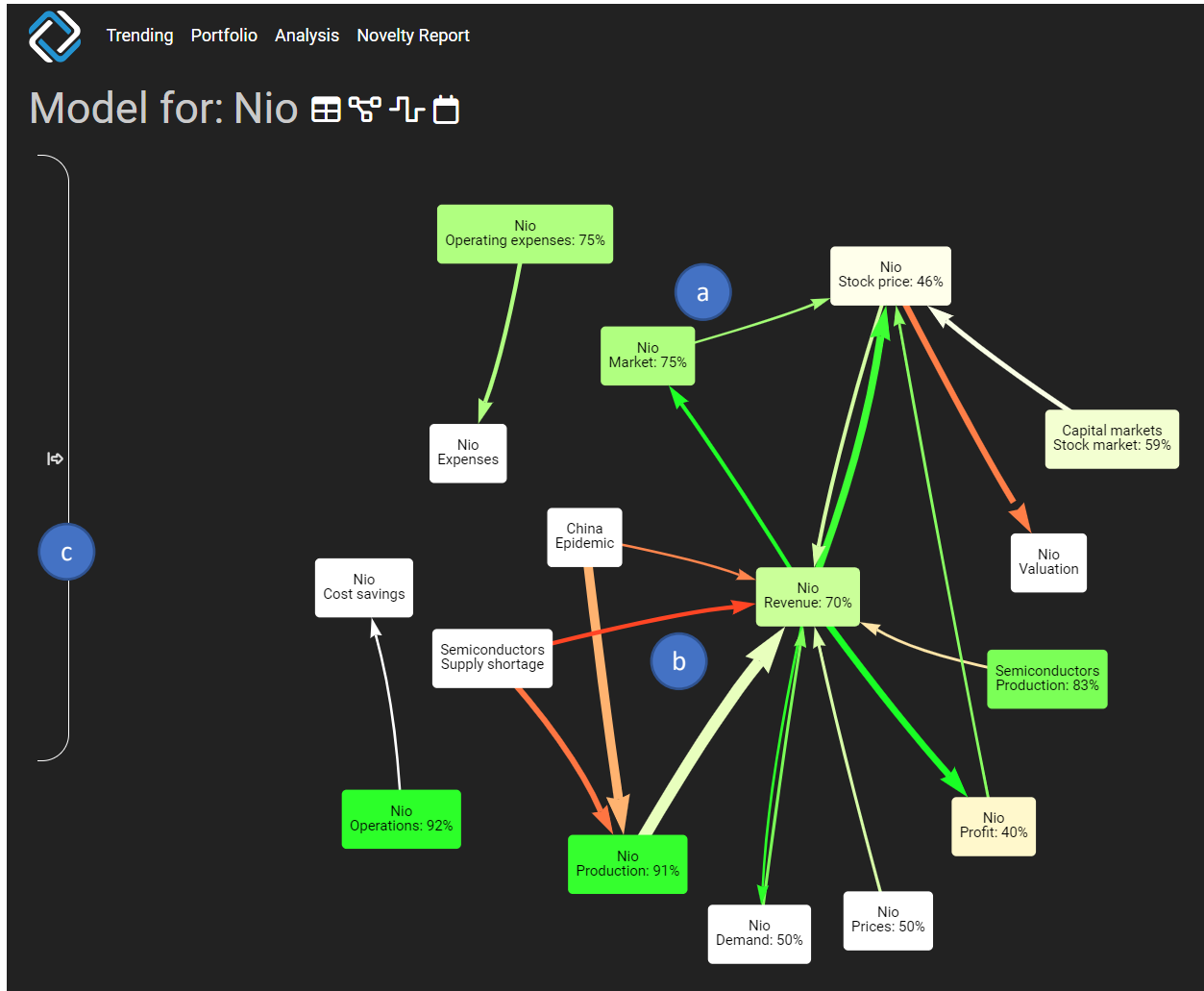
a- The nodes represent Indicators or Events and their number the current PTP of that indicator, which will be green if it is above 50% indicating growth. Events are white. Double clicking on a node will open its drivers panel (see 6.1.1).

b- The arrows represent causal relationships. Their thickness represents the frequency of mention of the relationship. Their direction represents the direction of the relationship. Their color represents a positive (green) or negative (red) relationship. Double clicking will open the Causal Relationship panel for that link (see 6.1.3).

c- The modal window bar opens a configuration panel with more options.

This configuration panel lets the user choose: the Model Type (a), the graph size (b), the types of links shown on the model (c). The toggle button (d) will stop the graph layout mechanism, which could cause some spinning. Entering another entity name (such as another company) will trigger the display of the comparison between the two causal graphs of the main entity and the compared one.
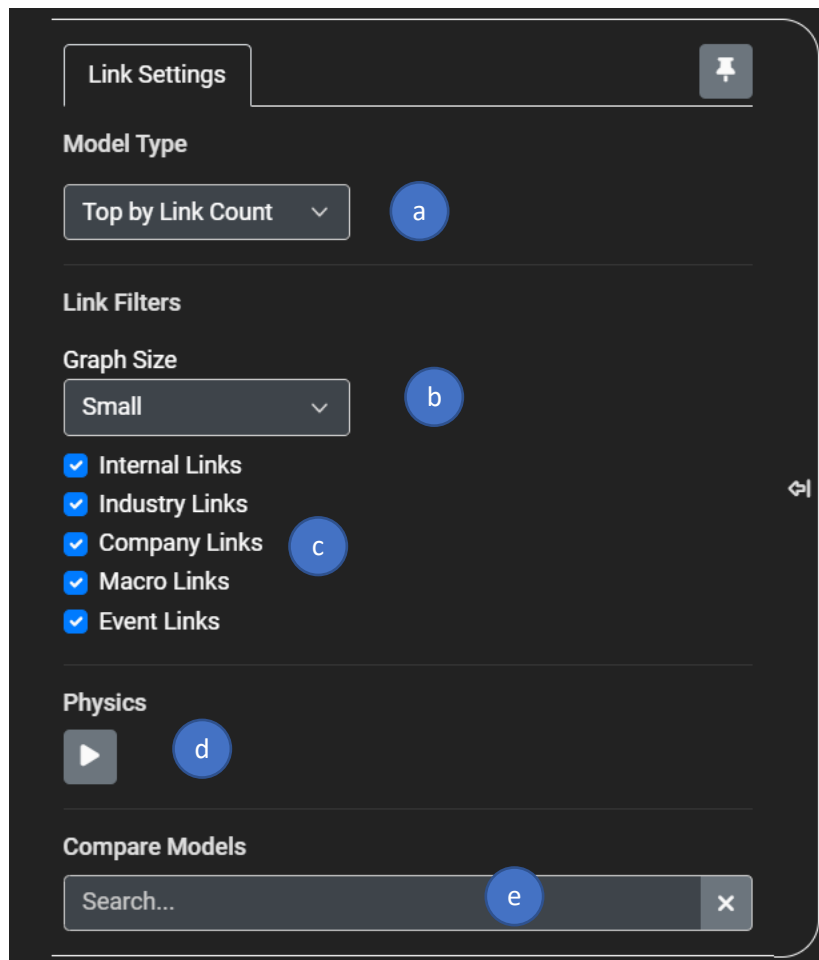
Types of links:

Internal Links: Intra-company relationship (e.g. NIO Production -> NIO Revenue)

Industry Links: Between an industry and the company (Semiconductor Production -> NIO Production)

Company Links: Between two different companies (NVIDIA Production -> NIO Production)

Macro Links: Between a Location and the company (USA Interest Rates -> Intel Demand)

Event Links: Between an Event and the company (China Epidemic -> NIO Revenue)

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6.3 Trends Signal

The Signal provides a synthetic view into the trends associated with the entity being analyzed over time. It is most useful for public companies as trends can be compared to stock prices.

The orange curve represents the evolution of the stock price over the period with the scale on the right.

The blue curve represents the selected aggregation of PTPs with the 0-100 scale on the left. This Signal has been extracted from texts and represents the "consensus view" of the company, generated by collecting trends on selected key performance indicators, using a training window (90 days by default) and a half-life decay (30 days by default).

A configuration panel (a) enables a high degree of customization of that signal.

The top bar chart (b) represents the daily number of detected trends (green is positive, red is negative, and blue is flat or unknown). Clicking on a bar will display the quotes containing these trend mentions.

The bottom bar chart (c) represents the daily number of detected events.

The configuration panel can be opened, closed, or pinned.

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The configuration panel main goal is to enable users to explore the different KPIs and Events influencing the company stock price.
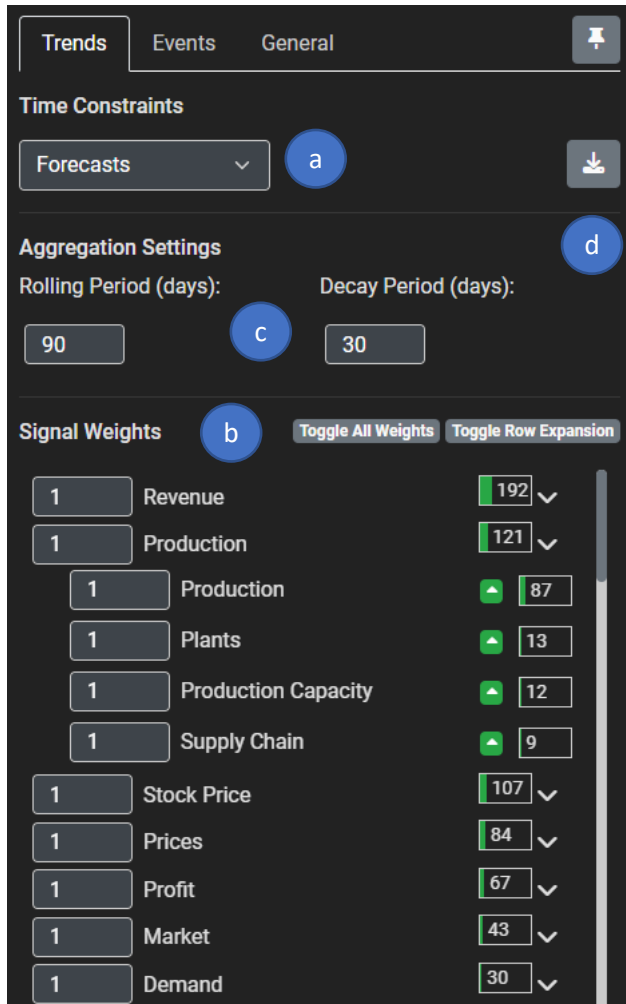
The trends that have been collected are categorized as "forecasted" trends (meaning they are to happen in the future) or "past and present" trends (meaning they already happened or are happening now). The Signal (blue line) is by default the trend forecasts but can be changed depending on user selection of this field (a).

The Key Performance Indicators (b) are the key ingredients in the Signal (blue line). The indicators can be removed by clicking on the indicator name (such as "Revenue"), or by changing the indicator weight to zero. They can also be increased to amplify the indicator impact. The Signal changes when changes are made to the Indicator Weights. "Toggle All Weights" will set all indicator weights to 0. "Toggle Row Expansion" will display all the underlying KPIs. The down arrow will expand just the underlying KPIs below the selected KPI (as demonstrated for "Production").

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The training window and half-life period of the PTP can be adjusted (c) to fit the frequency of the mentions detections. For macro signals such as the price of oil or other commodities, a shorter decay period (such as 5 days) will create a more responsive signal. In general, it is best to keep the training window to about 3-5 times the half-life.

It is also possible to download the detections and quotes in a spreadsheet format (d).

The Events configuration panel provides a subset of the configuration capabilities of the Trends configuration panel because Events are not integrated in the Signal so far.

The General configuration panel is about the structured data imported in the graph.
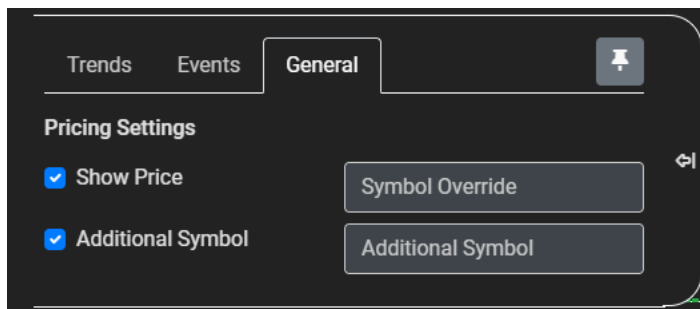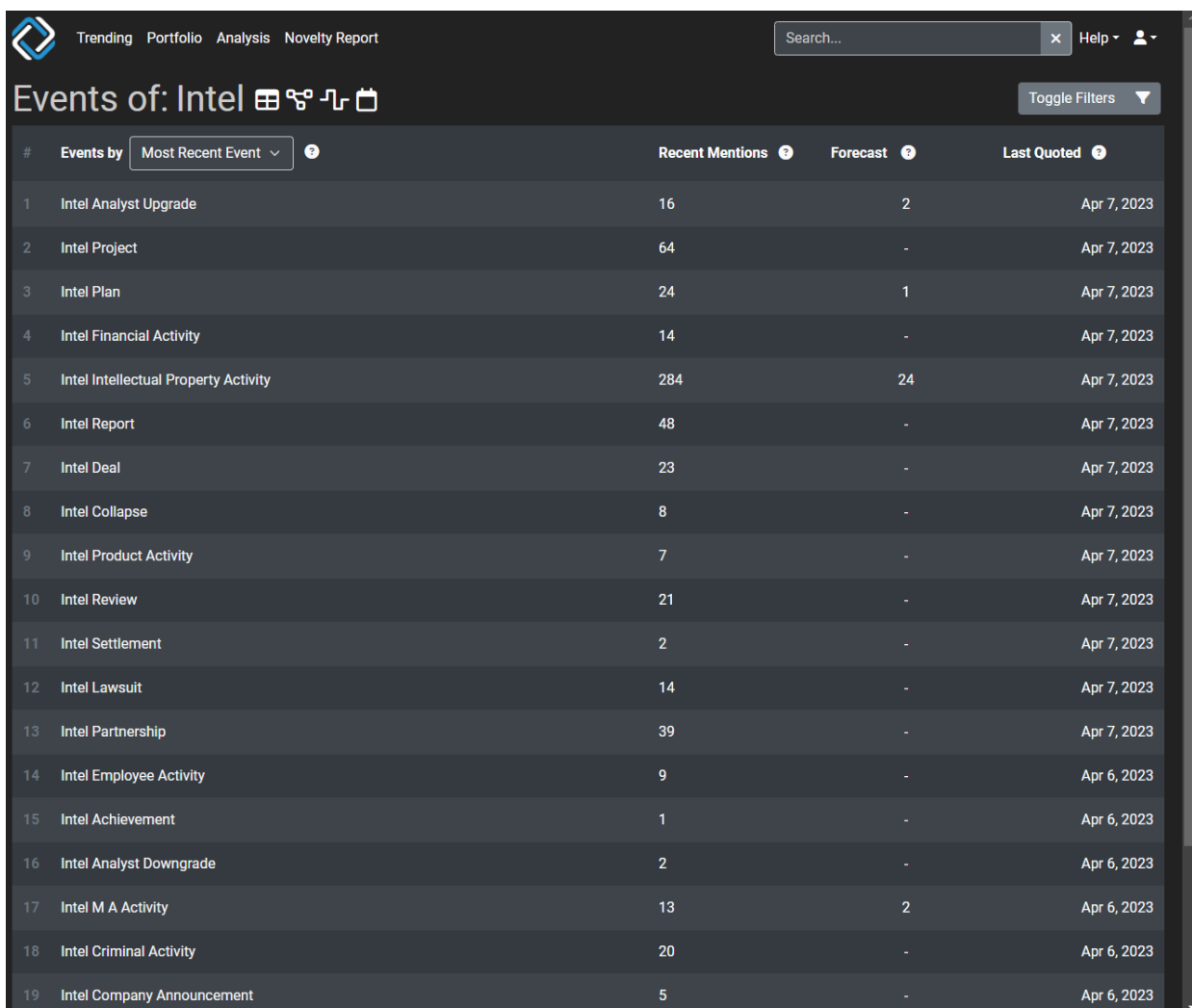
It is possible to toggle the orange curve (the stock price) with the Show Price toggle, or even to get a different ticker symbol for the orange curve in the Symbol Override editor.

It is also possible to add another ticker symbol (in the Additional Symbol editor) and toggle its presence as an additional white curve. This is useful to compare the performance of two companies, or to compare one company with the ETF of its industry.

6.4 Events

The Events panel is simple as we do not generate a signal from Events, just record their mentions.

It is possible to filter the list of events by Name, by number of Recent Mentions, and Most Recent Event.

Selecting a number in the column "Recent Mentions" will give access to the corresponding quotes.

Selecting a number in the column "Forecast" will produce a simplified version of the 6.1.2 e-3 panel.

Appendix:

This part of the documentation focuses on three features that can be accessed through many panels: the static user configuration panel, the "Toggle Filters" button and the Full Text panel.

A1 User Configuration

The User Configuration panels are accessible through the drop-down menu on the utmost upper right part of the screens, with the [icon] icon.

This drop-down menu contains four items: "Favorites", "Time Machine", "My Profile", "Logout".

"Logout" is the simplest one, as it enables disconnection to the SaaS server, and the user will have to login again with his/her credentials to access the SaaS.

"My Profile" will give the user access to his/her information: first name, last name, email address and time zone. The user can also change his/her password and check his/her login history.
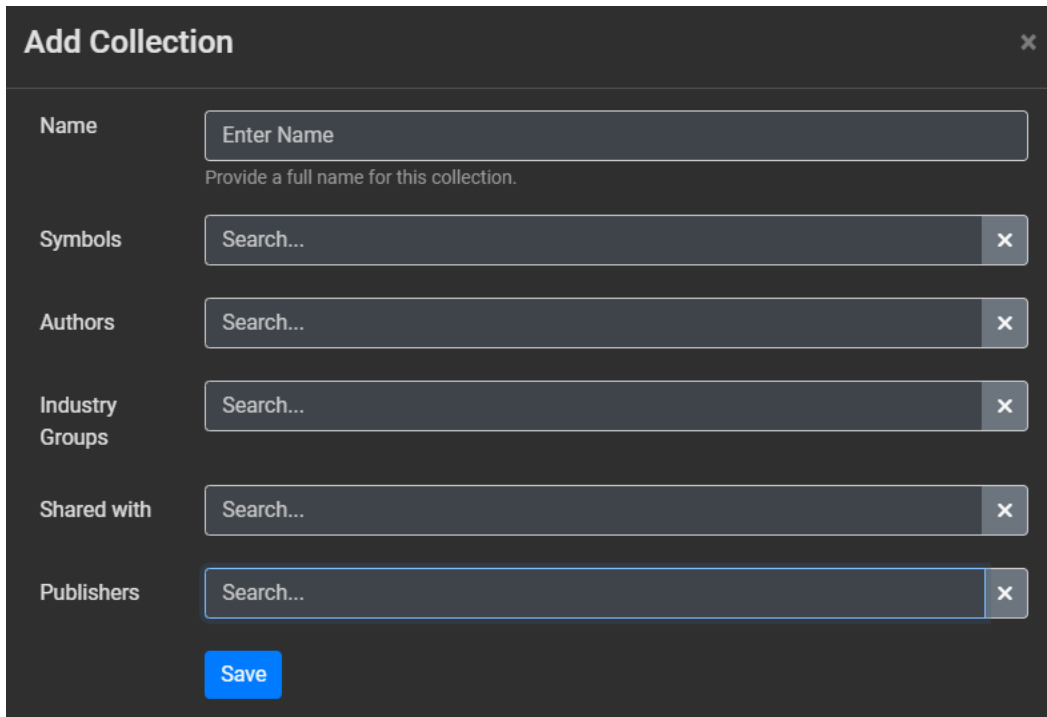
"Time Machine" will let the user select the "current date". By selecting a different date (in the past), the system will reposition itself as if "now" was that date, and all detections from texts that arrived after that date will be disregarded.
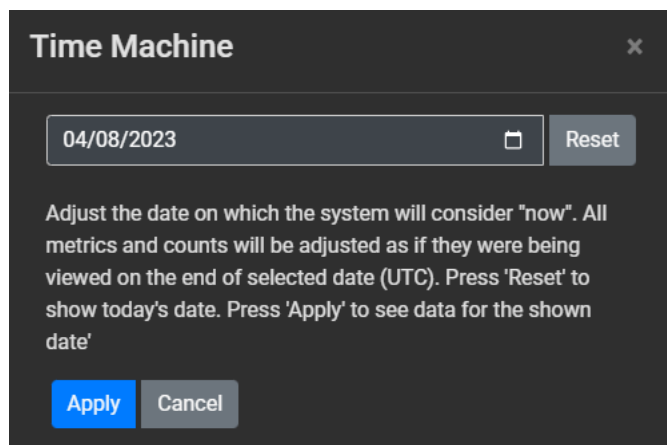
Once the user has pressed the "Apply" button, a transient light orange upper bar will appear on most panels (but for the "Analysis" and the "Novelty Report" panels) to remind the user that he/she has changed the definition of "now", as well as to enable them to readjust this date, or get back to the regular "today".

Finally, the "Favorites" capability enables the user to get back to some of the texts he/she has bookmarked.

First time users will have an empty page of "Bookmarks and Favorites" (unless they have created one or many portfolio) and the ability to Add a "Collection" by pressing the "+ Add" button.

Collections are extended definitions of Portfolio: all Portfolios are automatically mapped into equivalent Collections and all Collections are Portfolios.

As for Portfolios, the user should select a name which should describe what topics that Collections cover. The symbols and Industry Groups have to be edited through the Portfolio editor (see 3).

In Collections it is possible to add a filter on Authors and Publishers.

It is also possible to share them among "compatible" named users.

Once a Collection or a Portfolio is created, it is possible to bookmark texts (using the icon).
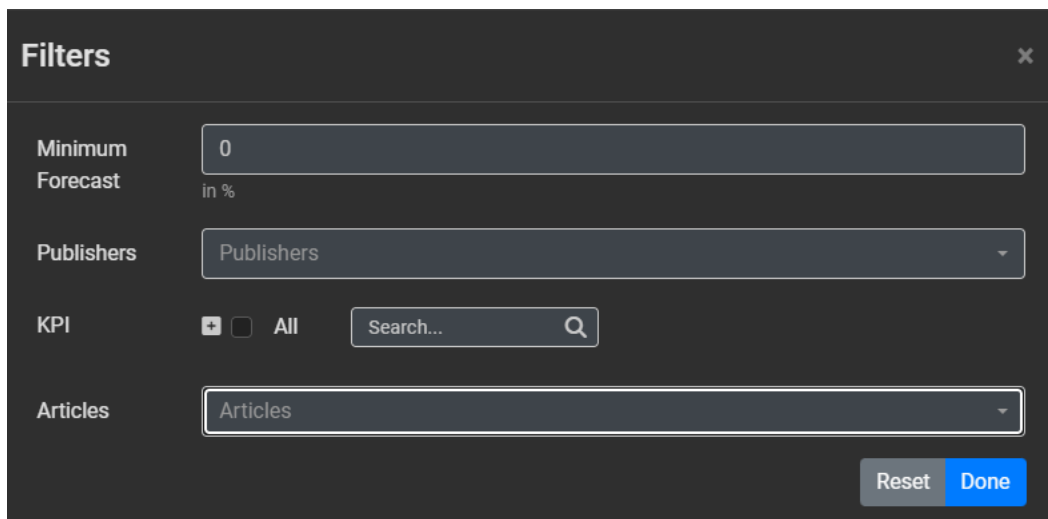
Portfolio or Collections can be viewed as indexing and filtering mechanisms for quick selective access to topic-focused information.

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A2 Filters

The "Toggle Filters" button which is present on all four Entity specific panels is an on/off switch that either lets all articles contribute to the panel, or only lets filtered articles contribute.

To establish an article filter, the user must press on the "Adjust Filters" ◤ icon just right of the "Toggle Filters" button.

For Indicators, this opens the following filter definition panel. A simpler panel is available for the three other panels.

The Minimum Forecast applies to the PTP forecast, is a number between 0 and 100 and will remove all indicators whose trend is below this minimum.

One can select filtered publishers through the Publishers pull down menu.

It is also possible to filter on multiple KPIs using the tree selector menu for KPI.

Finally, it is also possible to filter directly articles through the multi-selection possibilities of the Articles pull-down menu.

Selecting Done will apply the filter to the current panel. Selecting Reset will remove all selections.

A3 Full Texts

Almost all panels enable access to the visualization of the full text from which some quote was extracted.

The full text editor will look like this.

Under the title and the attribution, there is a pull-down menu and three buttons.

The pull-down menu is for toggling between the normal Reading mode and the Interactive mode. This second mode will enable the user to select a fragment of text and post a comment about its interpretation for Causality Link employees.

The first button will produce a list of all items detected in the text, which can be filtered by type. Selecting one of these items will position the text on this item and highlight it.

The second button will bookmark the current text in the user's Collection of choice.

The last button will only appear when the original language of the text was not in English, and will show this original version as in the following image:

Selecting the button again will restore the initial display.