**Behavior of styling/widget changes for plotting**

**On load:**

style\_dict set by default, data.column\_attributes determined, change plot\_type (default)

**User update column widget:**

data.column\_attributes (user defined) -> style\_dict -> properties -> UI widgets

**Change of plot type:**

style\_dict [default to data.column\_attributes] -> properties -> UI widgets

**Change of field type/field:**

data.column\_attributes (user\_defined) -> style\_dict -> properties -> UI widgets

**Change of UI/Blockly property:**

UI widgets -> properties -> style\_dict [axes bounds -> data.column\_attributes(user defined)]

**Reset of UI/Blockly property:**

Data.column\_attributes (static) -> data.column\_attributes (user defined) -> style\_dict -> properties -> UI widgets

**Change of property:**

UI widgets <- property -> style\_dict

**Data attribute table** (in data/info dock, drawn from processed\_data.column\_attributes)

Add attributes for plot\_min and plot\_max (user changeable axes limits for plotting)

Initialized with data bounds defined by autoscaling, reset restores these values

Add attributes for p\_min and p\_max (probablility axes associated with histograms, not changeable by user?)

Initialize as None

Set on first use of histogram, simple reset returns to these values

Change of n\_bins or bin\_width will change these values.

**Data Viewer**

Refresh button to be added to data, field and plot\_info(?) tabs

Add add\_attribute button. User can specify name and edit values of attributes.

**BLOCKLY**

Connections:

< left

> right

v bottom

^ top

x top and bottom

o internal

c loop

[block]

+ external window

**Global Settings:**

* Theme
* Notes
* Filters?
* x : Display figures | checkbox + opens a window that displays canvases, pauses for user input, then continues. Controls to figure UI, [continue, continues workflow], [stop, ends workflow], [skip save, does not save current plot]
* x : Add figures to plot selector | checkbox

x : batch samples for analysis

**File I/O:**

* *v : Load directory | text field (directory name) + runs file browser [Complete]*
* x : Load sample | text field (sample name) + runs file browser *[Complete]*
* < : Export figure data | text field (filename) + runs file browser *[Complete]*
* *C : loop over samples [Complete]*Comments: disabled pop up requesting to save current analysis
* C : loop over fields | drop down (field type select) *[Complete]*

Comments: should show available field types by default (['Analyte', 'Analyte (Normalised)']) need to update list when more field types are created (clustering, pca)

* C : global analysis? (batch processing) … e.g. clustering, pca, etc. > [subsample data]
* < : subsample data | drop down (method), text field (number of samples, or fraction?)

**Samples and Fields:**

x : Analyte select tool | drop down (saved list of analytes) + opens analyte select dialog… includes data scaling [*Complete*]

*x : Reference value | drop down (list of reference chemistries)* [*Complete*]

~~x : Data scaling | drop down (linear, log, logit)~~

< : Change pixel dimensions [Sample properties] | text field (dx), text field (dy) *)* [*Complete*]

< : Swap pixel dimension dx/dy *)* [*Complete*]

~~< : Swap pixel resolution dx/dy~~ *)*

< : Swap XY [Sample properties]

x : Outlier method | o [Field select or Custom list], drop down (methods), text fields (quantile bounds, initially hidden)

x : Negative method | o [Field select or Custom list], drop down (methods) , text fields (quantile bounds, initially hidden)

< : Field select | drop down (field type) dropdown (field), with options for all/none [*Complete*]

< : Custom list | drop down (loads saved custom list), icon when double clicked opens field select dialog and saves to a custom (ordered) list file, which can then be loaded using [Custom list] [*Complete*]

< : Compute custom field, drop down (defined custom field)

< : Custom field calculator, field text box (uses <https://github.com/tomas-berg/blockly-field-text-box> for text edit to enter formula), text edit (custom field name to be saved into custom field file… blank not saved)

**Image processing:**

x : Noise reduction method | drop down, text fields (parameters initially hidden), check box (gradient)

x : Edge detection | drop down (method)

more to come with future capabilities?

**Plotting:**

x : Map | drop down (field select), drop down (field), > **Styling** [X Axis, Y Axis, Scale, Font, Coloring], > [Polygons] [*Complete*]

x : Correlation | drop down (Pearson, Spearman, Kendall), checkbox (squared), > [Export table] [*Complete*]

< : Export table | o [Field select or Custom list]

x : Histogram | drop down (type), drop down (field select), drop down (field), o [Histogram options], > **Styling** [Aspect ratio, Tick direction, X Axis, Y Axis, Line properties, Transparency, Font properties] [*Complete*]

< : Histogram options | text field (bin width), text field (number of bins)… bin and number set each other [*Complete*]

x : Biplot | drop down (field type X), drop down (field X), drop down (field type Y), drop down (field Y), check box (heatmap), > **Styling** [depends on scatter/heatmap], < additional plots [Regression] or [PCA vectors] [*Complete*]

x : Ternary | drop down (field type X), drop down (field X), drop down (field type Y), drop down (field Y), drop down (field type Z), drop down (field Z), check box (heatmap), > **Styling** [depends on scatter/heatmap] [*Complete*]

x : Ternary map | drop down (field type X), drop down (field X), drop down (field type Y), drop down (field Y), drop down (field type Z), drop down (field Z),

x : Compatibility diagram | drop down (N-dim file lists) … (check that [Reference value] block has been included above… if not display message) [*Complete*]

x : Radar plot | drop down (N-dim file lists) … (check that [Reference value] block has been included above… if not display message)

x : Basis variance | > **Styling** [marker properties, line properties, font] [*Complete*]

x : Basis vectors plot > **Styling** [colormap, font] [*Complete*]

< : Basis vectors > **Styling** [line properties, transparency] [*Complete*]

< : Regression

x : Cluster performance | drop down (method) > [Seed] < [Cluster options] < [Custom field list] **> Styling** [marker, marker size, not color, line width (not color), font] [*Complete*]

**Multidimensional:**

x : Dimensional reduction | drop down (method), > [Custom field list] [*Complete*]

x : Clustering | drop down (method), > [Seed] > [Cluster options] > [Custom field list] … random seed generator button ? [*Complete*]

< : Seed | text edit (double-click changes seed using random number generator RNG) [*Complete*]

< : Cluster options | (mutator – plugin with advanced options) [*Complete*]

< : PCA preconditioning | text edit (number of basis vectors)

**Filtering:**

x : Load polygon(s) | drop down (polygon name)… (multiple drop downs using mutator block – plugin)

**Profiles:**

Come back later …

+ analysis blocks

**Styling**

< : Modify style | (dynamic connection block - plugin) with internal connections [*Complete*]

< : X Axis | text edit (label), text edit (lower bound), text edit (upper bound), drop down (scale) [*Complete*]

< : Y Axis | text edit (label), text edit (lower bound), text edit (upper bound), drop down (scale) [*Complete*]

< : Z Axis | text edit (label), text edit (lower bound), text edit (upper bound), drop down (scale) [*Complete*]

< : C Axis | text edit (label), text edit (lower bound), text edit (upper bound), drop down (scale) [*Complete*]

< : Tick direction | drop down (none, in, out) [*Complete*]

< : Aspect ratio | text edit (numeric value, default = 1.62 for most plots, 1 for most others) [*Complete*]

< : Add scale | o [Color select], text edit (units), show/hide additional options for text edit (length), drop down (direction) [*Complete*]

< : Marker properties | drop down (symbol), text edit (size), > [Color select] or > [Colormap]

< : Line properties | text edit (size, float) [*Complete*]

< : Color select | color tool [*Complete*]

< : Color field | drop down (field type), drop down (field) [*Complete*]

< : Colormap | drop down, check box (reverse), drop down (direction) [*Complete*]

< : Ternary colormap | drop down [*Complete*]

< : Show mass | Checkbox [*Complete*]

< : Color by cluster [*Complete*]

BlocklyModules.py

=================

Integration of Blockly (block-based visual programming) with the

LaserMapExplorer backend.

This module provides the `LameBlockly` class, which serves as the

execution context for Blockly-generated Python code, allowing visual

blocks to control data analysis, clustering, dimensionality reduction,

and plotting in the LaserMapExplorer application.

Responsibilities

----------------

- Execute dynamically generated Python code strings created by Blockly.

- Provide bridges between Blockly blocks and application logic:

clustering, dimensional reduction, field selections, styling, etc.

- Manage matplotlib canvases and their embedding in layouts or popup

dialogs.

- Synchronize Blockly block actions with `AppData`, `StyleData`, and

analysis modules.

- Support figure display policies (`display\_figures` block), error

reporting, and user-driven workflows.

Classes

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LameBlockly

Execution context and bridge for Blockly-generated Python code.