Smart Data Analyser for ArcGIS Pro

User Manual

Version 3.6

User Manual | Smart Data Analyser for ArcGIS Pro

Content

1   Introduction

1.1   What is Smart Data Analyser?

Smart Data Analyser is an extension for ArcGIS Pro. Its intuitive graphic user interface (GUI) allows the rapid analysis of tabular data. Because of the open operating concept as well as the use of standard tools and workflows, the entire GIS functionality (data collection, processing, analysis, presentation, publication) easily integrates with the analysis tool. Thus, workflows are streamlined and rapid analysis is facilitated.

1.2   Who is Smart Data Analyser for?

Smart Data Analyser is designed for GIS users who work with mass data and need an easy-to-use and fast analysis tool for attribute data. Through different display modes for attribute data, anomalies and patterns become easily visible. In an ordinary table this would not be the case or would require time intensive processing. Hence, the extension also facilitates quality control of your data.

In addition, Smart Data Analyser supports the InfoZoom (FOX) and CVS formats. InfoZoom users can open their data in ArcGIS and use GIS to analyze and display them.

1.3   What are typical applications for Smart Data Analyser?

Typical applications for the use of Smart Data Analyser are:

+ Outlier detection in mass data

+ Analyze and understand spatial relationships of attributes

+ Quality control and editing of attribute data

+ Open or export FOX data in ArcGIS Desktop

+ Data mining in large and very large data sets

2   Software Installation

2.1   System Requirements

Smart Data Analyser is an extension for ArcGIS Pro. The following versions are supported:

- ✛ 2.9 upwards
- ✛ 3.0 upwards

The extension is provided as an independent installation package.

Smart Data Analyser supports only ArcGIS Pro as a per-machine installation (Standard) (Link to ArcGIS documentation).

Note:

Before installing the extension, one of the above versions of ArcGIS Pro must be installed, including the latest patch.

The following operating systems are currently supported:

- ✛ Windows 11 Home, Pro und Enterprise (64bit)
- ✛ Windows 10 Home, Pro und Enterprise (64bit)
- ✛ Windows 8.1, Professional und Enterprise (64bit)

The operating system must have
- ✛ Microsoft NET 6 Desktop Runtime x64 (Download)
- ✛ Visual Studio Redistributable Package (Download)

installed.

2.2   Installation

Smart Data Analyser is provided as an individual installer and can be installed by executing the **Smart Data Analyser Pro 3.6.msi** file.

Please make sure you have full administrative rights to install software on your system. After starting the installation, a wizard will guide you through the individual steps of the setup.
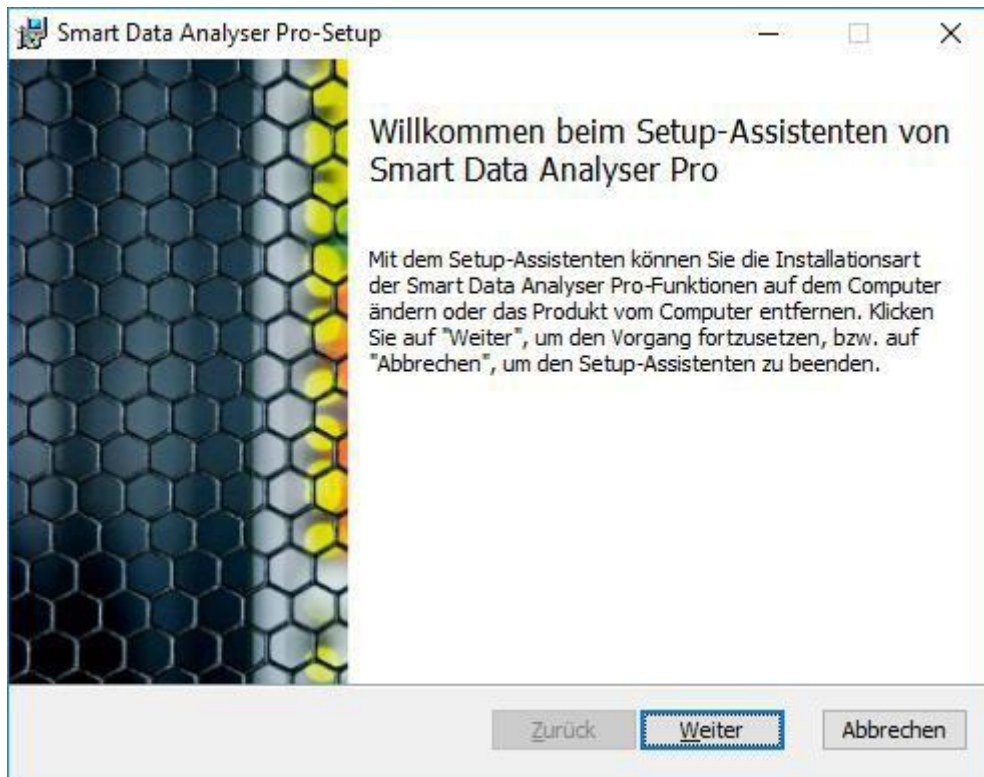
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Figure 1: Installation wizard

The install wizard will suggest a default directory for installing Smart Data Analyser. This can be changed if required.
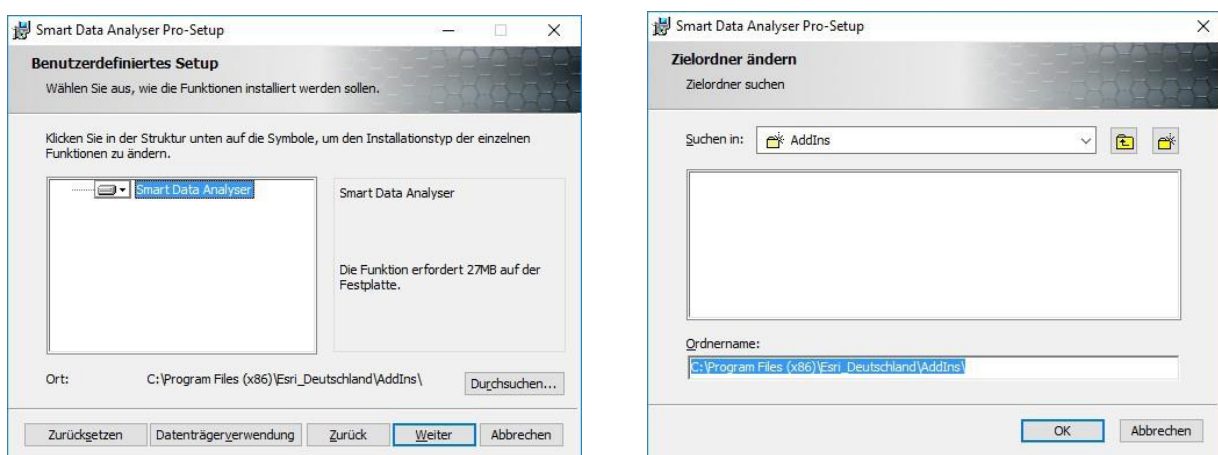

Figure 2: Selection of the installation path

The wizard will inform upon successful installation.
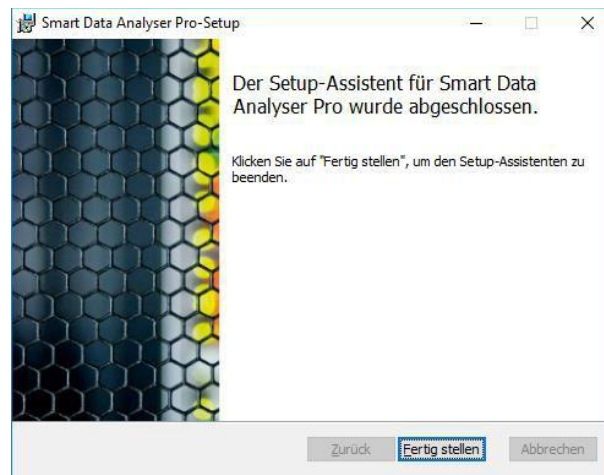
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Figure 3: Finishing the installation

2.3 Activation

Activation of the software is necessary before it is ready to use. Activation is executed in ArcGIS Pro and requires the following steps:

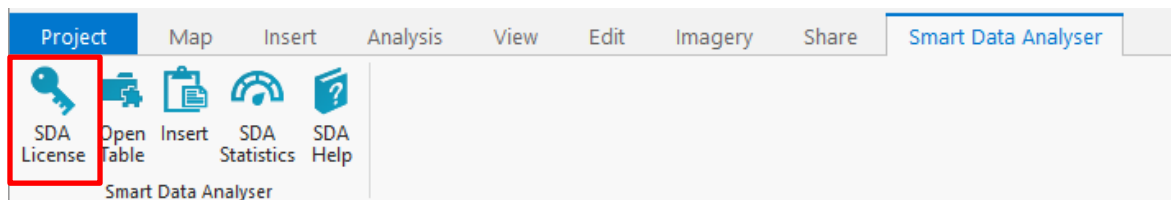**Step 1:** In ArcGIS Pro, open the main menu of Smart Data Analyser.

Figure 4: Main menu Smart Data Analyser

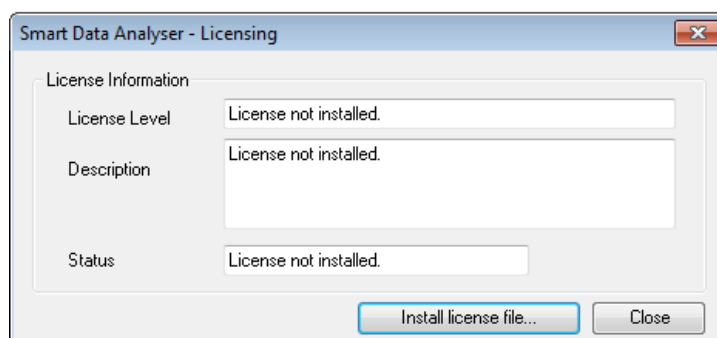**Step 2**: The window for displaying the license information appears via the SDA Licensing button.

Figure 5: License information

After installing the license using the button *Install license file*, the window will display detailed information. The license is now installed but not activated yet.
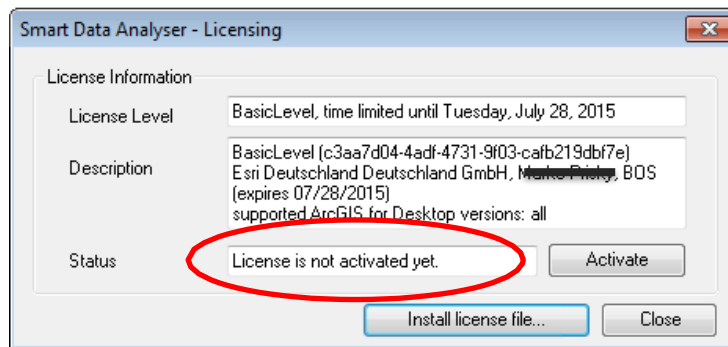

Figure 6: Activation status

Known issues while installing the license:

+ Insufficient permissions for writing to the registry. The user must have full access to the key located at HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432Node\Geosecure\Provisioning
.

Step 3: Activate the license using the button *Activate*. The required activation code can be requested by emailing the Install-ID using the provided link. If required, activation by phone is also possible. Please contact your Esri Deutschland GmbH representative.
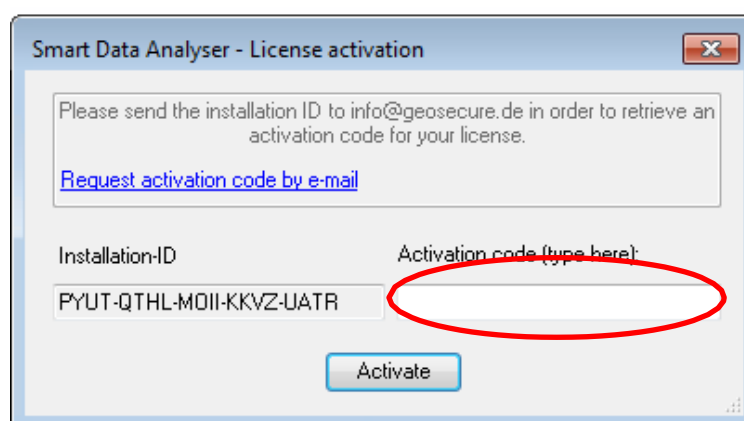

Figure 7: Entering the activation code

After receiving the activation code, the license can be activated. The status information will update correspondingly.

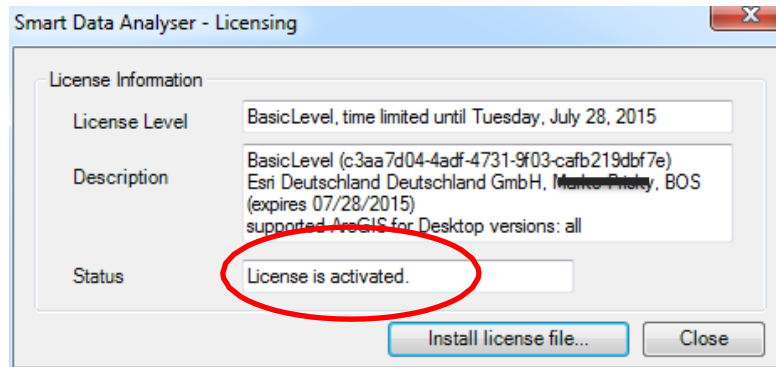User Manual | Smart Data Analyser for ArcGIS Pro

Figure 8: Aktiviated license

2.4 Language settings

Smart Data Analyser offers you the possibility to use the ArcGIS Pro extension in English or German; ArcGIS Pro is installed in English by default. To use the German interface, the operating system must be in German and the German language package for ArcGIS Pro must be installed. Furthermore, in the options of ArcGIS Pro under: *Project > Options > Language > Display Language.*
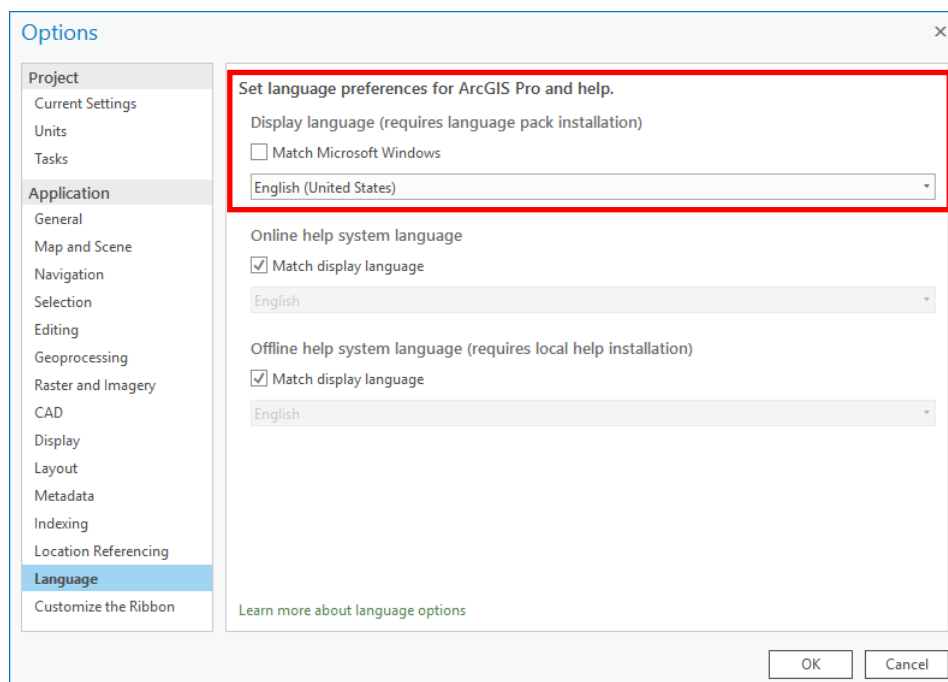

Figure 9: Language settings

3   Quick start

This quick start guide provides a compact overview of the most important functions while the function reference in chapter 4 contains more detailed information.

As an extension, Smart Data Analyser allows for an intuitive analysis of tabular data with spatial reference in ArcGIS Pro. Core functionality is the bidirectional exchange of selection sets between the geographic representation and the analysis table. Analysis results that result from selection in the analysis table are displayed automatically and directly in the map window as a selection. If records are selected from the map using a geographic feature selection, they are filtered directly in the analysis table.

If the data to be analyzed are available in the form of a GIS data set, e.g. as a feature layer or as a simple standalone table, an analysis table can be generated from it via the context menu (see Chapter 3.2). If the basic data to be analyzed are available in the form of a FOX or CSV file, they can also be included as an analysis table (see Chapter 3.3). In both cases, it is possible to link the analysis table to the feature layer. Selections are then automatically exchanged and visualized directly in the map view.

Buttons 1 to 5 are used to show/hide the respective tools that are available for use in the analysis table.
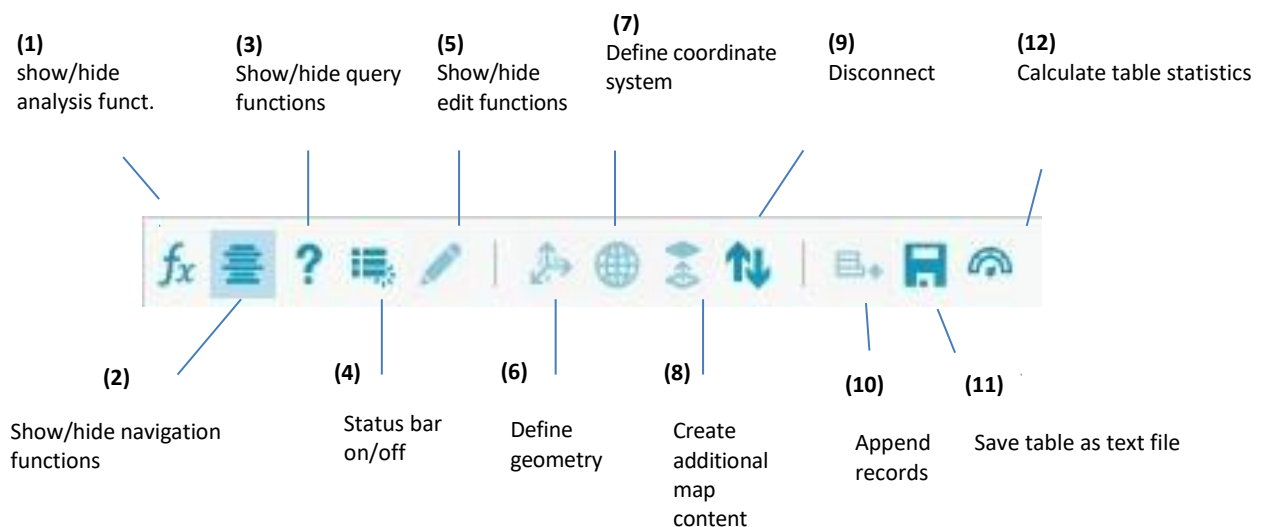
(1) show/hide analysis funct.

(3) Show/hide query functions

(5) Show/hide edit functions

(7) Define coordinate system

(9) Disconnect

(12) Calculate table statistics

(2) Show/hide navigation functions

(4) Status bar on/off

(6) Define geometry

(8) Create additional map content

(10) Append records

(11) Save table as text file

Figure 10: Smart Data Analyser - Toolbar

The other controls are used to create or export data records in the analysis table. When importing FOX or CSV files (see chapter 3.2), columns with coordinate information are automatically searched for in the data set and created as shape columns, which the user can also define later (button **6**). WGS 84 is set as geodetic reference system by default, another coordinate system can be selected via the menu (button **7**). The current status of the analysis can be stored as a so-called standalone table, which is then displayed in the ArcGIS Pro content window (button **8**). The user can separate the analysis table from the underlying data source (button 9). Additional data can be inserted into the existing analysis table (button **10**). The data must have the same schema as the existing table. In addition, you can export the analysis table as a file (button **11**). The attributes of the table can be analyzed with regard to their statistics (button **12**).

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3.1 User Interface – Analysis Window

The Smart Data Analyser user interface consists of the main menu, the toolbar and the analysis window.

The analysis window can be resized and docked to different positions in the ArcGIS Pro application window. Due to the width of the analysis table, we recommend that you anchor the window at the bottom of the application window.
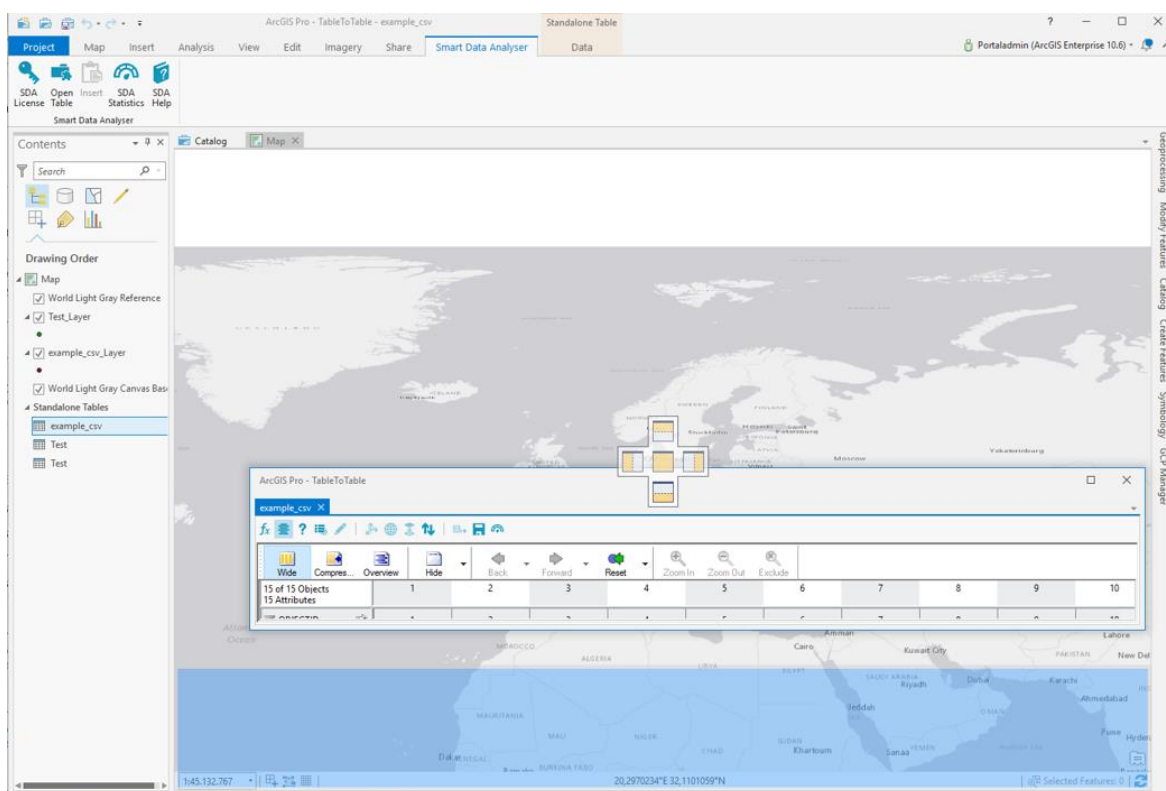

Figure 11: Anchoring the analysis window

3.2 Create Analysis Table from Feature Layer

Once a layer is selected in the map table of contents, the option for creating an analysis table is activated in the context menu (right mouse click on the layer). The selection is context- sensitive, in the case of a standalone table it is possible to create a simple table view. This means that data records that have no geographical reference, such as standalone attribute tables from a file geodatabase, can also be transferred to an analysis table. For these attribute tables, however, it is assumed that they contain the attribute OBJECTID (unique identifier of ArcGIS), similar to feature classes.
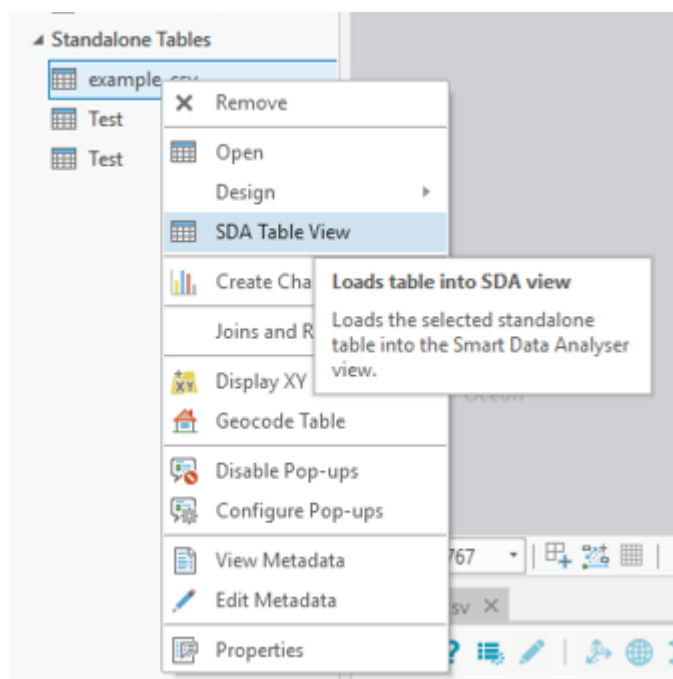
Figure 12: Creating the Analysis Table from a Feature Layer or Standalone Table

The progress of the data transfer is displayed in a progress bar at the bottom.
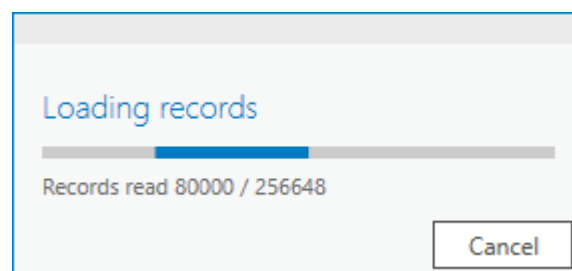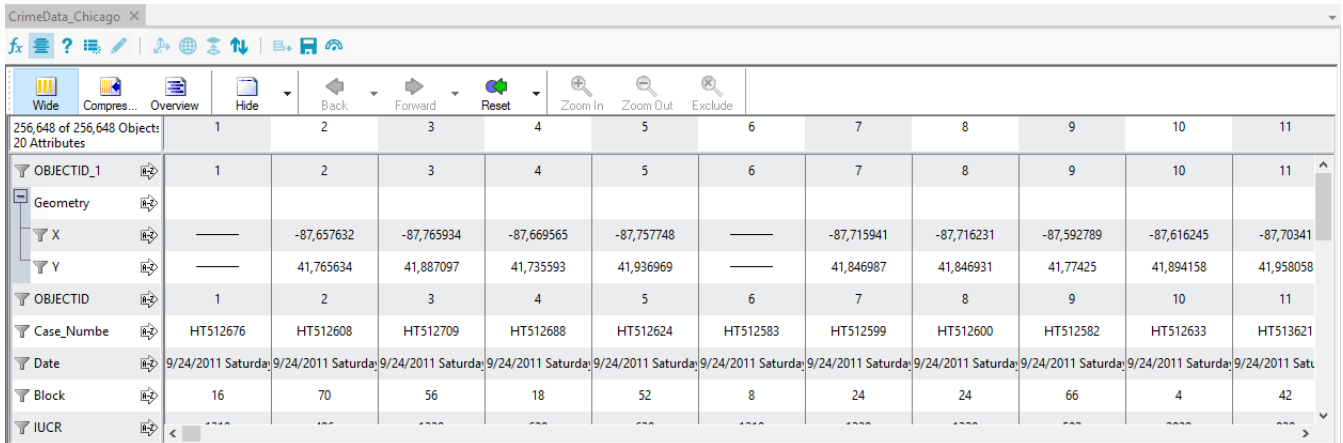
Figure 13: Progress bar

When the transfer is complete, the records of the selected layer or standalone table appear in the analysis table.

Figure 14: Transferred Analysis Table

3.3 Create Feature Layer from Analysis Table

If the initial data to be analyzed exists in the form of an InfoZoom FOX file or a CSV/text file, this can be loaded directly into an analysis table using the Add Table menu.
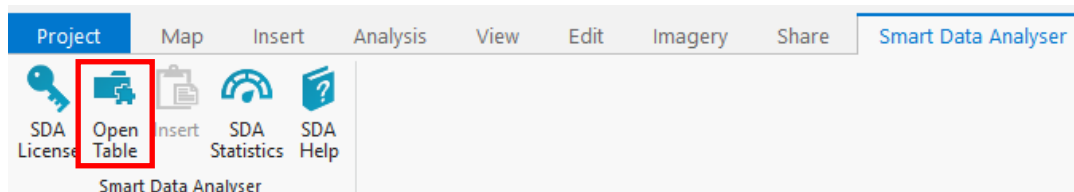

Figure 15 Opening a FOX or CSV/text file

If a CSV or text file has been selected for import, a dialog appears in which the data fields can be defined.
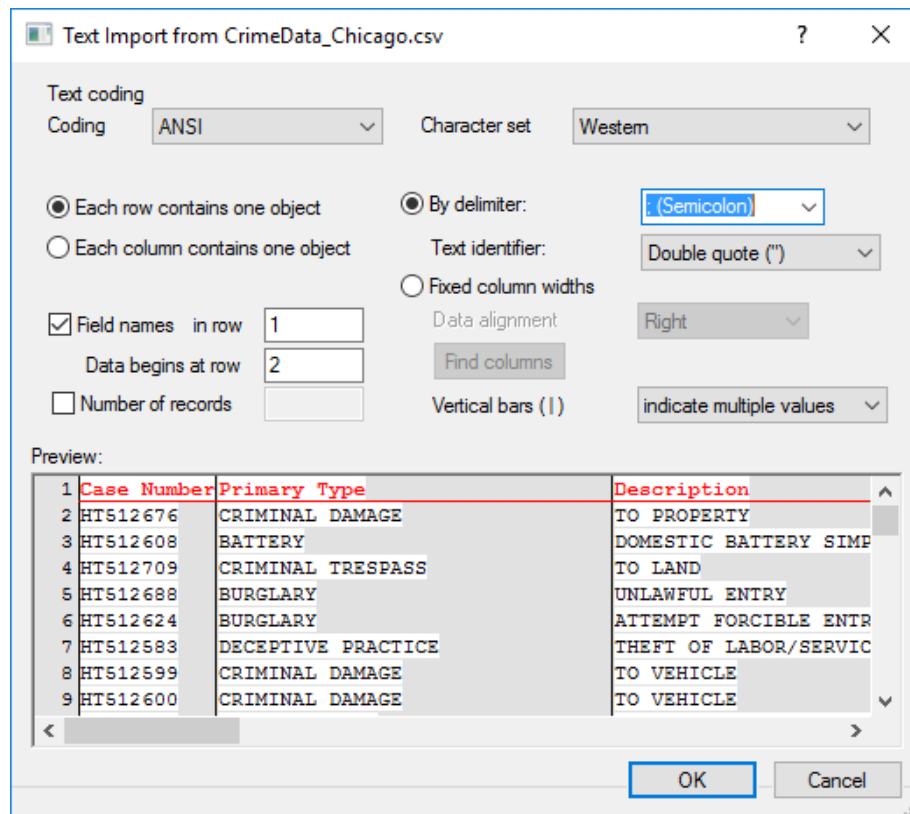
Figure 16: Text import

After confirming with OK, the data is added to the Smart Data Analyser analysis table and is ready for further processing.

Using the Create Map Content button, the analysis table can then be transferred to ArcGIS Pro as a layer or standalone table and appears there as an entry in the table of contents. If there are suitable attribute values with geographical reference in the file, e.g. columns with names x, y, lat, lon etc., a dot feature class is created. If these values are not available, a simple standalone table is created.

If a table contains geodata that was not automatically recognized, these can be defined later. Selecting the relevant attribute fields in the analysis table and clicking the Define Geometry button defines the X and Y coordinate columns.
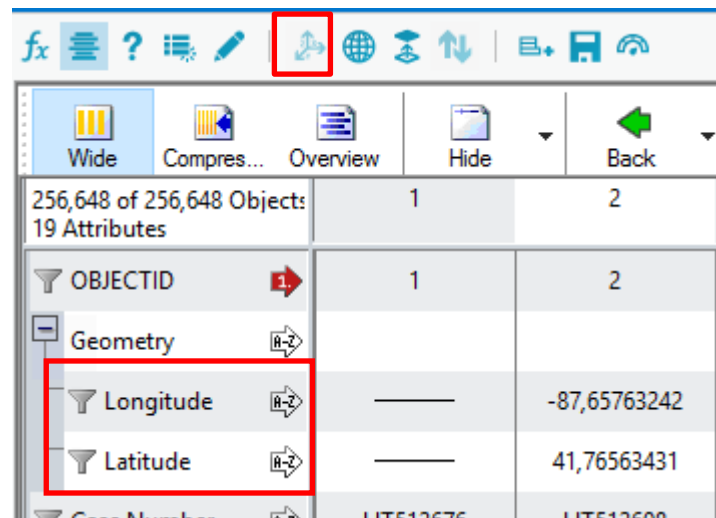
Figure 17: Defining the geometry

By default, the geodetic reference system WGS 84 is assigned to the geometry. If necessary, this can be changed before a new map content is created.
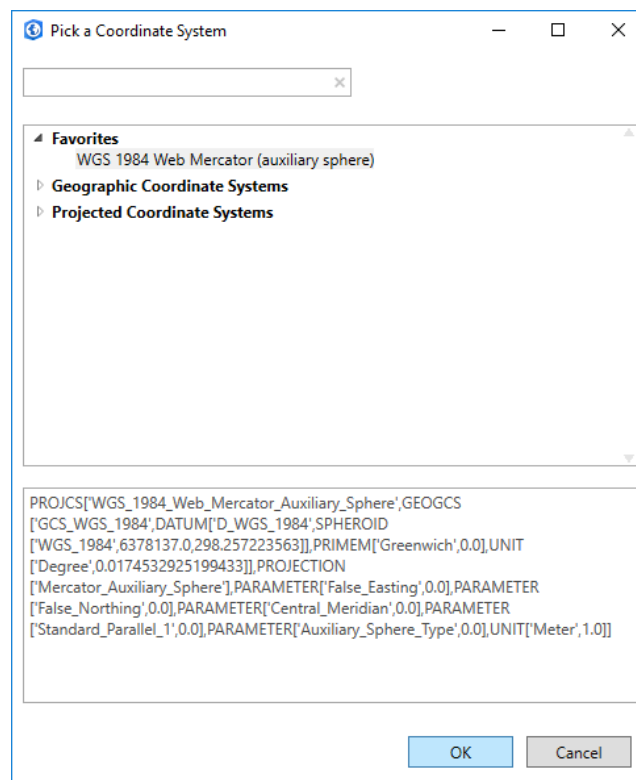To do this, click on the Select coordinate system button and the following dialog appears.

Figure 18: Selecting the coordinate system

The function reference in chapter 4 contains a complete list of supported column names for the recognition of geographical coordinates.

When a new map content is created, the transferred data is also stored in ArcGIS Pro's project database and remains available even after the application has been closed. In addition, the exported records are added to the table of contents.

Figure 19: Create map content

3.4 Working with the Analysis Table

The analysis table of Smart Data Analyser displays the imported data in three different views, a wide, a compressed, and an overview display. Regardless of the view, navigation in the table is done by zooming, whereby the view of the table is refined by selection. Individual cells can be selected with a mouse click; holding down the Ctrl+ control key or the Shift+ shift key simultaneously selects several cells. Double-clicking on a cell (or the Zoom In 🔍) zooms in on the view so that only the previously selected data records are displayed. This procedure can be carried out as often as desired in order to refine the view step by step. The Back function in the table toolbar restores the last view. This undoes the last refinement. Together with the pre-function from the toolbar, any navigation in the views is possible. This functionality is basically possible in all table views. A detailed list of all tools can be found in the function reference in chapter 4.
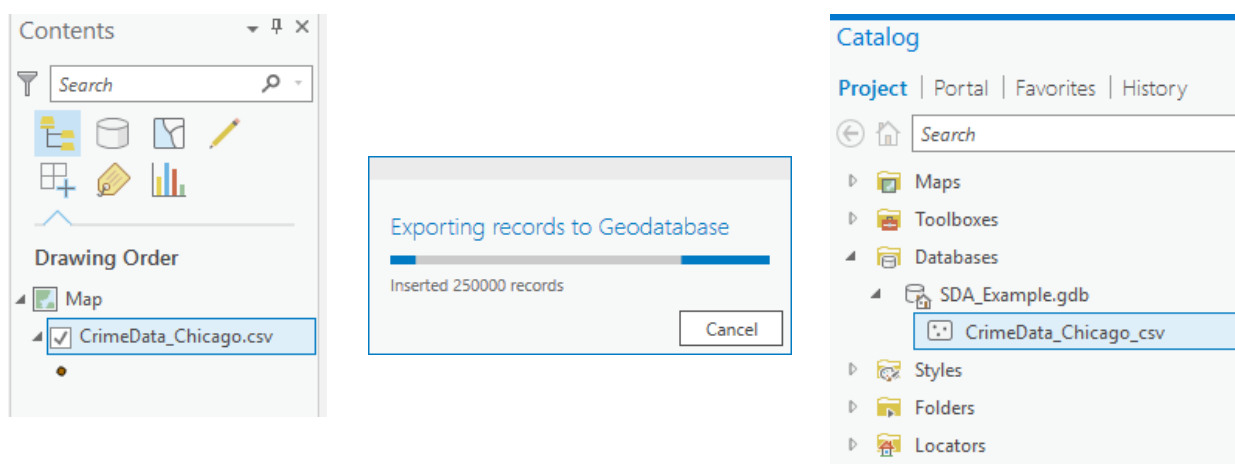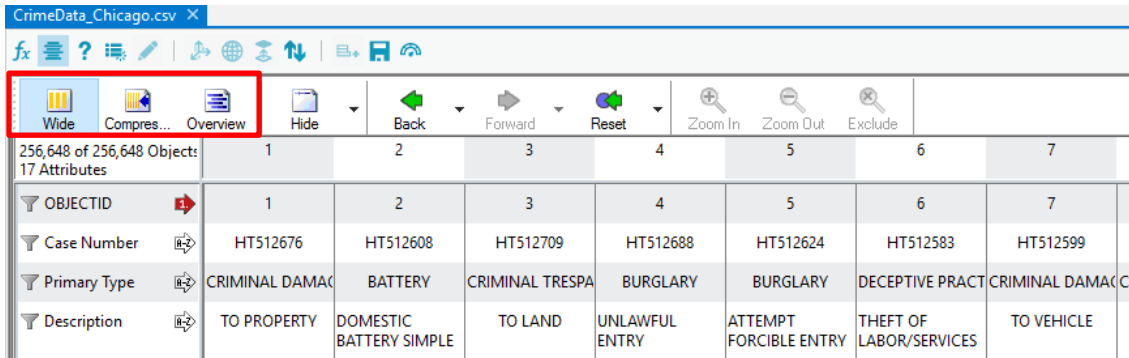

Figure 20: Exporting the data sets

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Figure 21: Views of the Analysis Table

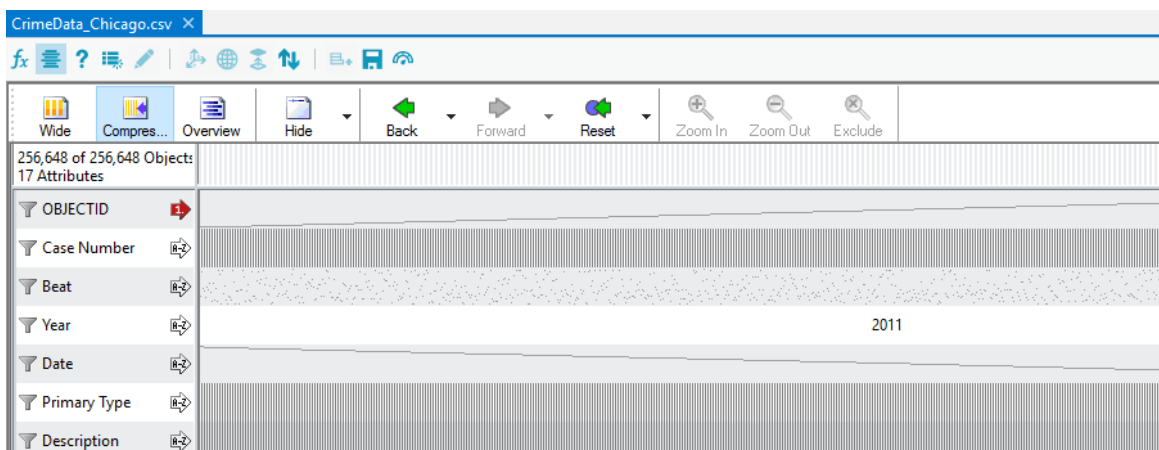![Wide table icon] **Wide table**

The wide table displays data, such as a traditional table in rows and columns, only that it is rotated and objects are shown in columns. Horizontal and vertical scrolling is possible to view all data.

![Compressed table icon] **Compressed table**

In the compressed table display, all object columns are first pushed together so that all data records can be displayed on the width of the screen. Horizontal scrolling is therefore not necessary in this view. Numerical values are displayed as polylines or points (see OBJECTID or LAT, LON). For repeated attributes, the distribution of values is represented by the width of the cells (see Year). The displayed cells can also be selected by double-clicking.

Figure 22: Compressed table

Overview

The overview is the optimal view for estimating the distribution of attribute values at a glance. In this view, the entire table is compressed horizontally so that all objects are displayed on one table width. There is no need to scroll horizontally. The analysis table groups together the same attribute values in a cell. The resulting cell widths provide information about the frequency of the attribute value. Each attribute value is displayed either alphabetically or numerically sorted; alphanumeric values with a large variety of data only with the initial letters, numeric values as a contour line between minimum and maximum of all occurring numeric values. In the overview, the contents of all attribute rows are sorted independently of each other, that means, values above each other are without direct reference to each other.
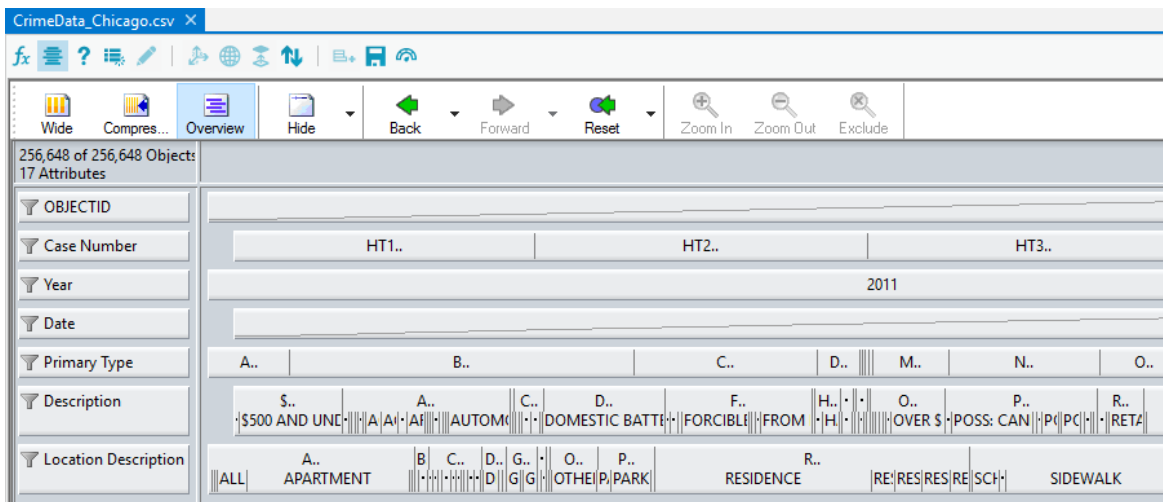
Figure 23: Overview table

3.5 Analysis results and selection in the map view

Selections are automatically transferred between the analysis table and the feature layer. A combination of attributive and geographical selection is made possible, depending on the user's needs and the application. Thus, analyses can be optimized through the effective use of both components.

This procedure is illustrated using an example data set:
For a fictitious analysis of burglary statistics in Germany, the geographical distribution of all burglaries that took place in 2011 using the weak point window in single-family houses is sought. Only burglaries are of interest that have been successfully detected and cleared up. By selecting the corresponding attribute values, the analysis table displays only the data records you are looking for. The table view shows that 338 of 42,821 intrusions meet these criteria. By transferring the selection to the feature layer, these 338 break-ins are marked on the map.
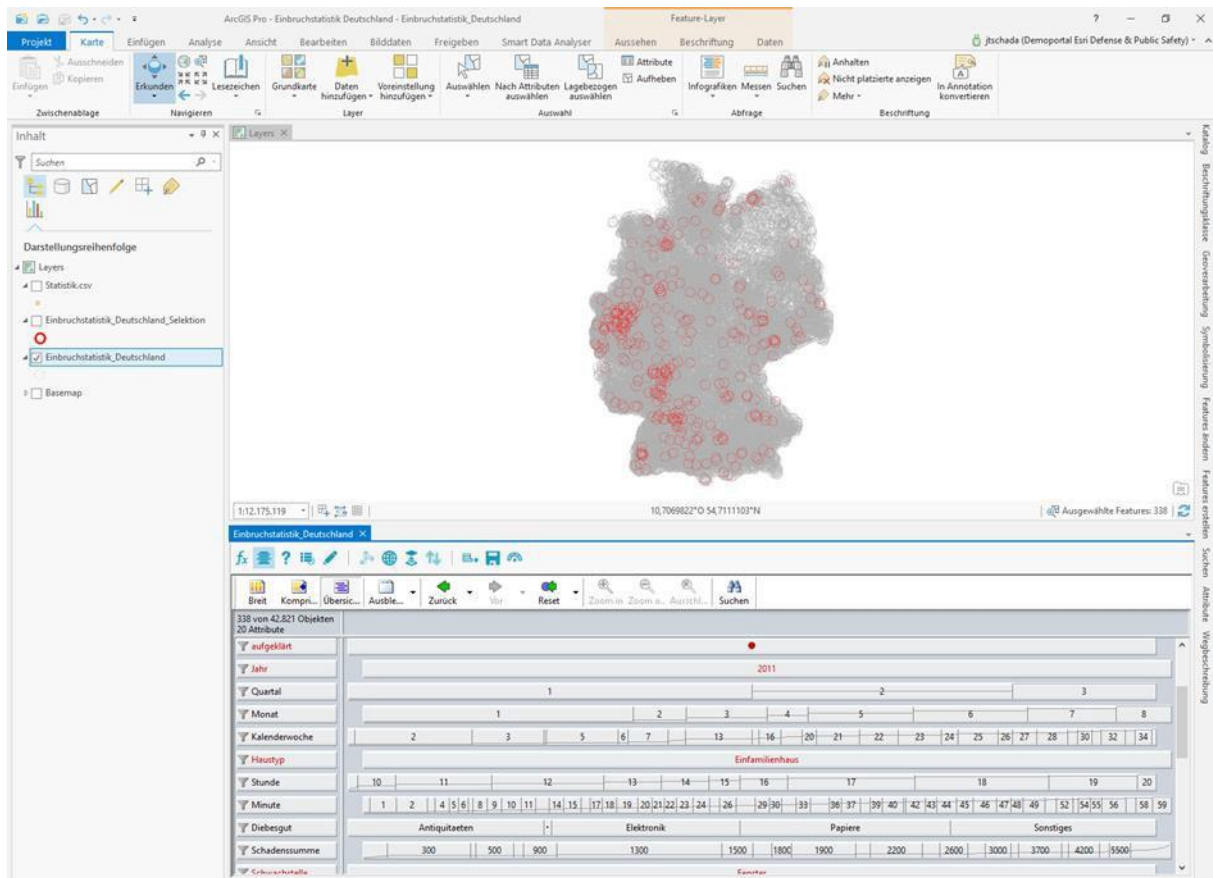
Figure 24: Transferring a selection to a feature layer

Note:

The records you are looking for are selected within the feature layer. If you only want to save the selected data sets as analysis results, you can create your own feature class from the selection set using standard tools in ArcGIS Pro.

If only data sets in a certain geographical area, e.g. in the Berlin area, which meet the above criteria are of interest, a standard feature selection can be used to preselect spatially. This spatial selection can be transferred to the analysis table using the corresponding button in the toolbar.
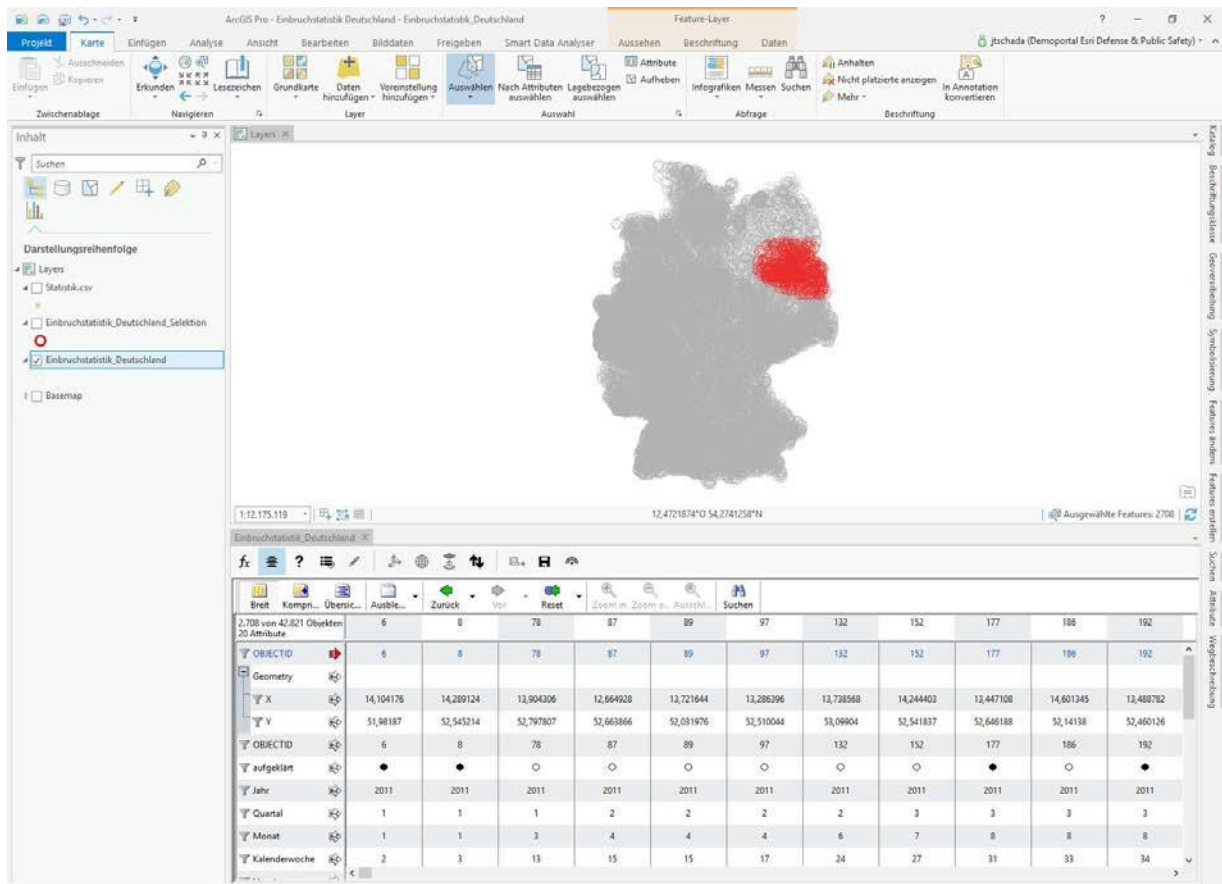
Figure 25: Spatial preselection

In this way, the analysis table displays only the spatially preselected data records.

An attributive refinement in the analysis table (selection for 2011, single-family house, windows and enlightened) results in the locations of three break-ins in the Berlin area that meet these criteria.
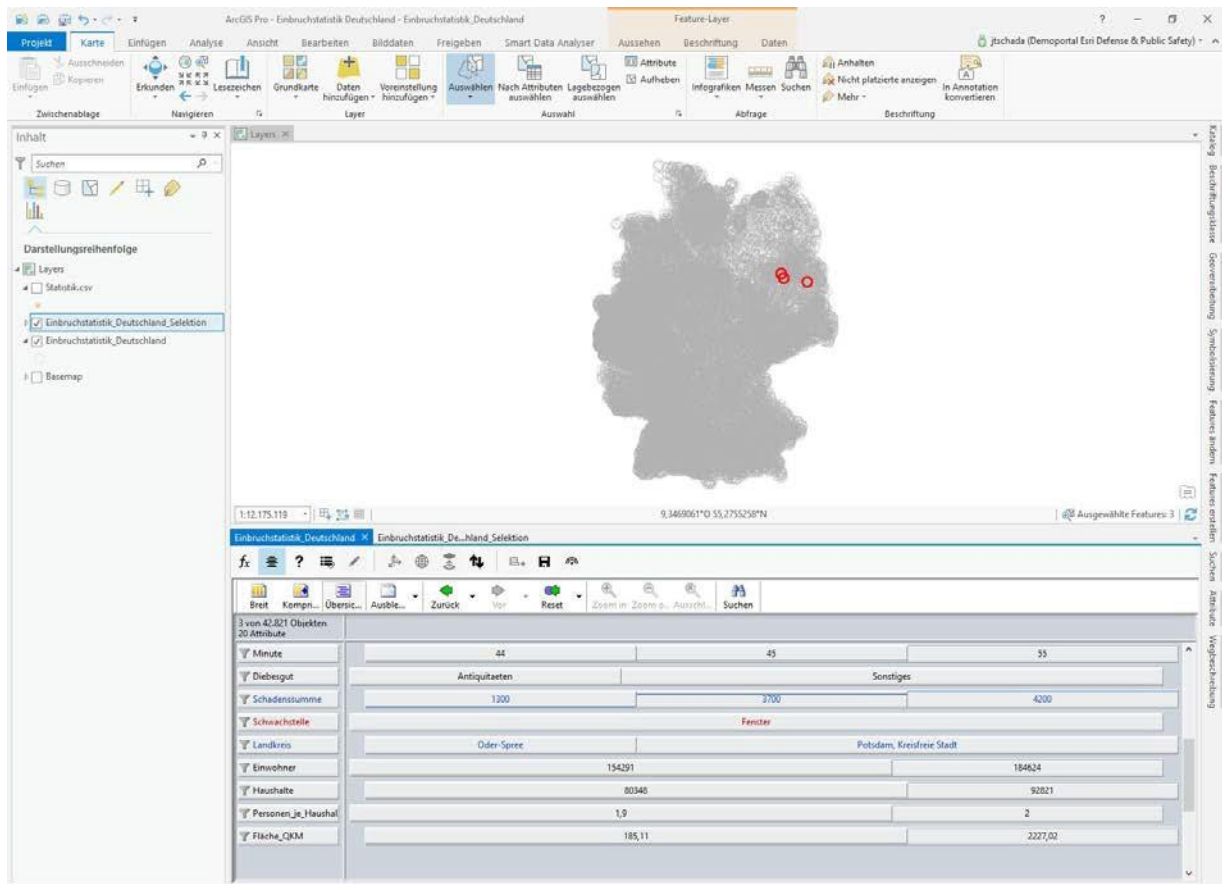
Figure 26: Evaluation in the Berlin area

This example shows the basic functionality of Smart Data Analyser. The basic workflow for using the tool becomes clear, with the exchange of selection sets between the analysis table and feature layer at its core.

However, the analysis table is supported by a large number of additional functions, which are described in detail in the function reference (see chapter 4) and in the referenced online help.

3.6 Editing

Since version 2.0 of Smart Data Analyser, you can edit data records, that is, change attribute values, using the edit bar in the analysis table.

Figure 27: Editing - toolbar

After you open the editor, you can select an attribute value within the analysis table and change it directly in the editing bar. After confirmation with the Enter key or by activating the green check mark, the change is accepted directly into the data set.
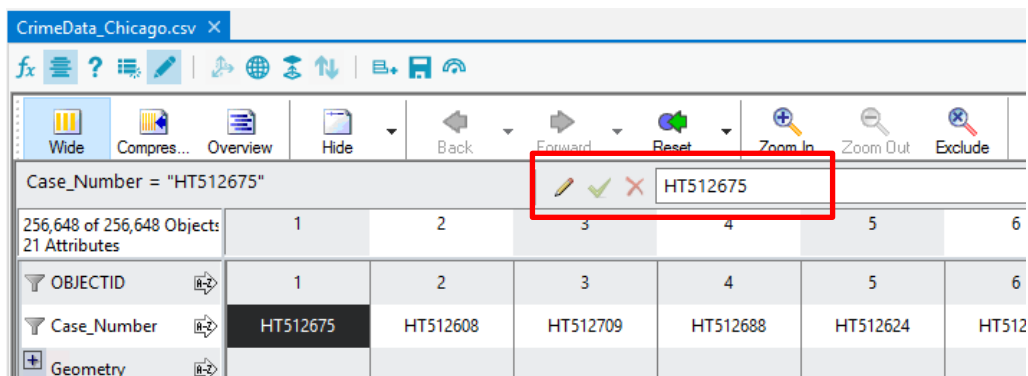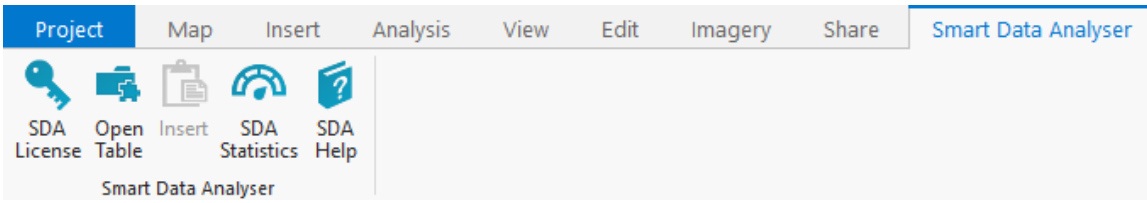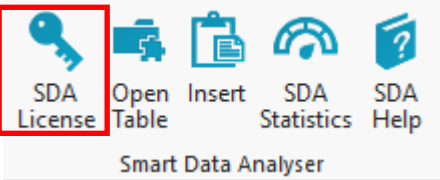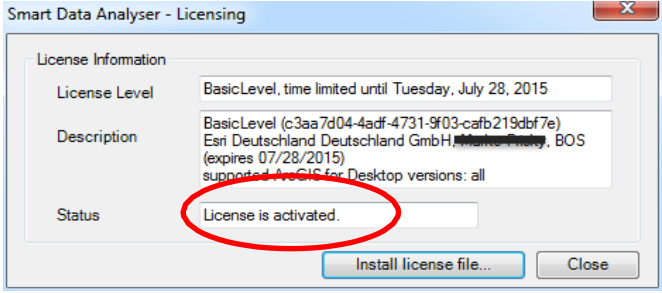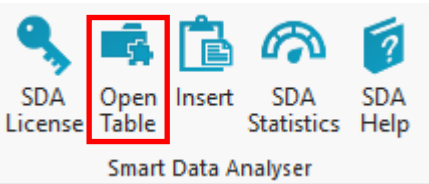
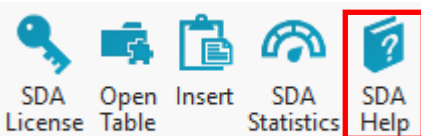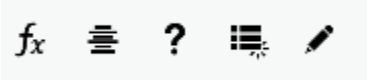*Figure 28: Edit attribute values*

Note:
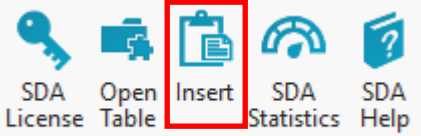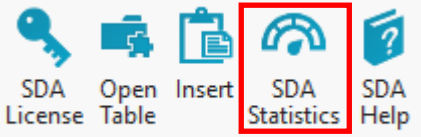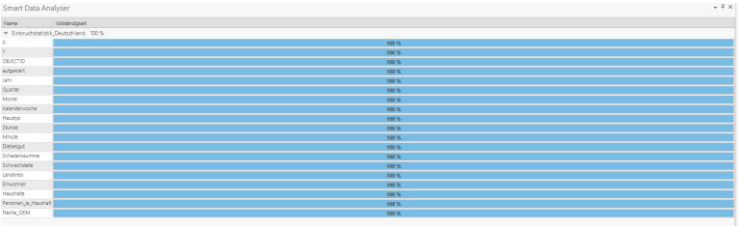
If there is a connection to a data source, the Edit option is disabled. You can edit the data directly using the ArcGIS Pro tools. However, if you prefer direct editing in the analysis table, you must first decouple it from the data source.

4 Function Reference

Smart Data Analyser - toolbar

- *Main menu*

- *Toolbar*

SDA Licensing	This menu item opens the licensing window where the license can be activated.

Add table	Loads a FOX or CSV file into the analysis table.
	The following column name pairs are recognized as coordinates and automatically converted to a point-feature class during transmission:

+ Latitude, Longitude
+ Lat, Lon
+ Y, X
+ North, East
+ Up, Right

Note:

The column name pairs are searched hierarchically according to the above list and the first recognized pair is used as the geometry of the point feature class. For a successful detection, WGS 84 is set as a geodetic reference system. If detection is unsuccessful, a transfer is made to a standalone table without the assigned geometry.
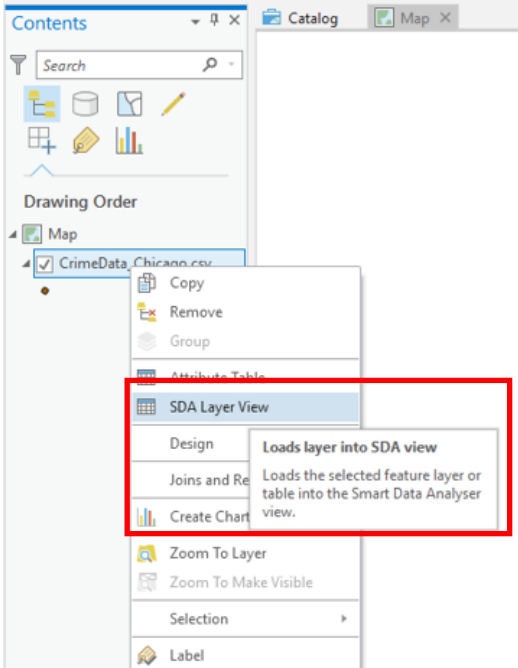
Paste from Clipboard	Inserts text content from the clipboard into a new analysis table.
SDA View	Shows or hides the statistics window with the tables. The statistics window appears as a dockable window.
SDA Help	Opens the Smart Data Analyser user manual with the application assigned by the operating system to the corresponding file name extension of the user manual file.
View Control	Controls the various views for using and editing the analysis table.
Analysis tools	Includes advanced analysis functions such as inserting new attributes and coloring attribute values
Navigation features	The navigation functions include the tools for changing the table display (wide, compressed, overview) and also the functions Back, Forward and Reset for navigating through the table views.
Query capabilities	Contains functions for defining and calling predefined queries
Status bar	The status bar displays additional information in the analysis window footer.
Editing bar	Shows or hides a toolbar with which selected cell contents can be edited.

Toolbar			
Define geometry columns			When importing FOX or CSV files, columns with coordinate information are automatically searched for in the data set and created as shape columns; this can also be defined later by the user.
Select coordinate system			By default, the geometry columns are defined as WGS84. Select a different map projection using select coordinate system.
Create map content			Creates a feature layer from the data records in the analysis table. From this point on, the analysis table is linked to the generated feature layer. The connection is displayed in the title bar of the analysis window (connected with ...). If no geographical information is contained in the data set, a standalone table is generated. The currently supported column names for geographical information can be found in the Add table function reference.
Insert data...			Imports data into the existing analysis table. The data must be in the same schema as the table.

Save as…		Saves the current analysis table as a file. The table can be saved as a FOX or CSV file. The FOX file format supports formula and reference attributes and stores the current selection and queries in addition to the basic data. When saved as a CSV file, this information is lost.
Calculate statistics...		Calculates the statistics in the analysis table and displays them in the statistics view.
Context menu 		A layer or an attribute table can also be transferred to an analysis table by right-clicking on the map table of contents. The selection is context-sensitive, in the case of a standalone table it is possible to create a simple table view. This means that data records that have no geographical reference, such as standalone attribute tables from a file geodatabase, can also be transferred to an analysis table. For these attribute tables, however, it is assumed that they contain the attribute OBJECTID (unique identifier of ArcGIS), similar to feature classes.

Smart Data Analyser - analysis table

CrimeData_Chicago.csv ✕							
fx ☰ ? 📑 ✎ | 🖋 ⊕ ⌛ ↑↓ | ▤ 🖫 ⌔							
▥ Wide · ▦ Compres... · 🗐 Overview · 🗋 Hide ▾ · ◀ Back ▾ · ▷ Forward ▾ · ◀ Reset ▾ · 🔍 Zoom In · 🔍 Zoom Out · ⊘ Exclude							
256,648 of 256,648 Objects 17 Attributes	1	2	3	4	5	6	7
▽ OBJECTID ◆	1	2	3	4	5	6	7
▽ Case Number ⇨	HT512676	HT512608	HT512709	HT512688	HT512624	HT512583	HT512599
▽ Primary Type ⇨	CRIMINAL DAMAG	BATTERY	CRIMINAL TRESPA	BURGLARY	BURGLARY	DECEPTIVE PRACT	CRIMINAL DAMAG CI
▽ Description ⇨	TO PROPERTY	DOMESTIC BATTERY SIMPLE	TO LAND	UNLAWFUL ENTRY	ATTEMPT FORCIBLE ENTRY	THEFT OF LABOR/SERVICES	TO VEHICLE

Navigation Bar

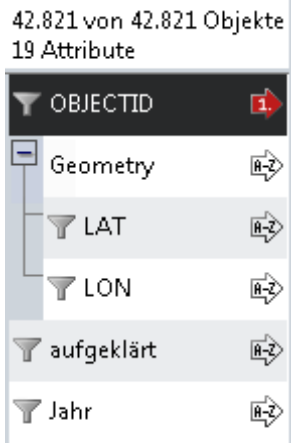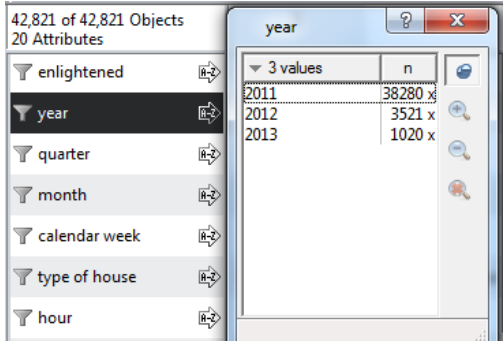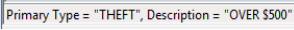|		
Wide	▥ Wide	In this view, all columns are displayed with the same width regardless of the number displayed. You can change the column width of the entire table interactively to make the objects easily readable. If more objects are displayed than fit in the window, you can scroll horizontally to view more objects.
Compressed	▦ Compres...	In the compressed view, all objects in a table can be displayed in the analysis table at once, whether there are three, one hundred, or even one million objects. The column width of the objects is reduced so that all objects next to each other fit into the window. However, you can usually recognize some values, since identical values next to each other are combined into one cell.
Overview	🗐 Overview	The overview offers meaningful analyses for tables with many objects at a glance. You can quickly zoom in on objects of interest by double-clicking on the desired values. In contrast to the other two views, the values of all attributes are normally displayed independently of each other in the overview. This gives you an overview of the value ranges of all displayed attributes and you can easily evaluate the distribution of the values, since the same values are combined into one cell and the width of the cell corresponds to the frequency of this value.

Hide		With this function the whole table or only the data part can be hidden.
Back		As soon as you have zoomed into cells, i.e. the selection has been refined, you can use the Back button to return to the previous selection.
Forward		This function restores the last selection if Back was previously used.
Reset		The complete selection can be reset via *Reset*. The analysis table then returns to its original state.
Zoom in		This function refines the view by making the selected cell(s) a filter and zooming into the table. This function is similar to double-clicking a cell.
Zoom out		This function cancels the last filter and zooms back one level.
Exclude		This tool allows the definition of negative filters. The selected cell(s) are excluded.
Search		This tool enables a textual search within the analysis table.

Data Area		
Attribute column		The header of the attribute column contains information about how many data records are selected by the current selection (in this case, no filter is active, so all objects are visible). The number of attributes is displayed below.
Value list		By clicking on the filter symbol a dialog appears, which shows the frequency distribution of the attribute values. Via this dialog you can also zoom into the database.
Sort by		The sorting tool allows the table to be sorted according to the selected attribute. The sort sequence can also be reversed.
Status Bar		Depending on the table display selected, the current filter is displayed in the status bar.

Queries

The query bar holds the functionality to define, save, and execute queries. Thus, analysis results can be saved as a query and given a telling name.
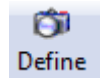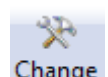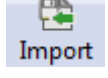
Note: Using the FOX format, queries are saved internally. For other formats, queries can be saved using the import/export function.

For a more detailed description of functions, please refer to the InfoZoom online help:
http://service.infozoom.com/fileadmin/daten/oh/desktop_8.2/de/Infozoom/

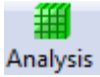| **Saved Queries**	Query1 ∨	
	Anfragen	
	Saved queries are available through the drop-down list.	
Perform	Perform	Executes the selected query.
Define	Define	Defines new queries.
Change	Change	Changes existing queries.
Delete	Delete	Deletes the current query.
Import	Import	With this function you can import queries from existing query files.
Export	Export	With the export function the queries can be exported as a separate query file.
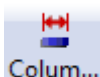
Analysis functions

The analysis bar contains numerous tools for advanced data analysis workflows, such as the creation of derived attributes based on existing attributes or the coloring of attribute values.

For a more detailed description of functions, please refer to the InfoZoom online help:

https://www.infozoom.com/onlinehelp/InfoZoom_2023/de/infozoom/

Attribute		Inserts derived attributes using formulas and text manipulation functions.
Analysis		Creates analysis groups (refer to online help).
Column Width		Adjusts column width in the overview or compressed display mode.
Colors		Uses specific rules to color attributes according to the attribute value.

Edit functions

The editing toolbar allows edit operations on attributes of the Smart Data Analyser table.

For a more detailed description of editing, please refer to the InfoZoom online help:

https://www.infozoom.com/onlinehelp/InfoZoom_2023/de/infozoom/

Infofeld		The info field shows information about the current selection in the table.
Edit Buttons	✔ ✕	If the content of the editing field has been changed, the buttons next to the editing field become active. Click on the respective button to make changes or discard them.
Edit Field		Attribute values and attribute names are edited in the editing field.

5   Appendix – Sample Data

There are generally two different methods for importing data into the Smart Data Analyser analysis table:

1. import from the map table of contents of ArcGIS Pro

   For this purpose, a feature layer or an attribute table can be selected in the ArcGIS Pro map content directory and then created via the layer context menu (menu item: SDA Layer View / Table View).

2. import via the main menu of Smart Data Analyser (menu item: add table)

   Using the Add Table menu item, a CSV or FOX file can be loaded directly into the Smart Data Analyser analysis table. Using the Smart Data Analyser toolbar (button: Generate Map Content), you can transfer the content of the analysis table to a feature layer visible in the map table of contents. If the imported file contains geographical coordinates, the data sets are immediately visible on the map. If the imported file does not contain any geographical coordinates, a standalone table is created in the map table of contents and the project database. For a detailed description of the supported coordinate representations see chapter 4.

For data in ArcGIS formats, Smart Data Analyser is a powerful data analysis tool for geographical data. If you already use the FOX file format, Smart Data Analyser provides the interface to the geographical analysis tools of ArcGIS Desktop.

To facilitate the entry into Smart Data Analyser for ArcGIS Pro users as well as for users of the FOX file format, numerous example files are included in the delivery of Smart Data Analyser:
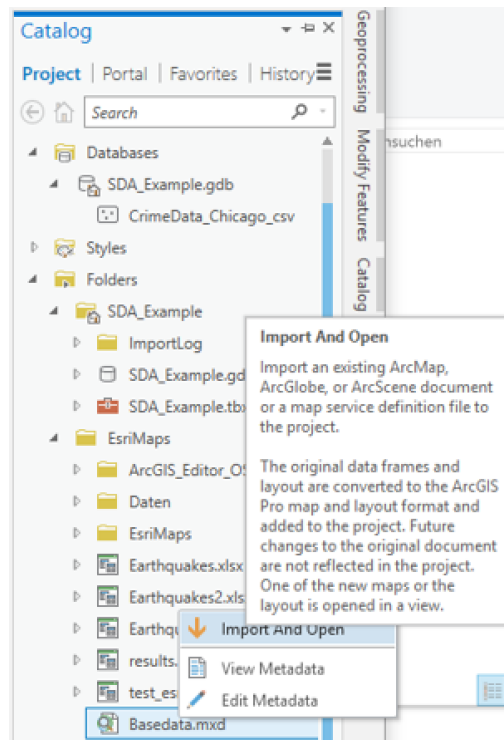
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Figure 29: Project folder in ArcGIS Pro

The GIS Data folder contains the geodatabase SDA_Data.gdb, which contains some sample feature classes for transfer to Smart Data Analyser. You can conveniently import these feature classes into ArcGIS Pro via the respective MXD file and generate an analysis table from them.
The folder Text Data contains the CSV file Einbruchstatistik_Deutschland.csv, which contains the feature layer Einbruchstatistik_Deutschland from the geodatabase in text format. This CSV file can be loaded into Smart Data Analyser via Open File and analyzed geographically after creating a feature layer.

Under FOX Files you can find some example files that have no geographical reference but further illustrate selected functions of the analysis table. Due to the lack of geographical reference, this data is transferred as a standalone attribute table to ArcGIS Pro, where it can be enriched with geographical information, for example.

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