

ModelBuilder: Tips and Tricks



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Resources



Resources and Geonet Community

- **ModelBuilder vocabulary**

<https://pro.arcgis.com/en/pro-app/latest/help/analysis/geoprocessing/modelbuilder/modelbuilder-vocabulary.htm>

- **Geonet community**

<https://community.esri.com/t5/arcgis-pro/ct-p/arcgis-pro>

- **ArcGIS keyboard shortcuts**

https://pro.arcgis.com/en/pro-app/latest/get-started/arcgis-pro-keyboard-shortcuts.htm#ESRI_SECTION1_B5890B2BE57D4F12AFF751A199FBE159

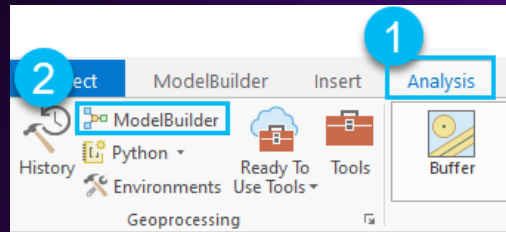


Search Tools

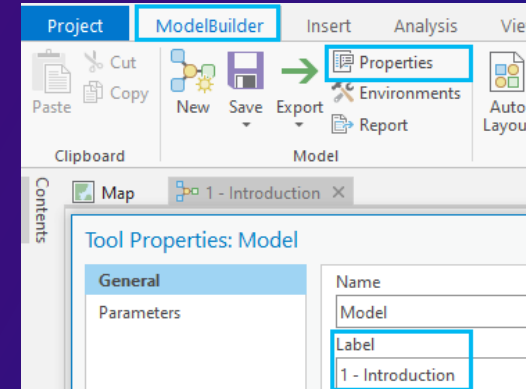
The background is a vibrant, abstract composition. It features a color gradient from deep purple on the left to bright orange on the right. Overlaid on this are various technical and geographical motifs: a stylized globe in the bottom right corner, a grid pattern, a wavy blue line, and some faint, illegible text or data points in the upper right quadrant.

Search Tools

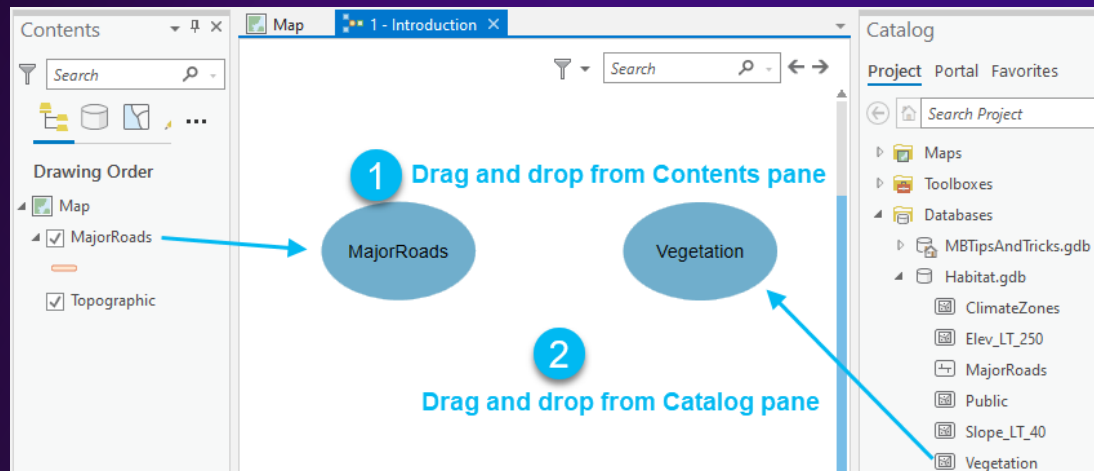
- Create a model



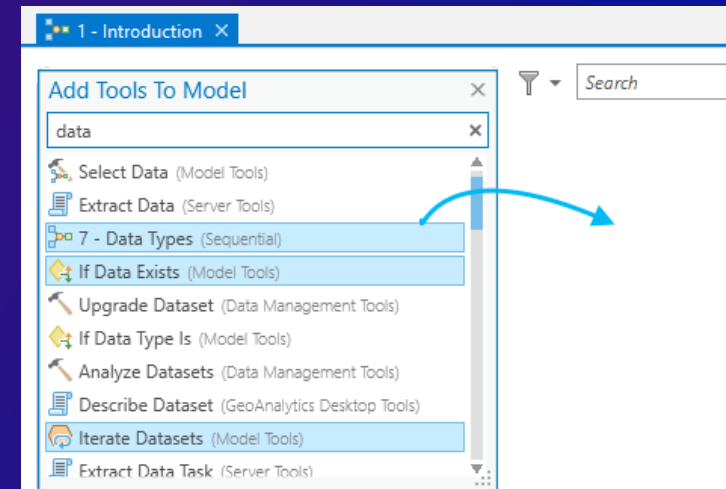
- Rename model



- Add data



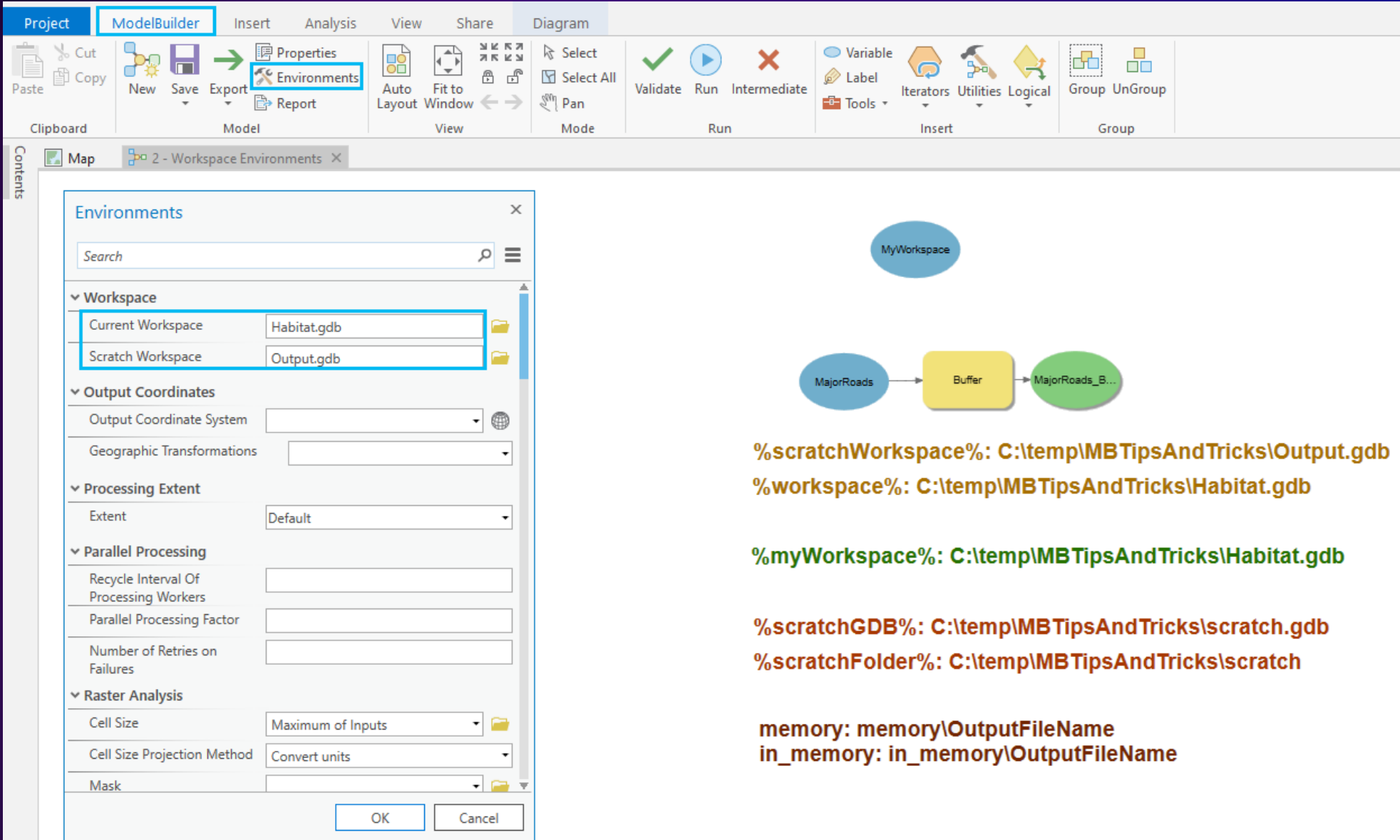
- Add tool



Workspace Environments

The background is a vibrant, abstract composition. It features a color gradient from deep purple on the left to bright orange on the right. Overlaid on this are various technical and geometric patterns: a grid of white lines, a blue wavy shape, and a stylized globe in the bottom right corner. The overall aesthetic is modern and digital.

Workspace Environments



The screenshot shows the 'Environments' dialog box in the ModelBuilder interface. The 'Workspace' section is expanded, showing two workspace entries:

Workspace	File
Current Workspace	Habitat.gdb
Scratch Workspace	Output.gdb

The 'Processing Extent' section shows 'Extent' set to 'Default'. The 'Parallel Processing' section has several empty input fields. The 'Raster Analysis' section has 'Cell Size' set to 'Maximum of Inputs' and 'Cell Size Projection Method' set to 'Convert units'.

Below the dialog box, a workflow diagram is shown with three nodes: 'MyWorkspace' (blue oval), 'MajorRoads' (blue oval), and 'MajorRoads_B...' (green oval). A yellow 'Buffer' tool node is positioned between 'MajorRoads' and 'MajorRoads_B...'. Arrows indicate the flow from 'MajorRoads' to 'Buffer' and then to 'MajorRoads_B...'.

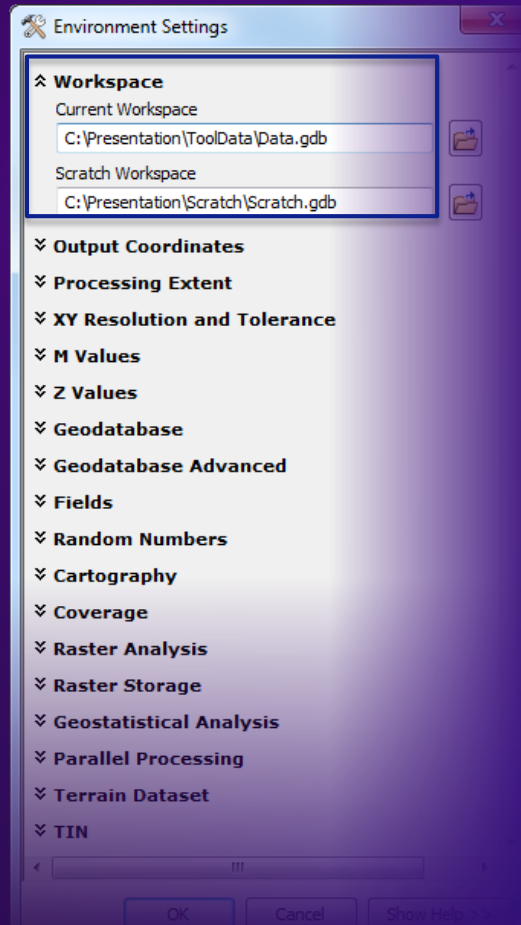
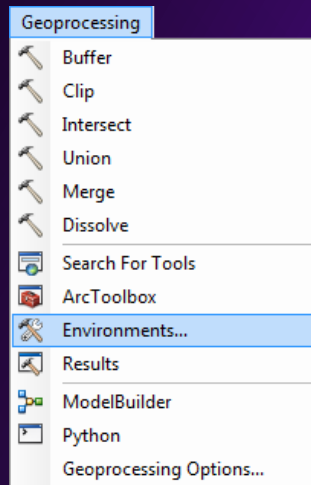
The following environment variables are listed:

```
%scratchWorkspace%: C:\temp\MBTipsAndTricks\Output.gdb  
%workspace%: C:\temp\MBTipsAndTricks\Habitat.gdb  
  
%myWorkspace%: C:\temp\MBTipsAndTricks\Habitat.gdb  
  
%scratchGDB%: C:\temp\MBTipsAndTricks\scratch.gdb  
%scratchFolder%: C:\temp\MBTipsAndTricks\scratch  
  
memory: memory\OutputFileName  
in_memory: in_memory\OutputFileName
```

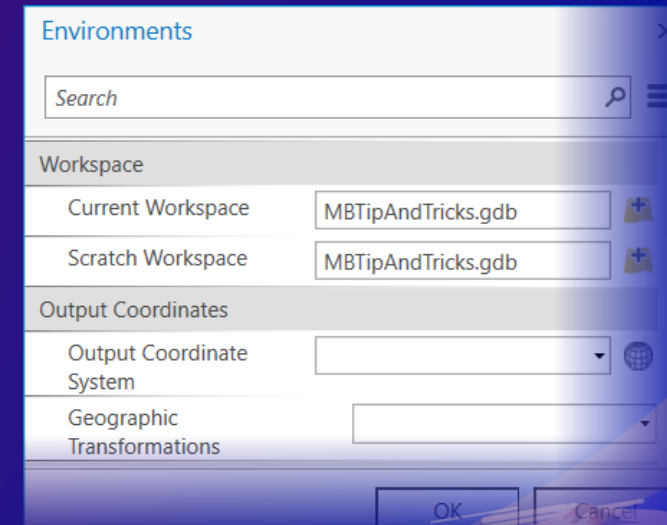
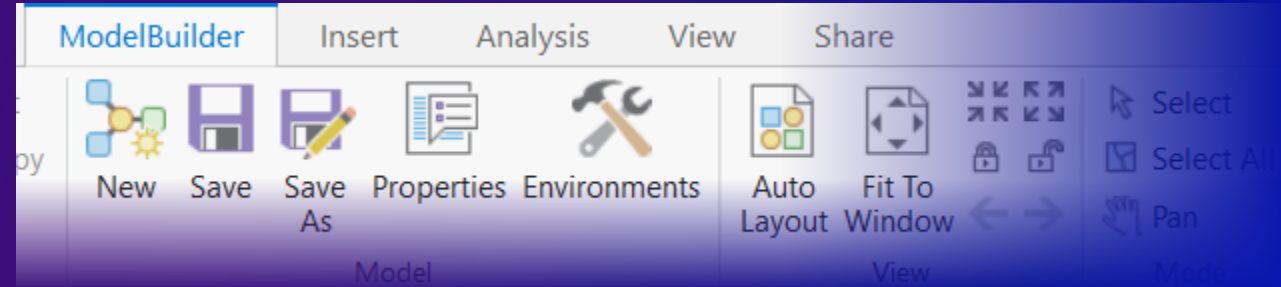
Workspace Environments

- Create and **save a map document in your root folder**
- Set the **workspace environments** at the application level

10x



Pro

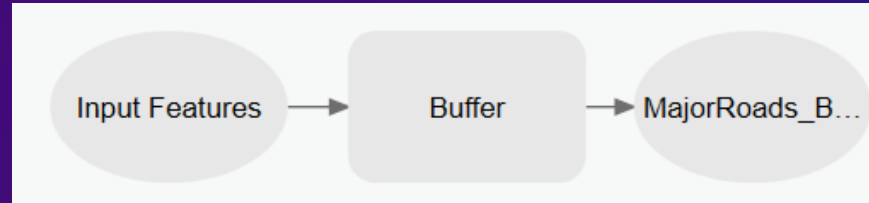


Model State

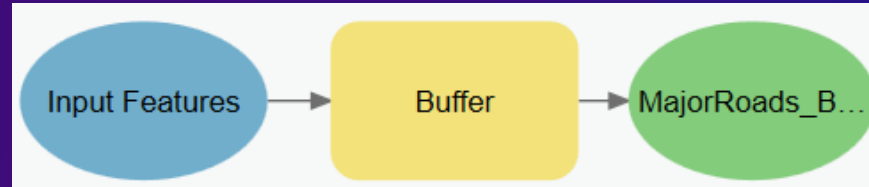


Model State

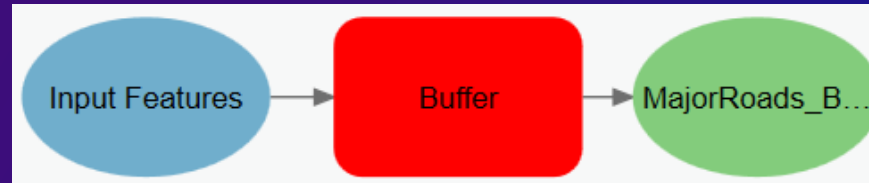
- **Not ready to run**



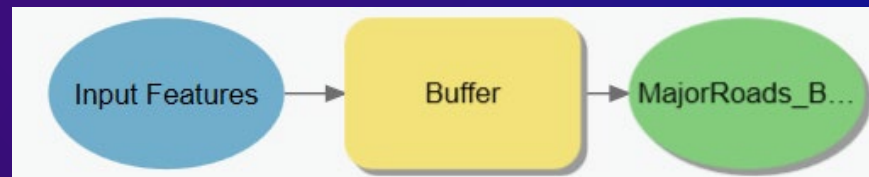
- **Ready to run**



- **Running**



- **Has been run**



Keyboard shortcuts

The background features a complex, abstract design. It includes a purple-to-blue gradient on the left, transitioning into a blue area with white contour lines and a grid pattern on the right. A bright orange and yellow curved shape is visible in the bottom right corner, partially overlapping a blue area with a grid pattern.

ModelBuilder Keyboard Shortcuts

Model element	
Keyboard shortcut	Action
Ctrl+O	Open the selected model element.
Ctrl+R	Rename the selected model element.
Ctrl+P	Revert the current Parameter setting for the selected model elements.
Ctrl+D	Check Add To Display for the selected model elements.
Ctrl+Shift+D	Uncheck Add To Display for the selected model elements.
Ctrl+I	Check Intermediate Data for the selected model elements.
Ctrl+Shift+I	Uncheck Intermediate Data for the selected model elements.

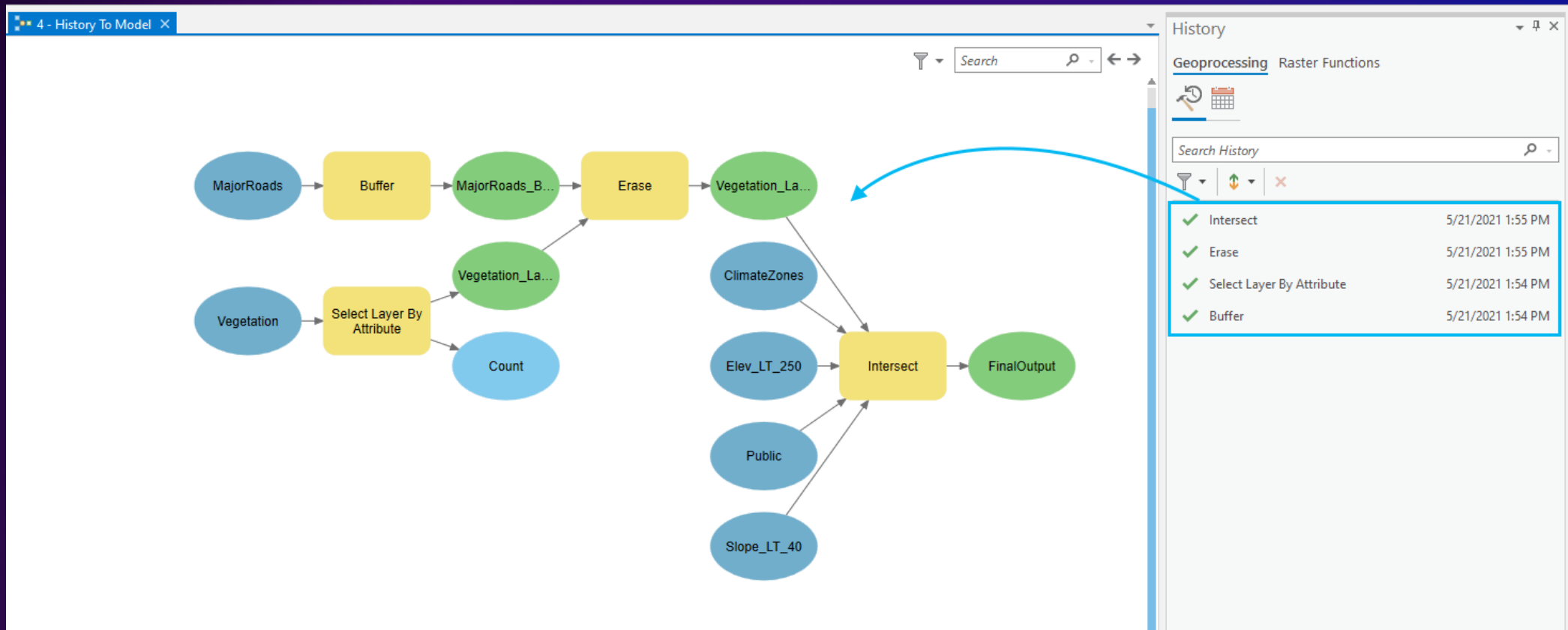
Find more ModelBuilder shortcuts at:

https://pro.arcgis.com/en/pro-app/latest/get-started/arcgis-pro-keyboard-shortcuts.htm#ESRI_SECTION1_B5890B2BE57D4F12AFF751A199FBE159

History To Model



History To Model



Variables



Variables

Single value variable: Feature Layer

Value Properties

Single value variable

MajorRoads

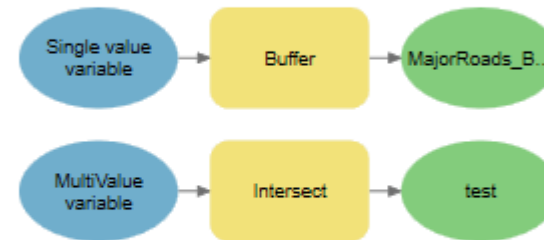
OK

MultiValue variable: Features, Ranks

MultiValue variable

	Ranks
ClimateZones	
Elev_LT_250	
Public	
Slope_LT_40	

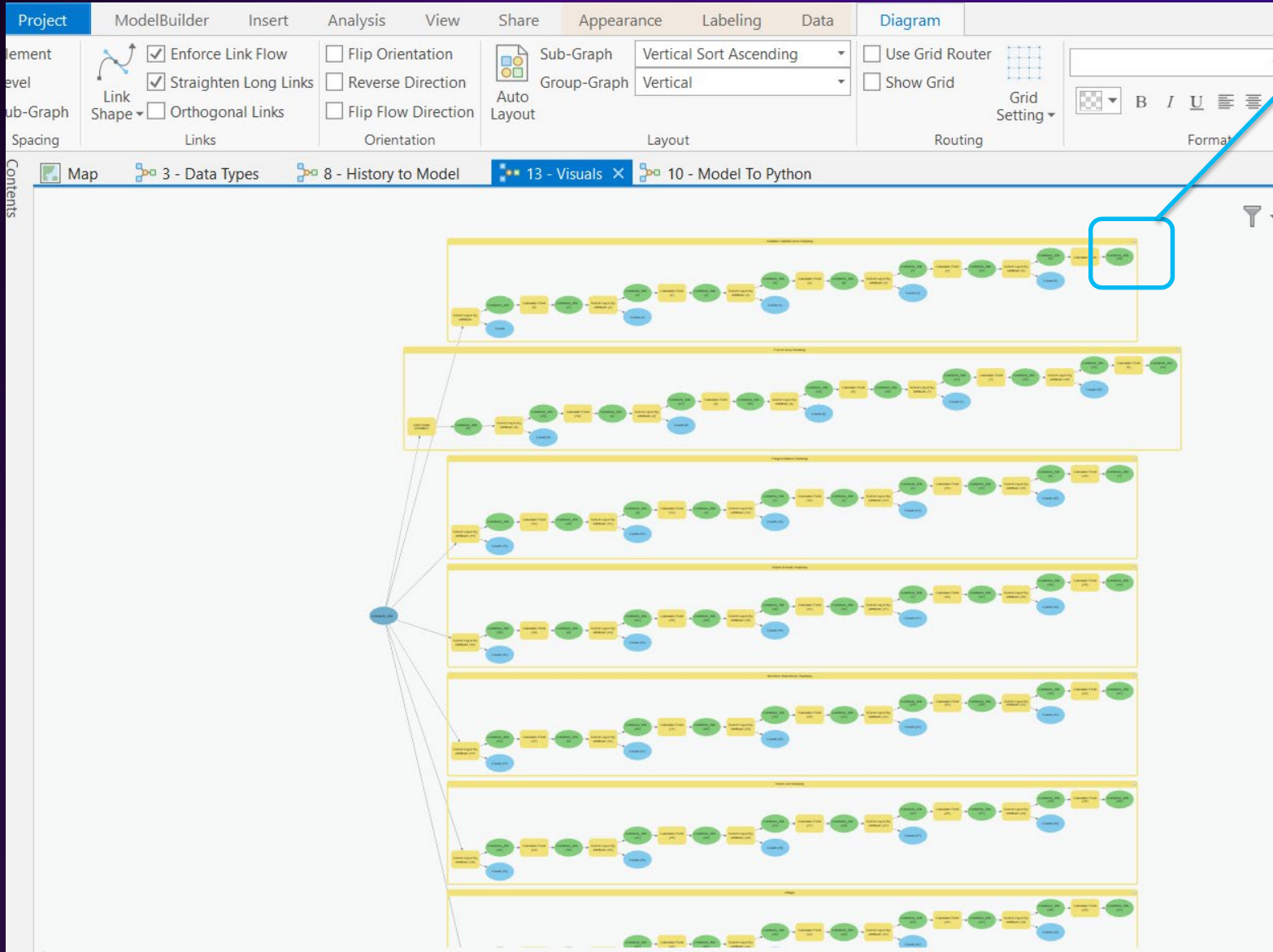
OK



Groups and Formatting

The background features a complex, abstract design. It includes a purple-to-blue gradient on the left, transitioning into a blue area with white contour lines and a grid pattern on the right. A prominent orange and red curved shape is visible in the bottom right corner, resembling a stylized globe or a large letter 'C'. The overall aesthetic is modern and digital.

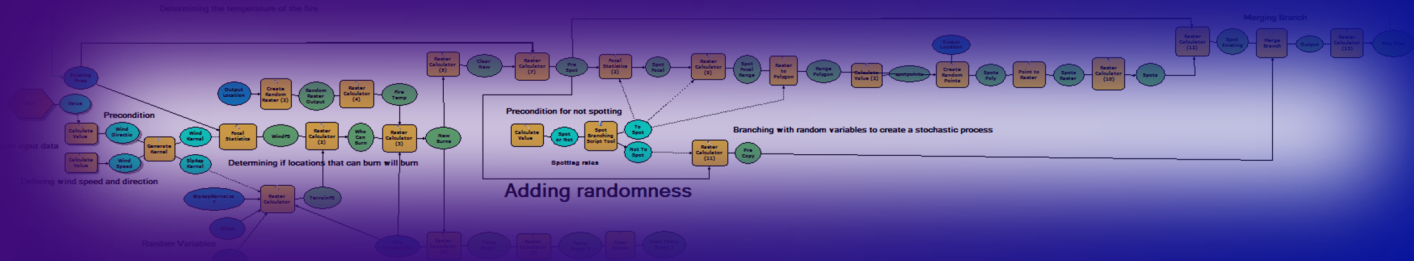
Grouping and Formatting



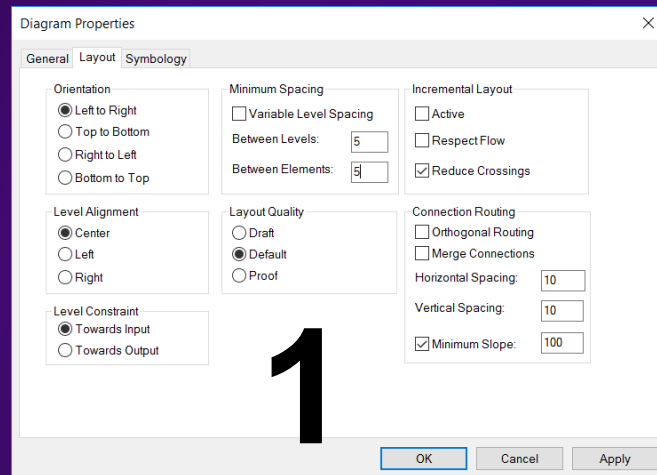
Corridors_Wit... (10)

- Create Variable...
- Create Label
- Validate
- Run
- Group
- Expand All Groups**
- Collapse All Groups
- Auto Layout Diagram
- Route All Links
- Cut
- Copy
- Paste
- Select All
- Pan

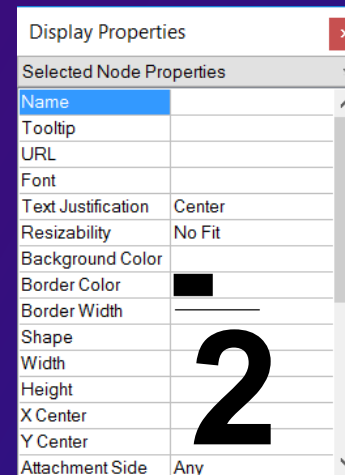
Viewing Big Models 10x



10x Diagram Properties



10x Display Properties



Pro Diagram

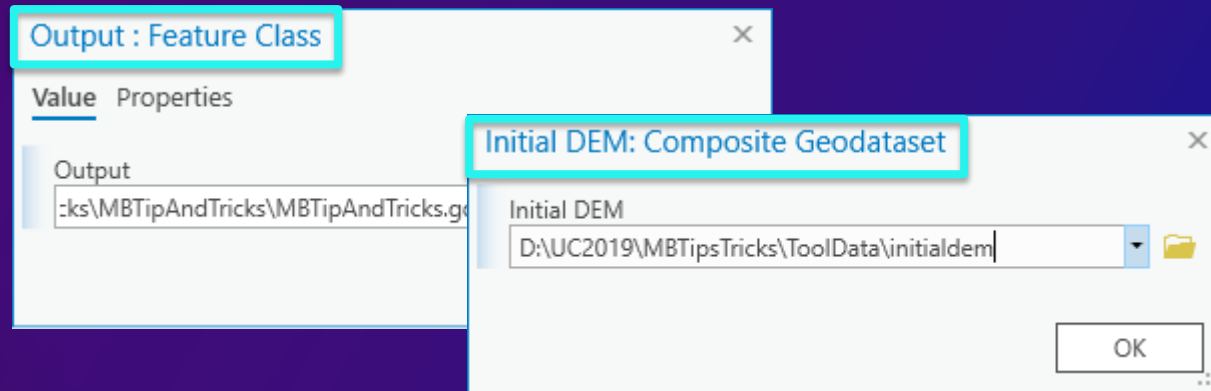
Spacing Element <input type="text" value="20"/> Level <input type="text" value="20"/> Sub-Graph <input type="text" value="20"/>	Links <input checked="" type="checkbox"/> Enforce Link Flow <input checked="" type="checkbox"/> Straighten Long Links <input type="checkbox"/> Orthogonal Links	Orientation <input type="checkbox"/> Flip Orientation <input type="checkbox"/> Reverse Direction <input type="checkbox"/> Flip Flow Direction	Layout Sub-Graph <input type="text" value="Vertical Sort Ascending"/> Group-Graph <input type="text" value="Horizontal Sort Ascending"/>	Routing <input type="checkbox"/> Use Grid Router <input type="checkbox"/> Show Grid Grid Setting <input type="text"/>	Text <input type="text"/> <input type="checkbox"/> B <i>I</i> <u>U</u> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
---	---	---	---	---	--

Pro Display

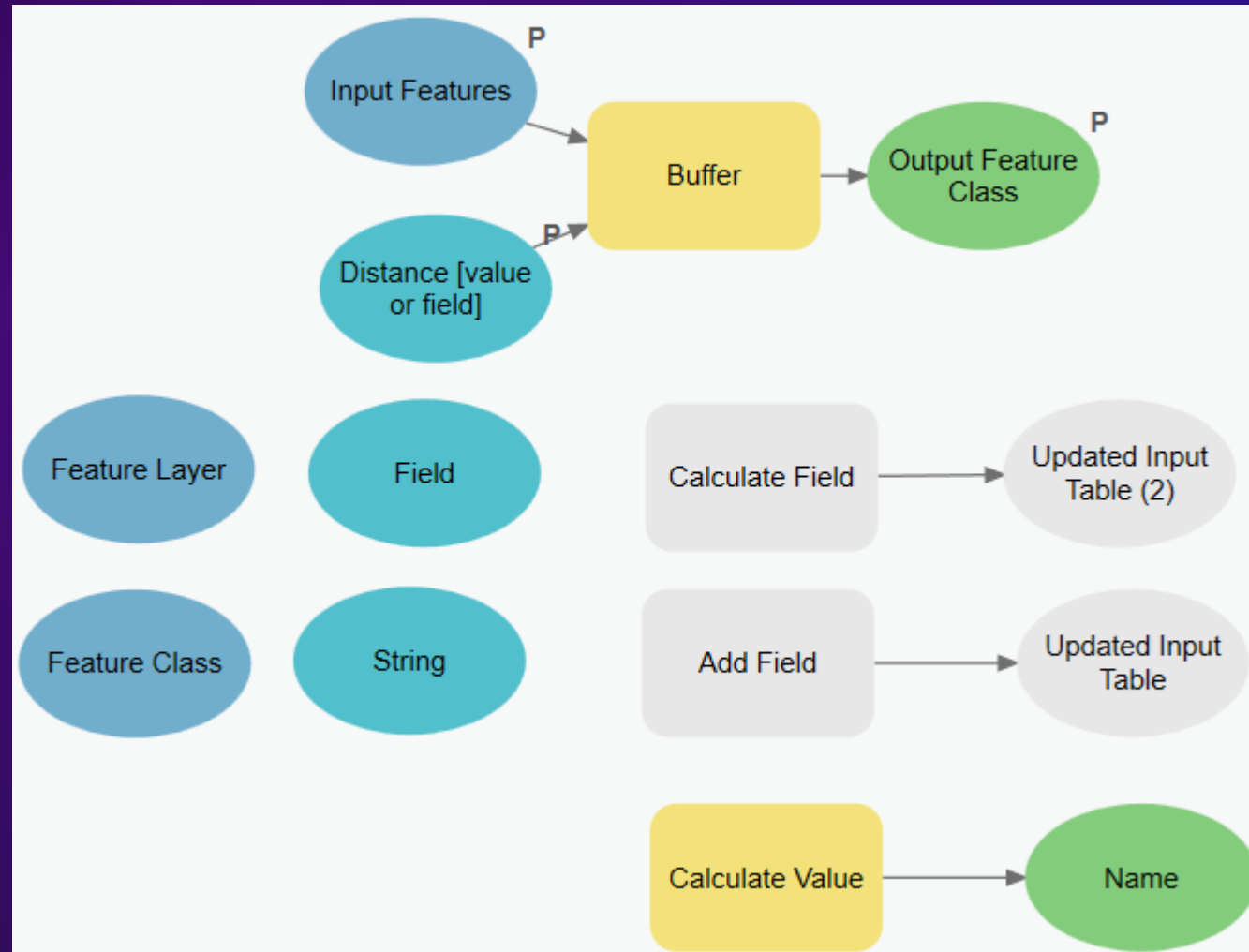
Data Types

The background features a complex, abstract design. It includes a purple-to-blue gradient on the left, transitioning into a blue and orange gradient on the right. There are various geometric shapes, including a grid pattern, a wavy blue line, and a circular orange shape in the bottom right corner. The overall aesthetic is modern and digital.

Data Types



Data Types



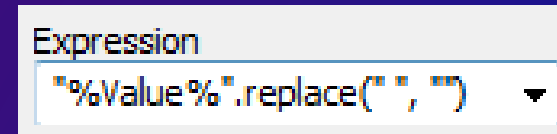
Inline Substitution

The background is a vibrant, abstract composition. It features a color gradient from deep purple on the left to bright orange on the right. Overlaid on this are various technical and geometric patterns: a grid of small squares, a wavy blue line, a globe showing continents, and some faint, illegible text or data points. The overall aesthetic is modern and digital.

Inline Substitution

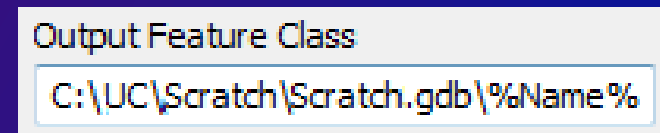
- In SQL expressions - Name = '%Value%'

- "%Value%".replace(" ", "")



Expression
"%Value%".replace(" ", "")

- In Output name – C:\Scratch\Scratch.gdb\%Value%



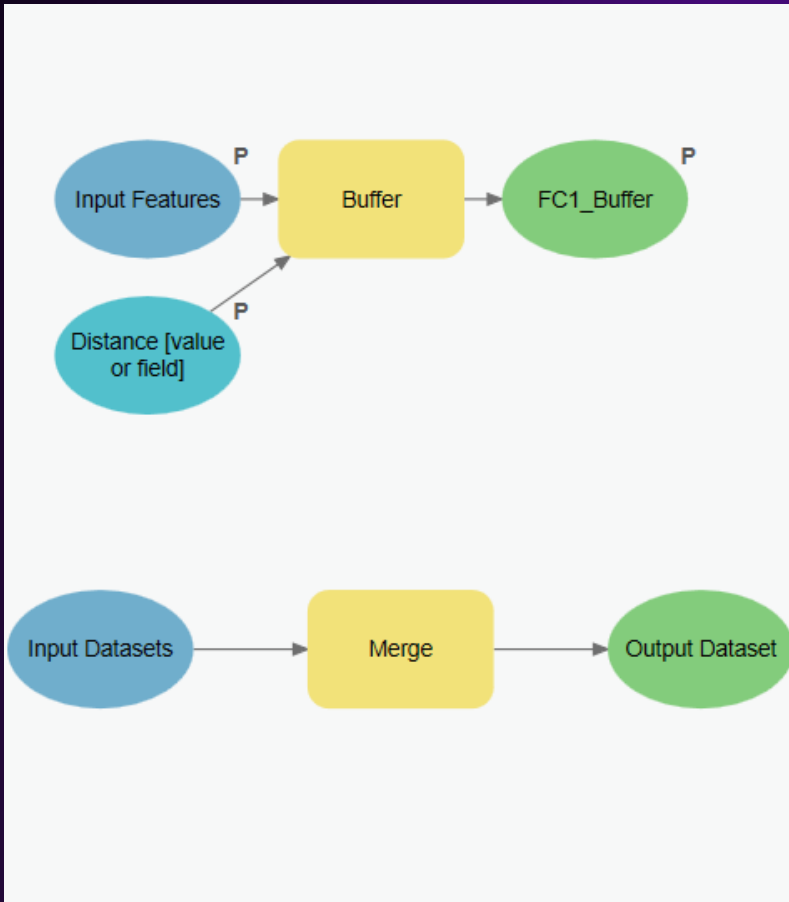
Output Feature Class
C:\UC\Scratch\Scratch.gdb\%Name%

- If string put “quotes” around your inline variable substitution

Model and Model Tool

The background is a vibrant, abstract composition. It features a gradient from deep purple on the left to bright orange on the right. In the lower right corner, a portion of a globe is visible, showing continents in a darker shade. A grid pattern, resembling a topographic map or a data grid, is overlaid on the purple and blue areas. The overall aesthetic is modern and technological.

Model and Model Tool



The screenshot shows the "Geoprocessing" window for the "Buffer" tool. The interface is titled "1 - Variables and Modes" and includes tabs for "Parameters" and "Environments".

- Input Features:** A text box containing "FC1".
- Distance [value or field]:** A text box containing "100".
- Linear Unit:** A dropdown menu set to "Meters".
- FC1_Buffer:** A text box containing "FC1_Buffer".

At the bottom right, there is a "Run" button with a play icon. The bottom of the window shows tabs for "History", "Catalog", and "Geoprocessing".

The screenshot shows the "Geoprocessing" window for the "Merge" tool. The interface is titled "2 - Parameter Categories" and includes tabs for "Parameters" and "Environments".

- Input Rasters:** A section with a dashed border containing two input rasters: "initialdem" and "magmaPipe".
- Volcanic Values:** A category with a right-pointing arrow.
- Output Rasters:** A category with a right-pointing arrow.
- Workspace:** A category with a right-pointing arrow.

Model Variables



Model Variables

Buffer

Parameters | Environments

Input Features
Input

Output Feature Class
D:\AUC2017\MBTipAndTricks.gdb\Output

Distance [value or field] Linear Unit
88 Meters

Side Type
Full

End Type
Round

Method
Planar

Dissolve Type
No Dissolve

New Derived Output
New output created

Add Field

Parameters | Environments

Input Table
Input

Field Name
Landuse

Field Type
Text

Field Length

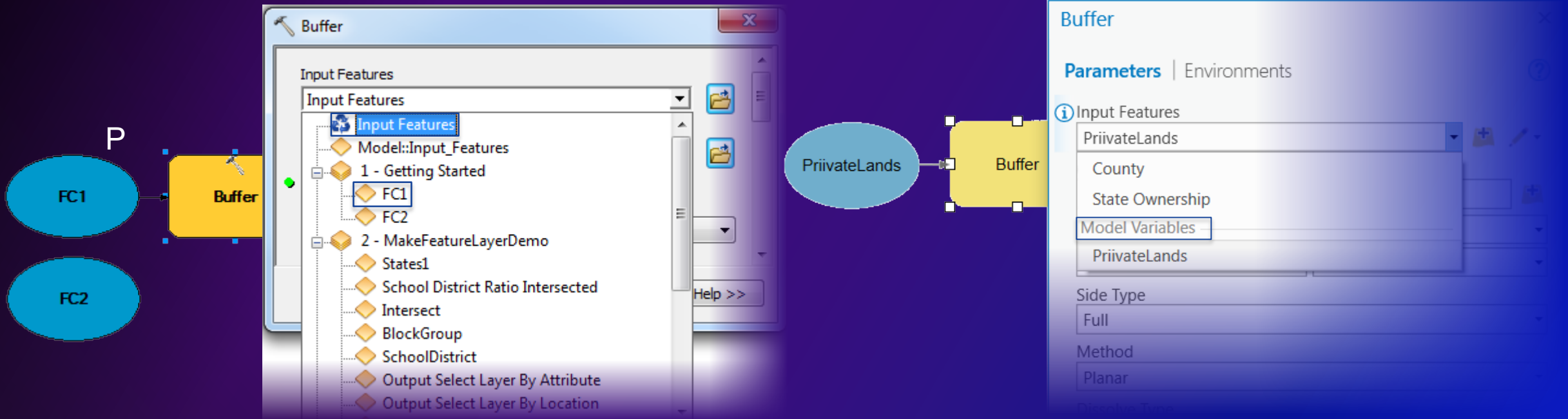
Field Alias

Field IsNullable
 Field IsRequired

Field Domain

In-Out Derived
Modifies Input/No new output

Variable and layer symbol 10x ArcMap

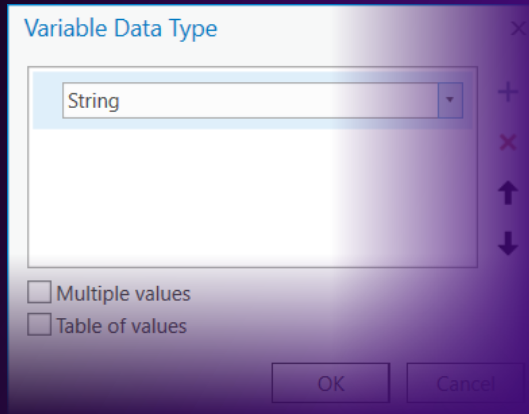


Parameter Filters

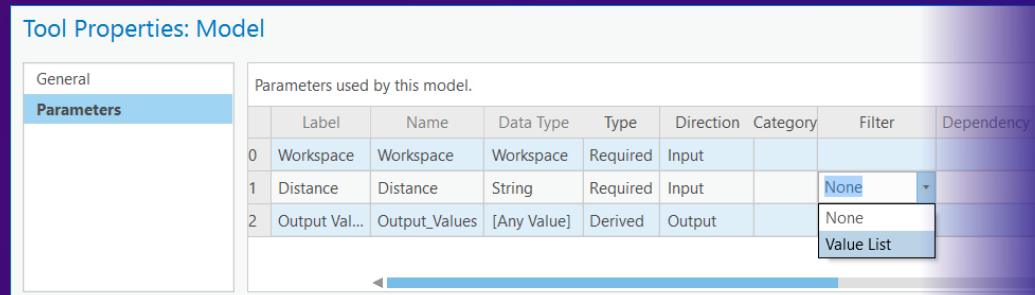


Variable Filters

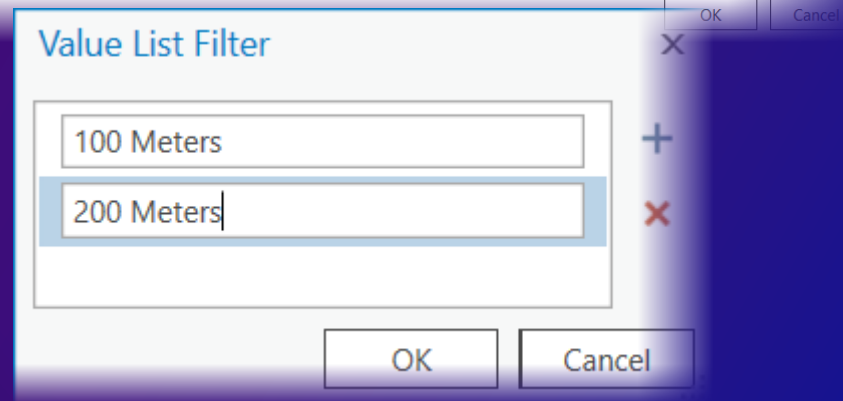
Create Variable of data type String



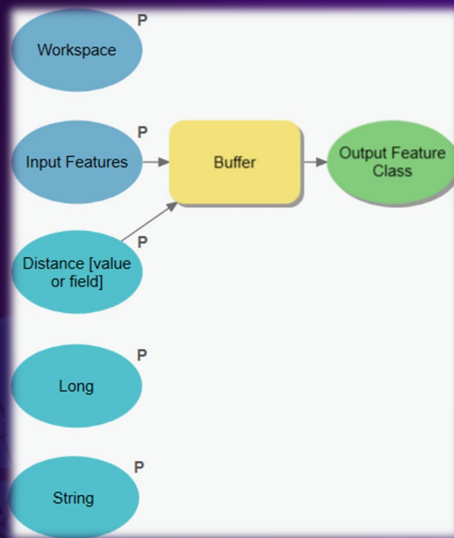
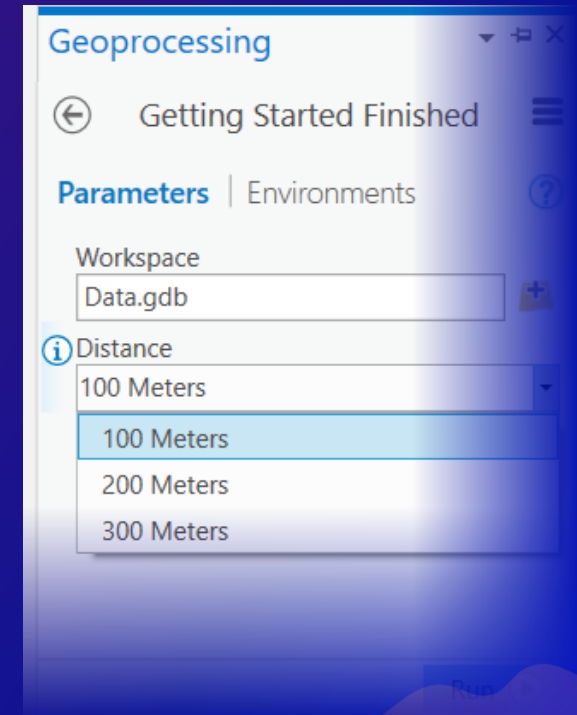
Rename the variable & Make model parameter



Add a value list filter



Choice list on tool dialog



Parameter Categories

The background features a vibrant purple-to-blue gradient. On the right side, there is a stylized globe with a grid pattern, partially obscured by a bright yellow and orange curved shape. The overall aesthetic is modern and technical.

Parameter Categories

The screenshot displays the ArcGIS Geoprocessing environment. The main window shows a workflow model with various tool nodes. A 'Tool Properties: Model' dialog is open, showing the 'Parameters' tab. The parameters are categorized as follows:

Label	Name	Data Type	Type	Direction	Category	Filter	De
0	InitialDEM	InitialDEM	GPSAGeo...	Required	Input	Input Rasters	
1	MagmaPipe	MagmaPipe	GPSAGeo...	Required	Input	Input Rasters	
2	LavaLoad	LavaLoad	Formulate...	Required	Input	Volcanic Values	
3	DepthCon...	DepthConversion	Double	Required	Input	Volcanic Values	
4	Smooth V...	Smooth_Volcano	Raster Dat...	Required	Output	Output Rasters	
5	Output W...	Output_Workspace	Workspace	Required	Input	Workspace	

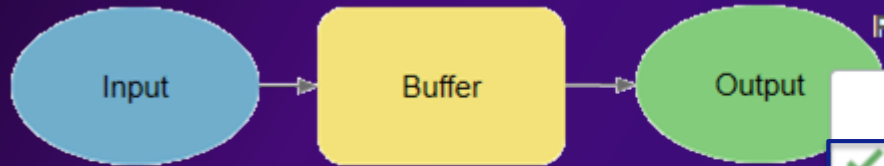
The right-hand pane, titled 'Geoprocessing', shows the current model '12 - Parameter Categories' with the following parameter settings:

- Input Rasters:** InitialDEM (initialdem), MagmaPipe (magmapipe)
- Volcanic Values:** LavaLoad (100), DepthConversion (0.05)
- Output Rasters:** Smooth Volcano (Focal_%Value%)
- Workspace:** Output Workspace (Volcano.gdb)

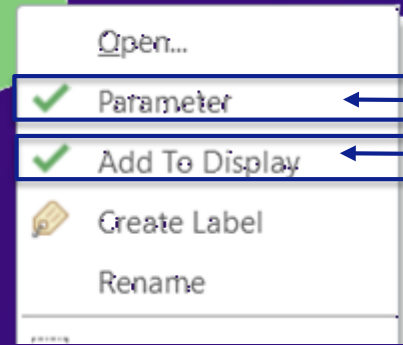
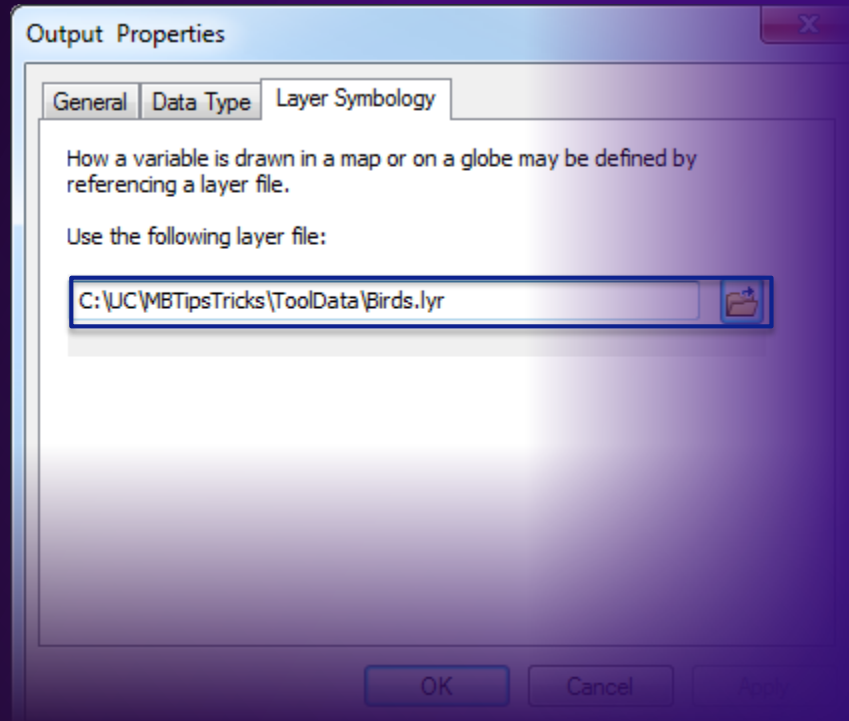
Add To Display and Symbology

The background features a complex, abstract design. It includes a purple-to-blue gradient, a prominent orange-to-red curved shape in the bottom right, and various geometric patterns such as a grid, a wavy line, and a circular pattern of dots.

Add To Display



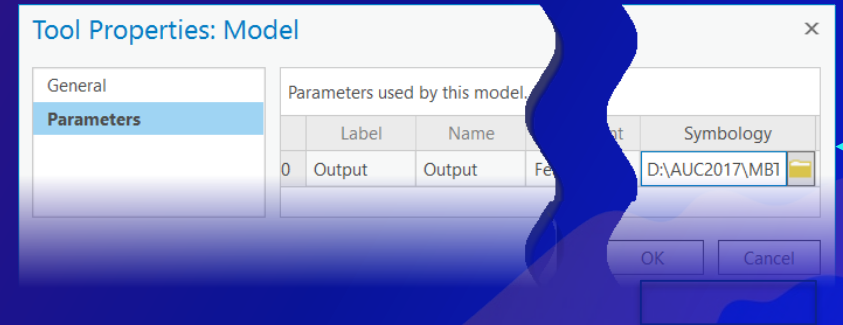
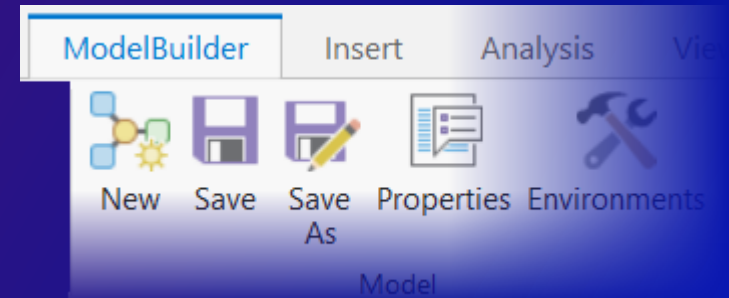
10x



Pro

Display output from model tool dialog

Display output inside the model

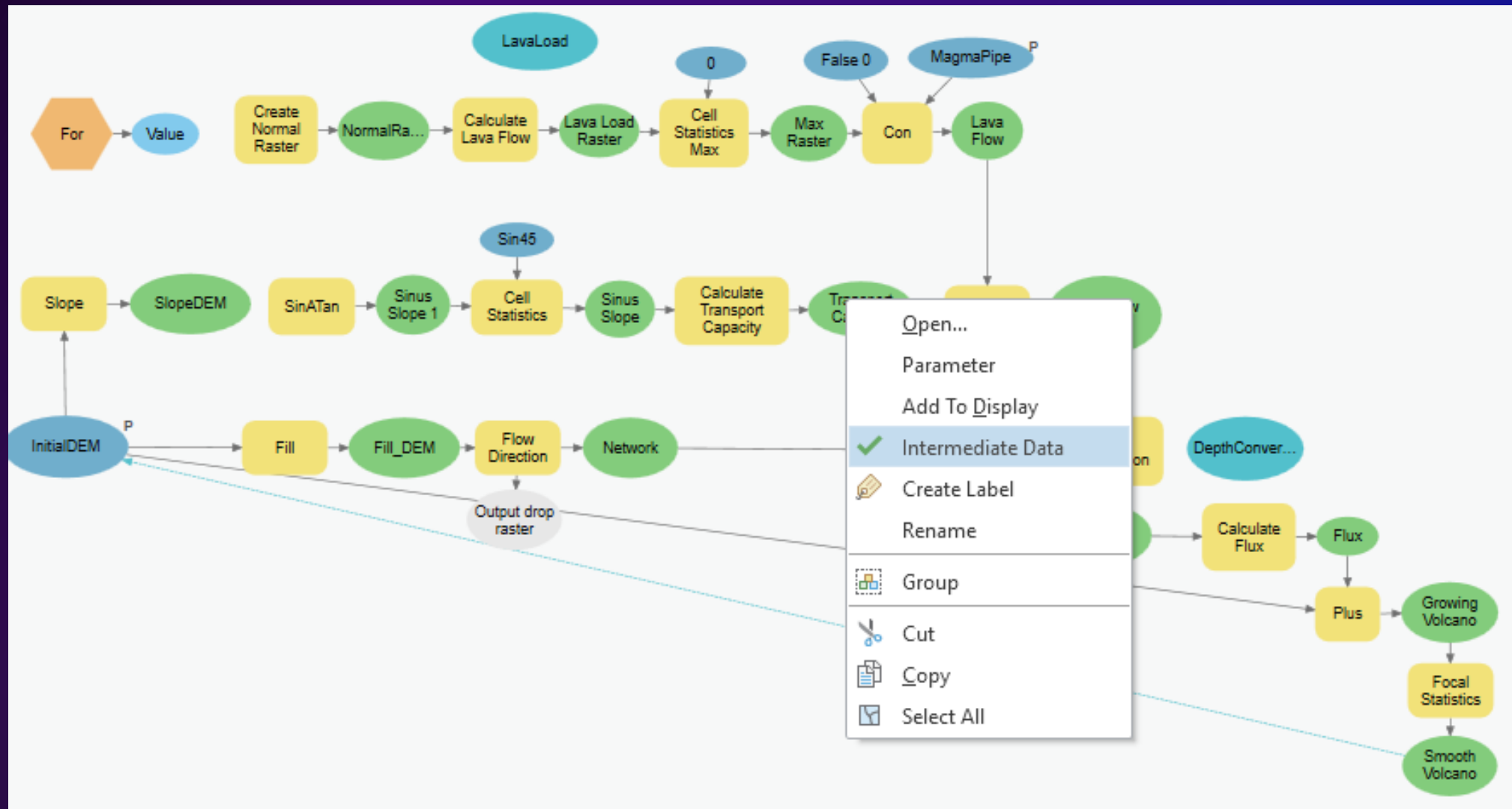


Display output with symbology using layer file

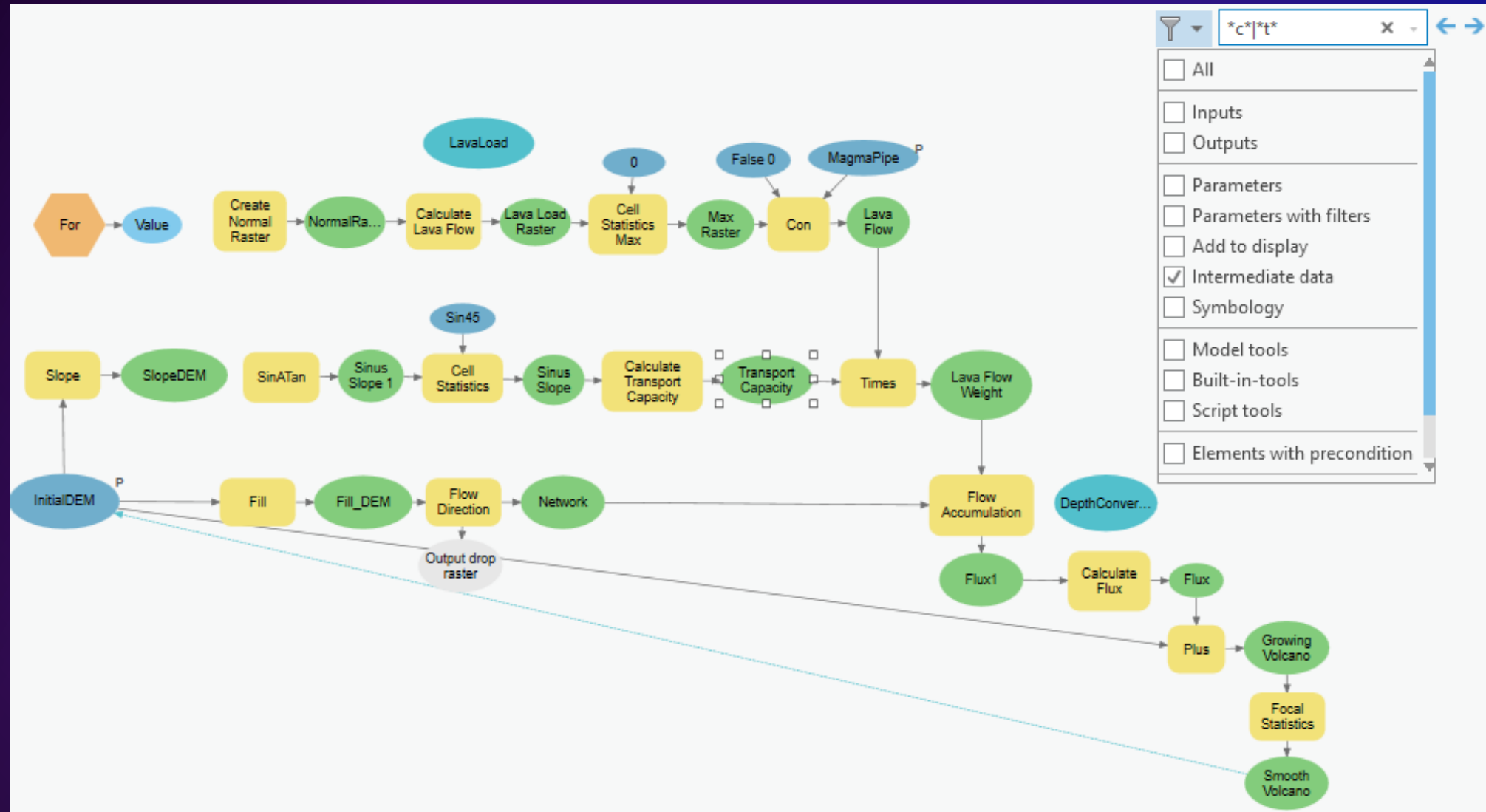
Intermediate Data and Search

The background is a vibrant, abstract composition. It features a color gradient from deep purple on the left to bright orange on the right. Overlaid on this are various geometric and data-related shapes: a stylized globe in the bottom right corner, a grid pattern, and several overlapping, semi-transparent shapes that suggest data flow or search paths. The overall aesthetic is modern and tech-oriented.

Intermediate Data



Search



Batch Model

The background is a vibrant, abstract composition. It features a gradient from deep purple on the left to bright orange on the right. In the lower right corner, a portion of a globe is visible, rendered in shades of blue and purple. A white grid pattern is overlaid on a dark blue, wavy shape in the center-right. The overall aesthetic is modern and digital.

Batch Model



Geoprocessing

14 - Batch Buffer

Parameters Environments

Batch Input Features

FC1	📁
FC2	📁
	📁

Output Feature Class

Distance [value or field]	Linear Unit
1500	Meters

Side Type
FULL

End Type
ROUND

Dissolve Type
NONE

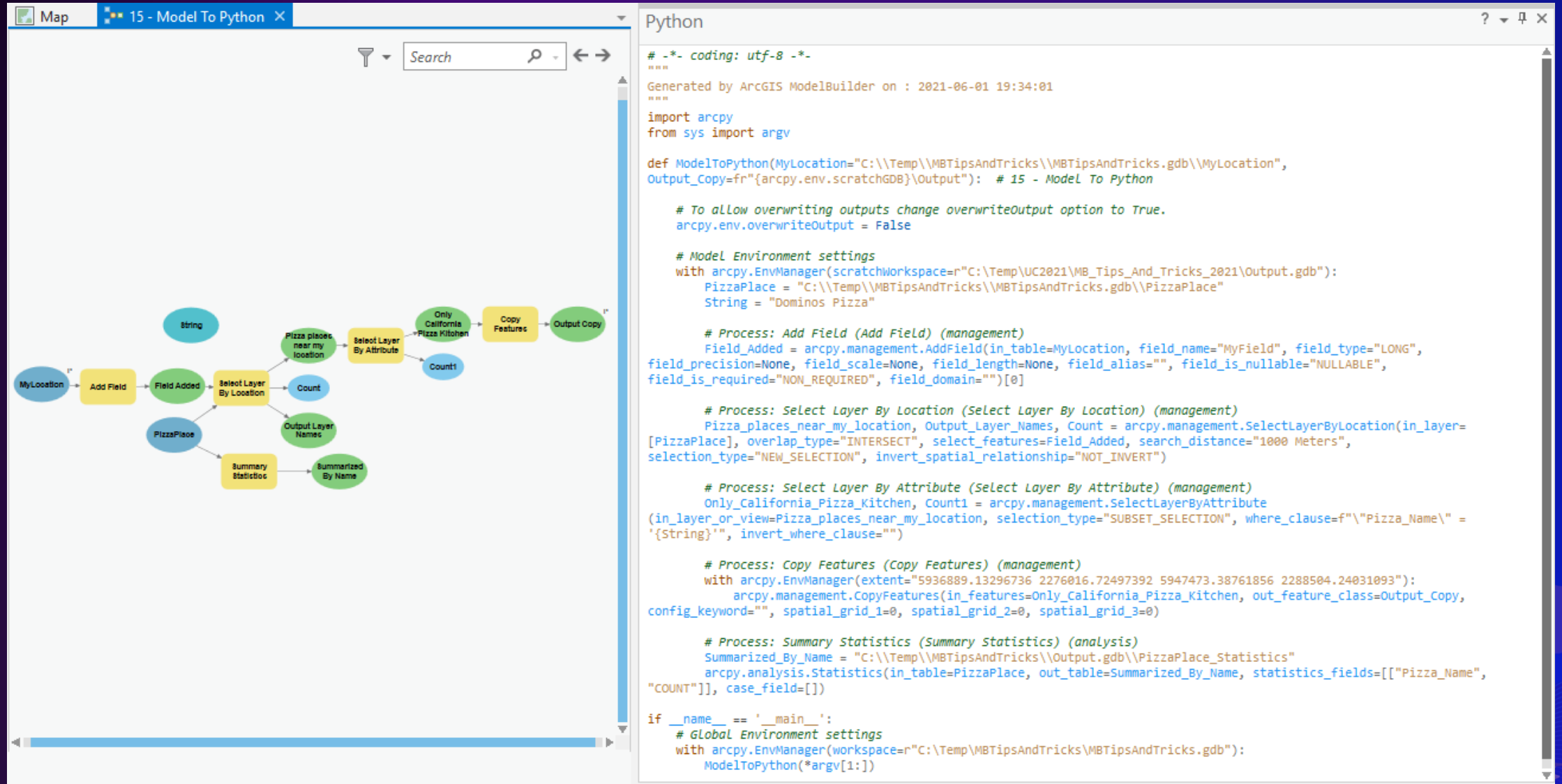
Dissolve Field(s)

Method
PLANAR

Model To Python

The background is a vibrant, abstract composition. It features a gradient from deep purple on the left to bright orange on the right. In the lower right corner, a portion of a globe is visible, showing continents in a darker shade. A white grid pattern is overlaid on the purple area, and a blue, wavy shape resembling a river or a stylized 'B' is present in the center-right. The overall aesthetic is modern and digital.

Model To Python



The image displays the ArcGIS ModelBuilder interface, showing a workflow diagram on the left and the generated Python code on the right.

Workflow Diagram:

- Input: MyLocation
- Process: Add Field (Field Added)
- Process: Select Layer By Location (Output Layer Names)
- Process: Summary Statistics (Summarized By Name)
- Process: Select Layer By Attribute (Count)
- Process: Copy Features (Output Copy)

Python Code:

```
Python
# -*- coding: utf-8 -*-
"""
Generated by ArcGIS ModelBuilder on : 2021-06-01 19:34:01
"""
import arcpy
from sys import argv

def ModelToPython(MyLocation="C:\\Temp\\MBTipsAndTricks\\MBTipsAndTricks.gdb\\MyLocation",
Output_Copy="r{arcpy.env.scratchGDB}\\Output"): # 15 - Model To Python

    # To allow overwriting outputs change overwriteOutput option to True.
    arcpy.env.overwriteOutput = False

    # Model Environment settings
    with arcpy.EnvManager(scratchWorkspace=r"C:\\Temp\\UC2021\\MB_Tips_And_Tricks_2021\\Output.gdb"):
        PizzaPlace = "C:\\Temp\\MBTipsAndTricks\\MBTipsAndTricks.gdb\\PizzaPlace"
        String = "Dominos Pizza"

    # Process: Add Field (Add Field) (management)
    Field_Added = arcpy.management.AddField(in_table=MyLocation, field_name="MyField", field_type="LONG",
field_precision=None, field_scale=None, field_length=None, field_alias="", field_is_nullable="NULLABLE",
field_is_required="NON_REQUIRED", field_domain="")[0]

    # Process: Select Layer By Location (Select Layer By Location) (management)
    Pizza_places_near_my_location, Output_Layer_Names, Count = arcpy.management.SelectLayerByLocation(in_layer=
[PizzaPlace], overlap_type="INTERSECT", select_features=Field_Added, search_distance="1000 Meters",
selection_type="NEW_SELECTION", invert_spatial_relationship="NOT_INVERT")

    # Process: Select Layer By Attribute (Select Layer By Attribute) (management)
    Only_California_Pizza_Kitchen, Count1 = arcpy.management.SelectLayerByAttribute
(in_layer_or_view=Pizza_places_near_my_location, selection_type="SUBSET_SELECTION", where_clause=f"\\"Pizza_Name\\" =
'{String}'", invert_where_clause="")

    # Process: Copy Features (Copy Features) (management)
    with arcpy.EnvManager(extent="5936889.13296736 2276016.72497392 5947473.38761856 2288504.24031093"):
        arcpy.management.CopyFeatures(in_features=Only_California_Pizza_Kitchen, out_feature_class=Output_Copy,
config_keyword="", spatial_grid_1=0, spatial_grid_2=0, spatial_grid_3=0)

    # Process: Summary Statistics (Summary Statistics) (analysis)
    Summarized_By_Name = "C:\\Temp\\MBTipsAndTricks\\Output.gdb\\PizzaPlace_Statistics"
    arcpy.analysis.Statistics(in_table=PizzaPlace, out_table=Summarized_By_Name, statistics_fields=[["Pizza_Name",
"COUNT"]], case_field=[])

if __name__ == '__main__':
    # Global Environment settings
    with arcpy.EnvManager(workspace=r"C:\\Temp\\MBTipsAndTricks\\MBTipsAndTricks.gdb"):
        ModelToPython(*argv[1:])
```

Model Report



Model Report

The screenshot displays a GIS Model Report interface. On the left, a workflow diagram shows the sequence of processes: Iterate Multivalue (orange) feeds into Input Features (green), which then feeds into the Buffer process (red). The Buffer process also receives inputs from Dissolve Field(s) (grey), Dissolve Type (cyan), Distance [value or... (cyan), End Type (cyan), Method (cyan), Side Type (cyan), and Name (cyan). The Buffer process outputs to FC1_Buf... (green), which then feeds into Collect Values (yellow), resulting in Output Values (green). A Parse Path process (yellow) is also shown, receiving inputs from Extension (cyan), Path (green), and Workspace Name (cyan).

On the right, a table provides a detailed report of the Buffer process parameters:

Name	Data Type	Value	Parameter Type
Model			
Variables			
Processes			
Iterate Multivalue	Iterate Multivalue		
Parse Path	Parse Path		
Buffer	Buffer		
Parameters			
Input Features	Feature Layer	C:\Temp\MBTipsAndTricks\MBTipsAndTricks.gdb\FC1	Required
Output Featur...	Feature Class	C:\Temp\UC2021\MB_Tips_And_Tricks_2021\Output1.gdb...	Required
Distance [valu...	Linear Unit or Field	1500 Meters	Required
Side Type	String	FULL	Optional
End Type	String	ROUND	Optional
Dissolve Type	String	NONE	Optional
Dissolve Field(s)	Multiple Value		Optional
Method	String	PLANAR	Optional
Messages			
Information	Executing (Buffer): Buffer C:\Temp\MBTipsAndTricks\...		
Information	Start Time: Thursday, May 27, 2021 2:24:35 PM		
Error	ERROR 000210: Cannot create output C:\Temp\UC2021...		
Error	Failed to execute (Buffer).		

Schedule a Model Run

The background features a complex, abstract design. It includes a purple-to-blue gradient, a blue wavy line, a grid pattern, and a large orange and red curved shape in the bottom right corner. The overall aesthetic is modern and technical.

Schedule a Model Run

The image displays a workflow diagram and the Geoprocessing tool window in a GIS application.

Workflow Diagram:

- Input** (blue oval) and **Roads** (blue oval) are the primary inputs (marked with 'P').
- Input** feeds into **Select Layer By Attribute** (yellow rectangle), which produces **Layer** (green oval) and **Count** (blue oval).
- Roads** feeds into **Buffer (2)** (yellow rectangle), which produces **Buffered Output** (green oval).
- Layer** and **Count** feed into **Erase** (yellow rectangle), which produces **Erased Features** (green oval).
- Erased Features**, **Climate Zones** (blue oval), **Elevation** (blue oval), **Public** (blue oval), and **Slope** (blue oval) all feed into **Intersect** (yellow rectangle).
- Intersect** produces the final **FinalOutput** (green oval, marked with 'P').

Geoprocessing Window:

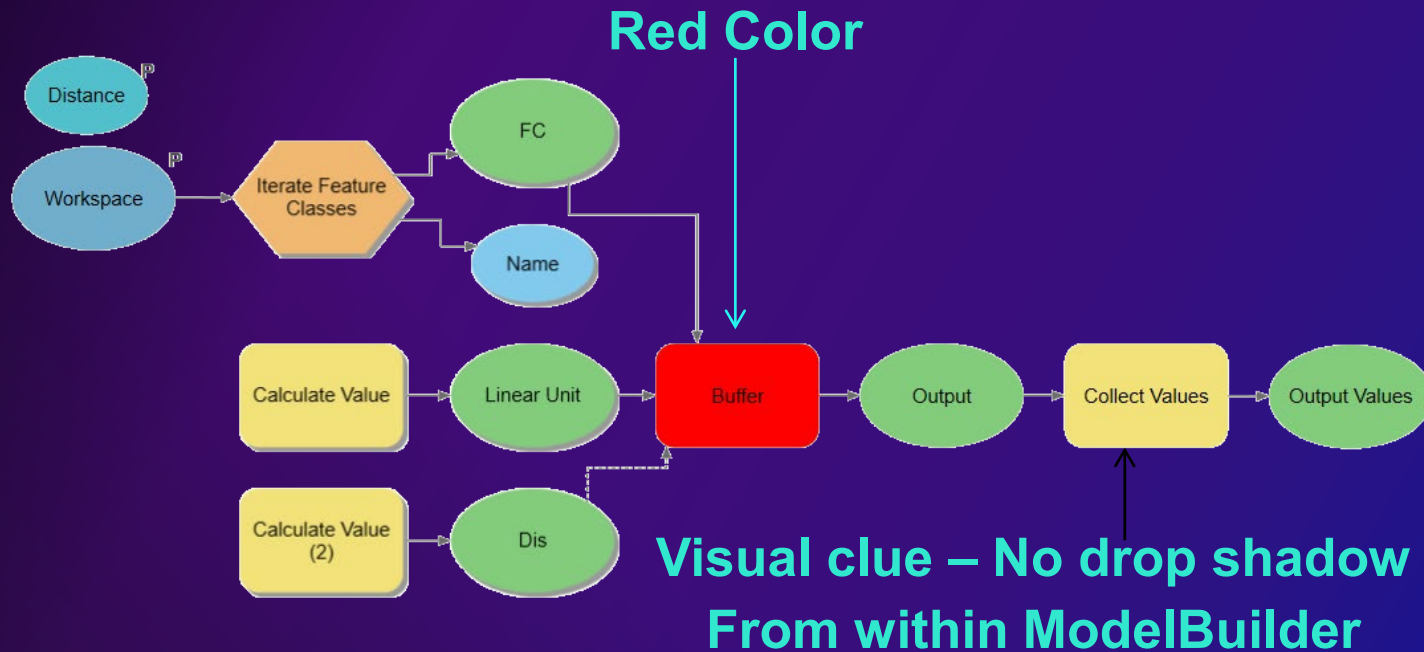
- Parameters:**
 - Input:** Vegetation
 - Roads:** MajorRoads
 - FinalOutput:** FinalOutput (Warning icon)
- Run** button
- History:**
 - MyScheduledModel (3)
 - GnatcatchedModel (3)

Debugging a Model

The background features a complex, abstract composition of overlapping geometric shapes and patterns. On the right side, there are prominent curved shapes in shades of orange and red, resembling a stylized globe or a portion of a sphere. The rest of the background is dominated by various shades of purple and blue, with intricate line art and grid patterns. A prominent blue wavy line runs horizontally across the middle-right section. The overall aesthetic is modern and technical, suggesting a focus on data, modeling, or engineering.

Debugging a model

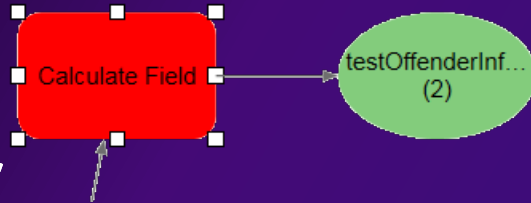
- How do I know where did my model break?



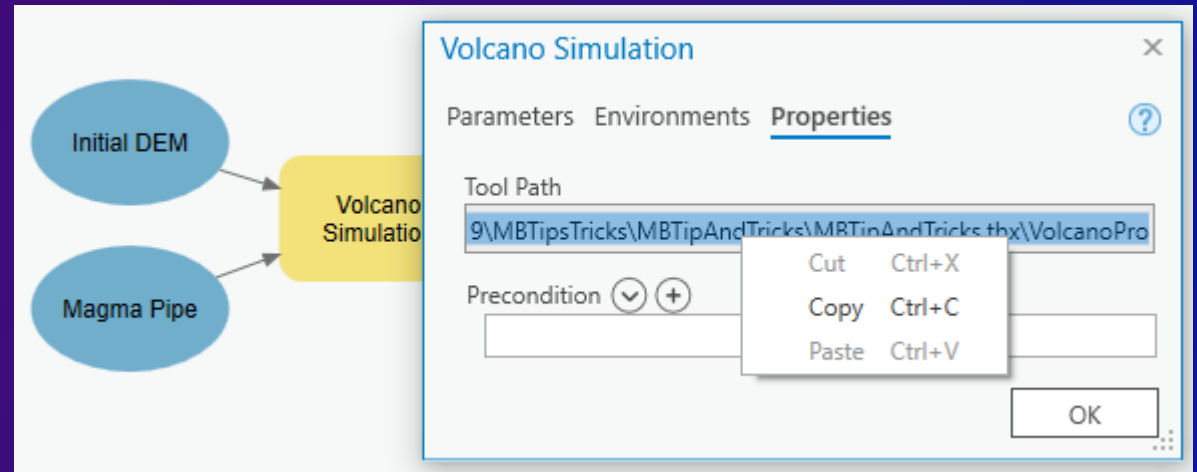
```
Getting Started Finished
Done
Executing (Iterate Feature Classes): IterateFeatureClasses D:\AUC2017
\MBTipsTricks\ToolData\Data.gdb FC* POINT NOT_RECURSIVE
Start Time: Thursday, June 22, 2017 10:44:28 PM
Succeeded at Thursday, June 22, 2017 10:44:29 PM (Elapsed Time: 0.41
seconds)
Executing (Calculate Value): CalculateValue "100 Meters" # "Linear unit"
Start Time: Thursday, June 22, 2017 10:44:29 PM
Value = 100 Meters
Succeeded at Thursday, June 22, 2017 10:44:29 PM (Elapsed Time: 0.00
seconds)
Executing (Calculate Value (2)): CalculateValue "100 Meters".replace(" ", "") #
Variant
Start Time: Thursday, June 22, 2017 10:44:29 PM
Value = 100Meters
Succeeded at Thursday, June 22, 2017 10:44:29 PM (Elapsed Time: 0.00
seconds)
Executing (Buffer): Buffer D:\AUC2017\MBTipsTricks\ToolData\Data.gdb\FC1
D:\AUC2018\MBTipsTricks\Scratch\Scratch.gdb\FC1_100Meters "100 Meters"
Full ROUND NONE # PLANAR
Start Time: Thursday, June 22, 2017 10:44:29 PM
❗ ERROR 000210: Cannot create output D:\AUC2018\MBTipsTricks
\Scratch\Scratch.gdb\FC1_100Meters
Failed to execute (Buffer).
Failed at Thursday, June 22, 2017 10:44:29 PM (Elapsed Time: 0.04 seconds)
 Close on Completion
```

Messages

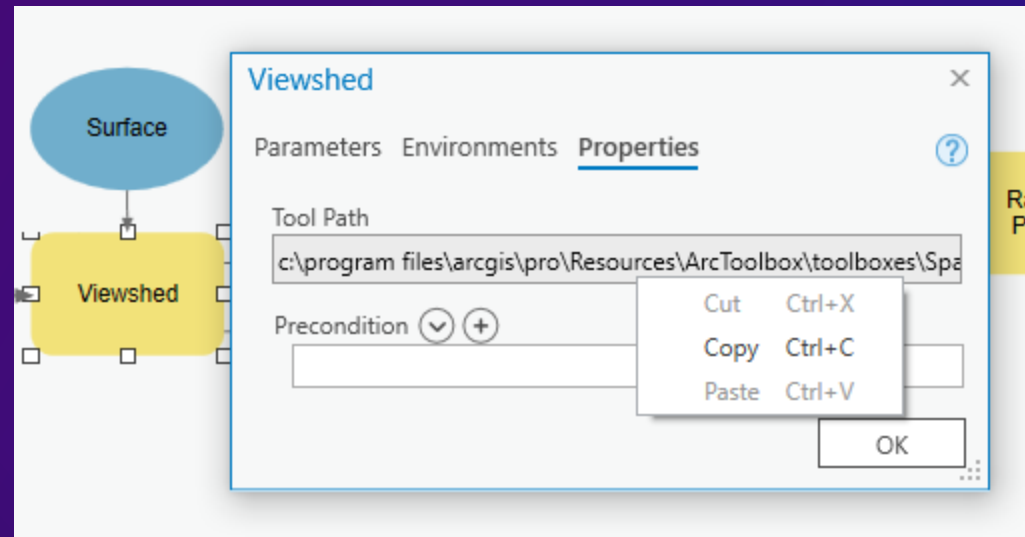
Debugging models



- Red color
- No drop Shadow
- UI validation error filter
- Python syntax error <>
- Tool missing – Delete toolbox or model
- Schema locks Add Geom during editing
- Script tool – script or tool missing python package is missing.
- Old models to Pro > Save > Popup > Save As – popup message
- Old Scripts don't work – Analyze tool - Print
- Calculation differences – Pairwise Buffer



Tool Missing



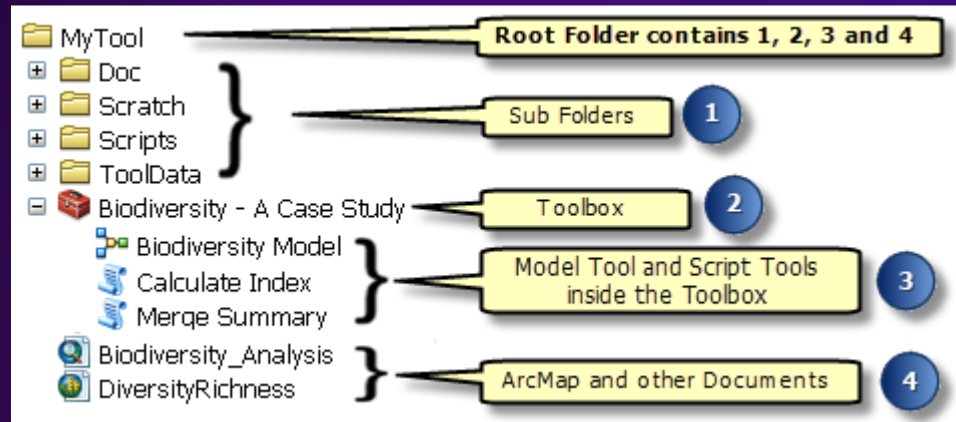
ArcMap Tips



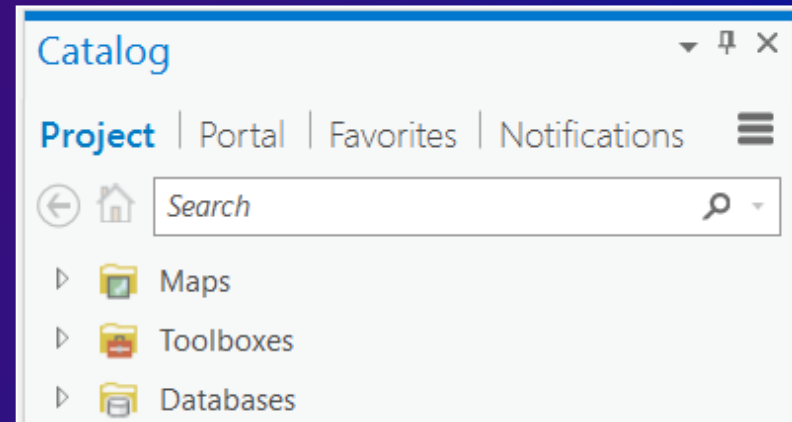
Organize well

- **Well begun is half done.** *Aristotle*

10x

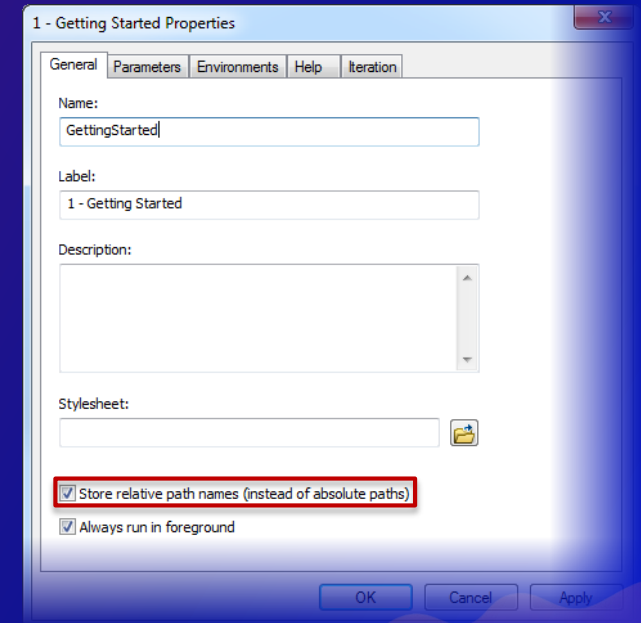
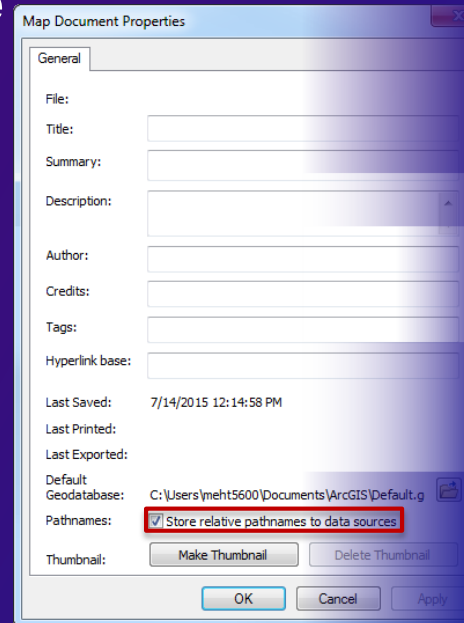


Pro



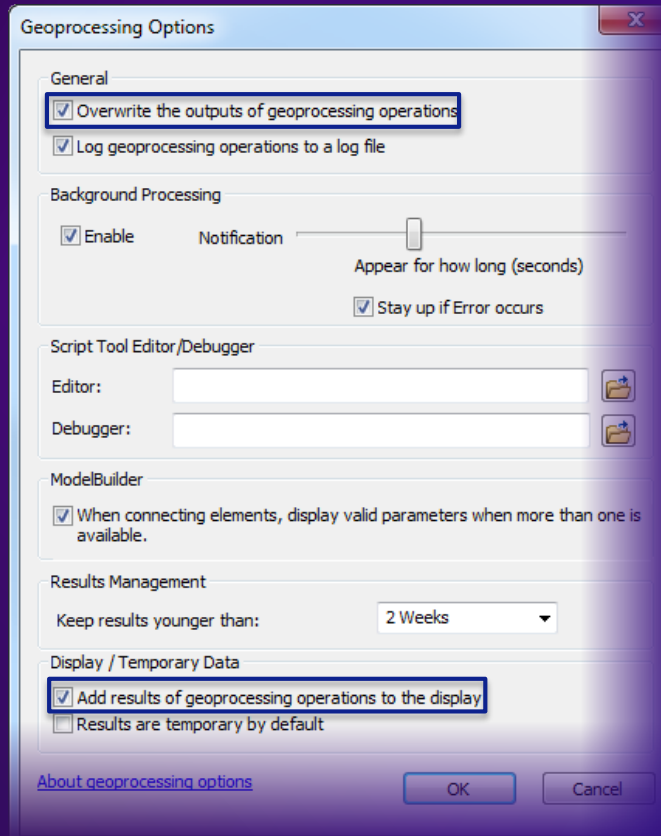
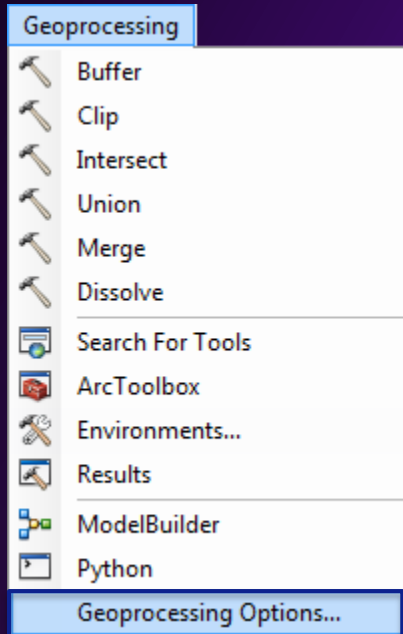
Relatively well 10x ArcMap

- Want to share Data + Map + Model/s
- Have to move Data + Map + Model/s from one dish space to another
 - Relative path in map document
 - Relative path in a model
- Relative paths do not work without data and folders
- GPK
- Relative path is true by default in ArcGIS Pro

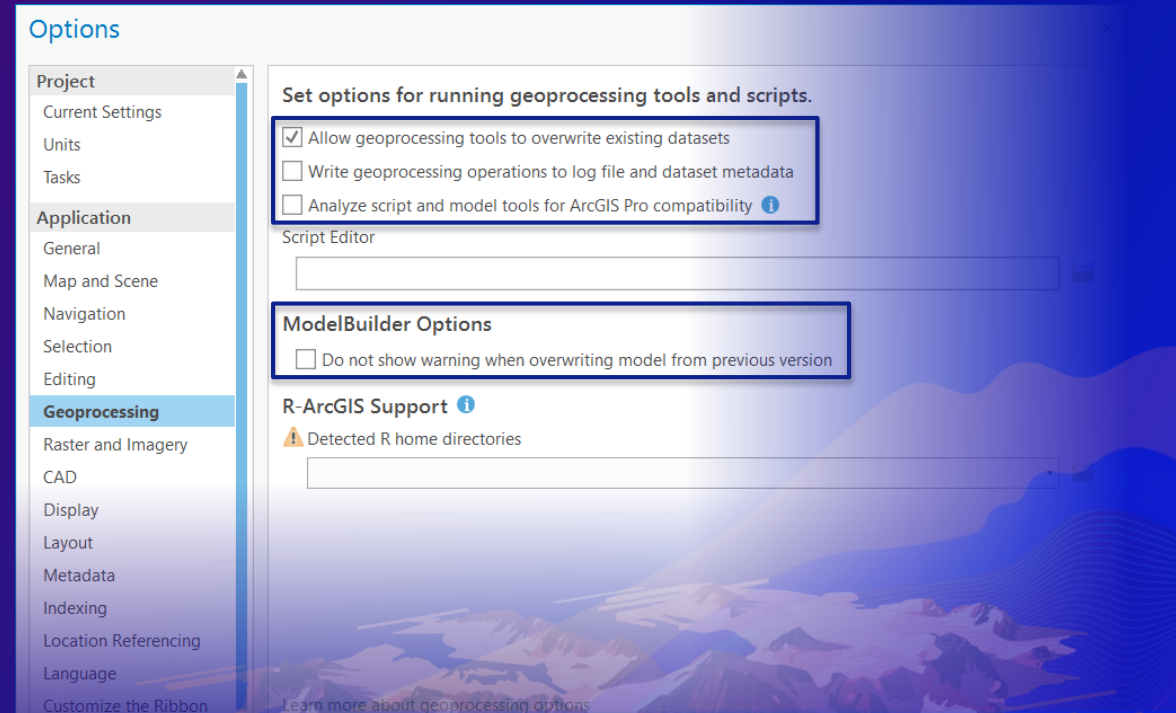
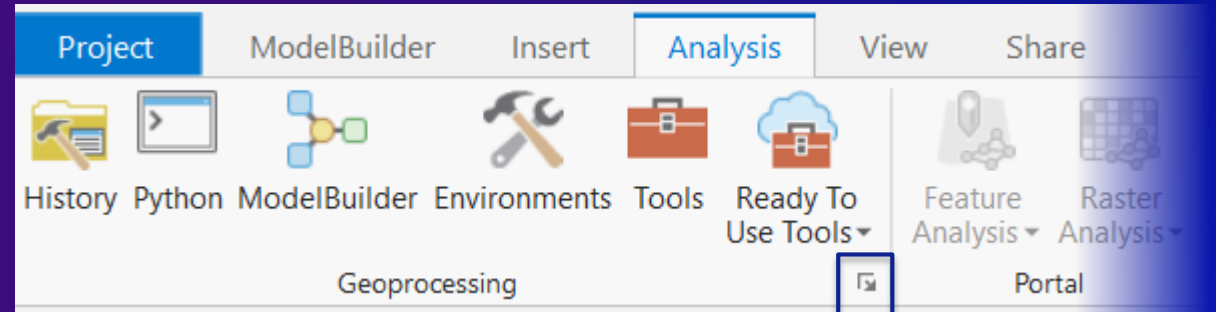


Geoprocessing options

10x



Pro



Advanced Techniques

1. Iterators
2. Inline Variable Substitution
3. Preconditions
4. Nested Models
5. Feedback Loops

What we have covered so far

1. Getting started
2. Resources and community
3. Adding Data and Tools
4. Environments
5. Model State
6. Shortcut Keys
7. History to Model
8. Variable Types
9. Groups and Formatting
10. Data Types
11. Model Tool
12. Add To Display and Symbology
13. Derived Data
14. Parameter Filters
15. Parameter Categories
16. Intermediate Data
17. Batch Model
18. Model To Python
19. Model Report
20. Schedule a Model
21. Debugging a Model

The background is a vibrant, abstract composition. It features a gradient of colors from deep purple and blue on the left to bright pink and orange on the right. There are several overlapping, organic shapes and patterns, including a prominent yellow curved line on the right side and a textured, grid-like pattern in the upper right. The overall aesthetic is modern and digital.

We want your feedback

Click on the [Session Survey link](#)
below this video window



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