

# ArcGIS Pro Tools: Proximity and Hot Spot Analysis

November 2021



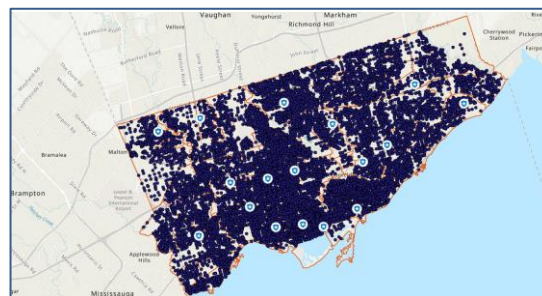
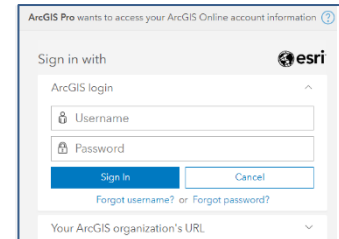
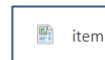
This tutorial will teach you how to use ArcGIS Pro tools to analyse data using proximity, aggregate data, and hot spot analyses. ArcGIS Pro v.2.8.1 was used to develop this tutorial.

You require the **ArcGIS Business Analyst Web and Mobile Apps Advanced** to be activated in your ArcGIS Online subscription to complete Part E. Teachers can contact [k12@esri.ca](mailto:k12@esri.ca) for assistance.

## Part A: Open the ArcGIS Pro Project

Access the Crime Analysis project to get started. Using analysis tools, you will work with break and enter data in Toronto.

1. Go to <https://bit.ly/3bAmcw4> and click **Open in ArcGIS Pro**.
2. The project will download. Click on the “Item” that appears at the bottom of your screen.
3. You may be prompted to sign into ArcGIS Online if this is your first-time using ArcGIS Pro. Sign in and the project will open.
4. You should see a map of Toronto with layers showing neighbourhoods, police stations and break and enter data.



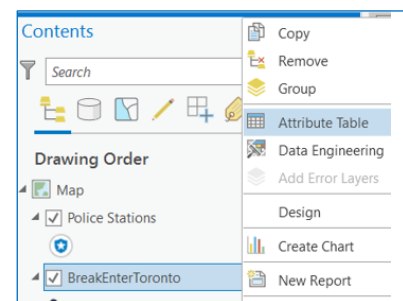
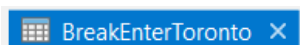
## Part B: Explore the Data: Attribute Table

Begin by exploring the Toronto break and enter crime data included in this tutorial. Each incident of break and enter is represented as a point on the map showing the approximate location of the crime.

1. In the *Contents* pane, right click the **BreakEnterToronto** layer and select **Attribute Table** to view the attribute data.
2. Explore the data in the table.

What are some of the fields you could use to create a subset of the data?

3. Close the table by clicking on the X to the right of the **BreakEnterToronto** tab.

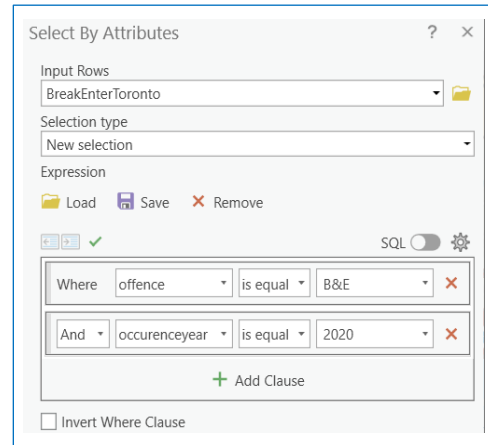


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## Part C: Query Data

Queries allow you to create a subset of your data. In this part of the tutorial, you will query the data to show where **Break and Enters occurred in Toronto in 2020**.

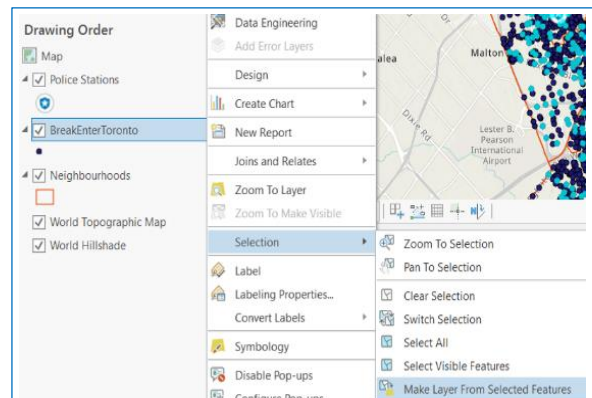
- Under the *Map* tab, click on **Select by Attributes** to create a query to view only the 2020 Break and Enters in Toronto.
  - Make the Input Rows **BreakEnterToronto**
  - Leave the default Selection type as **New selection**.
  - Click on **New Expression**
  - Where **offence is equal to B&E**.
  - Click **Add Clause**
  - Change to **And**
  - occurrenceyear is equal to 2020**.
  - Click **Run** to view this subset of the data.



- Check how many records have been selected. You can find the total # of records at the bottom of the attribute table.

5,926 of 50,164 selected

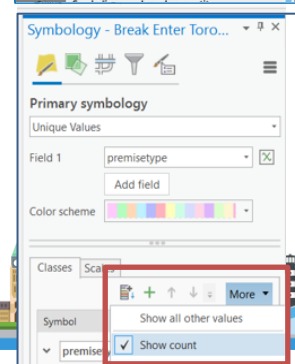
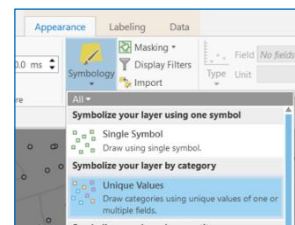
- Create a new layer by right clicking **BreakEnterToronto** > **Selection** > **Make layer from selected features**.
- Right click on the new layer and select **Properties**.
- Change the Name to **Break and Enter Toronto 2020**. This can be done under the *General* section.
- Uncheck the **BreakEnterToronto** layer.
- Explore the Break and Enter Toronto 2020 map.
- Click **Save** your project.



## Part D: Change Symbology

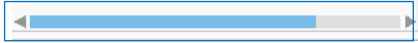
Now that you have the break and enter data visible on your map, let's find out what the premise types are where these incidents occurred. The premise types include, commercial, house, apartment, educational, transit, other and outside.

- Change the symbology of the **Break and Enter Toronto 2020** layer by clicking on the *Appearance* tab and selecting **Symbology** > **Unique Values**.
- Change the *Field 1* to **premisetype**.
- Click on **More** under *Classes*
  - Unselect **Show all other values**
  - Select **Show count**



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- Use the scroll bar below the categories of premise types in order to view the total count for each one.

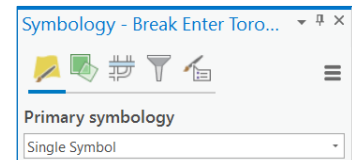


Apartment	Apartment	1788
Commercial	Commercial	2808
Educational	Educational	127
House	House	1559
Other	Other	450
Outside	Outside	5
Transit	Transit	11

Which premise type has the highest number of break-ins?

Why do you think this premise type experiences the most break-ins?

- In the *Symbology* window, change the *Primary symbology* to **Single Symbol**.
- Unselect the **Break and Enter Toronto 2020** and the **Neighbourhoods** layers.
- You should only see the **Police Stations** layer on the map now.
- Click on the X at the top right corner of the *Symbology* window to close it.
- Click  **Save** your project.

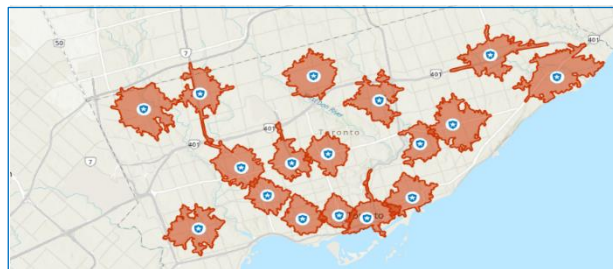
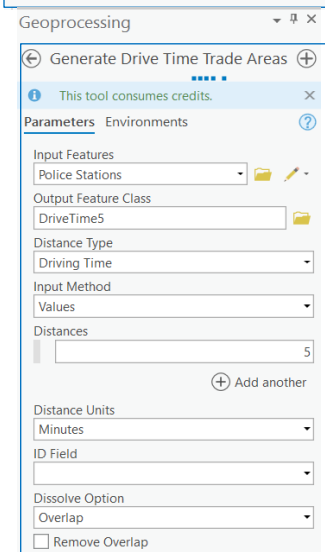
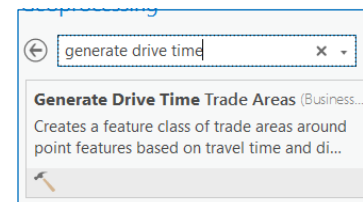


## Part E: Proximity Analysis

In this part of the tutorial, you will use the **Generate Drive Time Trade Areas** tool to analyse the proximity of break and enters to Toronto Police Stations. You will begin by creating drive-time areas around the Toronto Police Stations to determine visually on a map the drive zone of five minutes from a police station.

This analysis tool uses information about road networks and travel speed to determine how far someone could drive from a location within a specified time. The result of your analysis will determine the percentage of crimes that the Toronto Police Service can respond to within five minutes.

- Select the **Analysis** tab > **Tools**.
- In the search bar, start typing **generate drive time** and select the **Generate Drive Time Trade Areas** tool.
- Set up the tool with the following parameters:
  - Input Features - Select **Police Stations**
  - Output Feature Class – click on the folder and navigate to the appropriate geodatabase and name the new feature class to **DriveTime5\_YourInitials**
  - Change *Distance Type* to **Driving Time**
  - Under **Distances** - type **5**
  - Ensure **Minutes** is selected under *Distance Units*
  - Click **Run**.



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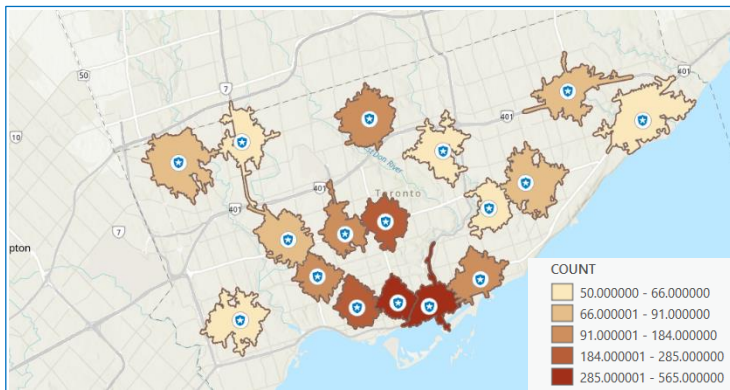
4. **Save** your project.

## Part F: Aggregate Points - Summarize Data

In this part of the tutorial, you will use the **Aggregate Points** tool to find out how many break and enters in 2020 occurred within a five-minute drive of each of the Toronto Police Stations. This tool summarizes a set of points that fall within a specified area. This will help us determine the percentage of break and enters that are close to police stations across the city.

1. Select the **Analysis** tab > **Tools**.
2. In the search bar, type **aggregate**.
3. Select the **Aggregate Points** (GeoAnalytics Desktop) tool.
4. Set up the tool with the following parameters:
  - a. *Point Layer* – Select **Break and Enter Toronto 2020**
  - b. *Output Feature Class* – click on the folder and navigate to the appropriate geodatabase and name the new feature class to **AggTool\_YourInitials**
  - c. Change the *Polygon Layer* to **DriveTime5\_YourInitials**
  - d. Click **Run**.

**Aggregate Points** (GeoAnalytics Desktop T...  
Aggregates points into polygon features c...  
bins. A polygon is returned with a count o...



Geoprocessing  
Aggregate Points  
Parameters Environments  
Point Layer: Break Enter Toronto 2020  
Output Feature Class: AggTool\_YourInitials  
Polygon or Bin: Polygon  
Polygon Layer: DriveTime5  
Time Step Interval: [ ] [ ]  
Time Step Repeat: [ ]  
Time Step Reference: [ ]  
Summary Fields: Field [ ] Statistics [ ]

Let's find the sum of the Break and Enters in Toronto in 2020.

5. Right click over the **AggTool\_YourInitials** layer and select **Attribute table** to open it.
6. Scroll over to the **Count** field and right click on it. Select **Statistics**.
7. Find the **Sum** in the window that appears.

Using a calculator, calculate the percentage of Break and Enters in 2020 that occurred within a five-minute drive time from a police station.

**Equation:** Sum of Values (aggregated points in five-minute drive zone)/total # of break and enters in 2020 (based on your query in Part C) \*100


Statistics	
<input checked="" type="checkbox"/> Mean	170.3
<input type="checkbox"/> Median	91
<input type="checkbox"/> Std. Dev.	152.3
Rows	17
Count	17
Nulls	0
Min	50
Max	565
<b>Sum</b>	<b>2,895</b>





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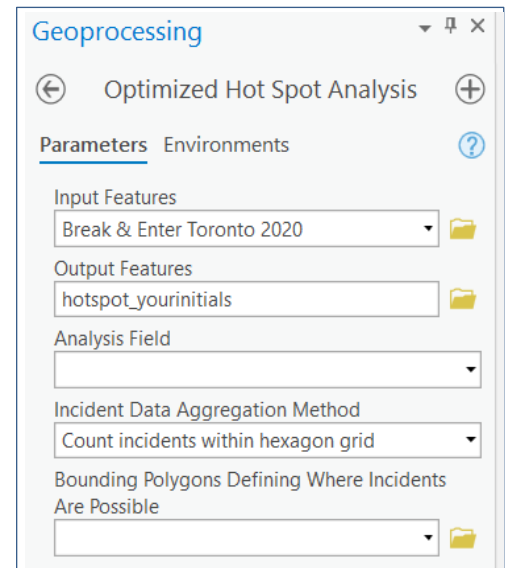
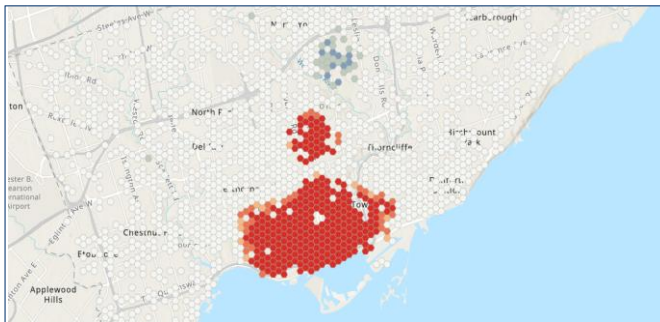
What is the percentage of total break and enters that occurred within a five-minute drive of a police station in Toronto?

8. Close the table.
9. Uncheck all the layers, except the **Break and Enter Toronto 2020** layer.
10. Click  **Save** your project.

## Part G: Hot Spot Analysis

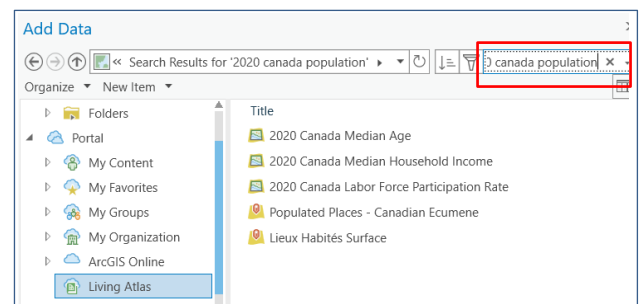
In this part of the tutorial, you will use the **Optimized Hot Spot Analysis** tool to discover the areas where a large concentration of break and enters occurred in 2020. Crime analysts use this tool to identify patterns in order to understand why crimes are happening where they are and to plan a response to deter incidence of crime in the area.

1. Select the **Analysis** tab > **Tools**
2. Search for **Hot Spot** and select **Optimized Hot Spot Analysis**.
3. Set up the tool to run based on these parameters:
  - a. *Input Features* – Select **Break and Enter Toronto 2020**
  - b. *Output Features* - click on the folder and navigate to the appropriate geodatabase and name the new feature class to **hotspot\_yourninitials**
  - c. Change the *Incident Data Aggregation Method* to **Count incidents within hexagon grid**
  - d. Click **Run**.
4. Uncheck the **Break and Enter Toronto 2020** layer.
5. Explore the map to view where the hot spots are located.



Now let's add some demographic data to the map to get a better picture of what is going on in those hot spots. This type of data provides characteristics of a geographic region, like a census dissemination area or census tract.

6. Go to **Map** tab > **Select Add Data > Data**
7. Select **Living Atlas Layers** under **Portals**:
  - a. Search for "Canada population 2020" and add **2020 Canada Median Household Income**
  - b. Search for "Canada dwellings 2016" and add **Dissemination Areas 2016** (This



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layer is symbolized to show Canada's population density)

8. If your new layers are located above the **hotspot\_yourinitials** layer, move (drag and drop) the new layers below it.
9. Zoom to the hot spots on your map and explore the dwellings and median household income in those areas. **Tip:** Turn the hotspot layer on and off to view the data underneath.

What connections can you make between the break and enter hot spots and the demographic data that you have explored on the map?

10. Click  **Save** your project.

Looking at the map and referring to the legend, what does this analysis tell you about where break and enters occurred in Toronto in 2020? What are some decisions the Toronto Police Service might make now that they have this information?

## Reference

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Track crime patterns to aid law enforcement [tutorial](#), Learn ArcGIS.

## Next Steps

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Want to learn how to create a map layout and export your map to a PDF? Check out this tutorial: <https://bit.ly/2UA7cXd>.

Search for more K-12 tutorials and lessons at [k12.esri.ca/resourcefinder](https://k12.esri.ca/resourcefinder).

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