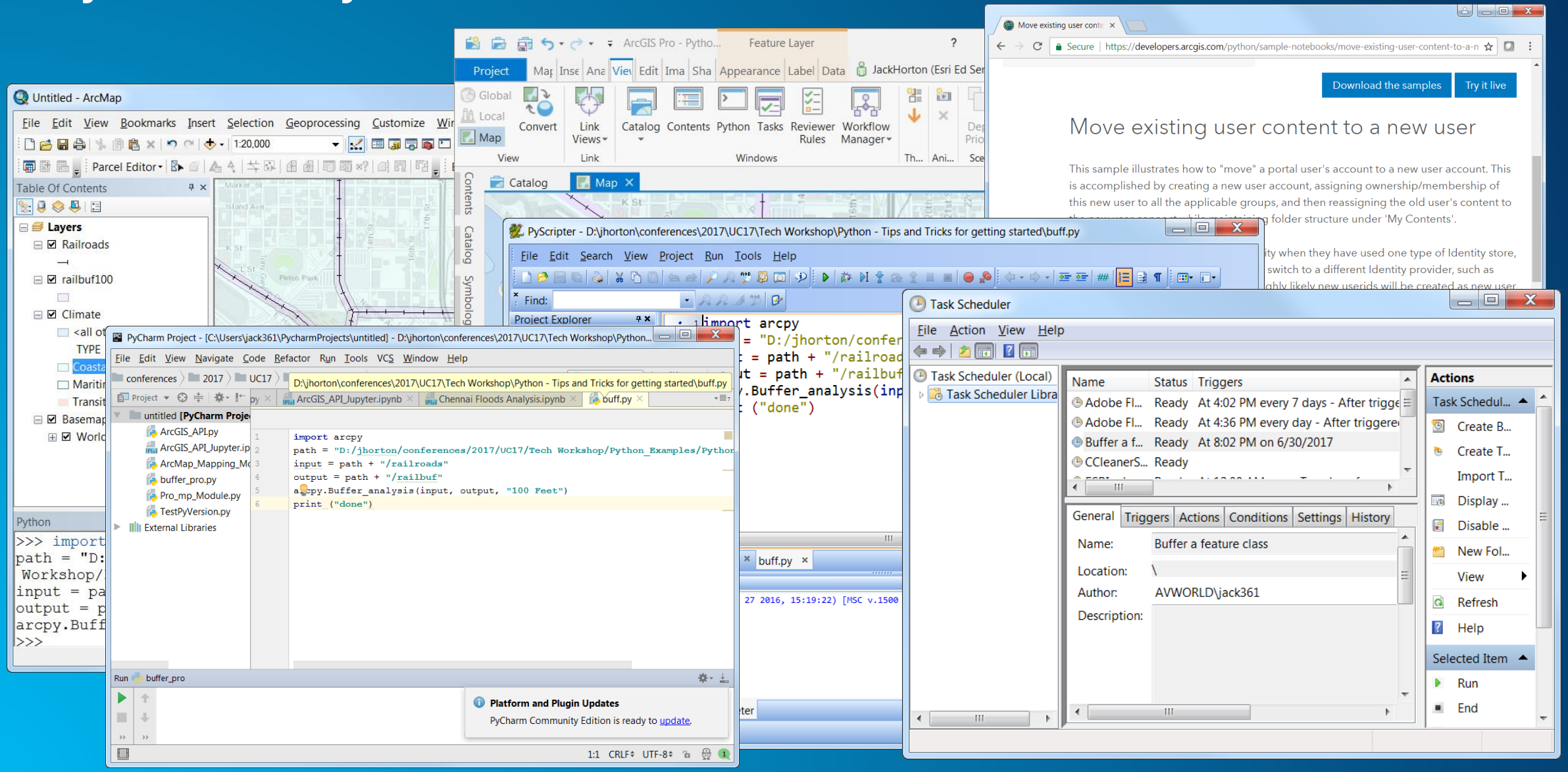
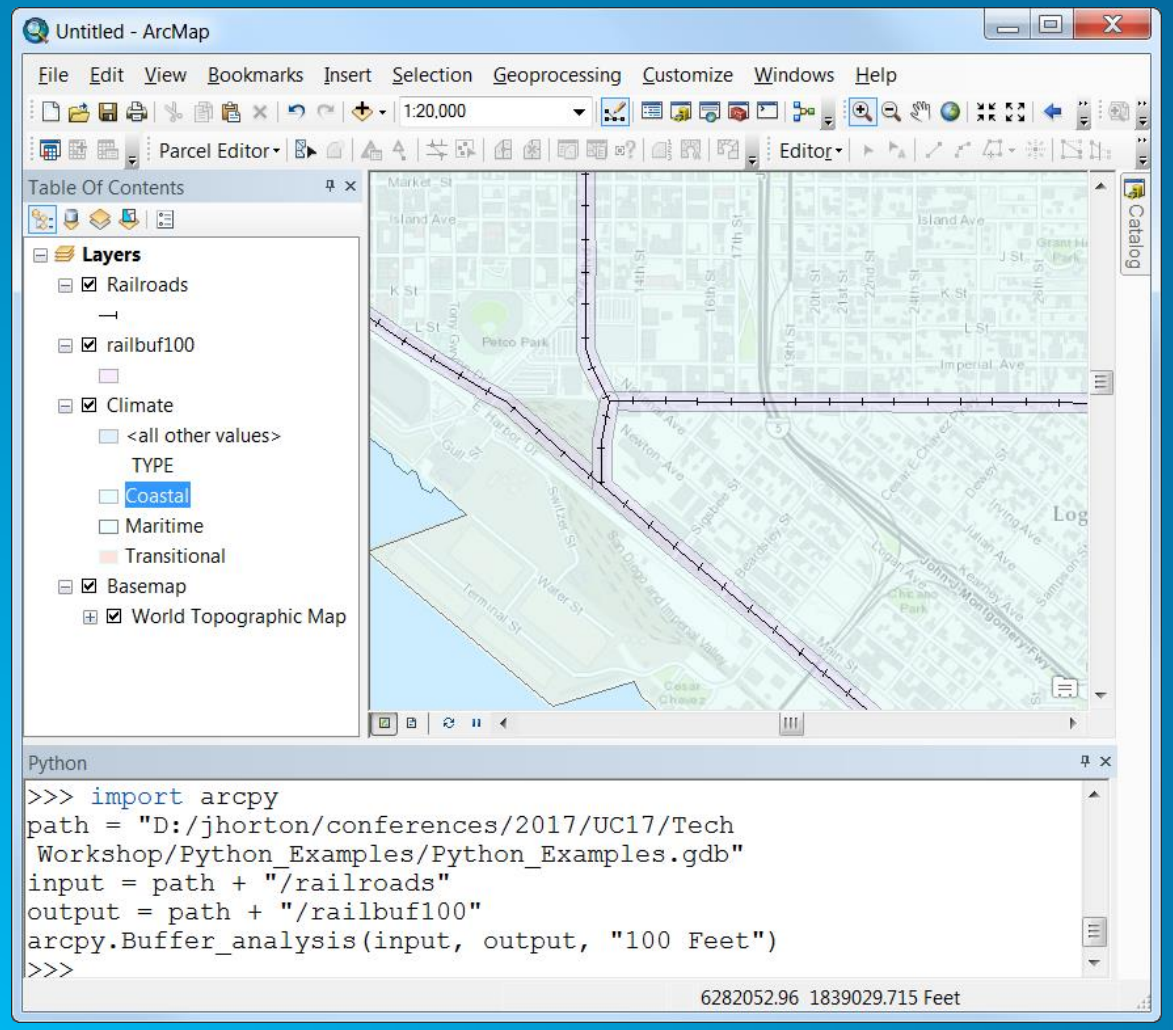
Python - Tips and Tricks for getting started

Jack Horton

Python is everywhere in ArcGIS



ArcMap


Untitled - ArcMap
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1:20,000
Parcel Editor
Editor
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Layers
Railroads
railbuf100
Climate
<all other values>
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Coastal
Maritime
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Basemap
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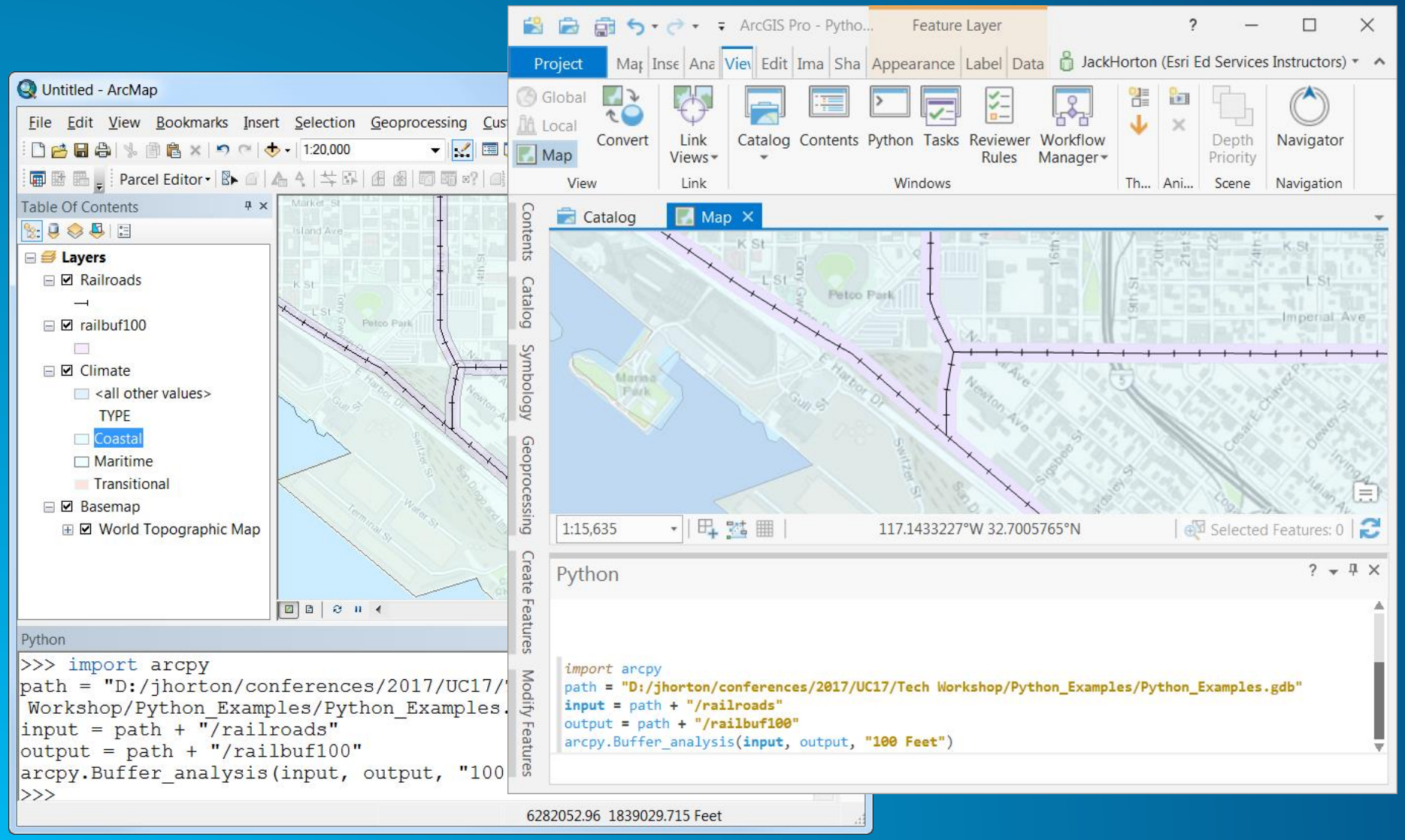
Catalog
Python
>>> import arcpy
path = "D:/jhorton/conferences/2017/UC17/Tech
Workshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf100"
arcpy.Buffer_analysis(input, output, "100 Feet")
>>>
6282052.96 1839029.715 Feet

ArcGIS Pro


Untitled - ArcMap
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1:20,000
Parcel Editor
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railbuf100
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<all other values>
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Maritime
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World Topographic Map
Python
>>> import arcpy
path = "D:/jhorton/conferences/2017/UC17/
Workshop/Python_Examples/Python_Examples.
input = path + "/railroads"
output = path + "/railbuf100"
arcpy.Buffer_analysis(input, output, "100
>>>
6282052.96 1839029.715 Feet
ArcGIS Pro - Pytho...
Feature Layer
Project
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Appearance
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JackHorton (Esri Ed Services Instructors)
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Catalog
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Depth Priority
Navigator
View
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Scene
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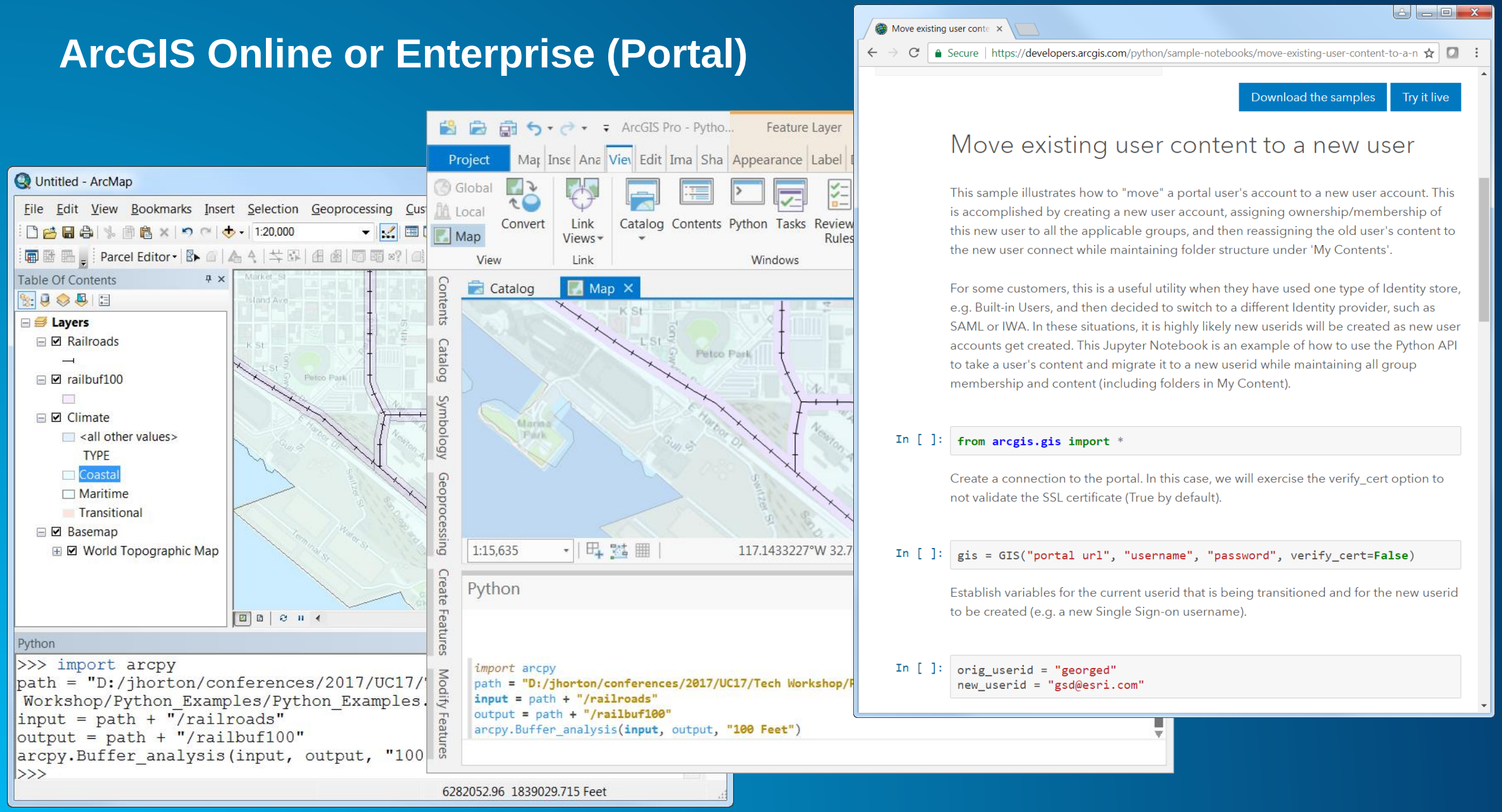
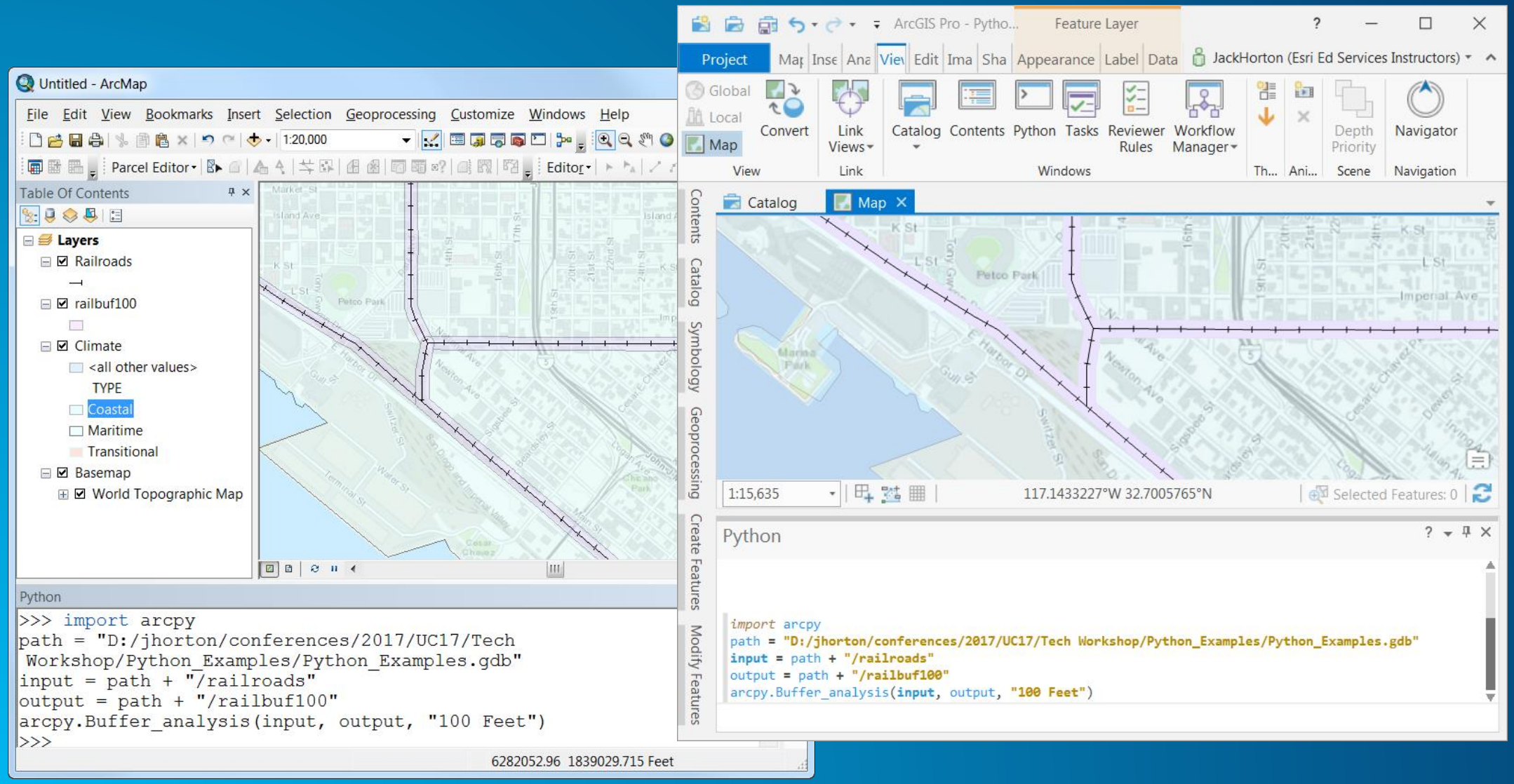
Petco Park
Marina Park
1:15,635
117.1433227°W 32.7005765°N
Selected Features: 0
Python
import arcpy
path = "D:/jhorton/conferences/2017/UC17/Tech Workshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf100"
arcpy.Buffer_analysis(input, output, "100 Feet")

ArcGIS Online or Enterprise (Portal)



You can run it in the application



You can run it in an IDE (Interactive Development Environment)

PyCharm Project - [C:\Users\jack361\PycharmProjects\untitled] - D:\jhorton\conferences\2017\UC17\Tech Workshop\Python...

File Edit View Navigate Code Refactor Run Tools VCS Window Help

conferences 2017 UC17

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Project ArcGIS_API_Jupyter.ipynb Chennai Floods An

untitled [PyCharm Proje

- ArcGIS_API.py
- ArcGIS_API_Jupyter.ip
- ArcMap_Mapping_Mo
- buffer_pro.py
- Pro_mp_Module.py
- TestPyVersion.py
- External Libraries

```
1 import arcpy
2 path = "D:/jhorton/conferences/2017/UC1
3 input = path + "/railroads"
4 output = path + "/railbuf"
5 arcpy.Buffer_analysis(input, output, "1
6 print ("done")
```

Run buffer_pro

Platfo

PyChar

PyScripter - D:\jhorton\conferences\2017\UC17\Tech Workshop\Python - Tips and Tricks for getting started\buff.py

File Edit Search View Project Run Tools Help

Find:

Project Explorer

- Untitled
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```
1 import arcpy
2 path = "D:/jhorton/conferences/2017/UC17/Tech Workshop/Python_Exampl
3 input = path + "/railroads"
4 output = path + "/railbuf"
5 arcpy.Buffer_analysis(input, output, "100 Feet")
6 print ("done")
```

File Expl... Project ... demosetup.py buff.py

Python Interpreter

```
*** Python 2.7.12 (v2.7.12:d33e0cf91556, Jun 27 2016, 15:19:22) [MSC v.1500 32 bit (Intel)] on win32. ***
*** Remote Python engine  is active ***
>>>
```

Variables Messages Python Interpreter

1: 1 Insert

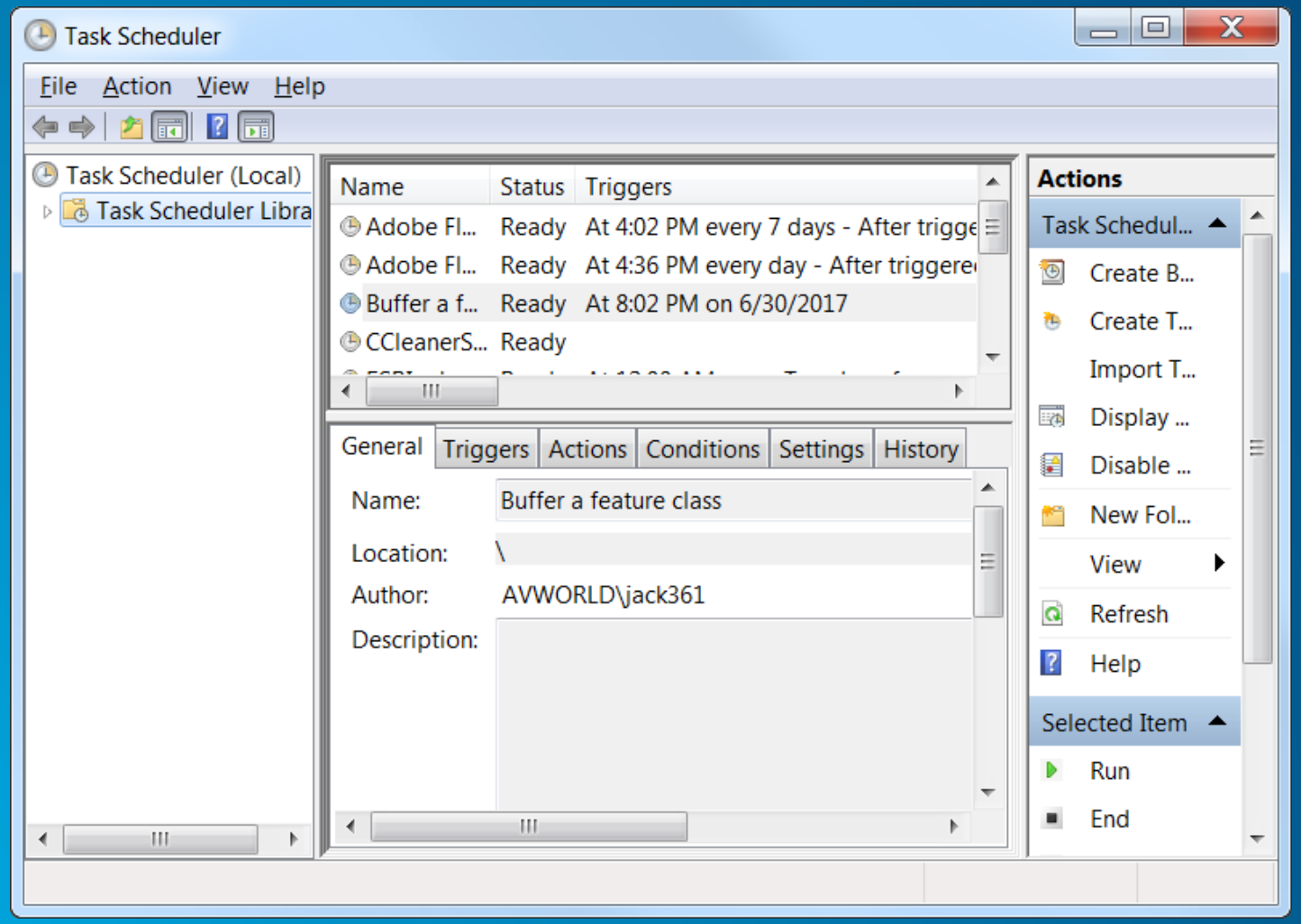
You can run it standalone

C:\windows\system32\cmd.exe

```
C:\Users\jack361>C:\Python27\ArcGIS10.5\python.exe "D:\jhorton\conferences\2017\
UC17\Tech Workshop\Python - Tips and Tricks for getting started\buff01.py"
done

C:\Users\jack361>_
```

Or you can schedule it to run automatically



A Python script is just a text file

buffer_example.py - Notepad

File Edit Format View Help

```
# buffer_example.py
#
# Demonstrates how to run the Buffer tool from Python
#
# JH   June 30, 2017

import arcpy

path   =  "D:/jhorton/data/Python_Testing.gdb"
input  =  path  +  "/railroads"
output =  path  +  "/railbuf"

arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Python automates the things you do by hand, such as

- Mapping
- Data management
- Analysis
- Publishing web services
- Administering your portal
- And much more

In this workshop, we will focus on simple analysis running geoprocessing tools.

The Help is full of code samples

Code sample

Buffer example 1 (Python window)

The following Python window script demonstrates how to use the Buffer tool.

```
import arcpy
arcpy.env.workspace = "C:/data"
arcpy.Buffer_analysis("roads", "C:/output/majorrdsBuffered", "100 Feet", "FULL", "ROUND", "LIST", "Distance")
```

…Copy and paste them to get started

arcpy contains the Esri Python code in ArcGIS Pro and ArcMap

We import the arcpy module so we can get to things like the buffer tool

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Variables store data

In this script, we put a long pathname in a variable called path

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Variables store data

Then we use it to make two new variables containing the pathnames to our data

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Variables store data

And we finally use these two variables as input to the Buffer geoprocessing tool

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Let’s run our script

PyScripter - D:\jhorton\conferences\2017\UC17\Tech Workshop\Python - Tips and Tricks for getting started\bu...

File Edit Search View Project Run Tools Help

Find:

Project Explorer

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- Files
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```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/Tech Workshop/P
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

File Expl... Project ... demosetup.py buff01.py

Python Interpreter

```
*** Python 2.7.12 (v2.7.12:d33e0cf91556, Jun 27 2016, 15:19:22) [MSC v.1500 32 bit (Intel)] on win32. ***
*** Remote Python engine  is active ***
>>>
```

Variables Messages Python Interpreter

2: 52 Insert

It worked! – It made the buffer, then printed “done”

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File Edit Search View Project Run Tools Help

Find:

Browse back (Alt+Left)

Project Explorer

Untitled
- Files
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```
1 import arcpy
2 path = "D:/jhorton/conferences/2017/UC17/Tech Workshop/P
3 input = path + "/railroads"
4 output = path + "/railbuf"
5 arcpy.Buffer_analysis(input, output, "100 Feet")
6 print ("done")
```

File Expl... | Project ... | demosetup.py | buff01.py | analysis.py

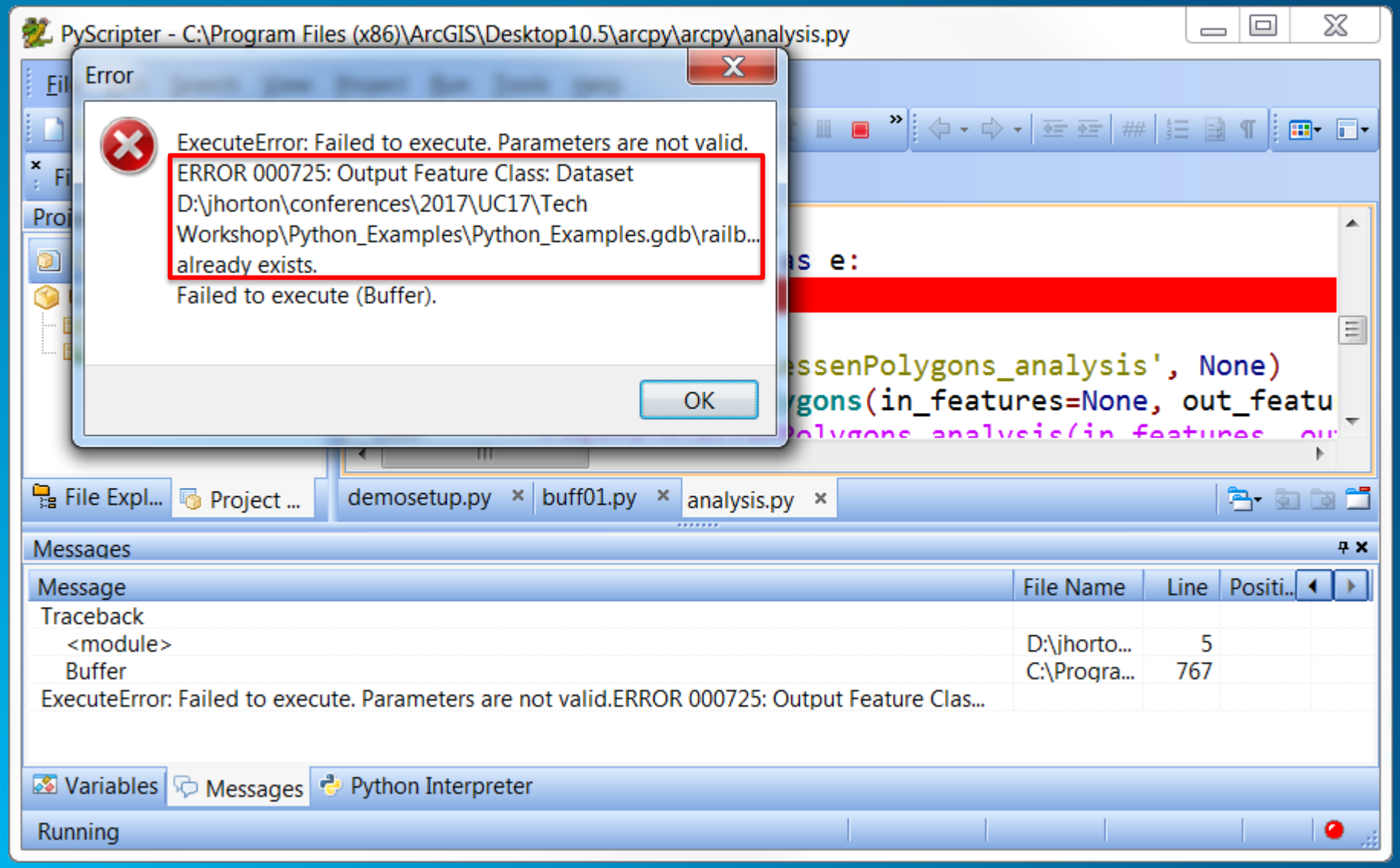
Python Interpreter

```
*** Python 2.7.12 (v2.7.12:d33e0cf91556, Jun 27 2016, 15:19:22) [MSC v.1500 32 bit (Intel)] on win32. ***
>>>
*** Remote Interpreter Reinitialized  ***
>>>
done
>>>
```

Variables | Messages | Python Interpreter

Browse back | 2: 52 | Insert

Lets run it again – it fails, because the output feature class already exists



Let's delete it if it already exists

- Search for "Exists" and get another code sample from the help

ArcGIS 10.5 Help

Hide Back Forward Home Options

Contents | Favorites | Search

Type a question, then click Ask.

exists

Powered by AnswerWorks® ask

History

100 topics found

Click to view	Rank
Exists (arcpy)	
001278 : Field does not exist. Check the Add fields check box to add new fields.	
001251 : Output exists.	
000337 : Indexes do not exist.	
001005 : The output already exists.	
000112 : Domain does not exist.	
000111 : Domain already exists.	
000110 : does not exist.	
000417 : Field does not exist	

Code sample

Exists example

Check for existence of specified data object.

```
import arcpy

# Set the current workspace
#
arcpy.env.workspace = "c:/base/data.gdb"

# Check for existence of data before deleting
#
if arcpy.Exists("roadbuffer"):
    arcpy.Delete_management("roadbuffer")
```

Let's delete it if it already exists

- Search for "Exists" and get another code sample from the help

ArcGIS 10.5 Help

Hide Back Forward Home Options

Contents | Favorites | Search

Type a question, then click Ask.

exists

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History

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001005 : The output already exists.	
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000111 : Domain already exists.	
000110 : does not exist.	
000417 : Field does not exist	

Code sample

Exists example

Check for existence of specified data object.

```
import arcpy

# Set the current workspace
#
arcpy.env.workspace = "c:/base/data.gdb"

# Check for existence of data before deleting
#
if arcpy.Exists("roadbuffer"):
    arcpy.Delete_management("roadbuffer")
```

Lets follow the pattern in the sample and put it in our code

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Lets follow the pattern in the sample and put it in our code

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"


arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Lets follow the pattern in the sample and put it in our code

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
if arcpy.Exists(output):
    arcpy.Delete_management(output)
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Lets follow the pattern in the sample and put it in our code

Note that we don’t use quotes, because our quoted string is in the variable called output

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
if arcpy.Exists(output):
    arcpy.Delete_management(output)
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Now it works, because it deletes the output feature class if it already exists

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File Edit Search View Project Run Tools Help

Find:

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```
3 input = path + "/railroads"
4 output = path + "/railbuf"
5 if arcpy.Exists(output):
6     arcpy.Delete_management(output)
7 arcpy.Buffer_analysis(input, output, "100 Feet")
8 print ("done")
```

File Expl... | Project ... | demosetup.py | buff02.py | analysis.py

Python Interpreter

```
.gdb\railbuf already exists.
Failed to execute (Buffer).

>>>
*** Remote Interpreter Reinitialized  ***
>>>
done
>>>
```

Last time

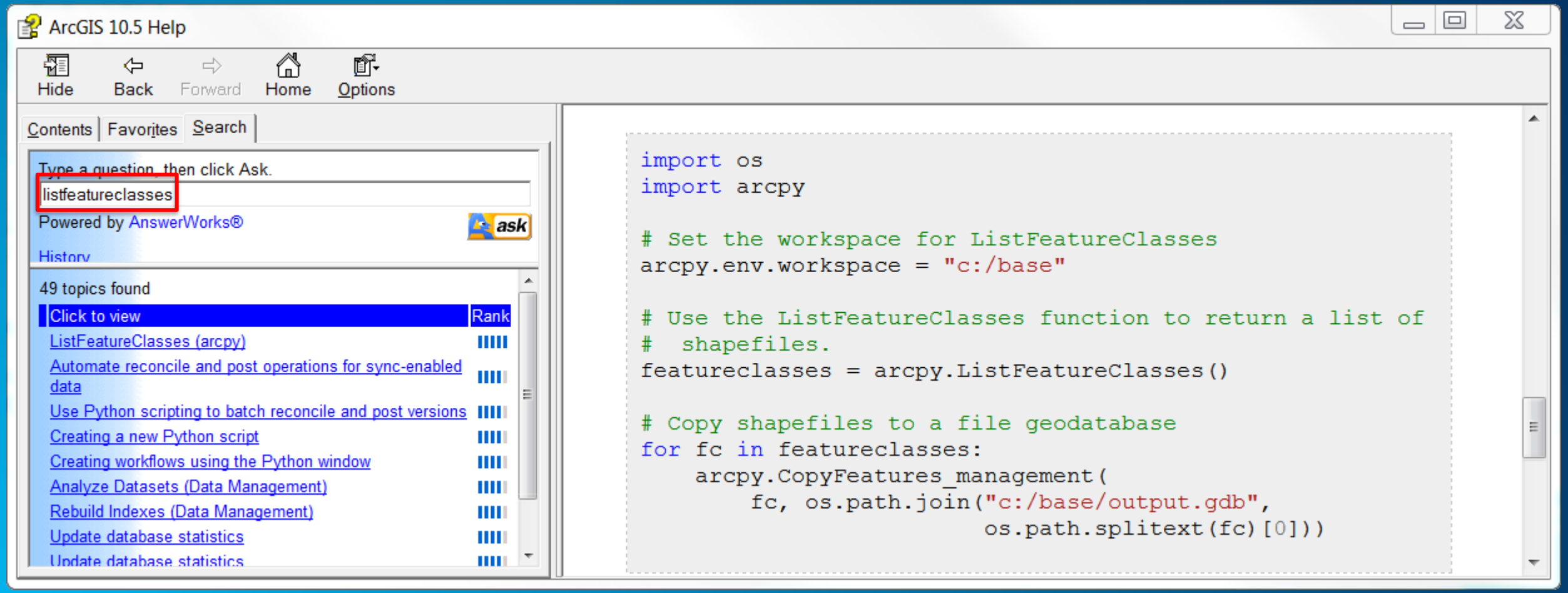
This time

Variables | Messages | Python Interpreter

8: 15 | Insert

Lets buffer all the feature classes in the geodatabase

Search the help for ListFeatureClasses



Lets buffer all the feature classes in the geodatabase

And copy the sample

ArcGIS 10.5 Help

Hide Back Forward Home Options

Contents | Favorites | Search

Type a question, then click Ask.

listfeatureclasses

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History

49 topics found

Click to view	Rank
ListFeatureClasses (arcpy)	
Automate reconcile and post operations for sync-enabled data	
Use Python scripting to batch reconcile and post versions	
Creating a new Python script	
Creating workflows using the Python window	
Analyze Datasets (Data Management)	
Rebuild Indexes (Data Management)	
Update database statistics	
Update database statistics	

```python
import os
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
    arcpy.CopyFeatures_management(
        fc, os.path.join("c:/base/output.gdb",
                         os.path.splitext(fc)[0]))
```

This sample is kind of fancy – lets remove what we don’t need

```
import os
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
    arcpy.CopyFeatures_management(
        fc, os.path.join("c:/base/output.gdb",
                         os.path.splitext(fc)[0]))
```

This sample is kind of fancy – lets remove what we don’t need

This example uses a Standard Python Module called OS to manipulate pathnames

```
import os
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
    arcpy.CopyFeatures_management(
        fc, os.path.join("c:/base/output.gdb",
                         os.path.splitext(fc)[0]))
```

This sample is kind of fancy – lets just pull out what we need

Lets remove that part…

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
```

This sample is kind of fancy – lets just pull out what we need

… and just print out the feature classes for now

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
    print (fc)
```

This sample is kind of fancy – lets just pull out what we need

… also update the comments to keep them relevant to what we are doing

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of
#  shapefiles.
featureclasses = arcpy.ListFeatureClasses()

# Copy shapefiles to a file geodatabase
for fc in featureclasses:
    print (fc)
```

This sample is kind of fancy – lets just pull out what we need

… also update the comments to keep them relevant to what we are doing

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of feature classes.

featureclasses = arcpy.ListFeatureClasses()

# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

We must set the workspace environment

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of feature classes.

featureclasses = arcpy.ListFeatureClasses()

# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

We must set the workspace environment

That is how LstFeatureClasses knows what workspace to list out

```
import arcpy

# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"

# Use the ListFeatureClasses function to return a list of feature classes

featureclasses = arcpy.ListFeatureClasses()

# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

Lets remove some blank lines

```
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

Lets remove some blank lines

```
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

…and merge in our existing script

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
if arcpy.Exists(output):
    arcpy.Delete_management(output)
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

…and merge in our existing script

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
if arcpy.Exists(output):
    arcpy.Delete_management(output)
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

We will comment out the lines that run the Buffer tool for now

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

This script is still trying to use the data from the sample

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = "c:/base"
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

Substitute our path variable for the workspace

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

Lets test what we have so far

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File Edit Search View Project Run Tools Help

Find:

Project Explorer

Untitled
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```
# Use the ListFeatureClasses function to return a list
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

File Expl... | Project ... | demosetup.py | buff03.py | analysis.py

Python Interpreter

```
*** Python 2.7.12 (v2.7.12:d33e0cf91556, Jun 27 2016, 15:19:22) [MSC v.1500 32 bit (Intel)] on win32. ***
>>>
```

Variables | Messages | Python Interpreter

16: 1 | Modified | Insert

It prints out all of the feature classes

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File Edit Search View Project Run Tools Help

Find:

Project Explorer

Untitled
- Files
- Run Configurations

```
10 arcpy.env.workspace = path
11 # Use the ListFeatureClasses function to return a list
12 featureclasses = arcpy.ListFeatureClasses()
13 # Print out each feature class name
14 for fc in featureclasses:
15     print (fc)
```

File Expl... | Project ...

demosetup.py | buff03.py | analysis.py

Python Interpreter

```
MajorAttractions
Ocean
Railroads
Streams
railbuf100
railbuf

>>>
```

Variables | Messages | Python Interpreter

14: 1 | Insert

Now that we got this far, lets start setting it up to run the Buffer tool

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

The input and output variables are currently hard-coded to our test data

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
```

Set up the input and output variables to use each feature class in the loop

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
input = path + "/railroads"
output = path + "/railbuf"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

… and remove the original hard-coded input and output variables

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"



# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

… and remove the original hard-coded input and output variables

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

… and remove the original hard-coded input and output variables

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

Print out our new variable values

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Lets confirm that it correctly sets our input and output variables

PyScripter - D:\jhorton\conferences\2017\UC17\Tech Workshop\Python - Tips and Tricks for getting started\bu...

File Edit Search View Project Run Tools Help

Find:

Project Explorer

Untitled
- Files
- Run Configurations

```
14 for fc in featureclasses:
15     print (fc)
16     input  = path + "/" + fc
17     output = path + "/" + fc + "buff"
18     print (input + "  -  " + output)
19     print
```

File Expl... | Project ...

demosetup.py | buff03.py | analysis.py

Python Interpreter

```
Ocean
D:/jhorton/conferences/2017/UC17/Tech Workshop/Python_Examples/Python_Examples.gdb/Ocean  -  D:/jhorton/conferences/2017
/UC17/Tech Workshop/Python_Examples/Python_Examples.gdb/Oceanbuff

Railroads
D:/jhorton/conferences/2017/UC17/Tech Workshop/Python_Examples/Python_Examples.gdb/Railroads  -  D:/jhorton/conferences
/2017/UC17/Tech Workshop/Python_Examples/Python_Examples.gdb/Railroadsbuff
```

Variables | Messages | Python Interpreter

Now alter the print statements and run the buffer

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Get ready to copy and paste the buffer statements into the for loop

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Get ready to copy and paste the buffer statements into the for loop

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
```

```
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Get ready to copy and paste the buffer statements into the for loop

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Remove the print() statements we used for testing

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    print (input + "  -  " + output)
    print ()
```

Remove the print() statements we used for testing

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

Alter the remaining print statement

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print (fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

Alter the remaining print statement

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Print out each feature class name
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
```

Paste in the lines that run the buffer tool

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
# if arcpy.Exists(output):
#     arcpy.Delete_management(output)
# arcpy.Buffer_analysis(input, output, "100 Feet")
# print ("done")
```

Remove the comment characters (#) to activate these lines

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
if arcpy.Exists(output):
    arcpy.Delete_management(output)
arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

And indent them properly so they run inside the for loop

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
    print ("done")
```

Un-indent the final print() statement, so it only prints “done” at the end

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Challenge: How do you keep it from buffering a buffered feature class?

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Challenge: How do you keep it from buffering a buffered feature class?

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Challenge: How do you keep it from buffering a buffered feature class?

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff“
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Challenge: How do you keep it from buffering a buffered feature class?

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff“
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Answer: Don’t run the buffer if the input ends in “buff”

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff“
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

The print() is now misleading – we are not buffering every feature class

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

The print() is now misleading – we are not buffering every feature class

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in "buff"
for fc in featureclasses:
    print ("Buffering " + fc)
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":


        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Put it inside the if so it only prints if we actually buffer the feature class

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:

    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":
        print ("Buffering " + fc)
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Put it inside the if so it only prints if we actually buffer the feature class

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:

    input  = path + "/" + fc
    output = path + "/" + fc + "buff“
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":
        print ("Buffering " + fc)
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

Put it inside the if so it only prints if we actually buffer the feature class

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    input  = path + "/" + fc
    output = path + "/" + fc + "buff“
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
     if input[-4:] <> "buff":
        print ("Buffering " + fc)
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

How did [-4:] specify the last four characters?

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in “buff”
for fc in featureclasses:
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    if input[-4:] <> "buff":
        print ("Buffering " + fc)
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("done")
```

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	**b**	**c**	**d**	**e**	**f**	**g**	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	**b**	**c**	**d**	**e**	**f**	**g**	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

"abcdefg"[-4:-1] also returns “def”

"abcdefg"[3:7] returns “defg”

"abcdefg"[3:] also returns “defg”

"abcdefg"[-4:7] returns “defg”

"abcdefg"[-4:] also returns “defg”

How did [-4:] specify the last four characters?

if input[-4:] <> "buff“:

basically says:

if the last 4 characters of input are not “buff”

Strings are indexed between the letters like this:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	
-7	-6	-5	-4	-3	-2	-1	

"abcdefg"[0:3] returns “abc”

"abcdefg"[:3] also returns “abc”

"abcdefg"[3:6] returns “def”

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That is how we use if to only run buffer if the last 4 characters are not “buff”

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
# Use the ListFeatureClasses function to return a list of feature classes
featureclasses = arcpy.ListFeatureClasses()
# Buffer each feature class that does not end in "buff"
for fc in featureclasses:
    input  = path + "/" + fc
    output = path + "/" + fc + "buff"
    if arcpy.Exists(output):
        arcpy.Delete_management(output)
    if input[-4:] <> "buff":
        print ("Buffering " + fc)
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("Done")
```

Almost done…

```
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
# Set the workspace for ListFeatureClasses
arcpy.env.workspace = path
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Add some header comments

```
# BufferAll.py
# Jack Horton   June 30, 2017
# Buffers all the feature classes in a workspace, adding “buff” to each output
#
import arcpy
path = "D:/jhorton/conferences/2017/UC17/TechWorkshop/Python_Examples/Python_Examples.gdb"
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    if input[-4:] <> "buff":
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        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("Done")
```

Our completed script!

```
# BufferAll.py
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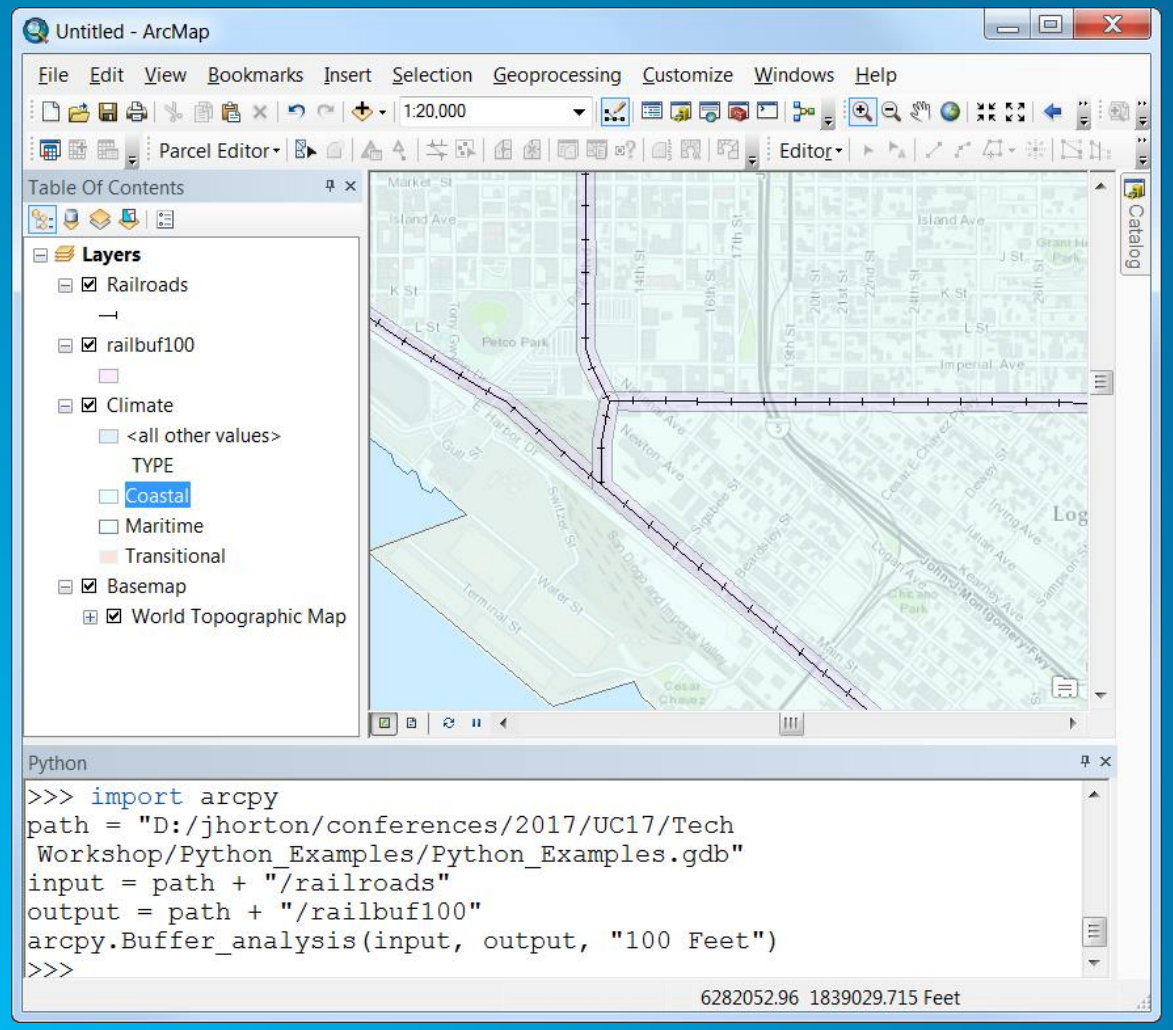
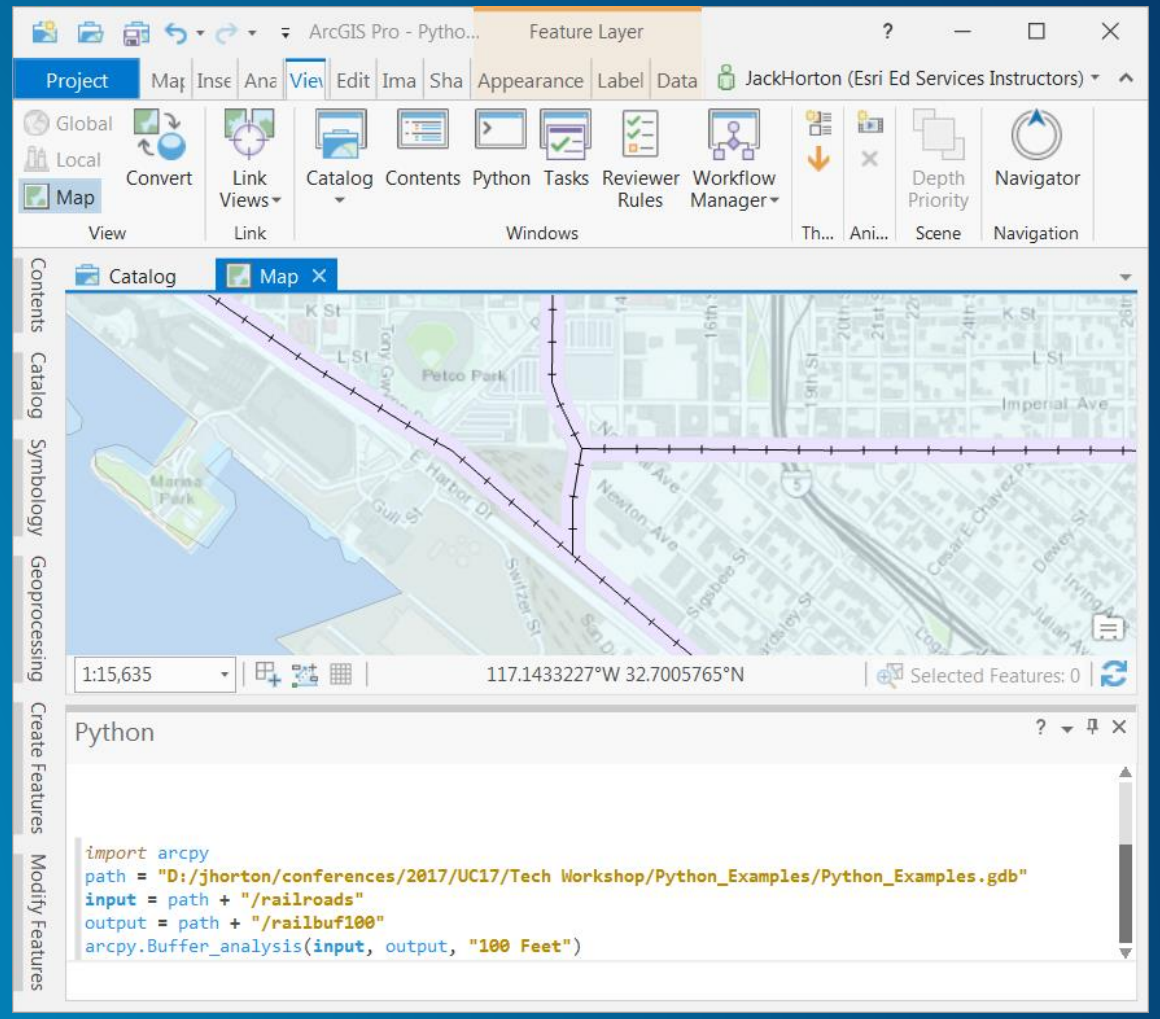
        arcpy.Buffer_analysis(input, output, "100 Feet")
print ("Done")
```

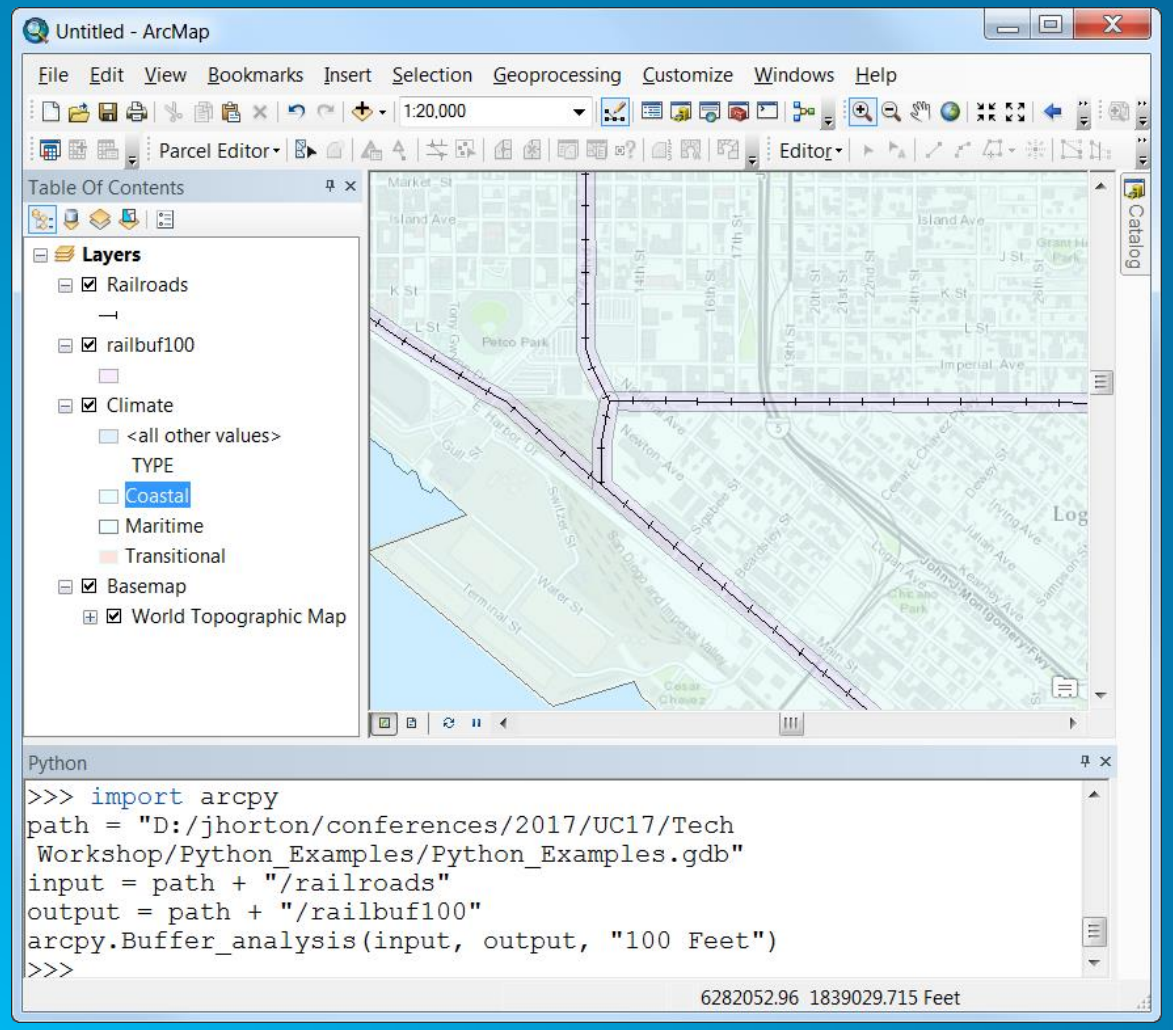
The same script runs in ArcMap or ArcGIS Pro

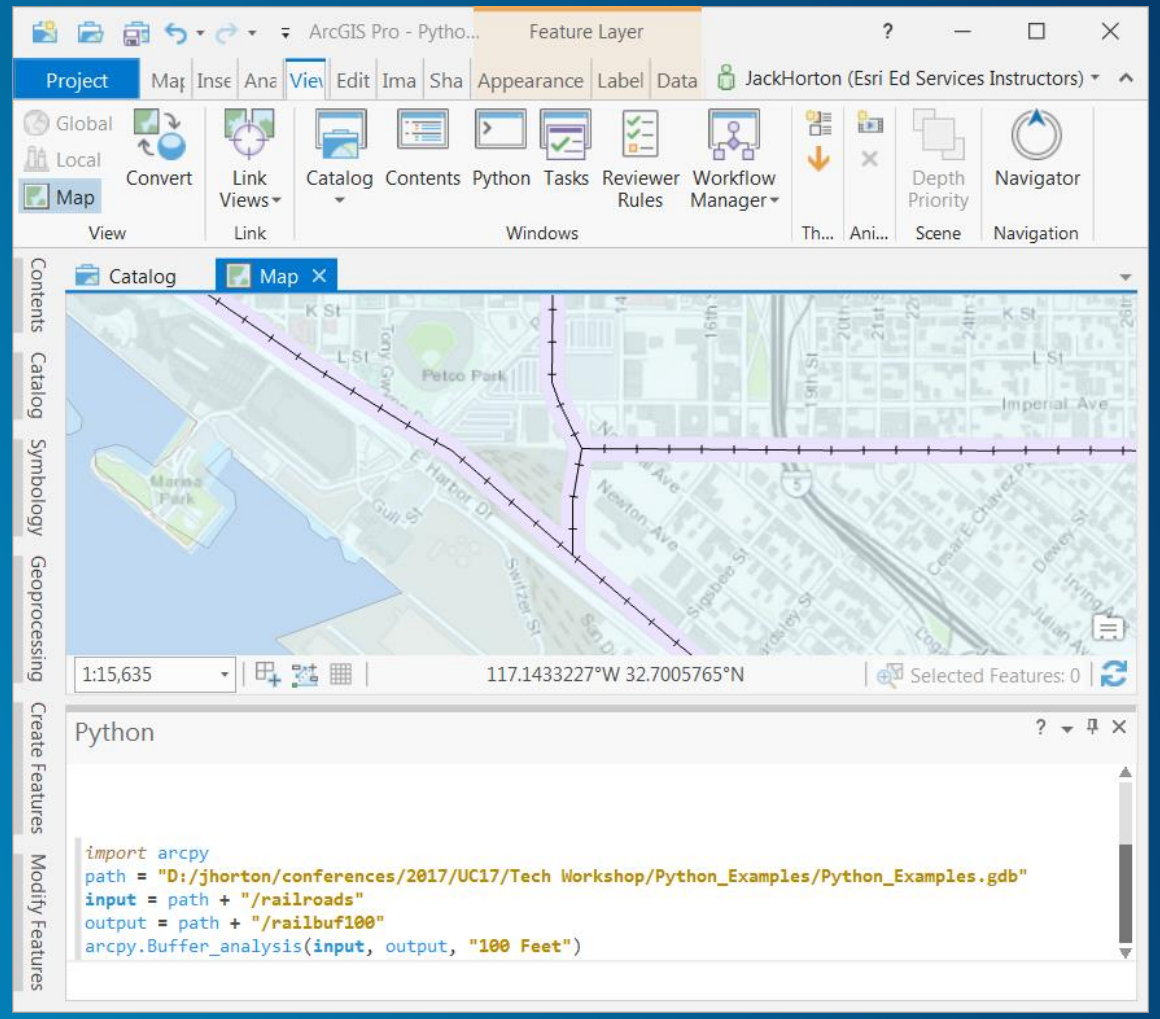




The same script runs in ArcMap or ArcGIS Pro

*** scripts that manipulate the user interface will, of course, be different**





Review

- Python is used throughout the ArcGIS platform
- There are many ways to run a Python script

- Coding techniques:
  - Use the samples in the help system
  - Test your script as you go
  - Use print() statements to see what the script is doing
  - Use variables to make your script easy to modify
  - You can use \ or / as separators in pathnames. / works better.
  - Use if: to make your script flexible
  - Use Exists to see if data already exists
  - Use for: to do things over and over
  - Use ListFeatureClasses to get a list of feature classes to process
  - Use character strings to work with file names and path names

esri

THE SCIENCE OF WHERE