(a.) Downloads .LAS files from MN DNR

```
In [3]: import arcpy
        import requests
        import os
        import zipfile
        import io
        import sys
```

```
In [2]: working_dir = r'C:\Users\siyal\Desktop\Lab 02'
```

```
In [3]: mn_geo = r'https://resources.gisdata.mn.gov/pub'
```

```
In [4]: 'https://resources.gisdata.mn.gov/pub'
Out[4]: 'https://resources.gisdata.mn.gov/pub'
```

```
In [5]: las_file=r'https://resources.gisdata.mn.gov/pub/data/elevation/lidar/examples/lidar_sample/l
        as/4342-12-05.las'
        las_file
Out[5]: 'https://resources.gisdata.mn.gov/pub/data/elevation/lidar/examples/lidar_sample/las/4342-12-
        05.las'
```

```
In [6]: las_file_obj = requests.post(las_file)
```

```
In [7]: las_file_obj
Out[7]: <Response [200]>
```

```
In [9]: path_to_las = os.path.join(working_dir, 'output.las')
        path_to_las
Out[9]: 'C:\\Users\\siyal\\Desktop\\Lab 02\\output.las'
```

b. Converts the .LAS file into both a DEM and a TIN

```
In [10]: with open(path_to_las, 'wb') as f:
             f.write(las_file_obj.content)
```

```
In [11]: arcpy.conversion.LasDatasetToRaster(r"C:\Users\siyal\Desktop\Lab 02\output.las", r"c:\users
         \siyal\documents\arcgis\projects\arcgis (lab 02)\arcgis (lab 02).gdb\output_lasda", "ELEVATI
         ON", "BINNING AVERAGE LINEAR", "FLOAT", "CELLSIZE", 10, 1)
Out[11]:
```

Messages

```
In [ ]: arcpy.ddd.LasDatasetToTin(r"C:\Users\siyal\Desktop\Lab_02\output.las", r"C:\Users\siyal\Doc
        uments\ArcGIS\Projects\ArcGIS (Lab 02)\output_LasDatasetToTIN", "RANDOM", "PERCENT", 75, 50
        00000, 1, "CLIP")
```

c. Saves the new DEM and TIN to disk

```
In [ ]: ####arcpy.management.SaveToLayerFile(in_layer, out_layer)####
```

d. Exports PDFs of the DEM and TIN with correct

```
In [3]: aprx = arcpy.mp.ArcGISProject("CURRENT")
```

```
In [4]: aprx.defaultGeodatabase = (r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS (Lab 02)\ArcGI
        S (Lab 02).gdb")
```

```
In [9]: print(aprx.filepath)

        ---------------------------------------------------------------------------
        AttributeError                            Traceback (most recent call last)
        In  [9]:
        Line 1:     print(aprx.filepath)

        AttributeError: 'ArcGISProject' object has no attribute 'filepath'
        ---------------------------------------------------------------------------
```

```
In [8]: aprx = arcpy.mp.ArcGISProject(r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS (Lab 02)\Ar
        cGIS (Lab 02).aprx")
```

```
In [10]: arcpy.server.GetLayoutTemplatesInfo(r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS (Lab
          02)")
Out[10]:
```

Messages

```
In [14]: lyt = aprx.listLayouts('Layout')[0]
```

```
In [15]: lyt.exportToPDF(r"C:\Users\siyal\Desktop\Lab 02.pdf", resolution = 300)
Out[15]: 'C:\\Users\\siyal\\Desktop\\Lab 02.pdf'
```

```
In [ ]: lyt = aprx.listLayouts('Layout1')[0]
```

```
In [19]: Outputpath= (r"C:\Users\siyal\Desktop\Lab_02\Tin.pdf")
         Outputpath
Out[19]: 'C:\\Users\\siyal\\Desktop\\Lab_02\\Tin.pdf'
```

```
In [ ]: lyt.exportToPDF(r'C:\Users\siyal\Desktop\Lab_02\Tin.pdf", resolution = 300)
```

```
In [ ]:
```

3(a) Downloads the annual 30-Year Normals .bil files for precipitation from PRISM

```
In [33]: PRISM_request_URL = r'https://prism.oregonstate.edu/fetchData.php'
         PRISM_request_URL
Out[33]: 'https://prism.oregonstate.edu/fetchData.php'
```

```
In [34]: 'https://prism.oregonstate.edu/fetchData.php'
Out[34]: 'https://prism.oregonstate.edu/fetchData.php'
```

```
In [35]: PRISM_params = r'type=all_bil&kind=normals&spatial=4km&elem=ppt&temporal=annual'
         PRISM_params
Out[35]: 'type=all_bil&kind=normals&spatial=4km&elem=ppt&temporal=annual'
```

```
In [36]: final_PRISM_path = PRISM_request_URL + '?' + PRISM_params
```

```
In [37]: print(final_PRISM_path)

         https://prism.oregonstate.edu/fetchData.php?type=all_bil&kind=normals&spatial=4km&elem=ppt
         &temporal=annual
```

```
In [38]: PRISM_post_request = requests.post(final_PRISM_path)
```

```
In [39]: PRISM_post_request
Out[39]: <Response [200]>
```

```
In [40]: ourzipfile = zipfile.ZipFile(
             io.BytesIO(
                 PRISM_post_request.content)
         )
```

```
In [41]: ourzipfile
Out[41]: <zipfile.ZipFile file=<_io.BytesIO object at 0x0000022AB4321310> mode='r'>
```

```
In [42]: bilsfolder = os.path.join(working_dir, 'bils')
         bilsfolder
Out[42]: 'C:\\Users\\siyal\\Desktop\\Lab 02\\bils'
```

```
In [43]: ourzipfile.extractall(bilsfolder)
```

Convert to TIF

```
In [44]: arcpy.conversion.RasterToOtherFormat(r"'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_
         normal_4kmM3_01_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_0
         2_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_03_bil.bi
         l';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_04_bil.bil';'C:\Users\s
         iyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_05_bil.bil';'C:\Users\siyal\Desktop\L
         ab 02\bils\PRISM_ppt_30yr_normal_4kmM3_06_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRI
         SM_ppt_30yr_normal_4kmM3_07_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_no
         rmal_4kmM3_08_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_09_
         bil.bil';'C:\Users\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_10_bil.bil';'C:\U
         sers\siyal\Desktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_11_bil.bil';'C:\Users\siyal\Des
         ktop\Lab 02\bils\PRISM_ppt_30yr_normal_4kmM3_12_bil.bil';'C:\Users\siyal\Desktop\Lab 02\bi
         ls\PRISM_ppt_30yr_normal_4kmM3_annual_bil.bil'", r"C:\Users\siyal\Desktop\Lab 02", "TIFF")
Out[44]:
```

Messages

```
In [45]: arcpy.management.CreateMosaicDataset(r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS
          (Lab 02)\ArcGIS (Lab 02).gdb", "Mosaic", 'PROJCS["datum_D_North_American_1983_HARN_UTM_
         Zone_15N",GEOGCS["GCS_datum_D_North_American_1983_HARN",DATUM["D_unknown",SPHEROID["GRS_
         1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.017453292519943
         3]],PROJECTION["Transverse_Mercator"],PARAMETER["false_easting",500000.0],PARAMETER["fal
         se_northing",0.0],PARAMETER["central_meridian",-93.0],PARAMETER["scale_factor",0.9996],P
         ARAMETER["latitude_of_origin",0.0],UNIT["Meter",1.0]],VERTCS["NAVD88 - Geoid03 (Meter
         s)",VDATUM["unknown"],PARAMETER["Vertical_Shift",0.0],PARAMETER["Direction",1.0],UNIT["M
         eter",1.0]]', None, '', "NONE", None)
Out[45]:
```

Messages

```
In [1]: arcpy.management.AddRastersToMosaicDataset(r"C:\Users\siyal\Documents\ArcGIS\Projects\A
        rcGIS (Lab 02)\ArcGIS (Lab 02).gdb\Mosaic", "Raster Dataset", r"'C:\Users\siyal\Desktop
        \Lab 02\PRISM_ppt_30yr_normal_4kmM3_01_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_pp
        t_30yr_normal_4kmM3_02_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4k
        mM3_03_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_04_bil.ti
        f';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_05_bil.tif';'C:\Users\siy
        al\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_06_bil.tif';'C:\Users\siyal\Desktop\Lab 0
        2\PRISM_ppt_30yr_normal_4kmM3_07_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr
        _normal_4kmM3_08_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_09
        _bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_10_bil.tif';'C:\Us
        ers\siyal\Desktop\Lab 02\PRISM_ppt_30yr_normal_4kmM3_11_bil.tif';'C:\Users\siyal\Deskto
        p\Lab 02\PRISM_ppt_30yr_normal_4kmM3_12_bil.tif';'C:\Users\siyal\Desktop\Lab 02\PRISM_p
        pt_30yr_normal_4kmM3_annual_bil.tif'", "UPDATE_CELL_SIZES", "UPDATE_BOUNDARY", "NO_OVER
        VIEWS", None, 0, 1500, None, '', "SUBFOLDERS", "ALLOW_DUPLICATES", "NO_PYRAMIDS", "NO_S
        TATISTICS", "NO_THUMBNAILS", '', "NO_FORCE_SPATIAL_REFERENCE", "NO_STATISTICS", None,
        "NO_PIXEL_CACHE", r"C:\Users\siyal\AppData\Local\ESRI\rasterproxies\Mosaic")
Out[1]:
```

Messages

Adding Timestamp

```
In [4]: arcpy.management.CalculateField(r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS (La
        b 02)\ArcGIS (Lab 02).gdb\mosaic", "Timestamp", "DateAdd(Date(2020,0,1),$feature.OBJE
        CTID-1,'month')","ARCADE", '', "TEXT")
Out[4]:
```

Messages

```
In [6]: arcpy.management.CalculateField(r"C:\Users\siyal\Documents\ArcGIS\Projects\ArcGIS (L
        ab 02)\ArcGIS (Lab 02).gdb\mosaic", "Timestamp", "$feature.OBJECTID", "ARCADE", '',
        "TEXT", "NO_ENFORCE_DOMAINS")
Out[6]:
```

Messages

Making Multidimensional Raster layer

```
In [9]: arcpy.md.BuildMultidimensionalInfo("mosaic", "Variable", "Timestamp # #", "mosaic
         # #")
Out[9]:
```

Messages

```
In [ ]: arcpy.md.MakeMultidimensionalRasterLayer(r"C:\Users\siyal\Documents\ArcGIS\Projec
        ts\ArcGIS (Lab 02)\ArcGIS (Lab 02).gdb\mosaic", "mosaic_MultidimLayer12", "mosai
        c", "ALL", None, None, '', '', '', None, '', '-13917257.2777 2761917.52169259 -74
        00428.75412497 6435460.7179 PROJCS["WGS_1984_Web_Mercator_Auxiliary_Sphere",GEOGC
        S["GCS_WGS_1984",DATUM["D_WGS_1984",SPHEROID["WGS_1984",6378137.0,298.25722356
        3]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Mercat
        or_Auxiliary_Sphere"],PARAMETER["False_Easting",0.0],PARAMETER["False_Northing",
        0.0],PARAMETER["Central_Meridian",0.0],PARAMETER["Standard_Parallel_1",0.0],PARAM
        ETER["Auxiliary_Sphere_Type",0.0],UNIT["Meter",1.0]]', "DIMENSIONS", None)
```