**APSIM Next Generation Simulation python Toolbox**

This Python toolbox allows users to easily upload and run simulations with the [APSIM Next Generation](https://www.apsim.info/) software. With this tool, users can specify the start and end dates of the simulation, import a watershed feature class layer, and set the cell sampling resolution for the simulation. The tool will automatically download weather and soils data and incorporate them into the APSIM Next Generation file.

The tool leverages the multiprocessing module in Python to run the simulation in parallel, which significantly reduces the run time. The cell resolution has a significant impact on the run time, as it generates many samplings point profiles for the simulation.

This toolbox also has the capability to run multiple cropping systems simultaneously, allowing users to create simulation output patterns for multiple crops at once. Users have the ultimate freedom to specify whether they want to view the simulation in real-time by turning on the console or turning it off.

**Features**

* Upload and run APSIM Next Generation simulations from Python
* Specify start and end dates for the simulation
* Import a watershed feature class layer
* Set the cell sampling resolution for the simulation
* Automatically download weather and soils data and incorporate them into the APSIM Next Generation file
* Run the simulation in parallel using the multiprocessing module in Python
* Run multiple cropping systems simultaneously
* View simulation in real-time with the console

**Requirements**

* Python 3.7 or higher
* APSIM Next Generation software
* Internet connection to download weather and soils data
* ArcGIS PRO 3.0 or higher

**Usage**

1. Download the toolbox and insert it in your desired directory
2. Import the **tool into your project folder in ARCGIS PRO**
3. Open the toolbox
4. Specify the working directory. We recommend that you do not select networked folder that sync automatically with the internet this greatly interferes with the API.
5. Specify the start and end dates, watershed feature class layer, and cell sampling resolution
6. Select the cropping system you intend to simulate, continuous corn, corn/rye cover crops, corn-soybean rotation with or without cover crops. You can select all these cropping systems once and compare the results for each simulation
7. Select the percentage of cores on your machine to be used in parallel processing. If you are not going to use the computer for other computing needs in real time, you can select higher percentage
8. Optionally, set the console parameter to **True** to view the simulations in real-time.
9. Press run.
10. The simulation will run with continuous update in the ArcGIS toolbox message panel

**Tips and Tricks:**

Do not use the online databases/folders such as cybox, or one drive as these may slow down the processing speed

Do not include spaces in your directory if possible after downloading the zipped folder copy the folder named application to a local drive before import the toolbox in ArcGIS pro.

Incorrect pathname: C:\DATA\APSIMtool Testing\python\_toolbox\_apsim\Application

Correct pathname: C:\DATA\APSIMtool\_Testing\python\_toolbox\_apsim\Application

Where possible edit the provided APSIM file instead of using a new one. This can be found ~./ Application/BaseAPSIM/APSIM\_fileExample.apsimx.

Use the check button provided at the end of the toolbox to test your user inputs before your run the whole simulation.

To save memory you may need to run the tool in asynchronous mode, the only caveats with this is that it is a bit lazy the synchronous mode.

When running this tool, progress can be monitored from within ArcMap by viewing the Results window, found under the Geoprocessing tab. This window will also contain any error messages generated by the toolbox.