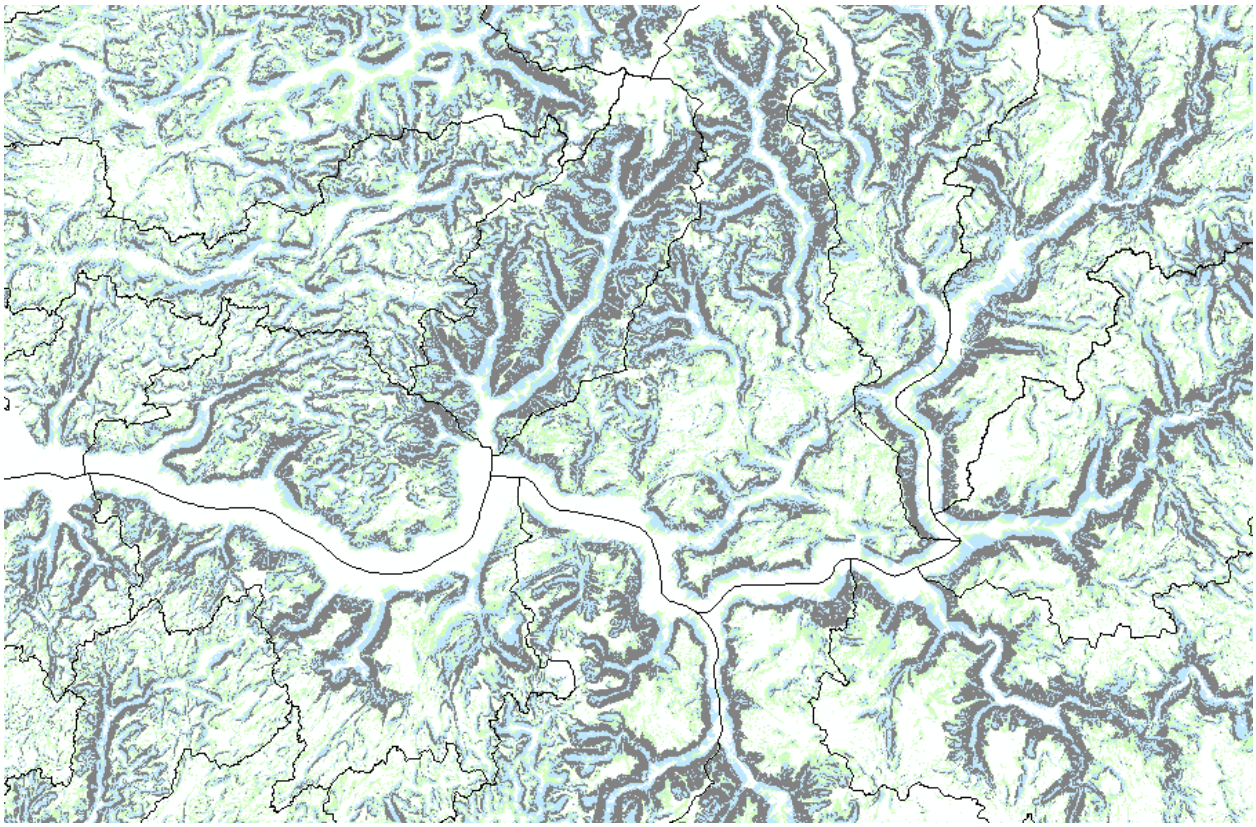
2018



User Manual

AUTOKAST FOR NVE

HÅVARD TOFT LARSEN

Outline

1. Install necessary programs

a. Download TauDEM 5.1 and install it. Administrator rights is needed. http://hydrology.usu.edu/taudem/taudem5/downloads5.0.html

b. Download SAGA 2.2.2. and install it. Administrator rights is needed. https://sourceforge.net/projects/saga-gis/files/SAGA%20-%202/SAGA%202.2.2/saga_2.2.2_x64_setup.exe/download

c. Download R 3.4.4 or newer, and install it. Administrator rights is needed.

   i. Open R

   ii. Write: install.packages *("packagename")*

   iii. Install the following packages: sp, gstat, shapefiles, foreign, methods, plyr, rgdal, raster and RSAGA.

2. Make sure that you have installed ArcGIS 10 or newer and Python

a) Note that Python should be installed by default when you install ArcGIS

b) Check for the location of several important directories, which are installed to C:\Program Files or C:\Program Files (x86) depending on your operating system. The directories you should be able to locate include:
   i. …\ArcGIS\Desktop10.x\bin
   ii. …\ArcGIS\Desktop10.x\arcpy
   iii. …\ArcGIS\Desktop\ArcToolbox\Scripts
   iv. …\Python26\ArcGIS10.0 or …\Python27\ArcGIS10.5.1

c) When you install ArcGIS and Python the above directories should be added automatically to your Python Path (an environment variable, which you will learn how to set in the next set of steps)
   i. To make sure that these directories were added to your Path environment variable automatically, open ArcMap, open the Python Window (from the Geoprocessing Dropdown), and type the following

>>> import sys
>>> print sys.path

ii. The output should include the following (the exact output will be different, but should include the pathnames listed above in i-iii)

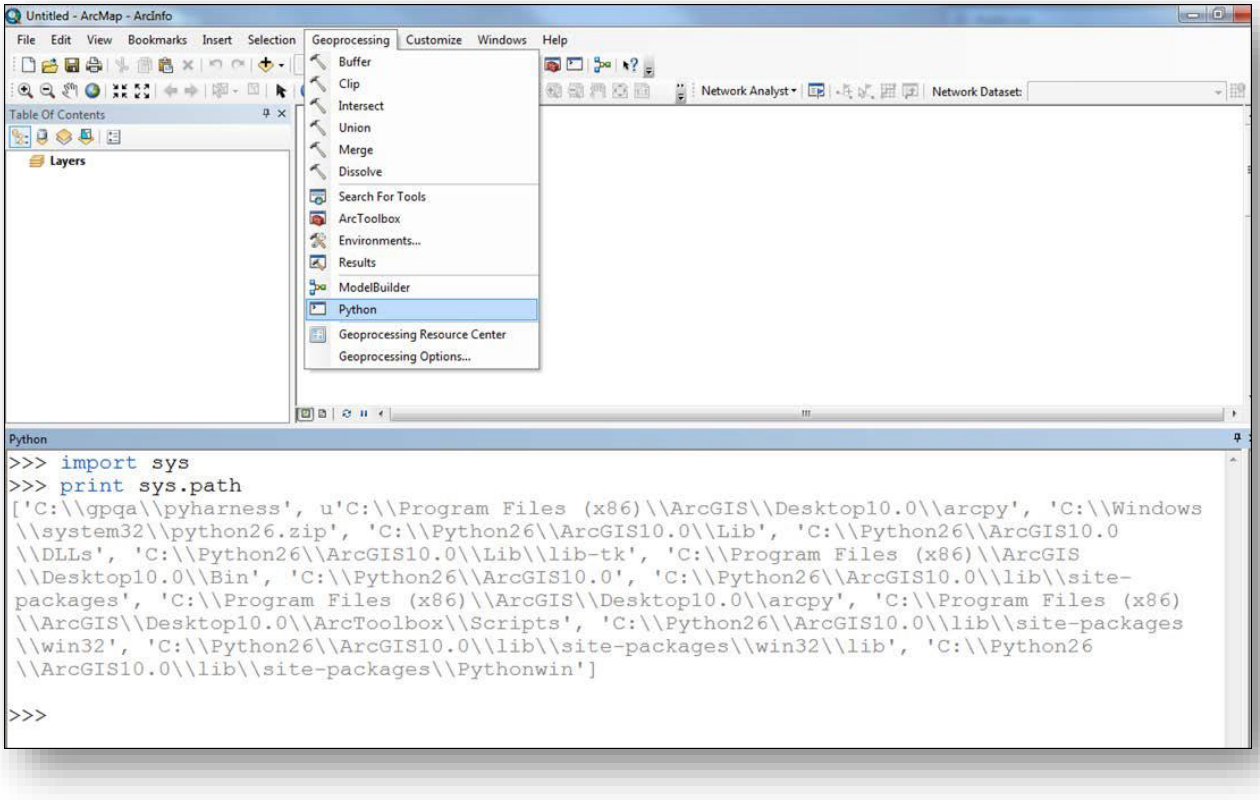


Figure 1: Python in ArcMap

iii. If you do not see the directories listed (which is unlikely), add them when you do step 3-5 below
iv. Close ArcMap

3. Add the R Bin directory to your Path environment variable

a) Navigate to the location where you save your program files and open the R\R-3.5.0\bin\x64 (you should find the R x64 .exe file in this folder)
b) Copy the full path location of the x64 folder. Go to your Start Menu, find the System icon (or just Computer icon, depending on what operating system you are using).
c) Or follow this path: Control Panel –> Security and Maintenance –> System

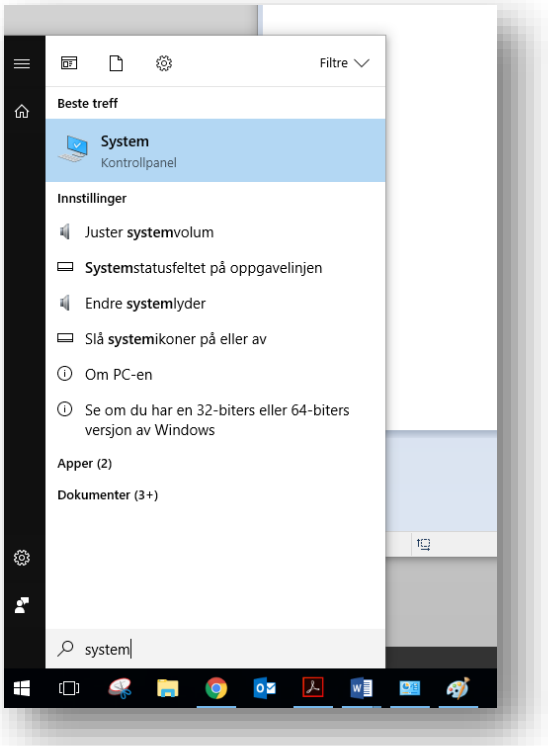


Figure 2: Find system in the Windows Start Menu

d) For Windows 10, open advanced system settings (highlighted in red, Figure 3). Type in administrator credentials and continue.

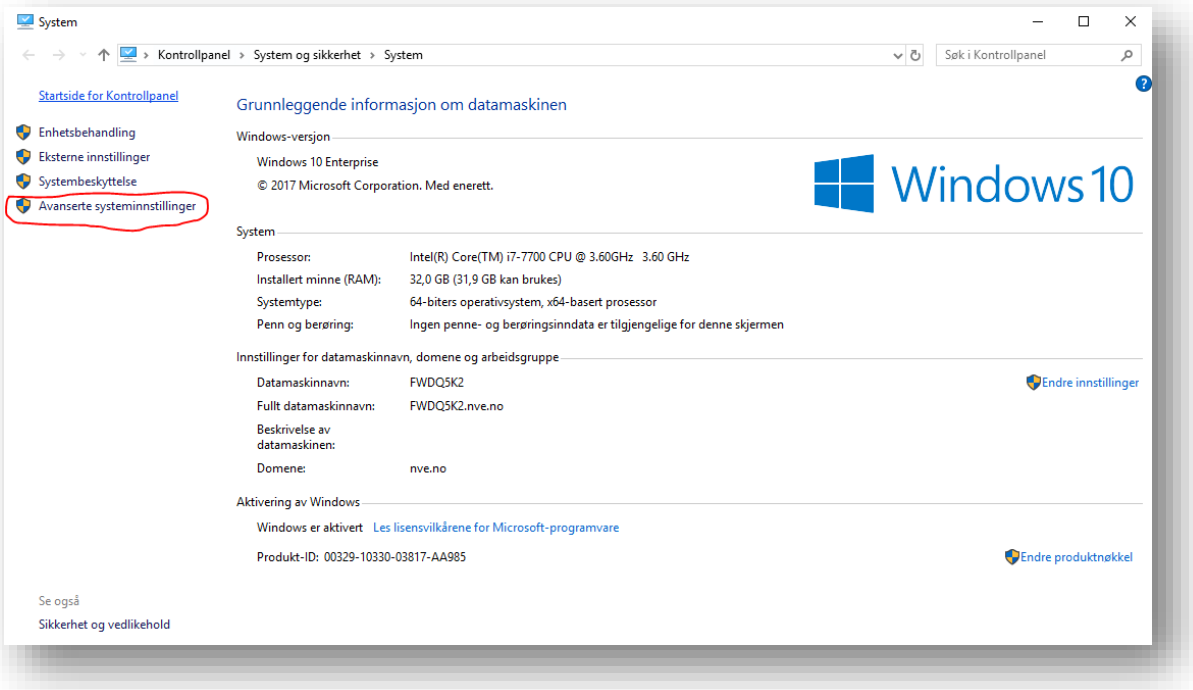


Figure 3: Advanced system settings

e) Click on environment variables, then edit «path»

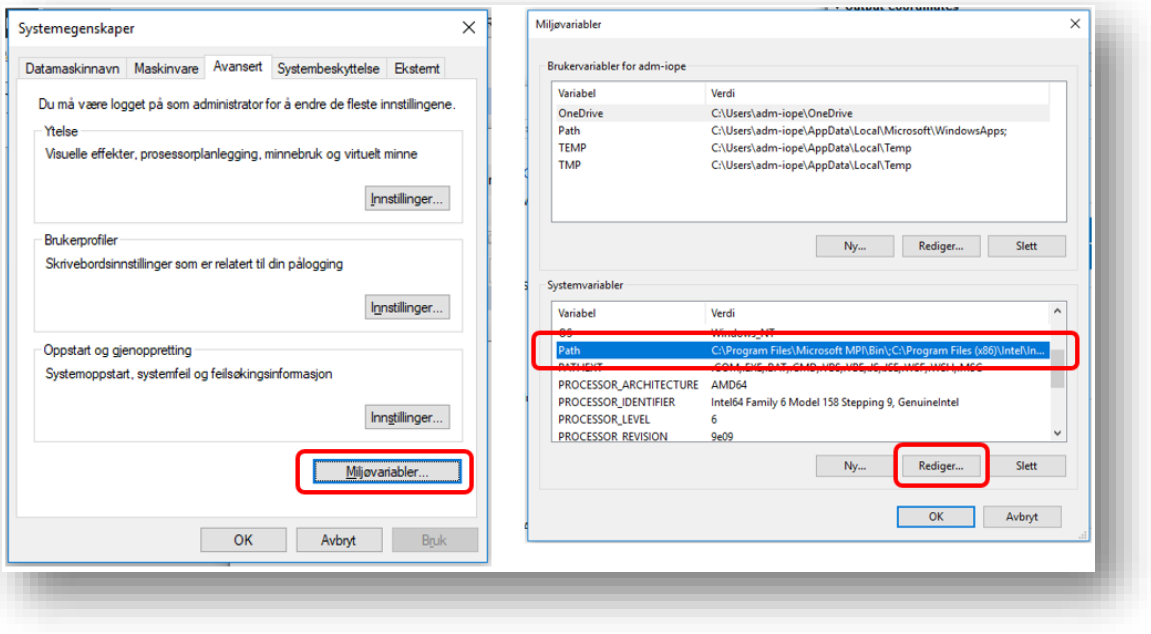


Figure 4a) Advanced System Settings. 4b) Environment variables

f) Add the full path location to R\R-3.5.0\bin\x64

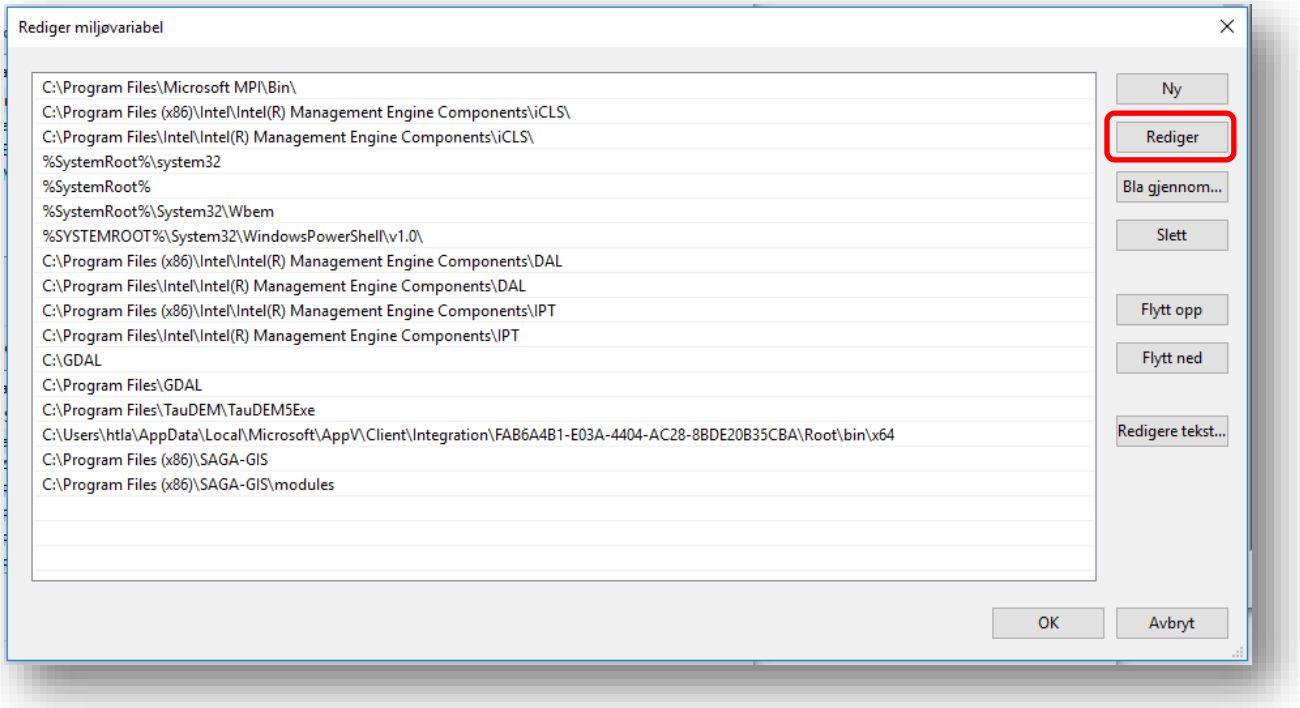


Figure 5: Edit environment variables

4. Add the SAGA-GIS directory to your Path environment variable

a) Same as in 3, but this time using the path to the \SAGA-GIS and SAGA-GIS\modules directories

5. Add the TauDEM directory to your Path environment variable

a) Same as in 3, but this time using the path to \TauDEM5Exe directory

6. Change the SAGA paths in the script

a. Open script file pra.r with a text editor and change the path (lines 40 – 41) to the location where you saved your (SAGA) files. The pra.r file is found in the PRA TBX folder -> PRA -> pra.r
NB! In R, you have to use \\ instead of \ for path lines.

```
34  library(RSAGA)
35  #library(maptools)
36
37  ####  preliminary calculations ####
38
39  myenv=rsaga.env(workspace=work_dir,
40                  path="C:\\Program Files (x86)\\SAGA-GIS",
41                  modules="C:\\Program Files (x86)\\SAGA-GIS\\modules")
42
43  setwd(work_dir)
44
45  print("Begin Calculations....")
```

Figure 6: Print screen from the pra.r file, edit line 40 and 41

7. Create a .gdb working directory and a working directory folder for raster files.

a) Open ArcCatalog, find the folder you want to save all intermediate feature type files from the algorithm. Right click the folder -> New -> File Geodatabase

b) Open ArcCatalog, find the folder you want to save all intermediate raster files from the algorithm. Right click the folder -> New -> Folder

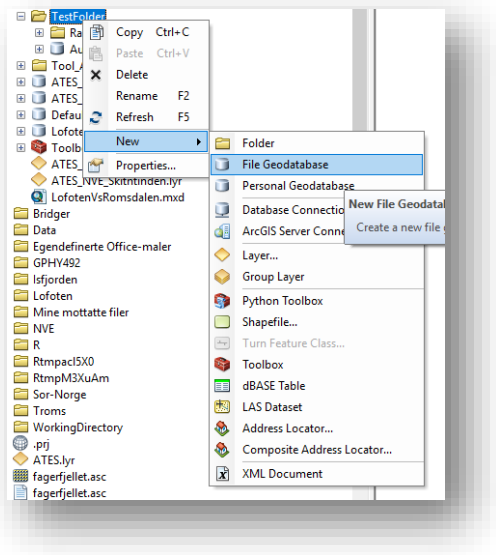


Figure 7: Create new «File Geodatabase»

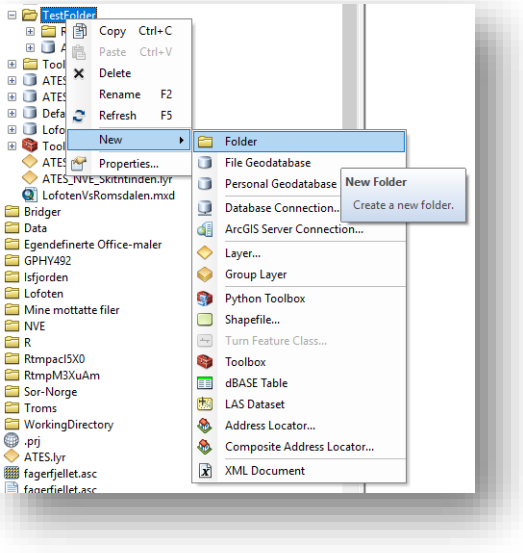


Figure 8: Create new «Folder»

8. Open AutokastBatch.py in a Python 2.7 editor (e.g. PyCharm).

a) Make sure your Python 2.7 is up to date.

b) Set the working directory for feature type data (personalfilegeodatabase.gdb, Line 27). This is the .gdb folder you created in step 6a). All intermediate feature type files will be saved here.

c) Set the working directory for raster type data (Line 28) This is the folder for raster file created in 6b). All intermediate raster type files will be saved here.

d) Edit the path to the Digital Elevation Model (DEM, Line 31)

e) Edit the path to the outline (Line 32)

   a. Polygon of the area within the DEM you want to calculate

   b. It is possible to use other shapefiles than the «VassOmr.shp» as mask, the script calculates autokast for the FID number regardless of which shapefile.

f) Set path to the TauDEM toolbox (Line 33)

   a. Make sure all necessary scripts is in the same folder as the toolbox.

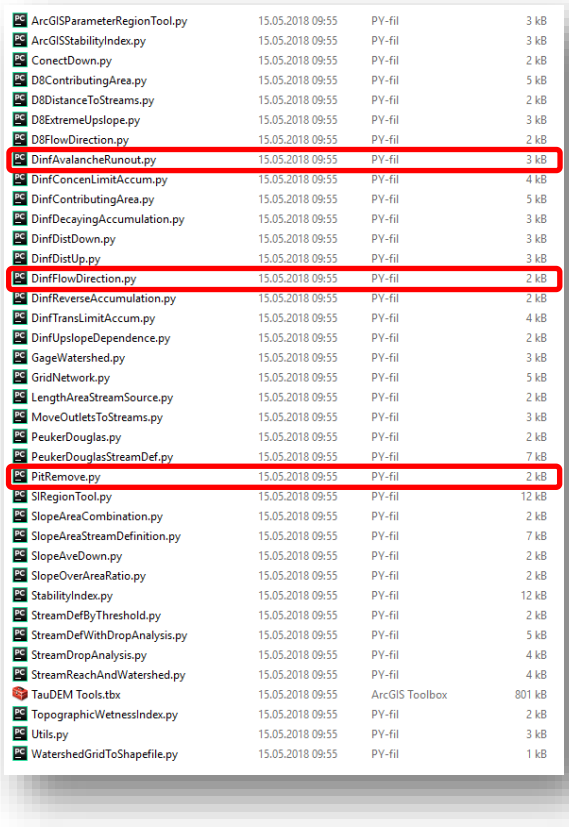


Figure 9: Scripts that should be in the same folder as the toolbox

g) Set path to the PRA toolbox (Line 34)

   a. Make sure all necessary scripts is in the folder PRA, which should be located in the same folder as the PRA toolbox.

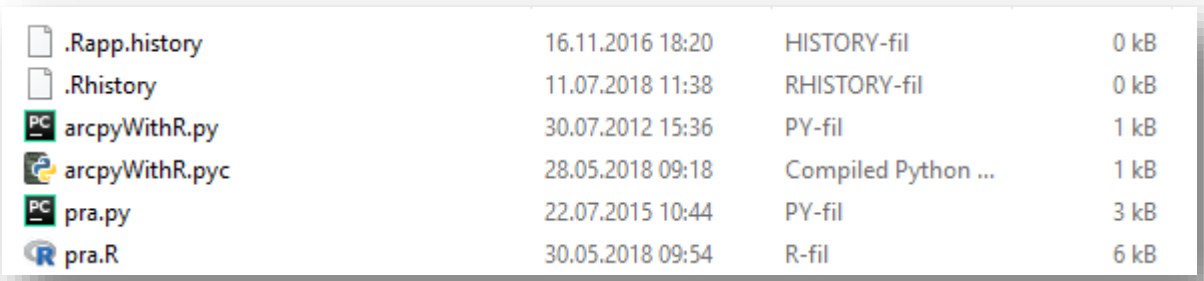
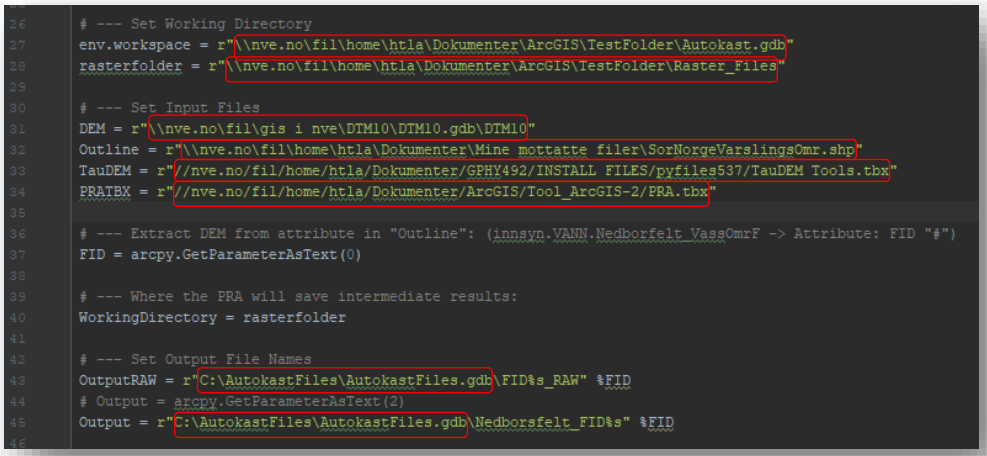


Figure 10: Files that should be in the folder PRA, in the PRA TBX folder

h) Edit the path to the location you want the Autokast files to be saved (Line 43 and 45)

   a. Do not remove the %s and %FID from the output name



```
# --- Set Working Directory
env.workspace = r"\\nve.no\fil\home\htla\Dokumenter\ArcGIS\TestFolder\Autokast.gdb"
rasterfolder = r"\\nve.no\fil\home\htla\Dokumenter\ArcGIS\TestFolder\Raster_Files"

# --- Set Input Files
DEM = r"\\nve.no\fil\gis i nve\DTM10\DTM10.gdb\DTM10"
Outline = r"\\nve.no\fil\home\htla\Dokumenter\Mine mottatte filer\SorNorgeVarslingsOmr.shp"
TauDEM = r"//nve.no/fil/home/htla/Dokumenter/GPHY492/INSTALL FILES/pyfiles537/TauDEM Tools.tbx"
PRATBX = r"//nve.no/fil/home/htla/Dokumenter/ArcGIS/Tool_ArcGIS-2/PRA.tbx"

# --- Extract DEM from attribute in "Outline": (innsyn.VANN.Nedborfelt_VassOmrF -> Attribute: FID "#")
FID = arcpy.GetParameterAsText(0)

# --- Where the PRA will save intermediate results:
WorkingDirectory = rasterfolder

# --- Set Output File Names
OutputRAW = r"C:\AutokastFiles\AutokastFiles.gdb\FID%s_RAW" %FID
# Output = arcpy.GetParameterAsText(2)
Output = r"C:\AutokastFiles\AutokastFiles.gdb\Nedborsfelt_FID%s" %FID
```

Figure 11: Print screen from the AutokastBatcg.py script

9. Open notepad

a) Save the text file with «name».bat

b) The first path is to your python.exe, the next path is the path to your python script, the number is the FID you want to calculate. If you want to calculate several FID's, ad 1 row for each FID with the same as above. See figure below.

c) Save and close the .bat file

d) Double click the «name».bat and the script will run automatically

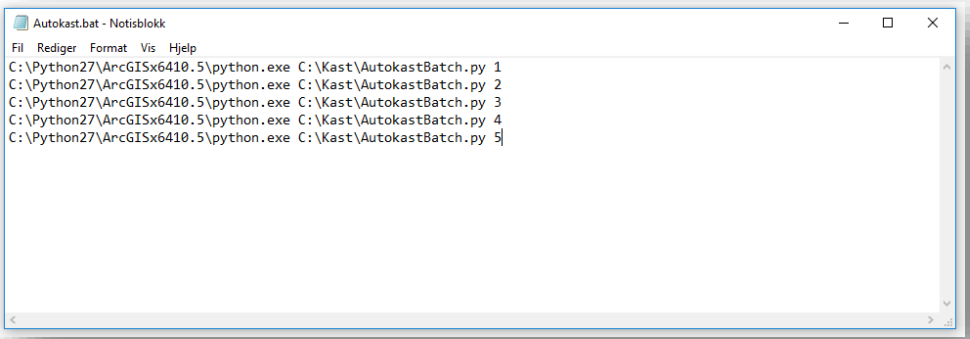


Figure 12: Print screen from an example .bat file

10. Edit thresholds (not recommended)

a) Thresholds can be edited, but this will change the end result.

   a. Everything within the C1AA angle, will be Class 1 – Simple terrain

   b. Everything within the C2AA angle, will be Class 2 – Challenging terrain

   c. SAT01, SAT12 and SAT23 is the slope angle thresholds used.

i. 0 – 15 degrees: Class 0

ii. 15 – 25 degrees: Class 1

iii. 25 – 40 degrees: Class 2

iv. 40 + degrees: Class 3

Figure 13: Printscreen from the AutokastBatch.py

For more information regarding why the thresholds have been set at the values above, see ISSW18 proceedings (Larsen et al., 2018).