RavenR Tutorial (under construction)

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This tutorial is currently under construction, and will be made fully available with a future version release

Introduction

This document is intended to get you started with using RavenR to aid your analysis with the Raven model. This will familiarize you with the RavenR package and running most of the commands within the package, and serves as a longer form help exercise and reference manual. If you are looking for a shorter exercise, you may find the RavenR Short Exercise files maintained with the RavenR package.

Some knowledge of R is presumed in this document. If you are not comfortable with R, take a look at any number of R training and Introductory resources, such as the tRaining repository) or the R training materials maintained by Dr. Kevin Shook under the Centre for Hydrology, both available on Github.

Sections of this tutorial will use sample files from the Nith River basin, which is referenced in the Raven Tutorial files. The Nith river model can be downloaded from the Raven Tutorial #2.

Getting Acquainted with RavenR

Start a new RStudio session by opening RStudio. If you don't have RavenR yet installed in your R library, run the following commands to install the latest version of RavenR from Github (you will need the **devtools** library to be installed and loaded as well, so install this library first if you haven't yet).

```r
# install.packages("devtools")
library(devtools)
devtools::install_github("rchlumsk/RavenR")
```

Load the RavenR library from the console and view its contents with the following commands:

```r
library(RavenR)
ls("package:RavenR") # view all functions in RavenR
```

You can look at what any one of these functions does by typing out the name of the function beginning with a question mark, which will show the help information at the right of the RStudio environment.

```r
?flow.scatterplot
```

Sample Data in RavenR

The RavenR package contains a number of sample data files, which are useful for training purposes and testing of functions. The package contains sample data both in R format (under RavenR/data) and as raw data files in their native formats (RavenR/inst/extdata). The sample data set from the RavenR package (in R format) can be loaded in using the data function, e.g.,

```
data(forcing.data)
?forcing.data
```

Notice as well that the sample data set in R format also has a built in help file to describe the data.

To pull out the raw data from the RavenR package, we will use a syntax to find the data by file name in the RavenR package directory, which ends up looking more similar to a raw file call. This raw data file comes from the **extdata** folder in the RavenR package, **not the data folder**. Note that this is done so that the sample data in raw format can be used and tested with functions, and the syntax to locate the data file is more portable across various computer operating systems.

```
# read in hydrograph sample csv data from RavenR package
ff <- system.file("extdata","run1_Hydrographs.csv", package="RavenR")

# read in sample rvi file from the RavenR package
rvi <- system.file("extdata", "Nith.rvi", package="RavenR")
```

The **system.file** command will simply build a file path for where this data file is located on your machine with the RavenR package installation, which can then be passed to any function as required to provide a file location. This command will be used throughout this tutorial in place of local files for portability, however, your own data files may be swapped in place of the system.file locations.

Package Functions

The package contains a few broad categories of functions. The broad categories include:

- Diagnostics and Plotting Functions
- Raven File Functions (reading and outputting Raven files)
- Time Series Functions (helpful functions for time series analysis and preparation)
- RavenR Utility functions (utility functions you likely won't need but are helpful for other RavenR functions)

Diagnostics and Plotting

This section contains a number of helpful functions related to model diagnostics, model performance evaluation, and plotting functions.

Forcing Functions (forcings.plot)

More exercises and Resources

This short exercise is meant to serve as a brief introduction to the RavenR package. The complete RavenR Tutorial can be found on the Raven downloads page or on the RavenR Github page. If you have any comments, suggestions or bug reports, please email the authors of the package or feel free to let us know on the Raven forum.