`EloSteepness` - a brief tutorial

(package version 0.3.0)

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prelims

`EloSteepness` is a package that allows estimating steepness of dominance hierarchies from interaction networks. It does so by estimating Bayesian Elo-ratings, from which the steepness metric can be calculated. The major difference from classic approaches is that we obtain posterior steepness *distributions*, not point estimates. More details on the theoretical background can be found in the accompanying preprint/paper.

Also included in this package is a version of steepness that is based on David's scores, but also with a Bayesian flavor. It turns out that the performance of this approach is somewhat below that of the Elo-based steepness, but still better than the classical algorithms. Also here the result is a posterior distribution. This latter approach will be featured only in passing in this tutorial, but in general, all the functions that work with the Elo-based algorithm will also work in a very similar way with the David's score-based steepness.

More interestingly, the package also contains functions that allow extraction of the raw individual scores (either Bayesian Elo-ratings or David's scores), although this is probably only of secondary interest when focusing on *steepness*.

Another batch of functions in the package relate to method evaluation. These are currently ignored in this document. They are relevant for replicating the simulations and analyses presented in the paper.

installing `EloSteepness`

The first requirement is that you use a fairly recent version of `R`, i.e. at least `R 3.5.0`, no way around that. To find which version you have, do this:

```
R.version$version.string
#> [1] "R version 4.0.4 (2021-02-15)"
```

If this returns at least 3.5.0 (or as in my case "`R version 4.0.4 (2021-02-15)`") all is good. Otherwise you need to update `R`, which might be a good idea anyway.

In order to get the package up an running you need a working installation of `rstan`. This in turn requires `stan` to be installed but this is taken care of during the setup of the `rstan` package. The easiest way of doing all this is to install the `brms` package.[1] If you already have `brms` (or `rstan`) then you are probably good to go. If not, then execute the following command and if asked for whether you want to install packages *from source* select 'no' (unless you know what you are doing of course).

```
install.packages("brms")
```

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[1] `brms` is not actually required for `EloSteepness` to work, but it handles the installation of `rstan` and friends very conveniently.

The only other thing you need are two more packages, `EloRating` and `aniDom`, which are easy to install:

```
install.packages("EloRating")
install.packages("aniDom")
```

With this done, you can install `EloSteepness`. For the moment, this works only via a local file that can be downloaded here https://owncloud.dpz.eu/index.php/s/N8VW9a9QIVIuIqZ. In the near future I will make the package publicly available via GitHub and hopefully also via CRAN.

Which file to choose from the three in the folder depends on your OS and your level of adventurousness. Download the one you need (don't unpack it!), and remember the path you saved it to...

If you are on Windows, go for the `.zip` file and run (and don't forget to change the path):

```
install.packages("C:/where/i/saved/my/file/EloSteepness_0.2.0.zip",
                 repos = NULL, type = "win.binary")
```

If you are on MacOS, go for the `.tgz` file and run (and don't forget to change the path):

```
install.packages("~/where/i/saved/my/file/EloSteepness_0.2.0.tgz",
                 repos = NULL, type = "mac.binary")
```

And finally, if you are on Linux and/or feel adventurous take the `.tar.gz` file:

```
install.packages("~/Documents/EloSteepness_0.2.0.tar.gz",
                 repos = NULL, type = "source")
```

And for good measure at this point it might be a good idea to restart your computer, or at least restart R (or RStudio).