Tool documentation

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1 Top-level structure

The tools directory contains the data and scripts for performing a range of functions produced in the course of this research. Both `python` and `R` are used as scripting languages, and results are produced as `.csv` comma-delimited tables, `.nc4` NetCDF4 files, `shapefiles`, and images.

The top-level directory contains the following:

data Pre-processed data files, and original source data in the `data/sources` subdirectory.

extdata Larger, "external" data files which are not stored in the source control repository.

lib Common function definitions.

climate A tool to study the changes in GCM projections.

suitability A tool for generating suitability results.

variability A tool to estimating variability from climate signals.

production A tool to estimating yields from weather.

The `extdata` directory is not stored in the normal repository. It is available at `http://eicoffee.net/files/extdata/`.

2 Suitability tool

2.1 Conditions and Intake Methods

The "intake" methods estimate the distribution of observed harvests across environmental variables, including soil, elevation, temperature, and precipitation climatologies. They write the `[variable]dist.csv` and `[var1][var2]corr.csv` files in the `data` directory. These are written in R, and the individual files corresponding to input variables need to be refreshed if their underlying data changes (for example, if a new collection of climate estimates is produced).

Each quality used to determine suitability is described in a condition object, stored in the `conditions` subdirectory.

2.2 Calculating present suitabilities

The `suitability.py` tool calculates suitability under present conditions. The configuration and process for doing this is at the end of the `suitability.py` file after the if `__name__ == '__main__':` line, including which variety suitability is calculated for.

3 Variability tool

Two tools are available to study the role of global variability of coffee production. Both use the range of five climate signals

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`linproj.py` produces a naïve estimate of coffee under a future constellation of climate signals, using a linear model. This combines the effects of El Niño/La Niña with those of AMO, SOI, PDO, and NAO, without interactions.

`estimate.py` uses the principal component analysis results to project a constellation of climate signals into the most likely part of the interactive space of the combined climate-yield system, and then reports the associated yields.

4   Production tool

The production tool sets up a framework for asking production questions, using data from the hierarchical model.

`model.py` creates a general class for storing and applying estimates for a given country and variety.

`global.py` loads all models estimated in the hierarchical model, to be applied to changes in GDDs, KDDs, and the other predictors.

References