Vignette

Climr package

Climr package makes use of the latest global, northern and southern hemisphere climate data to model the statistical and gaussian parameters.

```
library(climr)
```

Functionalities of Climr package:

- Loads the global, northern hemisphere, and southern hemisphere temperature datasets.
- Fits the models.
- Generate nice plots of the fitted model.

Datasets used:

- GLB - Global temperature anamolies
- NH - Northern hemisphere
- SH - Southern Hemisphere

Functions used:

- load_claim - For loading the input temperature anamolies dataset
- fit - For fitting the loaded temperature data using Statistical models.
- gp_fit - For fitting the loaded temperature data using Guassian models.
- plot - For plotting the output of both fit and gp fit functions.

Primal packages to be installed:

- devtools - To configure behaviour.
- roxygen2 - To Generate inline documentation.
- knitr - To Generate dynamic report in R.
- readr - To read rectangular text data.

Functions:

Load_claim:

- Loads the climate data from NASA.
- Fetches the data from one of the datasets ‘GH’, ‘SH’, and ‘NH’.
- Stores the output data into a tibble.
- Performs manipulation on the tibble and extracts the required fields.
- Constructs a list containing the tibble and the input temperature anamolies.
- Returns the list by modifying the class type of the object to climr and makes the variable specific to our R package climr.

Example:
The following code loads the ‘NH’ temperature anamolies from NASA Climate data.

```
ans1 = load_clim("NH")
ans1
#> $clim_year
#> # A tibble: 138 x 2
#>     year  temp
#>    <int> <dbl>
#>  1  1881 -0.21
#>  2  1882 -0.23
#>  3  1883 -0.34
#>  4  1884 -0.46
#>  5  1885 -0.42
#>  6  1886 -0.43
#>  7  1887 -0.42
#>  8  1888 -0.24
#>  9  1889 -0.17
#> 10  1890 -0.42
#> # ... with 128 more rows
#>
#> $type
#> [1] "NH"
#>
#> attr(,"class")
#> [1] "climr"
```

fit:

- Fit function takes its first argument an object of class climr.
- Second argument to be one among these “linear model”, “loess” and “smooth splines” Statistical models.

- Performs corresponding fit operation based on the input.
- Constructs a list with fitted model, previously constructed tibble and input argument of fit function.
- Modifies the class type of the object to climr and make the variable properatery only to climr package.

Example:
The below code fits the statistical model ‘lm’ on ‘NH’ climate data

```
ans2 = fit(ans1, 'lm')
#>
#> Call:
#> lm(formula = temp ~ year)
#>
#> Coefficients:
#> (Intercept)         year
#>  -16.488522     0.008485
ans2
#> $model
#>
#> Call:
#> lm(formula = temp ~ year)
#>
#> Coefficients:
#> (Intercept)         year
#>  -16.488522     0.008485
#>
#>
#> $data
#> # A tibble: 138 x 2
#>     year  temp
#>    <int> <dbl>
#>  1  1881 -0.21
#>  2  1882 -0.23
#>  3  1883 -0.34
#>  4  1884 -0.46
#>  5  1885 -0.42
#>  6  1886 -0.43
#>  7  1887 -0.42
#>  8  1888 -0.24
#>  9  1889 -0.17
#> 10  1890 -0.42
#> # ... with 128 more rows
#>
#> $fit_type
#> [1] "lm"
#>
```

```
#> attr(,"class")
#> [1] "climr_fit"
```

gp_fit:

- GP Fit function takes its first argument an object of class climr.
- Second argument to be one among these “Nelder-Mead”, “BFGS”, “SANN”, “Brent” Guassian optimization methods.
- Performs variable scaling and identify the best hyperparameters.
- Extracts the required fields and constructs the covariance matrix.
- Builds a list with fitted model, along with previously constructed tibble and input argument of gp fit function.
- Modifies the class type of the object to climr by making the class properatery only to climr package.

Example:
The below code fits the guassian model ‘BFGS’ on ‘NH’ climate data.

```
ans3 = gp_fit(ans1, 'BFGS')
class(ans3)
#> [1] "climr_gp_fit"
```

plot:

- Since plot function already exist in base R, we dont construct method as done for fit and gp fit.
- Plot takes its mandatory argument an object X of class climr.
- Time grid as first optional argument with predictors with pretty to create sequence of points.
- Number of intervals mentioned n as second optional argument (n=100 as default).
- Additional option argument mentioned as “…” to incorporate future need.
- Constructs the regression line through the scatter plot.
- Constructs time grid sequence and the predicted value with respect to the fit criterion.
- Use the fit variable over ggplot to visualize the plot of the fitted model.

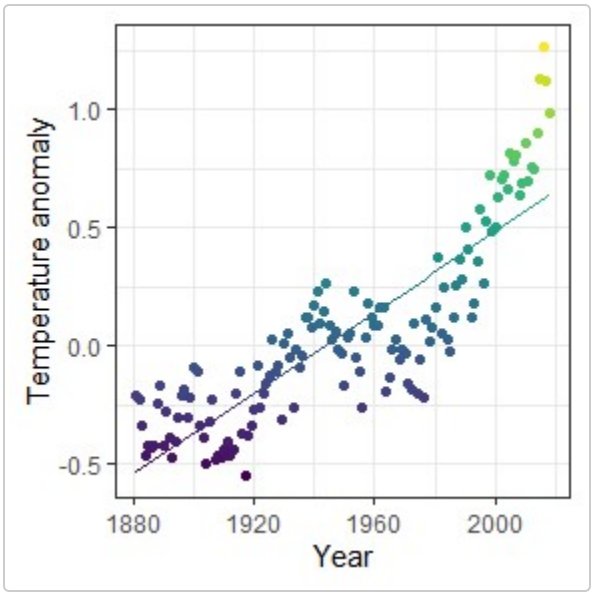
Plot function performs action based upon the type of the input class

- If the input is of class climr_fit it generates plot with respect to fit function.
- If the input is of class climr_gp_fit it generates plot with respect to gp_fit function.

Example:
The below line generates plot for “fit” model

Climate data plot with statistical model “lm”

```
plot(ans2)
```



Example:
The below line generates plot for “gp_fit” model

Climate data plot with guassian model “BFGS”

```
plot(ans3)
```