

# Package ‘sarp.snowprofile.pyface’

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**Title** 'python' Modules from Snowpack and Avalanche Research

**Description** The development of post-processing functionality for simulated snow profiles by the snow and avalanche community is often done in 'python'. This package aims to make these tools accessible to 'R' users. Currently integrated modules contain functions to calculate dry snow layer instabilities in support of avalanche hazard assessments following the publications of Richter, Schweizer, Rotach, and Van Herwijnen (2019) <doi:10.5194/tc-13-3353-2019>, and Mayer, Van Herwijnen, Techel, and Schweizer (2022) <doi:10.5194/tc-2022-34>.

**URL** <http://www.avalancheresearch.ca>

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**Encoding** UTF-8

**RoxygenNote** 7.1.2

**Language** en-CA

**Depends** sarp.snowprofile (>= 1.3.0)

**Imports** utils, reticulate, data.table

**Config/reticulate** list( packages = list( list(package =  
 ``scikit-learn", version = ``0.22.1"), list(package = ``joblib"),  
 list(package = ``numpy"), list(package = ``pandas") ) )

**NeedsCompilation** no

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**Repository** CRAN

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|                      |                                      |
|----------------------|--------------------------------------|
| computeCritCutLength | <i>Compute critical crack length</i> |
|----------------------|--------------------------------------|

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## Description

This function implements Bettina Richter's (2019) parametrization for the critical crack length for flat simulations based on density, grain size, and shear strength. The parametrization also needs the mean density of the slab, which can be computed automatically if a snowprofile object is provided. In case the functions gets a snowprofileLayers object it expects slab\_rho being precomputed. This acts as a safety mechanism to ensure that slab\_rho is computed over one profile and not over a stacked layers dataframe containing multiple profiles. Note that the critical crack length can be computed alongside the layer probabilities for instability p\_unstable in [computePunstable](#).

## Usage

```
computeCritCutLength(x)

## S3 method for class 'snowprofileSet'
computeCritCutLength(x)

## S3 method for class 'snowprofile'
computeCritCutLength(x)

## S3 method for class 'snowprofileLayers'
computeCritCutLength(x)
```

## Arguments

x [snowprofileSet](#), [snowprofile](#), or [snowprofileLayers](#) object

## Value

Input object is returned with \$crit\_cut\_length (and potentially \$slab\_rho) appended to the layers object.

**Methods (by class)**

- snowprofileSet: for [snowprofileSets](#)
- snowprofile: for [snowprofiles](#)
- snowprofileLayers: for [snowprofileLayers](#)

**Author(s)**

fherla based on the python function by smayer and brichter

**References**

Richter, B., Schweizer, J., Rotach, M. W., & Van Herwijnen, A. (2019). Validating modeled critical crack length for crack propagation in the snow cover model SNOWPACK. *The Cryosphere*, 13(12), 3353–3366. <https://doi.org/10.5194/tc-13-3353-2019>

**See Also**

[computePunstable](#)

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computePunstable

*Compute probability of layer instability based on random forest model*

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**Description**

This function enables comfortable and fast R access to Stephanie Mayer’s python implementation of her random forest model to estimate the probability of dry snow layer instability. The routine can be run very efficiently on large [snowprofileSets](#). Layer properties required are sphericity, viscous deformation rate (10e-6 s-1), density (kg m-3), grain size (mm), and the critical crack length (m) (which can be computed very efficiently automatically if shear strength (kPA) is available.) Additionally, skier penetration depth in (m) is required.

**Usage**

```
computePunstable(x, ...)

## S3 method for class 'snowprofileSet'
computePunstable(
  x,
  ski_pen = NA,
  recompute_crit_cut_length = TRUE,
  buffer = TRUE,
  ...
)

## S3 method for class 'snowprofile'
computePunstable(x, ski_pen = NA, recompute_crit_cut_length = TRUE, ...)
```

```
## S3 method for class 'snowprofileLayers'
computePunstable(x, ski_pen = NA, ...)
```

### Arguments

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                         | <a href="#">snowprofile</a> , <a href="#">snowprofileSet</a> , or <a href="#">snowprofileLayers</a>                                                                                                                                                                                                                                                                                                                                                                                 |
| ...                       | passed on to subsequent methods                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ski_pen                   | skier penetration depth (m), one scalar for each profile in x                                                                                                                                                                                                                                                                                                                                                                                                                       |
| recompute_crit_cut_length | This routine can very efficiently compute the critical crack length with <a href="#">computeCritCutLength</a> . SNOWPACK often provides NA values of the critical crack length even for layers that have a real solution to it. With this flag you can conveniently recompute all critical crack lengths (TRUE). If set to FALSE, it will only be computed if not all profiles already contain it. Note that shear strength must be available to compute the critical crack length! |
| buffer                    | internal switch to ensure fast computation at low memory cost. Leave at TRUE!                                                                                                                                                                                                                                                                                                                                                                                                       |

### Value

x is returned with \$p\_unstable (and potentially \$crit\_cut\_length, \$slab\_rho, and slab\_rhogs) appended to each profile's layers object.

### Methods (by class)

- snowprofileSet: for [sarp.snowprofile::snowprofileSets](#)
- snowprofile: for [snowprofiles](#)
- snowprofileLayers: for [snowprofileLayers](#)

### Author(s)

fherla and smayer

### References

Mayer, S., Herwijnen, A. Van, Techel, F., & Schweizer, J. (accepted, 2022). A random forest model to assess snow instability from simulated snow stratigraphy. The Cryosphere Discussions. <https://doi.org/10.5194/tc-2022-34>

### Examples

```
## load a handful of example profiles from a PRO file
profiles <- snowprofilePro(system.file("extdata/snowprofile.pro",
                                     package = "sarp.snowprofile.pyface"),
                          remove_soil = TRUE, suppressWarnings = TRUE)

summary(profiles)
names(profiles[[1]]$layers)
## compute p_unstable alongside critical crack length, slab_rho, slab_rhogs:
if (have_dependencies()) {
```

```
profiles <- computePunstable(profiles)
names(profiles[[1]]$layers)
}
```

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|                   |                                                                      |
|-------------------|----------------------------------------------------------------------|
| have_dependencies | <i>Check whether python and dependencies are available on system</i> |
|-------------------|----------------------------------------------------------------------|

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**Description**

Check whether python and dependencies are available on system

**Usage**

```
have_dependencies()
```

**Value**

boolean TRUE/ FALSE

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|                   |                                        |
|-------------------|----------------------------------------|
| import_pyunstable | <i>Import python module pyunstable</i> |
|-------------------|----------------------------------------|

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**Description**

Convenience wrapper to make python module pyunstable accessible in R session

**Usage**

```
import_pyunstable()
```

**Value**

attach python module pyunstable to use python functions therein

**See Also**

[computePunstable](#)

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|                |                                                       |
|----------------|-------------------------------------------------------|
| import_RFmodel | <i>Make RFmodel available for direct python calls</i> |
|----------------|-------------------------------------------------------|

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**Description**

Convenience wrapper to make the python random forest model for snow layer instability 'p\_unstable' accessible in R session

**Usage**

```
import_RFmodel()
```

**Value**

attach python RandomForestClassifier to variable RFmodel

**See Also**

[computePunstable](#)

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