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| Comet\_maths  Requirements  Documentation  Version 1.0 Draft1 | |
| Pieter De Vis |
| 01/04/2023 |
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| **Version** | **Date** | **Description** | **Author** |
| V1.0 | **01/04/2023** | Initial draft | Pieter De Vis |
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**Version History**

# Introduction

## Terminology

Terminology used in this document.

## References

References to external documents as well as the statement of work, design document, …

# User Requirements

comet\_maths is a python module with useful mathematical algorithms (including interpolation with uncertainties) for general use as well as for use in the other tools in the CoMet toolkit. There are quite a range of different functionalities within comet\_maths. There are currently three submodules. One for linear algebra (mainly used for matrix operations in both obsarray and punpy), one for random generators (mainly used for sample generation in punpy) and one for interpolation (for general use).

The interpolation submodules focuses on two aspects. First, it aims to provide interpolation uncertainties that are as realistic as possible, and include both a contribution from the uncertainty on the input data point, as well as a contribution from the uncertainty in the model used for interpolation. Second, the interpolation module has functionality to interpolate between some low-resolution data points following a high resolution example. The example spectrum gets scaled in order to go through the low-resolution data points to form a sensible interpolation. For more info, see the comet\_maths documentation.

# Functional Requirements

Requirements are graded as follows:

* *Critical:* Core to the software, must be met.
* *Major:* Improves the software, should be met.
* *Minor:* Useful, but not critical or major. If cannot be implemented in a first release perhaps can be implemented later.

## General requirements

### [Critical] comet\_maths should provide all the utility functions related to generating MC samples for punpy

### [Critical] comet\_maths should provide all the utility functions related to linear algebra for all CoMet tools

### [Critical] comet\_maths should provide functions to do 1D interpolation with uncertainty

## User interface

Definition of those user interface characteristics that allow to understand and learn the software easily so the user be able to perform his/her tasks efficiently including the interface exemplar description.

### [Critical] comet\_maths should make all key functionality available as easily imported functions (e.g. using a functional programming design).

## External interface

Definition of interfaces with other software or hardware.

### [Critical] comet\_maths should interface seamlessly with other CoMet tools.

## Mathematical

Equations the software is to apply.

### [Critical] see https://comet-maths.readthedocs.io/en/latest/content/atbd.html

## Operational\*

Hardware, operating system, memory requirements, performance, efficiency, portability etc.

### [critical] should run on any system with python=3.11.

## Reliability\*

Specification of the software execution level concerning the maturity, fault tolerance and recovery.

### [Major] Reach at least 80% coverage.

## Design and construction limitations/constraints\*

Needs, timelines imposed by the Customer.

### [Critical] Should be part of the open source v1 release of CoMet In April 2024

## Legal and regulative\*

Needs imposed by laws, regulations, NPL security or IP regulations.

### [Critical] All codes should be made open-source.

# Appendix I: Algorithm description\*