OpenTURNS Developer training: first steps with OpenTURNS

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Developers training

Navigation in the source code

The Uniform distribution

- Locate the class within the library source code;
- Follow its inheritance graph in order to explore the Bridge pattern;
- Locate the associated regression test;
- Execute the test;
- Locate its SWIG interface file and its associated Python module;
- Execute the associated python test.

Projects

1. Implementation of a BoundConstrainedAlgorithm using L-BFGS-B. The module must adopt the GPL license. The objective is to solve:

$$\min_{\underline{a} \geq \underline{x} \leq b} f(\underline{x}) \tag{1}$$

where $f \in \mathcal{F}(\mathbb{R}^n, \mathbb{R})$

2. Interface of the kissFFT library to convert a Collection¡ NumericalComplex ¿ into another Collection¡ NumericalComplex ¿ using direct or inverse Discrete Fourier Transform (DFT or iDFT):

$$DFT(\underline{x})_j = \sum_{k=0}^{N-1} x_j \exp(2i\pi jk/N) \quad iDFT(\underline{x})_j = \frac{1}{N}\sum_{k=0}^{N-1} x_j \exp(-2i\pi jk/N) \tag{2}$$

3. Weighted interpolation: create a new NumericalMathEvaluation that interpolate between points of a NumericalSample using weighted kernel interpolation.

$$f(\underline{x}) = \alpha \sum_{i=0}^{N-1} K(\underline{x} - \underline{X}^i)\underline{Y}^i \tag{3}$$

where K is a given Distribution and α is a normalization factor.

Projects

4. Add a drawing capability to the NumericalMathFunction in the 1D and 2D cases (take inspiration from the drawPDF() method of the DistributionImplementation class)
5. Convert the IntegralCompoundPoisson distribution python module into an OpenTURNS C++ module
6. Create a new Drawable using the `pairs` command of R.
7. Create an Event that check a point against an Interval.
8. Create a RandomVector distributed uniformly over an n dimensional sphere;
9. Create a RandomVector distributed uniformly over an n dimensional ball;
10. Create a RandomVector distributed uniformly over an n dimensional simplex;

The projects 2, 3 and 5 can be written in pure Python, without using the OpenTURNS module infrastructure.