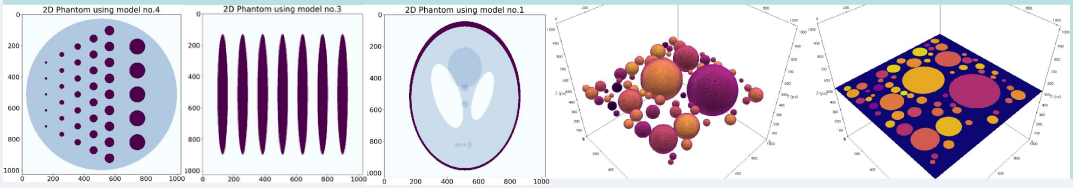
# TomoPhantom: software package to generate 2D–4D phantoms for CT image reconstruction algorithm benchmarks




CCPi Core Imaging Library (CIL)

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## *Core Imaging Library CIL:*

***CIL is a framework*** for 3D and 4D reconstruction of Computerized Tomographic data, consisting of a set of modules for each process involved in the data analysis workflow. This is part of the Collaborative Computational Project in Tomographic Imaging; CCPi for the UK tomography community – with over 370 registered.

**https://www.ccpi.ac.uk**

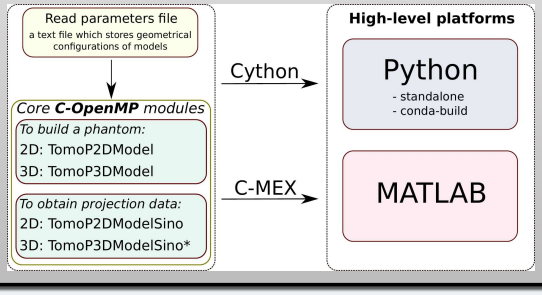
***TomoPhantom:–*** within CT imaging many novel reconstruction techniques are routinely tested using simplistic numerical phantoms. This package allows quick access to an external library to create advanced modular analytical 2D/3D phantoms with temporal extensions.

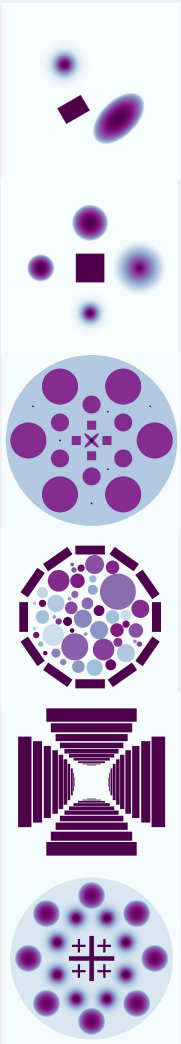
**https://github.com/dkazanc/TomoPhantom**

## *Core Modules:*

Package is written in the C-OpenMP language with wrappers for Python and MATLAB providing easy access and portability.

C-based multi-threaded implementation, means volumetric phantoms of high spatial resolution can be obtained with computational efficiency.



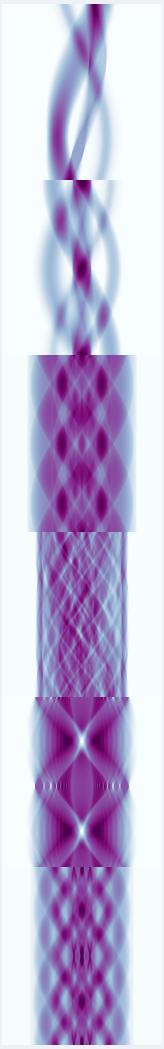



## *Resolution Independent Phantoms:*

Complex static 2D and 3D phantoms can be built using additive combinations of geometrical objects, such as, Gaussians, parabolas, cones, ellipses, rectangles and volumetric extensions.

- Phantoms of any-resolution can then be created on demand saving memory and storage requirements: *left hand side.*
- Subsequently any-resolution analytical tomographic projections, from these geometrically defined phantoms, can be created: *right hand side.*

This extends the applicability of software towards more realistic testing scenarios all free from the "inverse crime" testing of same-resolution models.

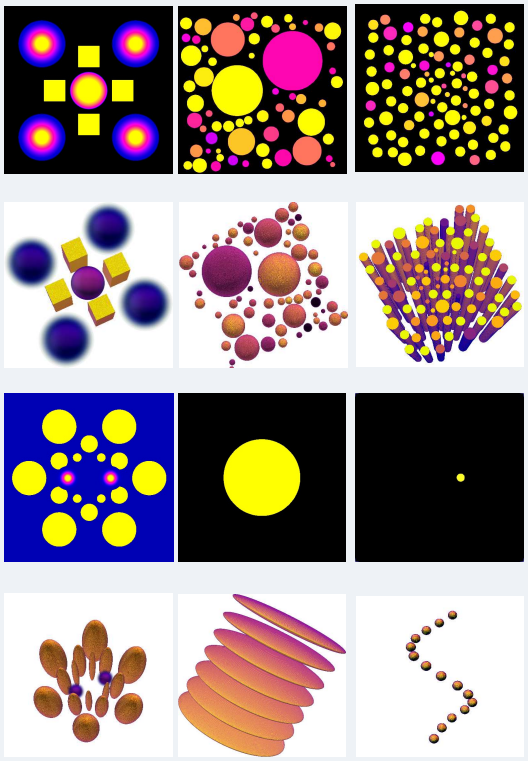


## *Applications:*

Phantoms are being built to test new reconstruction algorithms, including a 3D Shepp-Logan, and for evaluating new beamline data analysis workflows, including within the Diamond Light Source.

## *Extensions to 4D:*

Temporally extending this to 3D + time; so 4D, is now a trivial procedural process.



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CoSeC Computational Science Centre for Research Communities
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