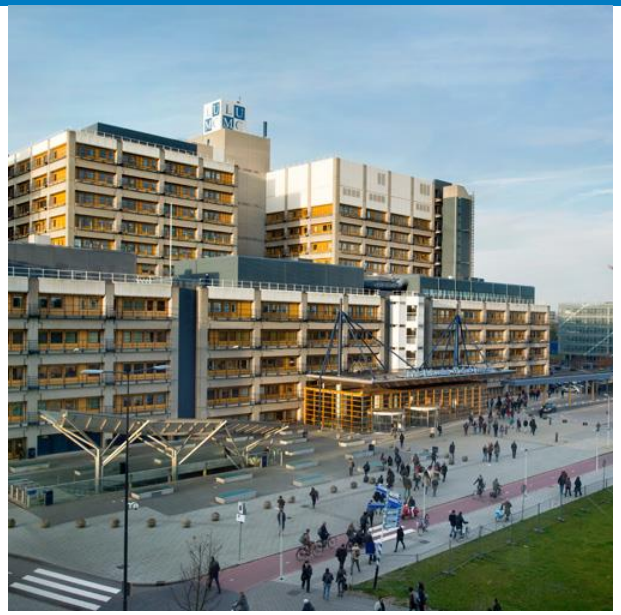
Leids Universitair
Medisch Centrum

(itk-)elastix



Konstantinos Ntatsis,
Niels Dekker

23/05/2023

The elastix team

Stefan Klein

Marius Staring

Niels Dekker

Konstantinos Ntatsis

We are located in the Netherlands

- LUMC, Leiden (Marius, Niels, Konstantinos)
- Erasmus MC, Rotterdam (Stefan)

The elastix design

Stefan Klein

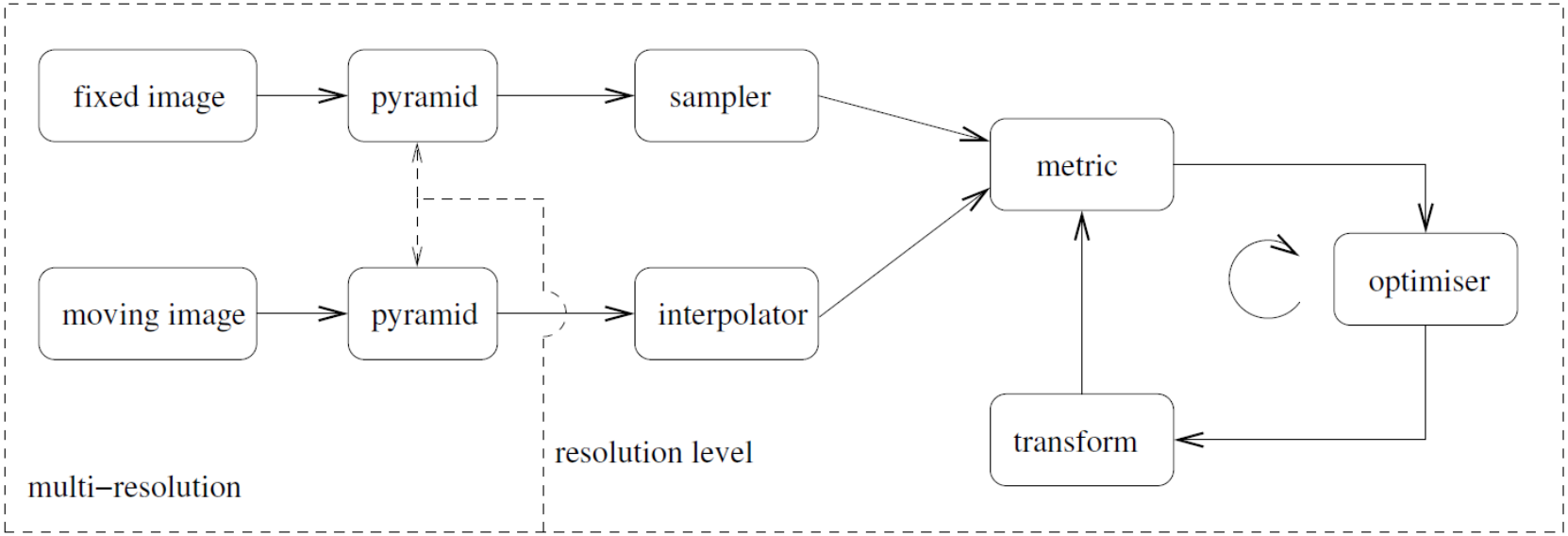
Marius Staring

- Open-source toolbox for medical image registration
- Modular design for easy experimentation
- Official first release in 2010
- Built on top of ITK → “Everything in the physical space”

S. Klein, M. Staring, K. Murphy, M. A. Viergever and J. P. W. Pluim, "elastix: A Toolbox for Intensity-Based Medical Image Registration," in *IEEE Transactions on Medical Imaging*, vol. 29, no. 1, pp. 196-205, Jan. 2010, doi: 10.1109/TMI.2009.2035616.

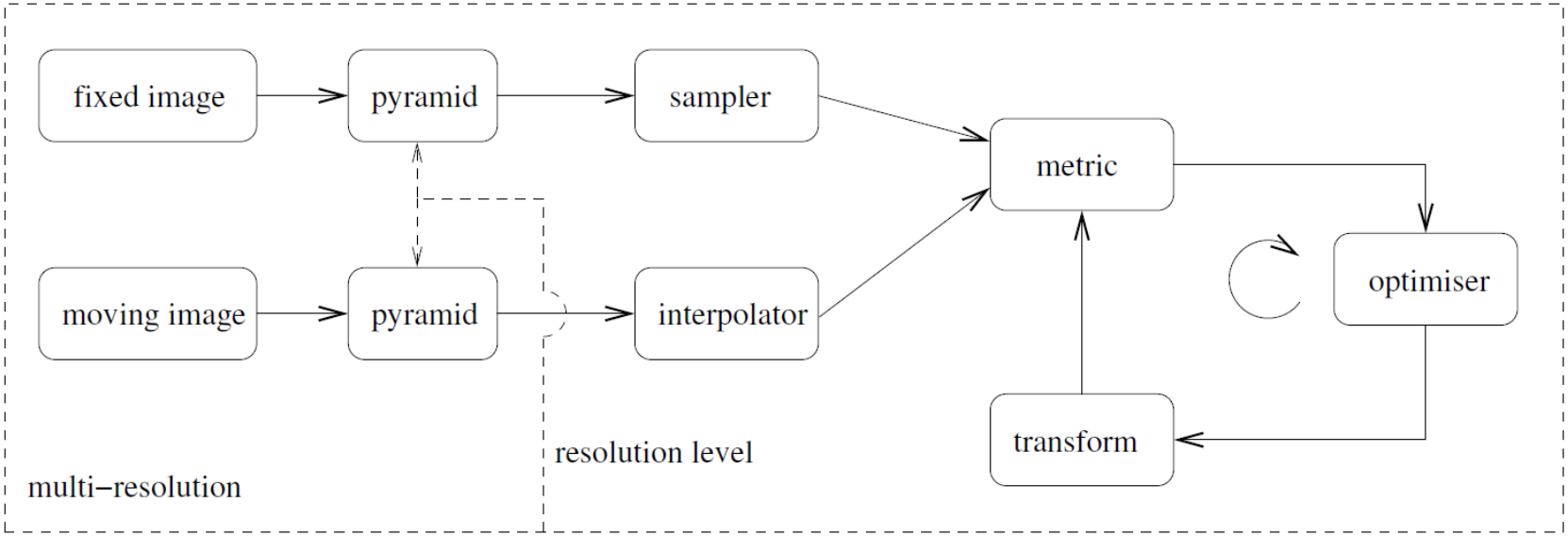
Elastix components + modularity

elastix

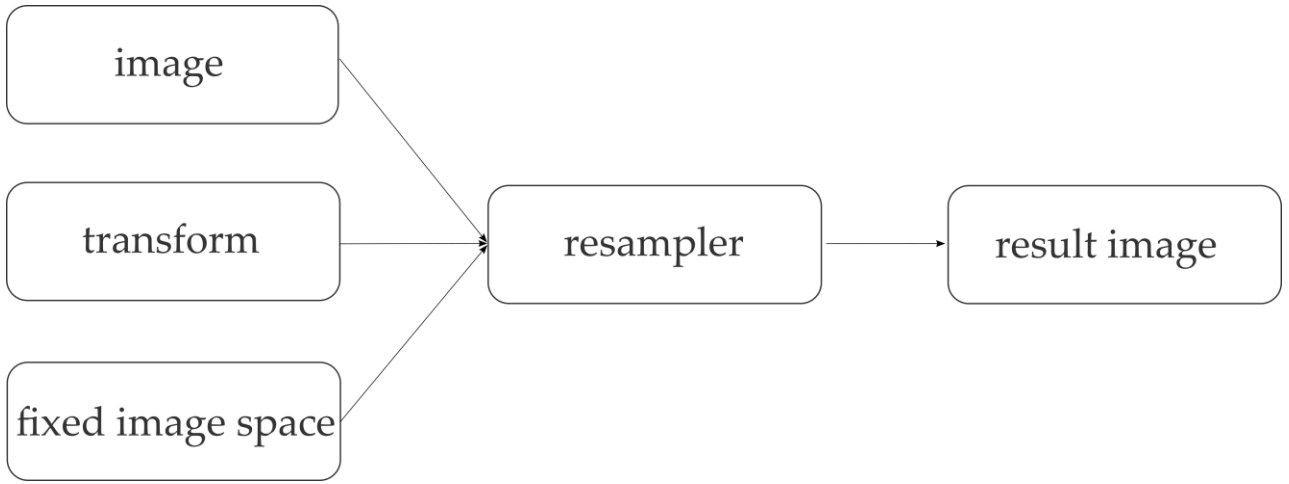


Elastix components + modularity

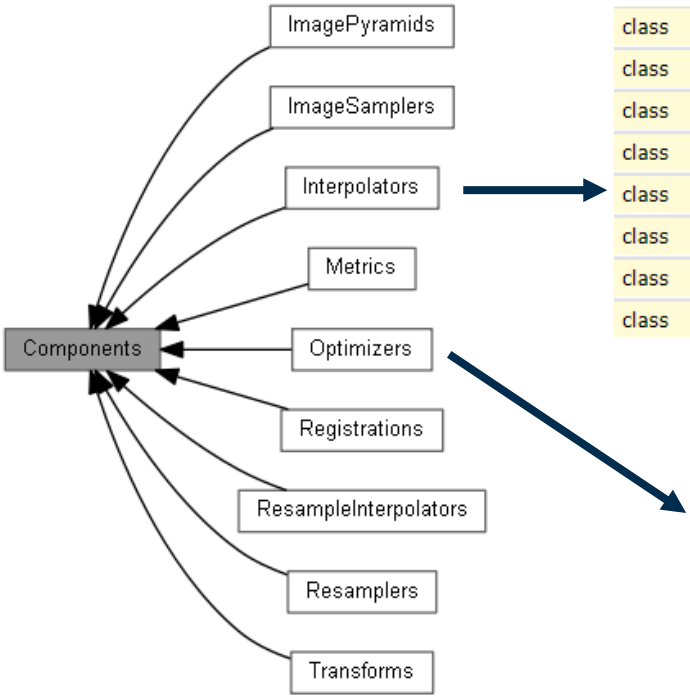
elastix



transformix



Elastix components + modularity



class	**elastix::BSplineInterpolator< TElastix >**
class	**elastix::BSplineInterpolatorFloat< TElastix >**
class	**elastix::InterpolatorBase< TElastix >**
class	**elastix::LinearInterpolator< TElastix >**
class	**elastix::NearestNeighborInterpolator< TElastix >**
class	**elastix::RayCastInterpolator< TElastix >**
class	**elastix::RayCastResampleInterpolator< TElastix >**
class	**elastix::ReducedDimensionBSplineInterpolator< TElastix >**

class	**elastix::AdaGrad< TElastix >**
class	**elastix::AdaptiveStochasticGradientDescent< TElastix >**
class	**elastix::AdaptiveStochasticLBFGS< TElastix >**
class	**elastix::AdaptiveStochasticVarianceReducedGradient< TElastix >**
class	**elastix::CMAEvolutionStrategy< TElastix >**
class	**elastix::ConjugateGradient< TElastix >**
class	**elastix::ConjugateGradientFRPR< TElastix >**
class	**elastix::FiniteDifferenceGradientDescent< TElastix >**

[elastix: Components (lumc.nl)]

Parameter file/map - Example

(Registration "MultiResolutionRegistration")
(Interpolator "BSplineInterpolator")
(ResampleInterpolator "FinalBSplineInterpolator")
(Resampler "DefaultResampler")

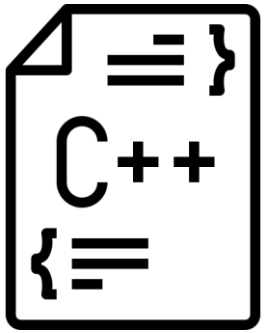
(FixedImagePyramid "FixedRecursiveImagePyramid")
(MovingImagePyramid "MovingRecursiveImagePyramid")

(Optimizer "AdaptiveStochasticGradientDescent")
(Transform "AffineTransform")
(Metric "AdvancedMattesMutualInformation")
…

all parameters → https://elastix.lumc.nl/doxygen/parameter.html
parameter file zoo→ https://elastix.lumc.nl/modelzoo/

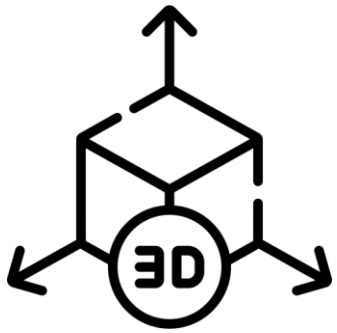
4 ways (flavours) to use elastix

executable



C++ API

wrapping

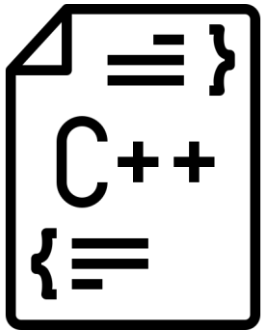


integration

icons from: https://www.flaticon.com/

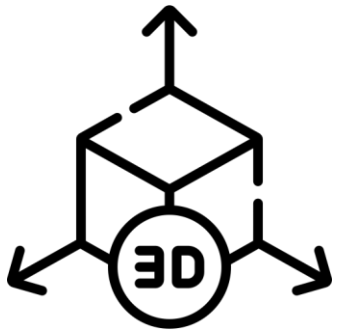
4 ways (flavours) to use elastix

executable



C++ API

wrapping



integration

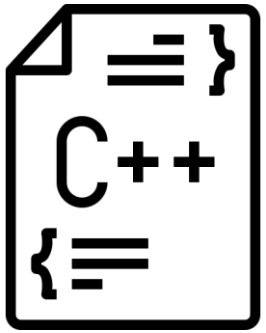
demo

itk-elastix

icons from: https://www.flaticon.com/

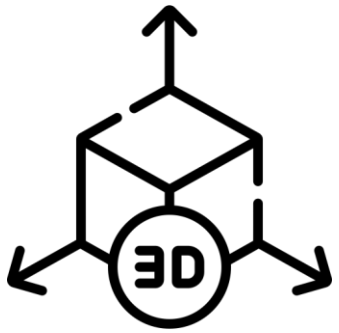
4 ways (flavours) to use elastix

executable



C++ API

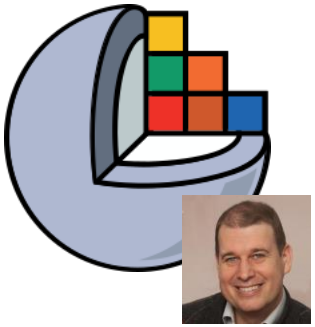
wrapping



integration

icons from: https://www.flaticon.com/

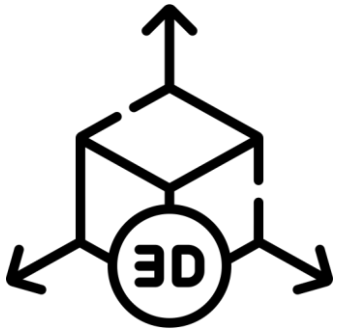
4th flavour: plugin inside a visualization software



Andras Lasso

SlicerElastix plugin

https://github.com/lassoan/SlicerElastix



Viktor van der Valk

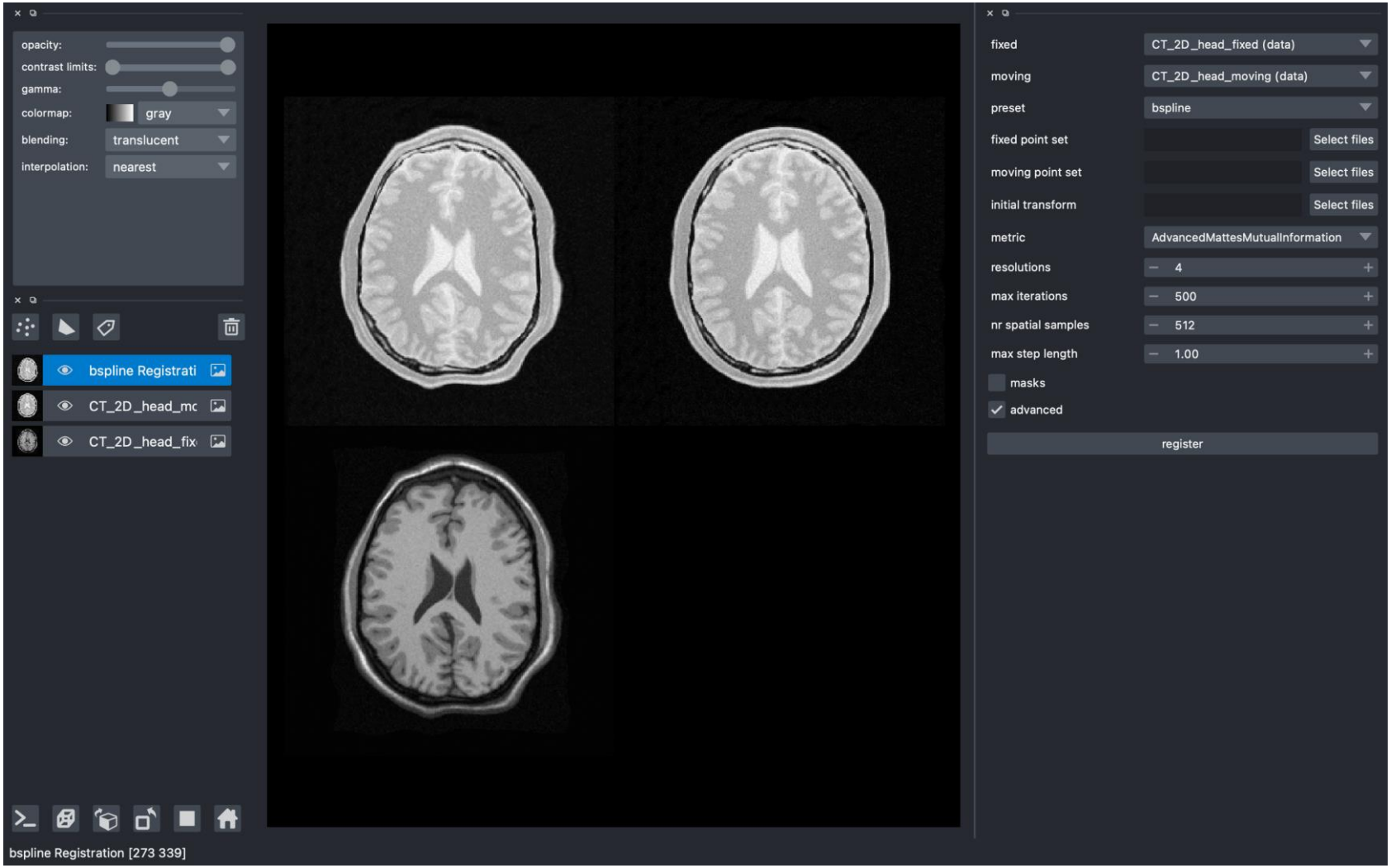
elastix-napari plugin

https://github.com/SuperElastix/elastix-napari

"pip install elastix-napari"

4th flavour: plugin inside a visualization software

elastix-napari plugin https://github.com/SuperElastix/elastix-napari

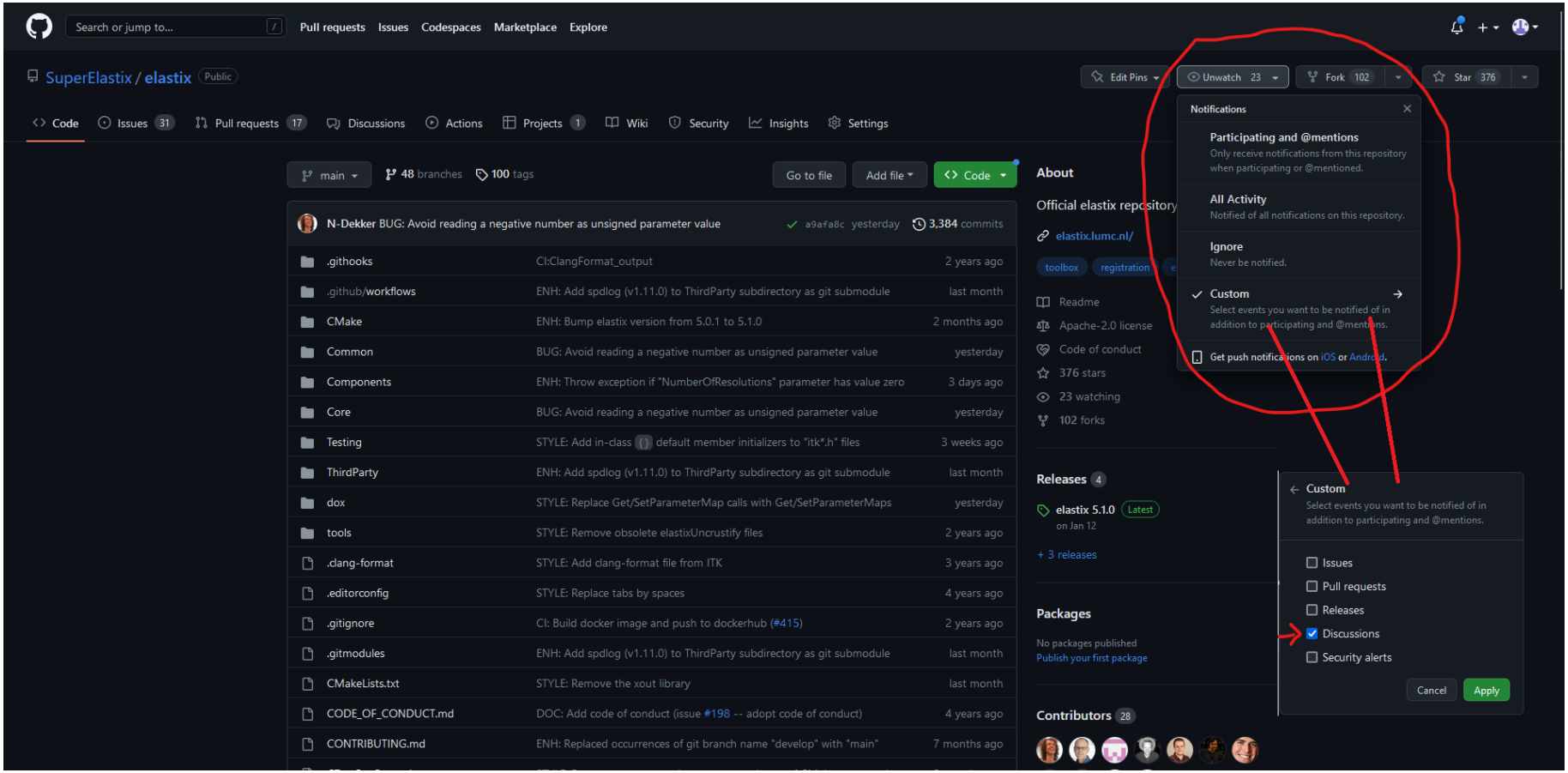


OK, it’s time for the tutorial!

Connect:

Make sure to “watch” (enable notifications) for the **elastix discussions**

https://github.com/SuperElastix/elastix/discussions



Useful links:

- elastix → https://github.com/SuperElastix/elastix
- discussions → https://github.com/SuperElastix/elastix/discussions
- itk-elastix → https://github.com/InsightSoftwareConsortium/ITKElastix
- examples → https://github.com/InsightSoftwareConsortium/ITKElastix/tree/main/examples
- elastix-napari (plugin) → https://github.com/SuperElastix/elastix-napari
- model zoo → https://elastix.lumc.nl/modelzoo/
- manual → https://elastix.lumc.nl/download/elastix-5.1.0-manual.pdf

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c.e.dekker@lumc.nl

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