

Title

ITK5: Image analysis with artificial intelligence in C++, Python, and Javascript

Course Description and Learning Outcomes

The Insight Toolkit (ITK) is a standard in academia and industry for medical image analysis. ITK is known for providing high-performance algorithms for many medical image processing software packages like 3D Slicer, ANTs, BRAINSTools, ITK-SNAP, and many more applications along with commercial applications. In recent years, the ITK developer community has focused on providing modern programming interfaces to ITK from Python, Javascript, and C++. Also, new artificial intelligence capabilities are possible by integrating ITK's proven spatial analysis architecture with deep learning tools.

In this course, we present best practices for taking advantage of ITK in your imaging research and commercial products. Via interactive examples that attendees can run on their laptops during the course, they will learn how ITK can accelerate their research and commercial product development. We demonstrate how scripting and interactive GUIs can be used to access the algorithms in ITK and the multitude of ITK extensions that are freely available on the web. We also cover how to integrate machine learning tools with ITK to produce reproducible, interactive web applications for image segmentation, registration, and quantification.

Learning Outcomes:

- * Integration of ITK's medical imaging features with data-analytics, machine learning, visualization, and data-science packages available in Python environments.

- * Use the ITK interface for Python for rapid prototyping and engage in the conversion process to C++ for a final commercial product.

- * Inspect and understand intermediate results with the ITK Jupyter widgets for 3D interactive visualization.

- * Create reproducible, interactive web applications for ITK processing pipelines running in WebAssembly.

Contact Information

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Target Audience, Prerequisite Knowledge, Skills

* Graduate students and faculty in biomedical engineering and/or involved with basic, pre-clinical, and clinical imaging including microscopy, pathology, CT, MRI, ultrasound, PET, and all other N-Dimensional imaging modalities.

* Engineers, software developers, and laboratory technologists and managers in academic and commercial settings where imaging is used to develop or validate tools and techniques.

* Rudimentary programming knowledge, e.g. simple Matlab/Python scripting, is required.

Expected Audience Participation

A laptop is required for attendees to participate in hands-on exercises. The laptop must have the Firefox or Chrome web browser and be capable of connecting to the internet.

Course Materials

Course materials will be distributed as Jupyter Notebooks, distributed under the permissive, OSI-approved, Apache 2.0 License.