



# Modular Libraries for Surgical Navigation

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## Aim 1: High Quality, Useful Libraries

- Implement core functions for image guided surgery to support our research.

# Aim 1: Platform Tools Covering 6 Domains

Imaging

Segmentation / Medical Image Computing

Hardware Interfaces

Registration

Visualisation

User Interface

## Aim 1b: High Quality, Useful Libraries

- Allow code to be used as is in production applications.

## Aim 2: Sustainability / Maintainability

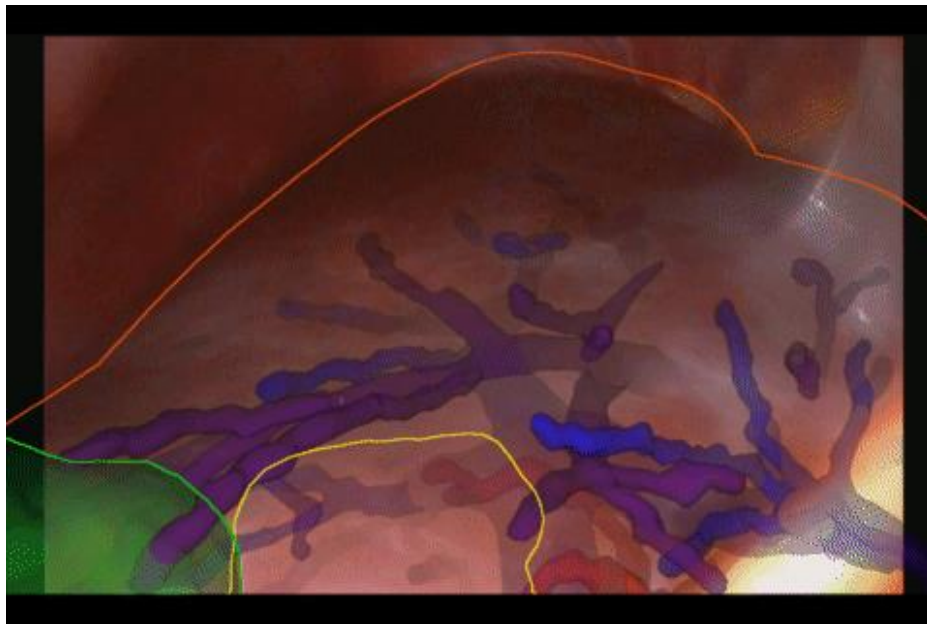
- Can be maintained (bug fixes / new features / update dependencies) by users (PhDs and Post Docs)

## Design Choices

- Choice of Python Language
- Small modules that do a single task
- Infrastructure for managing modular code
  - Python package installer - pip

## Background, SmartLiver and NifTK

- Augmented reality for surgery.



# Historical Example – SmartLiver built with NifTK

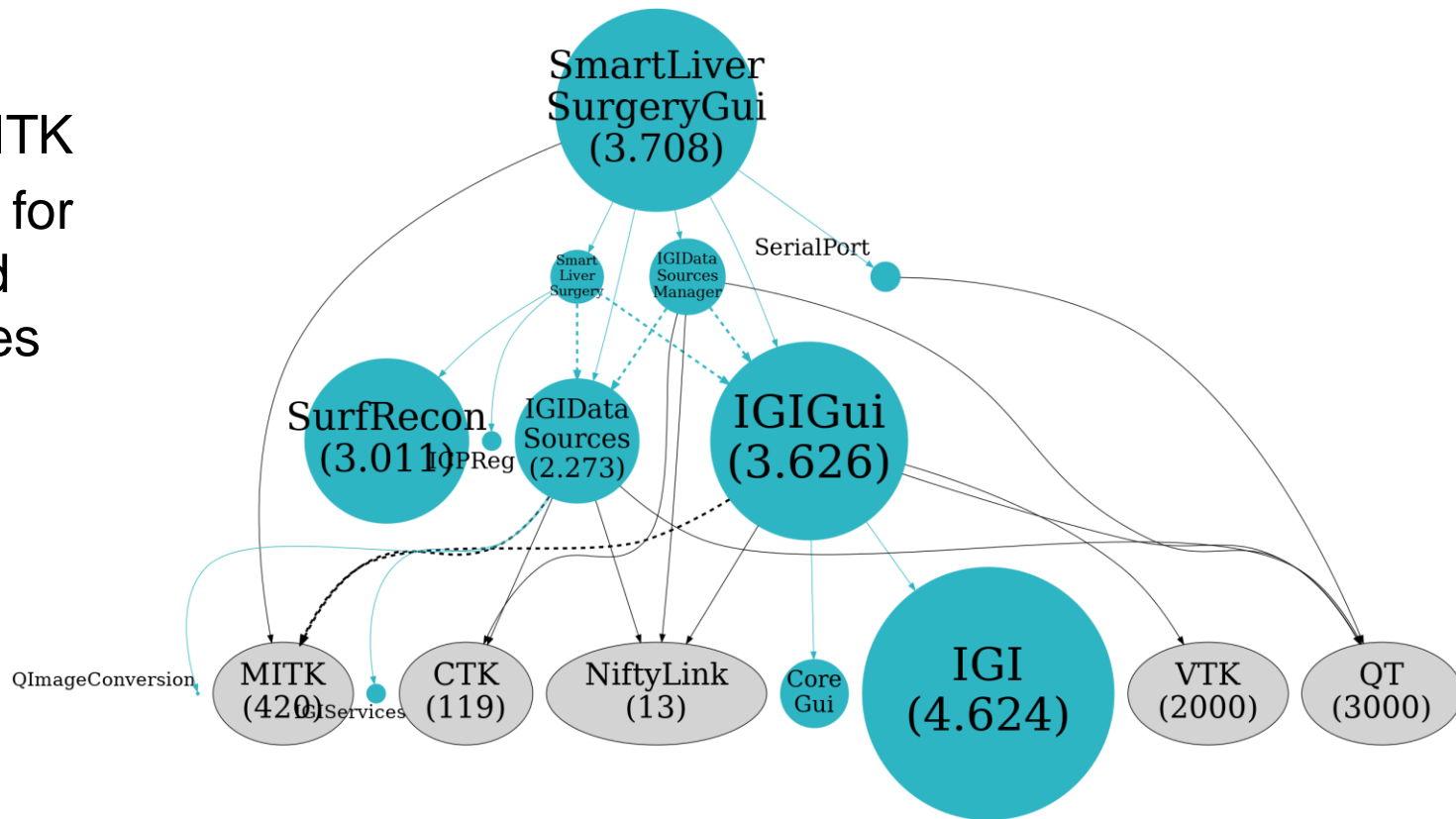




SmartLiver Application. Closed source, IP protected, Quality Controlled. Approx 3.7 thousand lines of code.

NiFTK Platform. Opensource, Tested. Approx. 230 thousand lines of code (C++)



- C++
- Based on MITK
- Uses cmake for modules and dependencies





NifTK

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Projects
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## NifTK

Open-source for medical image computing, computer-assisted interventions, web services and more.

5 followers London, UK <http://niftk.org>

Follow

### Pinned



NiftyNet

Public archive

[unmaintained] An open-source convolutional neural networks platform for research in medical image analysis and image-guided therapy

Python 1.3k 407



NiftyLink

Public

Mirror of NiftyLink on cmiclab, providing a library for transmitting OpenIGTLink messages over TCP/IP using Qt.

C++ 5 3



NifTK

Public

Mirror of NifTK on cmiclab, providing 3 main GUIs and about 150+ command line apps.

C++ 14 12

Repositories

View as: Public

You are viewing the README and pinned repositories as a public user.

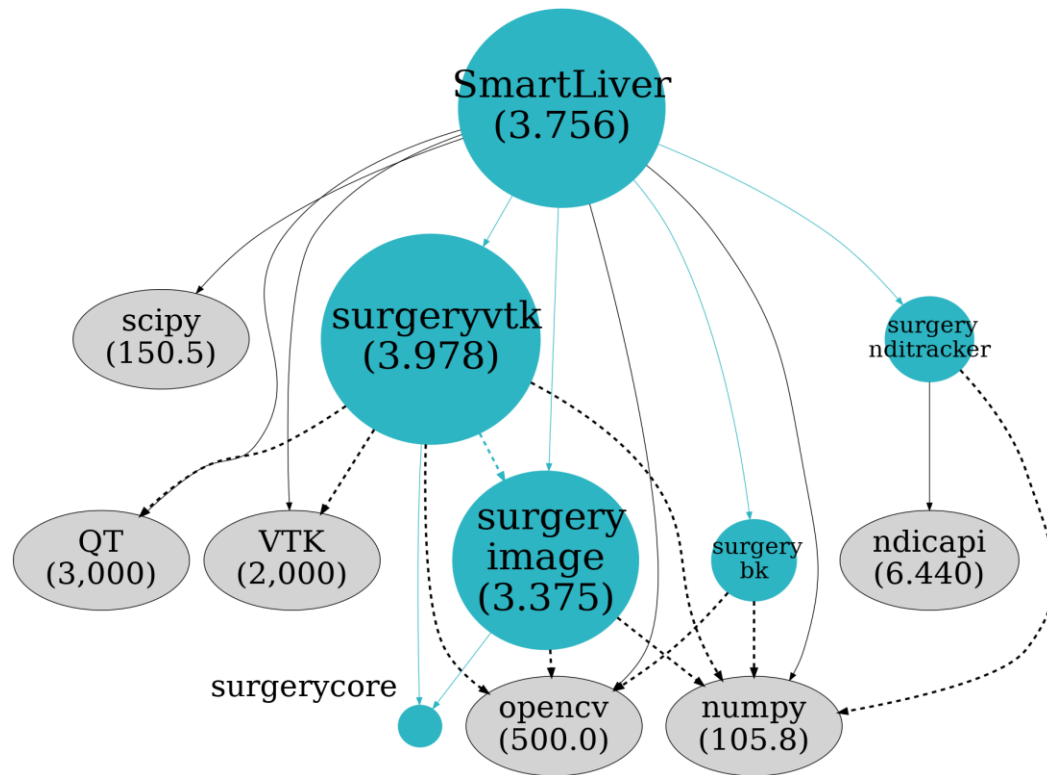
### People



### Top languages

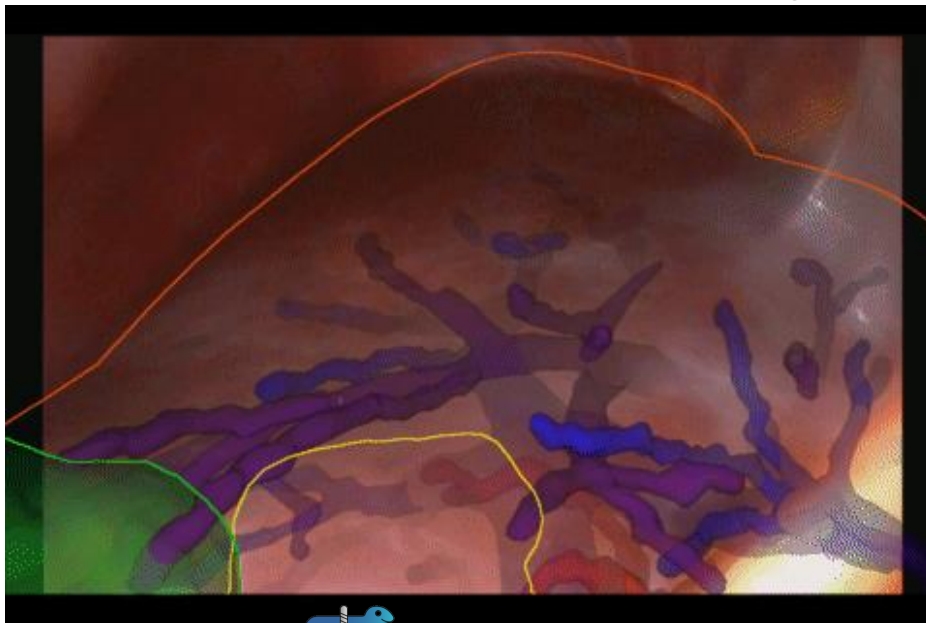
C++ Python PHP PostScript

- Python
- Uses pip for modules and dependencies



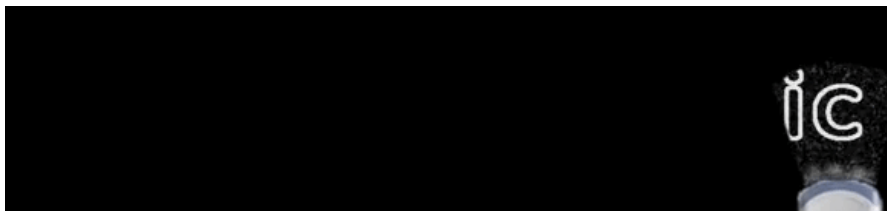
# Case Study – SmartLiver

- Augmented reality in keyhole liver surgery.
- In use, developed under ISO-13485 Quality Management System



# Case Studies – SnappySonic

- Public engagement demo. Deployed in 2 weeks.
- <https://github.com/scikit-surgery/snappysonic>
- <https://youtu.be/BI4qyg9NEOk>

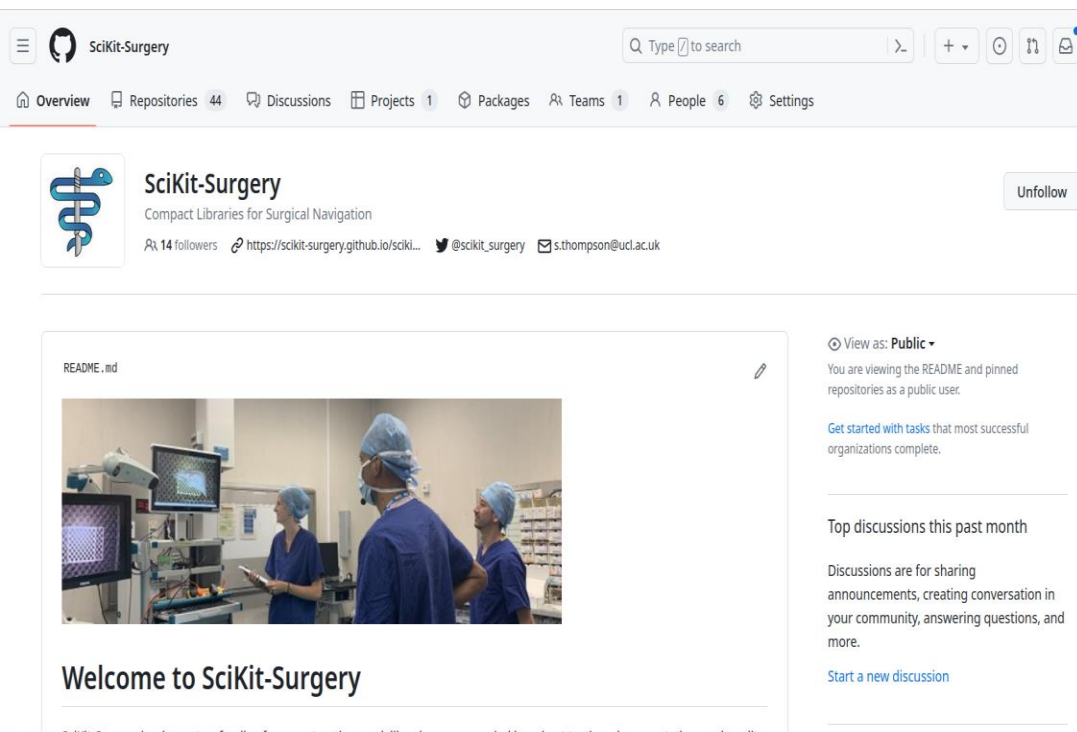


# Case Studies

## Basic Augmented Reality Demonstration



- Teaching software for AR in surgery.
- Highly extensible to test new user interfaces.
- Can be used anywhere with ArUco:
  - <https://youtu.be/jWVsO4nkcZI>
  - <https://github.com/scikit-surgery/scikit-surgerybard>
- Plug and play NDI tracker to use in theatre.



The screenshot shows the GitHub repository for SciKit-Surgery. The repository name is "SciKit-Surgery" with the description "Compact Libraries for Surgical Navigation". It has 14 followers and a link to the GitHub repository. The README file is pinned, showing a photo of three surgeons in an operating room. The welcome message reads: "Welcome to SciKit-Surgery".

- OpenSource
- Cross platform
- Tested and documented
- Install with pip
- Find us on github
- <https://github.com/SciKit-Surgery>
- [SciKit-Surgery Tutorial 00](#)
- [SciKit-Surgery Tutorial 01](#)

# Thank you to the developers,



Miguel Xochicale



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Thomas Dowrick



Raj Kundu



Athena Reissis



Nina Montana Brown



Kim Kahl

and the funders.



Engineering and  
Physical Sciences  
Research Council





# Takeaways and Questions

<https://link.springer.com/content/pdf/10.1007/s11548-020-02180-5.pdf>

- 1) `pip install scikit-surgeryvtk` : augmented reality with VTK models
- 2) `pip install scikit-surgerynditracker` : interface to nditrackers