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Modular Libraries for Surgical Navigation

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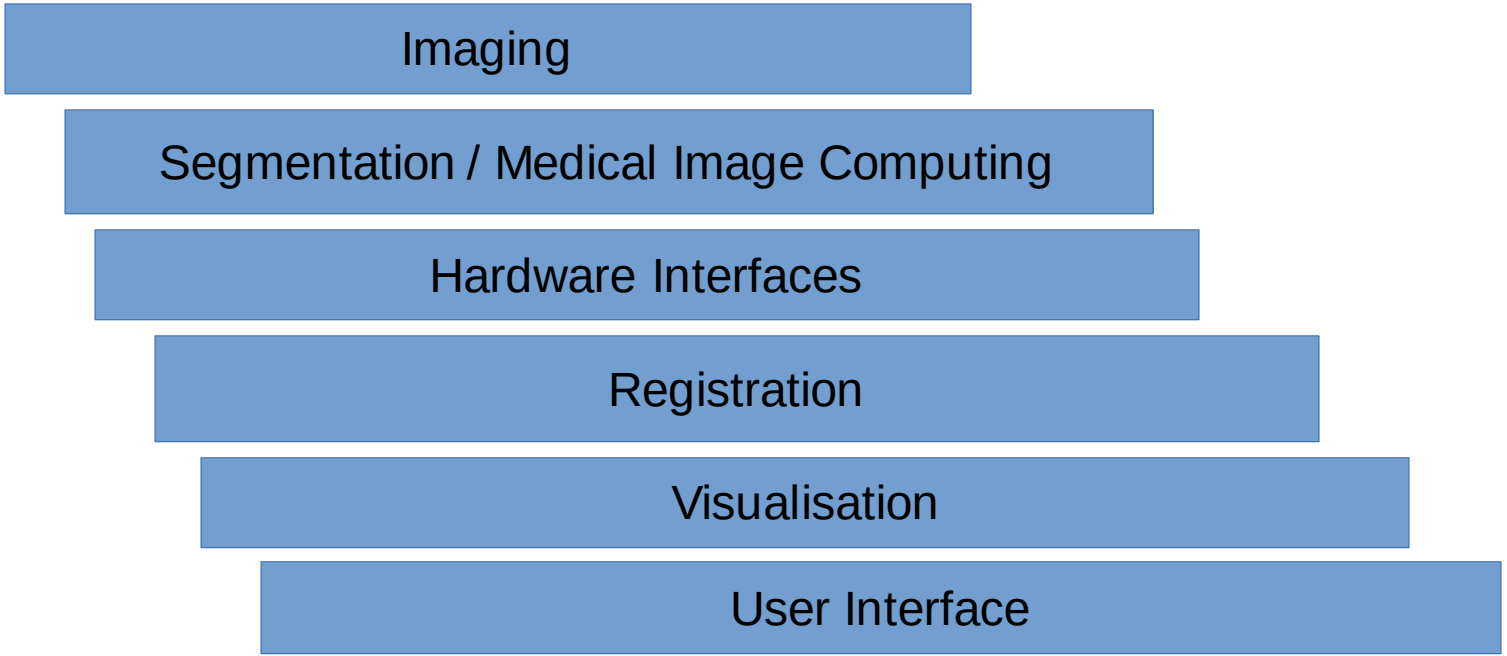
Aim 1: High Quality, Useful Libraries

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

Aim 1: Platform Tools Covering 6 Domains



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Aim 1b: High Quality, Useful Libraries

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

Aim 2: Sustainability / Maintainability

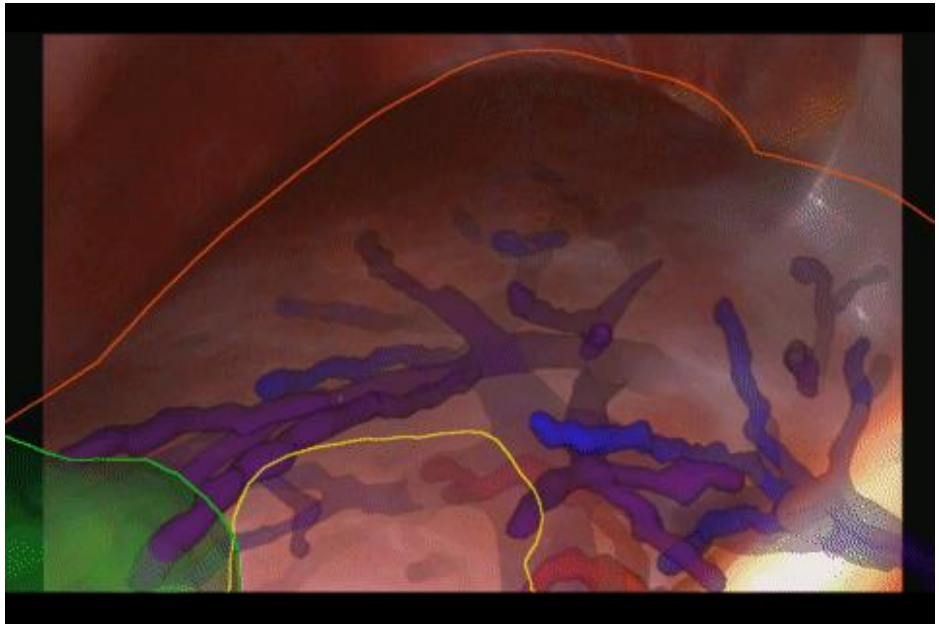
- Can be maintained (bug fixes / new features / update dependencies) by users (PhDs and Post Docs)

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.

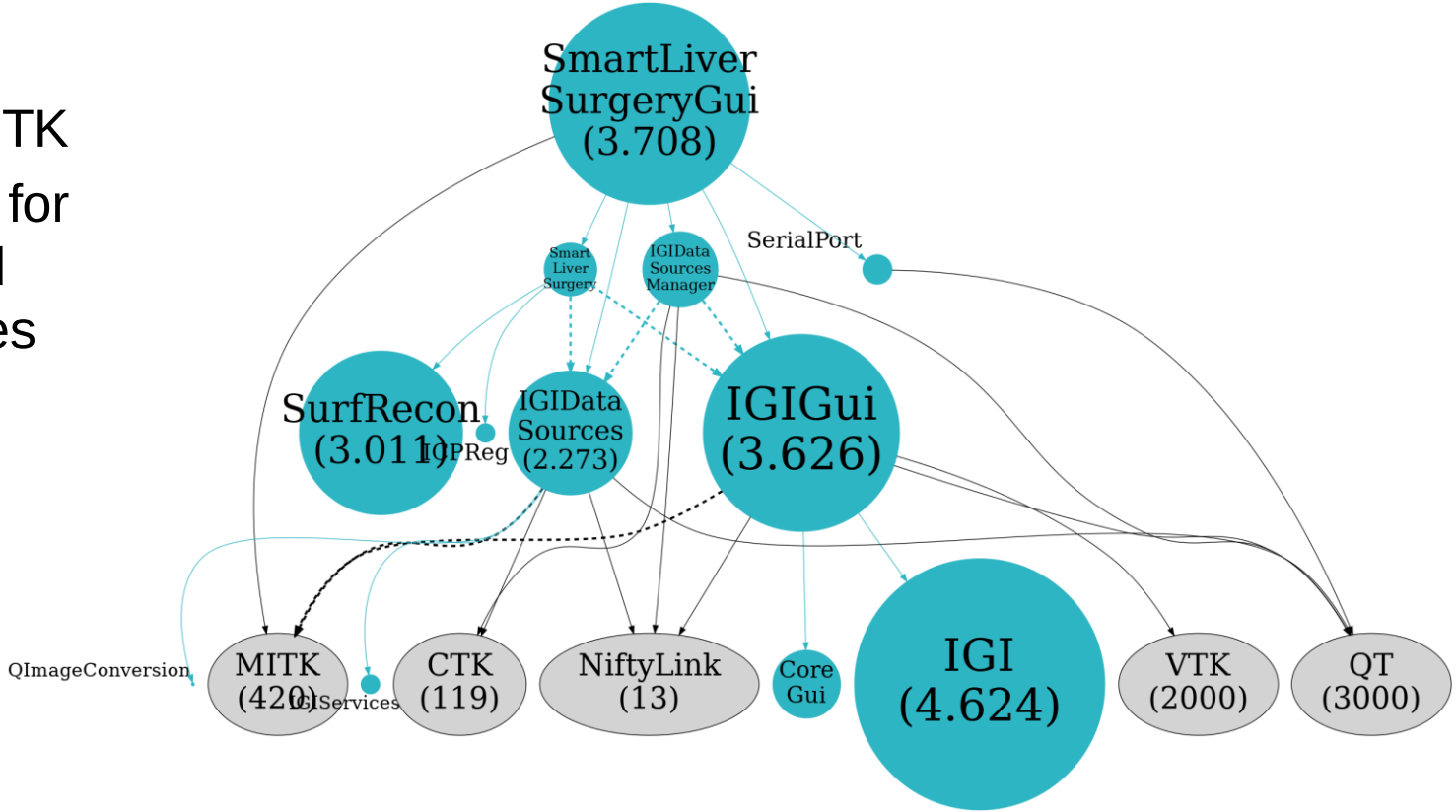


Historical Example – SmartLiver built with NifTK

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



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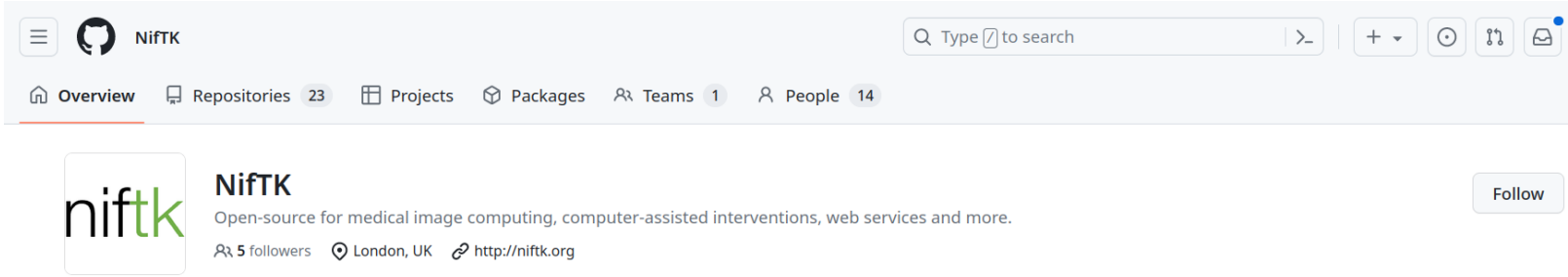
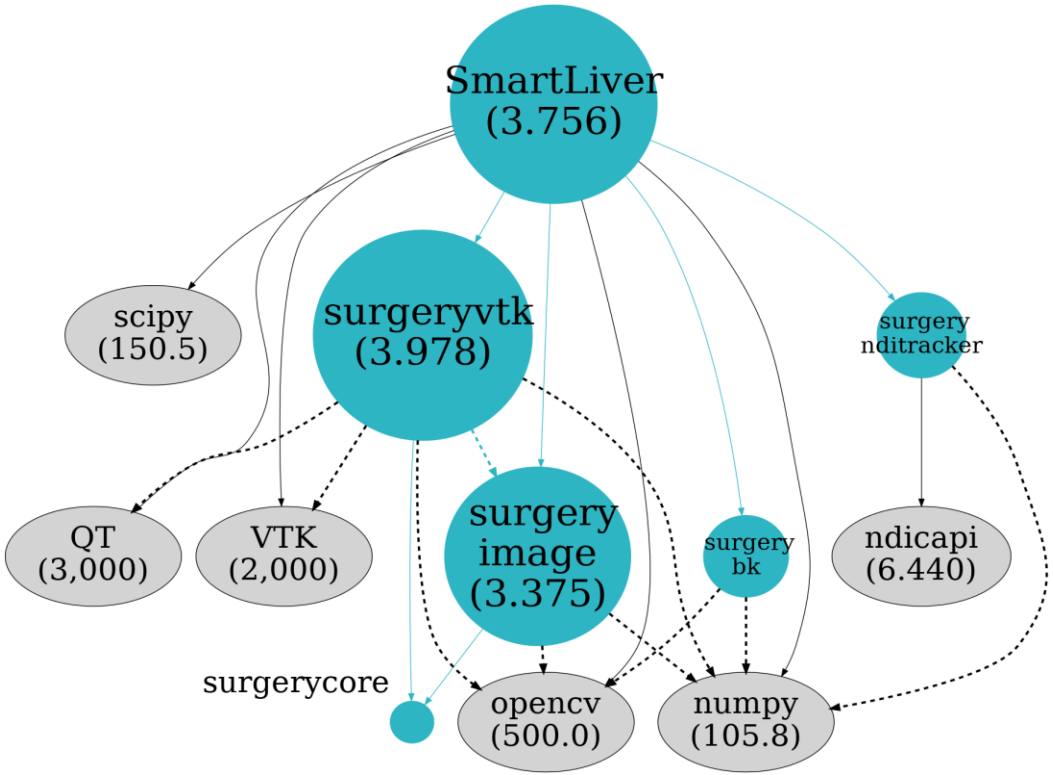


https://github.com/NifTK

- Python
- Uses pip for modules and dependencies



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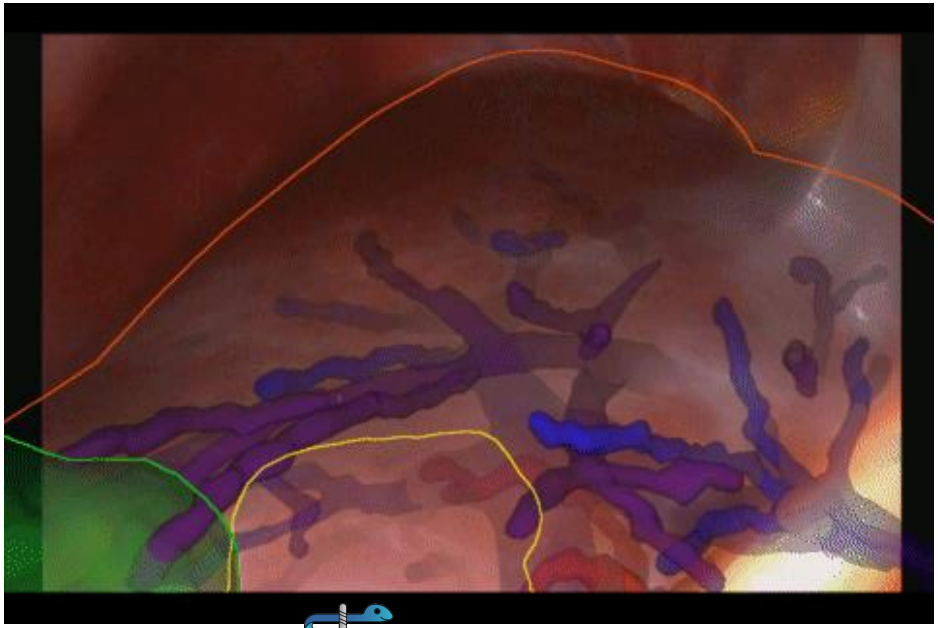
Case Study – SmartLiver

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



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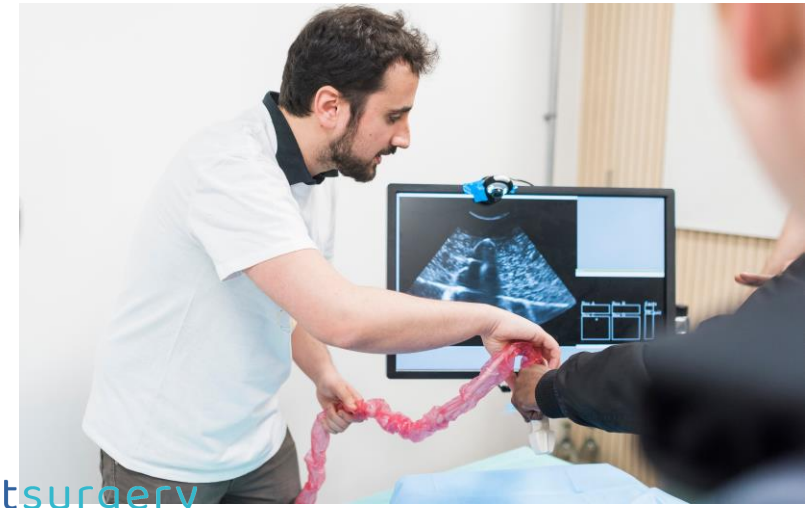
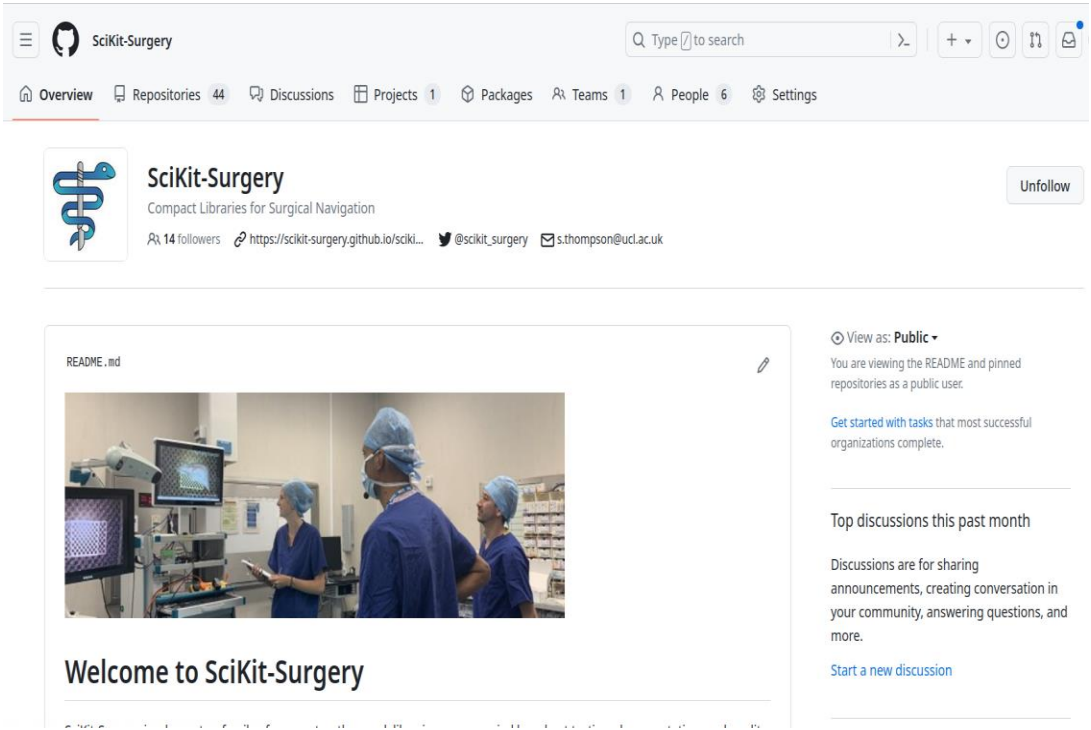
Case Studies – SnappySonic

- 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.



- 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

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Thank you to the developers,


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Nina Montana Brown


Kim Kahl

and the funders.

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