Medical Images Research Framework

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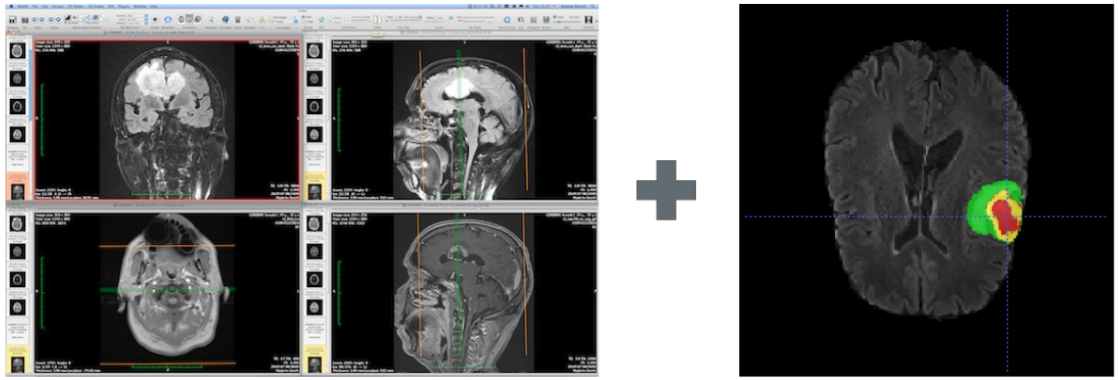
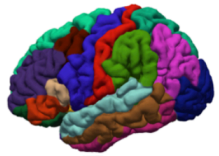
Motivation



Project goal:

- to create an extensible platform for development of medical instruments
- to integrate this instruments into a convenient environment in which many other essential instruments for physicians may be seamlessly used

Related work



FreeSurfer

icometrix

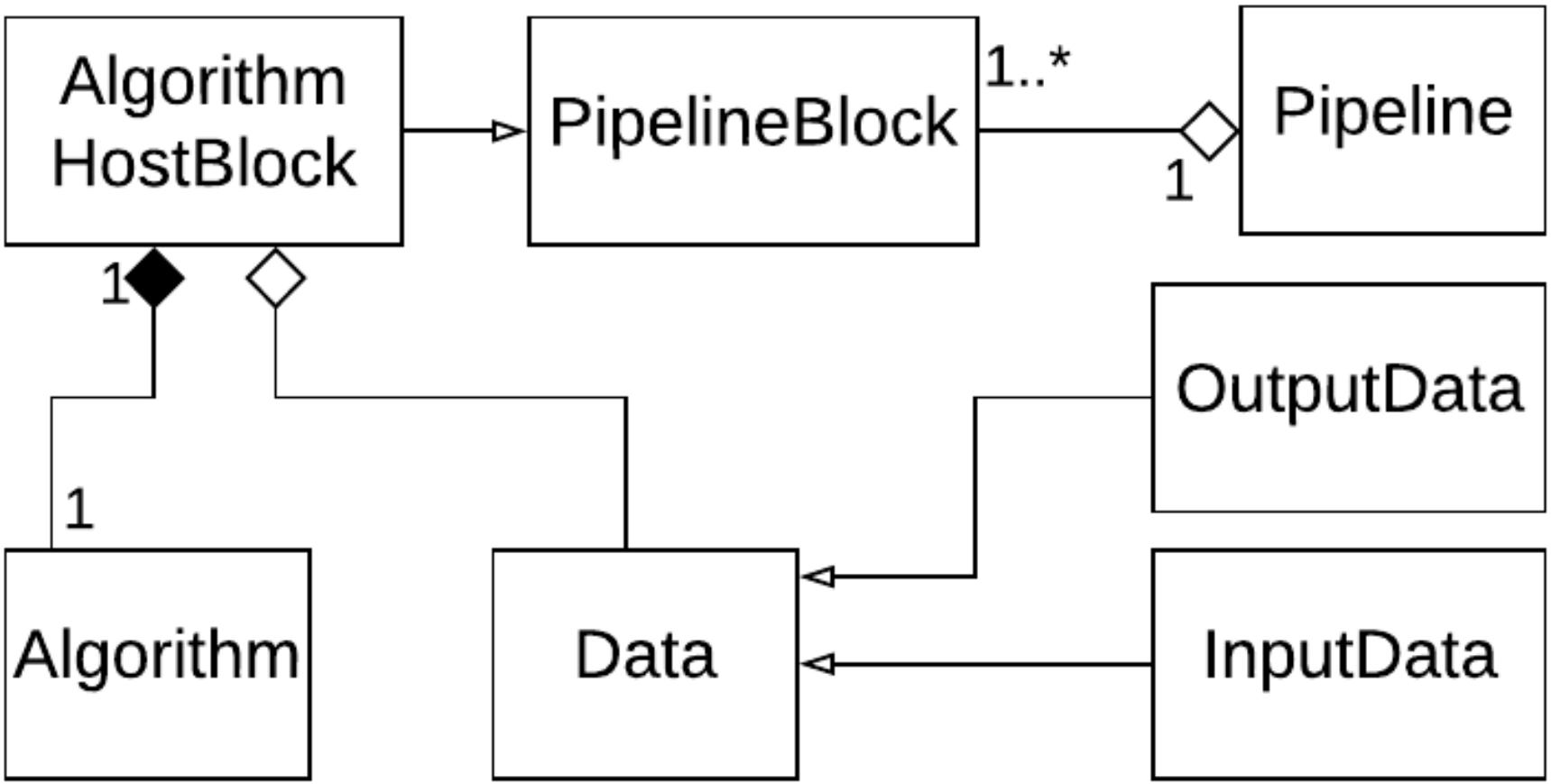
Ginkgo CADx

MITK vs MIRF

- C++
- Requires integration into its own infrastructure
- Many good plugins for medical images

- Kotlin
- Can be integrated into existing applications
- Cross-platform and supports mobile apps

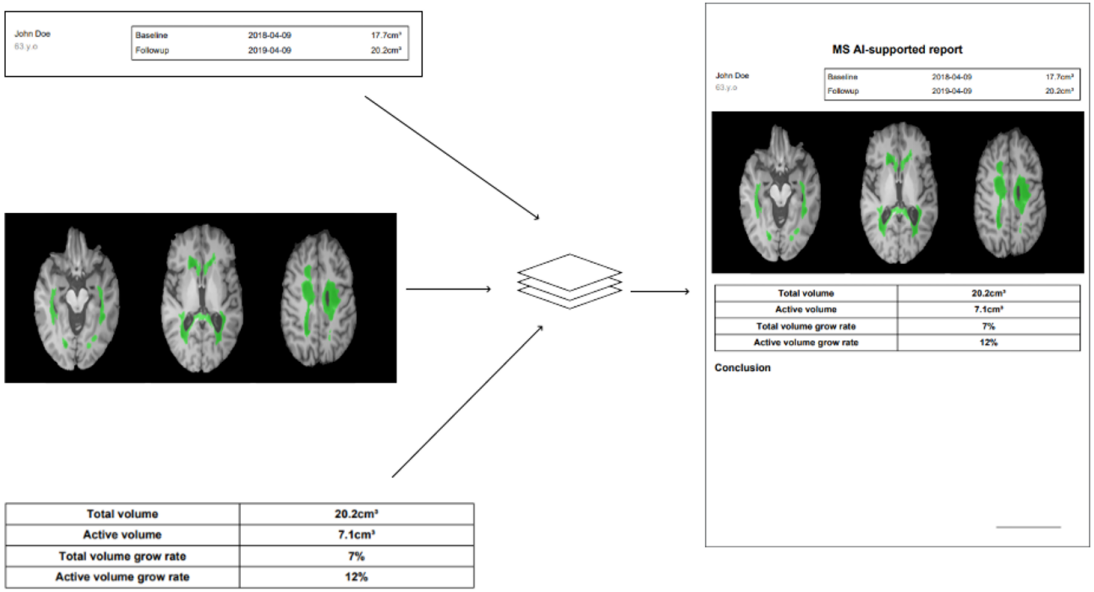
MIRF Core architecture



Supported image formats

- Common intermediate representation
- Supported formats:
  - DICOM
  - NIfTI
  - MHD (from ITK)

Report generation



name	value
Total volume	46.172 cm³
Active volume	12.0 cm³
Total volume grow rate	144.2875%
Active volume grow rate	120.0%

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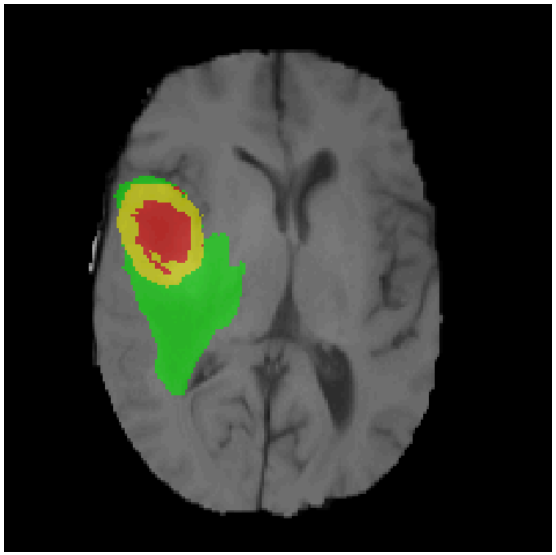
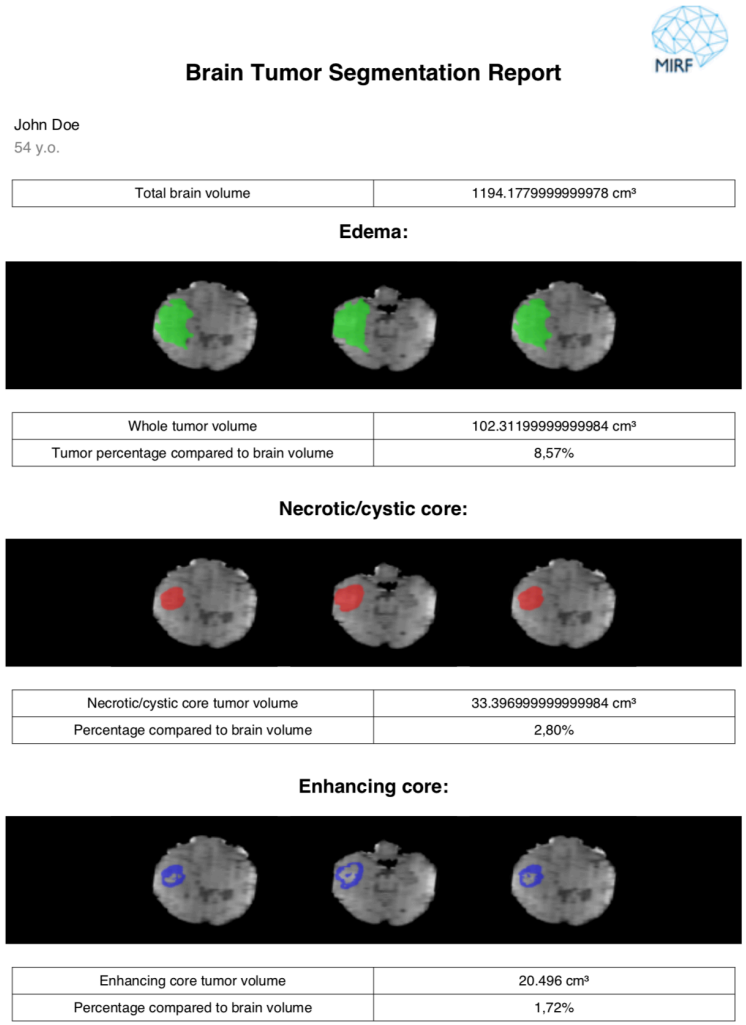
Tensorflow integration

- Java API for Tensorflow
- Wrapper blocks for pre-learned models

Example: brain tumor analysis



Various tumor tissues: necrotic core (red), tumor site (yellow), edema (green)



Brain Tumor Segmentation Report

MIRF

John Doe
54 y.o.

Total brain volume	1194.1779999999978 cm³

Edema:

Whole tumor volume	102.31199999999984 cm³
Tumor percentage compared to brain volume	8,57%

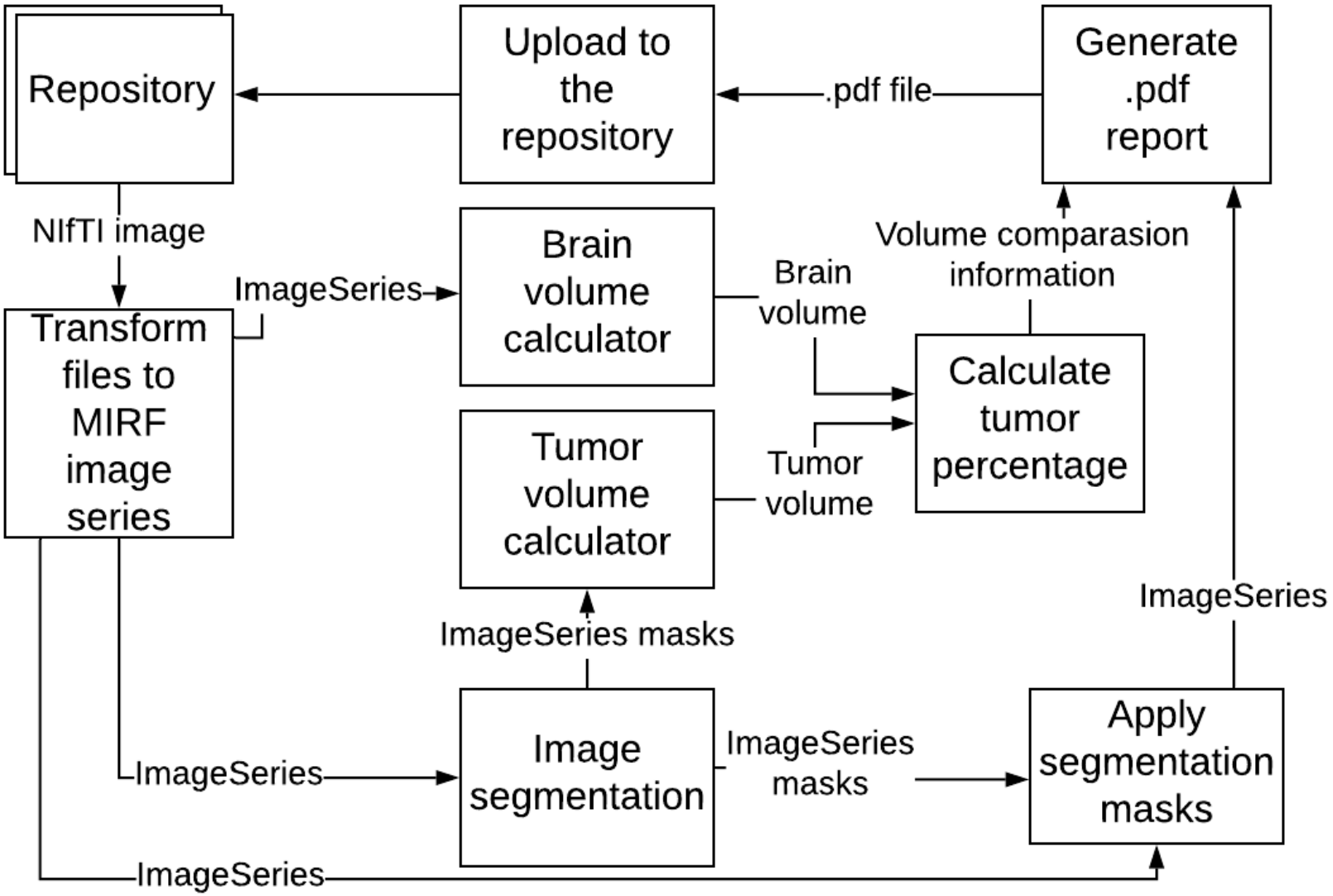
Necrotic/cystic core:

Necrotic/cystic core tumor volume	33.396999999999984 cm³
Percentage compared to brain volume	2,80%

Enhancing core:

Enhancing core tumor volume	20.496 cm³
Percentage compared to brain volume	1,72%

Example: brain tumor analysis

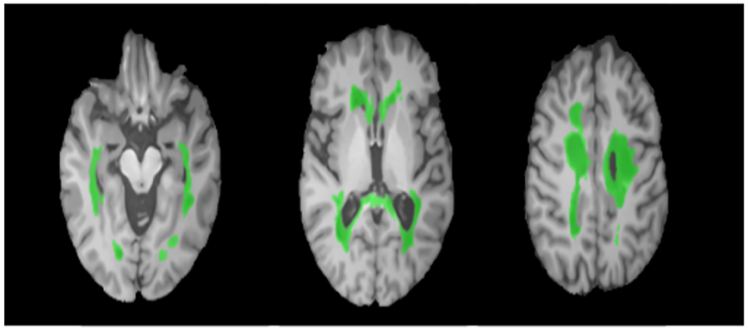


Example: multiple sclerosis

MS AI-supported report

John Doe
63.y.o

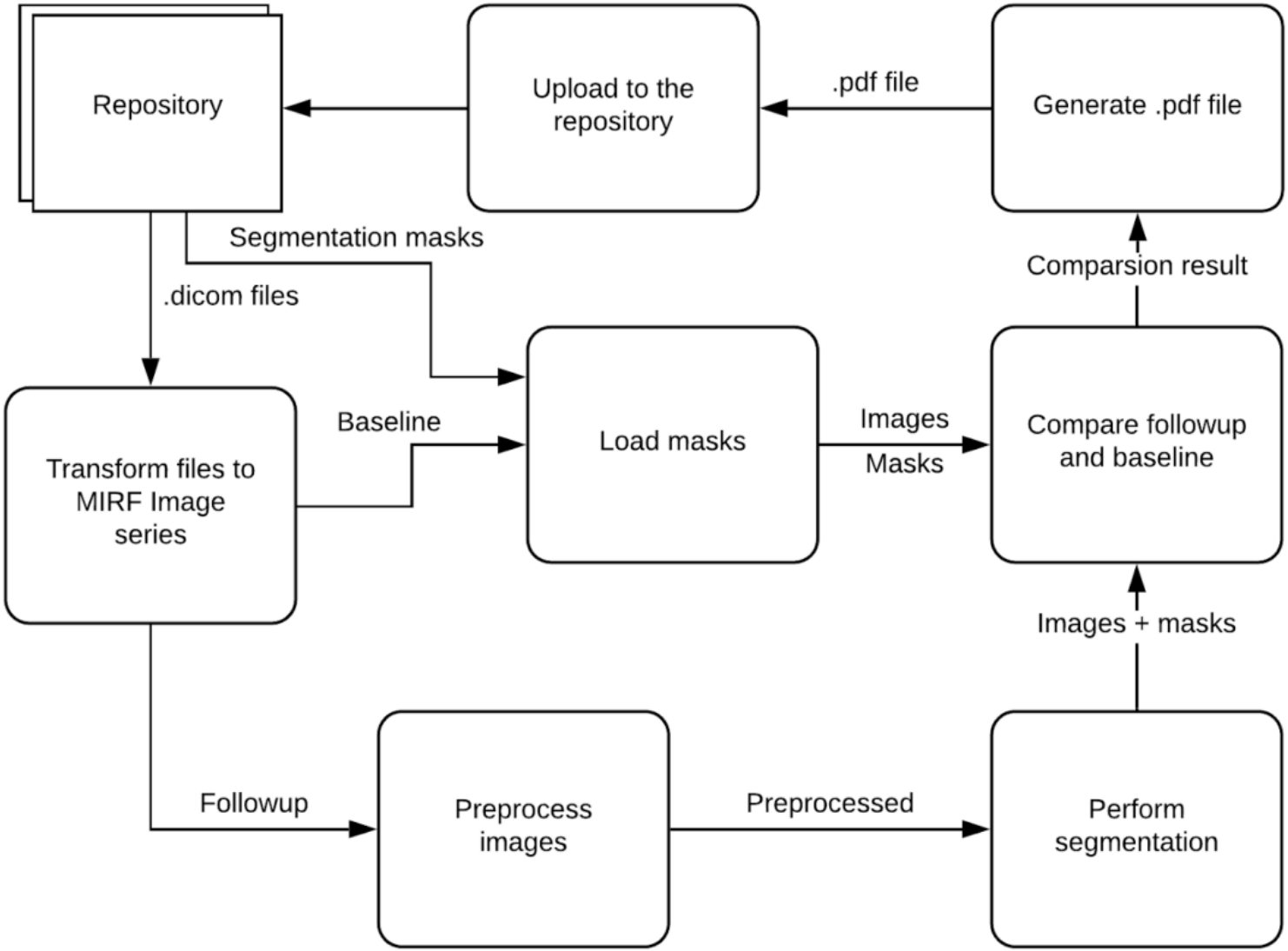
Baseline	2018-04-09	17.7cm³
Followup	2019-04-09	20.2cm³



Total volume	**20.2cm³**
Active volume	**7.1cm³**
Total volume grow rate	**7%**
Active volume grow rate	**12%**

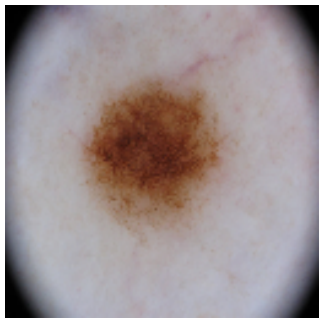
Conclusion

Example: multiple sclerosis

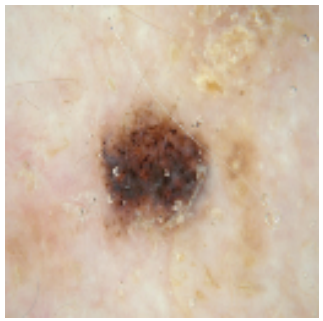


Android integration

- Example: skin cancer diagnosis using phone camera



Benign mole



Malignant mole

- Separate MIRF build for Android

Contacts

- http://mathandmedlab.com/mirf.html
- https://github.com/MathAndMedLab/Medical-images-research-framework
- contact@mathandmedlab.com