**The Increasing Importance of MIC**

- More users and hospitals are now using MIC.
- More complexity.
- More applications.
- Discovery.
- Therapy.

**What is MIC?**

- Goal: achieve extraction of intensity, intensity-based, or knowledge-driven knowledge from medical images.

**Imaging Modalities**

- CT
- MRI
- PET
- OCT
- Confocal
- Ultrasound
- Positron Emission Tomography
- Ultrasound

**Post-processing is Critical**

- Given:
  - image data
  - information

- How do you integrate:
  - knowledge
  - interventions

**From Research to Clinical Tools**

- Questions and answers:
  - Can we do this?
  - Process:
    - Is it worth doing?
    - Tool:
      - Single user
      - Not portable
      - Not portable
      - Not portable

- Translation Requires Tools

- A prototype works for the ground researchers:
  - Tool: paper
  - Disadvantages:
    - Lack of quality in the processing pipeline
    - Tool: not available

**The Valley of Death**

- The translation pipeline is failing to create tools enabling biomedical research

**Group Comparisons**

- Clinical imaging studies are similar to the basic science paradigm:
  - You have a hypothesis
  - You have a data set
  - You have an outcome

- Requires fully automated pipelines.

- Requires large computer resources.

- Lack of quality in the processing pipeline can be compensated by doing it again.

**Group Comparisons**

- COPDGene

- Genetic factors rather than smoking status explain COPD.

- COPD is a complex multifactorial disease with genetic contributions.

- Smoking Status and Genes Interactive:

**Subject Specific Analysis**

- Targets local pathology:
  - More specific
  - Less ambiguous
  - More direct

- More information-driven interventions:

**Phenotype Extraction in the Lung**

- Phenotype extraction from lung.

- Phenotype extraction from lung.

**Example Traumatic Brain Injury**

- Traumatic brain injury.

- Neuronal analysis.

- Techniques required.

**Expanded Technological Ability**

- SSA challenges:
  - Many patients have visible pathology.
  - Few MIC tools were developed for analysis of healthy tissue.

- SSA techniques are necessary to use such technologies.

**Subject Specific Analysis**

- Data segmentation:
  - Size-based statistical representation
  - Able to deal with pathology

**Subject Specific Analysis**

- Subject specific analysis leads to increased use of technology.

- Technology leads to increased use of technology.

- Technology leads to increased use of technology.

**Subject Specific Analysis**

- Data segmentation:
  - Size-based statistical representation
  - Able to deal with pathology

**Subject Specific Analysis**

- SSA 2

- Longitudinal changes in the brain.

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Connectograms

Personalized Connectograms

FA Changes Around a Tumor

Dislocation of Normal Anatomy

CTK: An example of OPM

Software Process

3D Slicer

Python in Slicer

Extension Framework

NA-MIC Kit Engineering Team

DTI

Translational Research in MIC

NA-MIC

NA-MIC Community

Why Open Source

Impact Acceleration

OpenIGTLink: API for Devices

Some Features

Why not open source software to develop a complex, long life cycle product?

What are the risks of OS use in a big industrial development?

Why use open source software to develop a complex, long life cycle product?

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Conclusions

- Free Open Source Software
  - Facilitates translation: bridging the valley of death
  - Is a win-win proposition: the OPM principle
  - Requires proper policies and governance
- Slicer and the NA-MIC kit are a good example of FOSS for translational work

URL's

- National Alliance for Medical Image Computing
  - www.na-mic.org
- Neuroimage Analysis Center
  - nac.spl.harvard.edu
- Surgical Planning Laboratory, Brigham and Women's Hospital
  - spl.harvard.edu
- National Center For Image Guided Therapy
  - www.ncigt.org

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http://supportferencjolesz.com