Beatriz Paniagua
Postdoctoral researcher
Departments of Computer Science and Psychiatry
Institutional framework
National Alliance for Medical Image Computing

http://www.na-mic.org
NA-MIC Cores

Leadership
PI: R. Kikinis

DBP
MIND Institute CA
JHU/Queens University, Canada
UNC, NC
HMS, MA

DBP's, til 07
PNL, Brockton VA, HMS
UCI, CA
Dartmouth College, NH
Indiana University,
Indianapolis
U of Toronto, Canada

Algorithms
Core PI: R. Whitaker
U of Utah
Martinos, MGH
MIT, MA
UNC, NC
Georgia Tech, GA

Engineering
Core PI: W. Schroeder
Kitware, Inc.
LONI, UCLA
BIRN CC, UCSD
NRG, WUSTL
GRC, GE
Isomics, Inc.

Service
Core PI: W. Schroeder
Kitware, Inc.

Training
Core PI: R. Gollub
Martinos Center, MGH

Dissemination
Core Co-PI: T. Kapur, S. Pieper
SPL, BWH, Isomics Inc.
Free Open Source Software

• Open source is a development method for software, that promises better quality, higher reliability, more flexibility, lower cost, and an end to predatory vendor lock-in.

• Research should avoid proprietary software and hardware, because
  • Locks researchers to a single vendor
  • Prevents leveraging of the work of other scientists

• The Open Source Initiative (OSI) is a non-profit corporation formed to educate about and advocate for the benefits of FOSS.

http://www.opensource.org/
NA-MIC Kit
ITK provides leading-edge segmentation and registration algorithms in two, three, and more dimensions; it is distributed as an open-source software package.

http://www.itk.org
VTK

Thousands of researchers and developers around the world use VTK, an open source, freely available software system for 3D computer graphics, image processing, and visualization.

http://www.vtk.org
- Image analysis and data visualization
- Free Open Source Software (FOSS) available for Windows, Linux, Solaris and Mac OS X
• **Open Source:** No restrictions on use, no license fees
  
The source code could be used to develop a commercial package that could be sold. No need to ask for permission.
  
  • If you use this software, you are responsible to make sure that you comply with all regulations that apply to the way you use it. I.e. if you want to use it for clinical trials, you have to apply for the proper authorizations at your institution
  
  • In any case, MUST acknowledge Slicer’s contribution
  
  • Possible to contribute. One’s choice, is NA-MIC’s decision, if contributions will be accepted.

More info...

http://www.slicer.org/
ITK-SNAP
Software development at UNC and UofM
Dental research

• **Neuro-Imaging Research and Analysis Lab (UNC):**
  – PI, Martin Styner
  – Research on diverse brain morphometry studies.
  – Emphasis on *shape analysis* and structural research for neurodevelopmental diseases.

• **Orthodontics Research Lab (UofM):**
  – PI, Lucia Cevidanes.
  – Diverse 3D imaging studies related with dentistry applications, asymmetry, TMJ OA, orthognatic surgery.
Imagine

Imagine by Mathieu Jomier
MeshValmet

Shape Analysis

- Algorithms development, 3D structural shape analysis
  - Correspondence, SPHARM-PDM & particle based entropy systems
  - Statistical Analysis, MANCOVA.
- Experienced clinicians are able to evaluate and diagnose 3D anatomical structures by looking at 2D classical imaging techniques → difficult to quantify
Conclusions

- Interdisciplinary, multi-institutional software development benefits medical imaging research.
- FOSS = Free Open Source Software
  - 3D Slicer, ITK, VTK, ITK-Snap
    - Demo – CMF reg
  - 3D quantification different methodologies: SPHARM, particle-based systems, MeshValmet - Closest Points.
    - SPHARM-PDM and entropy-based particle systems still being developed, but usable in research purposes and sometimes already applied to clinical cases.
    - Demo – SPHARM data
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- UofM lab: Dion Taylor, Joao R. Goncalves, Cauby Chaves Jr
- CWRU: Mark Hans, Martin Palomo
Hands-on workshop outline

1. ITK-SNAP - Segmentation
2. Imagine – Registration
   ➜ Demo CMFreg
3. 3D Slicer - Model visualization
4. MeshValmet - 3D quantification
   ➜ Demo shape correspondence