Radnostics CT
Spine Segmentation & Osteoporosis Screening

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Screening for Osteoporosis in CT Scans

- **Osteoporosis** – A condition of decreased bone mass leading to fractures

- **Common**
  - 1.5 million vertebral fractures per year (US)
  - 180 thousand patients placed in nursing homes per year (US)

- **Devastating & Costly**
  - immobility, pain, mortality
  - 18 billion dollar per year (US)

- **Preventable & Treatable**
  - diet, exercise
  - quit smoking & access drinking
  - medication, fall prevention, etc...

- **Under Diagnosed**
  - DXA screening has low compliance rate
  - Frequently missed in CT
Automated screening for findings of osteoporosis in CT scans performed for other clinical reasons

CT Study → Segmentation → Quantitative Osteoporotic Score (vertebral fractures, density etc.) → Referral to additional test (DXA)
Milestone 1 – Spine Segmentation

- NA-MIC Spine Segmentation Challenge + full automation
- Slicer integration
  - Basic integration complete: Spine Segmentation Module + Tutorial
  - Atlas integration in the works

The different colors highlight holes in the cortex.
Not a Silver Bullet (yet)

- Abdomen CT only. Chest CT in next milestone.
- Tested on Windows 7 64 bit, 3DSlicer 3.6.3
- Mapping to formal vertebrae labels – TBD
- Known issues to be resolved in next milestone:
  ◦ Calcifications
  ◦ Contrast

Need to Remove calcification in the aorta

But keep osteophytes
Availability

- Segmentation module expected to be available for NA–MIC research community, pending legal review.

More details

- Anthony.Blumfield@Radnastics.com

Thank you
Appendix
Load an abdomen CT study into 3D Slicer
Select Radnostics CT Spine Segmentation module
Execution – 2

- Select loaded volume as CT Study
- Select “Create New Volume” as label map
- Press Apply
- Wait Patiently
  - Can Take 3–5 minutes
Results in Sagittal View

- Vertebral body segmentation:
  - Cortex
  - Trabecular bone
  - Intervertebral disc
- Label for each entity at each level
1. Use Model Maker to create a surface model
   - Use labelmap as input volume and Create New for models
   - Select Joint Smoothing, press apply.

2. In 3D layout Click Models Icon
   - Use Model Hierarchy to set visibility of each segmented entity

The different colors highlight holes in the cortex.
Command Line Execution


- **InputFilePath**: path of CT study
  - MHA, NRRD etc.
  - If DICOM, will search for complete series in same directory

- **OutputFilePath**: path of output file
  - Default: <InputFilePath>.Labelmap.mha

- **--testDir <TestDirectory>**: Name of test directory.
  - Default: %temp%

- **--logfile <Logfile>**: Name of logfile.
  - Default: logfile.xml

- **--cache**: use cached input from proceeding execution of same volume
  - Useful to avoid rereading 100s of DICOM files during debug sessions.

- Basic Example:
  - RadnosticsCTSpineSegmentation.exe C:\Images\Study1\000001.dcm Study1Labelmap.mha