



Extending data warehousing with image extraction capabilities for radiomics studies

Karine SEYMOUR



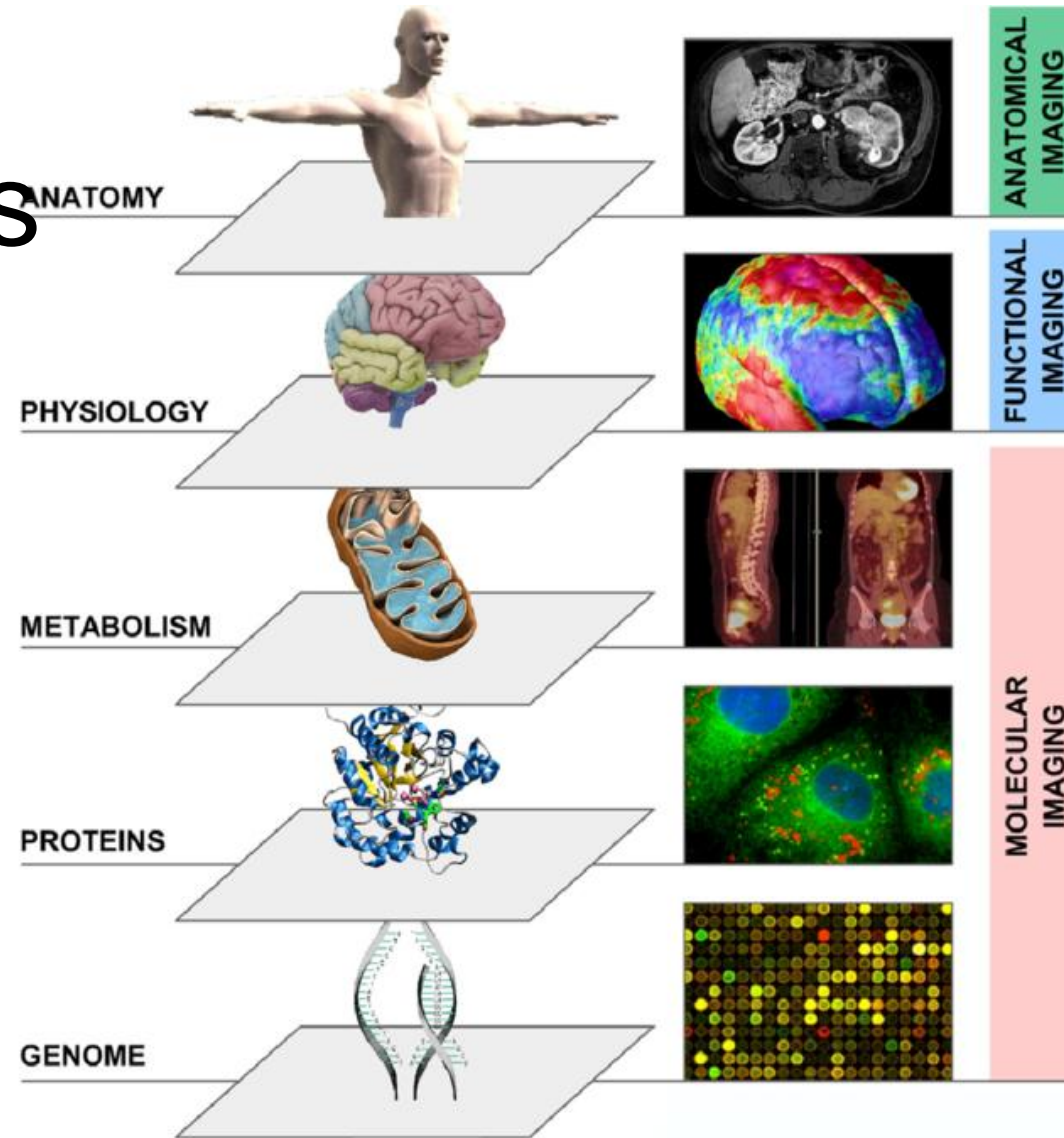
2017 European Meeting
Paris, Oct. 5, 2017

Conflict of interest disclosure

- I am the President of  **Medexprim**
- We sell professional services around *Radiomics Enabler*[®]

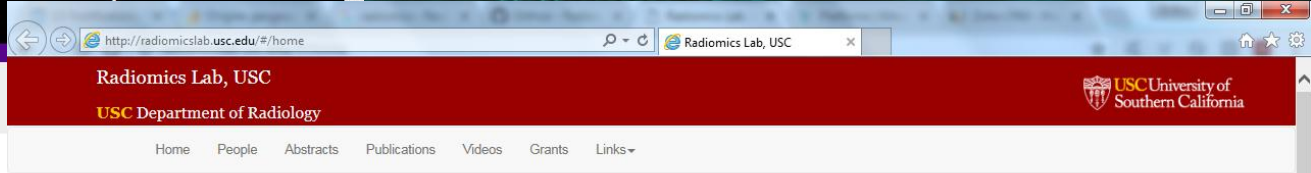
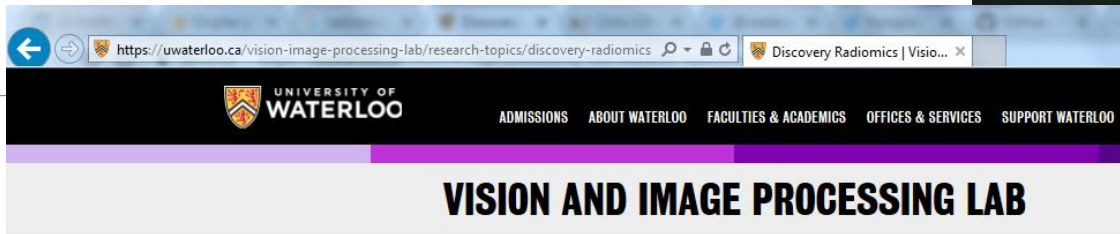
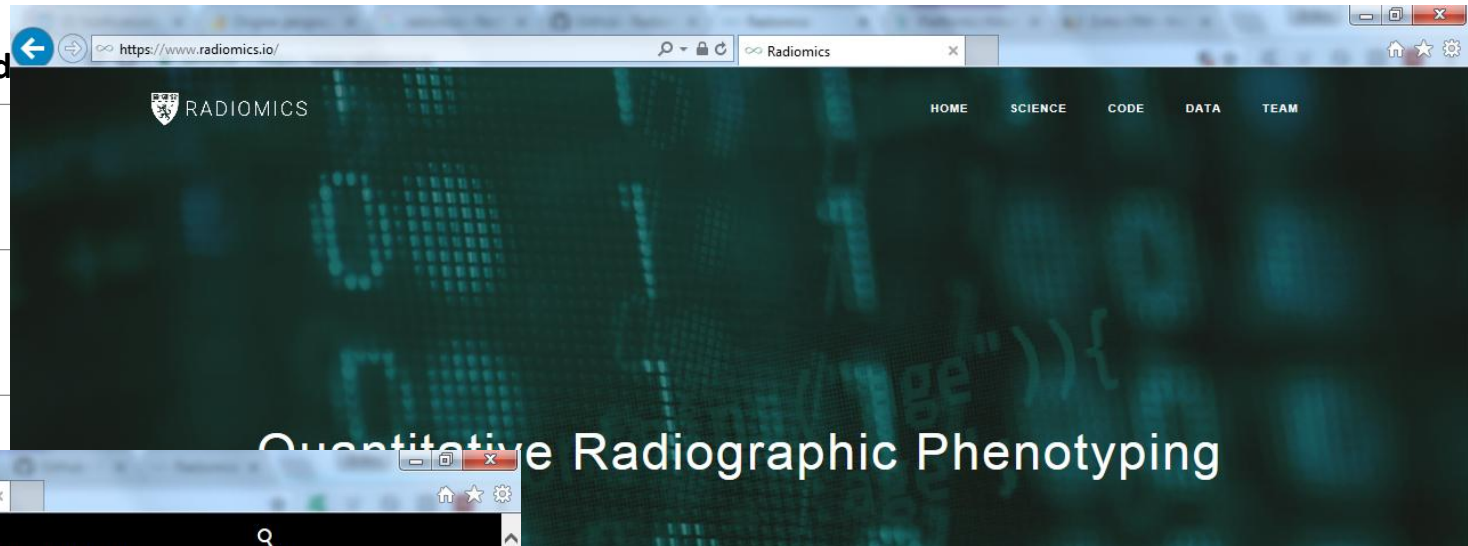
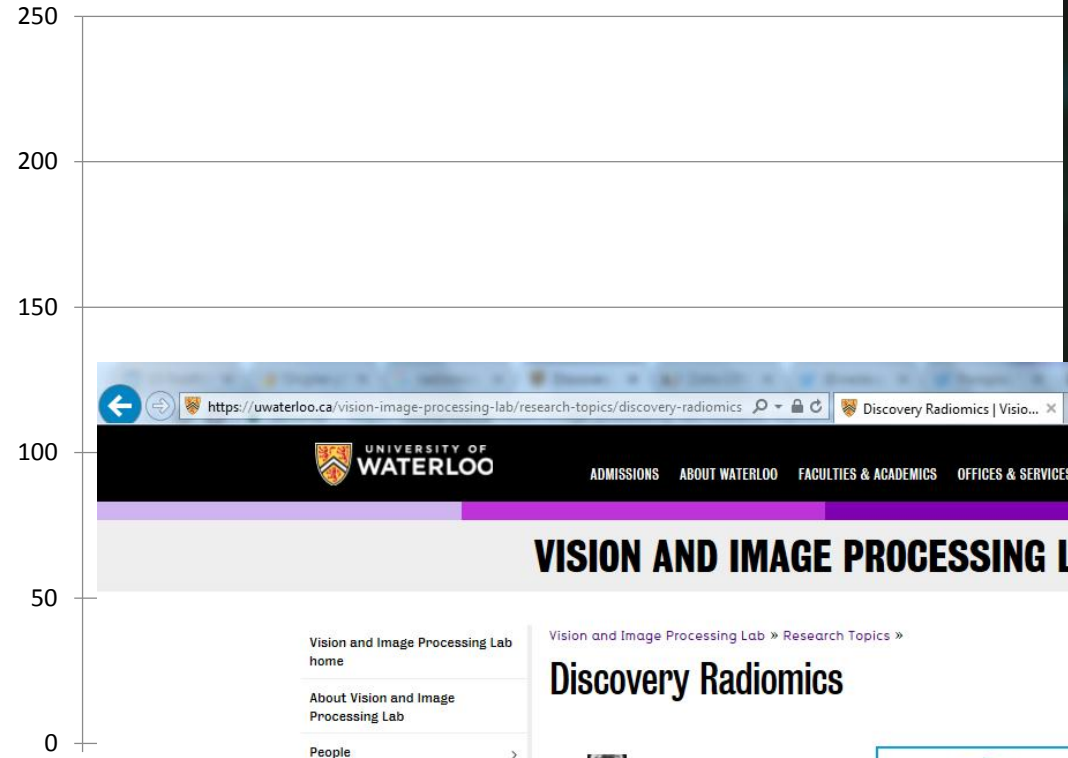


Context : Radiomics

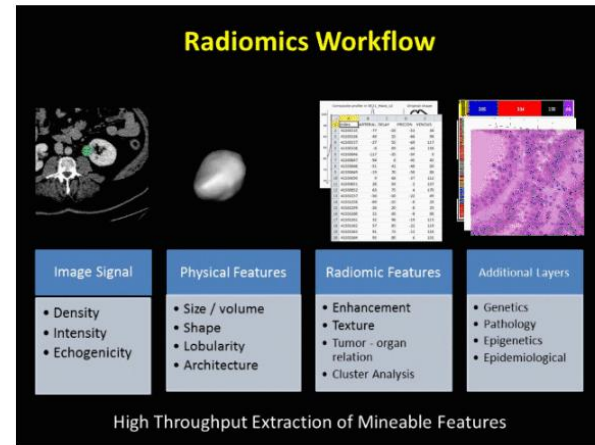
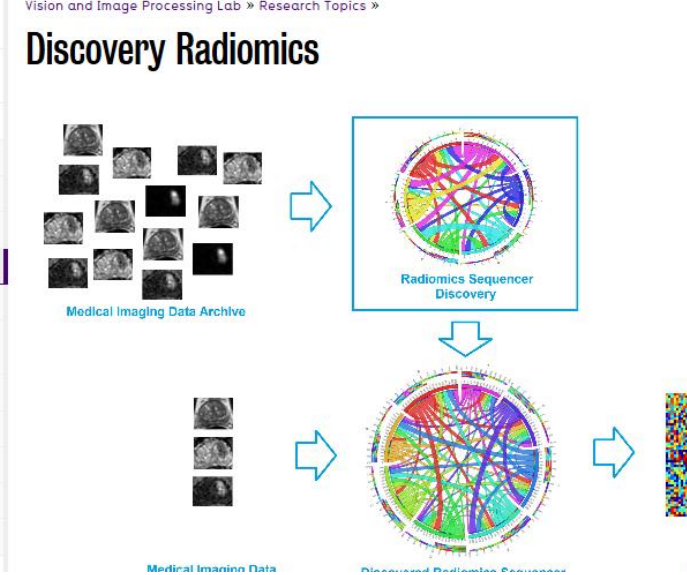


Source : Lambin et al. (2012) - **Radiomics**: Extracting more information from medical images using advanced feature analysis *Eur J Cancer*

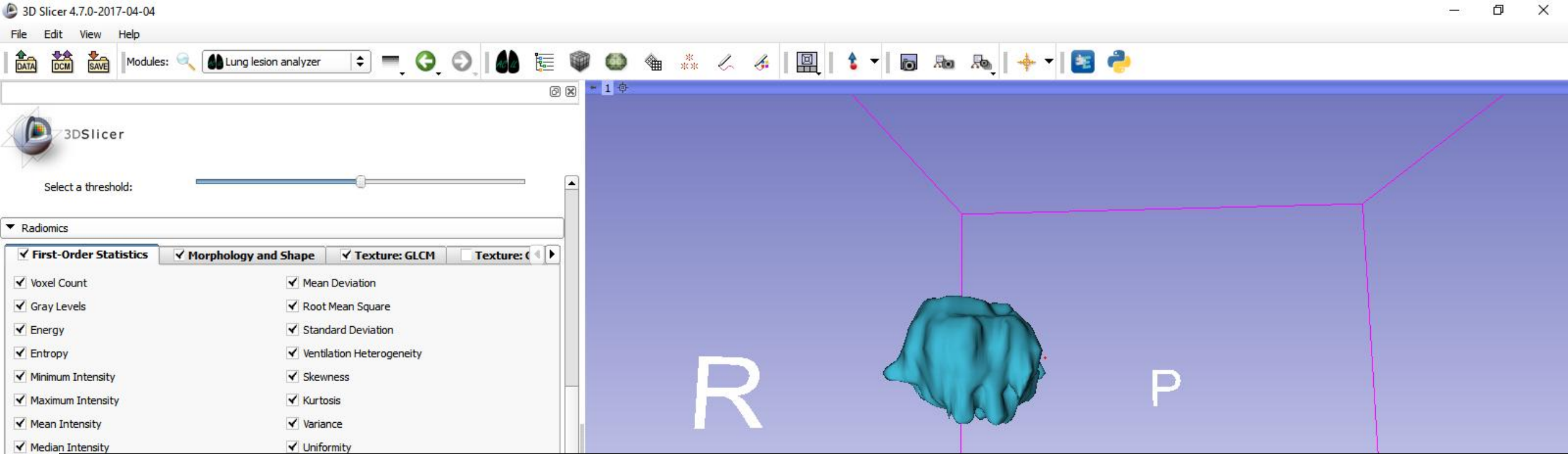
number of "Radiomics" publications on Pubmed



- Vision and Image Processing Lab home
- About Vision and Image Processing Lab
- People >
- Research Topics ▾
 - Biomedical Imaging
 - Computer Vision
 - Discovery Radiomics
- Evolutionary Deep Intelligence
- Image Segmentation/Classification
- Multiresolution Techniques
- Remote Sensing
- Scientific Imaging
- Stochastic Models
- Video Analysis

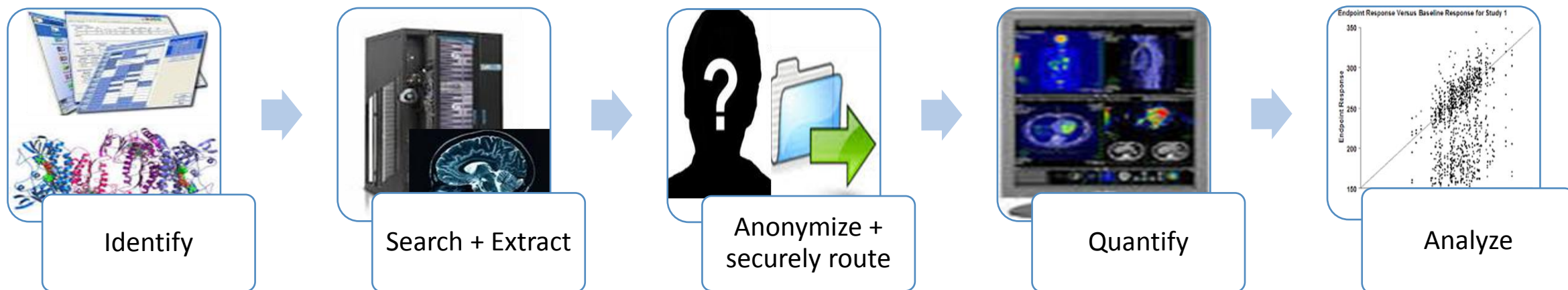


Welcome to the Radiomics Lab

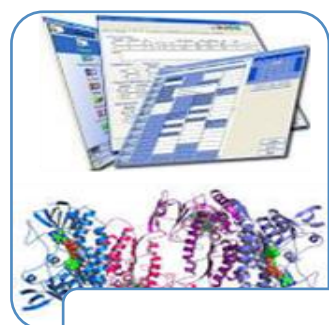


Caseld	Date	NoduleId	SphereRadius	Threshold	Seeds_LPS
5: Thorax 5.0 B31f_1	04/10/17 17:31		1	0.0	[[-74.45877838134766, -190.9071044921875, -168.0]]
5: Thorax 5.0 B31f_r20_1	04/10/17 17:31		1	20 0.0	[[-74.45877838134766, -190.9071044921875, -168.0]]
5: Thorax 5.0 B31f_r15_1	04/10/17 17:31		1	15 0.0	[[-74.45877838134766, -190.9071044921875, -168.0]]

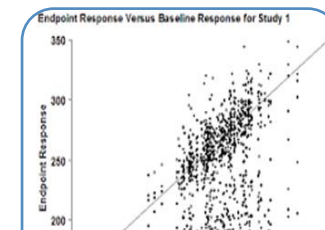
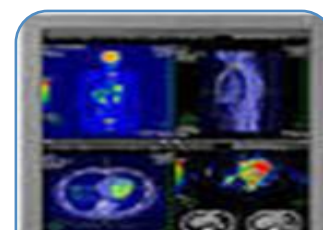
Bottleneck



State of the art



Identify



J Digit Imaging (2015) 28:194–204
DOI 10.1007/s10278-014-9733-9

High Throughput Tools to Access Images from Clinical Archives for Research

Shawn N. Murphy • Christopher Herrick • Yanbing Wang • Taowei David Wang •
Darren Sack • Katherine P. Andriole • Jesse Wei • Nathaniel Reynolds •
Wendy Plesniak • Bruce R. Rosen • Steven Pieper • Randy L. Gollub

Solution



Radiomics Enabler®



Gains - example

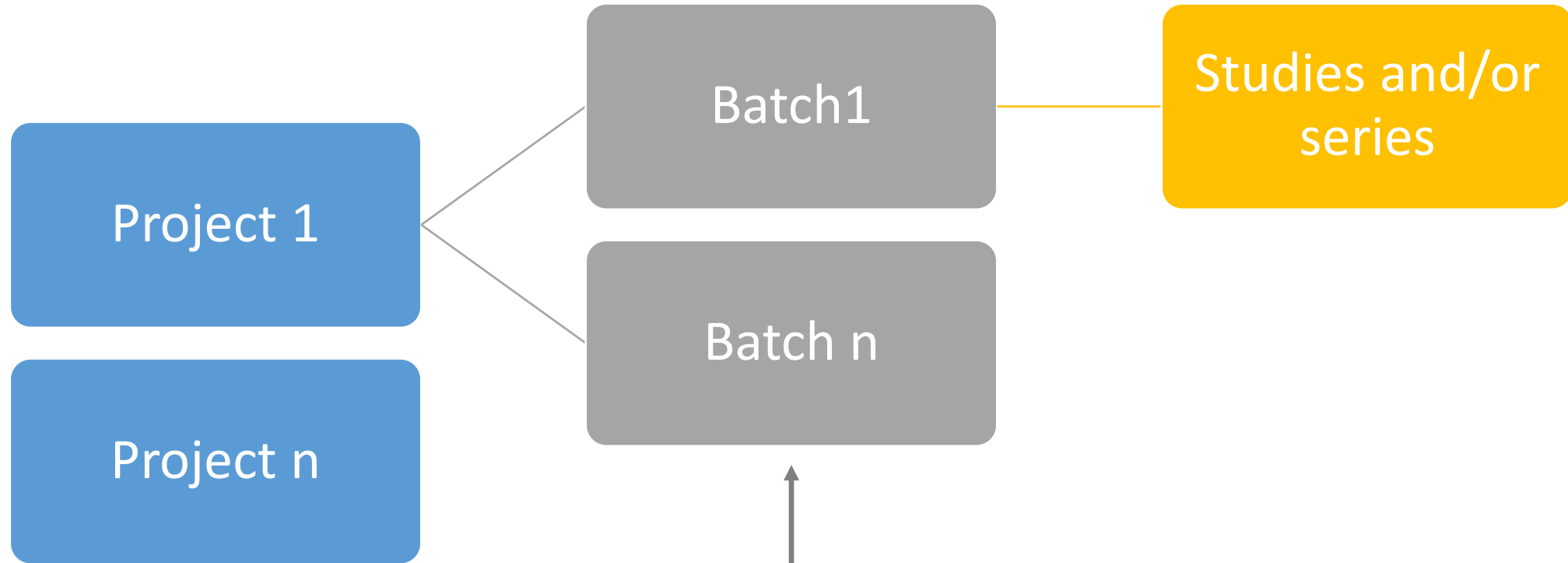
For 118 exams (MRI and PET-CT)

	With the PACS workstation	With Radiomics Enabler®
Operator dependent time required for extracting, anonymizing and saving on an external medium	5 hours and 37 min (extrapolation from 12 exams)	17 min
PACS' workstation availability during the extraction process	Unavailable for its primary purpose (reading imaging exams)	Available
Traceability	Low	High
Risk of errors	High	Low



Pr. Pierre Payoux

Structure



Status : In preparation,
processing, interrupted,
complete, error, archived

Previous Queries

Find



Query Tool

Query Name:

Temporal Cons:

Dates

Treat Independen

Run Query

Detailed List View

Category: ALL

- Demographics (1 Patient Set) - Simple Counts**
This plugin displays a demographic break-down of a Patient Set.
 - Demographics (2 Patient Sets) - Simple Counts**
This plugin compares the demographic break-down of two Patient Sets.
 - Timeline**
This plugin creates a visual representation of when selected observations occur within a given patient set.
 - Workplace Items Sharing Enhancement - Searcher**
This plugin facilitates searching for similar Workplace items (folder, query, patient set, etc.) within the web client framework.
 - CARE (Cohort Analysis & Refinement Expeditor) - Concept Demographics Histograms**
This plugin generates the histograms of demographic break-downs of a selected subset of a Patient Set against those from that subset that are associated (observed) with specified concepts.
 - CARE (Cohort Analysis & Refinement Expeditor) - Concept Observation Tally Demographics Histograms**
This plugin generates the histograms of demographic break-downs of a selected subset of a Patient Set against those from that subset that are associated with various observation counts of a specified concept.
 - ExportXLS**
This plugin tabulates unidentified patient data of selectable concepts/observations and provides options to download the result to specified file type.
- Click here to view more plugins in i2b2 Gallery... Close

Show Query Status

Graph Results

Query Report

- (t) Digestive syste@09:58:31 [10-4-2017] [demo]
- Results of (t) Digestive syste@09:58:31 [10-4-2017] [demo] - FINIS
 - # Number of patients for "(t) Digestive syste@09:58:31" is 29 - F
 - Patient Set for "(t) Digestive syste@09:58:31" - FINISHED
 - 1000000007 [29 y/o M asian]
 - 1000000009 [21 y/o F hispanic]
 - 1000000012 [19 y/o F black]
 - 1000000023 [33 y/o M hispanic]
 - 1000000024 [30 y/o M black]
 - 1000000026 [65 y/o M white]
 - 1000000029 [25 y/o M hispanic]
 - 1000000037 [19 y/o M indian]
 - 1000000041 [16 y/o M hispanic]
 - 1000000043 [61 y/o M hispanic]
 - 1000000044 [16 y/o M asian]
 - 1000000049 [44 y/o M black]
 - 1000000050 [21 y/o F black]
 - 1000000052 [38 y/o M asian]
 - 1000000061 [41 y/o M asian]
 - 1000000063 [48 y/o F black]
 - 1000000064 [25 y/o M asian]
 - 1000000070 [38 y/o M black]
 - 1000000074 [45 y/o F hispanic]
 - 1000000079 [31 y/o F asian]
 - 1000000083 [65 y/o F black]
 - 1000000085 [63 y/o F indian]
 - 1000000087 [55 y/o M asian]
 - 1000000092 [40 y/o M black]
 - 1000000093 [30 y/o F black]
 - 100000107 [30 y/o M hispanic]

Group 3 [X]

Occurs > 0x Exclude

endently ▾

◀ ▶ New Group ▶▶



Radiomics Enabler

Logout

[Home](#)>[Poumon](#)>[batch_41647260864650000](#)>PACS List Query

Study date

From:

To:

Modality type(s):

CR: Computed Radiography
CT: Computed Tomography
MR: Magnetic Resonance
NM: Nuclear Medicine

Exam type(s):

Input a comma separated list of items to be found in the study description.

Advanced search

Indicate an XML file containing your custom advanced search.

No file selected.

Contact [Medexprim](#) to build a custom search.

Validate

Cancel



Search results

Found 9 matching study(ies) for 6 input row(s).

[Display series of selected studies](#)[Add selection to batch](#)[Launch a new search](#)[Go to batch](#)Show entriesSearch:

<input type="checkbox"/>	Patient ID	Name	First name	Birth date	Study date	Modality	Study Description
<input type="checkbox"/>	PAasdf20161021.7541	asdf	Peter	2016-10-21	2016-10-21	OT	Prostate001
<input type="checkbox"/>	PAasdf20161021.7541	asdf	Peter	2016-10-21	2016-10-21	OT	Prostate001
<input type="checkbox"/>	PAT020	Clarke	Wendy		2017-08-21	CT	
<input type="checkbox"/>	PAT020	Clarke	Wendy			CR	
<input type="checkbox"/>	PAT020	Clarke	Wendy		2017-08-21	CR	
<input type="checkbox"/>	05247	Copeland	Stewart			US	
<input type="checkbox"/>	39419238	Doe	John		2001-01-01	MR	LEFT KNEE
<input type="checkbox"/>	77567152C	GARCIA RUIZ	PASCUAL	1974-10-15	2017-06-12	MR	RM CEREBRAL
<input type="checkbox"/>	PAT009	Jones	John	1954-08-12	2017-08-30	MR	MRI Chest

Showing 1 to 9 of 9 entries

[Previous](#)[Next](#)



Radiomics Enabler

Logout

Home > [Neurology Test](#) > 26sept

Add new studies or series to batch

Extract from PACS

Show 10 entries

Search:

Patient ID	Name	First name	Birth date	Study date	Modality	Description
PAsdf20161021.7541	asdf	Peter	2016-10-21	2016-10-21	OT	Prostate001
PAsdf20161021.7541	asdf	Peter	2016-10-21	2016-10-21	OT	Prostate001
PAT020	Clarke	Wendy		2017-08-21	CT	
PAT020	Clarke	Wendy			CR	
PAT020	Clarke	Wendy		2017-08-21	CR	
05247	Copeland	Stewart			US	
39419238	Doe	John		2001-01-01	MR	LEFT KNEE
77567152C	GARCIA RUIZ	PASCUAL	1974-10-15	2017-06-12	MR	RM CEREBRAL
PAT009	Jones	John	1954-08-12	2017-08-30	MR	MRI Chest

Showing 1 to 9 of 9 entries

Previous 1 Next



RSNA
Radiological Society
of North America

CTP



Radiomics Enabler

Logout

Home>

Select an existing project or create a [new project](#)

Project Name <small>▲</small>	Owner <small>▲</small>	Creation Date <small>▲</small>	Last Update <small>▼</small>	Modify	Delete
Neurology Test	medexprim1	07/21/2017	09/26/2017		
Test1	medexprim1	06/07/2017	09/15/2017		
Test2	medexprim1	06/09/2017	06/29/2017		



Radiomics Enabler

Home>KS_19avril

Select an existing batch or create a [new batch](#)

In preparation

Name	Prepared On	Number Of Patients	Number Of Studies	Number Of Series	Modify	Delete
jeudi	2017-05-04 17:02	1	1	0		
31 mai	2017-05-31 20:31	0	0	0		

Done or pending

Name	Extracted On	Number Of Patients	Number Of Studies	Number Of Series	Number Of Images	Status	File Size	Modify	Delete
April22	2017-04-24 20:11	2	4	4	16	Completed	8.2 MBs		
20avril2_modif		1	2	0	0	Completed	0 bytes		
April24_1	2017-04-25 15:49	1	1	1	6	Completed	1.1 MB		
April25_1		1	7	7	6	Interrupted	3.0 MBs		
Test CHSF		2	8	7	18	Processing	8.9 MBs		

Archived

Name	Extracted On	Validated On	Number Of Patients	Number Of Studies	Number Of Series	Number Of Images
April19_batch2	2017-04-20 14:34	2017-04-21 20:29	2	2	2	0
April19_batch1	2017-04-19 09:46	2017-04-22 09:11	1	1	0	0
20April3		2017-04-24 19:58	1	2	0	6
20avril1	2017-04-20 15:04	2017-04-22 09:12	1	1	0	0



Pr. Nicolas Sans



« *Radiomics Enabler® opens **new perspectives** in the way we conduct our research. The Toulouse University Hospitals counts several millions imaging exams which represents a huge amount of information that is **now exploitable.** »*

Available open-source by the end of 2017

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