Big Data – Why are you even here?

(Volpara update including big data, density maps, and Q&A)

ASX:VHT

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volpara® health technologies

Why are you even here?

Why are you even here?

This AI software can tell if you're at risk from cancer before symptoms appear

Ah, this is why you are here……

Original Investigation | Less Is More

November 2015

Diagnostic Accuracy of Digital Screening Mammography With and Without Computer-Aided Detection

Abstract

Why are you even here?

Neural networks read mammograms as well as radiologists

By Kate Madden Yee, AuntMinnie.com staff writer

March 3, 2017

VIENNA - Deep artificial neural networks can read mammograms as well as radiologists, according to research presented at ECR 2017 on Thursday.

Whether radiologists welcome the finding as good news remains to be seen, as the field continues to grapple with the implications of artificial intelligence. But in any case, mammography is a good candidate for machine learning, said presenter Dr. Anton Becker of the University of Zurich.

"Mammography interpretation is a challenging task, and the performance of even experienced radiologists is only moderate," Becker said. "Mammographic images are an ideal target for computer-based analysis because they're 2D projection images and they're very high-resolution images, so there's a lot of information to feed to the computer."

Industrial grade

Becker and colleagues sought to evaluate the diagnostic performance of an industrial-grade deep-learning artificial neural network for the detection of breast cancer. The network is based on artificial neurons that are stacked in layers, much like natural neurons; the different layers extract different features from test images, according to Becker.

"One big advantage of the network we used is that it generates heat maps that

Ah, this is why you are here……

MD Anderson Benches IBM Watson In Setback For Artificial Intelligence In Medicine

Feb 2017

"Volpara update, big data, density maps and Q&A"

Today, I want to explain:

Why artificial intelligence** in conjunction with big data++ is going to bring you insights to help you do your job even better, and to help save more lives….and why it finds mammograms so challenging.

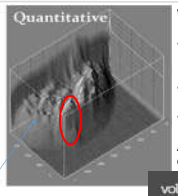
**machine learning = a machine learning to do a task artificial intelligence = a machine learning to act like a human, not necessarily optimal but can explain why it has done something.	++big data = ability to store massive amounts of data, usually on the infinite resources of the Cloud

Density maps remove the imaging parameters to get to breast tissue

(mammo or tomo central projection)

Lots of physics & image processing

Basic science behind Volpara



We can provide:

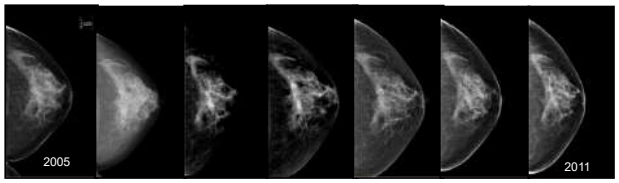
- Better inputs for machine learning (CAD etc)
- Regional volumetric breast density
- Whole volumetric breast density

And make things easier trying to judge density change over time…..

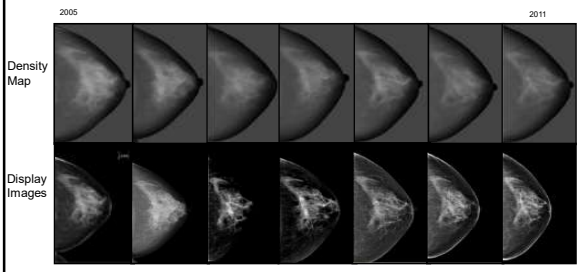
At each pixel, we have the thickness of dense tissue between that pixel and the x-ray source, this is quantitative information about the breast tissue, completely divorced from the imaging process.

Breasts can look very different according to manufacturer

"For Presentation" data



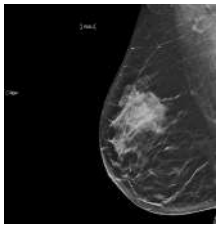
Density maps remove the imaging parameters to get to breast tissue



Breasts can look very different according to manufacturer

Conventional 2D Mammogram

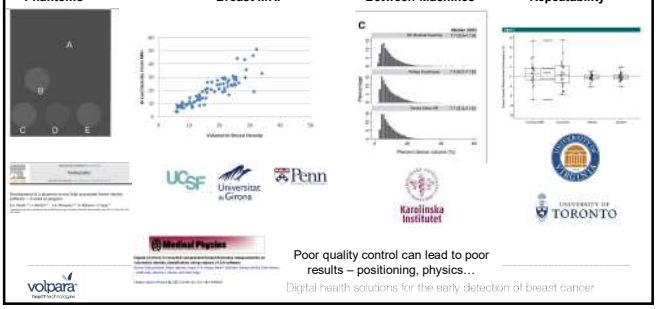
Same woman, same time.



Hologic C-View Image

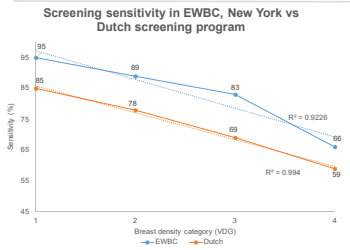
Density maps – making sure they are accurate

Phantoms | **Breast MRI** | **Between Machines** | **Repeatability**



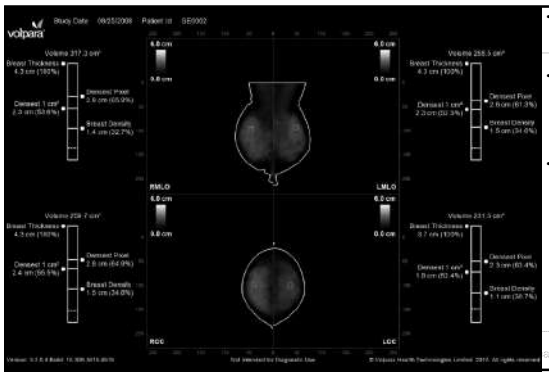
Poor quality control can lead to poor results – positioning, physics…

Risk of missing cancer



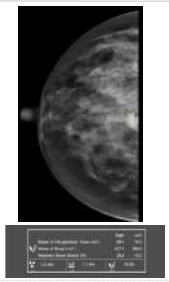
EWBC much higher recall rates, they do double read + CAD + annual screens

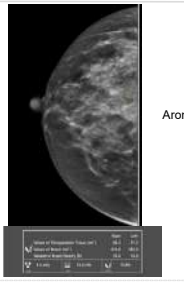
Change over time



- We can provide more regional information.
- Volumetric density good for sensitivity, but can we improve further?
- We can compute many things – risk of missing micros, risk of missing stellate…but what is really clinically usable?

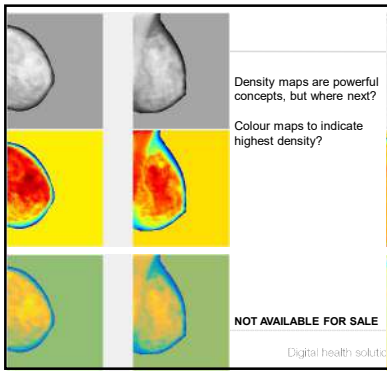
Change over time





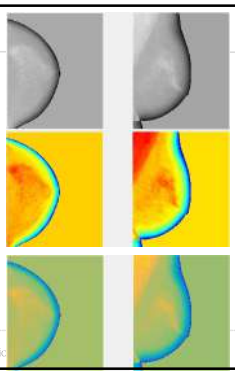
Aromatase inhibitor & testosterone

Wellend Health



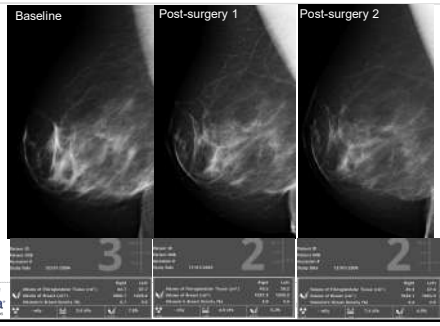
Density maps are powerful concepts, but where next?

Colour maps to indicate highest density?



NOT AVAILABLE FOR SALE

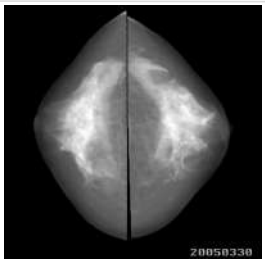
Change over time – effects of oophorectomy



Institut de cancérologie GUSTAVE ROUSSY

ECR 2016

Change over time



Tyrer-Cuzick 8 (IBIS Model)

Consider a 50 year old woman with no family history of breast or ovarian cancer, and population-average values of all risk factors…

On TC7, her lifetime risk is 8.2%—just population risk

On TC8, if she has low density (1.5% VBD) her lifetime risk is 2.7%—less than 3× the population risk

Conversely, if she has high density (17.5% VBD) her lifetime risk is 19.2%—more than 2× population risk

Risk of developing cancer

"Digital mammographic density and breast cancer risk: a case-control study of six alternative density assessment methods"
Breast Cancer Research, September 2014

"Automated Measurement of Volumetric Mammographic Density: A Tool for Widespread Breast Cancer Risk Assessment"
Cancer Epidemiology Biomarkers & Prevention, July 2014

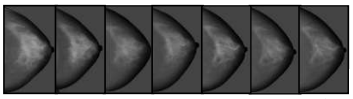
"Comparison of Clinical and Automated Breast Density Measurements: Implications for Risk Prediction and Supplemental Screening"
Radiology, January 2016

"Breast cancer risk and mammographic density assessed with semi-automated and fully automated methods and BI-RADS"
Radiology, October 2016

"Volumetric Breast Density Improves Breast Cancer Risk Prediction"
San Antonio Breast Cancer Symposium, December 2014

In conclusion

- We are at the start of how machines can help with breast cancer detection
- Big data, and the ability to process and look for subtle patterns will reveal new connections – but we need to understand them to be able to use them.



Millions of cases and controls

Family history
Lifestyle
Outcomes

How good can we get?

Risk

Tyrer-Cuzick 8 (IBIS Model)

Risk assessment tool for breast cancer, now includes breast density.

http://www.ems-trials.org/riskevaluator/