

norsvin



The use of Computerized Tomography in pig breeding

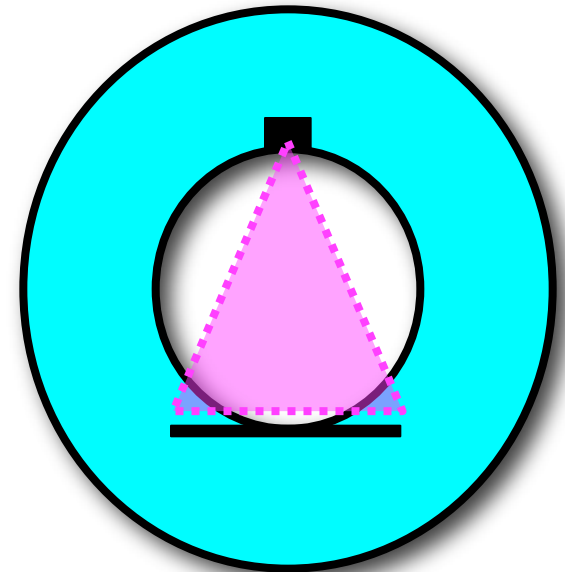
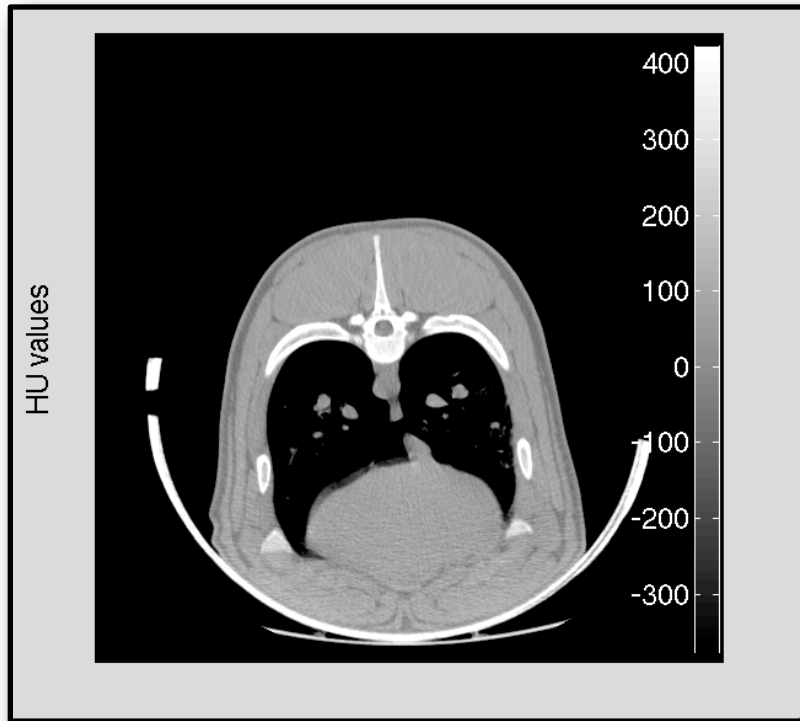
Jørgen Kongsro
Norsvin

Purpose

To give an overview to the use of Computerized Tomography (CT) in pig breeding

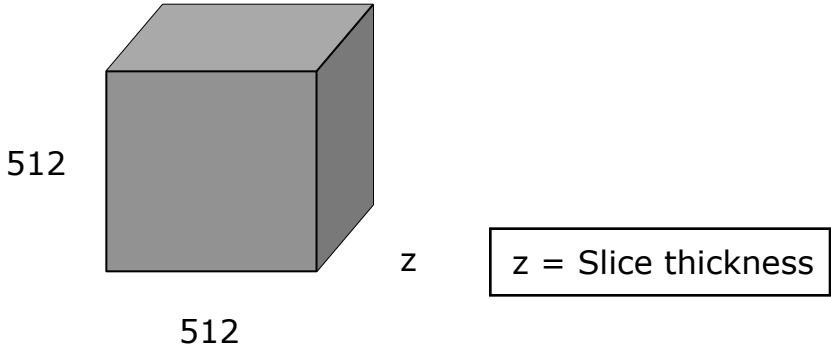
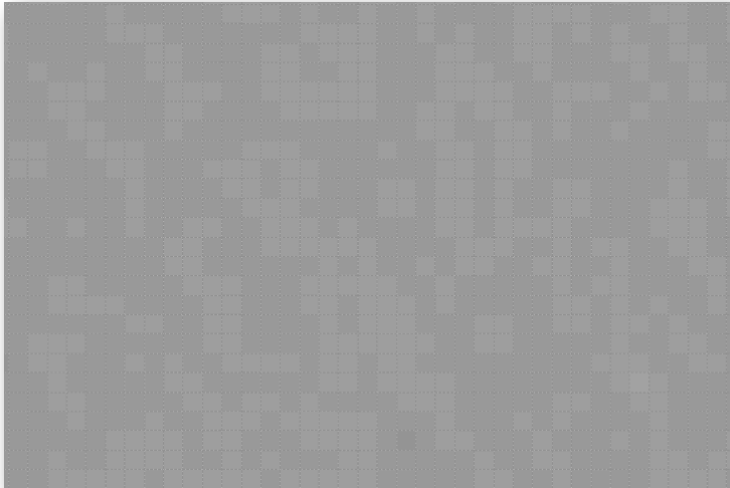
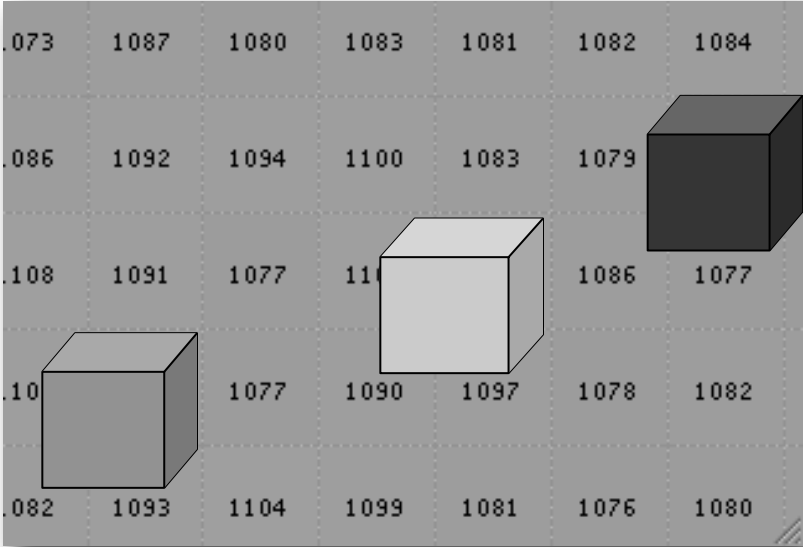


Computed Tomography

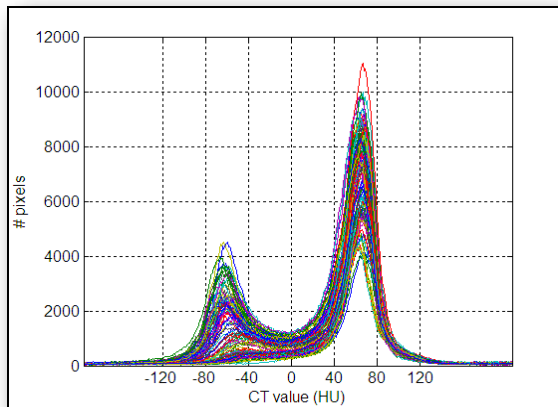
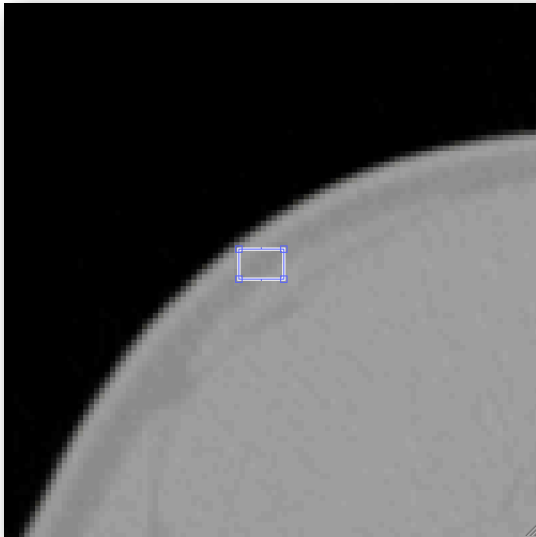


Pixels Voxels

Texture



Computed Tomography



1048	1068	1060	1020	994	979	945	940	1010
1060	1058	1032	977	955	955	946	958	1010
1033	1001	980	964	957	943	961	983	1010
1009	968	945	954	974	944	978	1036	1010
968	967	953	953	989	978	997	1061	1010
938	957	971	975	1010	1035	1047	1058	1010

HU = 0; gray value = 1024

Norsvin Delta test station



Boar test station

3.500 boars tested annually
(1800 landrace and 1700 duroc)

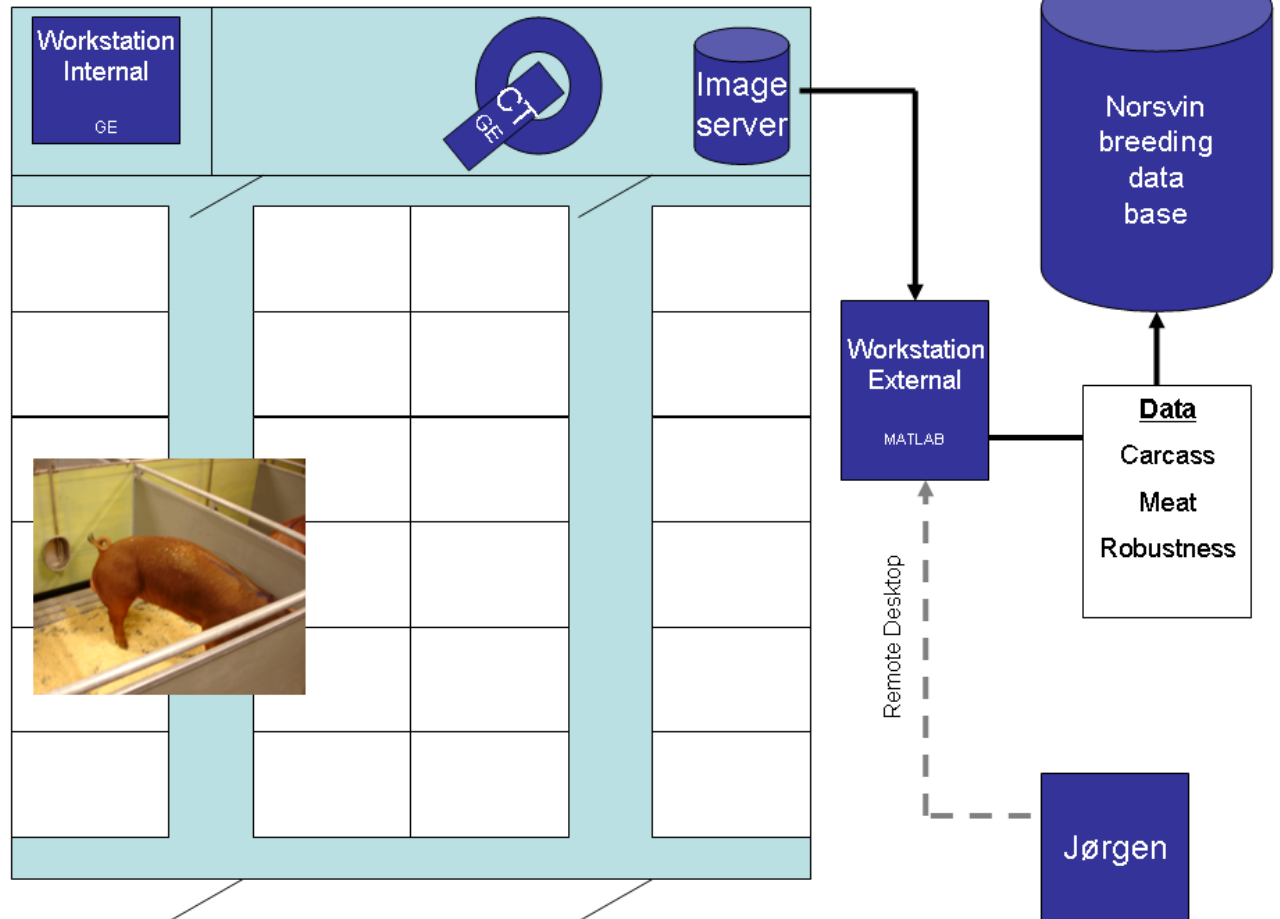
Boars are recruited from
nucleus farms across
Norway

- CT
- FIRE (feed and weight)
- Exterior evaluation

Norsvin Delta test station

The CT unit

- 1000-1100 images per animal
- 10 min handling and scanning per animal
- 25 min image analysis time per animal
- 24 animals a day
- 72 animals a week
- 3.500 animals a year



Norsvin Delta test station

The CT scanner

GE Healthcare Lightspeed
VCT Select 32

Multi-slice
32 slices per rotation
(upgradable to 64)

100 kW, 800 mA X-ray tube

0.4 s rotation time
0.625 mm slice thickness
190 cm scan length

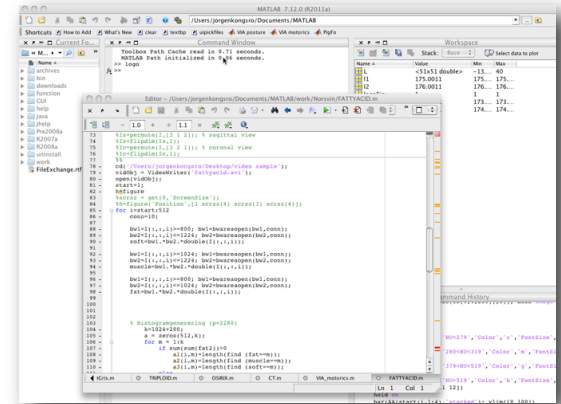
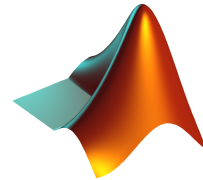


Norsvin Delta test station

The CT software

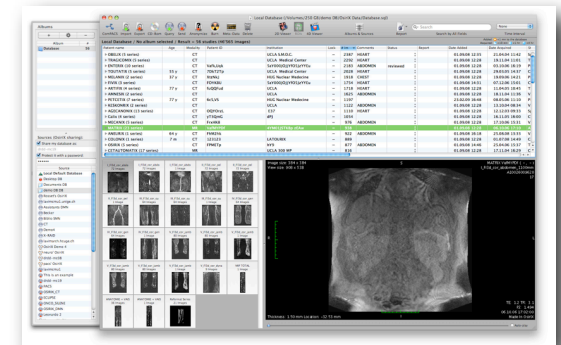
MATLAB

Image processing
toolbox
Automating

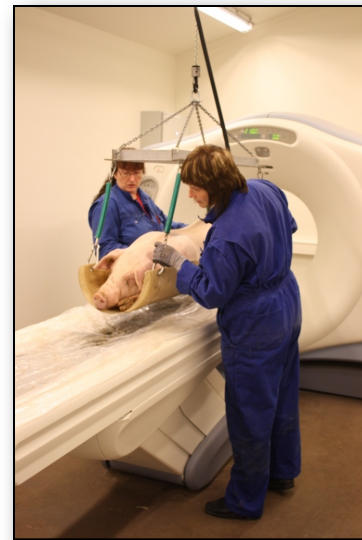


OSIRIX

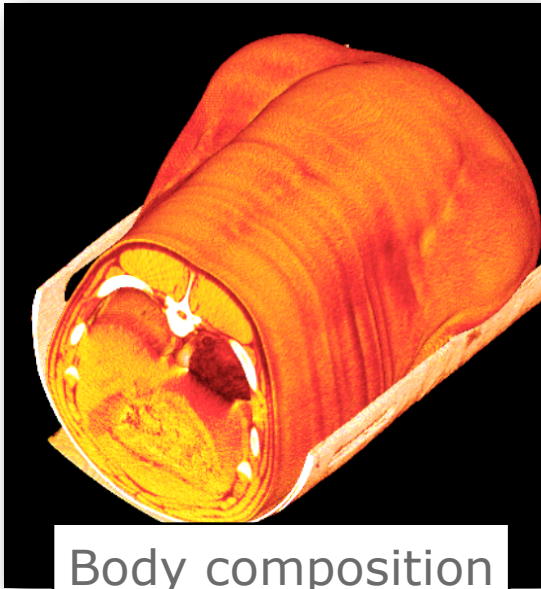
Graphic workstations
DICOM reader/writer
Navigation
Visualization







Phenotyping

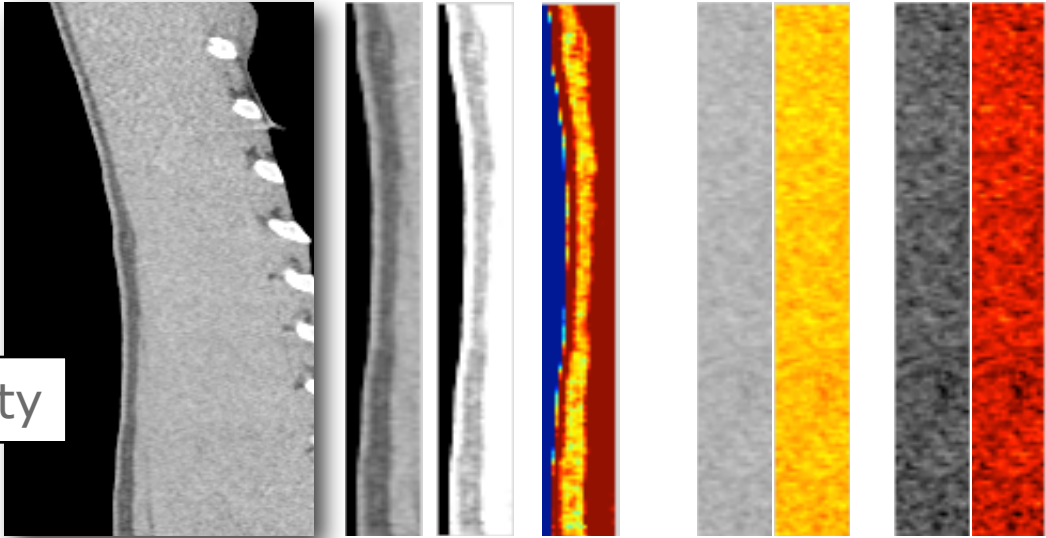


Body composition
Carcass quality



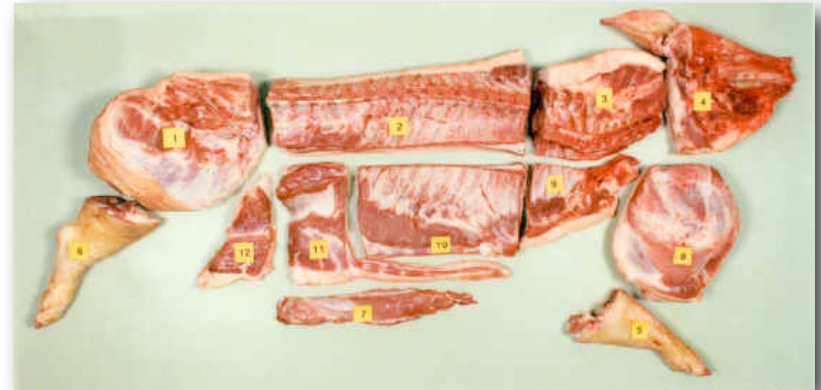
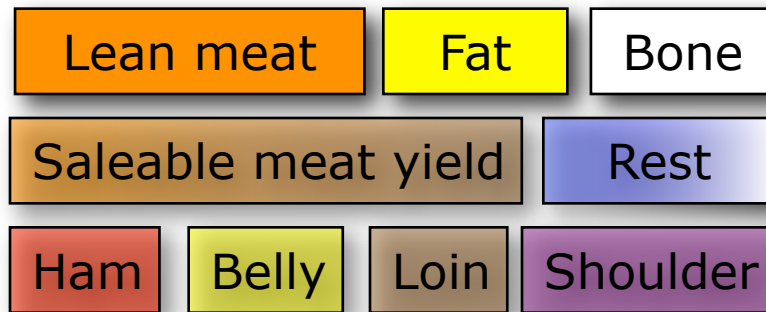
Diagnostic imaging

Meat quality



Body composition

Carcass quality



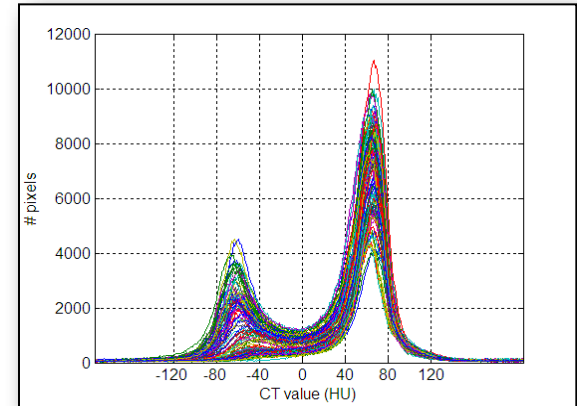
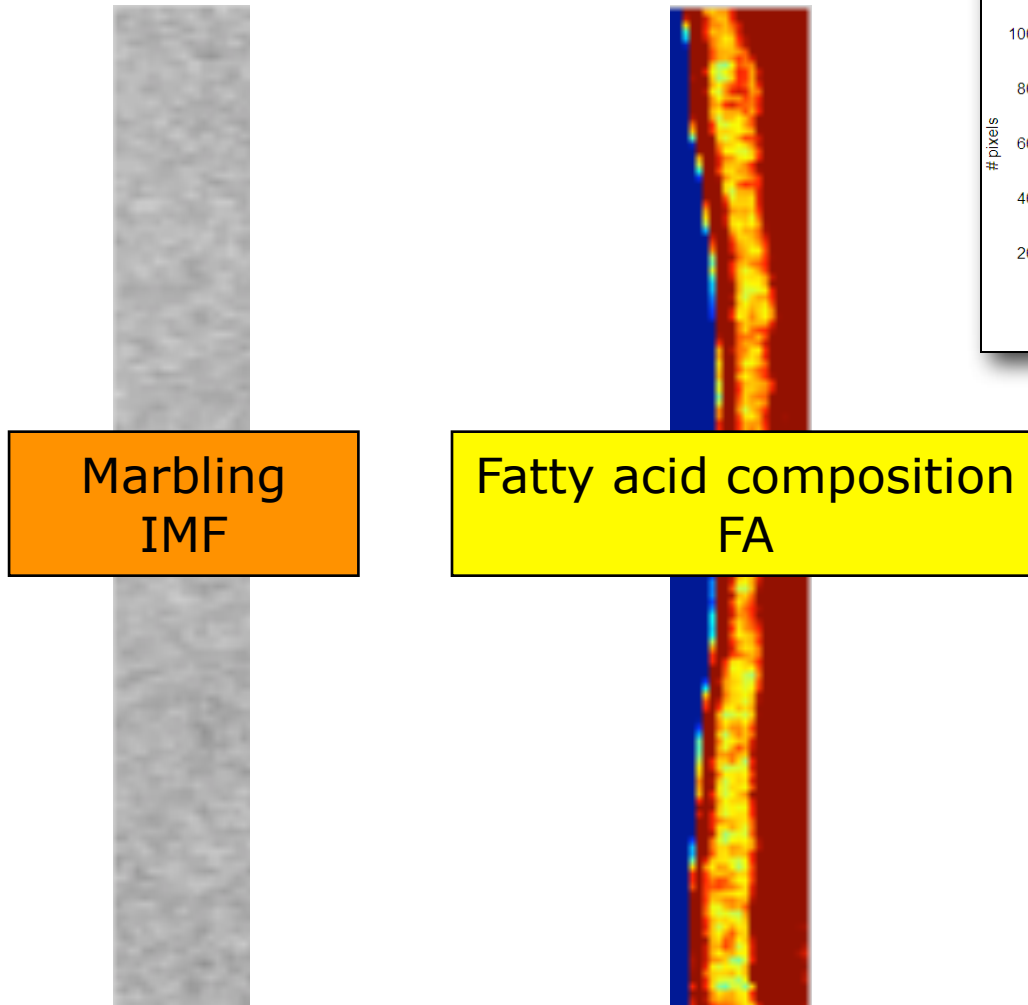
www.eupigclass.net

For body composition, it works!

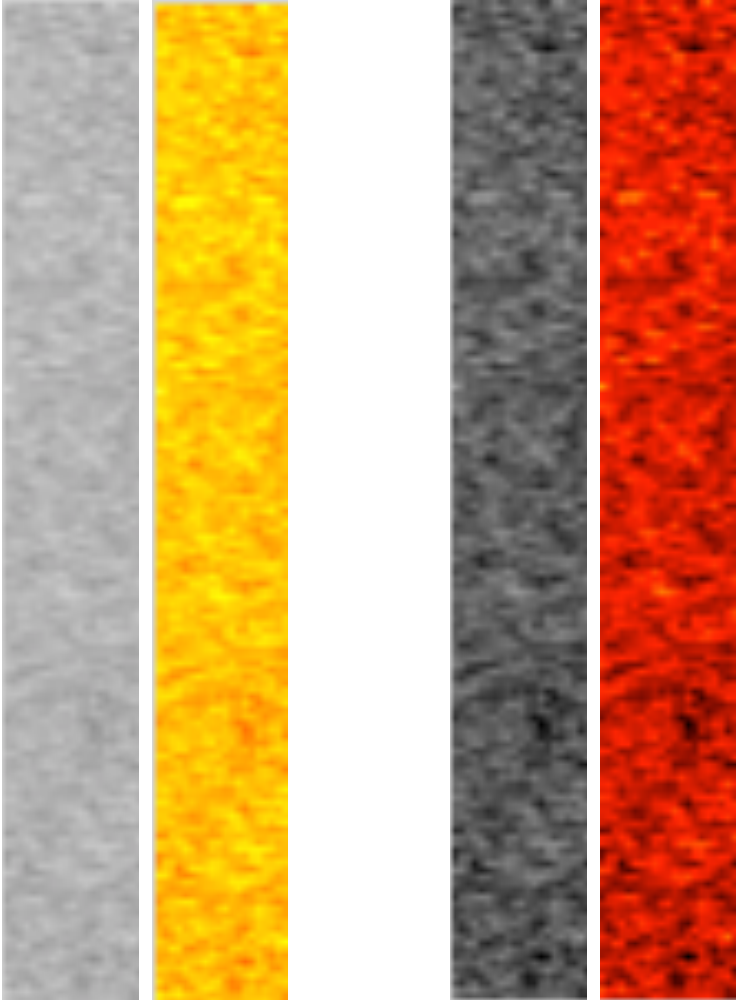
A matter of reference method; what is the gold standard

Biological vs. commercial dissection

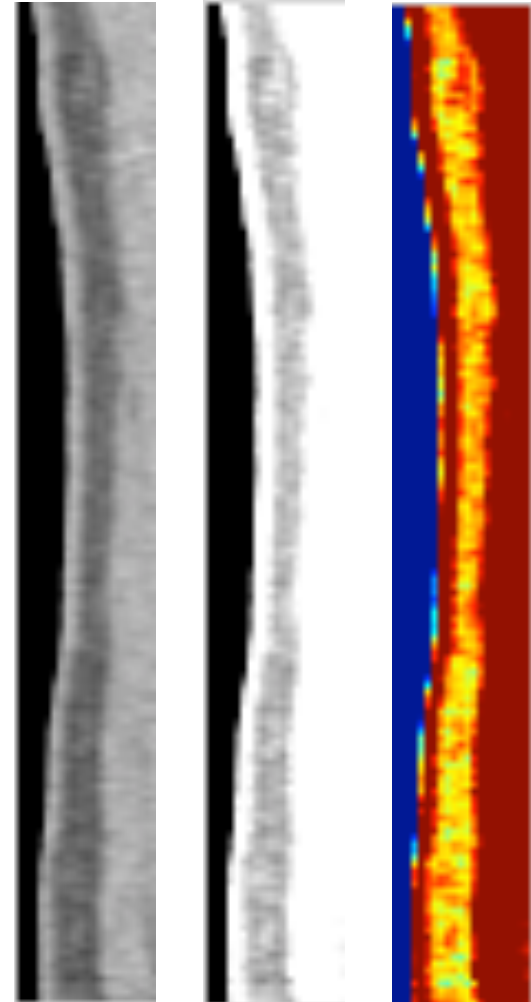
Meat quality



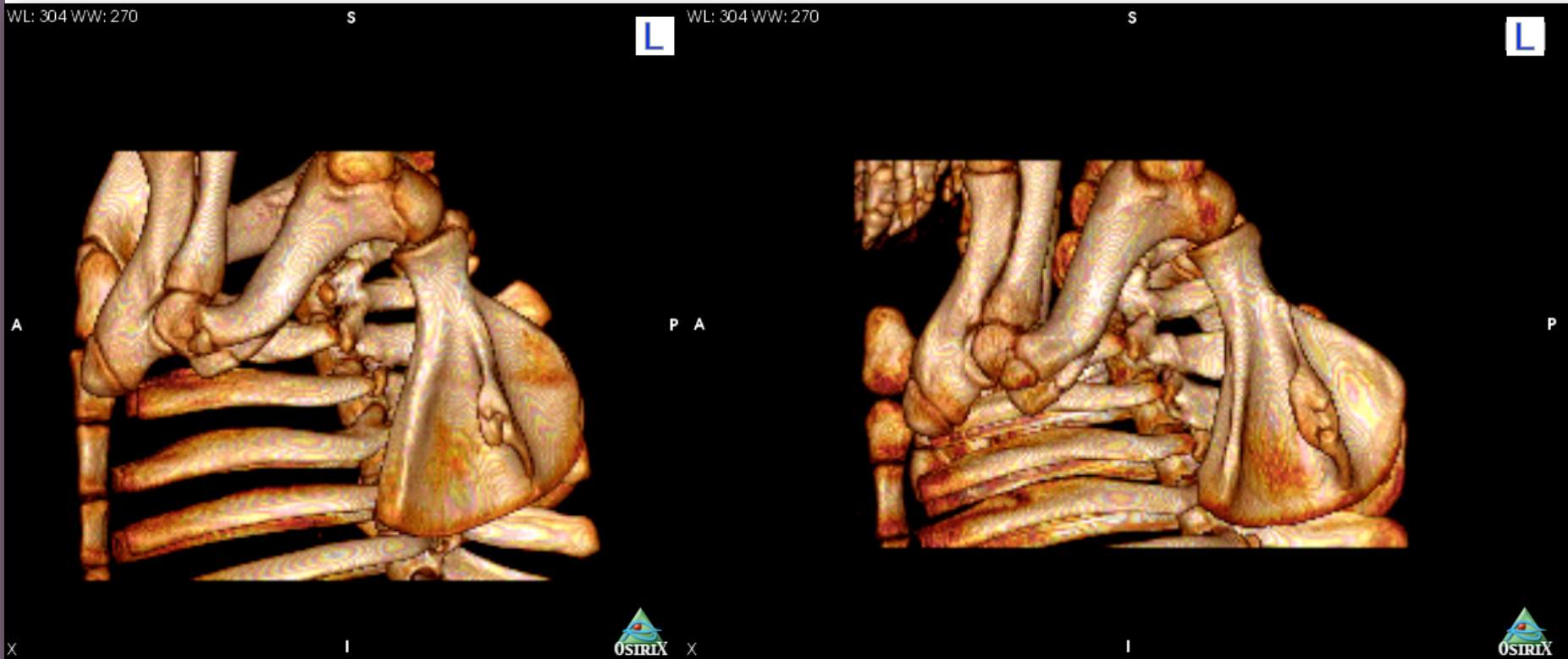
Intramuscular fat



Fatty acid composition (MUFA / PUFA)



Scapula morphology



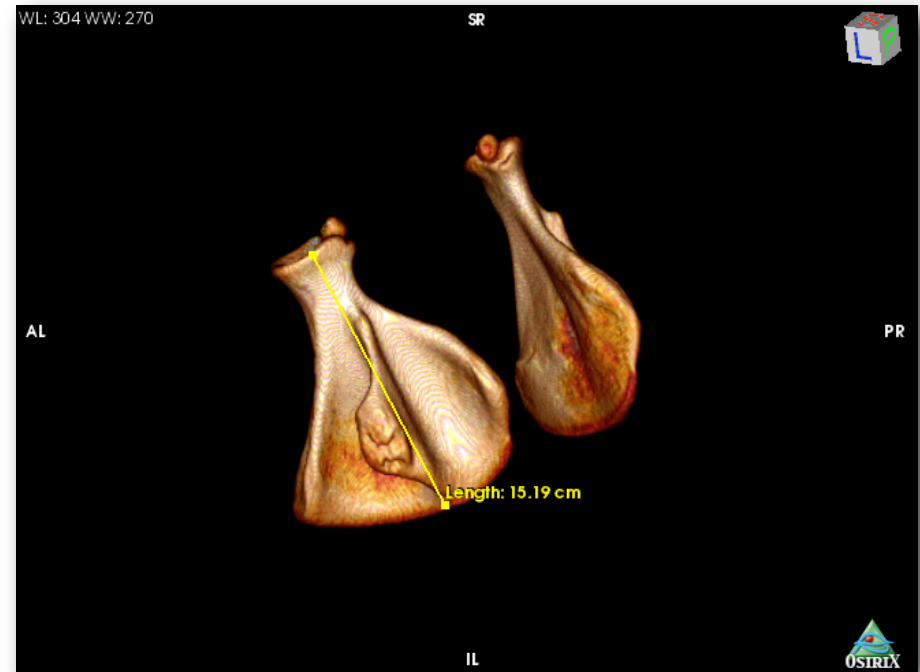
Duroc

Landrace

Scapula morphology

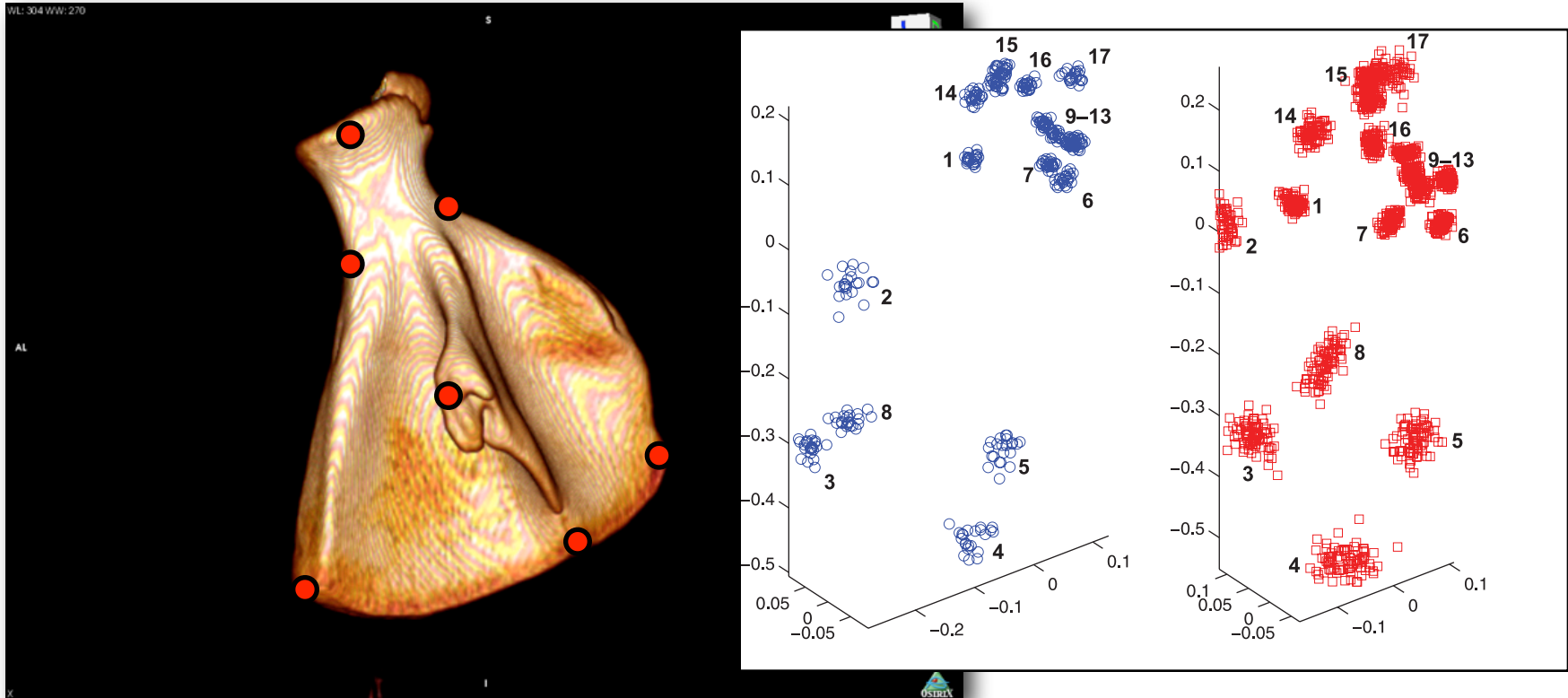


Duroc



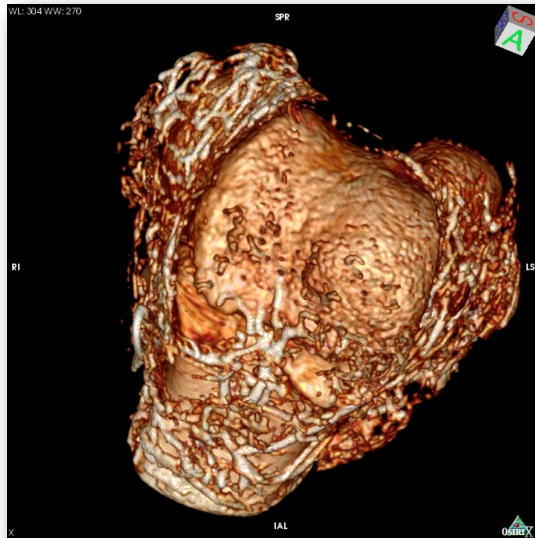
Landrace

Scapula morphology



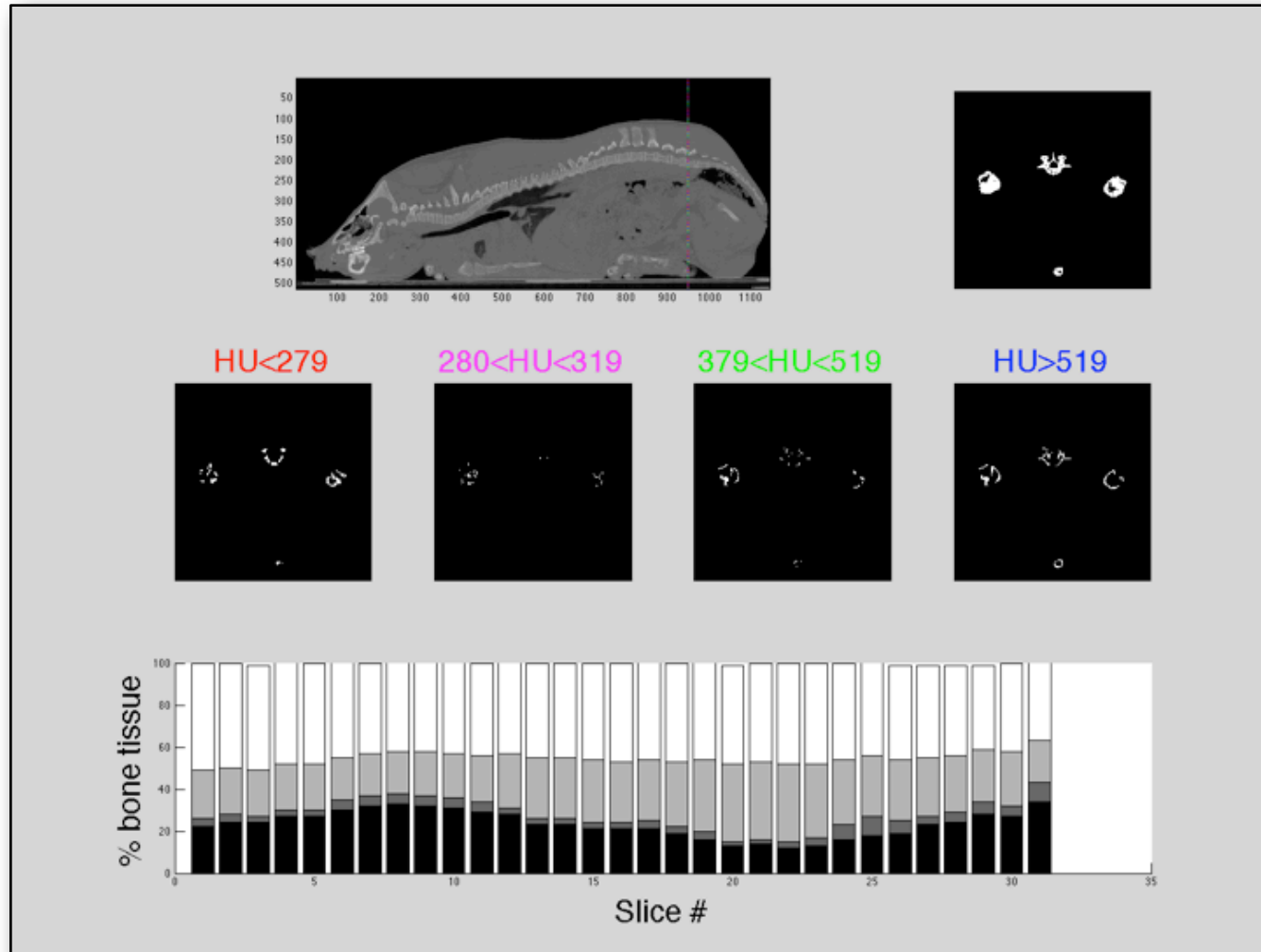
Young 2006. "Function, ontogeny and canalization of shape variance in the primate scapula." *Journal of anatomy* 209(5):623-36.

Osteochondrosis



Olstad et al. 2008. "Micro-computed tomography of early lesions of osteochondrosis in the tarsus of foals." *Bone* 43(3):574–583.

Osteochondrosis - quantitative



Empel & Sehested 1986. "Qualitative, Semiquantitative and Quantitative Diagnosis of Osteochondrosis in Pigs by Computed Tomography (CT)." *Acta Agriculturae Scandinavica* 36(2):186-194.

Requirements to apply CT in animal selection programs

- ✓ Handling
- ✓ Isolated units
- ✓ Biosecurity
- ✓ Large-scale breeding program to serve
- ✓ Image analysis system for CT

Horn (1995)

Conclusion

- Body composition

Harmonization of the use of CT in commercial dissection

Prediction / estimation of cuts, saleable meat yield

- Meat quality

Prediction of IMF and fatty acid composition

- Diagnostic imaging

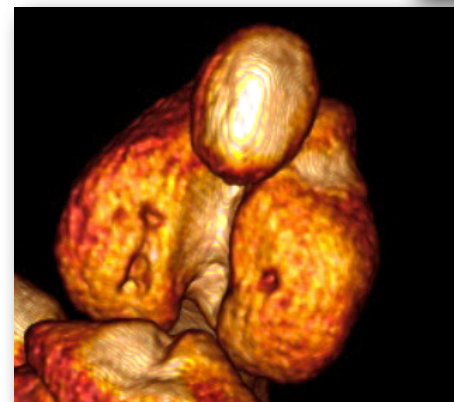
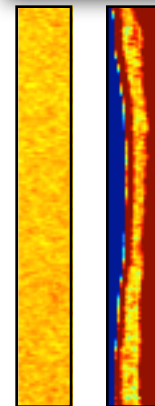
Lameness

Internal organs

Hernia

Conformation and shape

Exterior traits



Conclusion

What benefits do CT give to a pig breeding company like Norsvin?

Before CT, there was half-sib test...

Genetic improvement:

- > Carcass traits sampled from live animals
- > Higher reliability
- > Increased test capacity
- > Multiple registrations backward in time

norsvin

