

Svinekongres 2018

Realtidsovervågning i svineproduktionen

Nils Toft
Thomas Nejsum Madsen



Software i svineproduktionen



- Overvågning – generel udvikling i industrien
- Hvad kan vi lære fra Industry 4.0 og Machine learning?
- Udfordringer med biologiske data
- Relevante forskningsresultater
- Eksempler på overvågning
- Samkøring af flere datakilder
- Fremtiden – hvad skal du være opmærksom på som svineproducent

Tendenser

Børsen:

Regeringen vil satse på kunstig intelligens: "100 pct. af vores arbejdspladser bliver influeret"



Uddannelses- og forskningsminister Tommy Ahlers (V) lægger i forhandlingerne om næste års forskningsreserve op til at øge bevillingerne til forskning i digital udvikling fra 160 millioner kroner i år til 300 millioner kroner til næste år.

Foto: Mads Claus Rasmussen/Ritzau Scanpix

Forbes:

7,603 views | Feb 14, 2018, 12:30am

This Week In China Tech: Alibaba Brings AI To Pig Farming And Retail Tech On The Rise



Bay McLaughlin Contributor ⓘ

I write about underreported tech stories out of China.

"Big Data"

"Cloud computing"

"Kunstig intelligens (AI)"

"Machine learning"

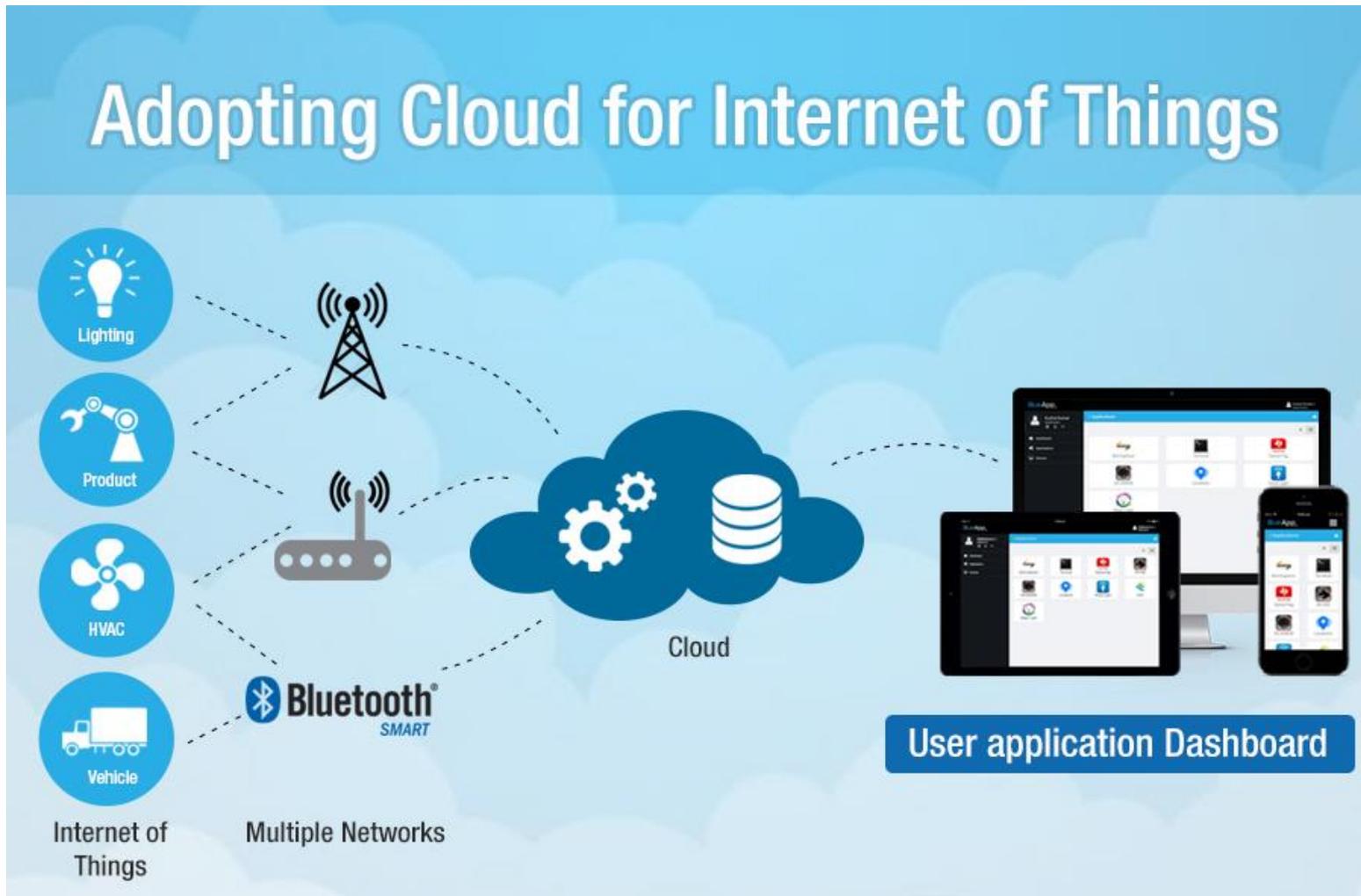
Ali Cloud AI technology



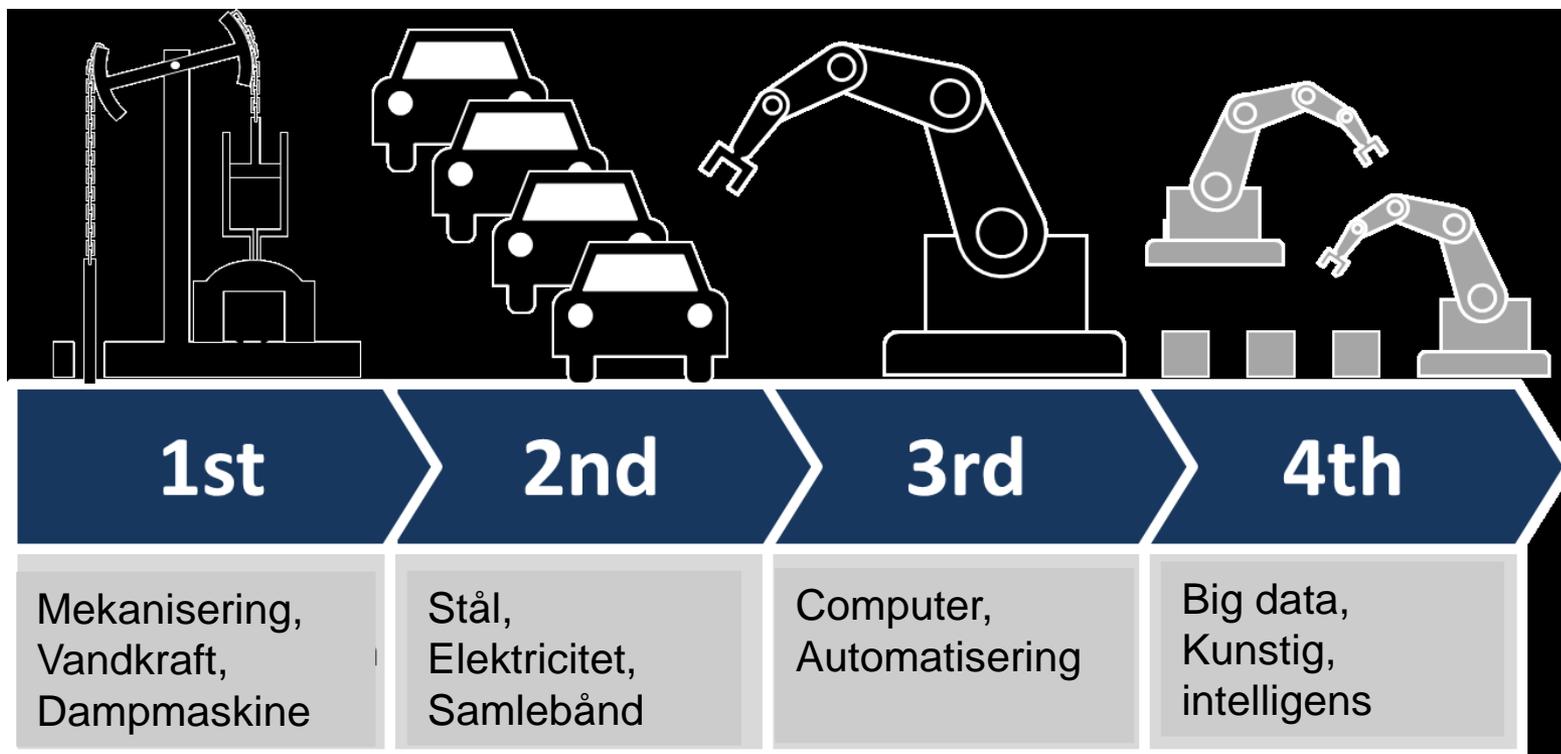
Cloned pigs (R) and their surrogate mother pig are pictured on July 4, 2017 in Tianjin, China. (Photo by Jiang Baocheng/VCG via Getty Images)

- Genkender grise på 'ansigt' og lyde
- Måler aktivitet og opdager sygdomme
- Hvilken so har født hvilke grise
- Måler grisens søvn
- Måler grisens glæde – via tid brugt på legetøj
- Dokumenterer fuld livscyklus for grisen

IoT – overordnet koncept

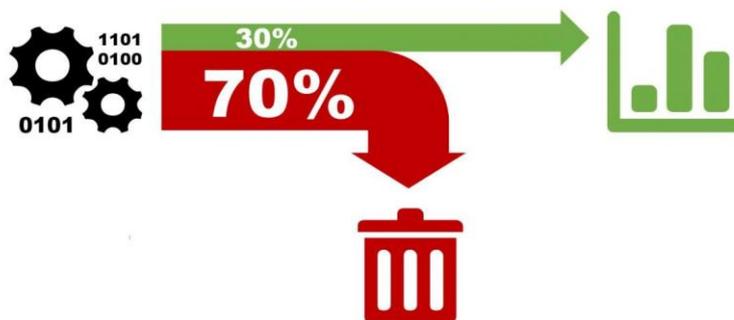


Industry 4.0 – den 4. industrielle revolution



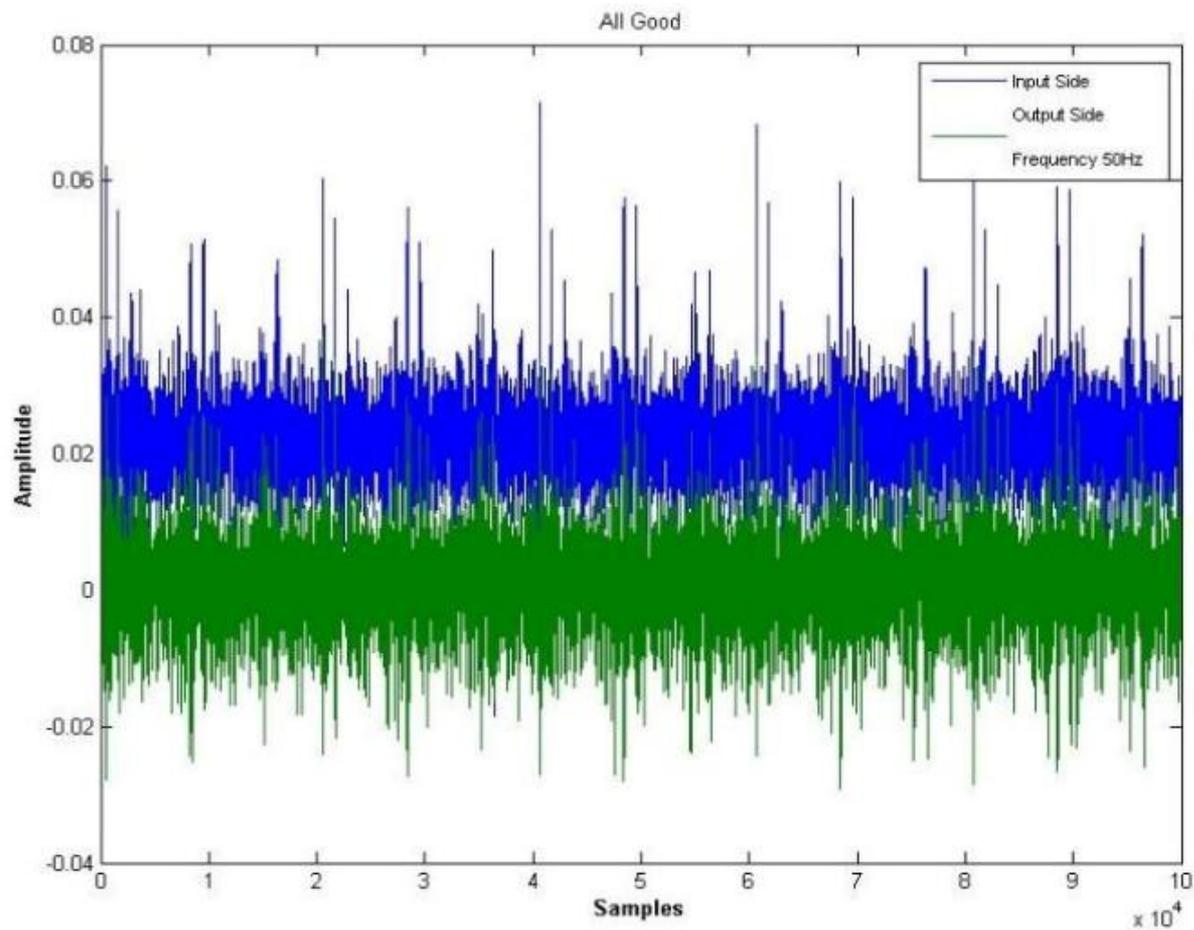
Brug af data i industrien – machine learning

”Machine learning er videnskaben om at få computere til at handle uden at være eksplicit programmeret”

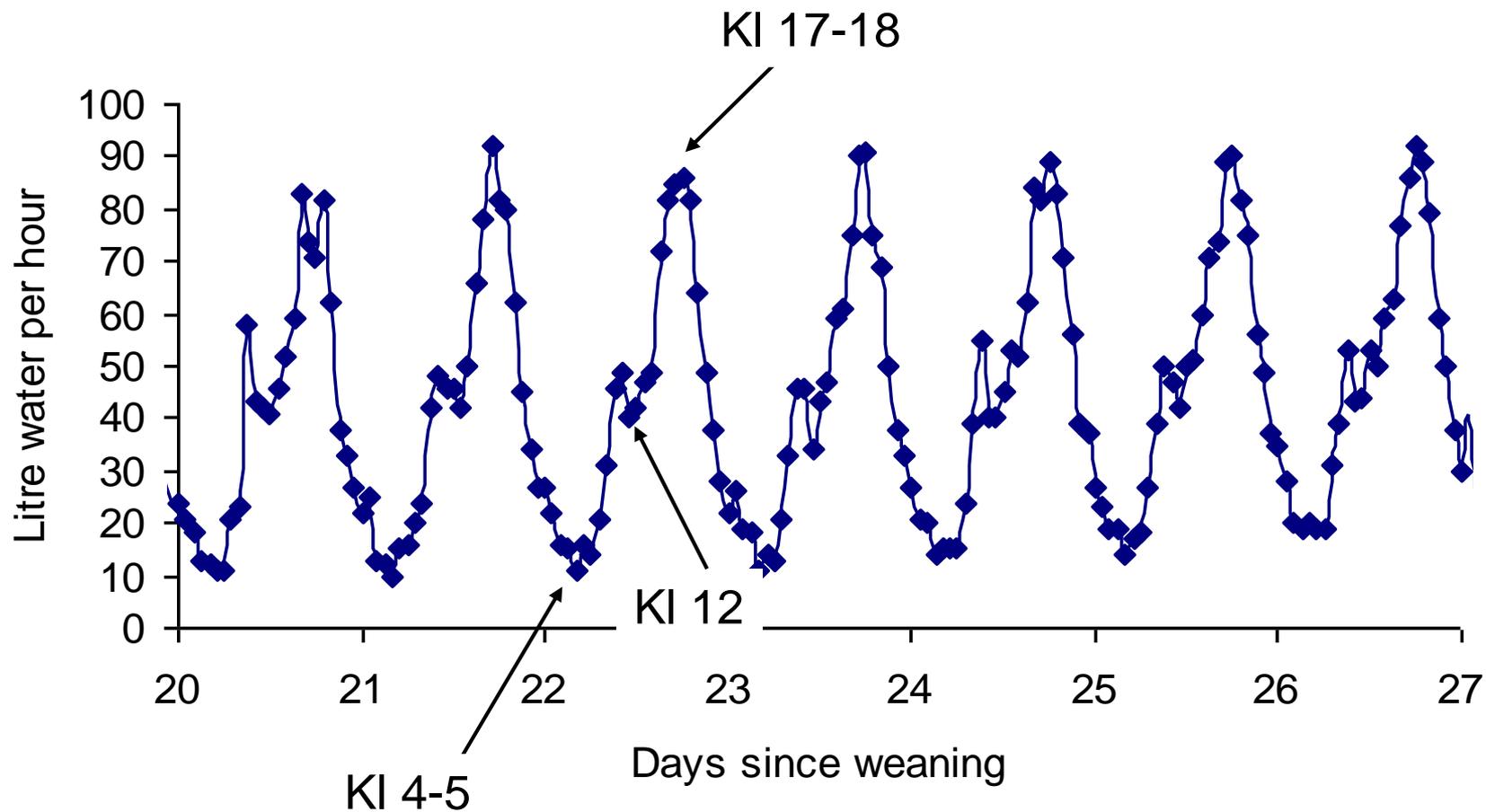


Data som ikke bruges

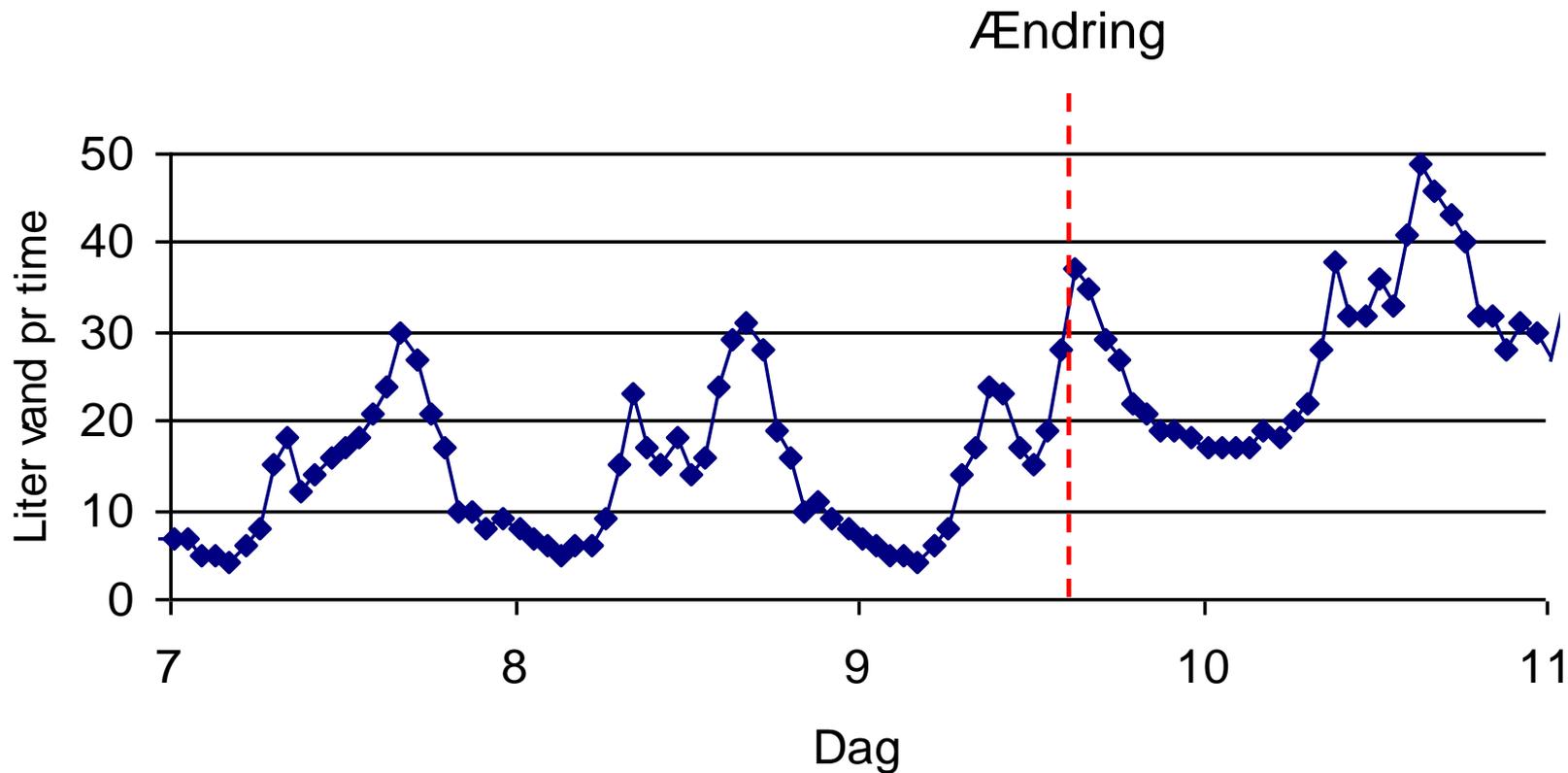
Vibrationer fra industrimaskine



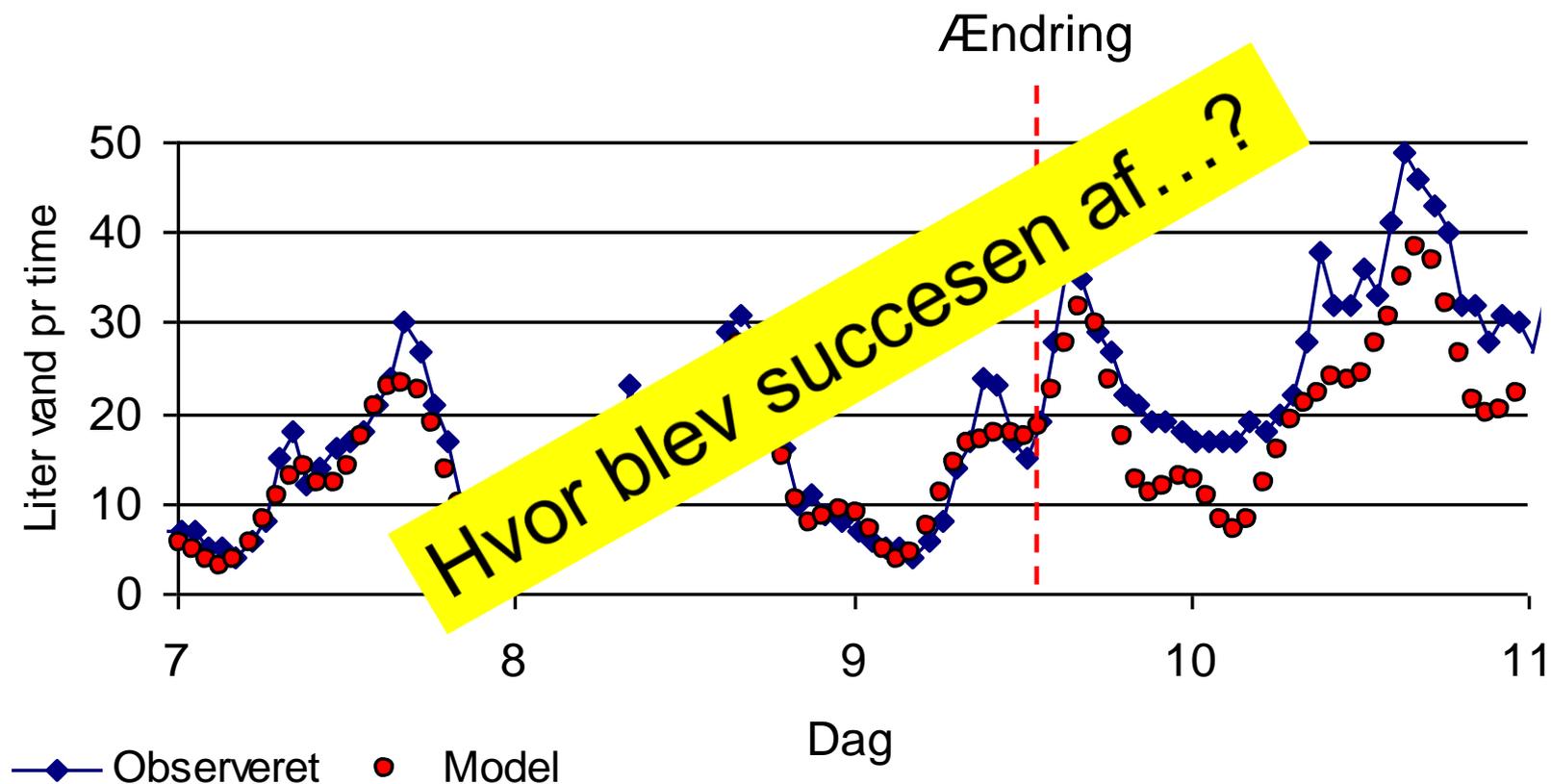
Vandforbrug pr time (7 dage)



Ændring i drikkeadfærd



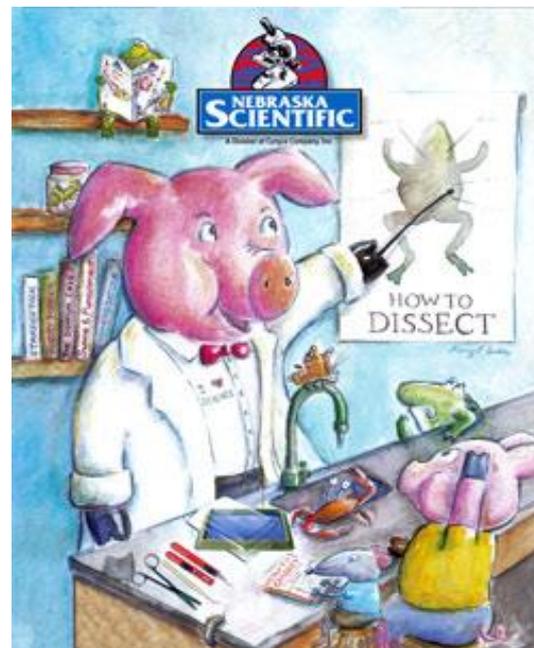
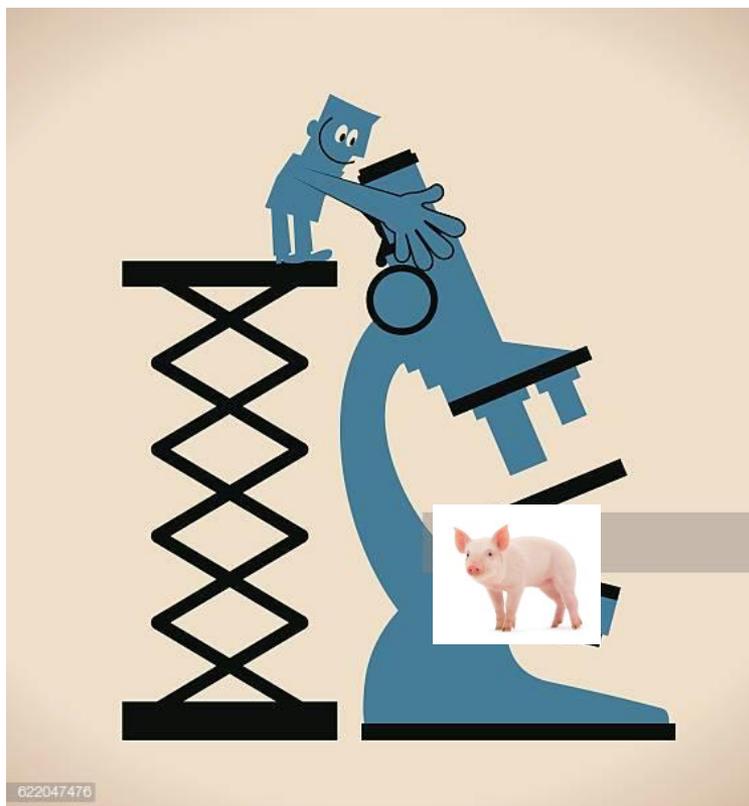
Forecast vs. observation



Vækst – Viden – Velfærdsteknologi

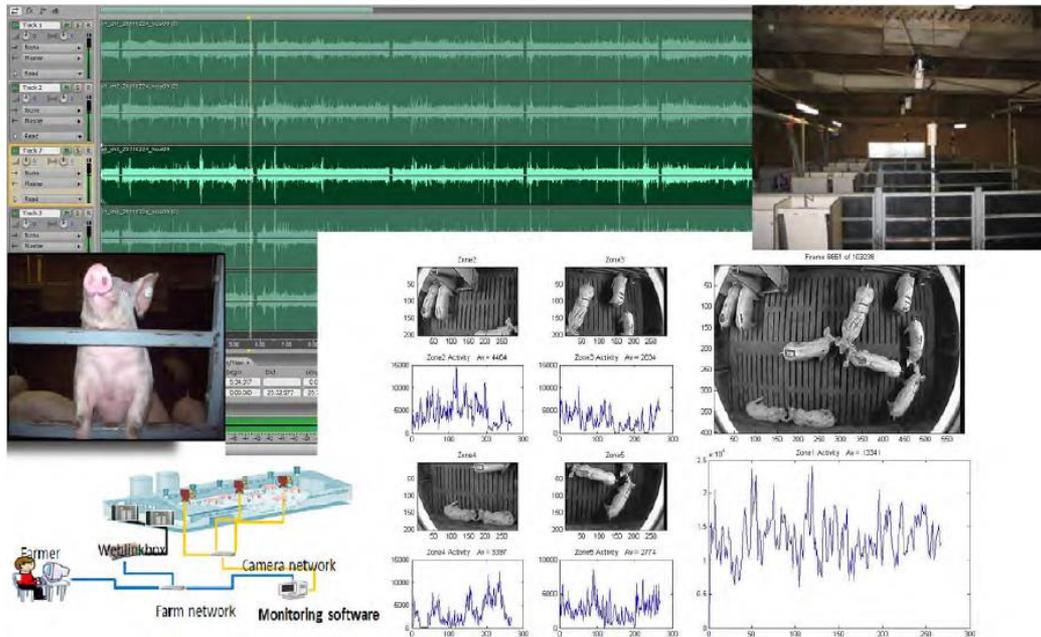


Eksempler fra litteraturen.





Kvantificering af adfærd, sundhed og produktivitet.



M3-BIORES KU LEUVE

(Ref: D. Berckmans)

SPONSORED DOCUMENT FROM

VETERINARY JOURNAL
(LONDON, ENGLAND : 1997)

ELSEVIER
FREE Full-text Article

[Vet J.](#) 2016 Nov; 217: 43–51.
doi: [10.1016/j.tvjl.2016.09.005](https://doi.org/10.1016/j.tvjl.2016.09.005)

PMCID: PMC5110645
PMID: 27810210

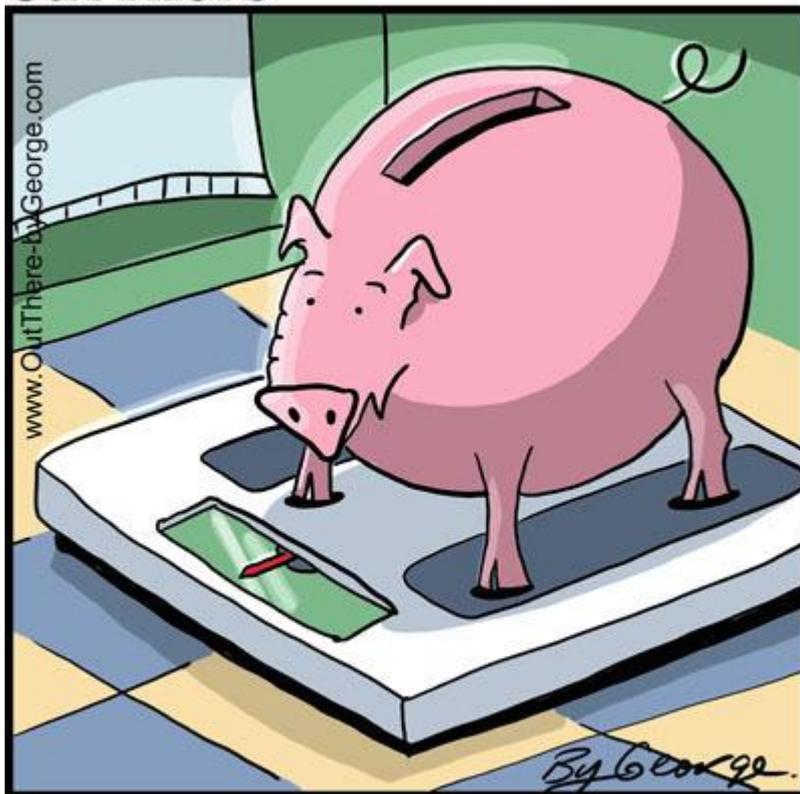
Early detection of health and welfare compromises through automated detection of behavioural changes in pigs

[Stephen G. Matthews](#),^{a,*} [Amy L. Miller](#),^b [James Clapp](#),^b [Thomas Plötz](#),^a and [Ilias Kyriazakis](#)^b

[Author information](#) ▶ [Article notes](#) ▶ [Copyright and License information](#) ▶ [Disclaimer](#)

Automatisk vejning af grise

Out There



“Excellent, I’ve lost three dollars”



Computers and Electronics in Agriculture

Volume 109, November 2014, Pages 32-35



Application note

Estimation of pig weight using a Microsoft Kinect prototype imaging system

Jørgen Kongsro

1985 –
Billedbehandling
kan veje grise

1996 –
Første danske publikation

2010+ regnekraft
og kamera billigere
– flere publikationer

2018 –
Kommercielle
systemer



Computers and Electronics in Agriculture

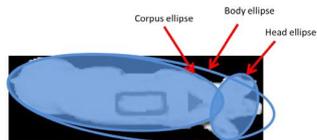
Volume 129, 1 November 2016, Pages 37-43



Original papers

An approach of pig weight estimation using binocular stereo system based on LabVIEW

Chen Shi, Guanghui Teng, Rui Li, Zhuo Li



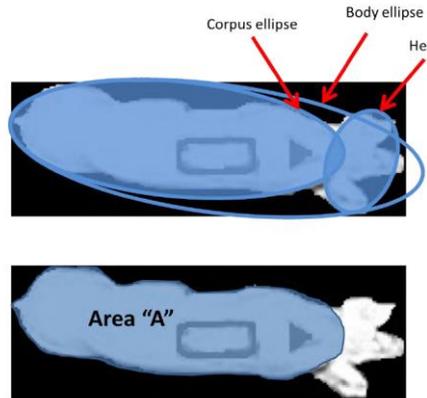
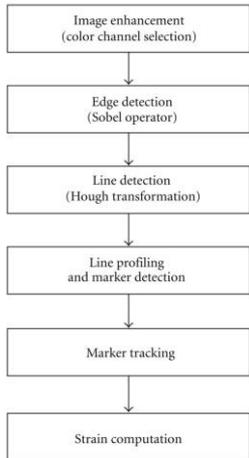
Totalløsninger Produkter Videns Kontakt

Manuel vejning er besværligt, tidskrævende, stressende for dyrene og samtidig giver vejnedata kun et øjeblikbillede af den aktuelle produktion. Med kameravejning kan du løbende følge dyrenes tilvækst og spredningen på dyrenes vægt i stien.

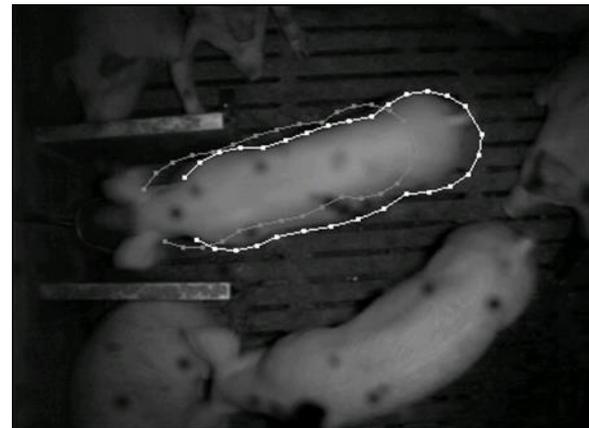
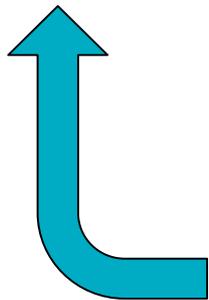
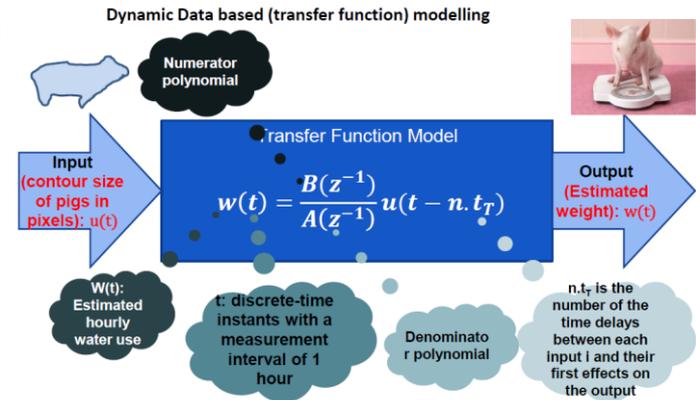


Præcis vejning





Model-based weight estimation







Totalløsninger Produkter Viden Kontakt

Manuel vejning er besværligt, tidskrævende, stressende for dyrene og samtidig giver vejedata kun et øjebliksbillede af den aktuelle produktion. Med kameravejning kan du løbende følge dyrenes tilvækst og spredningen på dyrenes vægt i stien.



Præcis vejning



REALTIDSOVERVÅGNING AF SLAGTESVIN MED PROGROW

MEDDELELSE NR. 1140

ProGrow giver med udglatning af data et sikkert billede af grisenes tilvækstkurve, for de stier der overvåges. Hvis der ønskes et udtryk for produktivitet i hele sektionen/stalden, skal mindst 2/3 af alle stier overvåges.

INSTITUTION:	SEGES SVINEPRODUKTION, DEN RULLENDE AFPRØVNING
FORFATTER:	FINN UDESEN & JULIE KROGSDAHL BACHE
UDGIVET:	14. AUGUST 2018

Dyregruppe:	Slagtesvin
Fagområde:	Produktionsovervågning

Hvordan bruger man så kontinuerte vægtdata?

Animal (2018), 12:2, pp 295–302 © The Animal Consortium 2017. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.
doi:10.1017/S1751731117001690



Analyses of body weight patterns in growing pigs: a new view on body weight in pigs for frequent monitoring

A. H. Stygar^{1†}, K. A. Dolecheck² and A. R. Kristensen¹

¹Department of Veterinary and Animal Sciences, University of Copenhagen, Grønnegårdsvej 2, DK-1870 Frederiksberg C, Denmark; ²Department of Animal and Food Sciences, University of Kentucky, Lexington, KY 40546, USA

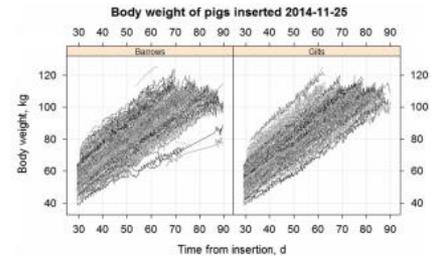


Figure 2 Body weight of all pigs from Batch 1. Each line represents the BW of an individual pig.

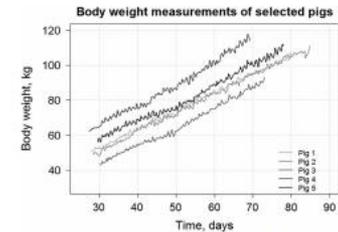


Figure 3 Body weight measurements collected during the whole fattening period of selected pigs from pen number 1.

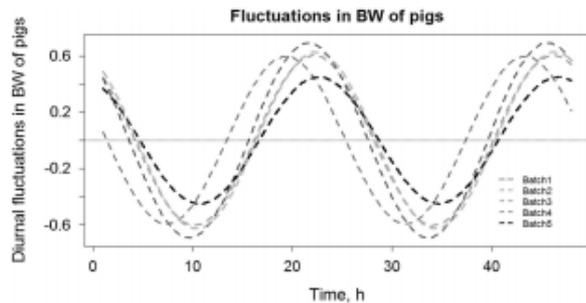


Figure 4 Diurnal fluctuations in the BW of pigs from each batch estimated from the developed model.

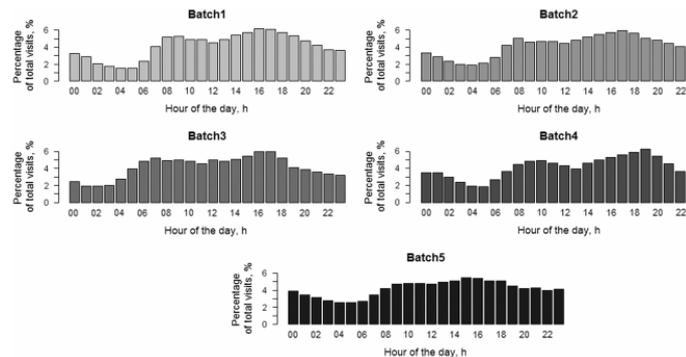


Figure 5 Percentage of total visits to the feeding area (BW measurements) in each batch depending on the hour of the day.

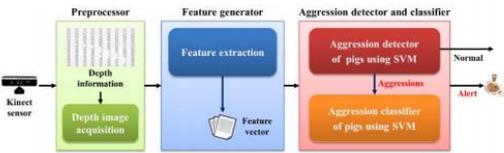


Figure 1. Overall structure of the pig aggression recognition system.



Article
Automatic Recognition of Aggressive Behavior in Pigs Using a Kinect Depth Sensor

Jonguk Lee¹, Long Jin², Daihee Park^{1*} and Yongwha Chung^{1*}

¹ Department of Computer and Information Science, Korea University, Sejong Campus, Sejong City 30019, Korea; eastwest9@korea.ac.kr
² Ctrip Co., 99 Fu Qian Road, IT Security Center, Shanghai 200335, China; jinlong823@korea.ac.kr
 * Correspondences: dhpark@korea.ac.kr (D.P.); ychung@korea.ac.kr (Y.C.); Tel.: +82-44-860-1344 (D.P.); +82-44-860-1343 (Y.C.); Fax: +82-44-860-1384 (D.P. & Y.C.)



Computers and Electronics in Agriculture
 Volume 124, June 2016, Pages 295-302



Original papers

Automatic detection of mounting behaviours among pigs using image analysis

Abozar Nasirahmadi^{a, b, c, d, e}, Oliver Hensel^b, Sandra A. Edwards^a, Barbara Sturm^{a, b}

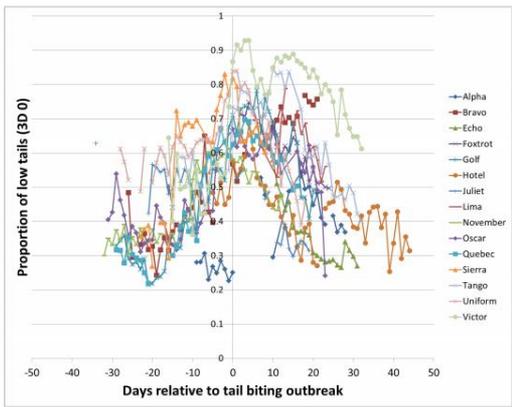


Fig 3. Proportion of 3D tail detections of low tails (3D 0) on the days before and after an outbreak. Data are shown for the 15 outbreak groups, and each line indicates a different group (designated Alpha to Victor).



RESEARCH ARTICLE
Automatic early warning of tail biting in pigs: 3D cameras can detect lowered tail posture before an outbreak

Richard B. D'Eagle^{1*}, Mhairi Jack¹, Agnieszka Pulus¹, Darren Tallon¹, Giming Zhu², David Barclay³, Emma M. Baxter¹

¹ SRUC, Edinburgh, United Kingdom, ² Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush, Midlothian, United Kingdom, ³ Inverness Technology Ltd, Turriff, Aberdeenshire, United Kingdom

* richard.d@sruc.ac.uk

Abstract



Computers and Electronics in Agriculture

Volume 117, September 2015, Pages 1-7



Validity of the Microsoft Kinect sensor for assessment of normal walking patterns in pigs

Sophia Stavrakakis^{a, b, c, d, e}, Wei Li^b, Jonathan H. Guy^a, Graham Morgan^b, Gary Ushaw^b, Garth R. Johnson^c, Sandra A. Edwards^a

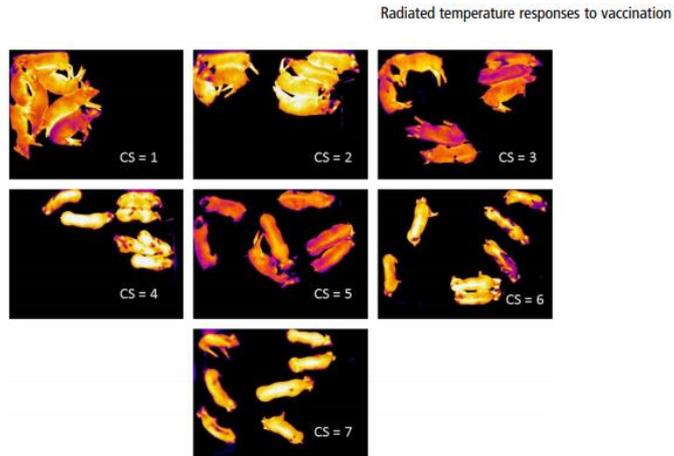


Figure 1 Examples of the spatial distributions of pigs within the pen showing cluster score categories 1 to 7. Cluster scores of 1, 2 and 3 were combined to give a high cluster score (HCS) category, and cluster scores of 4, 5, 6 and 7 were combined to give a low cluster score (LCS) category.

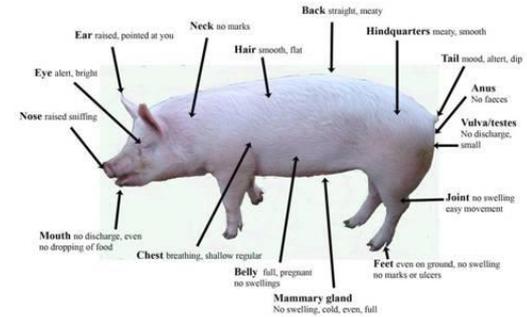
Animal (2015), 9:2, pp 339–346 © The Animal Consortium 2014. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/3.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.
doi:10.1017/S1751731114002481



Infrared thermography detects febrile and behavioural responses to vaccination of weaned piglets

N. J. Cook^{1†}, B. Chabot², T. Lui², C. J. Bench³ and A. L. Schaefer³

¹Alberta Agriculture and Rural Development, Livestock Research and Extension Division, Lacombe Research Centre, 6000 C&E Trail, Lacombe, Alberta, Canada T4L 1W1; ²Agriculture and Agri-Food Canada, Lacombe Research Centre, 6000 C&E Trail, Lacombe, Alberta, Canada T4L 1W1; ³University of Alberta, 3-10G Agriculture Forestry Centre, University of Alberta, Edmonton, Alberta, Canada T6G 2P5



Article

Depth-Based Detection of Standing-Pigs in Moving Noise Environments

Jinseong Kim¹, Yeonwoo Chung², Yunchang Choi¹, Jaewon Sa¹ , Heegon Kim¹, Yongwha Chung^{1,*}, Daihee Park¹ and Hakjae Kim³

¹ Department of Computer and Information Science, Korea University, Sejong City 30019, Korea; skykeepop@korea.ac.kr (J.K.); ycc4477@korea.ac.kr (Y.C.); sjwon92@korea.ac.kr (J.S.); khg86@korea.ac.kr (H.K.); dhpark@korea.ac.kr (D.P.)

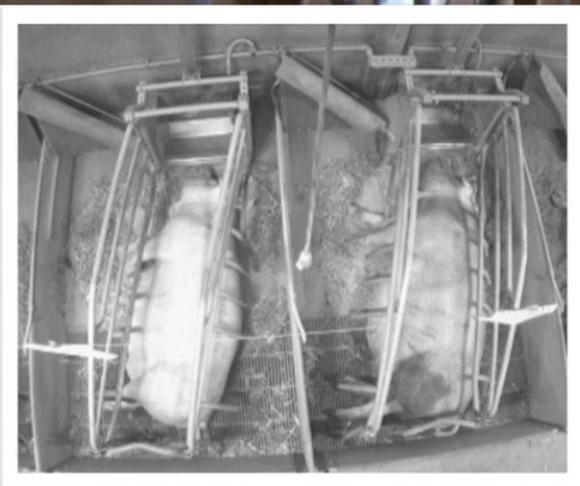
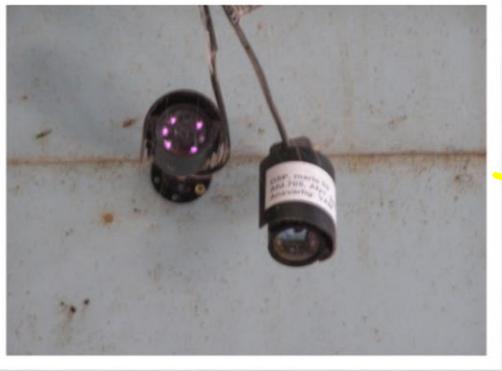
² Department of Applied Statistics, Korea University, Sejong City 30019, Korea; william0516@korea.ac.kr

³ Class Act Co., Ltd., Digital-ro, Geumcheon-gu, Seoul 08589, Korea; krunivs@gmail.com

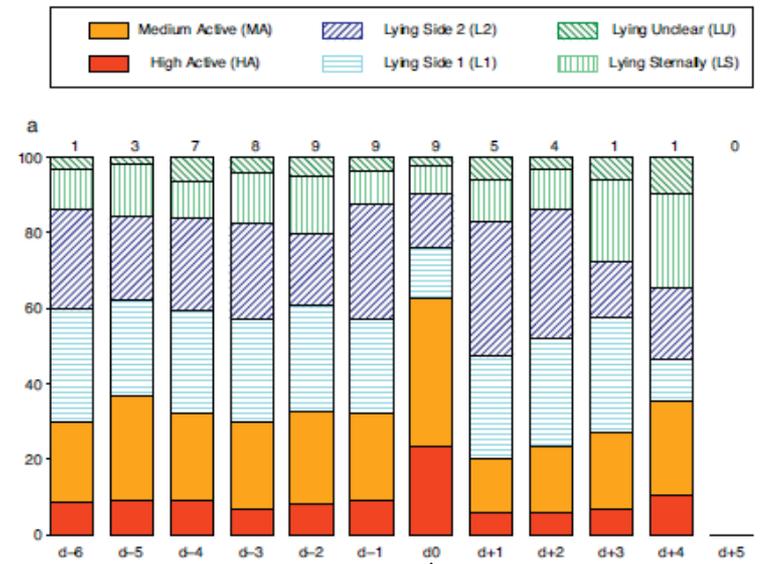
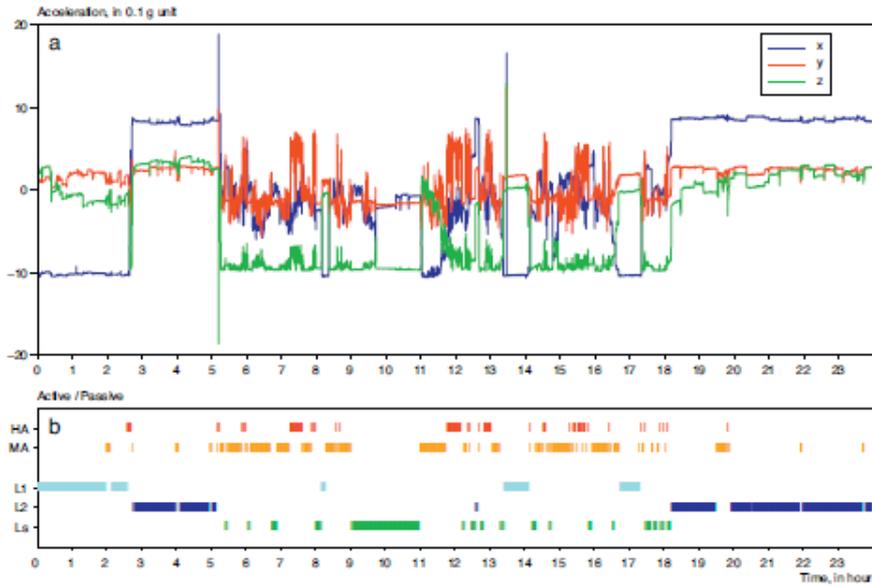
* Correspondence: ychungy@korea.ac.kr; Tel.: +82-44-860-1343

Received: 30 October 2017; Accepted: 27 November 2017; Published: 29 November 2017

Eksempel Hogthrob - Faresti



Accelerationsdata





Computers and Electronics in Agriculture

Volume 48, Issue 1, July 2005, Pages 39-61



Modelling the drinking patterns of young pigs using a state space model

Thomas Nejsum Madsen ^{a, b} ✉, Søren Andersen ^b ✉, Anders Ringgaard Kristensen ^a ✉

✉ [Show more](#)

<https://doi.org/10.1016/j.compag.2005.01.001>

[Get rights and content](#)

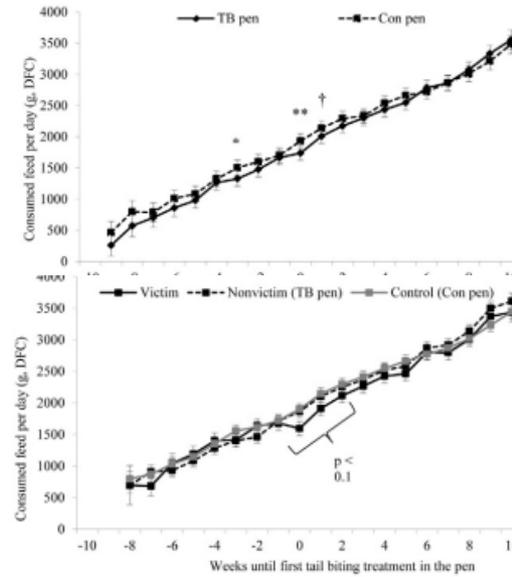
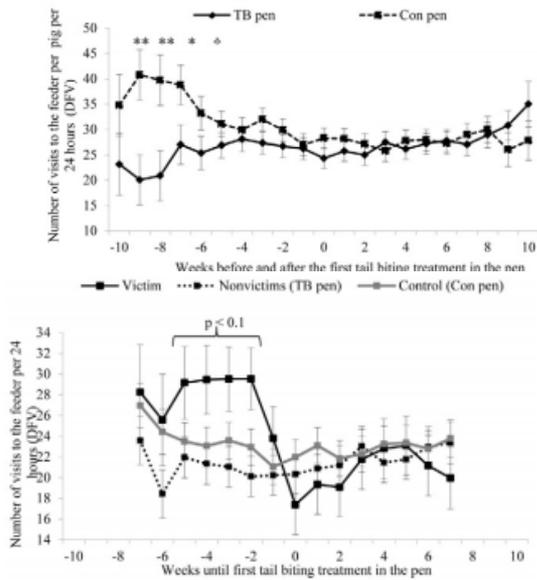
Animal (2014), 8:11, pp 1881–1888 © The Animal Consortium 2014
doi:10.1017/S175173111400192X



Growing pigs' drinking behaviour: number of visits, duration, water intake and diurnal variation

H. M.-L. Andersen[†], L. Dybkjær and M. S. Herskin

Department of Animal Science, Aarhus University, Blichers Allé 20, P.O. Box 50, DK-8830 Tjele, Denmark



Using data from electronic feeders on visit frequency and feed consumption to indicate tail biting outbreaks in commercial pig production¹

A. Wallenbeck² and L. J. Keeling

Department of Animal Environment and Health,
Swedish University of Agricultural Sciences, P.O. Box 7068, SE-750 07 Uppsala, Sweden

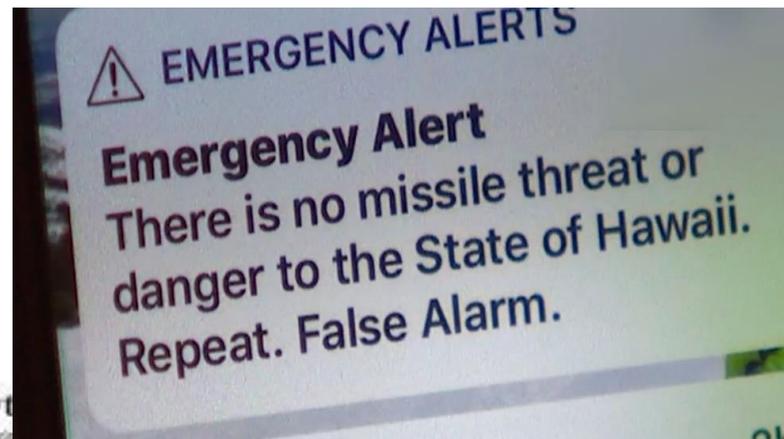
Udfordringer med automatisk overvågning



provided by National Swine Registry
Chester White



Landrace



Saturday, January 13



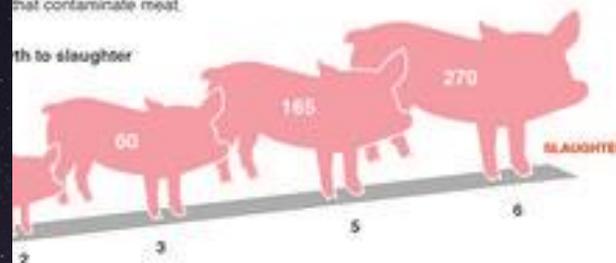
EMERGENCY ALERTS

now

Emergency Alert

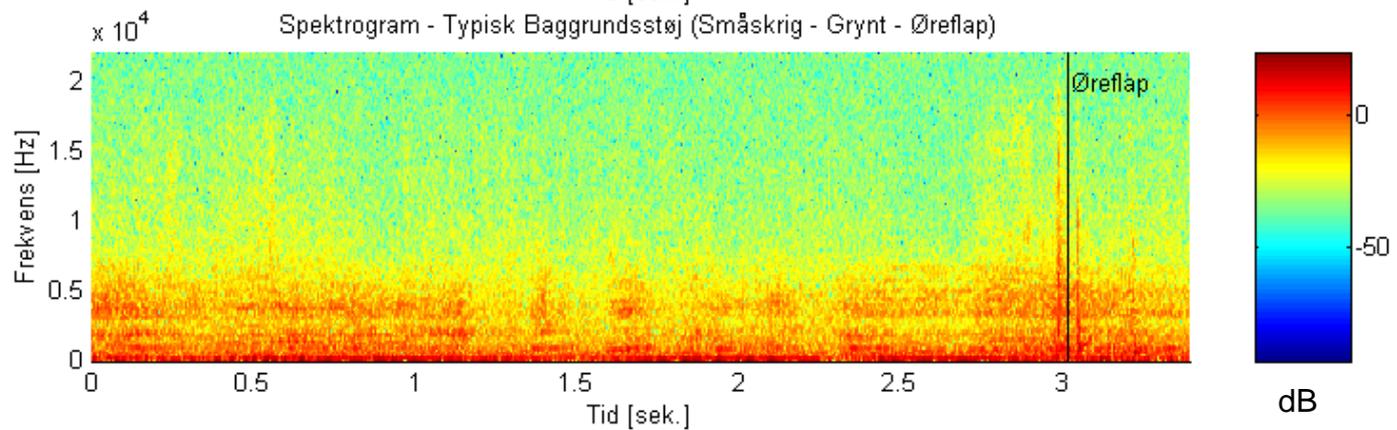
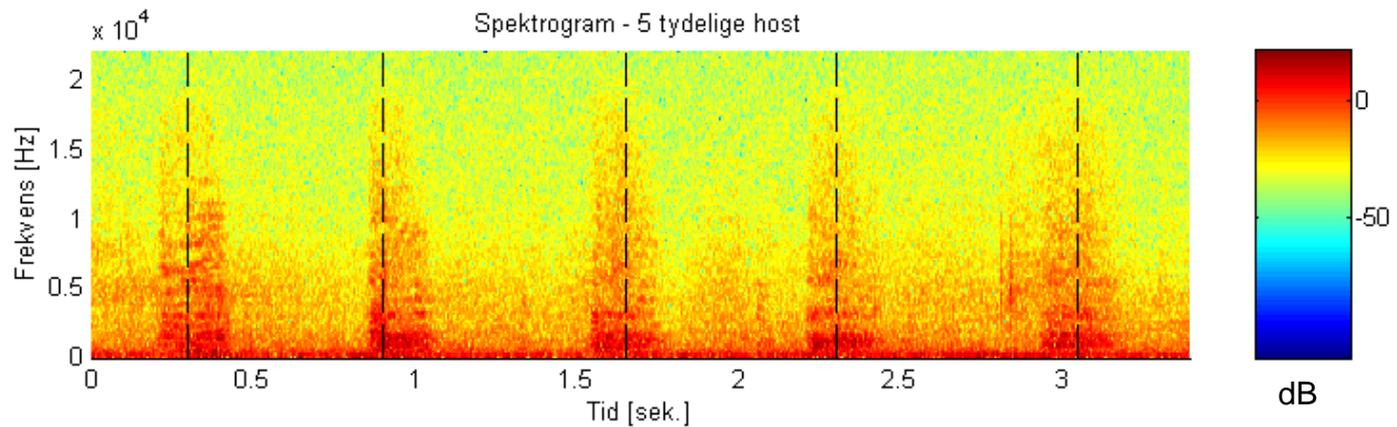
BALLISTIC MISSILE THREAT INBOUND TO HAWAII. SEEK IMMEDIATE SHELTER. THIS IS NOT A DRILL.

Slide for more

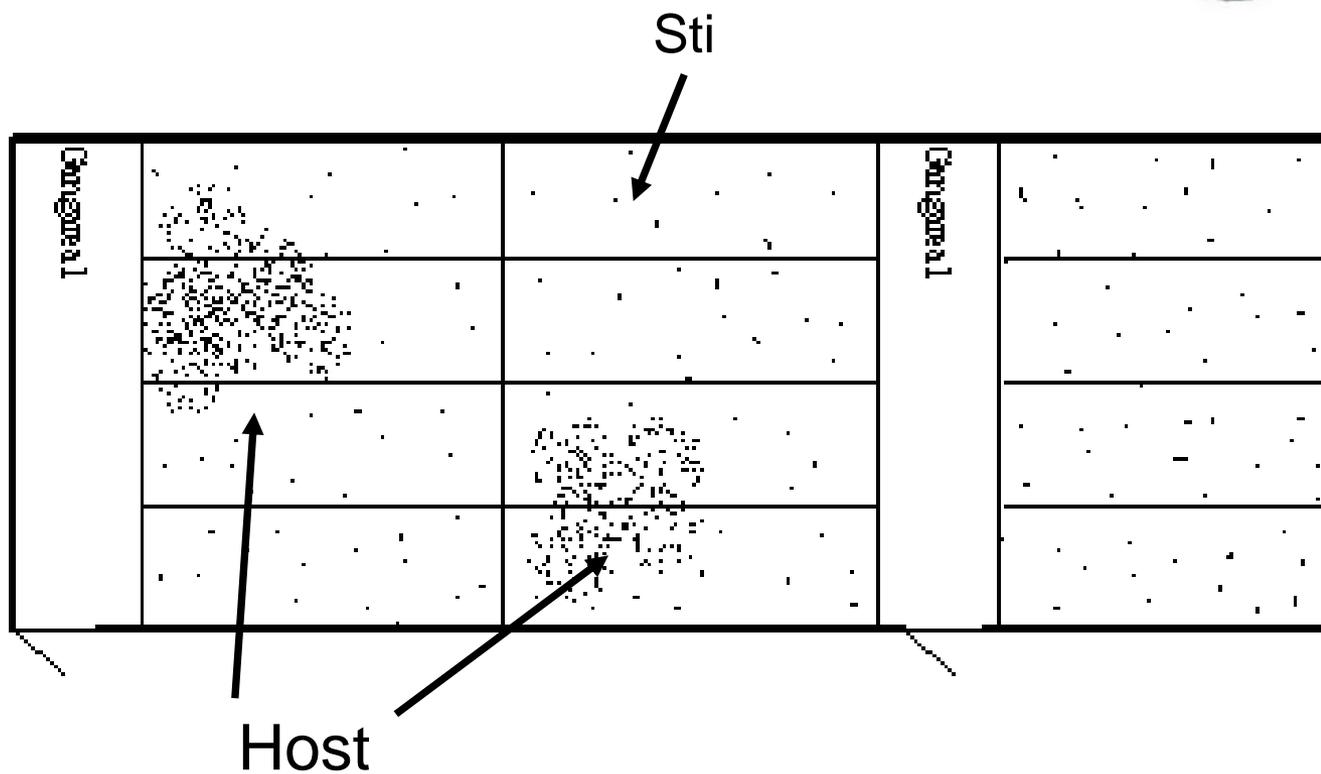


SOURCE: Tyson Foods Inc. Piscal Fact Book

Analyse af lyd



Retningsbestemt lydgenkendelse



PIG COUGH MONITOR

SOUND ANALYSIS FOR AUTOMATIC HEALTH MONITORING



The Pig Cough Monitor in the EU-PLF project: results and multimodal data analysis in two case studies

M. Hemeryck^{1,2}, D. Berckmans¹, E. Vranken³, E. Tullo⁴, I. Fontana⁴, M. Guarino⁴ and T. van Waterschoot²

¹SoundTalks, Kapeldreef 60, 3001 Leuven, Belgium

²KU Leuven, Department of Electrical Engineering (ESAT-ETC/STADIUS), Kasteelpark Arenberg 10, 3001 Leuven, Belgium

³KU Leuven, Department of Biosystems, Division M3-BIORES: Measure, Model & Manage Bioresponses, Kasteelpark Arenberg 30, 3001 Leuven, Belgium

⁴Department of Health, Animal Science and Food Safety (VESPA), University of Milan, Via Celoria 10, 20133 Milan, Italy

martijn.hemeryck@soundtalks.com

Sensors 2013, 13(10), 12929-12942; <https://doi.org/10.3390/s131012929>

Open Access Article

Automatic Detection and Recognition of Pig Wasting Diseases Using Sound Data in Audio Surveillance Systems

Yongwha Chung¹, Seunggeun Oh¹, Jonguk Lee¹, Daihee Park^{1,*}, Hong-Hee Chang² and Suk Kim³

¹ Department of Computer and Information Science, College of Science and Technology, Korea University, Sejong 339-700, Korea

² Department of Animal Science, Institute of Agriculture & Life Sciences, College of Agriculture and Life Sciences, Gyeongsang National University, Jinju 660-701, Korea

³ College of Veterinary Medicine, Gyeongsang National University, Jinju 660-701, Korea

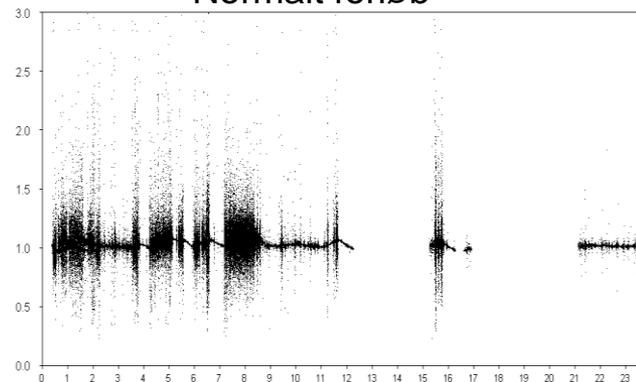
* Author to whom correspondence should be addressed.

Received: 13 June 2013 / Revised: 16 September 2013 / Accepted: 22 September 2013 / Published: 25 September 2013

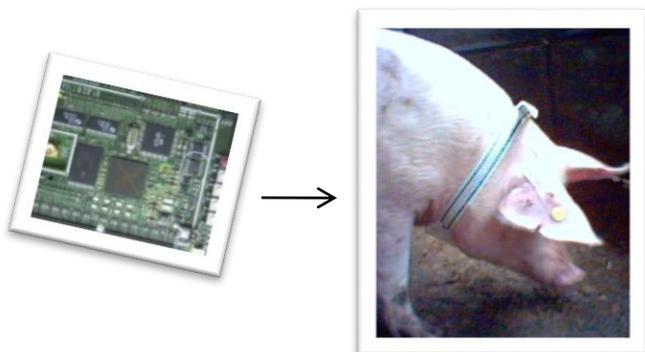
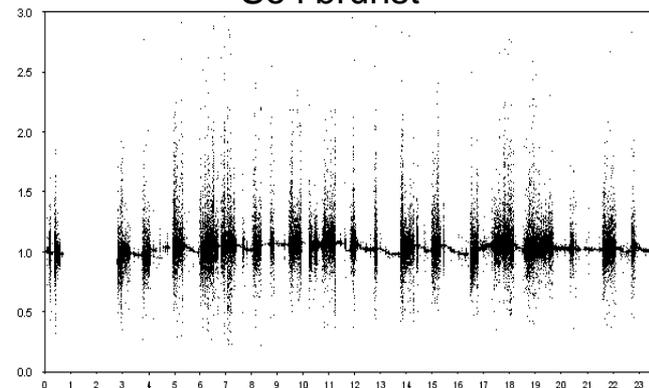
Måling af acceleration i 3D på søer



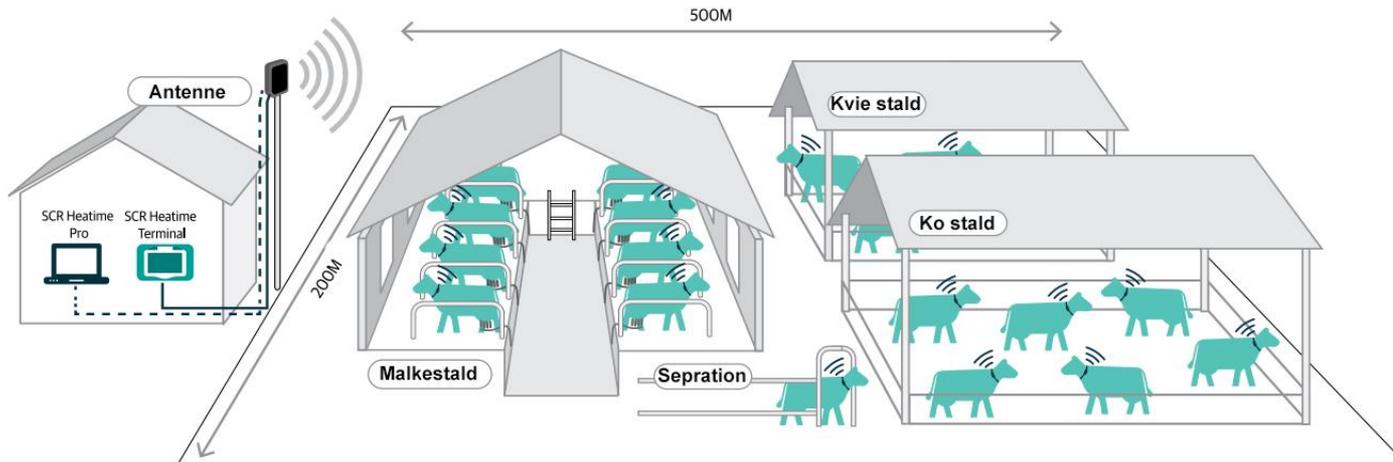
Normalt forløb



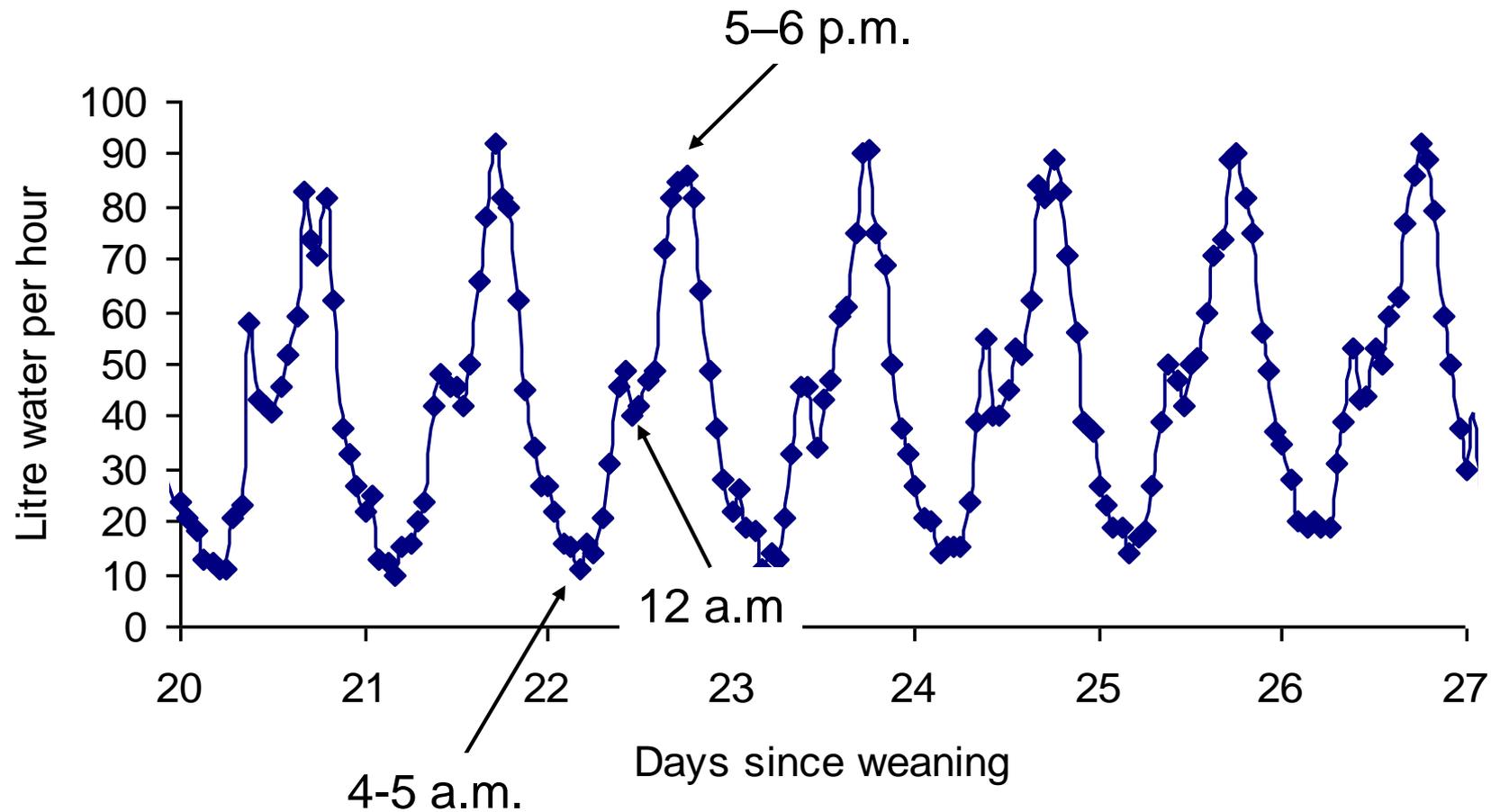
So i brunst



Eksempel fra kvægsektoren - Heattime



Vandforbrug – normalt forløb (7 dage)

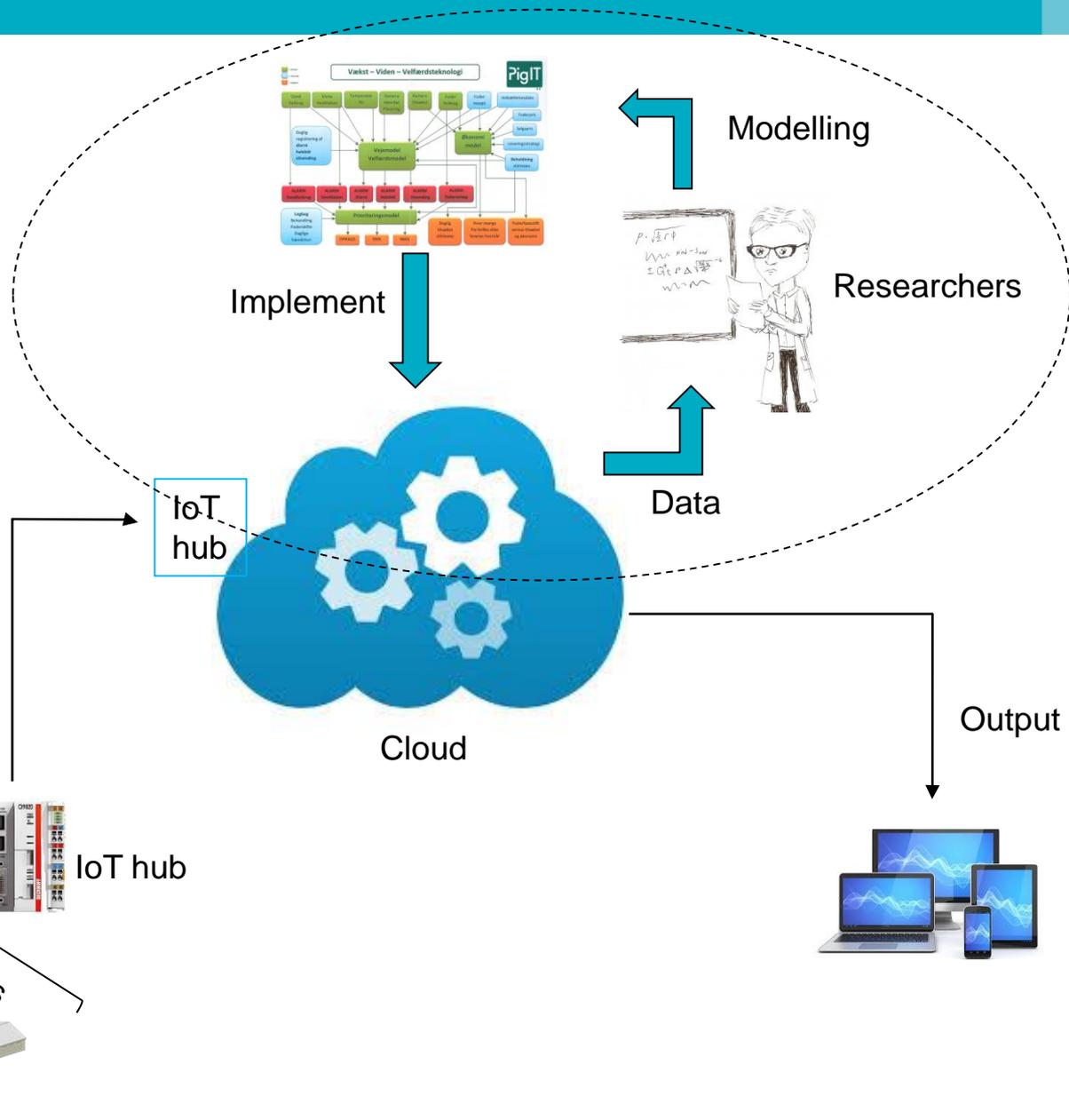


Vækst – Viden – Velfærdsteknologi



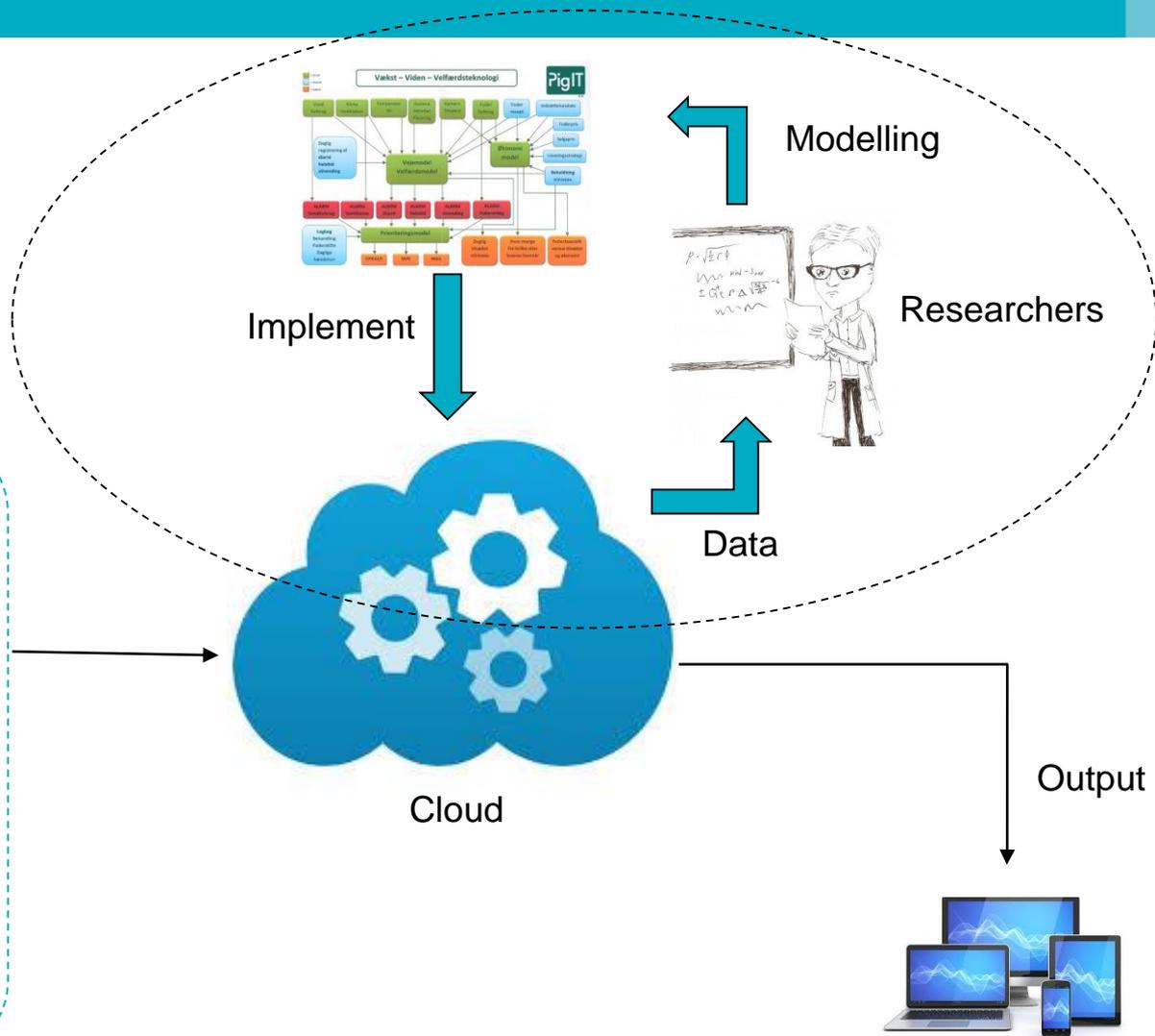
IQinAbox

- cloud based data science



IQinAbox

- cloud based data science



Muligheder med realtidsovervågning

- Alarm ved afvigelse fra 'normal', fx:
 - diarre
 - halebid
 - foderproblemer
- Samkøring af data => sandsynlig årsag til afvigelse
- Præcise forbrugsdata
- Benchmark mellem staldsektioner



Opsamling

- Værdiskabelse ved at koble flere datakilder
- Machine learning og AI-software kobles med biologisk viden
- IoT-teknologi muliggør genbrug fra andre industrier
- Sensorer og datakomponenter udvikler sig hurtigt => risiko for at sensorløsninger forældes
- Bind dig ikke for hårdt til en enkelt leverandør
- Hvad bringer fremtiden?
 - Overvågning på stiniveau...
 - Alibaba's vision...