Data integration to improve the prediction of individual dry matter intake of dairy cows

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DairyCare

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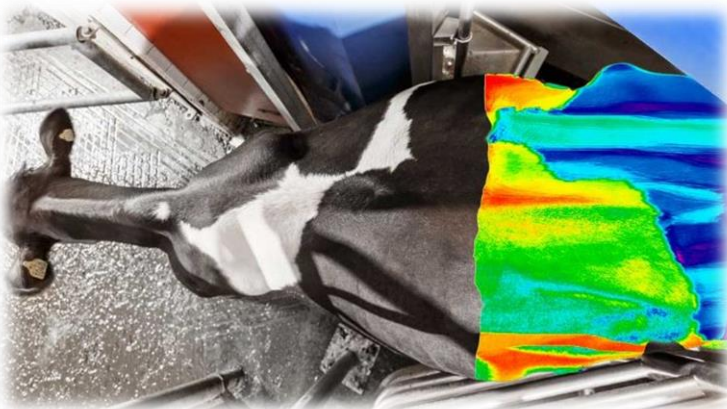
It's sensors time!!! (Big Data, IoT...)

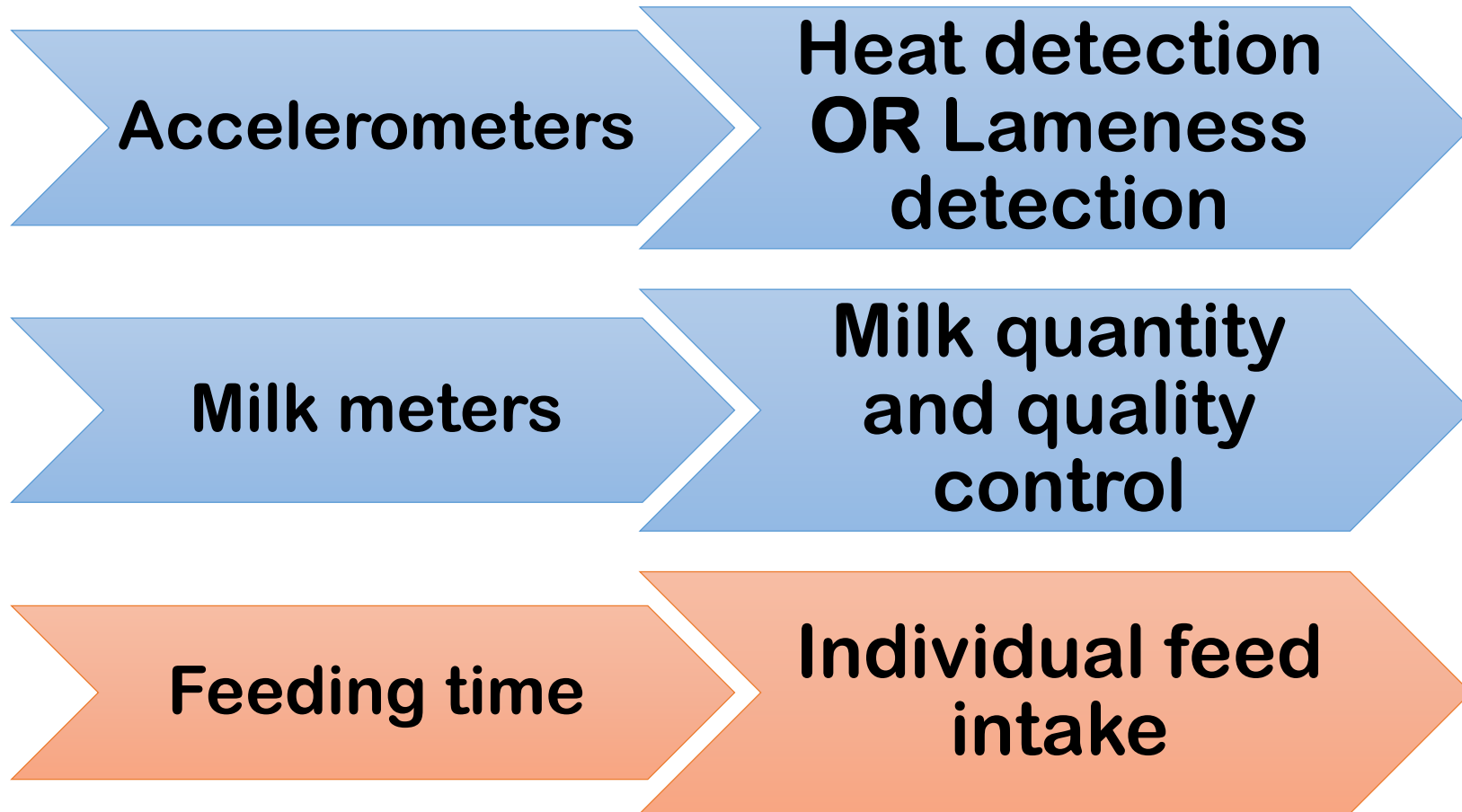**Accelerometers and pedometers**

Milk meters

Weather stations

NIRS

Body condition cameras

We normally have an "univariate" approach...

Accelerometers → **Heat detection OR Lameness detection**

Milk meters → **Milk quantity and quality control**

Feeding time → **Individual feed intake**

But biological phenomena use to be complex…
…a lot of factors have an effect on feed intake

Big Data 4 Vs:
One is VARIETY

What are the opportunities and challenges of data integration?

Data

- A research project with lots of animals and sensors is not possible for us…

- *…so let's start with an exploratory analysis using a <u>meta-analysis approach</u>*

- <u>Data from two old feeding trials:</u>
  - <u>12 cows x 12 days x 2 TMR (differing in silage PS)</u>
  - <u>14 cows x 10 days x 2 TMR (differing in energy and TMR PS)</u>

- <u>TOTAL: 19465 feeding visits</u>
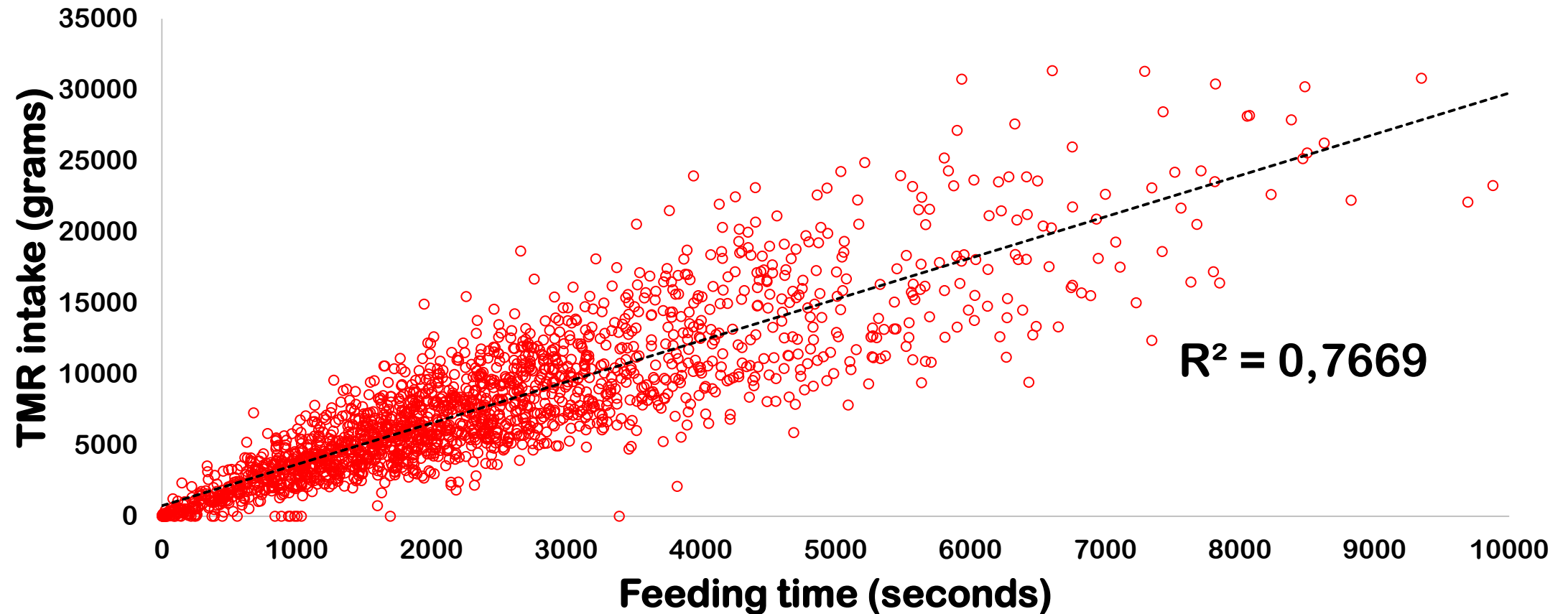
Feeding time vs. DMI intake

Not enough data!
19465 visits = 261 intake data per cow per day
(AFTER CLEANING!!!)

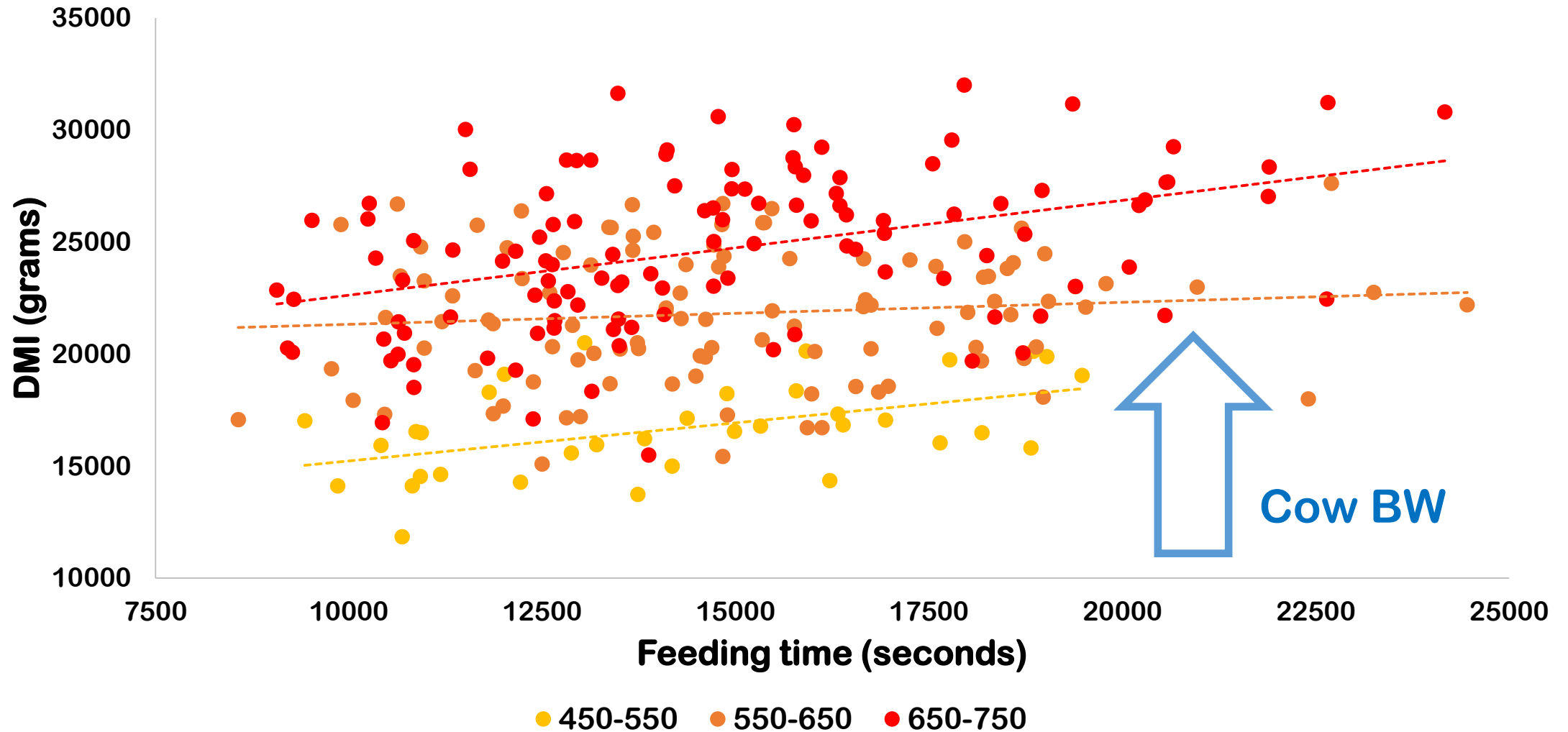y = 0,32x + 17742
R² = 0,06
SE = 3,94 kg
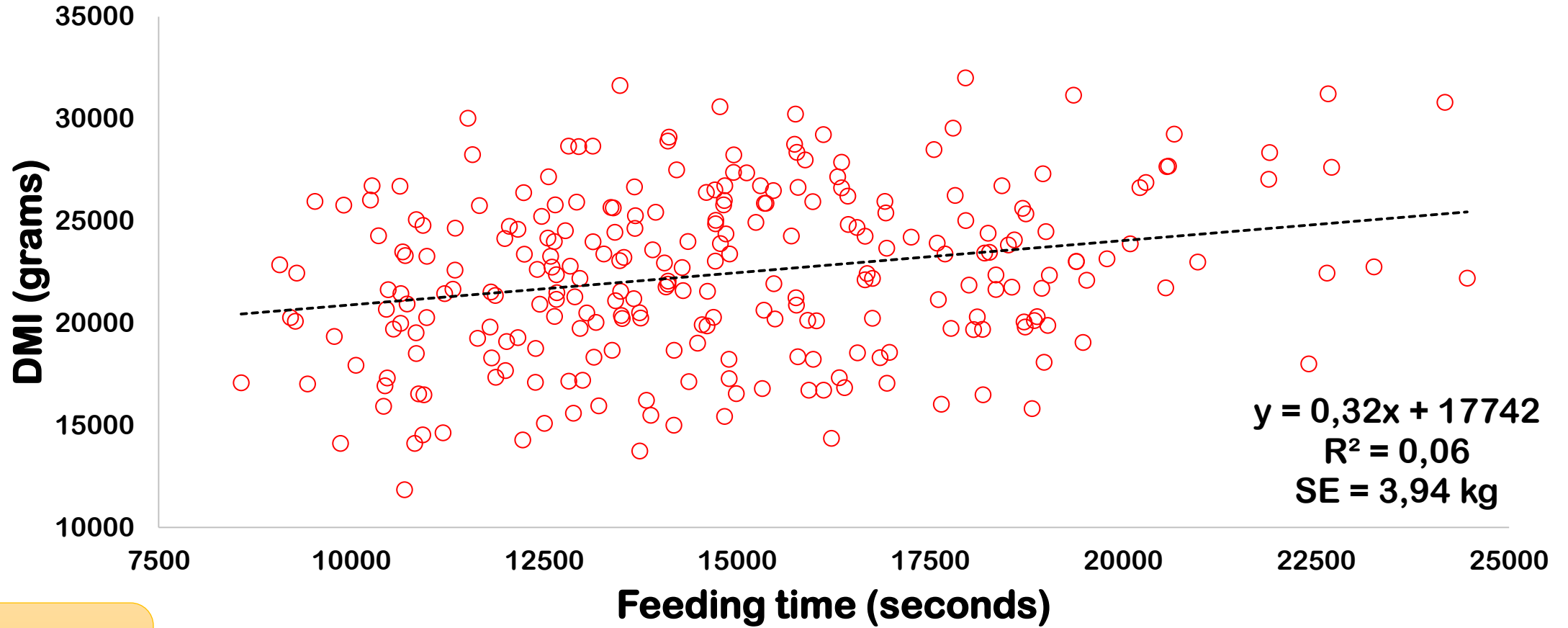
Very bad correlation!

It's a matter of range (among others)

Meal intake

$R^2 = 0{,}7669$

Axis labels: TMR intake (grams) vs Feeding time (seconds)

Other factors have an impact on individual DMI

Model: stepwise regression

R^2 = 0,62 (+0,56)
SE = 2,51 (-1,43)

Independent variables:	Results:
Feeding time	Included 3rd
Cow body weight	Included 1st
Daily change in body weight	Included 5th
Week of lactation	
ECM	Included 2nd
% NDF (TMR)	
PS (% < 19 mm)	
PS (% < 8 mm)	Included 4th

Still not a good model
We need:
- More data points
- More variables
- More variability

A collaborative project?

INTUITION: Local Algorithms could perform well in a much larger database

A challenge: data granularity

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Feed intake Feeding time Milk quantity	Feed intake Feeding time Milk quantity	Feed intake Feeding time Milk quantity	Feed intake Feeding time Milk quantity Milk quality	Feed intake Feeding time Milk quantity	Feed intake Feeding time Milk quantity Cow BW %DM (TMR) %NDF (TMR) Particle size	Feed intake Feeding time Milk quantity

Constant values?
Interpolation?
New sensors?

Thank you for your attention

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