

Deep Neural Networks for Transferable Cluster Models in Dairy Milk Transformation Ability Assessment



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Interreg
North-West Europe



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the European Union

HoliCow

 **LIÈGE université**
Gembloux
Agro-Bio Tech

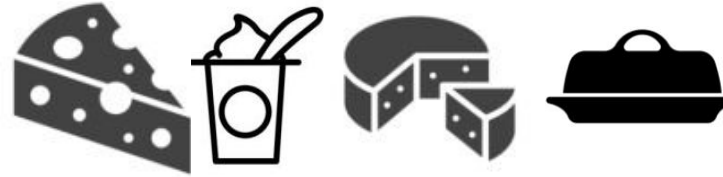
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How good?
Without investments?



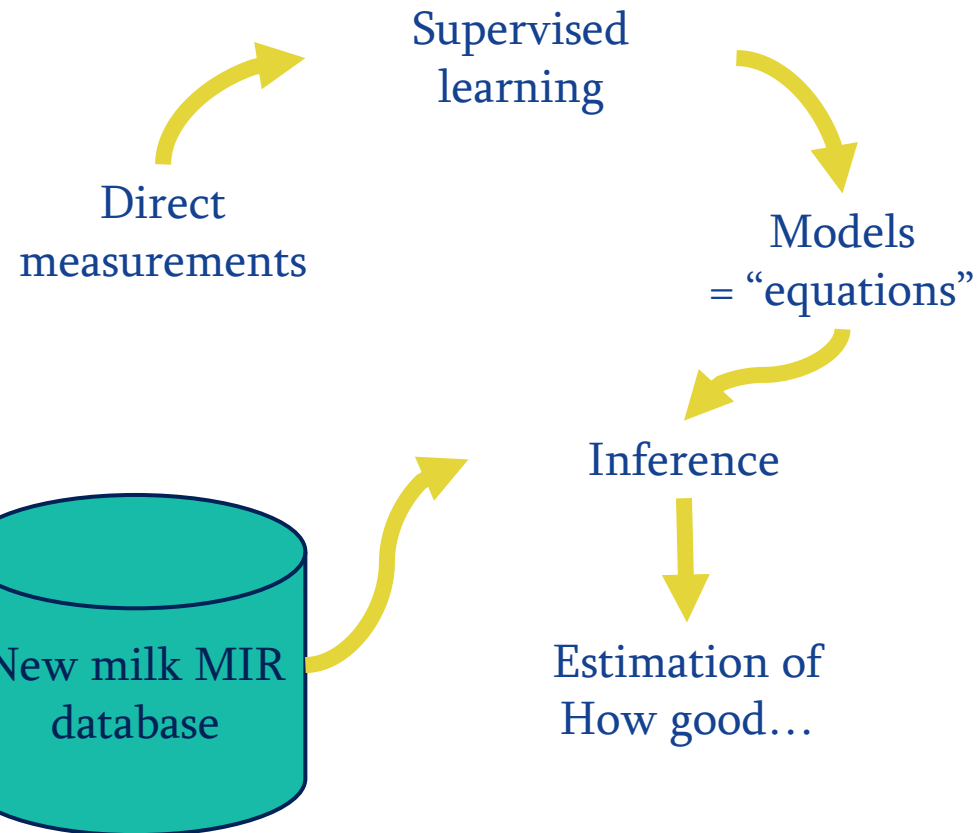
Existing and past
projects



ProFARMilk

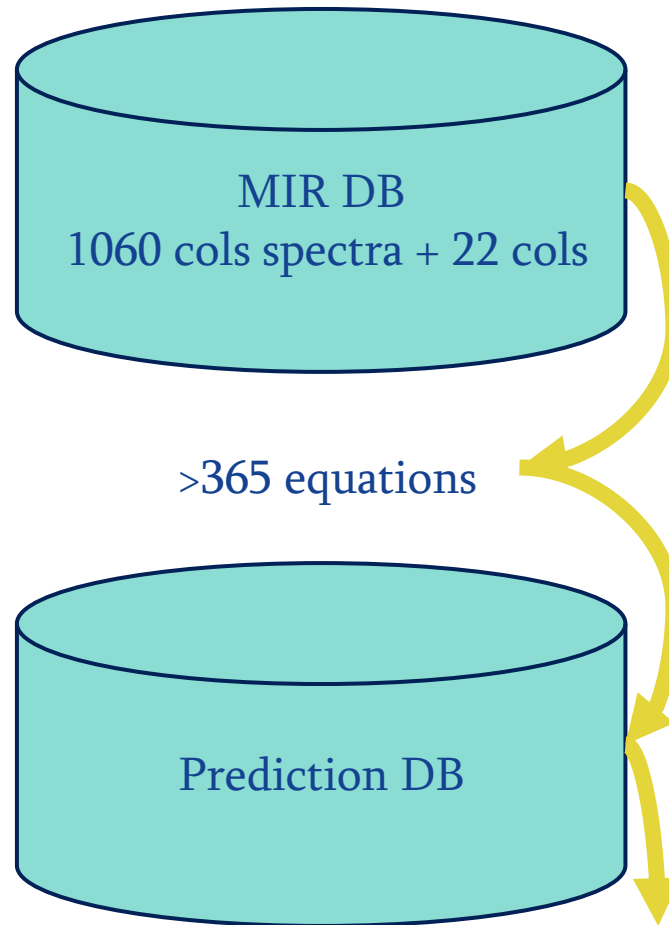


From a few individuals to
population level



Holicow research Interreg project

- 41 million records
- FT-MIR spectra
- Milk recording related data
- Gathering partners developed equations



- Pattern recognition
 - Clustering algorithms
 - Case study in the next presentation

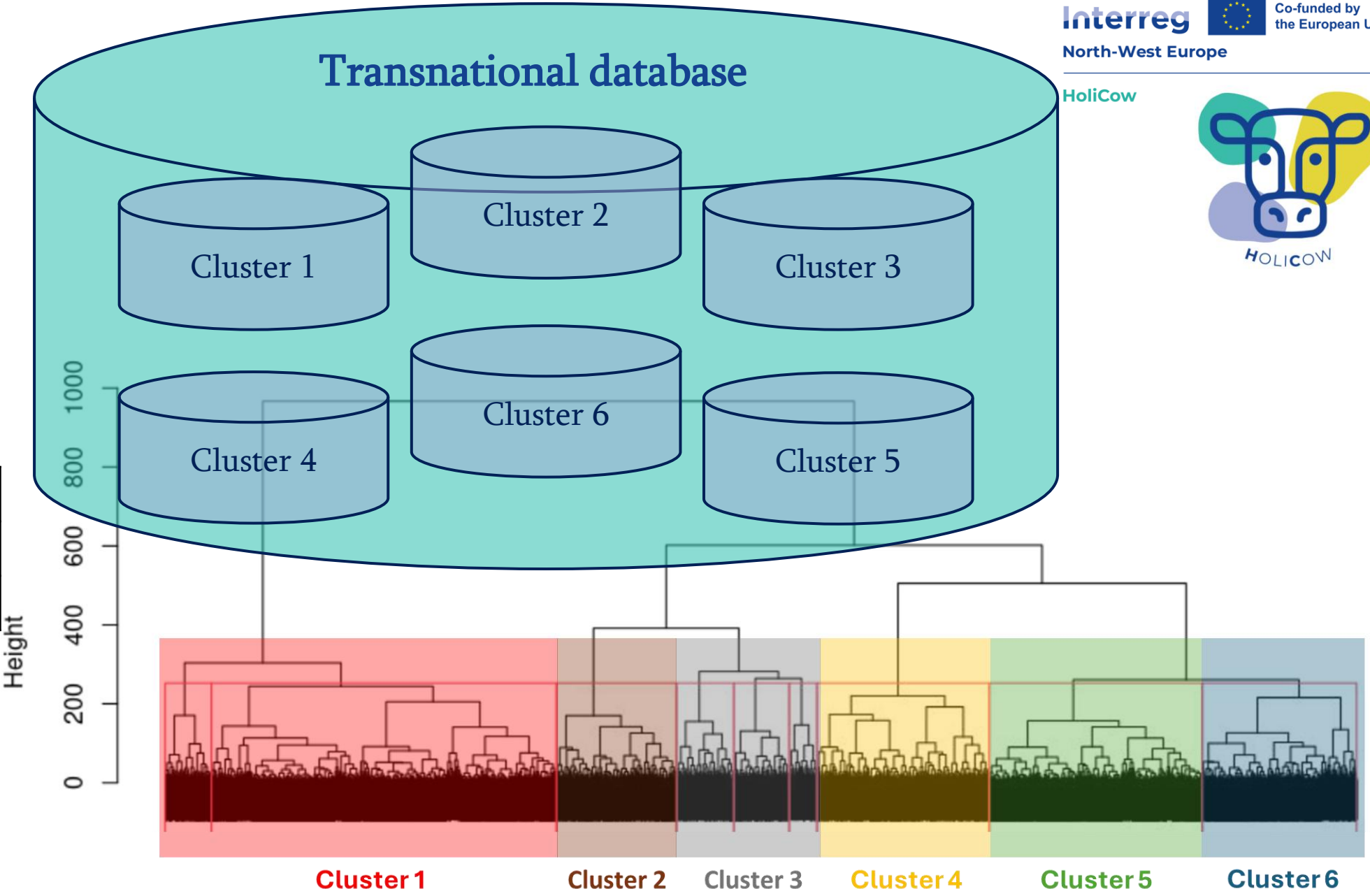


Clustering result?

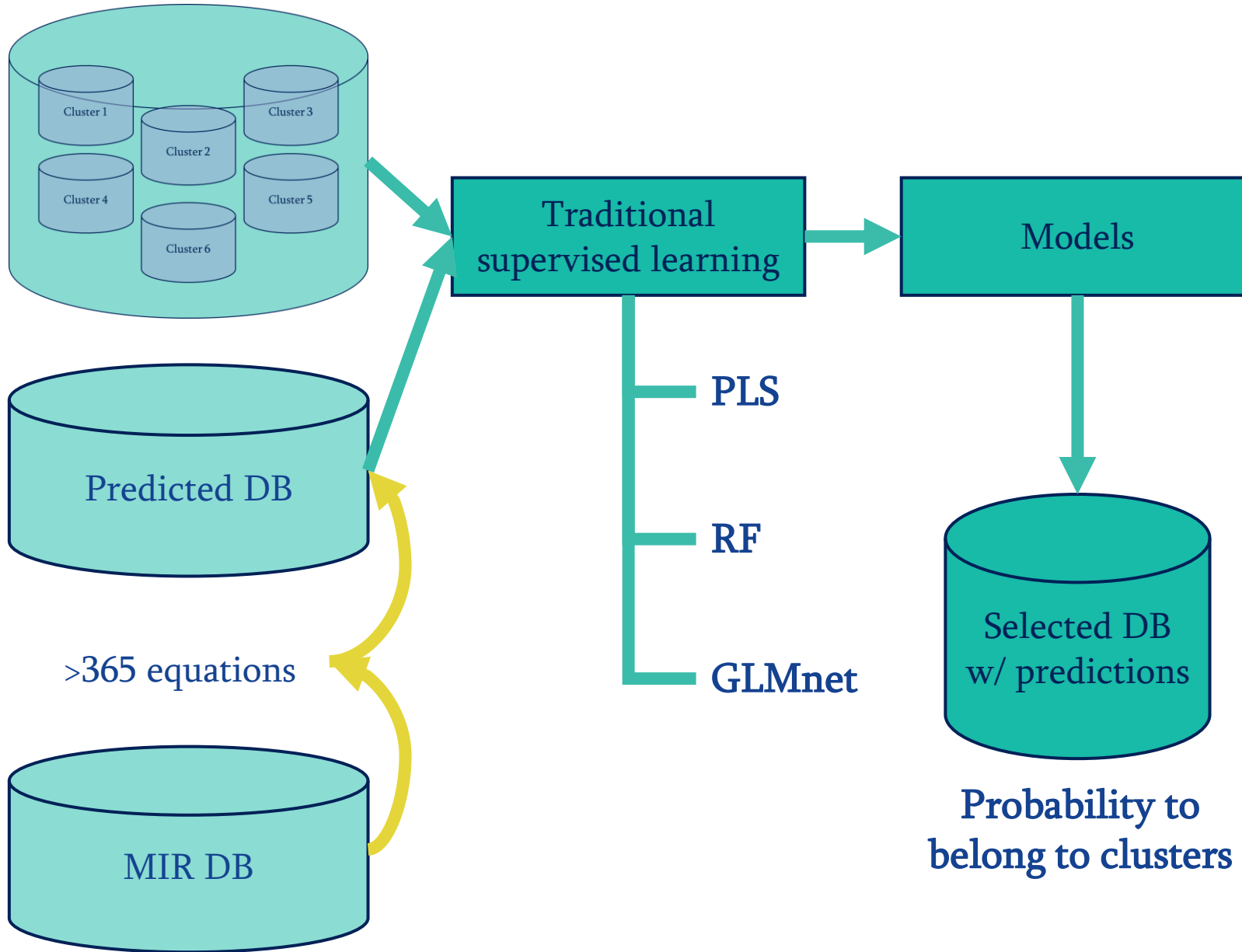
Cluster = Group of similar observations

Clusters	Meaning
Cluster i	Meaning i
...	...

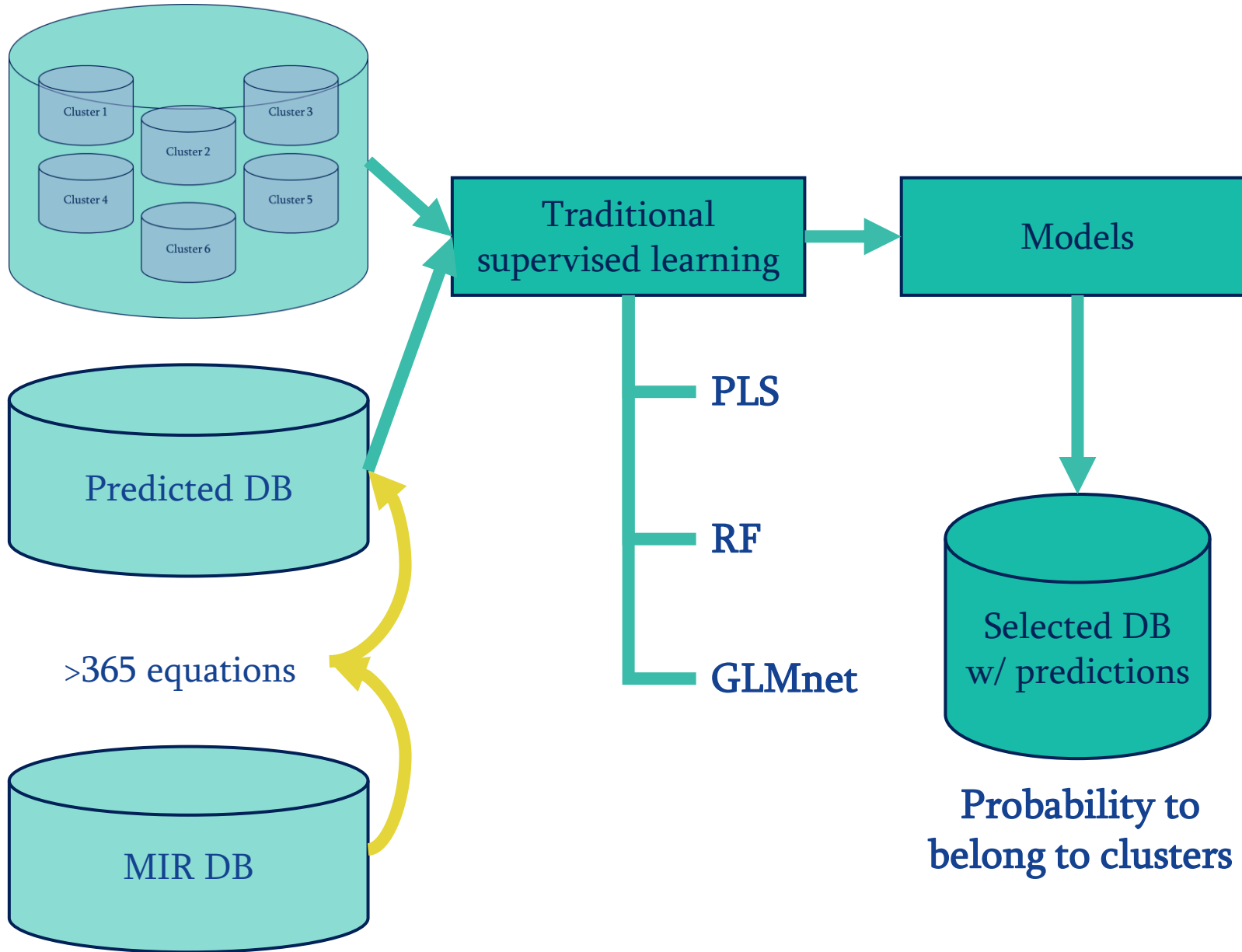
6 clusters related to transformation



Select sub-database

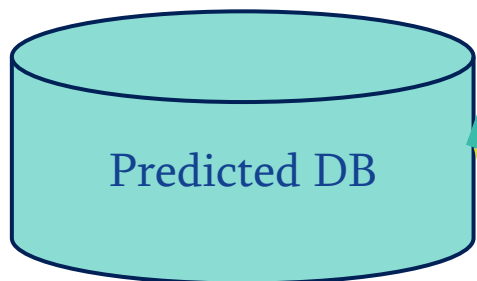
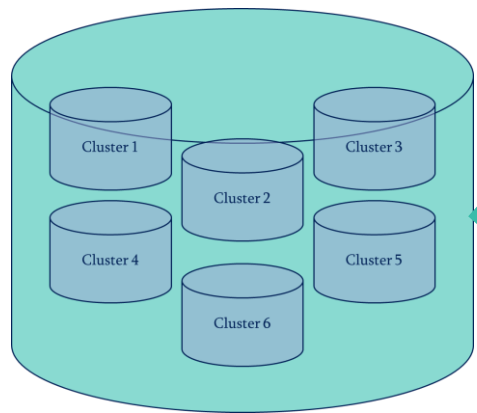


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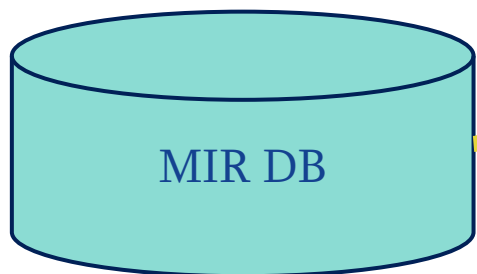


Problems ...

Select sub-database



>365 equations



Traditional supervised learning

PLS

RF

GLMnet

Models

Selected DB
w/ predictions

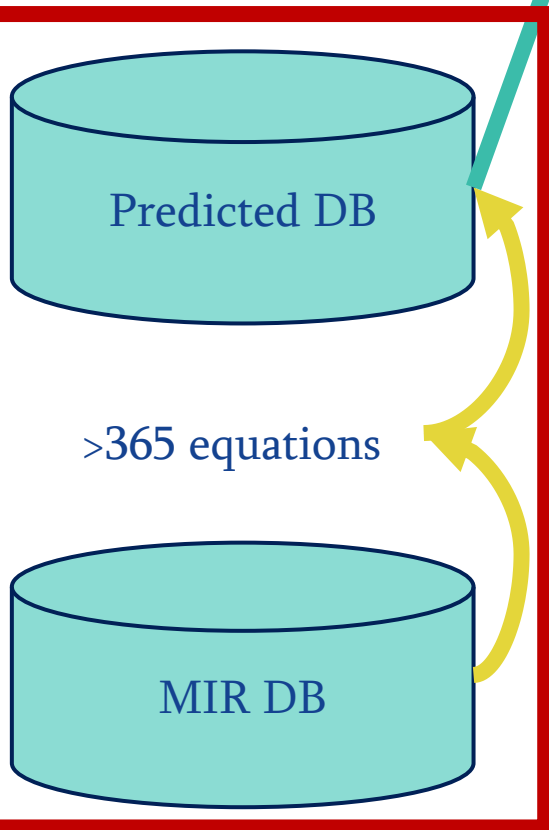
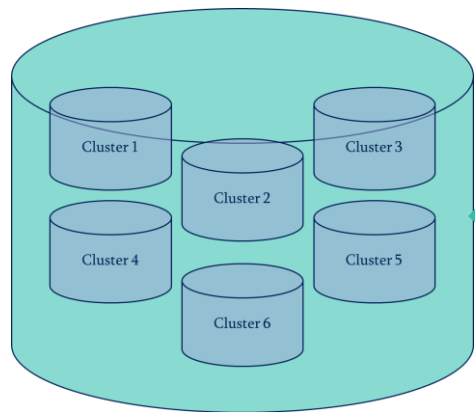
Probability to
belong to clusters



Problems ...

- 41 million records
 - Loads of dimensions (spectra => 1060 points)
 - Loading constraints (RAM)
 - Sampling representativity
 - Database structuration per MRO (>40)
 - Algorithm capabilities

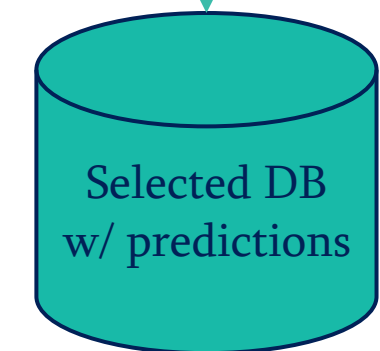
Select sub-database



Traditional supervised learning

PLS
RF
GLMnet

Models



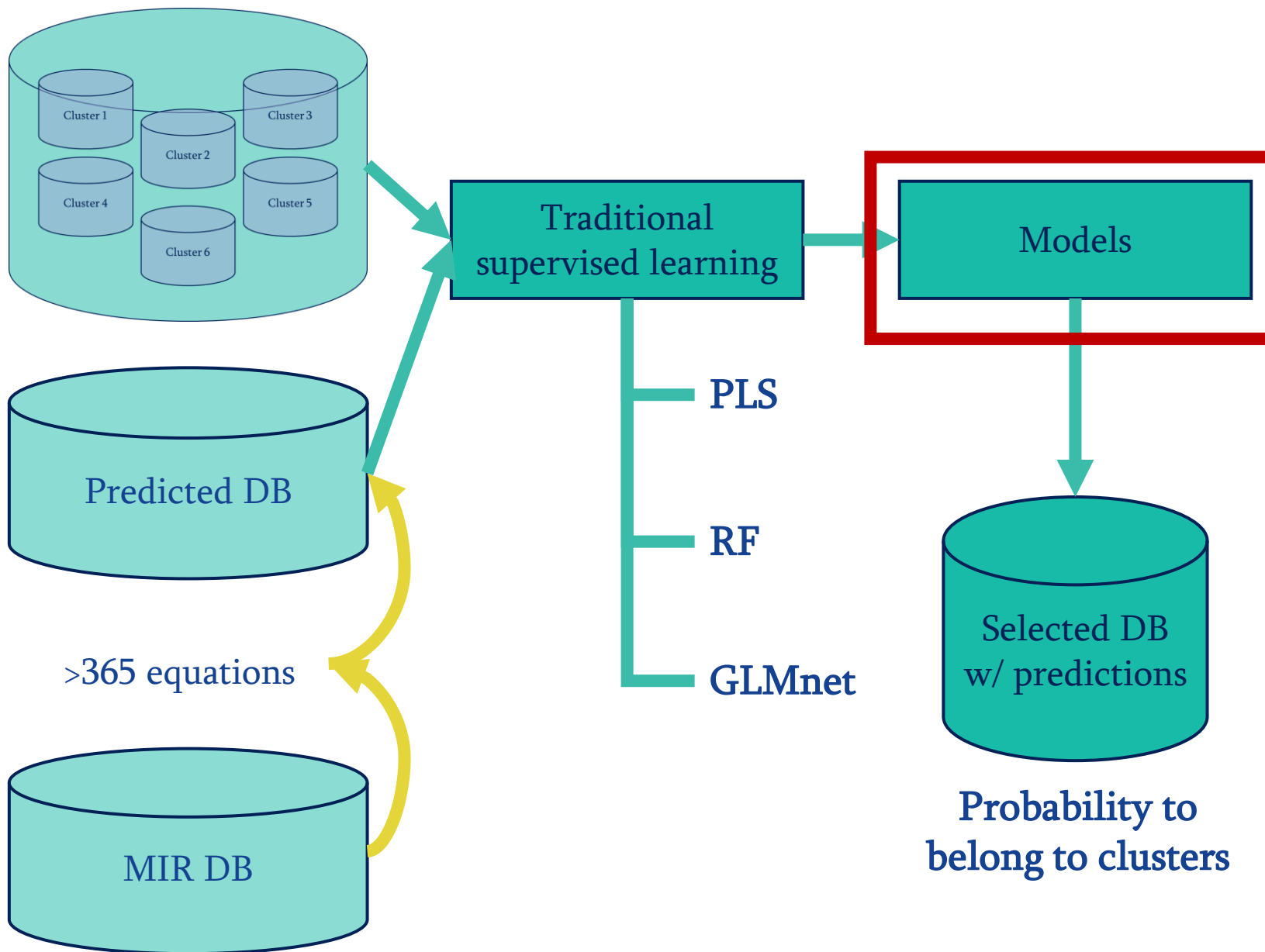
Probability to belong to clusters

- 41 million records
- Indirect predictions
 - Time
 - Additional processing constraints (RAM, CPU load)
 - Cumulation uncertainty
 - Proprietary equations



Problems ...

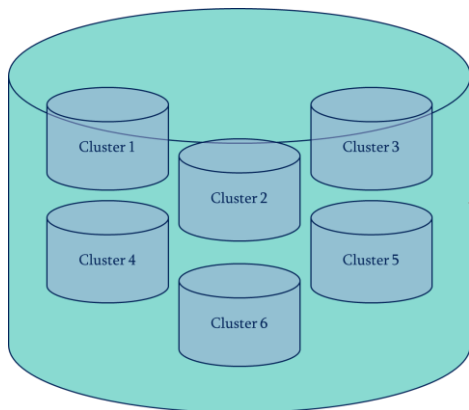
Select sub-database



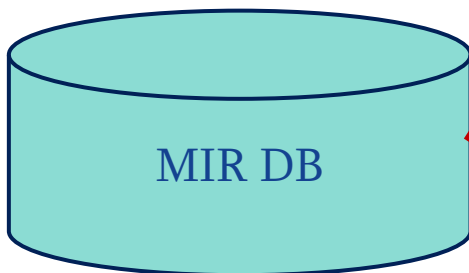
Problems ...

- 41 million records
- Indirect predictions
- Model inherent limitations
 - RAM consumption
 - Speed
 - Size on disk
 - Transferability of learned knowledge?

Select sub-database

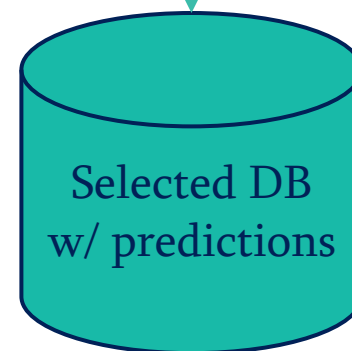


>365
ions



Transferable
modelling

Models

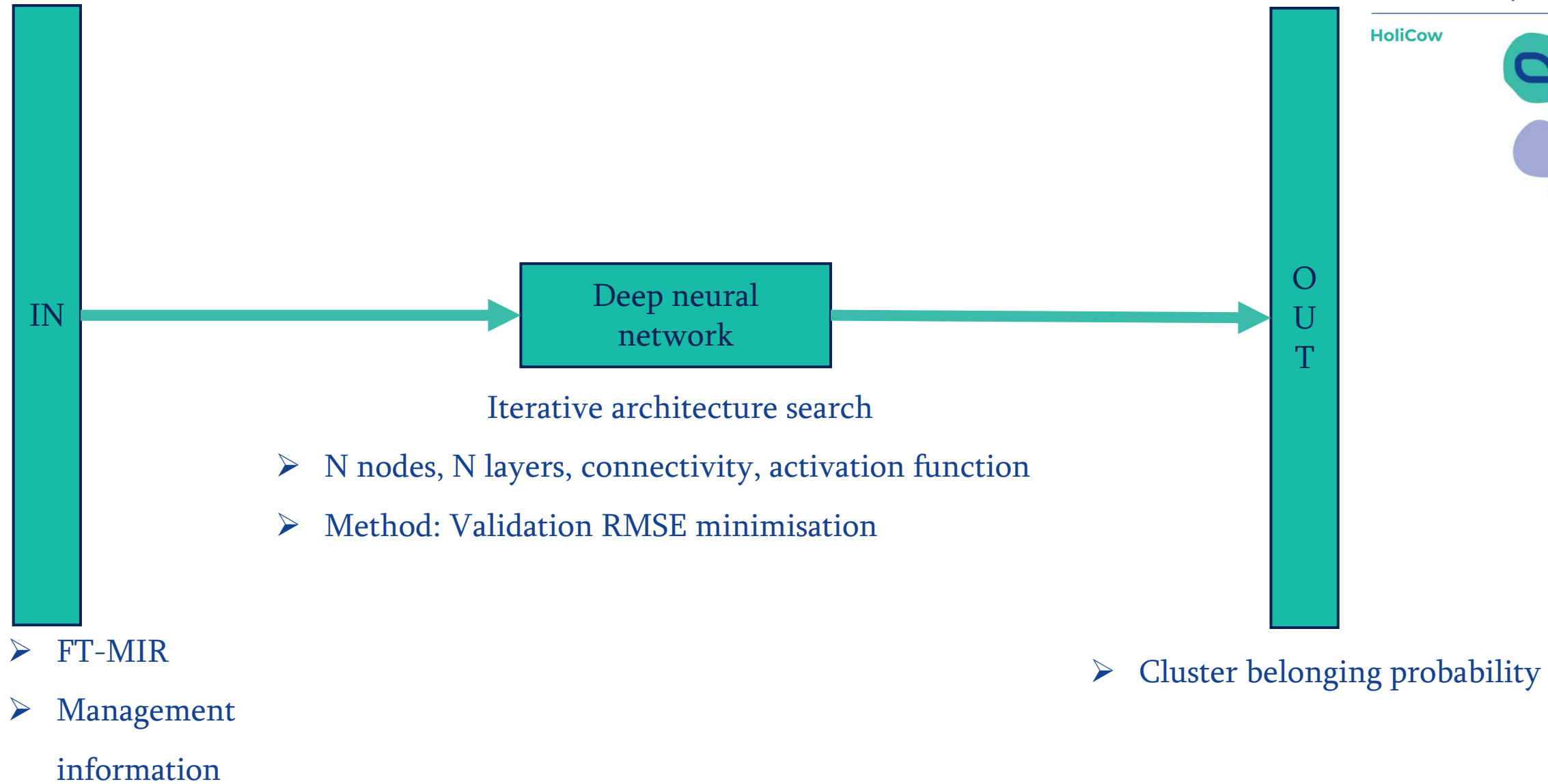


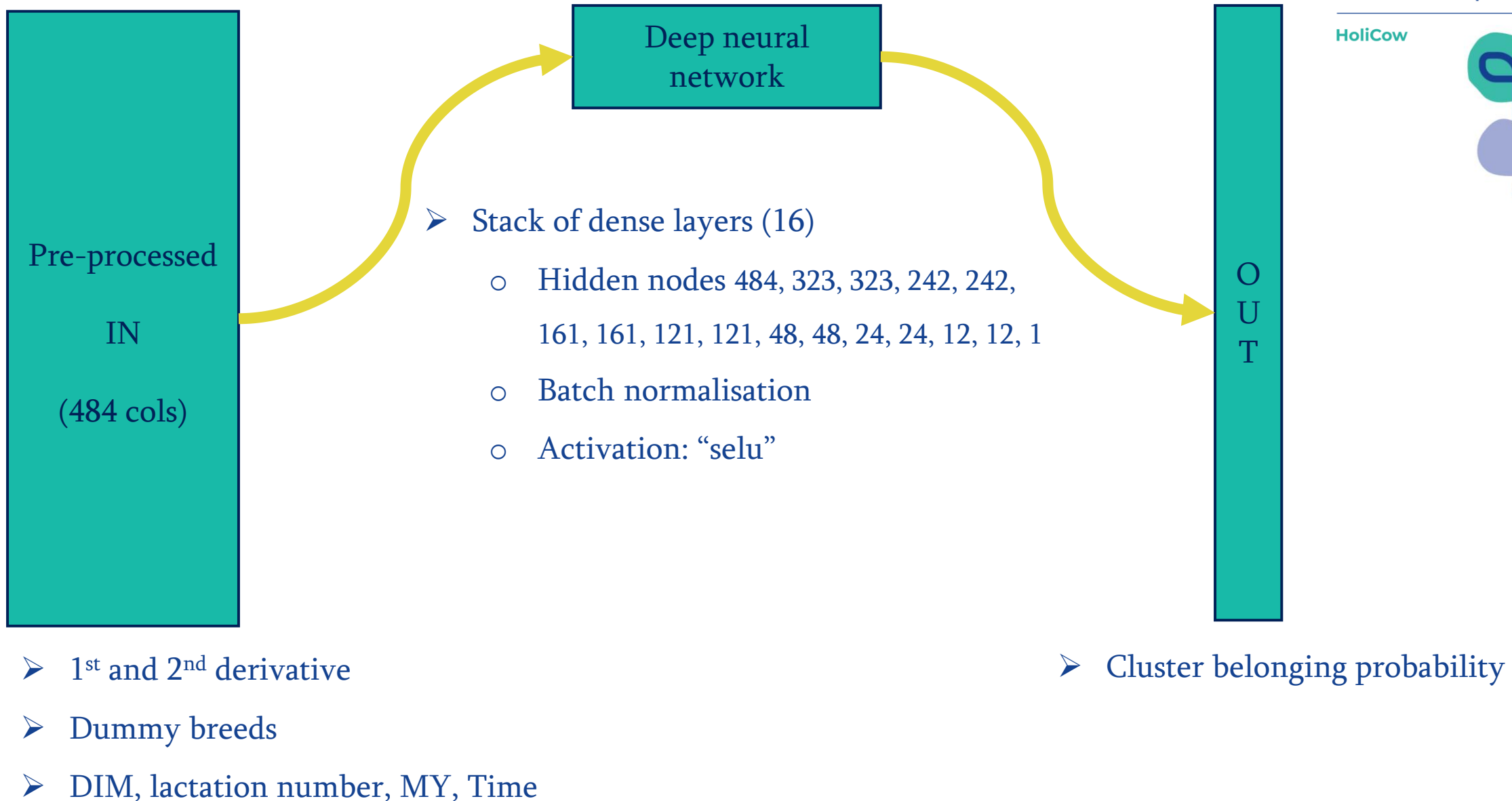
Probability to
belong to clusters

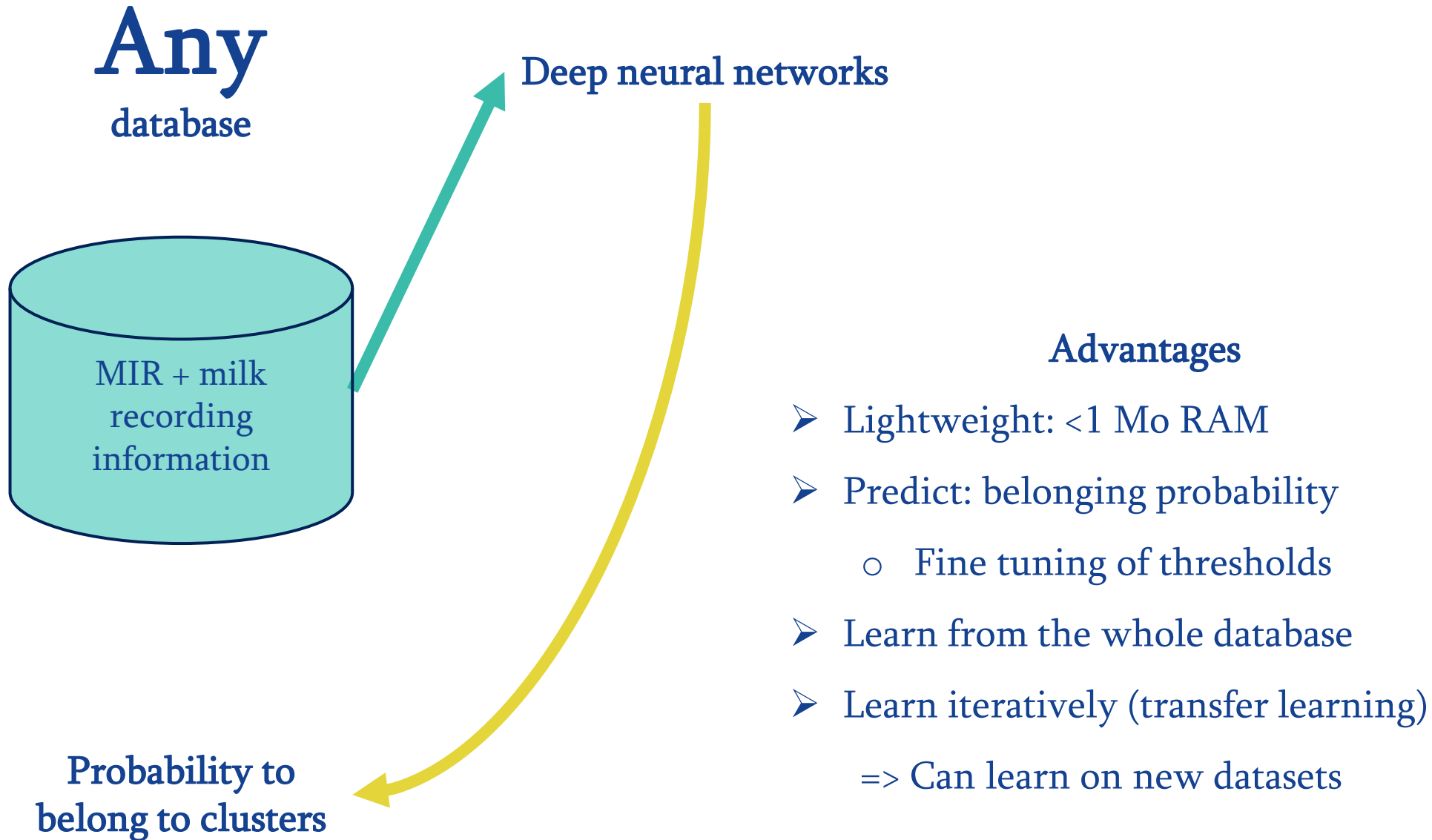


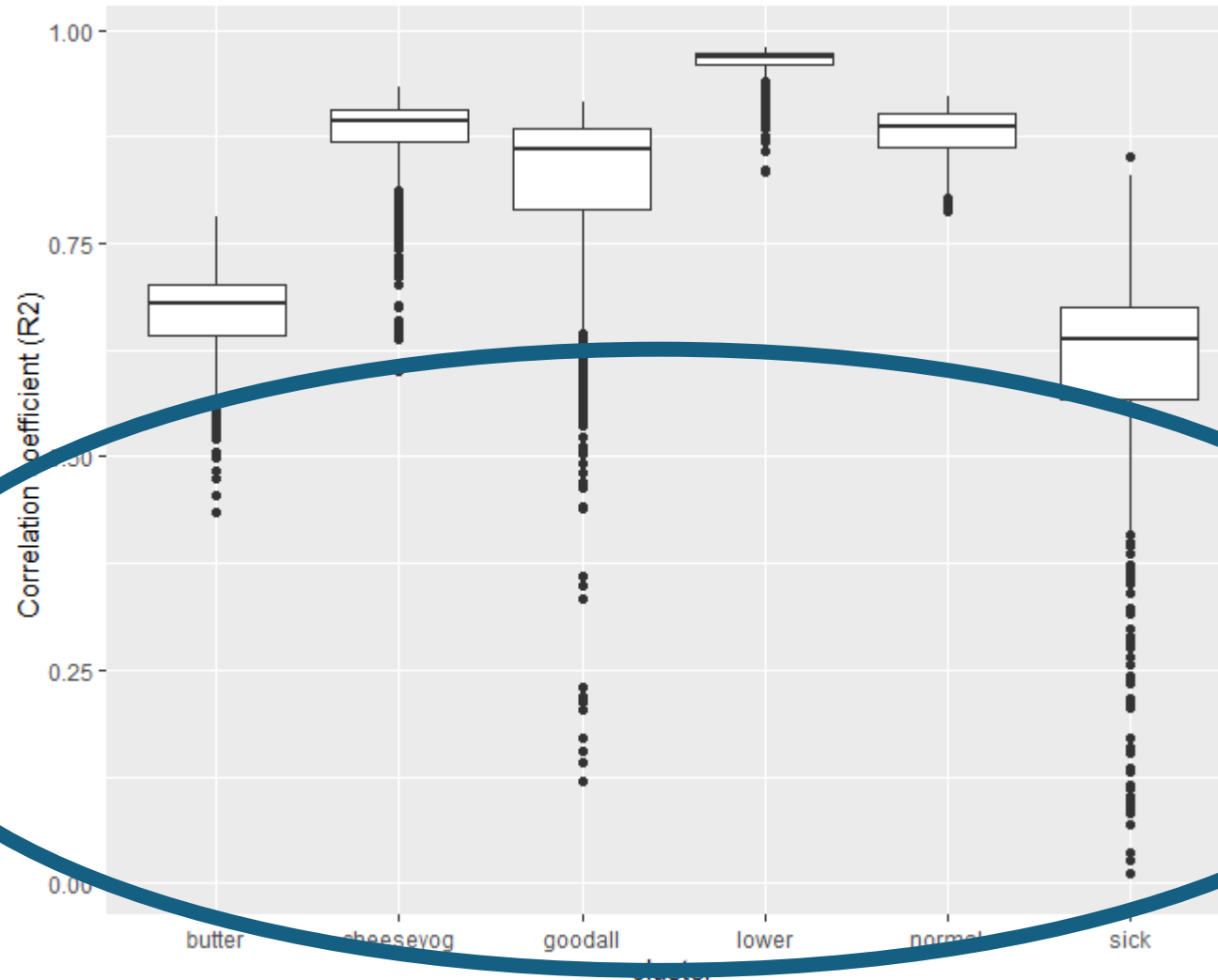
Problems ...

- 41 million records
- Indirect predictions
- Model inherent limitations
- Innovation
 - Bypass
 - Transfer knowledge









Noise and imperfections:

- Breeds
- Data sources (>40 MROs)
- Modelled cluster with originally high confusion
- Y = modelled probability based on indirect predictions (cumulation of errors?)



Final Note

- Transferring research models is key to widespread adoption
- Transferable models exist
- WIP: on better integration of temporal, breed and management data
- Presented clusters: transformation ability
 - WIP: fertility, well-being, environment, heat stress, production

Thank you

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