

Are MIR calibration datasets representative enough of cow milk MIR spectra real population?



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Interreg



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What's in milk?

Image courtesy:

<https://www.istockphoto.com/fr/vectoriel/ic%C3%B4ne-de-lait-bouteille-de-lait-du-lait-emball%C3%A9-gm1298696236-391512994>
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How to know what's in milk?



Chemical analysis



€€€ & Time

Proxy features &
“relationship”

Image courtesy:
<https://www.istockphoto.com/fr/vectoriel/ensemble-de-chimistes-avec-b%C3%A9chers-travail-du-personnel-de-chimie-les-gm1331900135-414896566>

How to know what's in milk?



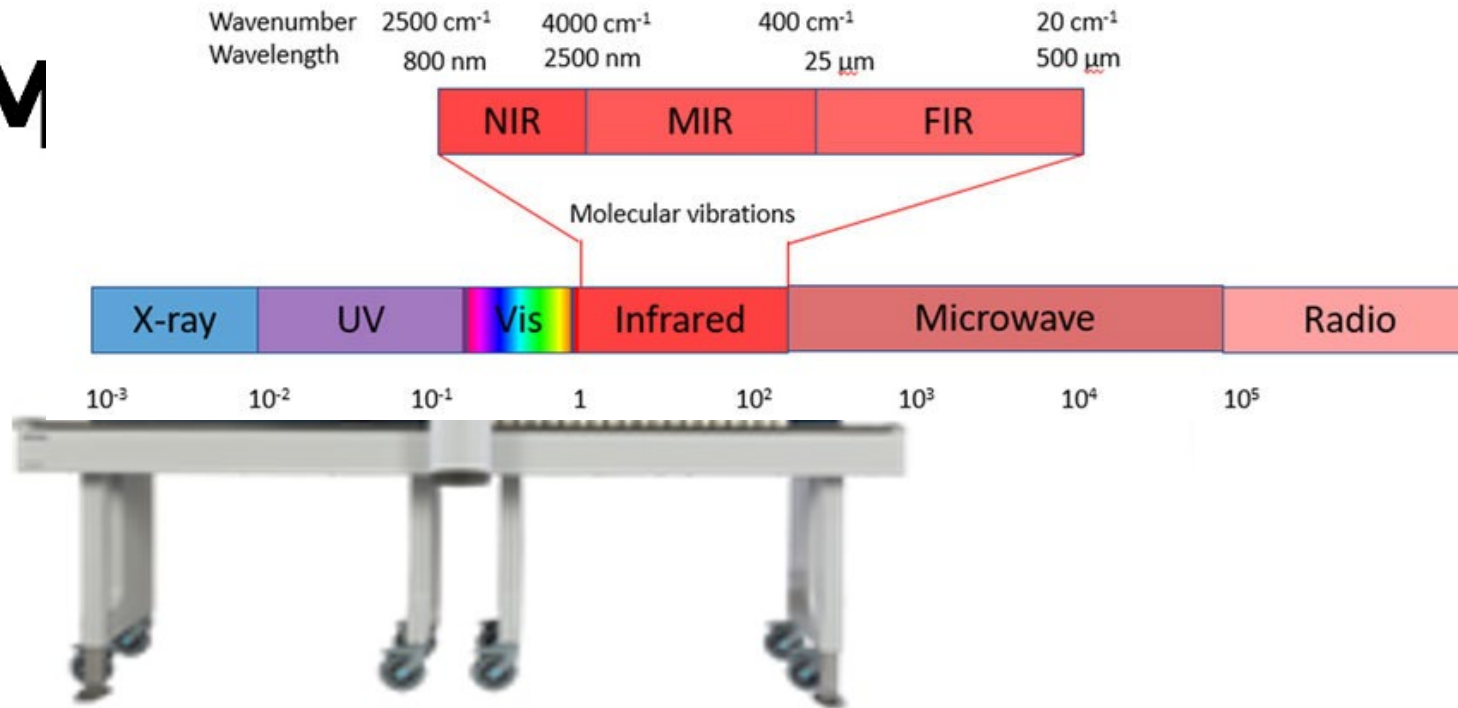
Proxy often used : FT_MIR

Typical machine

What it does?

What's the output?

M



MIR spectra

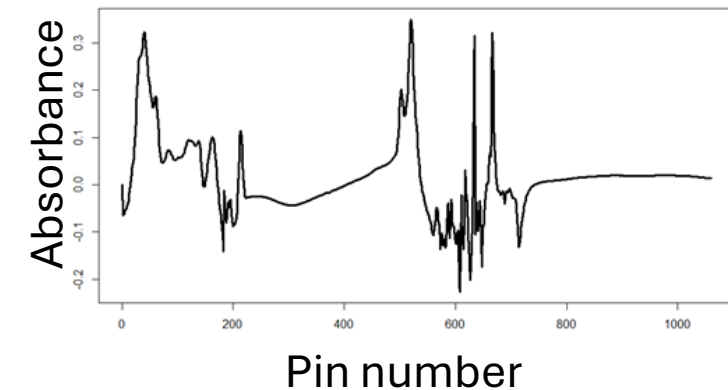
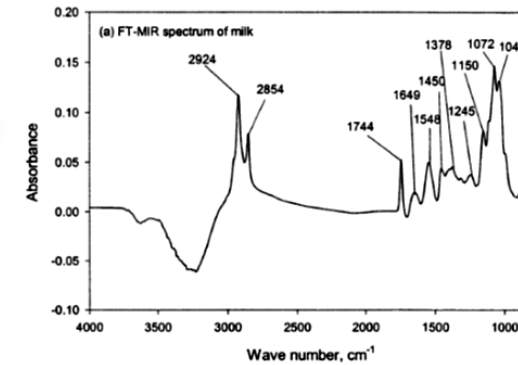


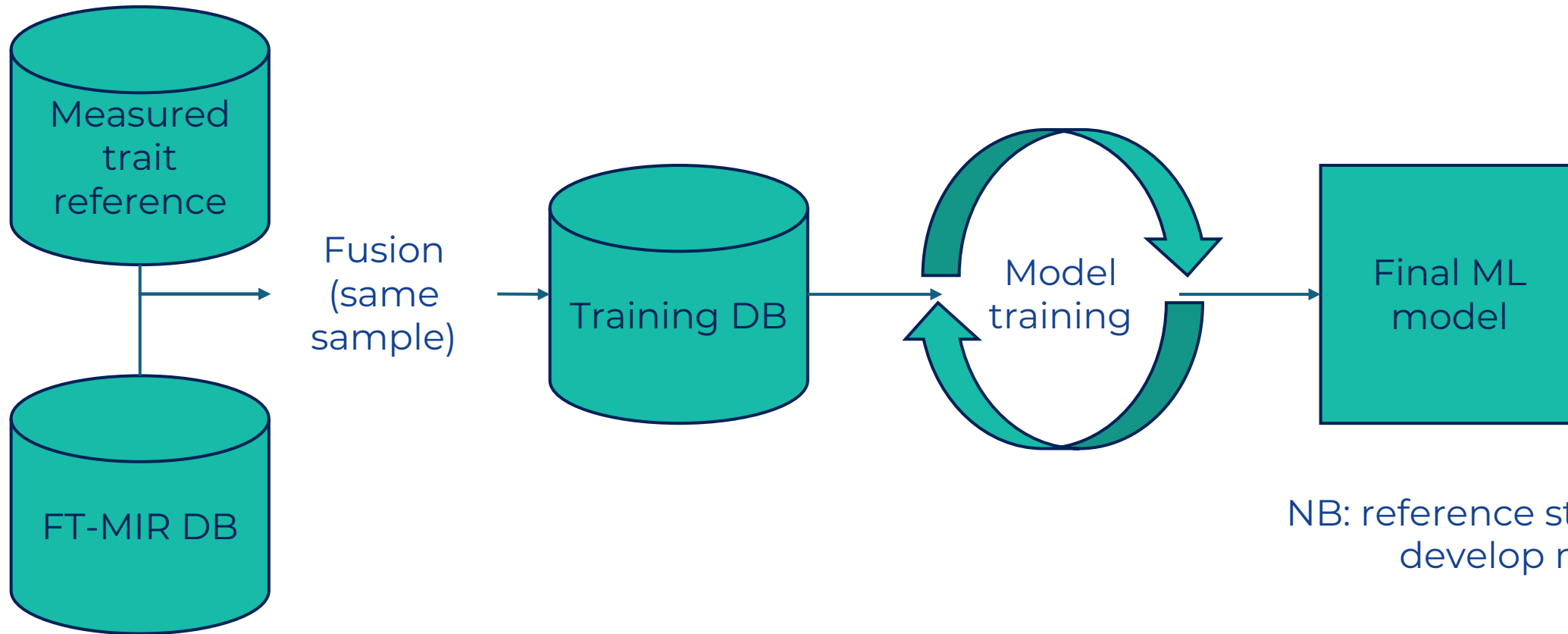
Image courtesy: Franceschini, 2024
Fox, G. The Brewing Industry and the Opportunities for Real-Time Quality Analysis Using Infrared Spectroscopy. Appl. Sci. 2020, 10, 616. <https://doi.org/10.3390/app10020616>

Introduction: a proxy : FT-MIR

How to know what's in milk?



Relationship often used : machine learning (ML) model

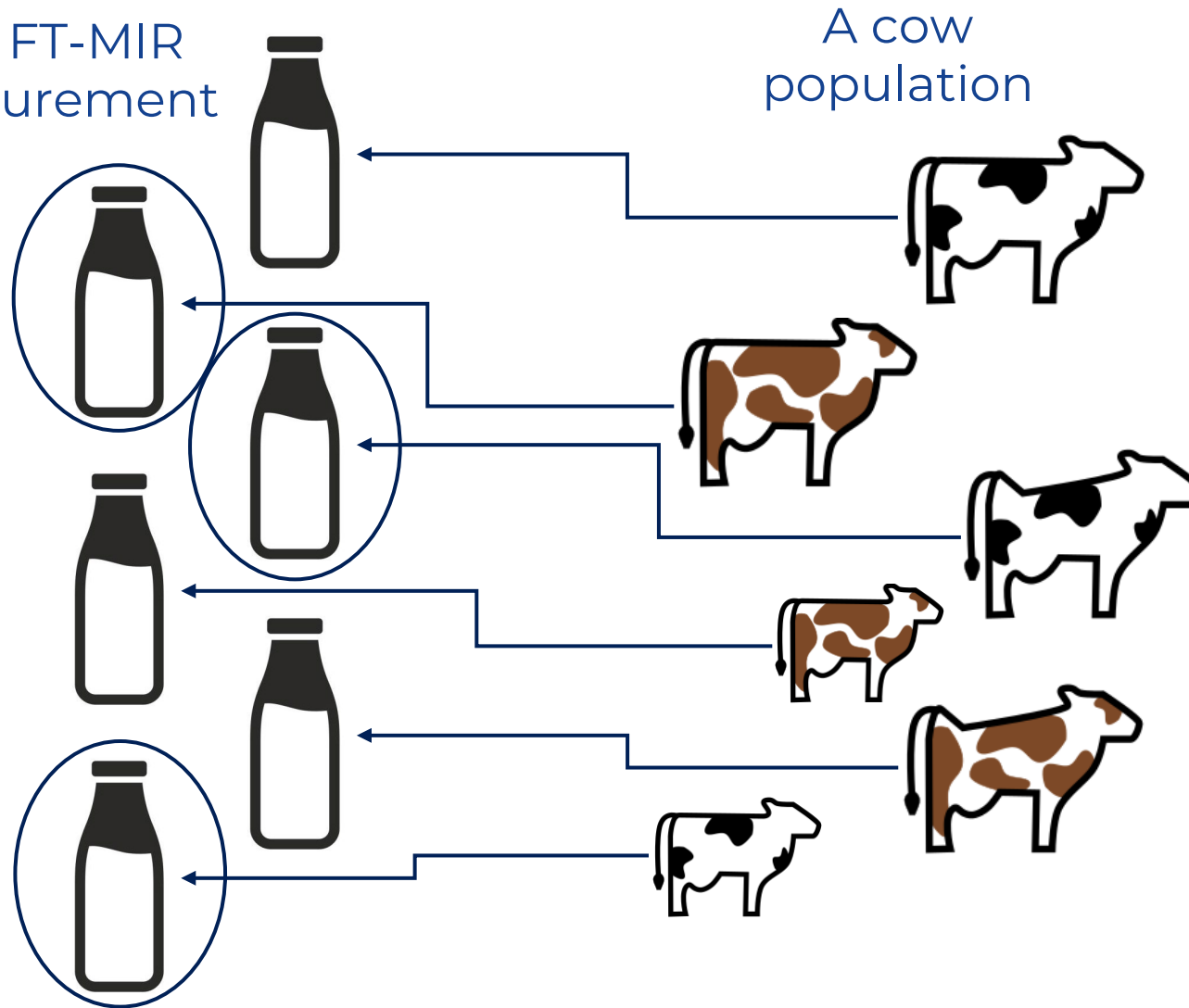


NB: reference still needed to develop models

A sampling campaign and then ...



Sampling for reference
and FT-MIR
measurement



A cow
population

Another cow
population

Sampling
representative?

Can models
developed on
the sampling be
applied?

HOT Topic:
dr Cecchinato'
presentation on Sunday:
“blood metabolites
predictions from Milk
MIR across breeds?”

Image courtesy:
Franceschini, 2021
<https://www.istockphoto.com/fr/vectoriel/ic%C3%B4ne-de-lait-bouteille-de-lait-du-lait-emball%C3%A9-gm1298696236-391512994>

Objective: representativity...

Representativity: a struggle in scope enlargement



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In Press, Journal Pre-proof [What's this?](#)



Rapid selection of milk mid-infrared spectra for creating a world representative spectral database of dairy cow population

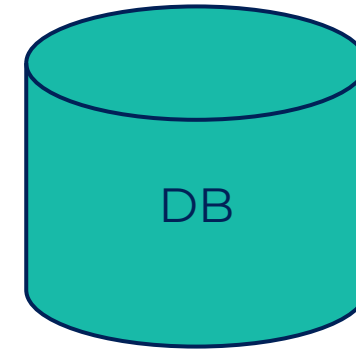
H. Soyeurt¹ , S. Franceschini¹, M. Bahadi², J. Leblois³, Y. Brostaux¹,
F. Dehareng⁴, M. Frizzarin⁵, K. Tiplady⁶, L. Dale⁷, C. Nickmilder¹

Show more

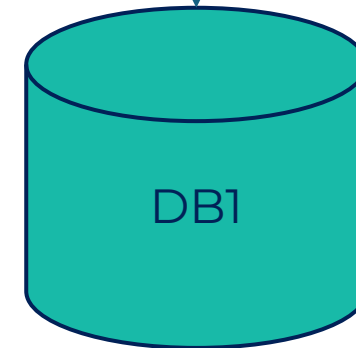
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<https://doi.org/10.3168/jds.2024-24911>

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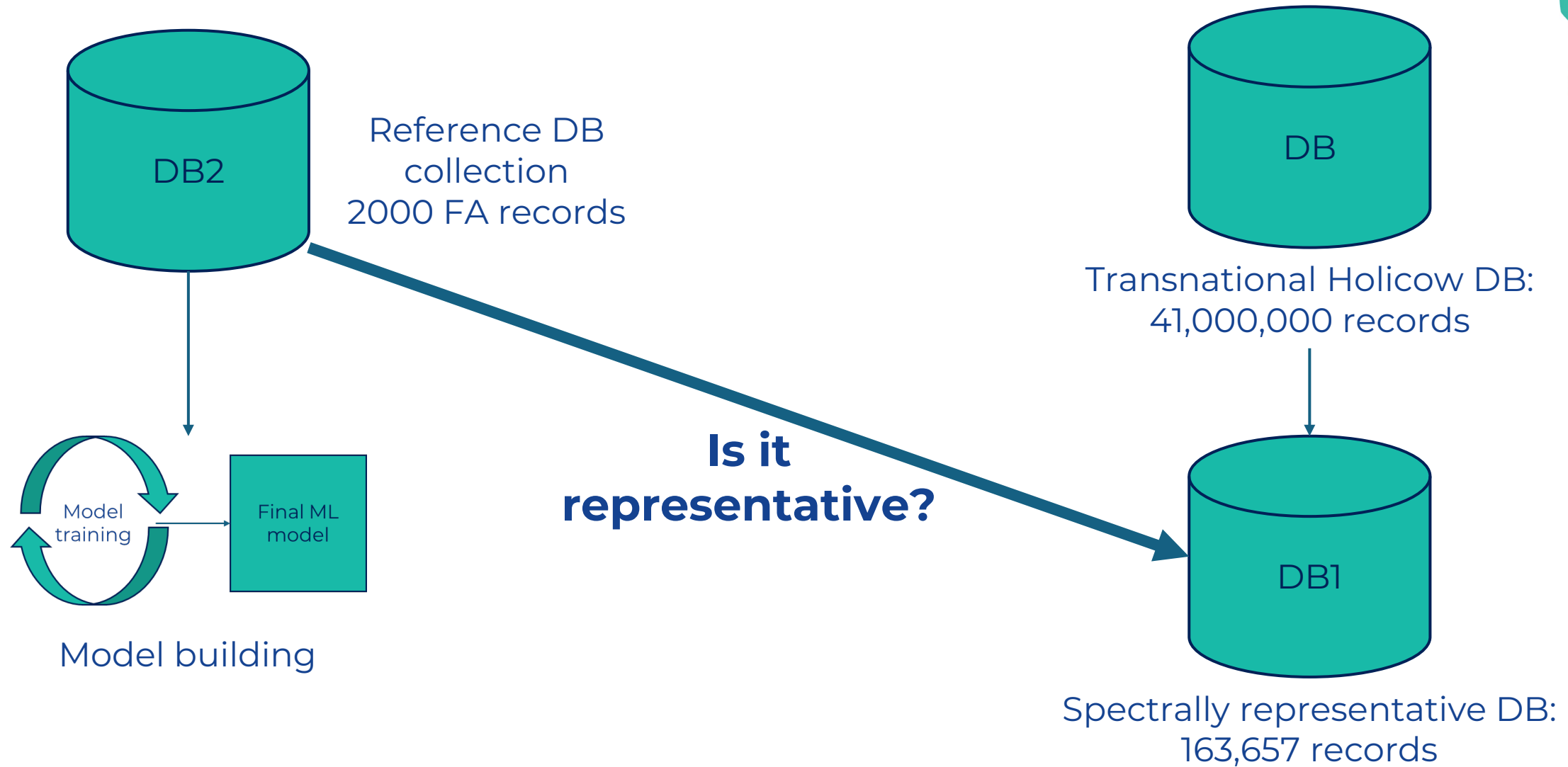


Transnational Holicow DB:
41,000,000 records

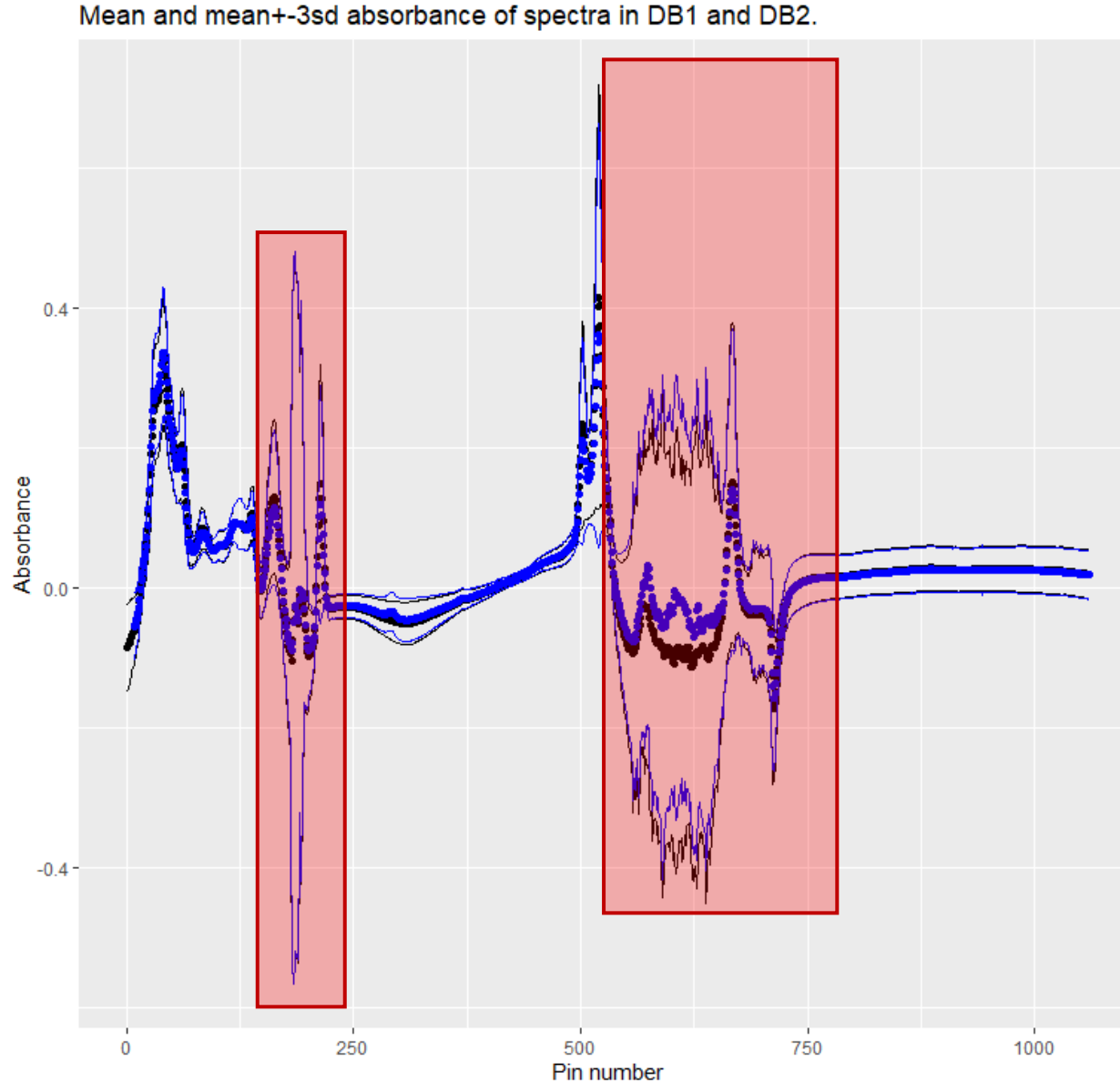


Spectrally representative DB:
163,657 records

Representativity: a struggle in scope enlargement



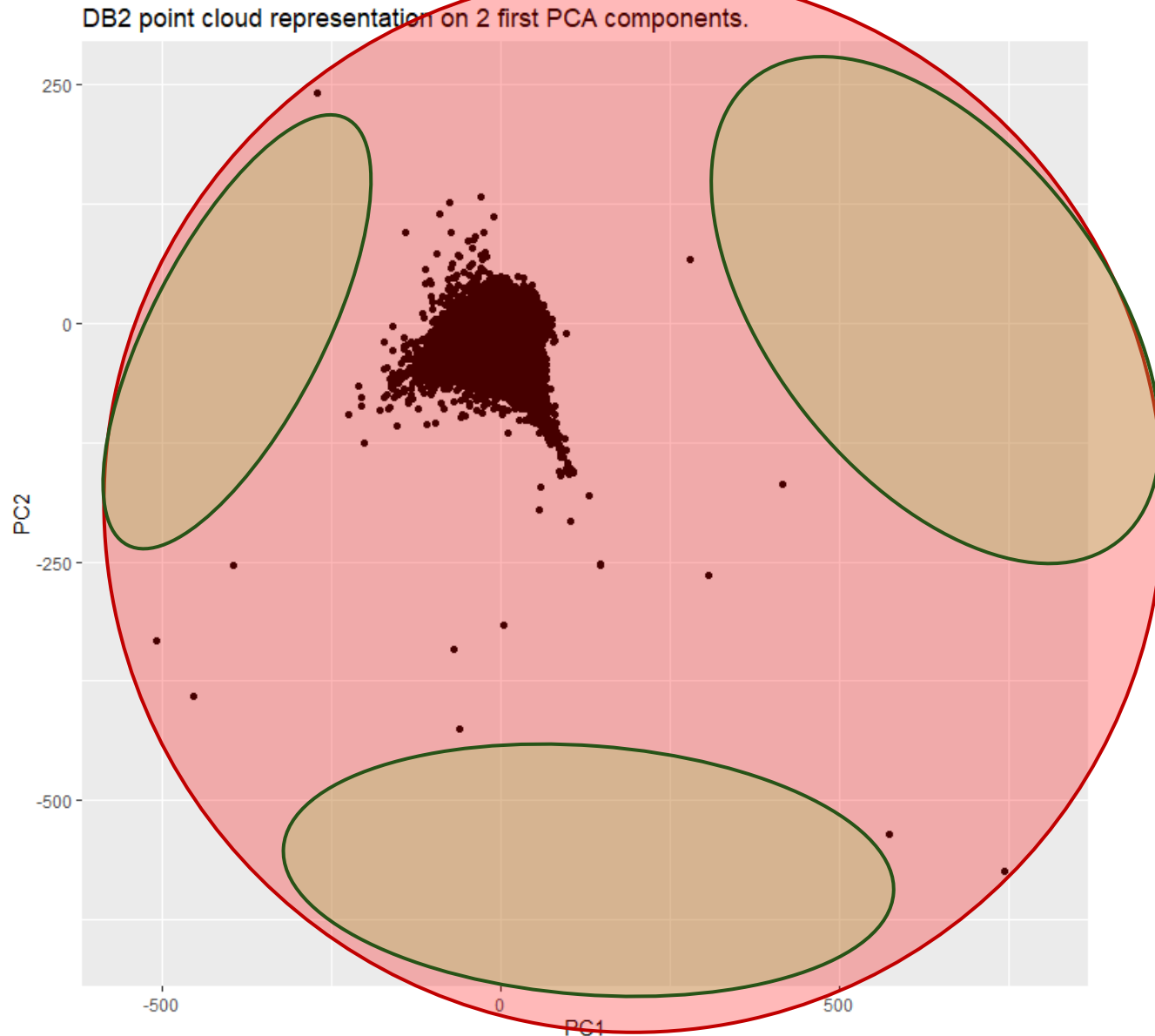
Representativity: a question of comparison



Messy

- 1060 dimensions => computation constraints
- noisy areas (Grelet, 2015)

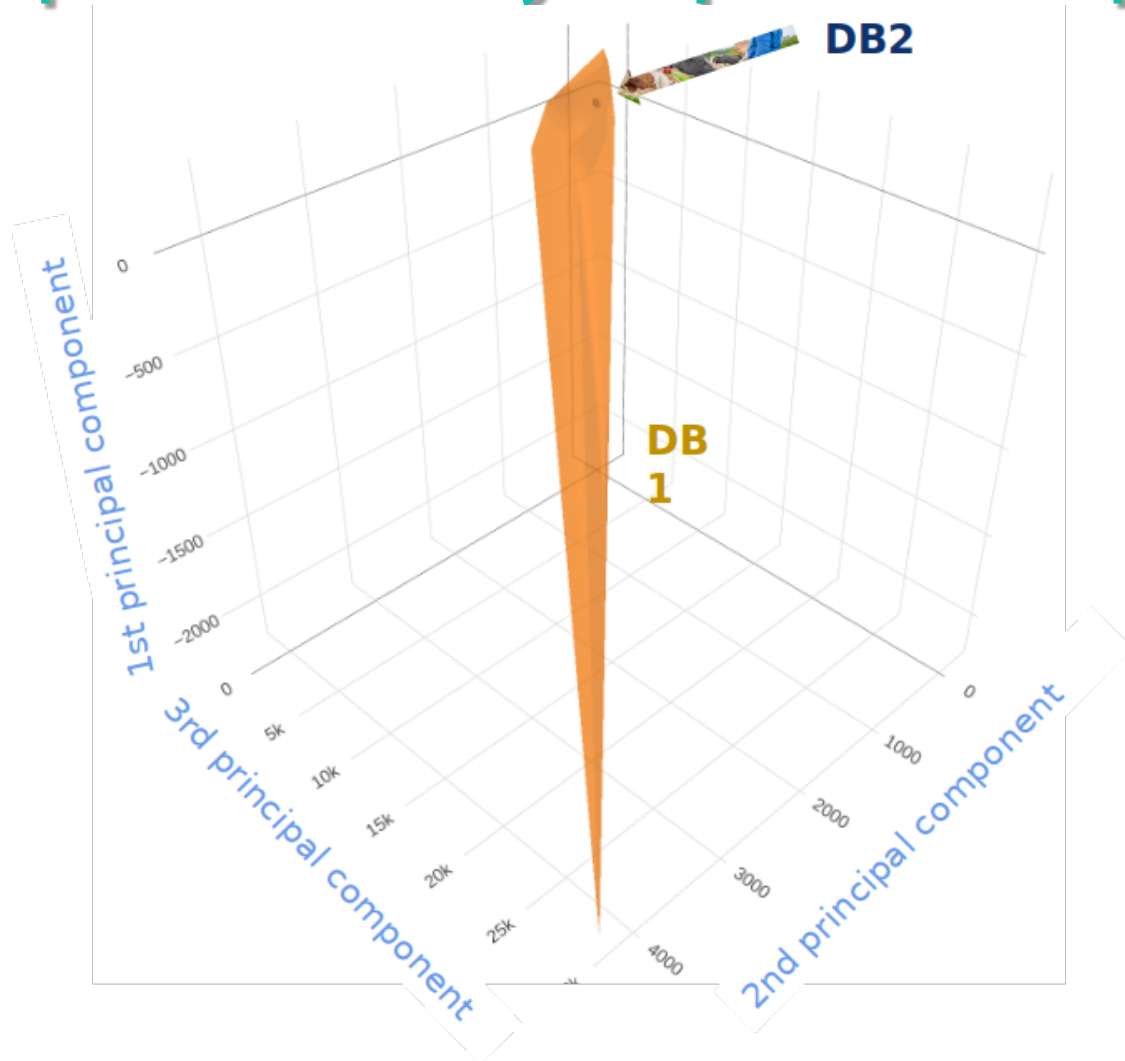
Representativity: a question of perspective



Classical population
discrimination: GH

Surrounding the points: OK
Yet spaces => convex hull

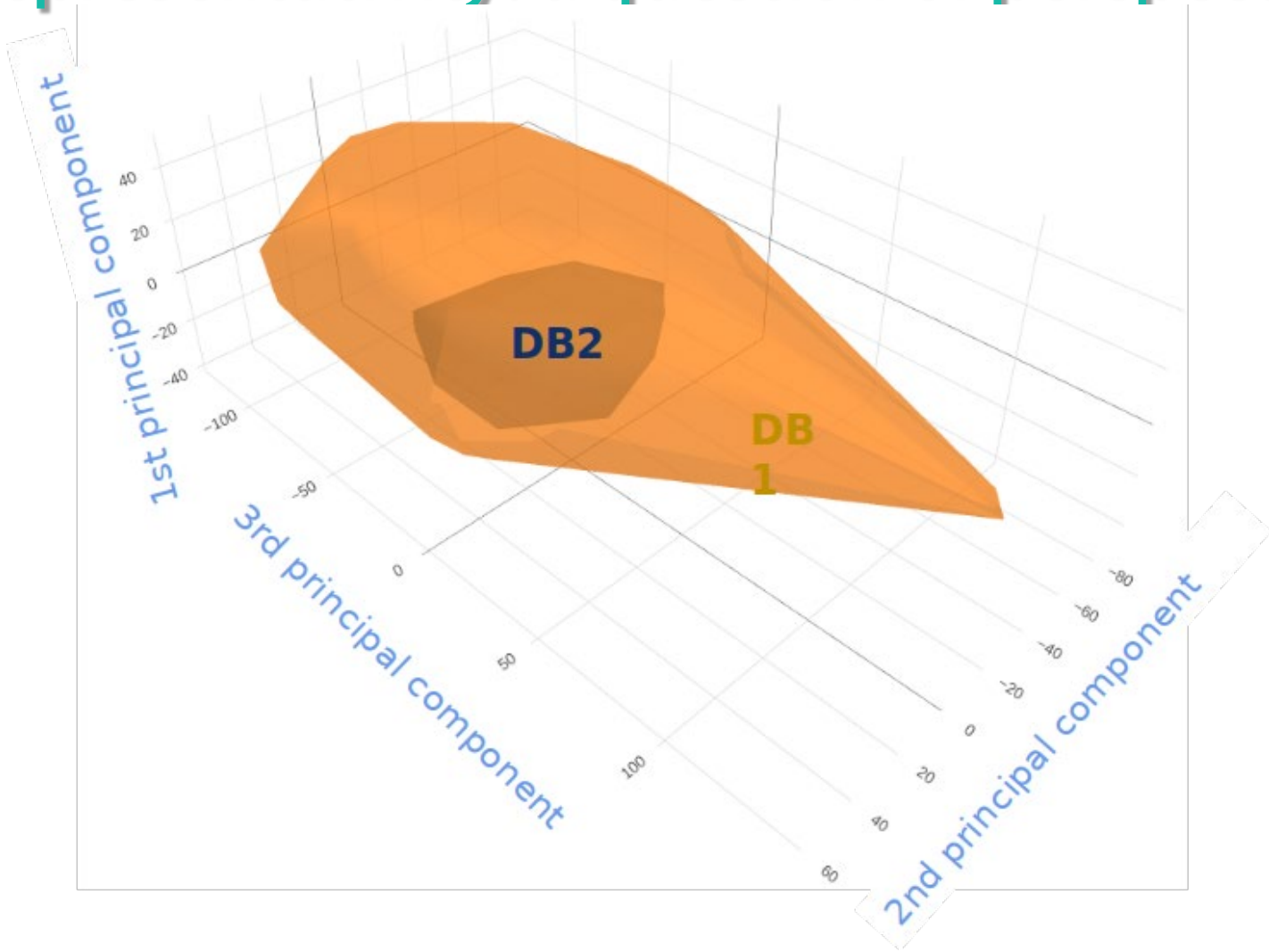
Representativity: a question of perspective



Strange behaviour...

	Volume without filters
Coverage	0,16%

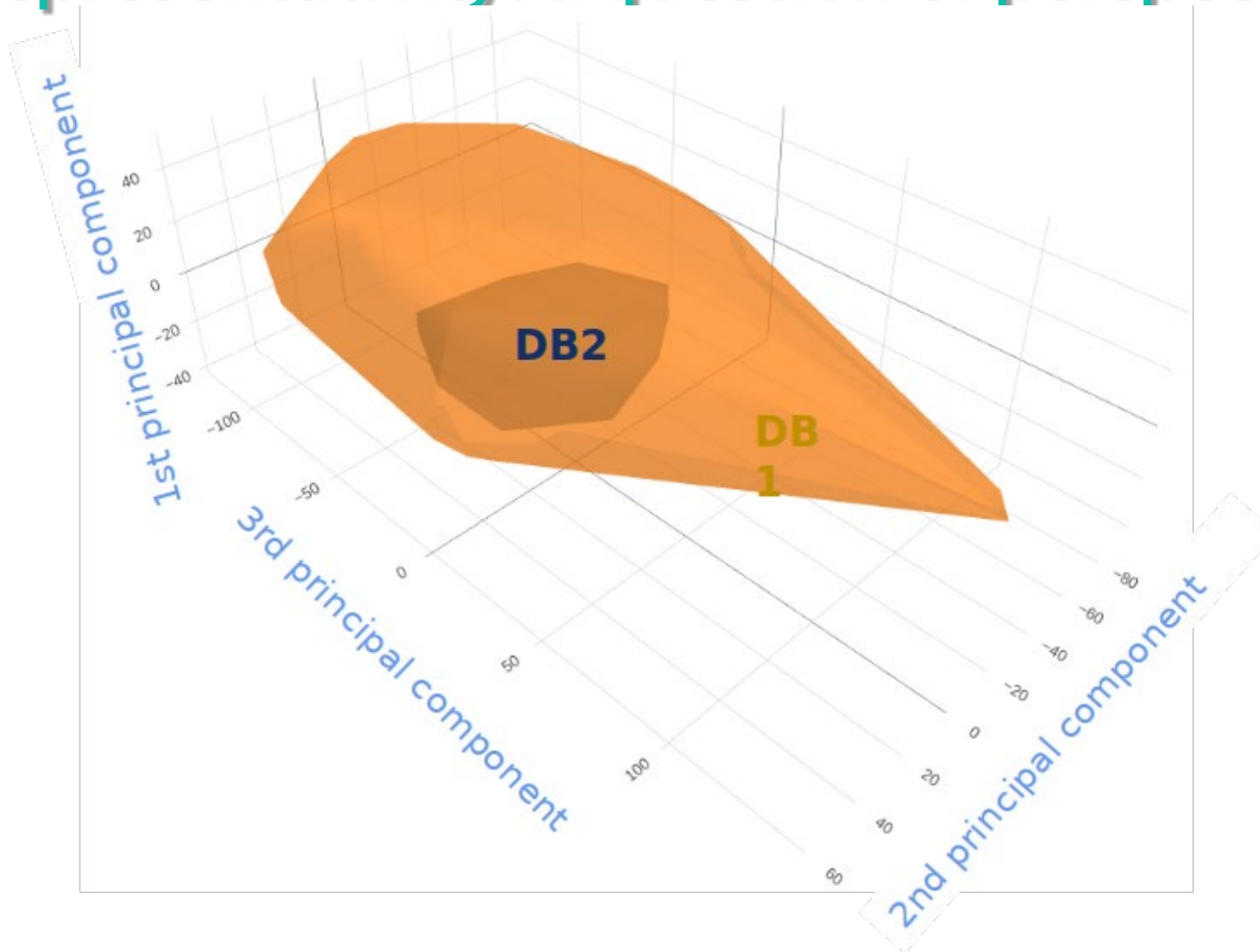
Representativity: a question of perspective



Much better, yet poor coverage

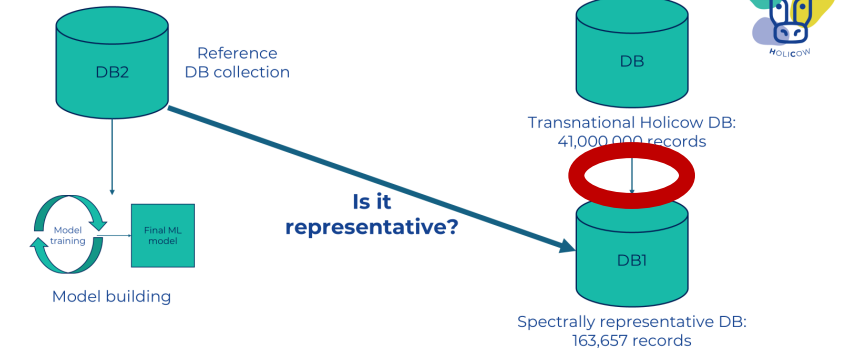
	Volume without filters	Volume with filters
Coverage	0,16%	12%

Representativity: a question of perspective



Reminder: downscaling based on density...

Representativity: a struggle in scope enlargement



Objective: representativity of DB...

6

	Volume without filters	Volume with filters
Coverage	0,16%	12%

What has been done?

- Development of a quick method to assess suitability and **spectral transferability** of a training DB and equations

To go further

- Based on the same principle: tool developed in ExtraMIR



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