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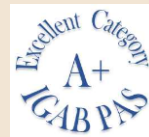


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Assessing the impact of extensive husbandry conditions on broiler meat quality using machine learning



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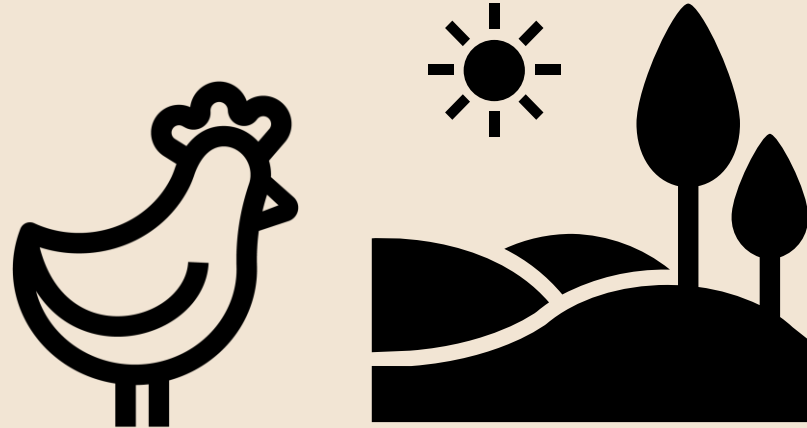


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UNIVERSITY & RESEARCH**



**INSTITUTE OF GENETICS
AND ANIMAL BIOTECHNOLOGY
of the Polish Academy of Sciences**

“Linking **extensive** husbandry practices to the intrinsic quality of broiler meat”



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Husbandry practices

Space allowance	Low density (≤ 35 kg/m ²)	High density (≥ 38 kg/m ²)
Diet	Roughage	No added roughage
Genetics	Slow-growing, male-layer, dual-purpose	Conventional fast-growing
Quality of Space	Enrichment (barrier, perch, straw/lucerne bale, dust bath)	No added enrichment
Welfare	High	Low

Husbandry practices

- Space allowance
- Diet
- Genetics
- Quality of Space

Welfare score

- Cleanliness
- Gait score
- Hock burn
- Skin condition



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Sensory



Chemical



- Trained sensory panel (8 panelists)
- Appearance, odour, flavour, texture and aftertaste

Intrinsic meat quality

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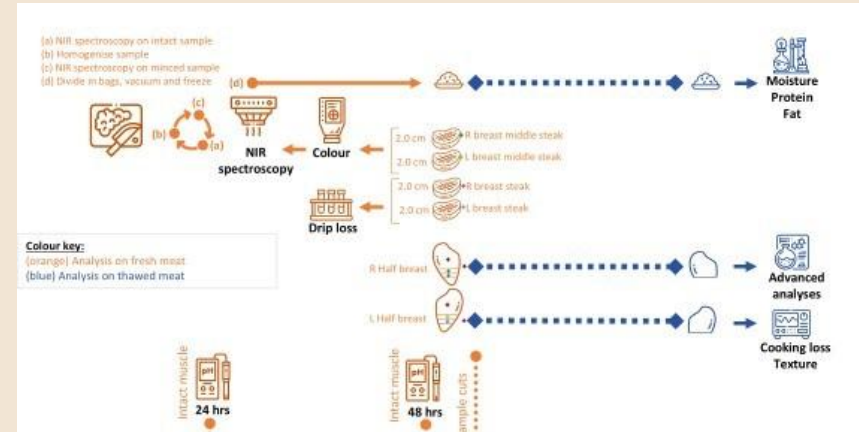
- pH, texture analysis, $L^*a^*b^*$ values, moisture content...



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Data processing

80% train set (with cross-validation)

20% test set

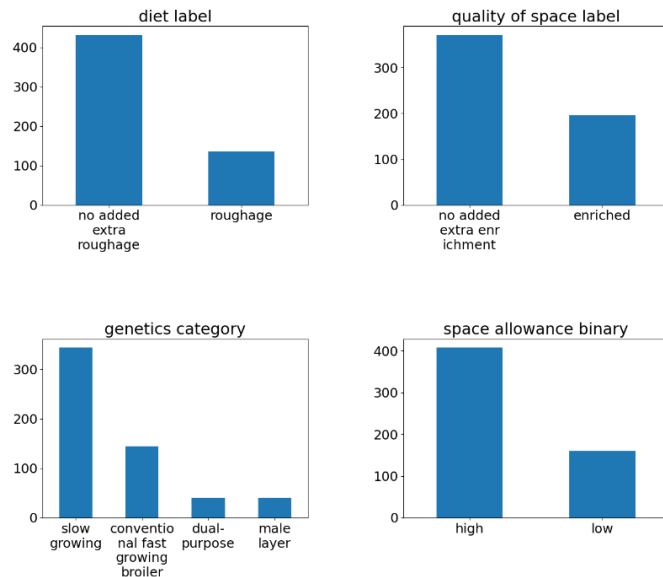
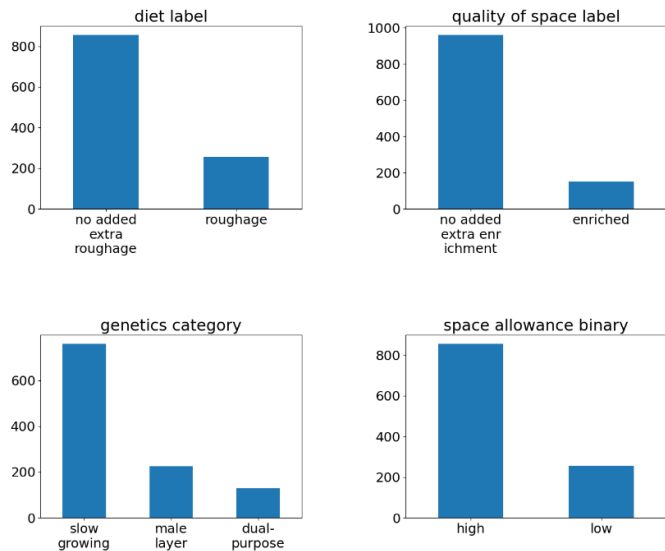
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Sensory

- Panelist-wise z-score scaling

Chemical

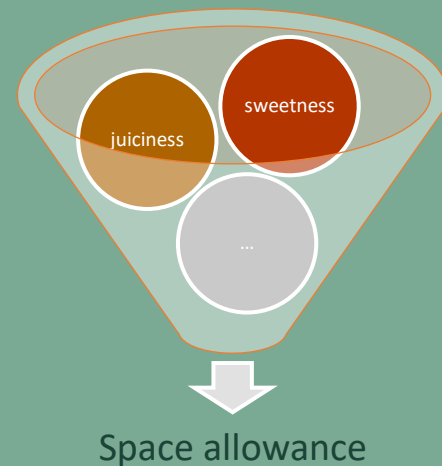
- Min-max scaling
- MICE imputation



Machine learning (ML) methodology

Can we trace back the extensiveness of a condition from the quality of meat?

- 1) Train ML models to classify husbandry conditions and welfare
- 2) Performance assessment (ROC-AUC)
- 3) Feature importance analysis



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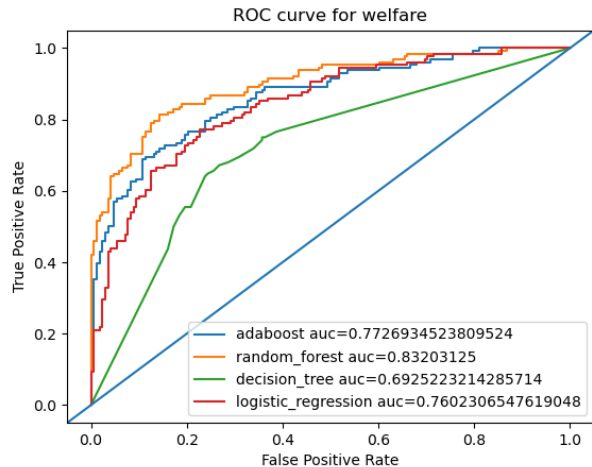
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Performance assessment

Architecture space:

AdaBoost, Random Forest, Logistic Regression, Decision Tree

Best results:



	Sensory		Chemical	
	ROC-AUC	Model	ROC-AUC	Model
Genetics	0.77	Random Forest	0.94	AdaBoost
Welfare	0.83	Random Forest	0.92	Random Forest

Feature importance analysis

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SHAP value-based explanations

Genetics:

sensory: crispiness skin, colour skin, and saltiness skin
chemical: colour (a^* , b^*) and texture (BMORS shear energy)

Welfare:

sensory: saltiness of skin, crispiness of skin and hardness at first bite
chemical: colour (a^*b^*), cooking loss, and texture (BMORS shear energy)



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Conclusion

Genetics and **welfare** have the strongest link
to meat quality



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Upcoming...



- Publication of “Assessing the impact of husbandry factors on poultry meat quality using a machine learning approach ”
- Data available at request*
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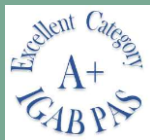
* After the end of the project



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Thank you
for your attention

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