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UAB
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Identification of meat defects in broilers with short-wave pocket NIR spectrometer

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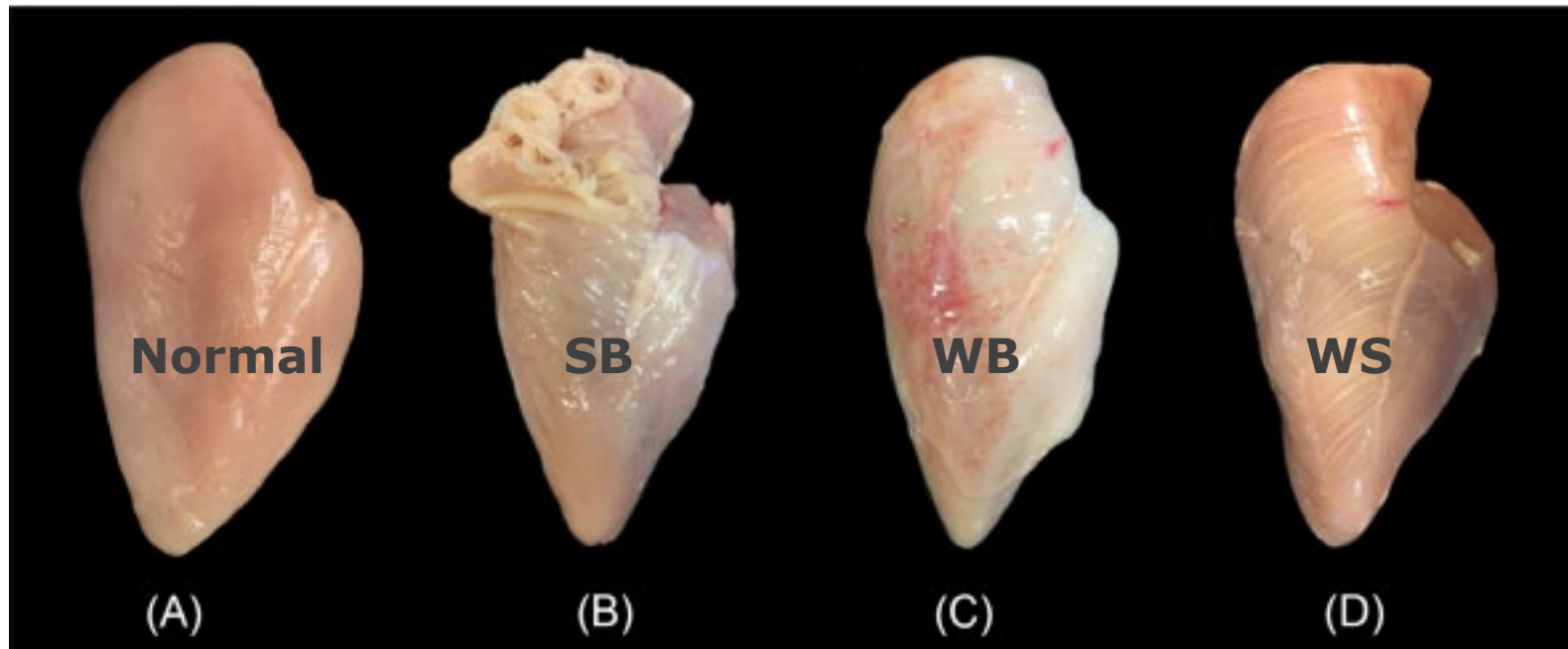
intaqt
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⁴ITAVI-URA BP1, France; ⁵INRAE-UMR BOA, France;



1. Introduction

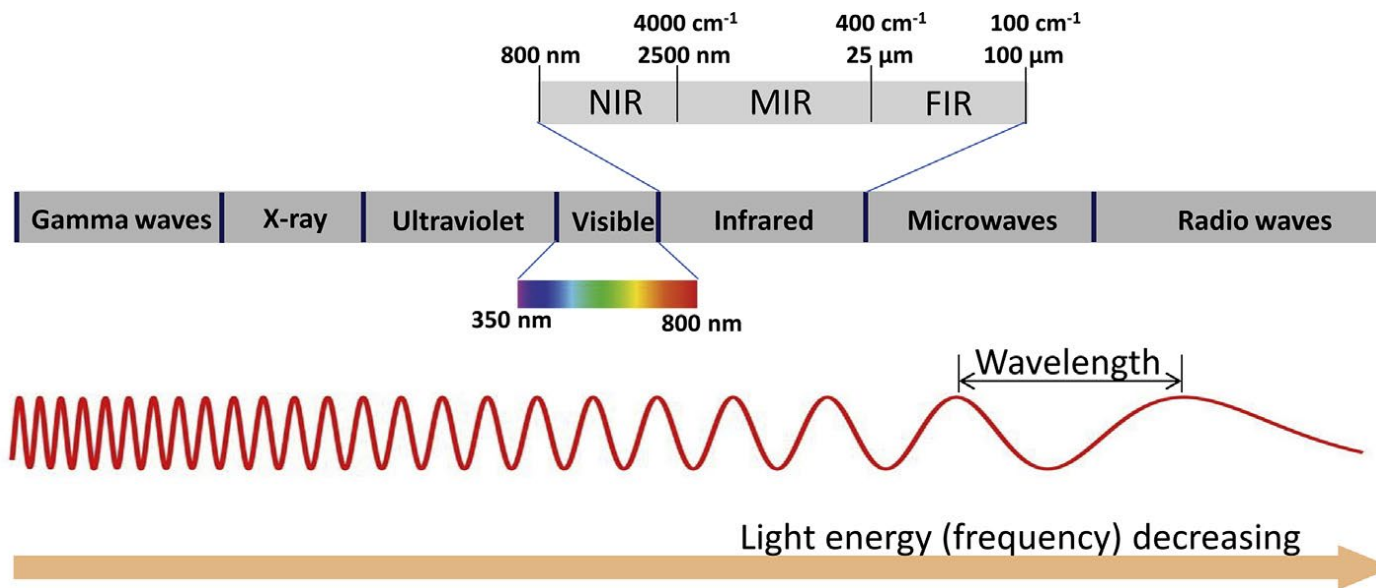
- **Novel myopathies: wooden breast (WB), white striping (WS), spaghetti breast (SB)**
- **Improvement growth rate, breast muscle size and yield**
- **Loss of myofibers and increase fibrous tissue**



(Che et al., 2022)

1. Introduction

- **Infrared spectroscopy: cost-effective, rapid, easy-to-use, environmentally friendly**



(Pu et al., 2020)



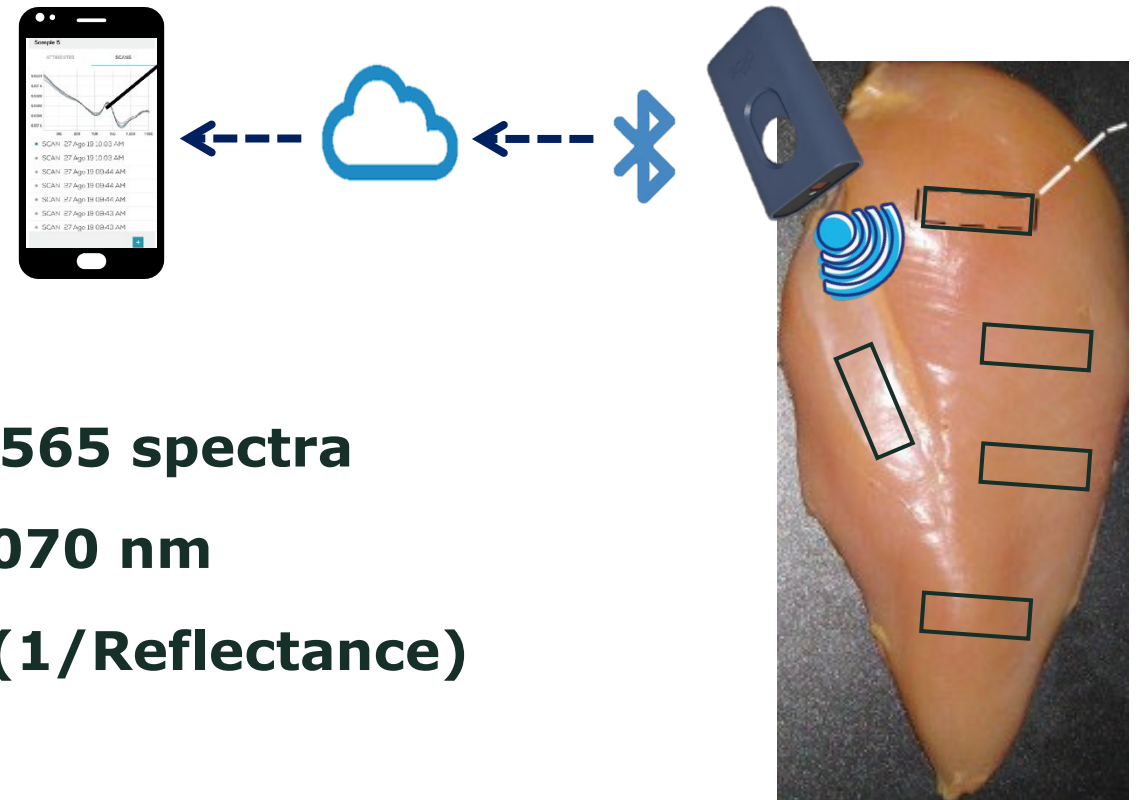
Pocket-sized NIR:
67.7 × 40.2 × 18.8 mm; SCiO™
Every 1 nm from **740 to 1070** nm

2. Aim

Evaluate the potential of a pocket-sized NIR spectrometer to predict WB, WS and SB in broilers

3. Material & Methods

- Ross 308 strain chicks
- 5 read per breast
- Cleaning data → 4,313 animals; 21,565 spectra
- SCiO™ → Every 1 nm from 740 to 1070 nm
- Absorbance was recorded as $\log_{10}(1/\text{Reflectance})$
- Room temperature



3. Material & Methods

- **PLS-DA package 'caret' 10-fold cv × 3 times**
- **Identification VIP regions (carte) + 1st derivative (mdatools)**
- **Dataset: 70:30**
- **N components ≤ 10**
- **Spectral data: centered and scaled**
- **Compared:**
 - **No Defect vs. Defects (WS, WB, and/or SB)**
 - **No Defect vs. WS**
 - **No Defect vs. WB**
 - **No Defect vs. SB**

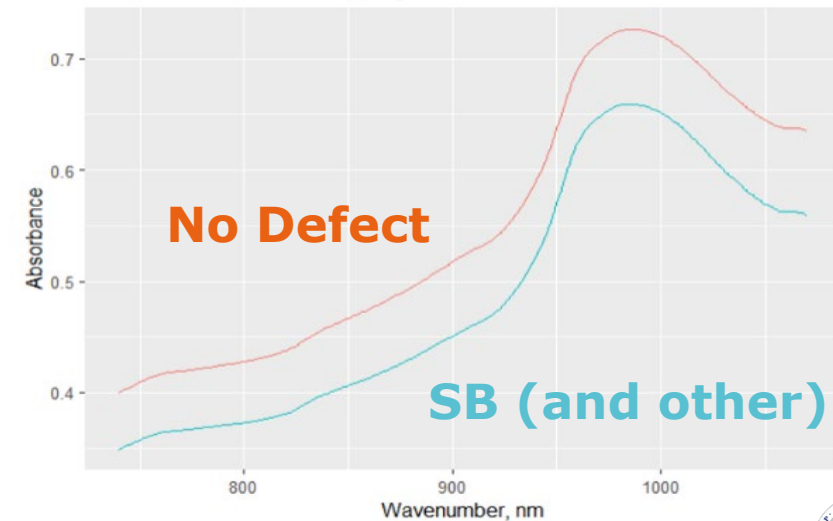
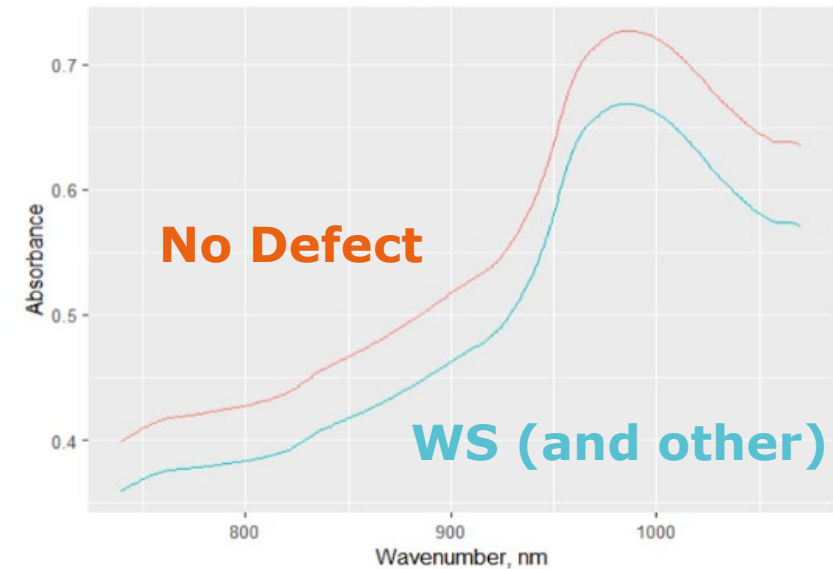
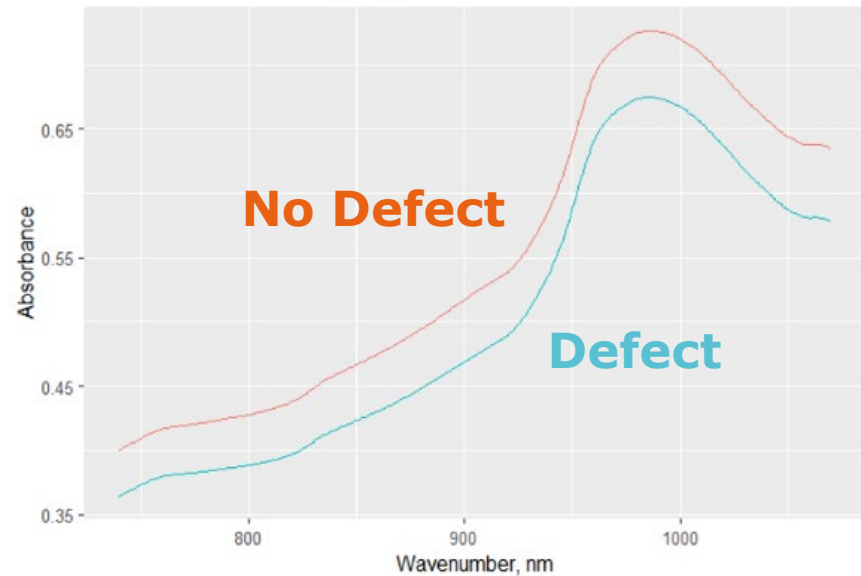


4. Results – Mahalanobis distance

	Initial (N)	After Mahalanobis (%)			
		≤ 20	≤ 15	≤ 10	≤ 3
None defect	2438	-1.23	-2.30	-5.09	-26.21
SB (alone)	40	0.00	0.00	-5.00	-22.50
SB+WB	17	0.00	0.00	0.00	-17.65
SB+WS	71	0.00	0.00	-2.82	-33.80
SB+WB+WS	86	0.00	-2.33	-6.98	-36.05
WB (alone)	322	-0.31	-0.31	-1.24	-16.77
WS (alone)	383	-1.31	-1.57	-3.39	-22.45
WS+WB	956	-0.84	-2.30	-7.32	-35.36
Total	4313	-1.02	-2.02	-5.12	-27.45

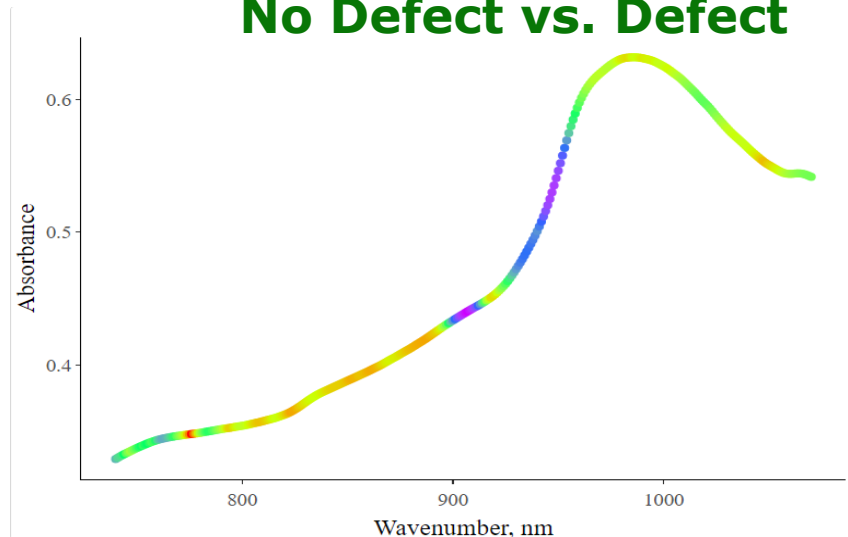


4. Results – Average Spectra Absorbance

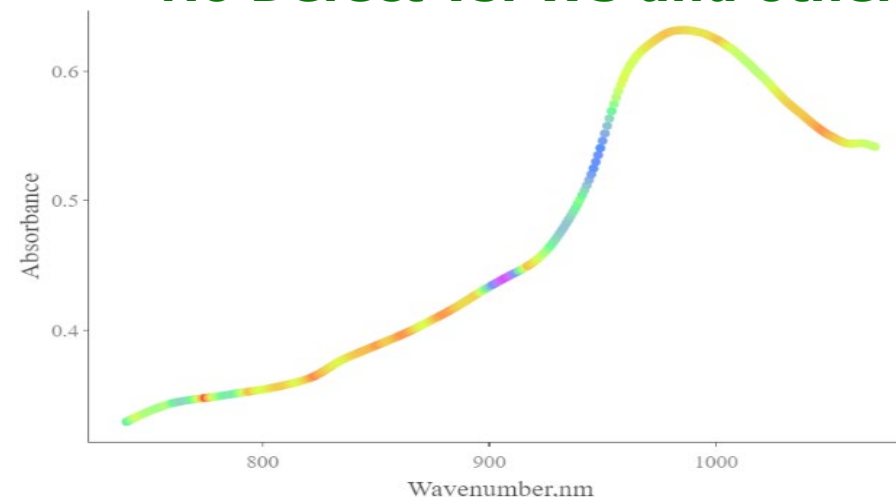


3. Results – VIP – Raw Spectra

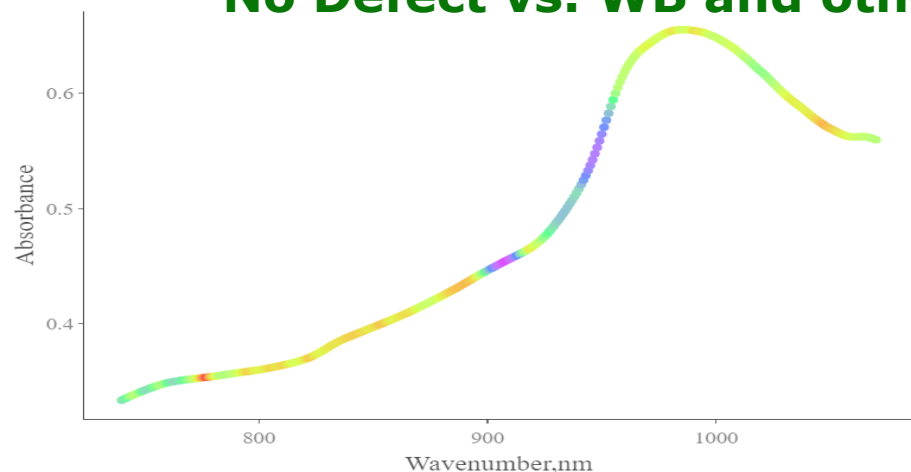
No Defect vs. Defect



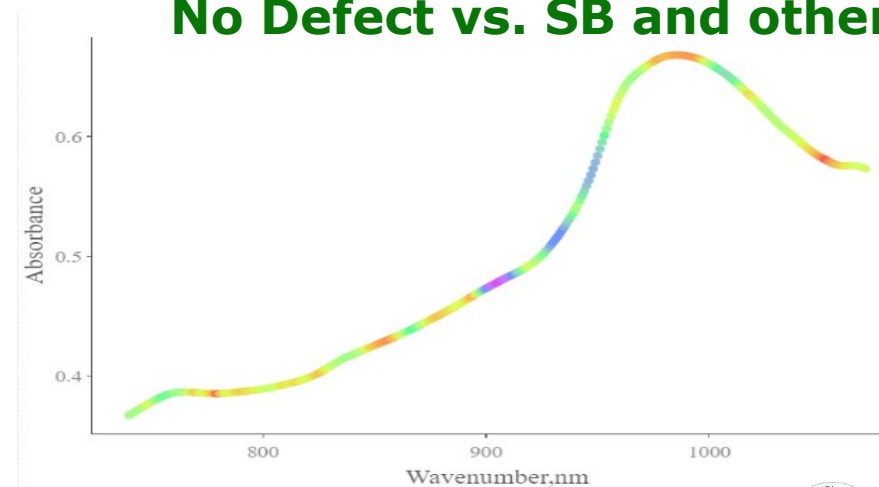
No Defect vs. WS and other



No Defect vs. WB and other



No Defect vs. SB and other



4. Results – Models’ Performance Raw Spectra

All	N. No Defect	N. Defect	LV	Test Set		
				Sensibility	Specificity	Bal Acc
No Defect vs. WS or/and WB	2408	1647	10	0.87	0.63	0.75
No Defect vs. Defect (WS or/and WB or/and SB)	2408	1861	10	0.85	0.63	0.74
Selecting 22 wavelengths No Defect vs. Defect	2408	1861	10	0.86	0.61	0.73



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Spaghetti Meat						
SB (Absent vs Present)	4055	214	10	1.00	0.00	0.50
SB (No defect vs. SB and other)	2408	214	9	1.00	0.02	0.51



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White Striping						
WS (Absent vs. Moderate or High)	2786	1483	10	0.88	0.63	0.76
WS (Absent or Moderate vs. High)	3903	366	9	0.99	0.02	0.51
WS (No Defect vs. only WS)	2408	378	10	0.99	0.03	0.51
WS (No Defect vs. WS and other)	2408	1483	10	0.89	0.72	0.80



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Wooden Breast						
WB (Absent vs. 1-2-3)	2897	1372	10	0.88	0.55	0.72
WB (0-1 vs 2-3)	3532	737	8	0.97	0.48	0.72
WB (No Defect vs. only WB)	2408	321	10	1.00	0.00	0.50
WB (No Defect vs. WB and other)	2408	1372	10	0.90	0.61	0.75

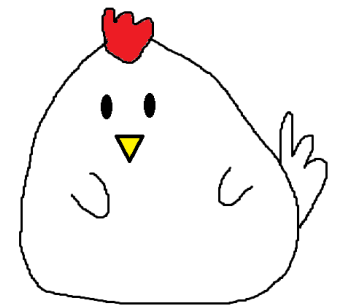


4. Results – Models' Performance – 1st Derivative

	N. No Defect	N. Defect	Model	LV	Test Set		
					Sensibility	Specificity	Balance Accuracy
No Defect vs. Defect (WS and/or WB and/or SB)	2408	1861	Raw spectra	10	0.85	0.63	0.74
			1st Derivate	10	0.83	0.66	0.75
SM (No Defect vs. SB and other)	2408	214	Raw spectra	9	1	0.02	0.51
			1st Derivate	9	1	0.02	0.51
WS (No Defect vs. WS and other)	2408	1483	Raw spectra	10	0.89	0.72	0.80
			1st Derivate	10	0.88	0.73	0.80
WB (No Defect vs. WB and other)	2408	1372	Raw spectra	10	0.90	0.61	0.75
			1st Derivate	10	0.89	0.62	0.75

5. Conclusions

- **Meat defects reduce the absorbance of the samples**
 - **1st Derivative and Wavelength selection did not improve the models**
 - **Raw spectra can be used to build the models**
-
- **Highest Balanced Accuracy: WS (0.80) > WB (0.75) > Any Defect (0.74)**
 - **All models high sensitivity**
 - **Specificity was moderate to low**
 - **NIR could be used to identify samples without defects**



... Thank you for your attention

Any questions?



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