AI for assessment of light leaf spot in winter oilseed rape varieties

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Agenda

1. Growth conditions for WOSR in DK
2. Presence of light leaf spot Pyrenopeziza brassicae (asexual stage, Cylindrosporium concentricum)
3. Background for making a model
4. Data collection
5. Results
6. Conclusions

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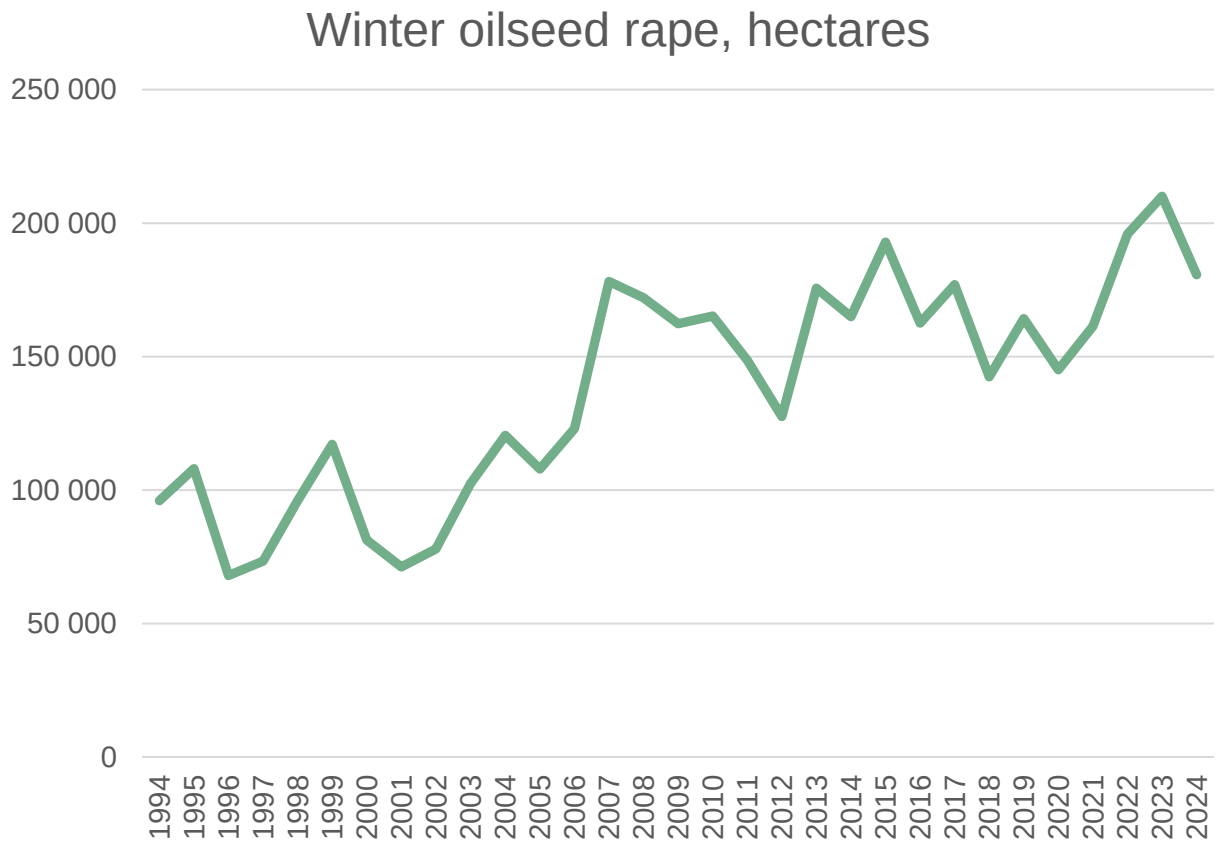
Growing WOSR in Denmark: Area, yield, soil, climate

- Precipitation: 760 mm/year
- Avg. temperatures (1991-2020)
  - Autumn : 9,5°C
  - Winter : 2,0°C
  - Spring: 7,3°C
  - Summer: 16,1°C
- Clay in soil: 5-25 % of soil weight
- Drilling and harvest: August
- Yield avg. (2018-2024): 4,0 t/ha



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Light leaf spot in Denmark

- Usually, no visual infections in Autumn
- Appears from February
- Threshold value (20 pct. plants with 5 pct. leaf coverage or more
- Fungicide treatment (once) if above TH. in 10 percent of fields
- Fungicide treatment st. 65 or split (primarily Sclerotinia)

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Why estimate the levels of light leaf spot with a quick metod?

- Levels of light leaf spot is not easy to assess unless you have trained skills
- OSR varieties shifts relatively fast and not all characteristics are well known, which make it nescessary to have tools for quick assesment
- Ranking in to 3-4 susceptibility groups (zero, low, medium and high)
- More favorable climate conditions for the disease is expected in Denmark in the coming years due to climate changes

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AI model for photo assessment of light leaf spot

Scores for level of infection on stems

1: No infection
2: Traces
3: Few spots
4: Approx. 1 percent coverage
5: Approx. 5 percent coverage
6: Approx. 10 percent coverage
7: Approx. 25 percent coverage
8: Approx. 50 percent coverage
9: Approx. 100 percent coverage

- Good correlation between infection levels on leaves and stems (2020-2021)
- Two years data (2023-2024)
- 10 varieties in 2023 and 28 in 2024 (2 repetitions)
- Traditionel visual assessment on stems in variety trial plots
- Three photos in the end of same plots from different angels with a uniform background (professional camera and smartphone)

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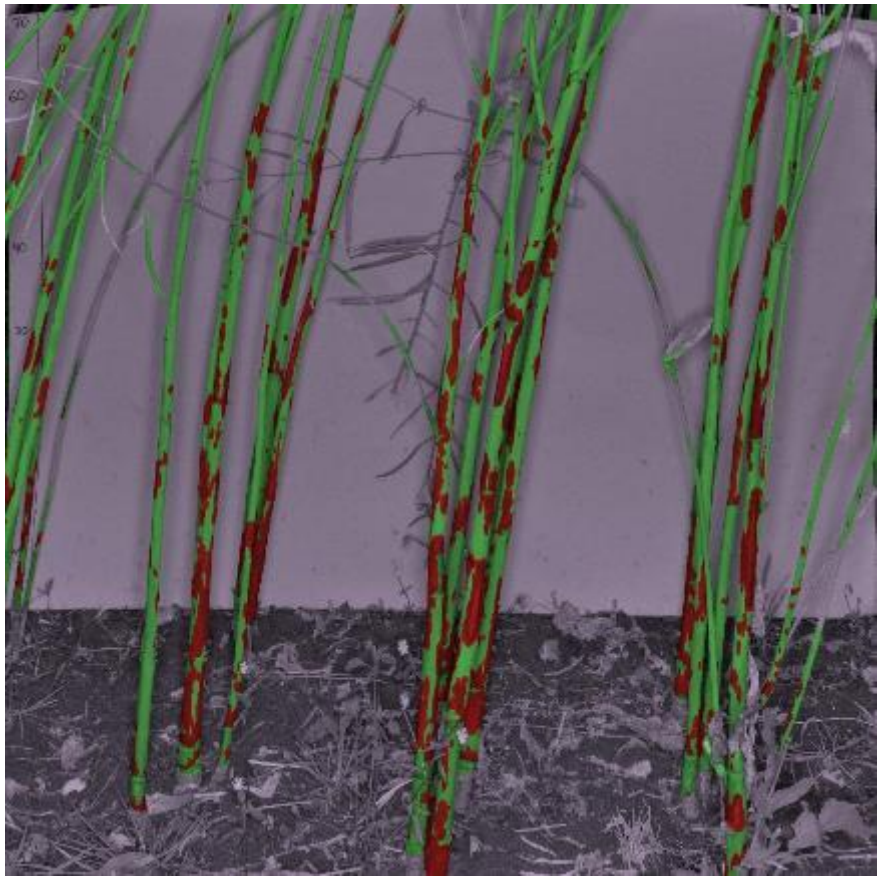
Annotation of light leaf spot on digital photos



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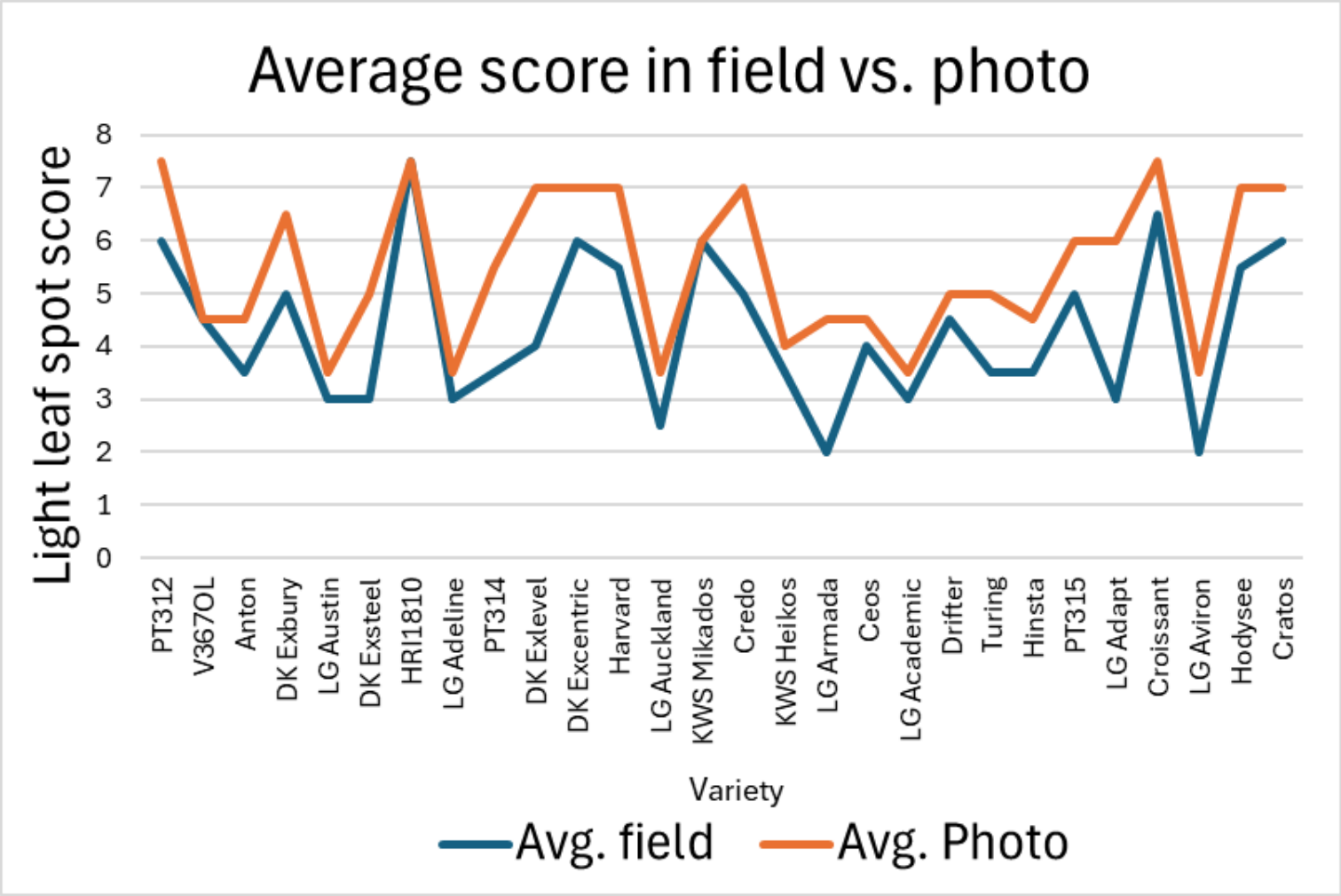
Correlation in 2024 between manual score and AI score from photos



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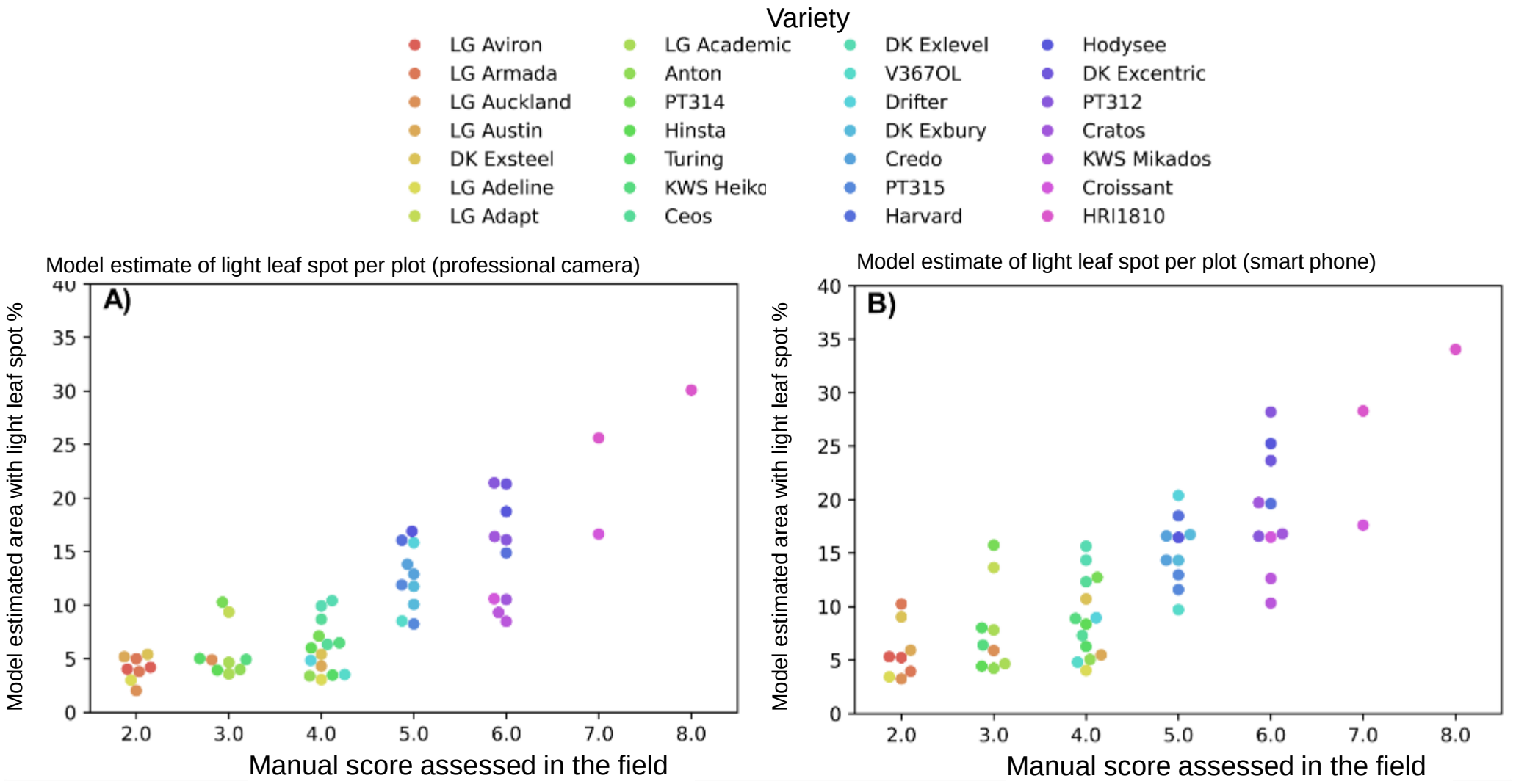
Comparison of varieties assessed in the field in 2024 with non-calibrated estimates derived from models with professional camera (A) or smart phone (B)



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Precision of smart phone photos

Smart phone	Probability for precise estimate of score	
	1 photo	3 photos
Score from photo	55,5 %	59,3 %
Score from field obs.	43,2 %	48,1 %

Smart phone	Probability for estimate of score ± 1	
	1 photo	3 photos
Score from photo	95,7 %	96,3 %
Score from field obs.	82,1 %	81,5 %

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Conclusions

- AI model is developed and validated to be sufficiently accurate to group scores of light leaf spot on stems
- Accuracy will increase with more data
- The model has not been stressed (e.g. material including other stem diseases or tall weeds)
- App version for smart phones to give a quick estimate of the degree of light leaf spot

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Thank’s for your attention!

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