Intelligence & Robotics in the Farming Landscape: Field-ready AI

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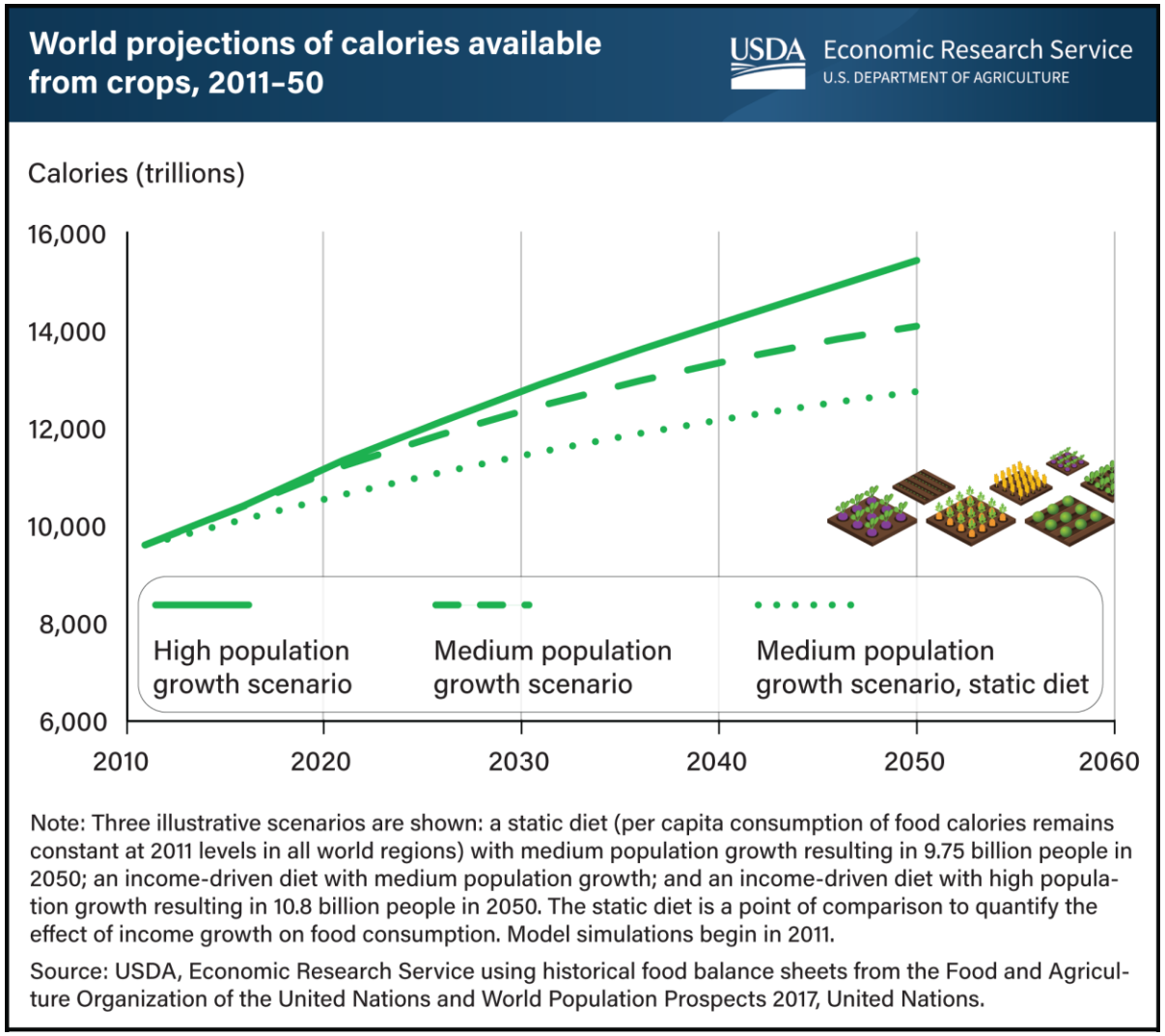
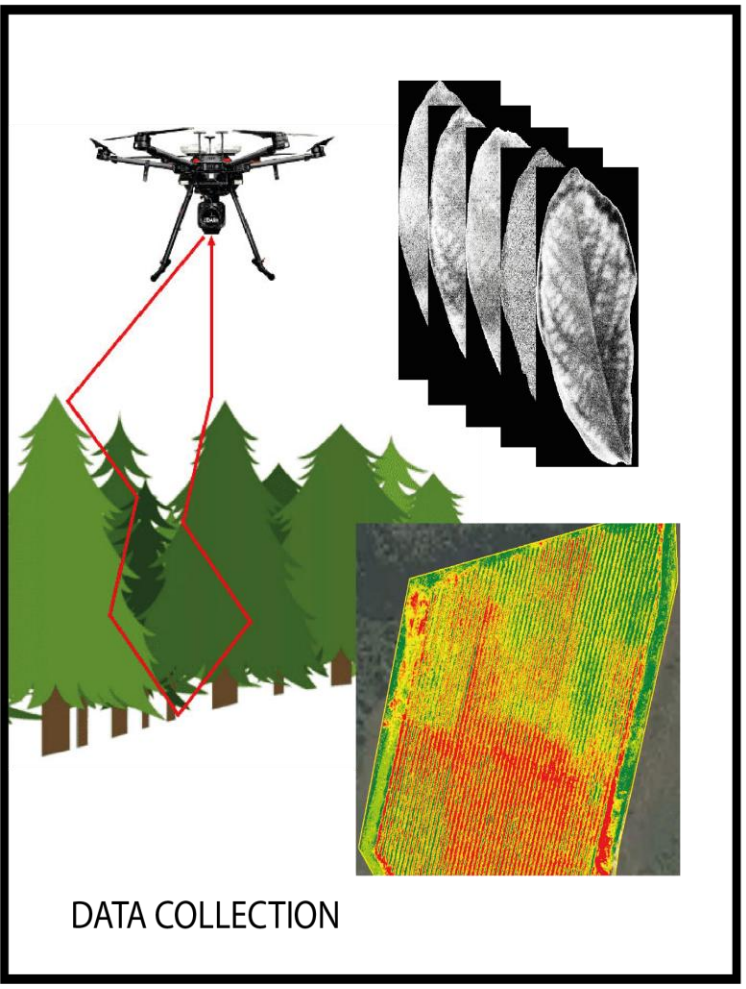
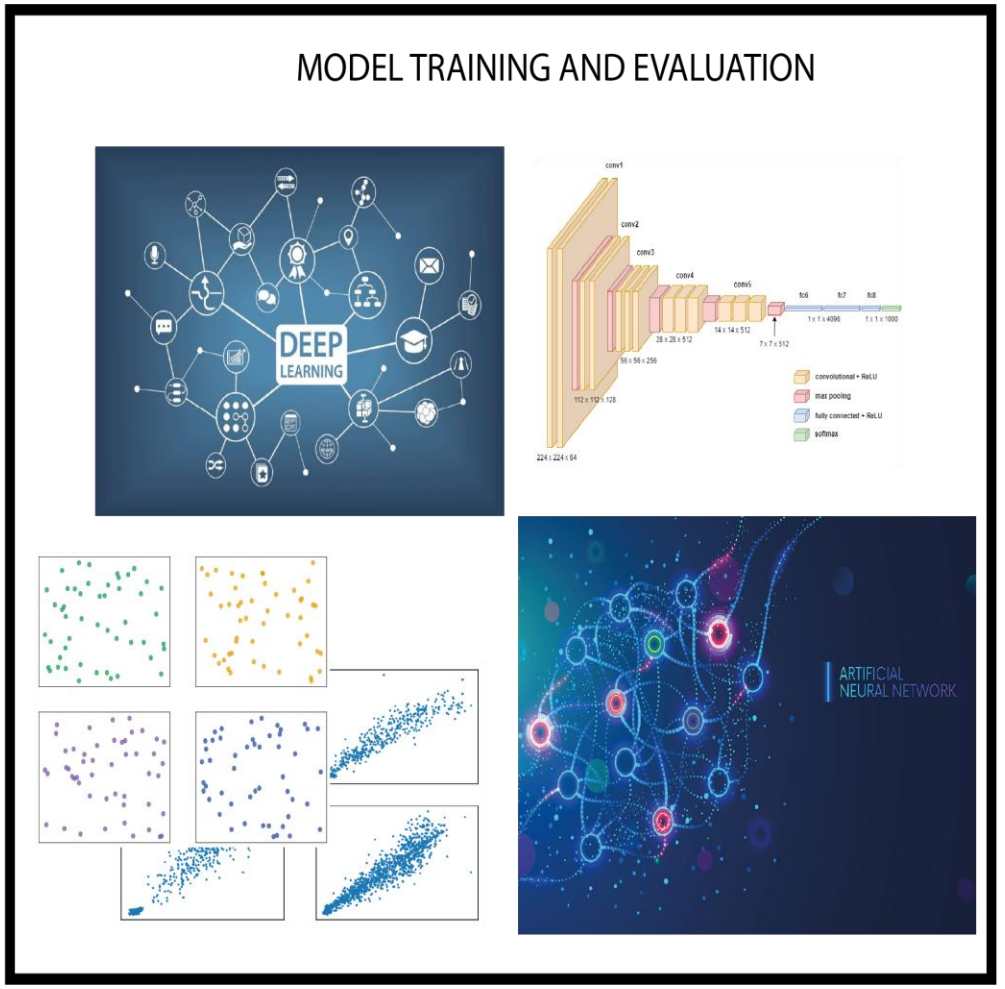
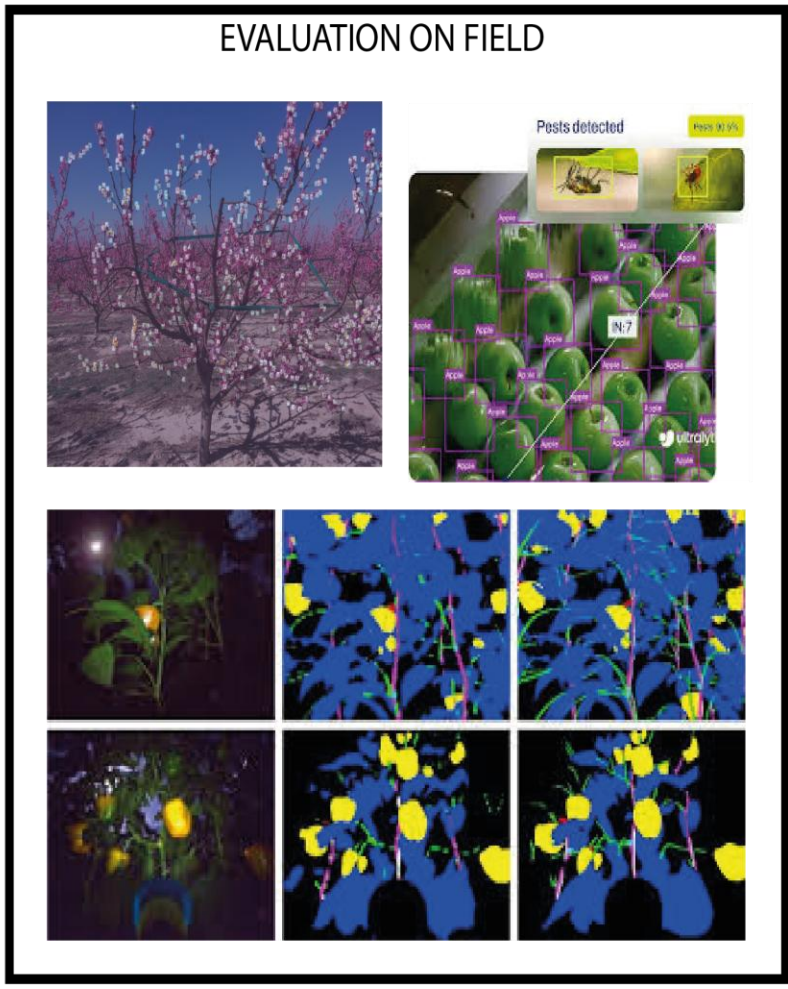
Why AI in Agriculture?



Source: Sands, R., Meade, B., Seale, Jr., J.L., Robinson, S., & Seeger, R. (2023). *Scenarios of global food consumption: Implications for agriculture* (Report No. ERR-323). U.S. Department of Agriculture, Economic Research







The AI workflow in Agriculture

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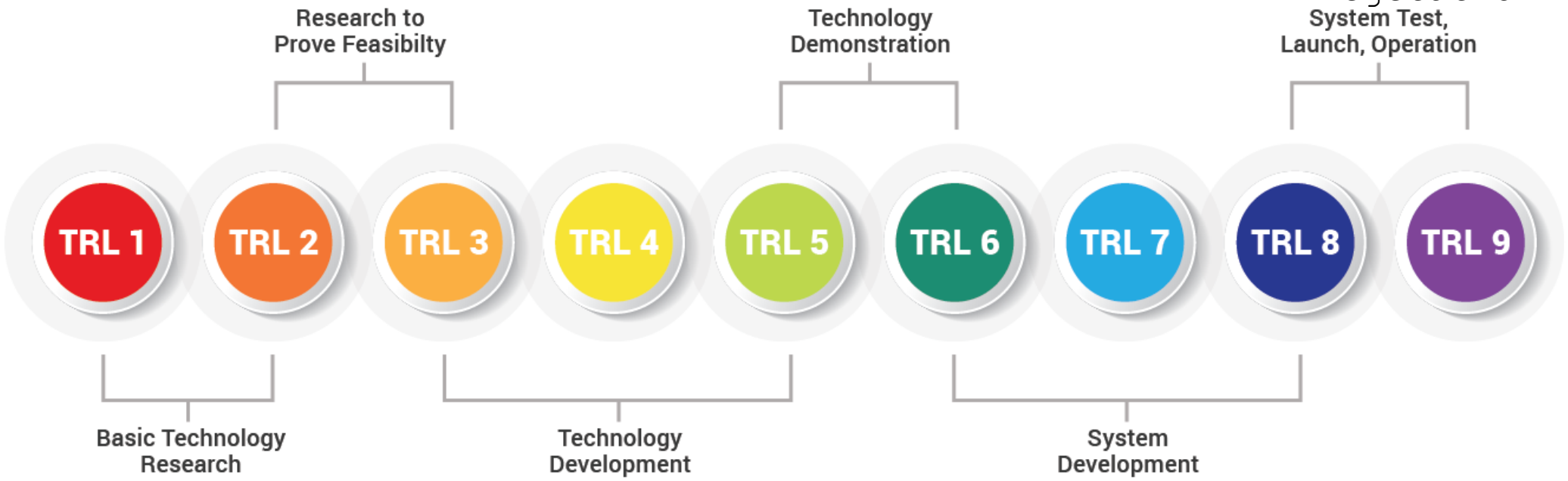
TRL Levels for IA in Agriculture

Propose a model on data gathered in lab conditions

Test the models in real environments (small plot of a farm)

A commercial system that analyzes the nutrition status of vegetation



Identifying AI algorithms for nutritional assessment

Training and evaluating the models, obtaining good performance in controlled conditions

Development of a platform that gathers data (images, laser scans, etc), and analyzes the data

Source: Yfanti, S.; Sakkas, N. Technology Readiness Levels (TRLs) in the Era of Co-Creation. *Appl. Syst. Innov.* **2024**, 7, 32. https://doi.org/10.3390/asi7020032

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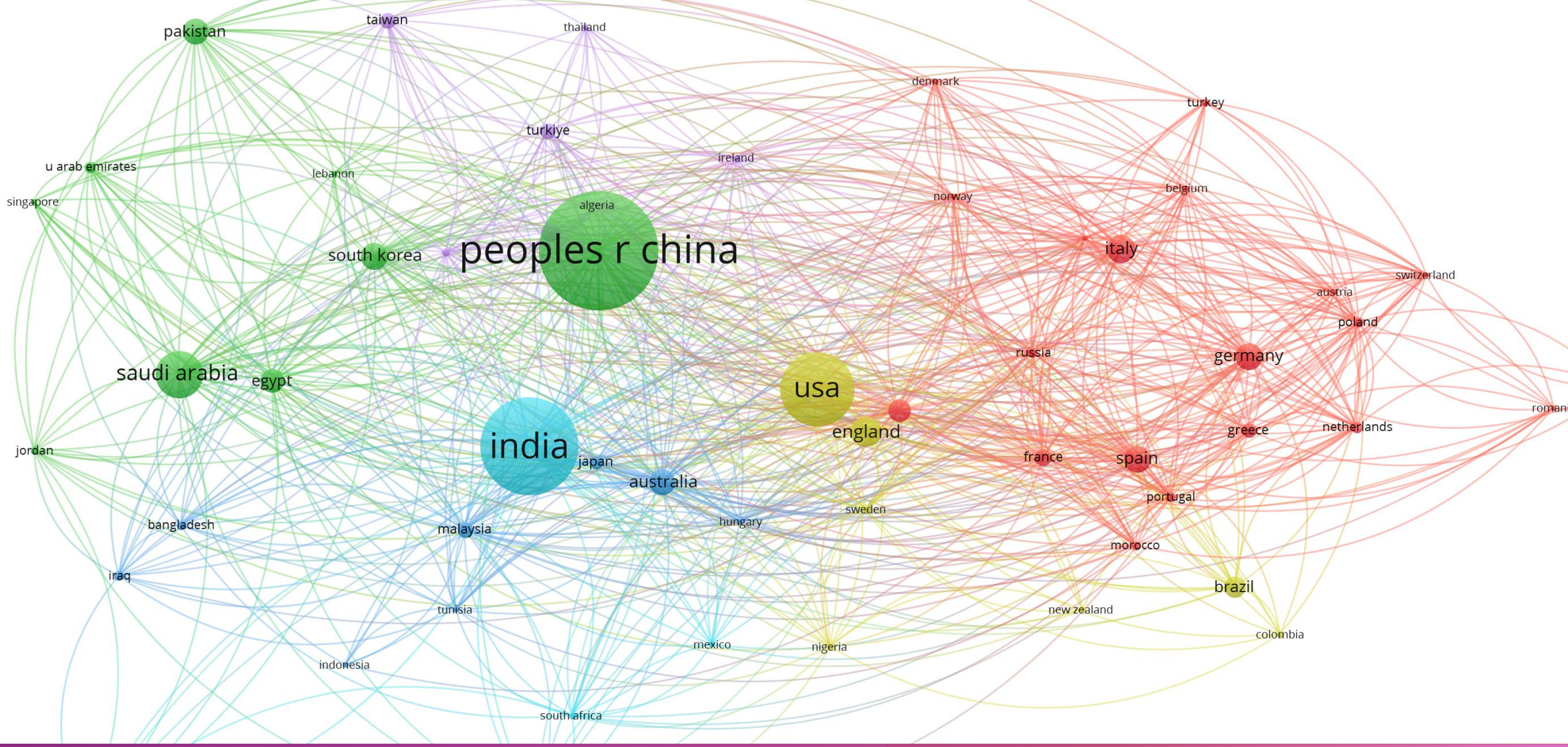

GLOBAL RESEARCH OF AI IN AGRICULTURE (TLR 3-6)

(Data from WoS: Web of Science)

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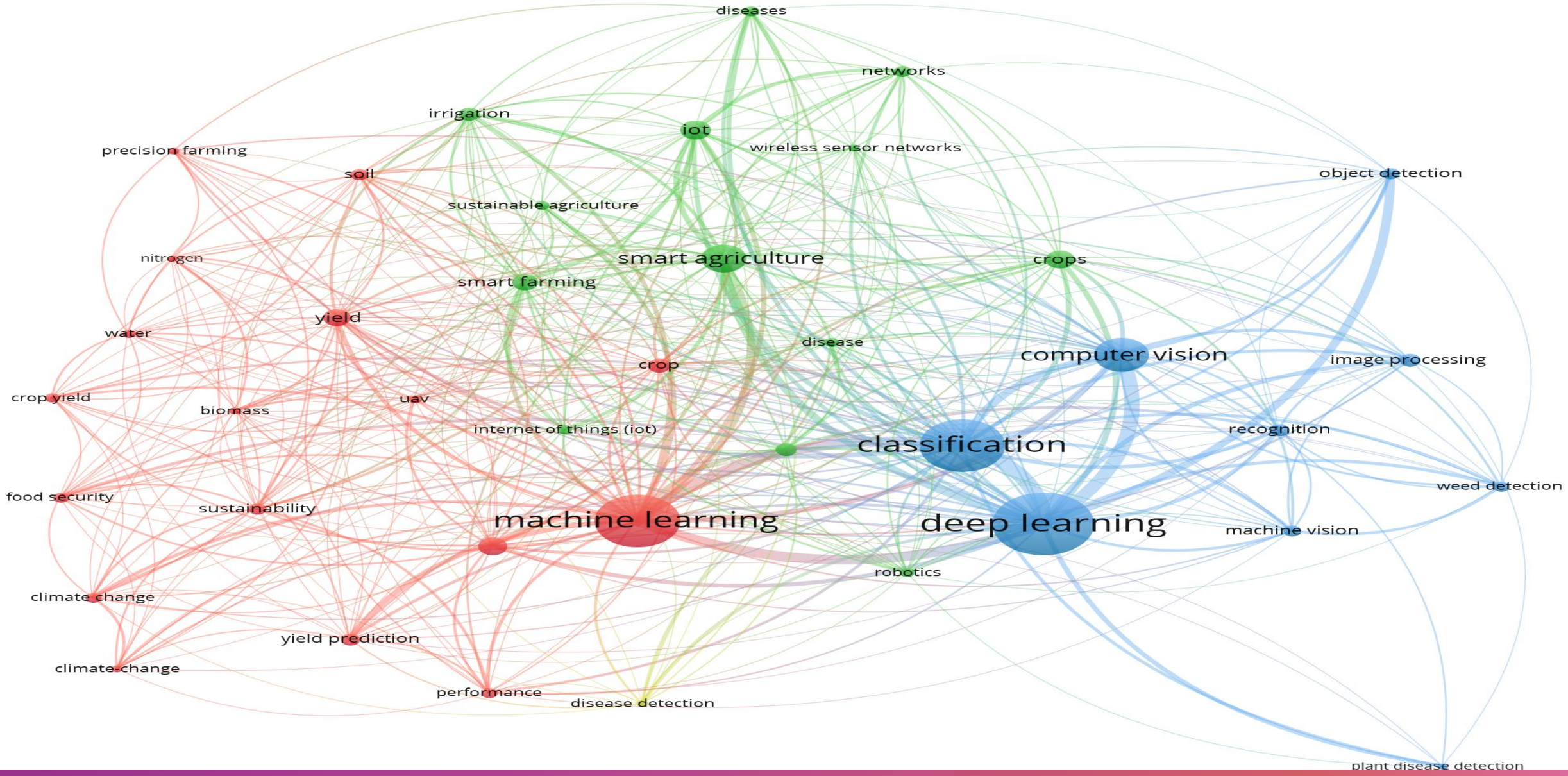

COMMON RESEARCH TOPICS

(Data from WoS: Web of Science)

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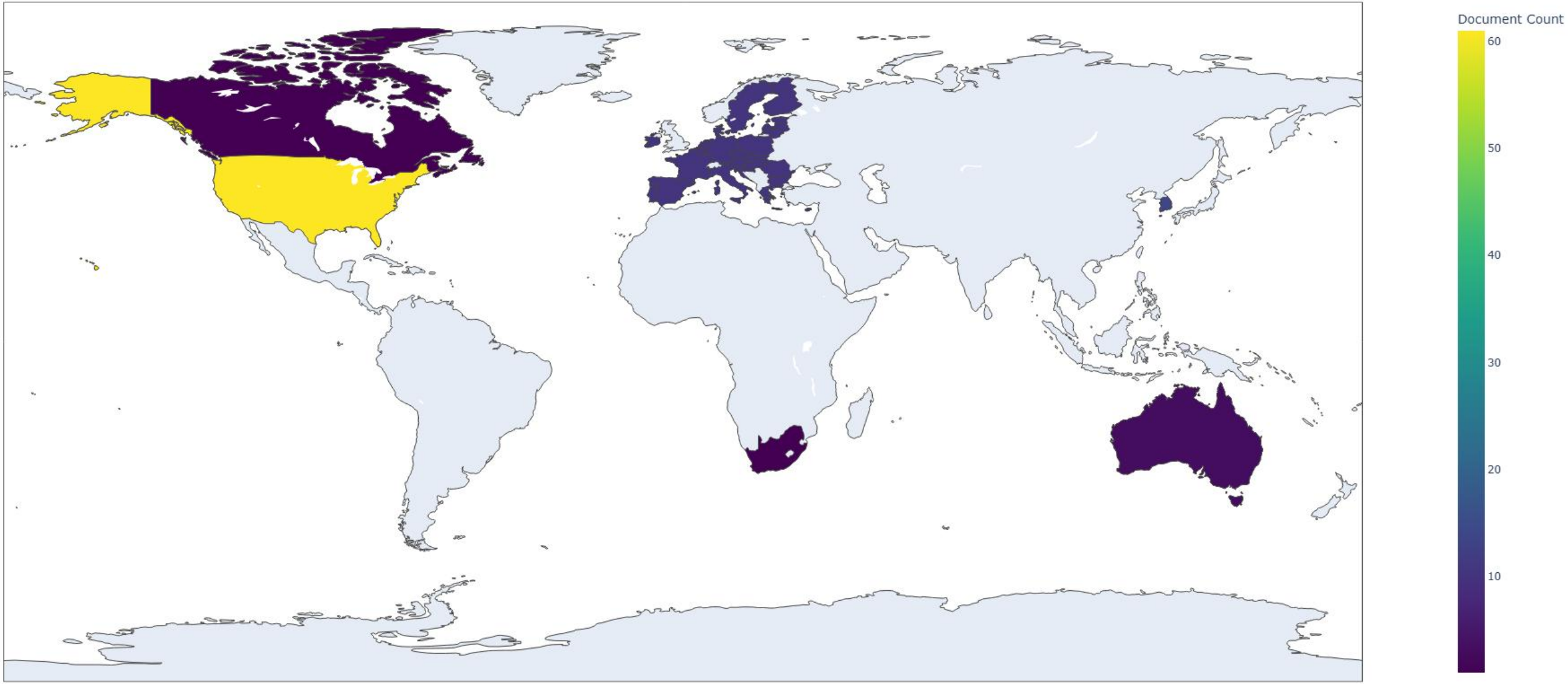

PATENTS BY REGION: TLR 7-9

(Information from: Lens.org)

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Applications of AI in agriculture

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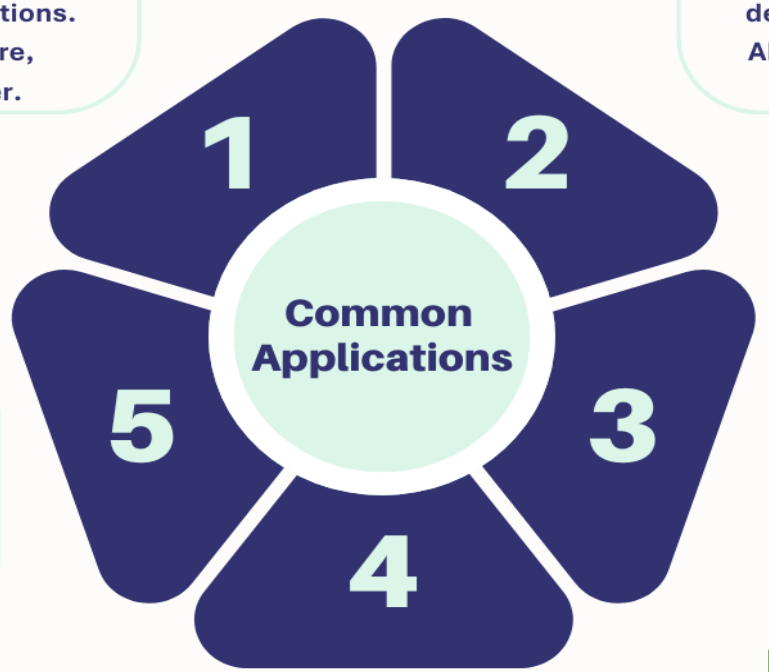
Crop Health Monitoring

Imaging and sensor data enable farmers to analyze crop vigor and soil conditions for targeted interventions. Farmers can monitor moisture, nutrients and organic matter.

Farm Management

Information such as moisture content and crop vigor status, allow the use of decision support platforms driven by AI, to recommend fertilizer Irrigation and crop plantation plans.



Yield Prediction

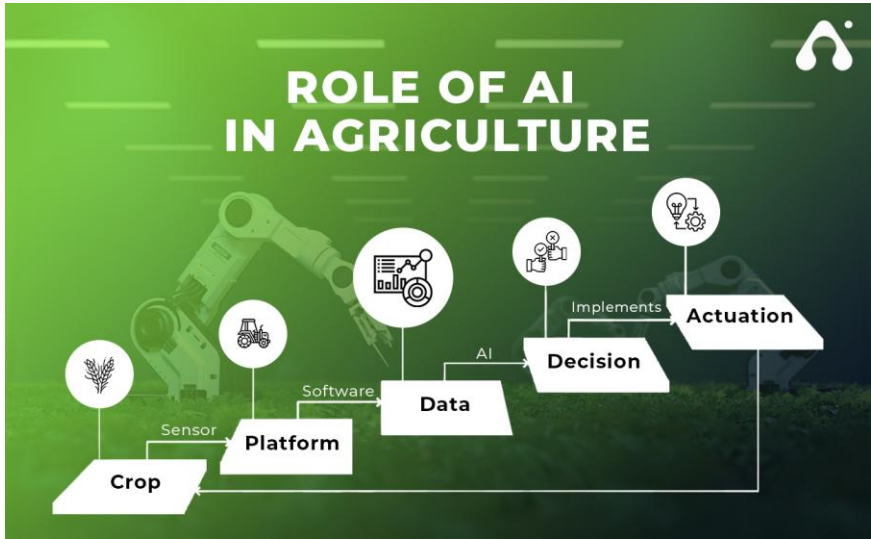
Leveraging historic weather data, soil , and crop health, it allows to the farmers to make accurate prediction about harvest volumes, enabling better resource planning.

Robotic Automation

Robots powered by AI can automate repetitive tasks such as weeding, planting and harvesting, reducing labor costs and human error.

Pest and Disease Detection

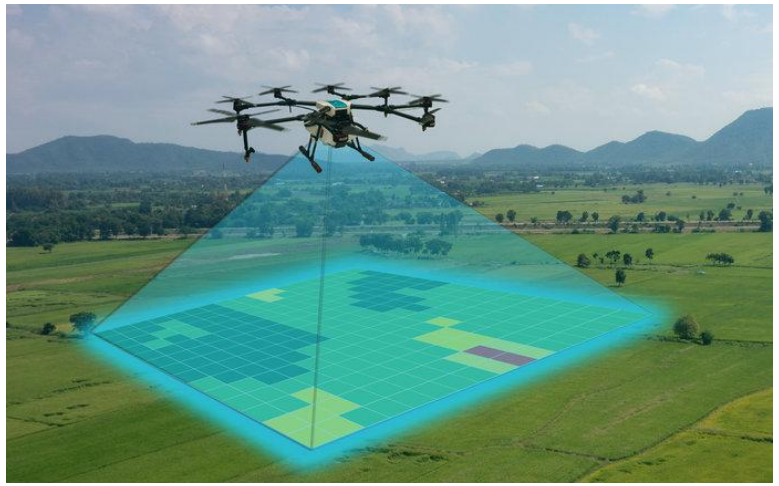
Imaging systems integrated with machine learning algorithms allow to identify early signs of pest infestations and crop diseases.

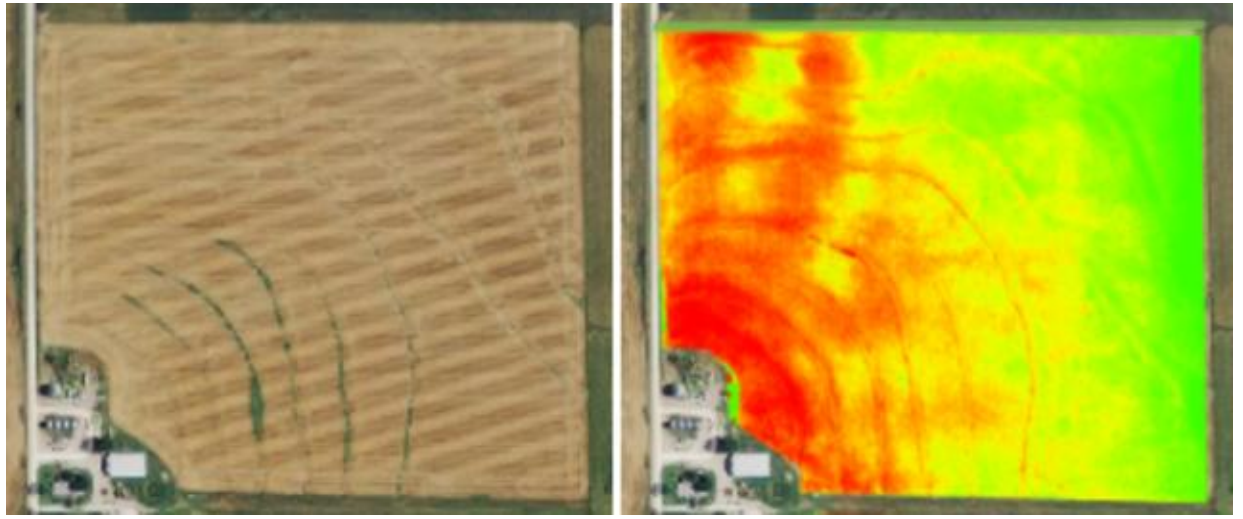


Source: Anand Prakash, How is AI in Agriculture Transforming the Farming Industry?, url:

STUDY CASE-CROP HEALTH MONITORING

TLR:8-9





ISSUES OF AI

High costs

Multiple models for various crops

Challenging environments

Large amount of data

LAST REMARKS

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- AI is currently tested on field conditions
- Improvements in yield prediction, crop management, and assisted harvesting
- Application of AI can save resources
- Implementation can be expensive
- Issues in Generalization