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Agrifood Detection Enhancement with Synthetic Data

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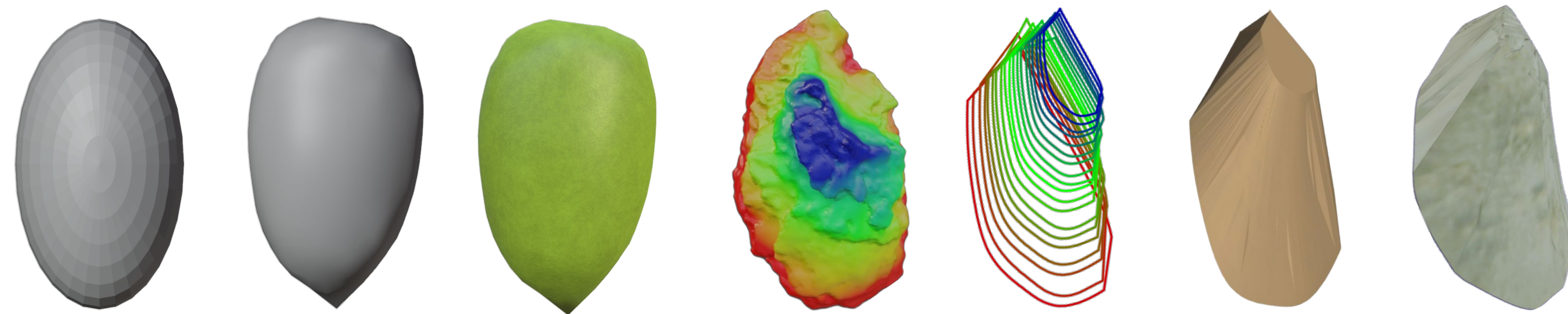
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Introduction



- **Motivation:** The global challenges of a growing population are driving the need for increased food production. Precision agriculture helps boost productivity and sustainability.
- **Solution:** We present a novel method to mathematically model agrifood and render images of the agrifood in simulation to boost the detection performance with real data

Synthetic 3D Modeling



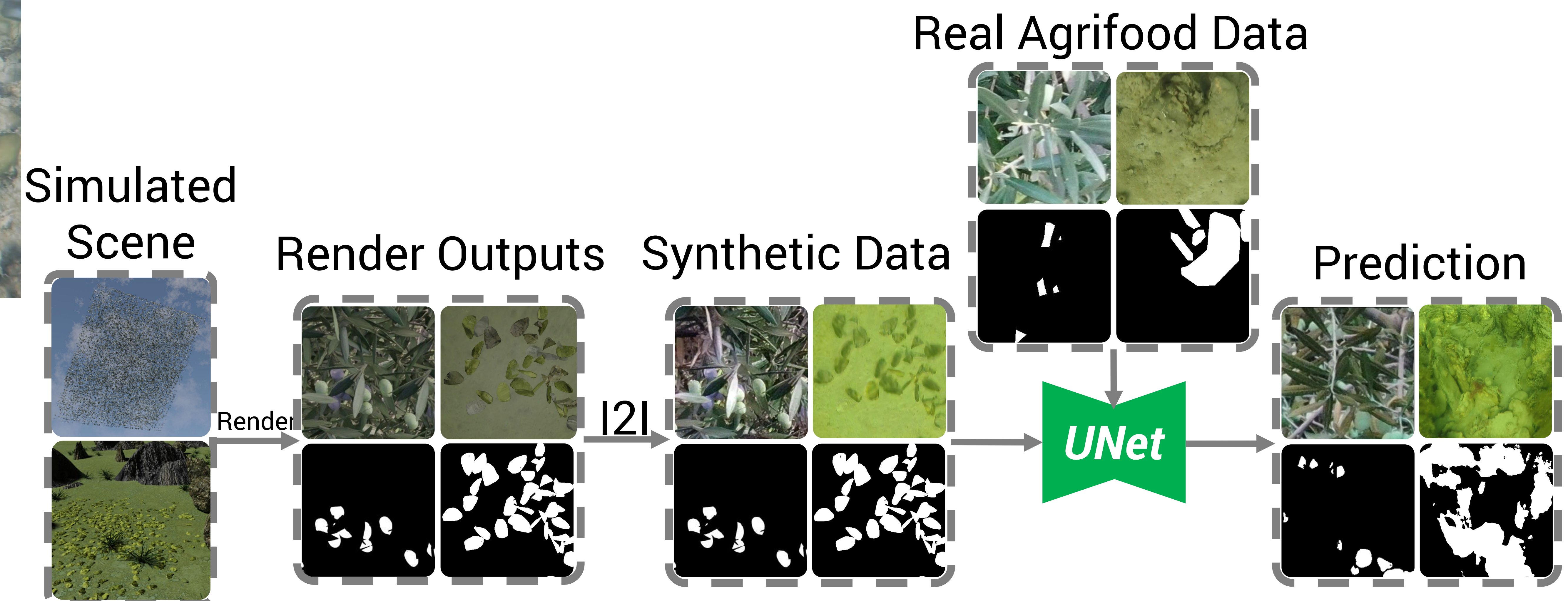
- 3D model of Agrifood (olives [1] and oysters [2]) with added texture

Image-2-Image Translation

- Blender was used to create a simulated agrifood image
- VSAIT and CUT is used to perform image-to-image translation



System Overview



Domain Adaptation

The comparison of different I2I translation methods.



Input image, ground truth, translated image of CUT, QS-Attn, SRUNIT, VSAIT

Results

- Achieving a state-of-the-art for live and oyster detection.
- The detection result is improved when combining synthetic dataset with real dataset for training

[1] Karabatis, Y., Lin, X., Sanket, N. J., Lagoudakis, M. G., & Aloimonos, Y. (2023). Detecting Olives with Synthetic or Real Data? Olive the Above. 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE.

[2] Lin, X., Sanket, N. J., Karapetyan, N., & Aloimonos, Y. (2023). Oysternet: Enhanced oyster detection using simulation. In 2023 IEEE International Conference on Robotics and Automation (ICRA) (pp. 5170-5176). IEEE