

CLAIMS

1. A computer-implemented method for improving harvesting of crops, the method comprising:
 - collecting data from one or more data sources;
 - 5 extracting one or more features from the collected data;
 - determining a quality grading from the extracted one or more features;
 - generating a harvesting data model based on one or more of the collected data, the extracted one or more features, and the determined quality grading; and
 - using the harvesting data model to determine one or more operational decisions.
- 10 2. The method of claim 1 wherein the collected data is images and videos of harvested produce.
3. The method of claim 2 wherein the step of determining a quality grading from the extracted one or more features comprises:
 - 15 identifying a number and extent of one or more objects of interest in the images and videos of harvested produce;
 - generating a set of features for each of the one or more objects of interest; and
 - predicting a quality of harvested produce.
4. The method of claim 3 wherein the step of identifying a number and extent of one or more objects of interest comprises selecting a first algorithm based on at least one of: age of tree; planting material; and water stress.
- 20 5. The method of claims 3 or 4 wherein the step of identifying a number and extent of one or more objects of interest comprises enhancing of the images and videos of harvested produce using generative adversarial network models.
6. The method of any of claims 3 to 5 wherein the step of generating a set of features for each of the one or more objects of interest comprises extracting a portion of the images and videos of harvested produce corresponding to each of the one or more objects of interest.
- 25 7. The method of any of claims 3 to 6 wherein the set of features for each of the one or more objects of interests are selected from the group consisting of: size; shape; socket detection; wavelet-based features; and colour-based features.

8. The method of any of claims 3 to 7 wherein the quality of harvested produce is selected from the group consisting of: ripeness grade; pest infestation; disease infestation; harvest cut quality; and one or more predefined genetic anomalies.
9. The method of any of claims 1 to 8 wherein the one or more data sources is a device
5 comprising one or more sensors and the collected data is movement and location data.
10. The method of claims 9 wherein the extracted one or more features are selected from the group consisting of: movement pattern; and location information.
11. The method of claim 10 wherein the step of extracting one or more features further comprises processing the extracted one or more features to determine a likely action being
10 carried out.
12. The method of claim 11 wherein the step of processing the extracted one or more features is based on at least one of location data; and characteristics of a tree being harvested.
13. The method of any of claims 10 to 12 further comprising:
comparing the extracted movement pattern with an ideal movement pattern stored on a
15 database; and
generating a first alert if the extracted movement pattern differs from the ideal movement pattern.
14. The method of any of claims 10 to 13, further comprising:
comparing the location information of the determined likely action being carried out
20 with an expected action at a location with the same location information; and
generating a second alert if the determined likely action being carried out differs from the expected action.
15. The method of any of claims 9 to 14 further comprising using the harvesting data model to predict yield at a tree level.
- 25 16. The method of claim 15 further comprising comparing the predicted yield to an actual yield; and determining a reason if the predicted yield differs from the actual yield.
17. The method of claims 15 or 16 further comprising:
quantifying an impact of worker actions based on partial dependence analysis;
identifying key worker actions impacting yield; and

prioritizing key worker actions.

18. The method of any of claims 9 to 17, further comprising:
determining one or more thresholds for worker action based on partial dependence analysis; and
5 deploying the one or more thresholds on the device.
19. A system for improving harvesting of crops, the system comprising:
at least one memory device and at least one processor, the at least one processor is operably coupled to the at least one memory device;
the at least one memory device comprising instructions to be executed by the at least
10 one processor, the instructions instruct the at least one processor:
receives data from one or more data sources;
extracts one or more features from the received data;
determines a quality grading from the extracted one or more features;
generates a harvesting data model based on one or more of the received data,
15 the extracted one or more features, and the determined quality grading; and
uses the harvesting data model to determine one or more operational decisions.
20. The system of claim 19 further comprising:
a device comprising one or more sensors, the one or more sensors configured to collect movement and location data to be processed by the processor.
- 20 21. A computer-readable storage medium comprising instructions to be executed with at least one memory device and at least one processor, when executing the instructions, the at least one processor:
receives data from one or more data sources;
extracts one or more features from the received data;
25 determines a quality grading from the extracted one or more features;
generates a harvesting data model based on one or more of the received data, the extracted one or more features and the determined quality grading; and
uses the harvesting data model to determine one or more operational decisions.