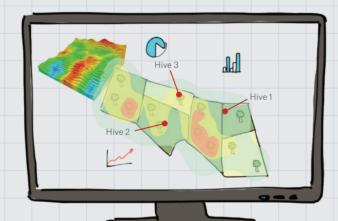


### Machine learning algorithms

- Individual spectral signatures are analysed in time and frequency domains and sorted using machine learning algorithms
- Positive acoustic signatures from the different detectors are combined to triangulate the positions of the pollinating insects





#### Visualization

- Areas of highest pollinator activity are displayed through a web portal
- This information is displayed as a contour map, overlaid on the orchard map and current hive positions
- Farm-level planning enabled by linking this data to other insights such as crop maturity, spray schedules, weather, etc.

## Technical options

orchards each year.

Flying insects can be uniquely identified by the characteristic frequency signatures of their wingbeats. Bee activity could be tracked via acoustic modulation or microphone arrays dispersed across an orchard with cloud-based machine learning algorithms analysing the raw data to pinpoint their position. Hives could be located for optimum results and improved residency time. An alternative would be to deploy artificial pollination techniques in areas where bee activity is lowest.

understood, there is no current means to monitor the level of bee activity. Sagentia seeks to change this, by

using our expertise in optical and acoustic sensor

technology to track bees and map their pollination

deployment of the bees - a high value asset trucked thousands of miles across the US between blooming

improvements, this would allow more efficient

activity. In addition to tangible crop yield

- Maintenance-free sensor design could be developed at an affordable cost point to be distributed within orchards along with an energy harvesting feature and low-power data comms
- These acoustic principles have been successfully demonstrated in a range of industrial (e.g. water meter) and medical (e.g. drug use) applications
- Alternative approaches include optical detection based on LIDAR and back scattering of light from the insect
- This solution would allow farmers and beekeepers to better manage the location of hives and their residency time. An alternative would be to deploy artificial pollination techniques in areas where bee activity is lowest
- The data could also be combined with other data sources such as crop maturity, spray schedules and weather stats for farm-level planning

#### Pollinator detection

- Ruggedized acoustic detector units are temporarily placed around the orchard to capture ambient sound
- On board DSP analyses spectral signature of recordings on a loop.
  It only records data which displays characteristic frequency of pollinators
- ¬ Via cellular technology, the data is transmitted to the cloud for further analysis. GPS locations are also captured.

Crop yield improvement

Iterate

# Pollinator management

- ¬ Hives can be repositioned to ensure a more uniform coverage
- ¬ The process (1-4) can be repeated until optimal distribution is achieved