Produce Pics

Blockchain and AI integrated Image and Smart contract Processing Platform for the Produce Industry

www.producepics.com

The Concept

Perishable Agricultural Commodities Act (PACA) is an existing and most-used “smart” contract framework.

Our effort (under Launch Incubator program) will transform PACA framework into a Blockchain based smart contact framework.

Will also integrate AI and Human integrated Image Processing system to estimate quality and remaining shelf-life for the Produce Industry.

Integrate built-in support (through third party integrations) for screen sharing and video calls.

An Image and Smart-contract Platform for the entire Produce Industry.

The Benefits to the Produce Industry

Without any additional new hardware (e.g., IoT) to buy and nothing new to learn, through the use of existing smart phones, even the smallest of small farmers can easily utilize this framework and greatly improve quality, traceability and cost of fruits and vegetables.

Reduces cost of inspections, increases regulatory compliance and increases profits (for all stakeholders: growers, distributors and consumers)

Additional benefit: global database of images for different families of produce (apple, berries, etc.) that become better with time - the images database will be able to account for variations in growth regions, seasons, maturity of produce, etc.

USDA Inspections & PACA Compliant Smart Contracts

Automated “reading” of chest X-Rays, Mammograms, and others are becoming commonplace in the healthcare sector.

AI systems tend to be more consistent, reliable and economical than humans.

Perishable Agricultural Commodities Act (PACA) provides a ”smart” framework for contracts between farmers and others in the produce industry.

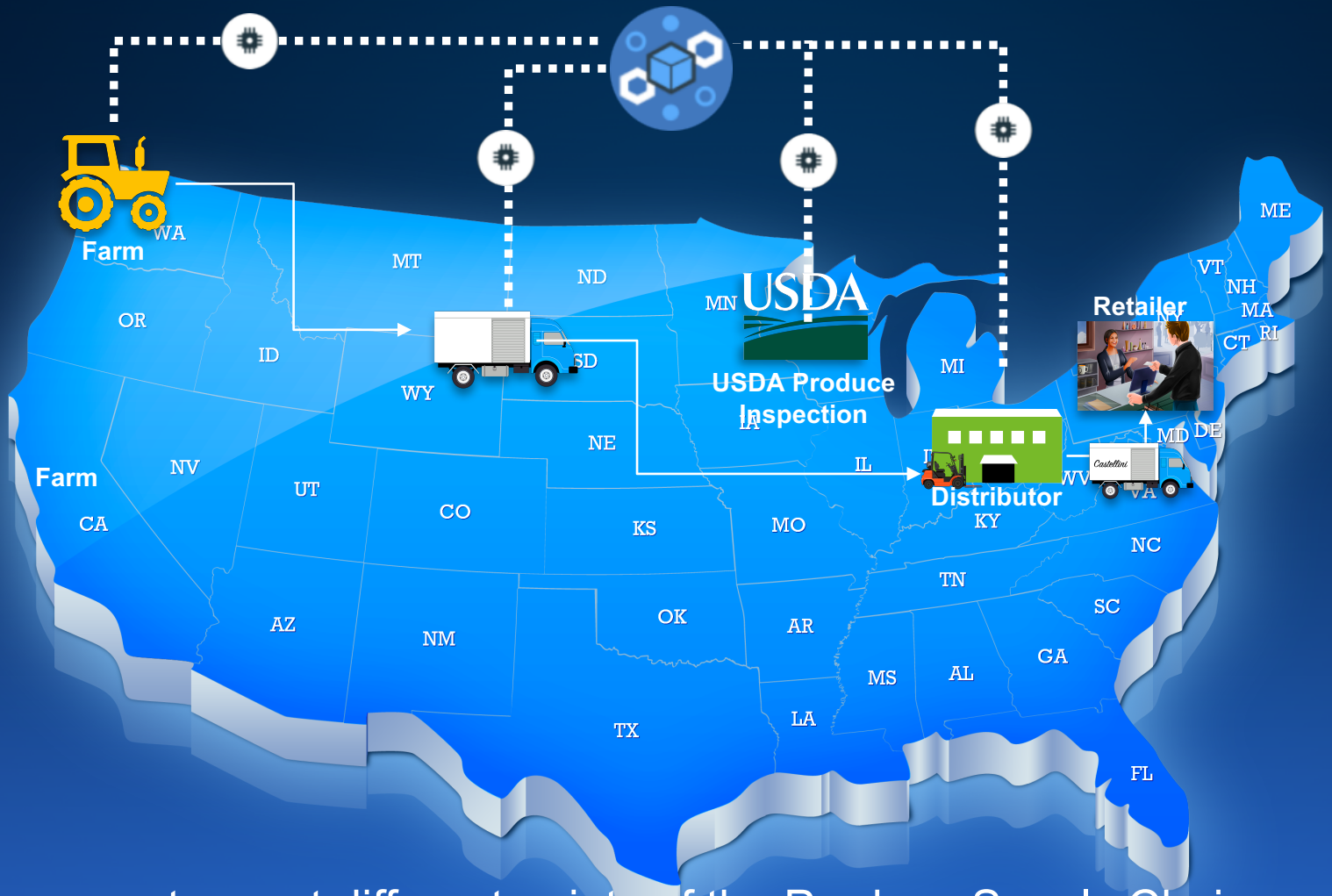
PACA disputes (especially about quality and price) are settled via USDA inspections.

PACA is an ideal framework for Blockchain based implementation.

AI assisted Image based USDA Inspection of Produce

Current State		Future State
	Automation	
	Sensing Device	
	Interpreting Device	
Subjective & Inconsistent	Results	**Objective & Consistent**
$150-$500 Per Inspection	Cost	$10 to $25 Per Inspection
2 – 24 Hours (Wait Time)	Time	Real-time (Near Zero Wait Time)

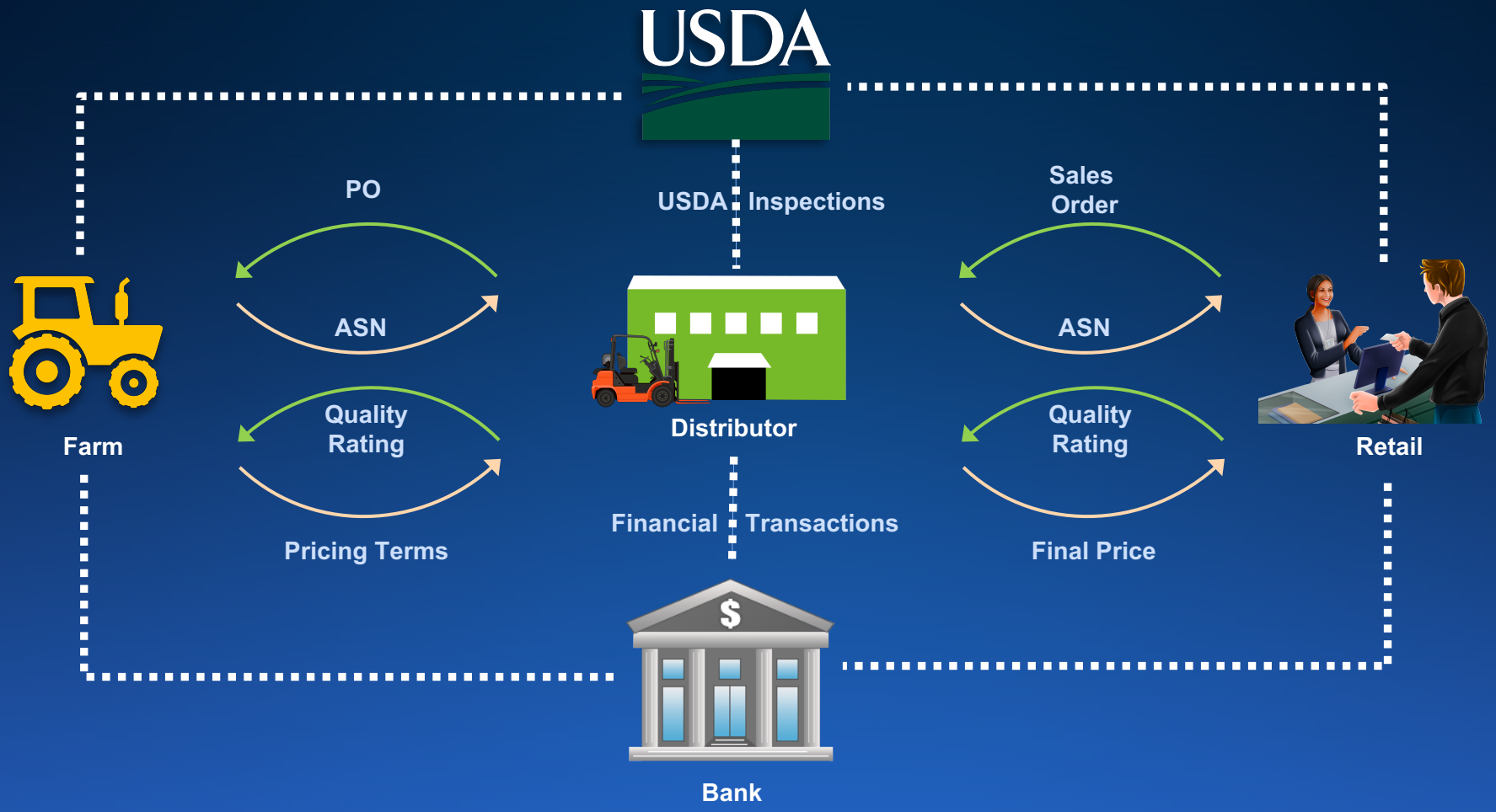
Live video / AI integrated remote USDA Inspection



Images captures at different points of the Produce Supply Chain, and Stored in a Blockchain framework.

PACA Compliant Smart Contracts triggered by human/automated USDA inspections.

Smart PACA Contract – potential for enormous cost / effort savings



Many days of effort, wait-times, several communication cycles, and higher costs can be reduced via “smart” triggers.

Why integrate blockchain and image processing?

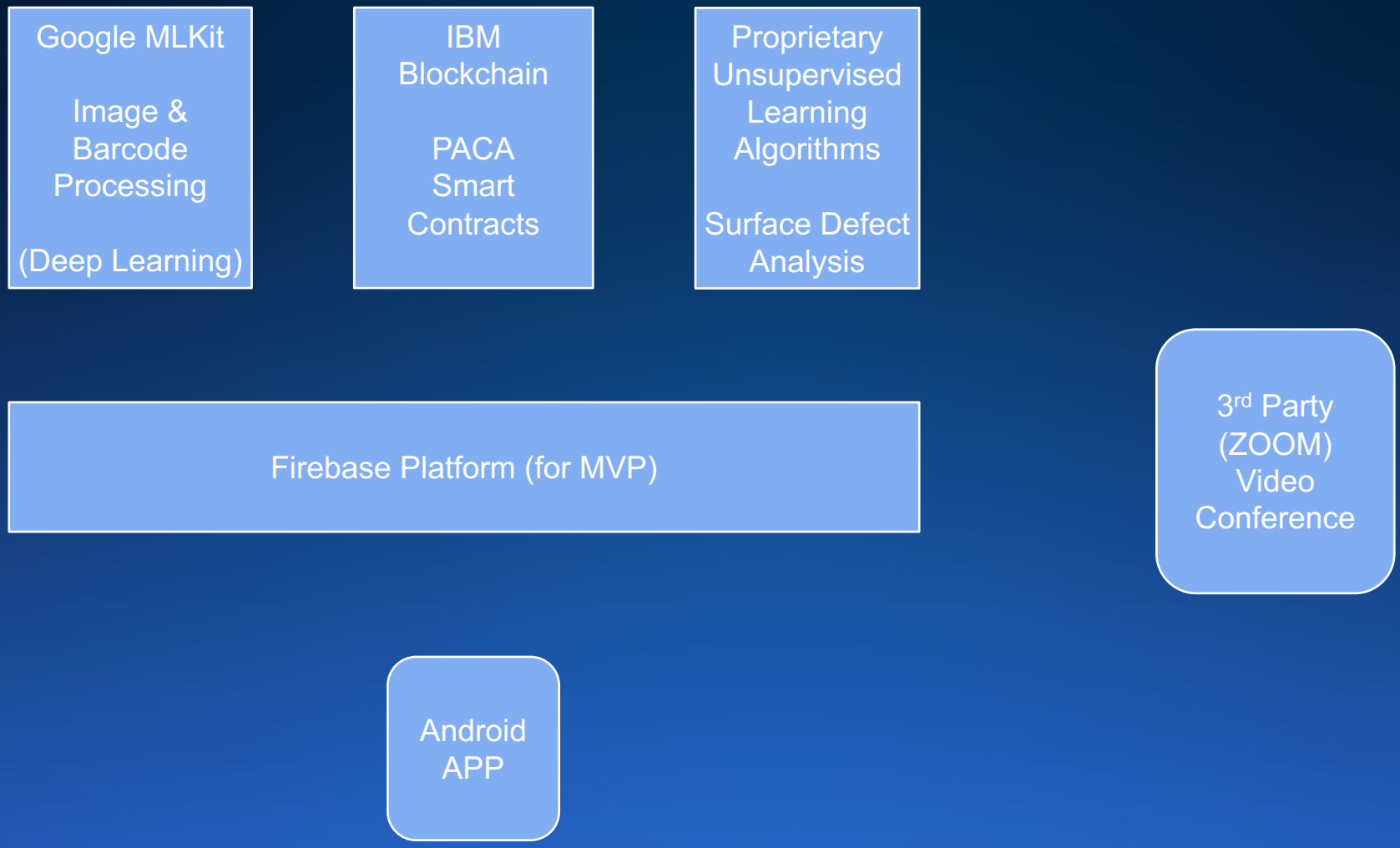
Example of an existing PACA contract:
Truckload of tomatoes, grade 5 (highest). Price $ 10,000 (for grade 5),
Or 9,000 (for grade 4) or on-consignment (for grade 1 or 2).

Produce arrives from California (farmer) to ABC Company (distributor) in Ohio.
Grower claims: Tomatoes are grade 5.
Distributor claims: Tomatoes are grade 4.

The Grower can request USDA Inspection. (can take up to 36 hours to execute, the inspections can cost up to $ 500, then share the results via e-mail, etc. While people are waiting for the inspection, the perishable tomatoes further languish in the receiving area of the warehouse)

Proposed framework can execute the same in under 15 minutes and for less than $ 25 per inspection. **The automated image analysis (or human visual analysis) acts as "triggers" for the PACA based smart contracts.**

Proposed Platform Architecture



Technology development status

Already under development:
Use both deep-learning and unsupervised learning

Image processing currently based on Google MLKit which provides support for both image and barcode processing.

Custom unsupervised learning routines prototyped in OpenCV / Python.

To the best of our knowledge, only effort to utilize unsupervised learning for quality assessment.

Plan to utilize Zoom conferencing system for potential screen sharing / video conference application areas (i.e., the remote human expert to validate AI based quality analysis)

TO DO: Utilize IBM Blockchain framework to develop PACA compliant smart contract framework.

Leveraging existing technologies: Image + Barcode

First (and only) app to include both image and GS1 compliant barcodes

Even the smallest farmer can utilize the app with no additional cost

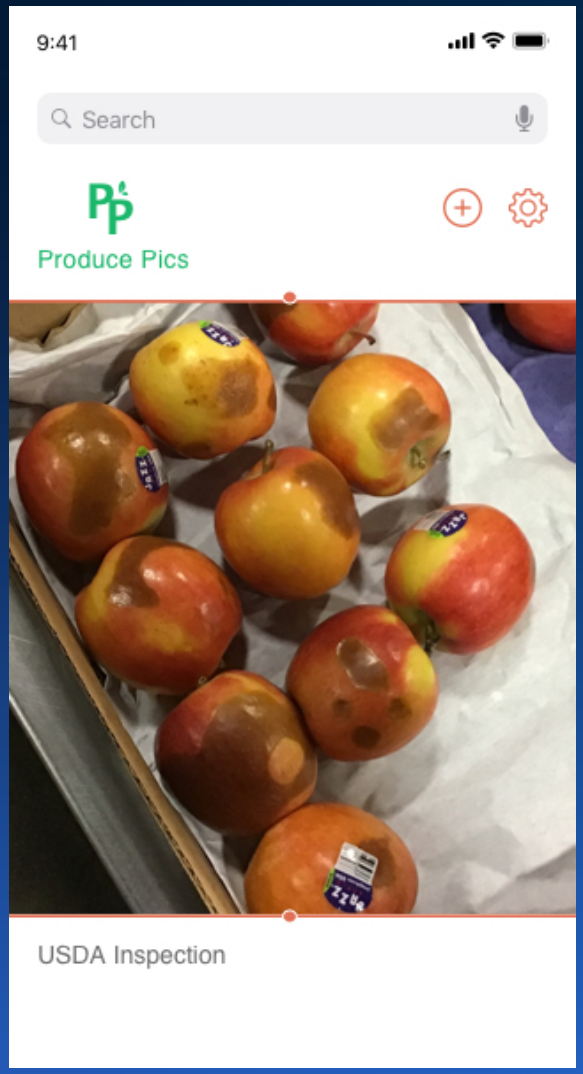
Can be used to estimate both quality and remaining shelf life

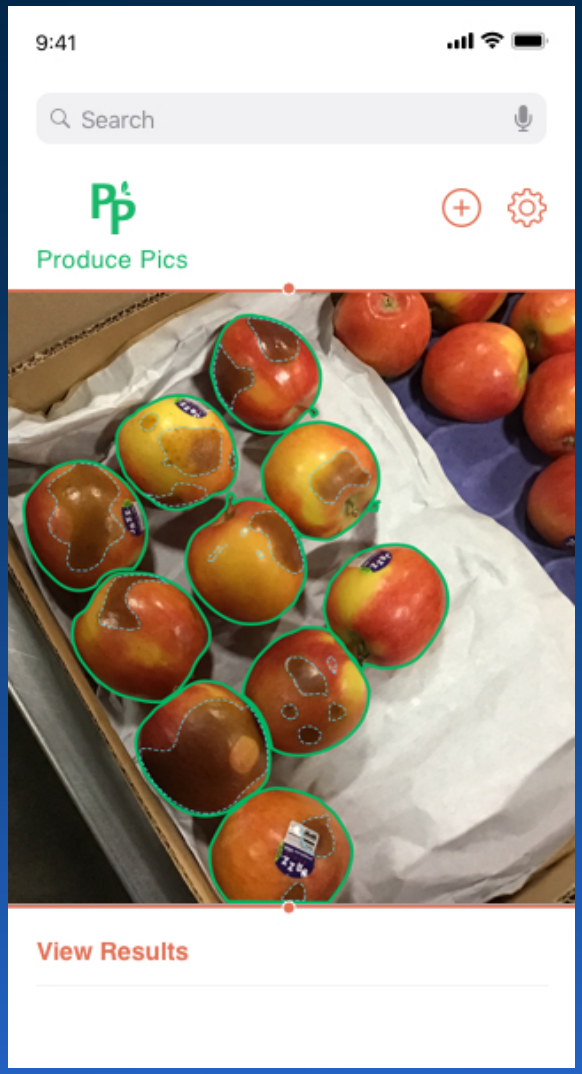
Hyperspectral imaging to be introduced in 18 to 24 months.

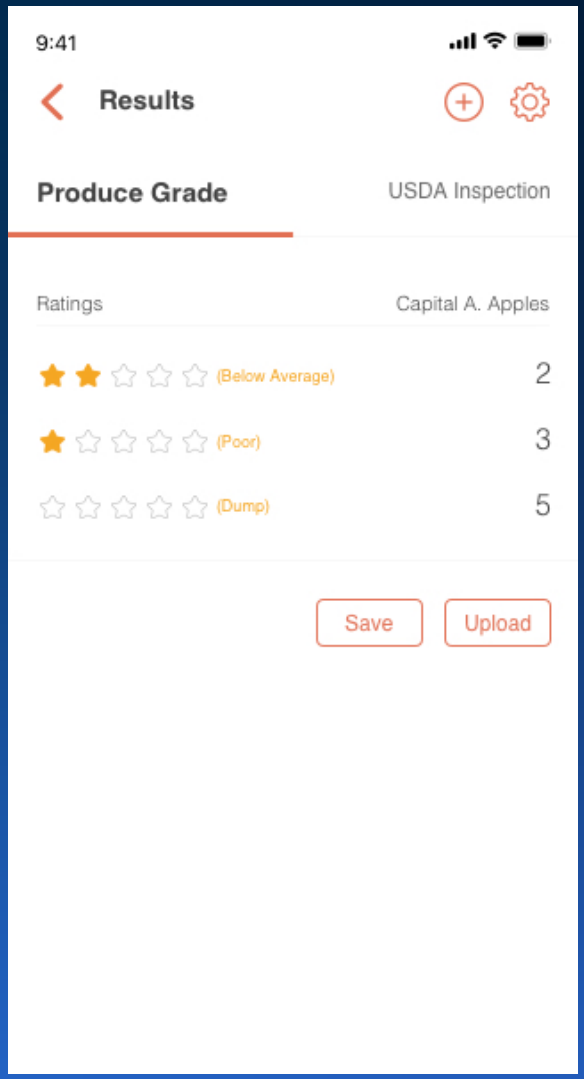
Google MLKit provides both image processing and bar-code handling capabilities.

Proposed effort : "How to integrate such an image into a blockchain framework and auto-trigger PACA compliant smart contracts?

Sample Screenshots (of image processing app)

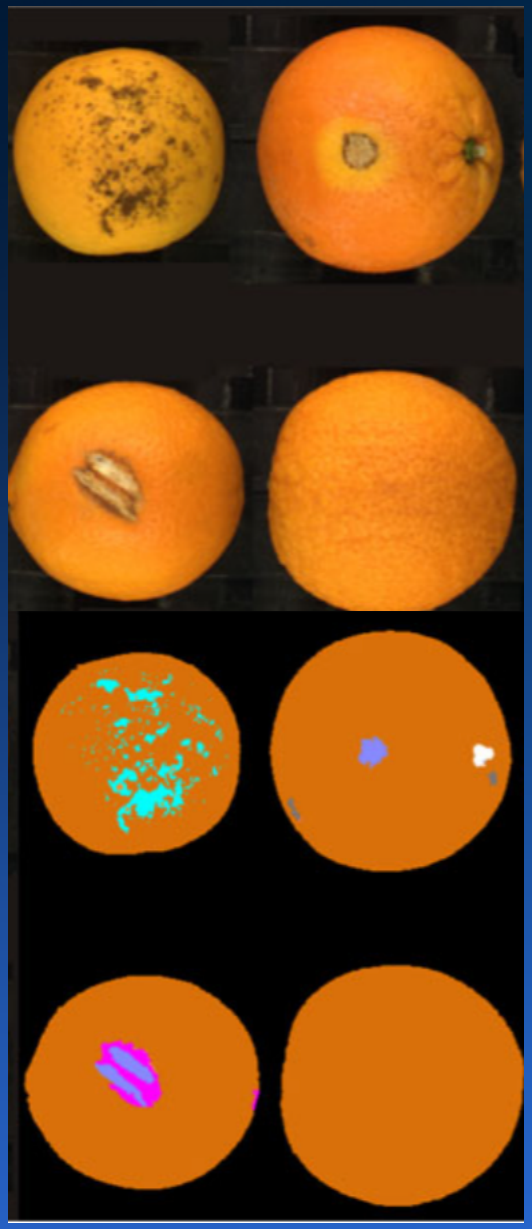




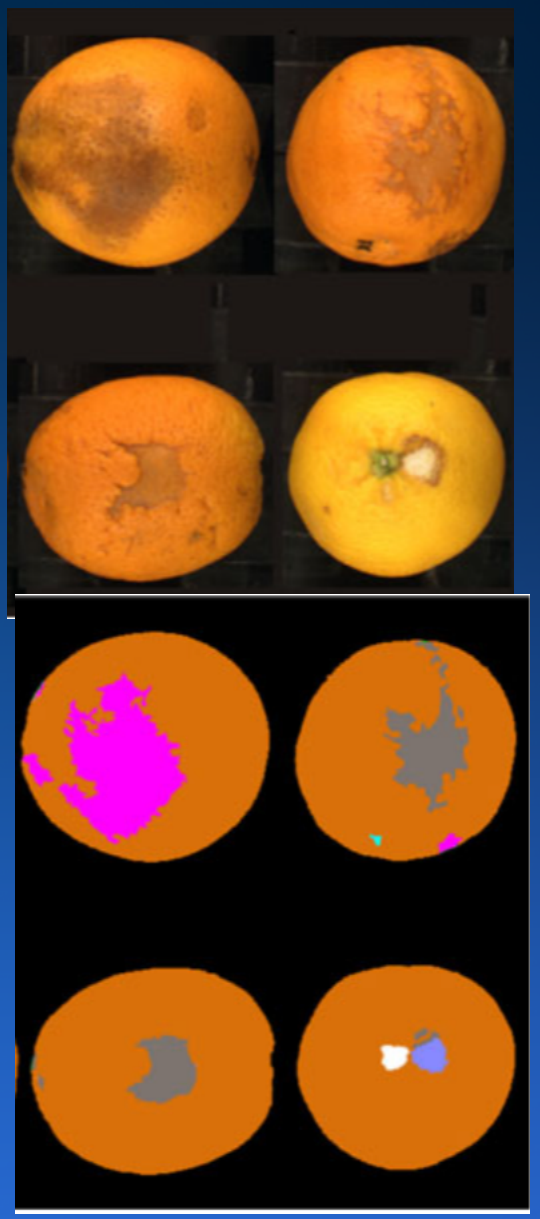


Integrate the above into a blockchain framework

Unsupervised Learning combined with Deep Learning



Our image processing includes support for Unsupervised Learning for surface defects analysis.



Founders

Sunand Iyer : graduating senior (Computer Science) at Columbia University. Has been working on the image processing app and algorithms for the last two years. Has developed both supervised and unsupervised algorithms for image processing. Has taken courses in cryptography and experimented with crypto currencies and blockchain.

Sridhar Iyer: Ph.D with years of experience in software development. Had completed three graduate courses at Columbia University prior to transferring to the University of Illinois. Has been working closely with a large produce distributor on image based quality inspections.

NO PRIOR FUNDING, COMPANY IS IN CONCEPT STATUS.

BOTH FOUNDERS HAVE CONTRIBUTED PERSONAL “SWEAT” EFFORT TO DEVELOP A PROTOTYPE (MVP) OF THE IMAGE PROCESSING APP.

Potential collaborators

Currently working with a 100 year old US $ 800 million a year produce distributor in the mid-west : (the founding team has been working with them, processing images of incoming produce from their facilities to estimate produce quality).

The produce distributor is a potential partner for this venture : the system (including PACA compliant smartcontracts) may be tested through their extensive supplier network.

The Open Ag Technology and Systems Center (https://oatscenter.org/)

The Trellis framework (http://trellisframework.org/) is an open-source framework for managing Audit & Compliance documents. It can be integrated into a blockchain framework (Phase II, not part of the proposed Launch MVP work).

Competitors

IBM Foodtrust blockchain initiative : appears to be aimed at Food Safety Modernization Act (FSMA) compliance – does not offer support for image analysis, remote inspections or PACA based smartcontracts.

Foodlogiq : same as above (IBM Foodtrust), but not yet blockchain based.

Ripe.io : Blockchain based for everything from IoT sensors to RFID. Requires substantial investment in new hardware. (Most farms do not have WiFi or power access at the field level). Our approach leverages the ubiquity of smartphones.

Impactvi : hyperspectral imaging (requires 20K investment per camera) aimed at detecting foreign objects, etc. Not yet practical for use in the filed. Our approach will utilize hyperspectral imaging when it becomes available on a smartphone (within two years)

AgShift : deep learning based food inspection system. Requires special hardware. Deep learning alone can not identify all defects in produce.

Competitive Advantages

Visual analysis integrated into smart contracts - in order to realize the benefits of smart contracts, the results of visual inspections are required. The proposed platform address this unmet need.

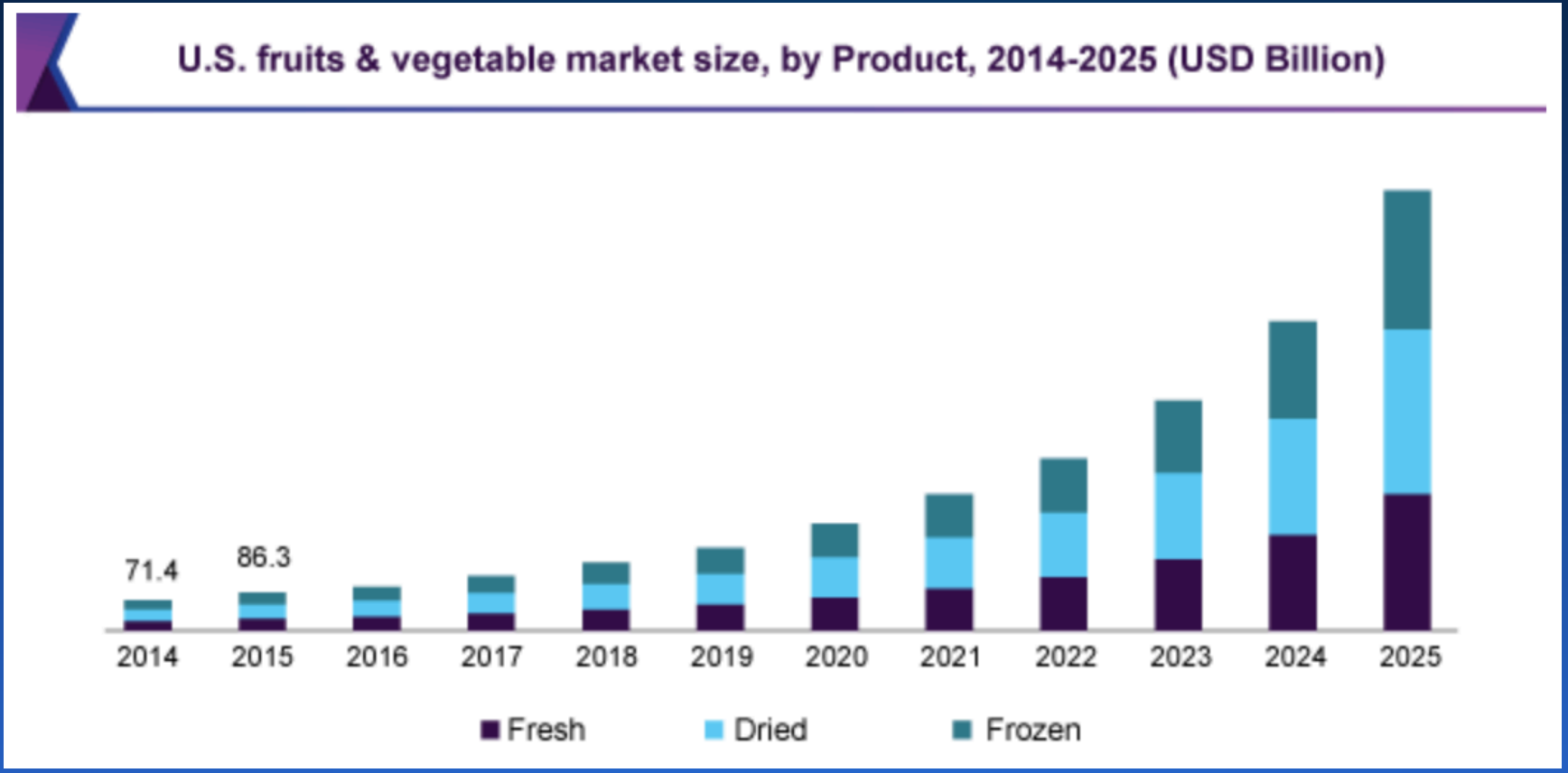
Reduces overall cost and improves efficiency.

Easy to use, leverages existing smartphones – no need for new investment.

Princes in produce industry are always negotiated – in addition to supply and demand, the price depends on quality of the product. A farmer can send a picture or short video to a distributor/retailer prior to price negotiations and such an image/video can become part of the smart-contracts. Upon delivery of produce, current state image/video may be compared with images from the time of purchase, etc. to trigger appropriate clause of a smart contract.

Total Addressable Market

The US fruit and vegetable market is projected to reach $ 1.1 trillion by 2025. Detailed info available at: https://www.grandviewresearch.com/press-release/us-fruit-vegetables-market-analysis



Business Model

Charge a nominal fee per image based inspection.

Eventually evolve into an online marketplace
- featuring images of produce
- quality audited by an AI system

Custom quality audit rubrics
- for restaurants / chains (like Chipotle)
- locally sourced produce (usually from smaller growers)

Analytics for Growers
- based on analysis of images of their produce
- improving yield, quality, etc.

Additional information at:

www.producepics.com