



BURR

*People-Scale Collaborative Robots
Beginning In Agriculture*



- Grew up on working farm
- Love machinery and technology that does hard work people shouldn't have to do
- Got an MBA from Harvard, then spent 4 years at CNHi working on special projects (including looking at Autonomy companies from a BD perspective)
- Founded Burro to build robots - we build a collaborative robot called Burro



Autonomy is a new market disruption in Agriculture...

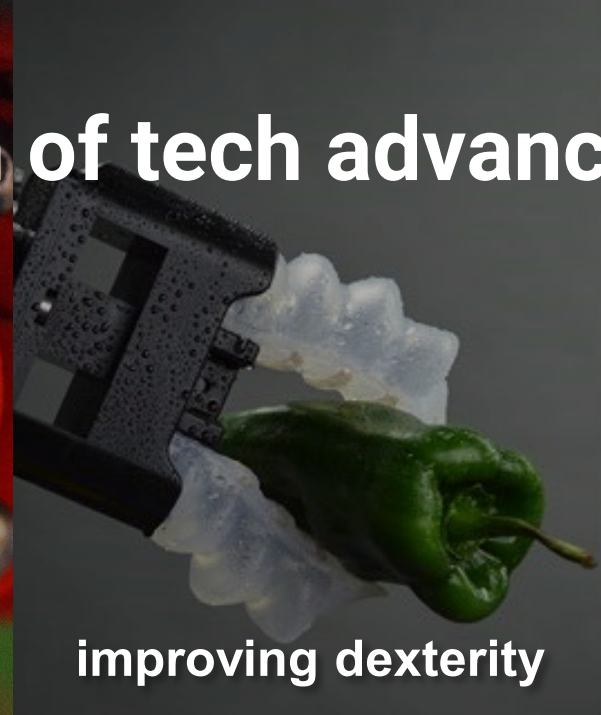


...creating new markets that are underserved by existing incumbents

Why now? The perfect storm of tech advances...



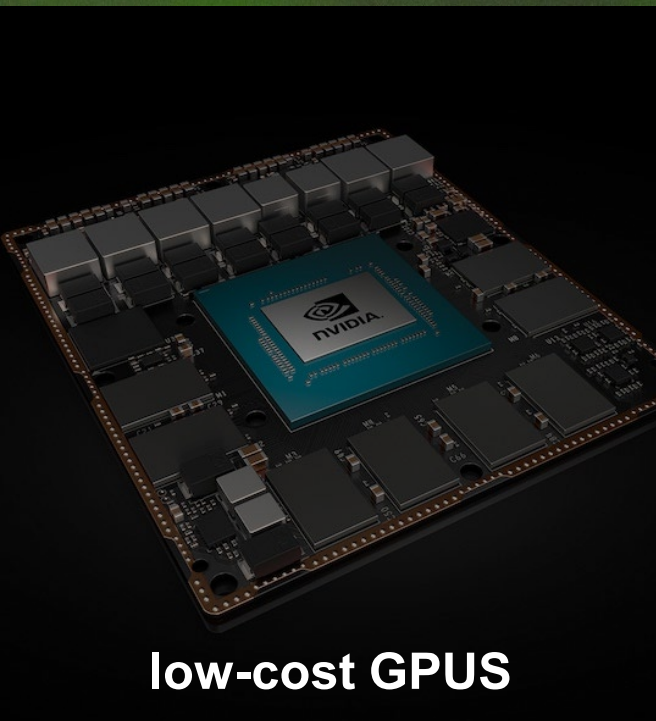
low-cost computer vision



improving dexterity



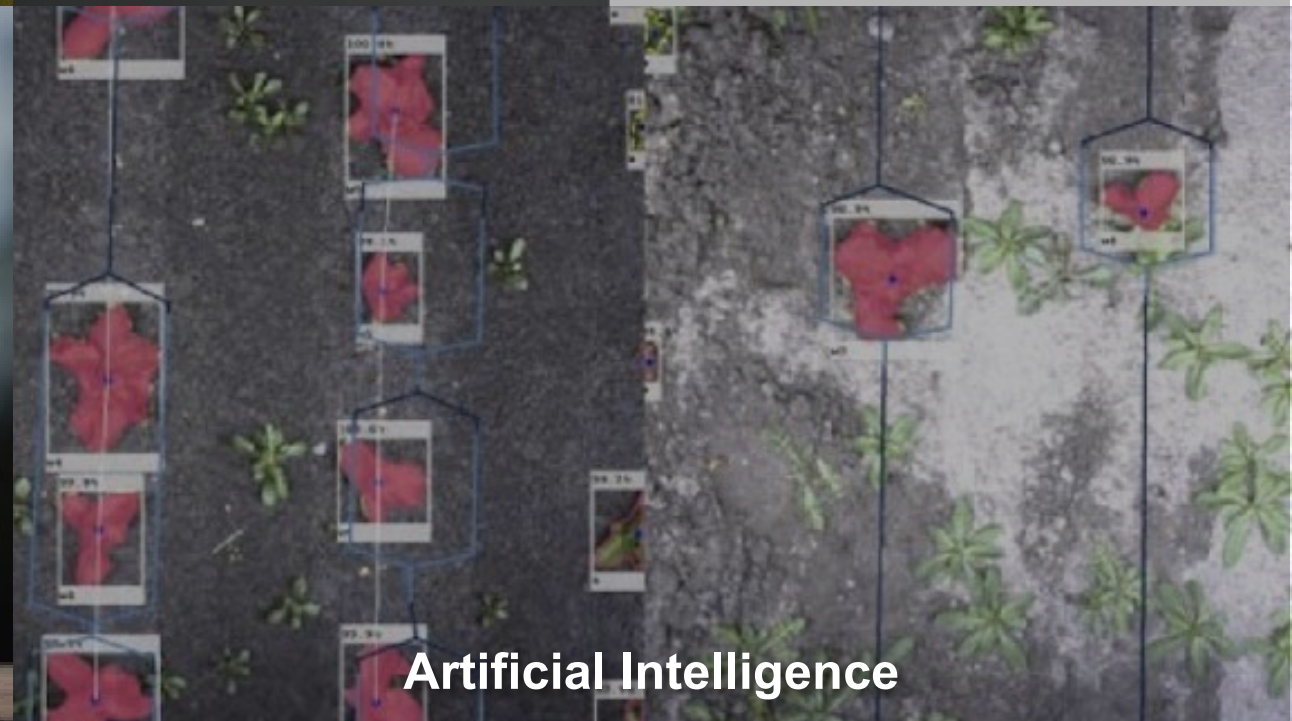
modular software



low-cost GPUS



low-cost RTK GPS



Artificial Intelligence

...Mean emerging autonomous platforms can



**Navigate
Anywhere**



**Recognize
Anything**



**Tackle
Dexterity**



Farmers are running out of people

Wages rise on California farms. Americans still don't want the job

Trump's immigration crackdown is supposed to help U.S. citizens. For California farmers, it's worsening a desperate labor shortage.

By NATALIE KITROEFF AND GEOFFREY MOHAN

MARCH 17, 2017 | REPORTING FROM STOCKTON, CALIF.

20% decline in number of farm workers over past decade

\$14 minimum wage in 2021 and **1.5X** overtime above **45 hour work week**

75% of US crop workers are legal/illegal immigrants, according to the USDA

**10% of US crop workers work in
\$115B field crops**



**88% work in \$64B
fruit, vegetable,
& nursery crops**



**Labor costs = 24% of revenue
Labor is #1 challenge
WHERE ARE THE ROBOTS?**

Known: In 20 years most labor-intensive areas will be automated



**Autonomous
Farming**

Unknown: How to win in the next 5 years?

TEAM

We see a way to build a platform, beginning in agriculture

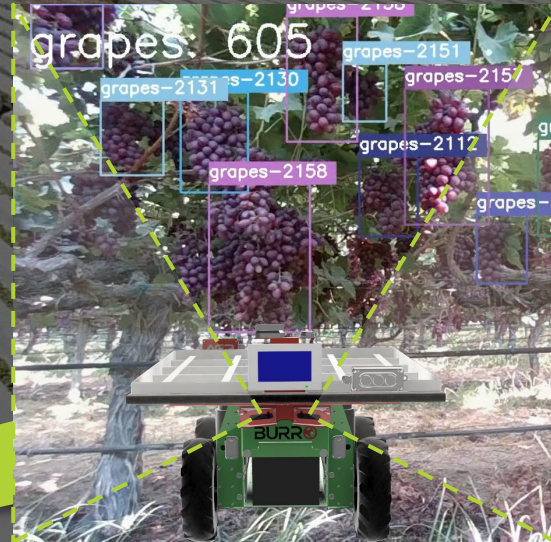
Team experienced in vision-based autonomy, with a background in industry

Industry Partners	Business	Autonomy				Sales & Support
	 <p>Charlie Andersen CEO & Cofounder</p> 	 <p>Dr. Terry Scott CTO & Cofounder</p> 	 <p>Vibhor Sood Software Engineer & Cofounder</p> 	 <p>Stephen Jablonski Lead Mechanical engineer</p> 	 <p>Yilun Zhang Perception Engineer</p> 	 <p>Chris Thiesen CA Sales/Service</p>   <p>Zach Esmili Strategy & Ops</p>   <p>Dr. Chao Wan Embedded System Engineer</p>   <p>Dr. Nikolaos Stefas Senior Robotic Software Engineer</p>   <p>Abhilesh Borde Robotics Software Engineer</p>   <p>Luc Bettaieb Senior Software Engineer</p>   <p>Josue Ortega Sales & Support Engineer</p>   <p>Noe Toribio Sales & Support Representative</p> 

How to win in the next 5 years



Phase I
“People-Scale”
Collaborative Robots
IN MARKET TODAY



Phase II
Crop Data
IN DEVELOPMENT



Phase III
Dexterity
3-5 YEARS



Autonomous
Farming

BEGINNING WITH BURRO



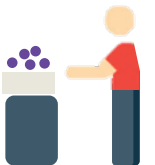
- People-scale autonomous platform, built around computer vision
- Used today to help laborers harvest fruit more efficiently
- Features Pop up autonomy™, enabling anyone to operate, packaged in a modular platform designed to enable more autonomy
- 12 cameras on board producing 1TB of images/hour, and an Autonomy stack that fuses computer vision and AI with high precision GPS, to run routes autonomously

Initial Value Proposition

One Burro allows **6+ people** to harvest up to **48% more fruit/day**, for a **1 month ROI***



Labor Cost / Person / Day	×	People Supported / Burro	×	Typical Gains	=	Value / Day / Robot
\$150		6		30%		\$270



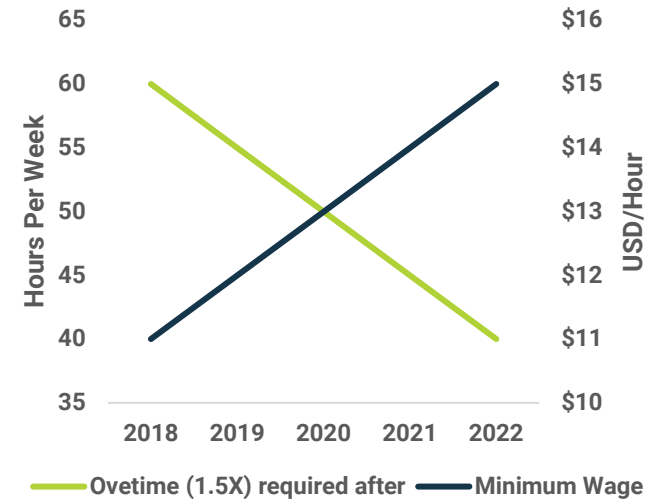
*Productivity gains based off of A/B test of Burros vs. non-Burro Crews in various arrangements, in commercial use, through the 2020 harvest season

CUSTOMERS

Starting in the most labor-intensive US crops

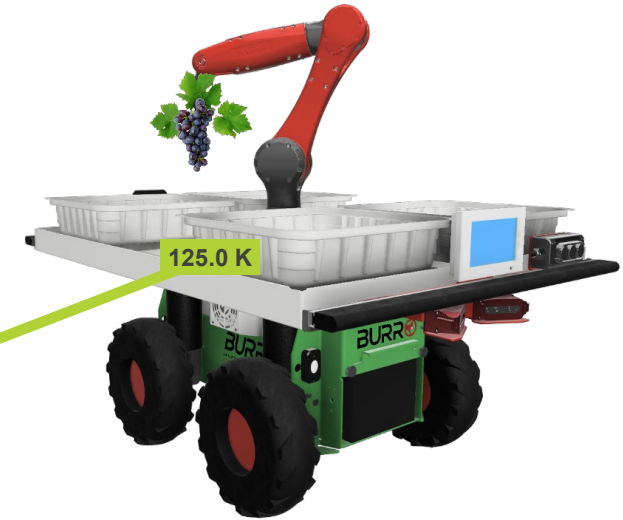
- Burros have been **in commercial use in table grapes**, and in paid trials in blueberries, caneberries, and nursery crops
- Focused commercially, today, on US table grapes
 - All grown in California; hand harvested May to December
 - \$3B revenue yet **50% of revenue goes to labor**
 - At a **tipping point with labor**, driven by California regulation
 - 125K acres in US; **harvesting an acre takes 70-man-days**
 - US is only <10% of global production

Overtime and Minimum Wage Regulations (California)



Racing into the Market and Towards Scale

Autonomous Miles



2017-2019

- > Company founded.
- > Burros Generation 1 through 5
- > 4+ months of paid pilots in 5 industries with 15+ growers.
- > Utility patent filed

2020

- > Receive 60 orders for gen 6 Burros, deliver 33% of them.
- > 8 customers run Burros 6 days a week from May to November
- > Capture crop data + Design gen 7
- > **3.5M raised | team at 13**

2021 [Goal]

- > 25,000+ autonomous miles on Burro Gen 7 with 20+ burros/grower
- > Develop crop data as a commercial feature
- > **Series A | team to 25+**

2022 [Goal]

- > Commercial crop data product
- > Expansion into other segments and sales of platform to other autonomy companies
- > Develop higher dexterity functionality

Today				
				
7 generations of hardware	8,500+ autonomous miles with 20+ growers	15,000+ hours of autonomous operation	20 robots run in 2020 by 1000+ people 6 days/week	5+ Autonomous miles between intervention

TRACTION

Commercial Traction

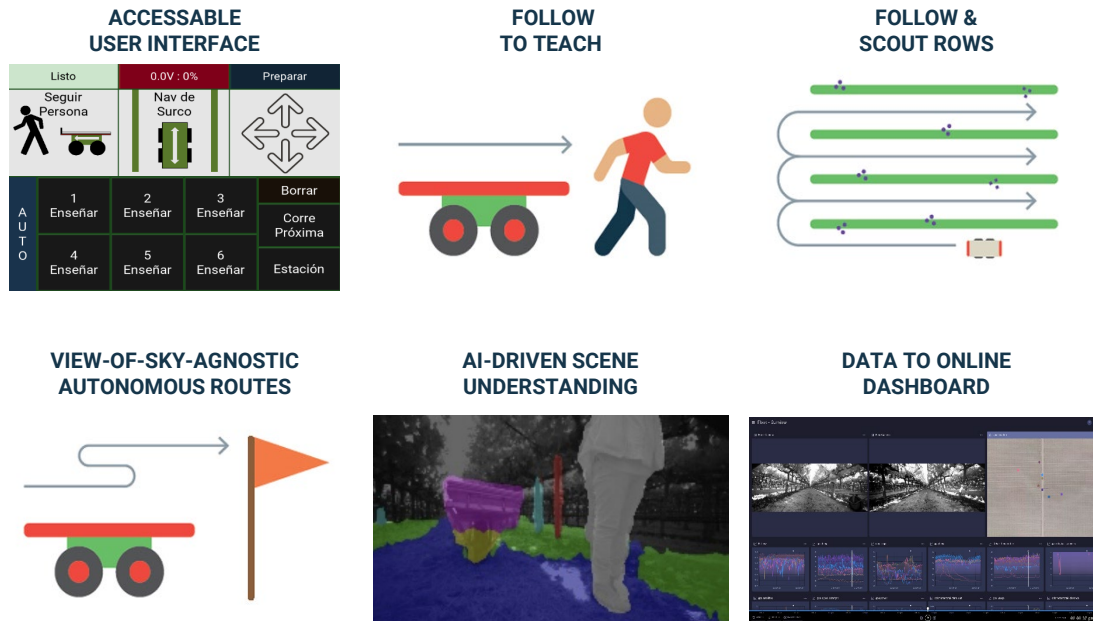
- Partnered with the California Table Grape Commission, which represents entire US industry
- 2018 and 2019 – paid pilots over 1000 autonomous miles
- 2020 - Received orders for 60 Burros from 8 table grape growers; delivered 33% of those orders in 2020
 - 20 units ran 7500+ miles in use in 2020, across 8 different grower operations
- Now building re-order board for 2021
 - 24 unit reorder [in negotiation] – \$400K+
 - 22 unit reorder [in negotiation] – \$375K+



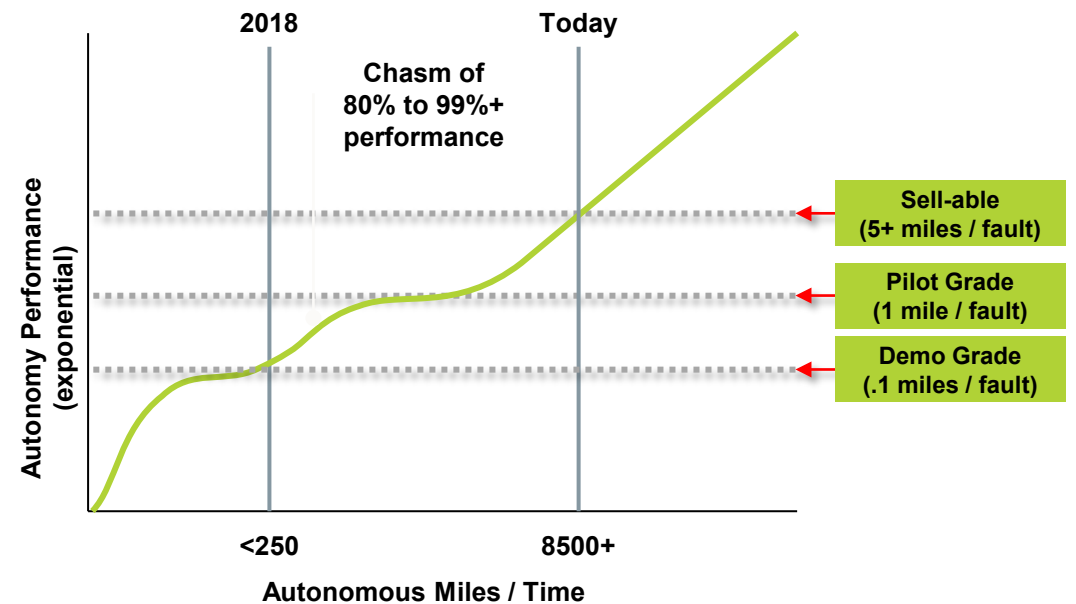
Novel approach to autonomy, past chasm of 80% to 99%+

Vision-based autonomy stack **trained over 8500+ miles** to travel on farm
Patent-pending **pop-up autonomy™** is “turn-on-and-go”, allowing anyone to operate Burros without any infrastructure

Pop Up Autonomy™ - Flexible Foundation that Works Today



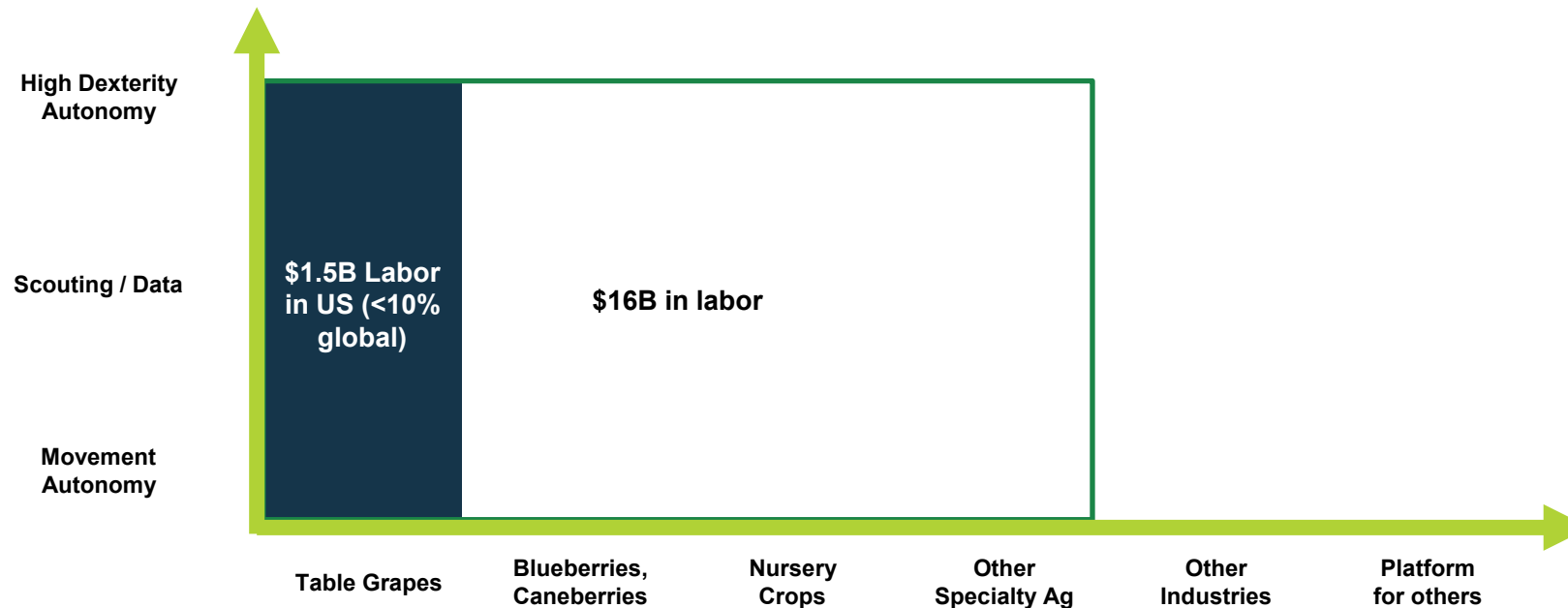
Burro Autonomy Performance



EXPANSION

Niche Market to Collaborative Ag Platform

- Focused first on a niche, with a people-scale robot and flexible foundational autonomy, necessary for many applications
- We've had 25+ requests from other autonomy companies seeking to buy our platform – plan to enable this as we grow



TODAY

Democratizes access, with an OS that enables Autonomous A to B, plus data capture, and modular for peripherals



2030

Modular people-scale platform used for work in ag and other outdoor off-road applications

BURR



*People-Scale Collaborative Robots,
Beginning In Agriculture*

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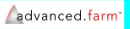













Appendix: Autonomy in Ag Market Map

Key:
In development
In trials
First paying customer
2 to 10 Paying customers
Scaling - 10+ customers

Where Autonomy / Robot can work? ***NOTE – Sizes have no relation to size of market

Field Crop – in the ground		Specialty Crop – in the ground			Tree				Vine/Bush			Nursery or Indoor structure		
Corn / Soybeans	Others (i.e. wheat, cotton)	Strawberries	Field vegetables and Greens	Other	Apples	Citrus	Nuts	Others (i.e. Stone Fruit)	Grapes	Caneberries & Blueberries	Others	Others (i.e. peppers, cannabis)	Tomatoes	Strawberries

What Autonomy / Robot does?	Autonomous Movement	<p><1000lbs People Scale Platforms (cargo &/or tool-carrier)</p> <p style="text-align: center;">   </p>	
	Autonomous Movement	<p>>3000lbs. Robotic tractors</p> <p style="text-align: center;">       </p>	
	Data	<p>Crop Scouting <small>*As a sell-able item - all companies using tons of data **Includes soil sampling</small></p> <p style="text-align: center;">      </p>	
	Low dexterity	<p>Planting / Seeding/Spraying / Fertilizing</p> <p style="text-align: center;">    </p>	
		Mowing	<p style="text-align: center;"></p>
		Other (i.e. UV Lighting, moving pots)	<p style="text-align: center;"> </p>
	High Dexterity	<p>Spot Spraying</p> <p style="text-align: center;">  </p>	
		Physical Weed Removal	<p style="text-align: center;">    </p>
		Harvesting / Picking	<p style="text-align: center;">            </p>