



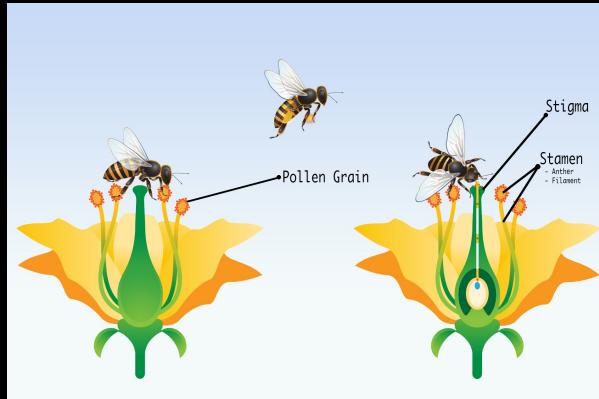
Beehive AI monitoring and robotic automation



Artjom Kurapov
Founding engineer

Problem statement - Food security

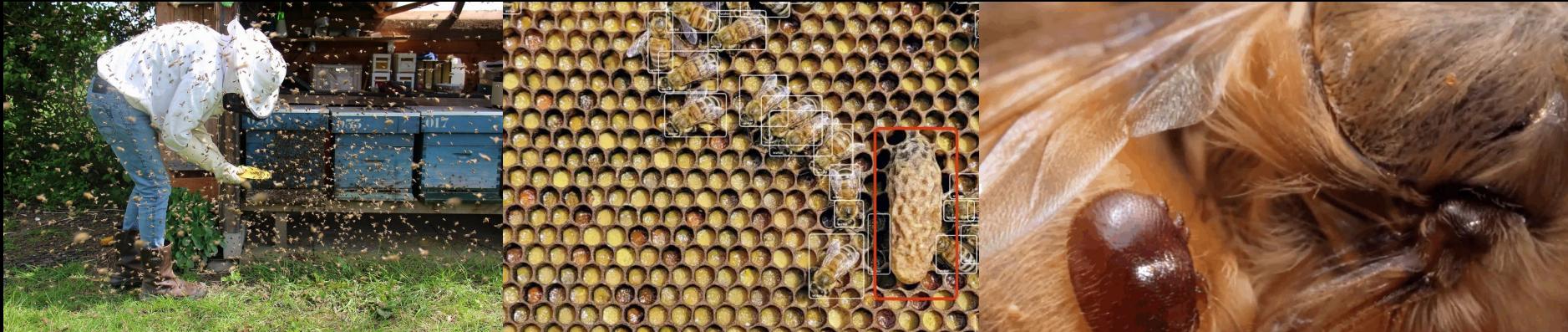
- Farmers need precise pollination to increase crop yields
 - ex. oilseed ([+37%](#)), coffee, cocoa, almond and soybean
- **Beekeepers** providing services to **farmers** earn 9x more money compared to simply selling honey
- Demand of pollination grows 2x faster than growth of honeybee colonies



Problem statement - Efficiency

Beekeepers need to perform regular inspections to "save the bees"

Hard physical labour that does not scale as apiary grows

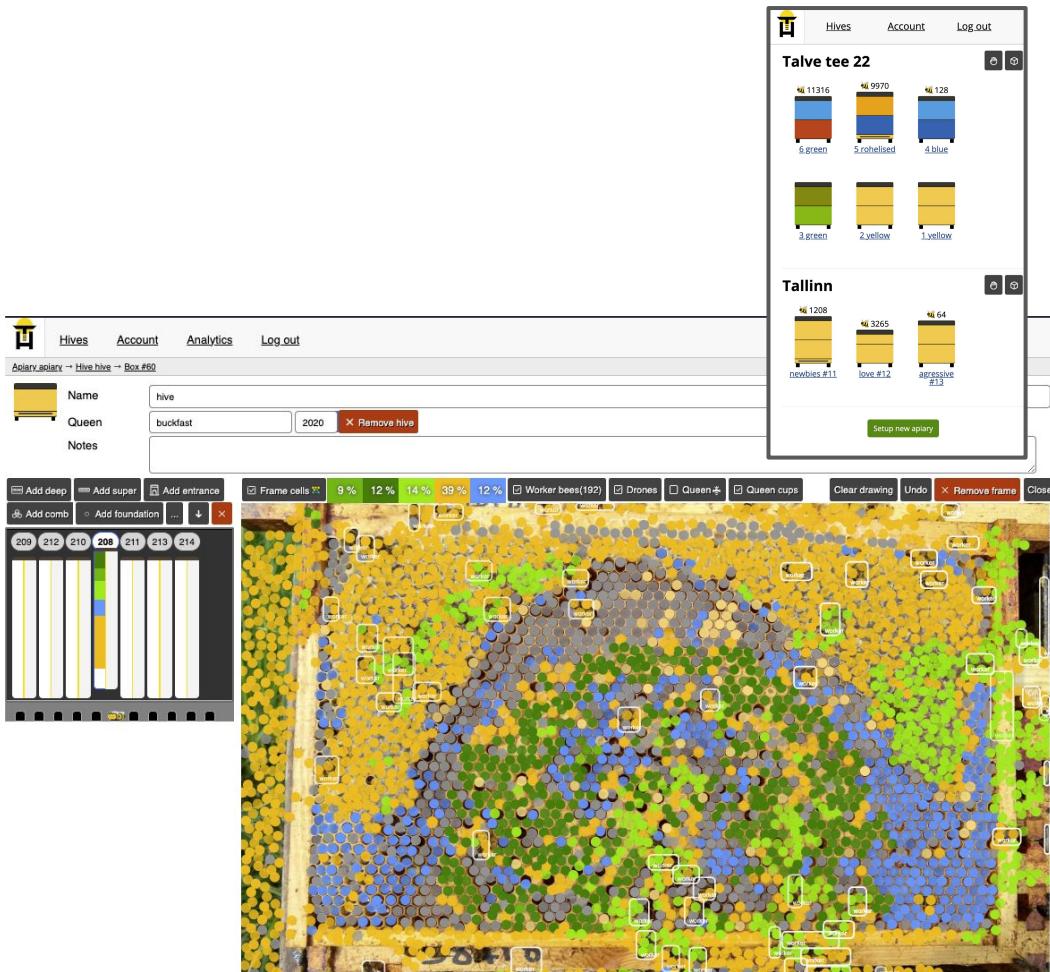


Vision

app

Data analytics SaaS app for beekeepers

- AI detections of a frame photo
 - Bee counts
 - Queen and queen cups
 - Varroa mites
 - Frame cells
- Manage apiaries, hives, frames, photos
- AI advisor
- Mobile app
- Manual inspections, inspection timeline
- Re-train on user data



Vision



Hardware to send infrequent telemetry data:

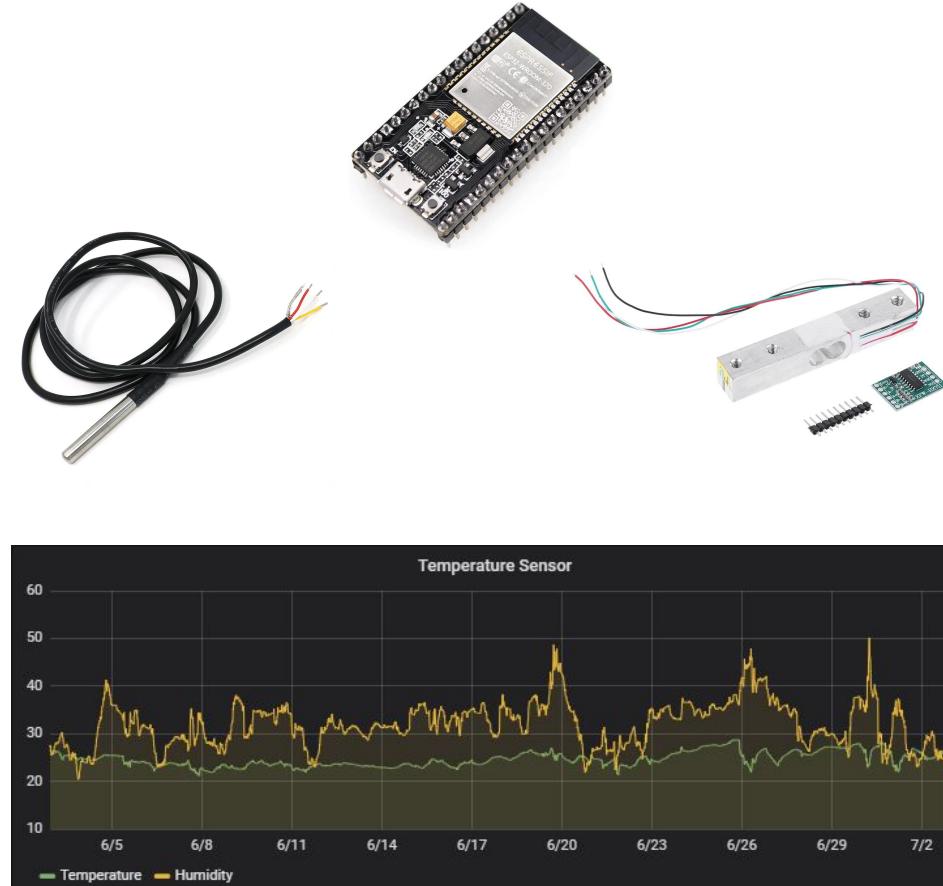
- Hive internal temperature
- Humidity
- Atmospheric pressure
- Hive weight
- CO₂ levels inside the hive
- PM2 pollution outside the hive
- Wind speed
- Audio (optional)

In web-app:

- Plot result timeseries data in grafana
- Analytics (graphs) to find correlations/anomalies
- Alerts

In mobile app:

- easy way to connect device to the app (wifi / LoRa)



Vision



Hive entrance video monitoring / IoT device

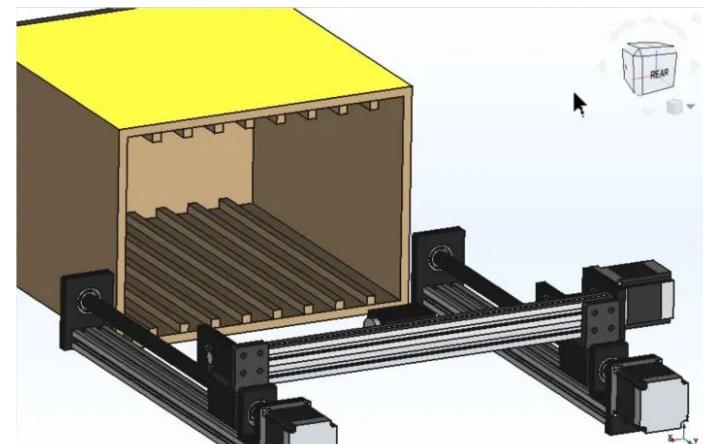
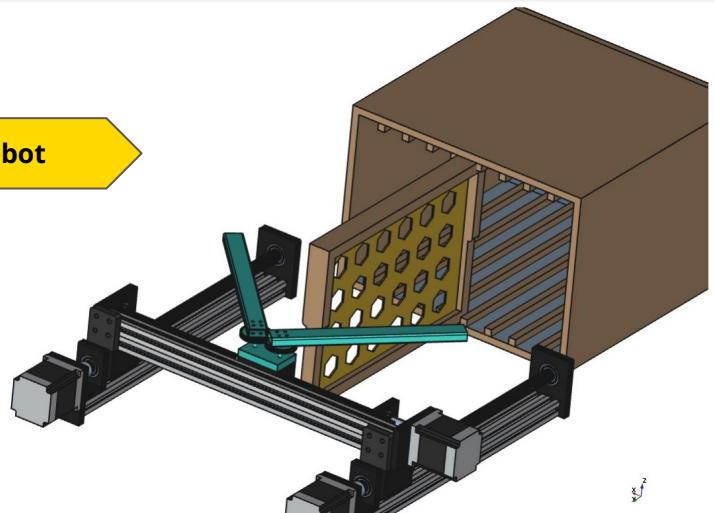
- Video streaming & playback
- Incoming/Outgoing bee counter
- Varroa mite detection
- Pesticide exposure seizures
- Pollen foraging activity
- Ant infestation
- Queen mating flight
- Stealing state alert
- Hornet alerts



Vision



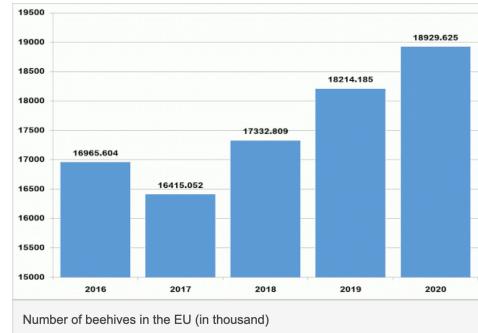
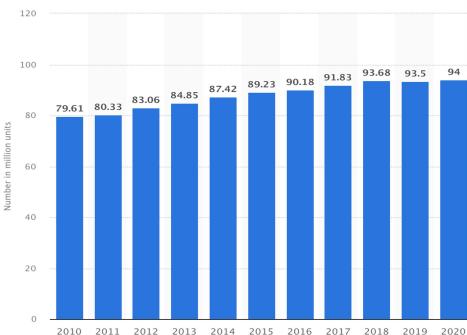
- Frame extraction mechanism
 - 2 cameras to take photos of the frame to upload to web-app
 - Frame extraction for honey harvesting
- Frame movement across hives
- Initially, single colony robot
- Next, cost-effective multi-hive robot. Moves on rails
- Temperature, humidity, weight, audio monitoring
- Ventilation, Automatic feeding
- Anti-varroa mite treatment



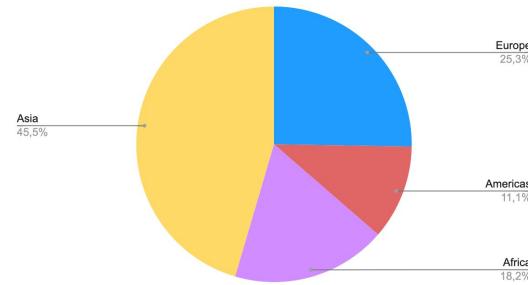


Market

- Target customers - beekeepers (B2B2B, web-app, IoT, vision)
- Secondary - industrial beekeepers/farmers (B2B, robot)
- Addressable market
 - Estonia - 6425 **apiaries** (PRIA sources). ~ 60% beekeepers have > 25 bee colonies
 - Europe - 620k **beekeepers**, **19-25M** colonies
 - World wide - 94M **colonies** in 2020 → 101.6 M **colonies** in 2021



Bee colonies world wide ~100M in 2021





Market

- 10% market share * 1M industrial beekeepers * 2 robots * 150 EUR/mo = 360M EUR YoY
- 5% market share * 2M beekeepers * 15 EUR/mo for web-app = 18M EUR YoY

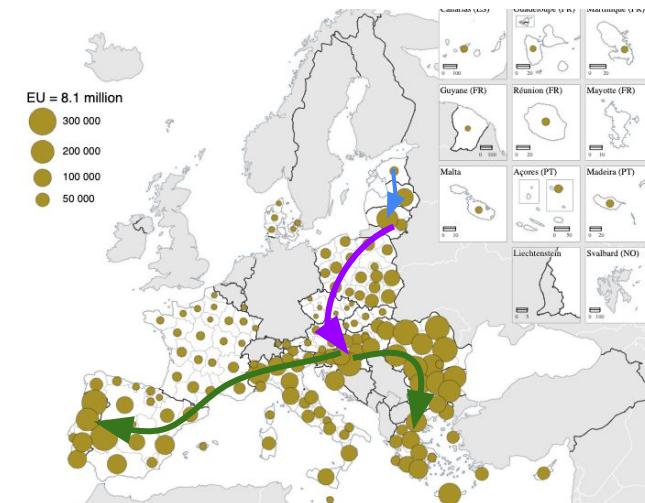
Go to market strategy by Product development

- Web-app
- Entrance observer
- Robotic beehive + apiary

Go to market strategy by region

- Estonia, Baltics (Seed / R&D phase)
- Europe - Poland, Hungary, Croatia, Italy, Bulgaria (Series A)
- US, Middle East, Portugal (Series B)

Number of beehives on farms, 2020



Pricing model

Community

free

5 hives max

Essential

15 EUR / month

2 weeks trial, annual billing

- ✓ More AI detection features
- ✓ Timeline
- ✓ Sharing
- ✓ Alerting
- ✓ Telemetry API

Professional

5 EUR per beehive per month
+ **10 EUR per user per month**

(All of Essential plan, plus)

- ✓ Analytics + Demographic breakdown
- ✓ Multiple users
- ✓ Inventory management
- ✓ Video streaming playback

	⚡ Beehive IoT sensors	⌚ Entrance Observer	⌚ Robotic Beehive	⌚ Robotic Apiary
Web-app subscription	5 EUR / month	20 EUR / month	50 EUR / month	200 EUR / month
Purchase retail price (estimated)	200 EUR	~ 600 EUR	~ 3000 EUR	~ 10 beehives ~ 6000 EUR
Rent (annual billing)	20 EUR / month	50 EUR / month	250 EUR / month	500 EUR / month





Team

Research advisors, Czech Republic



Artjom Kurapov

Founding engineer / beekeeper
(ex-Pipedrive, Clarifai)



Šimon Bilík

Researcher, PHD
System engineer / Beekeeper



Aleksei Prokopov

Robotics, backend engineer



Adam Ligocki

ML engineer, PHD



Kurban Ramazanov

UX engineer volunteer



Traction

- 100 registered users (0 paying)
 - 10 mobile app installs
- Community and volunteer building
 - 5+ contributors
 - 70+ discord members
 - Reached out from local research institutions
(Kood Jõhvi, Vidrik.TalTech, University of Tartu)
- Publicity
 - 2 interviews to local newspapers
 - 200+ followers on linkedin





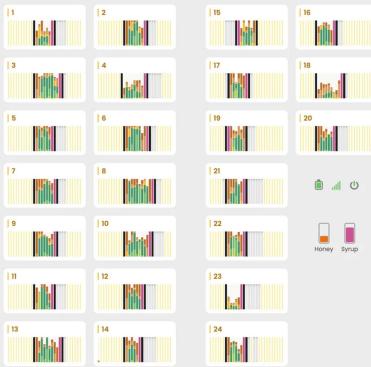
- Raising 35k angel investments
 - Hardware development (Entrance observer)
 - Field testing with local beekeepers
 - GPU hosting cluster + cloud video storage
- Raising 1M pre-seed round for runway: 24 months
 - **Team of 4** + external contractors & beekeepers
 - AI models improvements
 - Robot R&D

pilot@gratheon.com



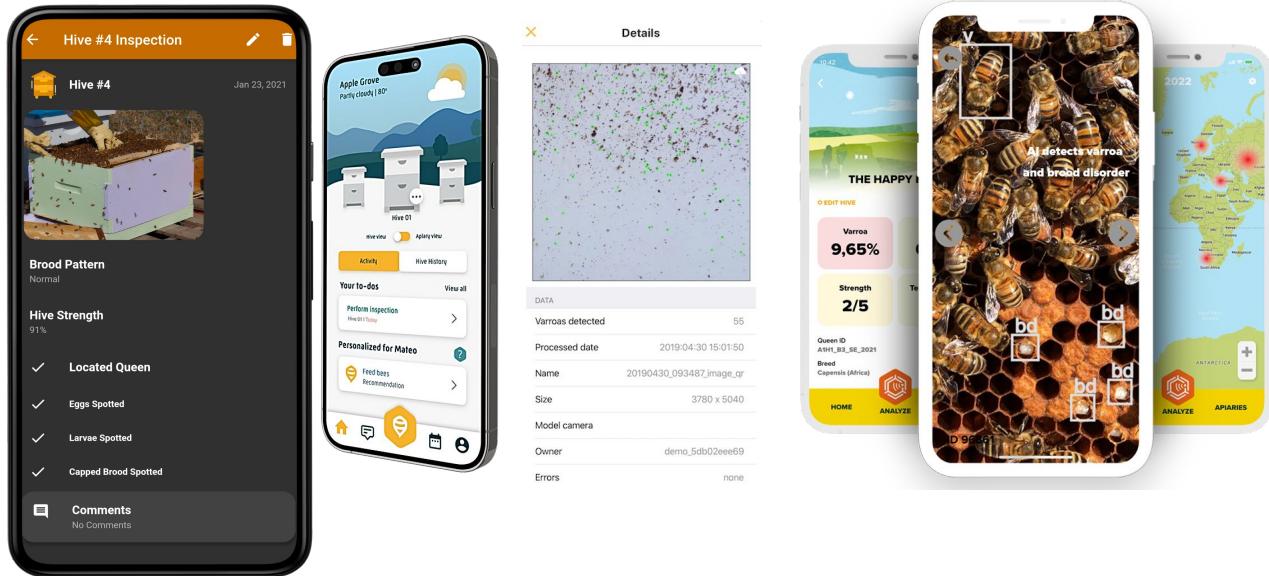
Competition - Vision AI and hardware

- beewise.ag - robotic multi-colony container hive
- beehero.io - IoT
- beemate.buzz - counts bees
- apic.ai
- bestbees.com



Competition - Data organizer apps

- nectar.buzz
- BeeScanning
- ApiZoom
- HiveTracks
- HiveBloom
- BeeQueenDetector
- apimanager
- apiary book



Competition - IoT (audio, humidity, temperature)

- beehero.io
- beep.nl - opensource
- broodminder.com
- beelab.se
- intelligenthives.eu
- beehivemonitoring.com
- solutionbee.com
- beehivemonitoringusa.com
- osbeehives.com
- beesage.co

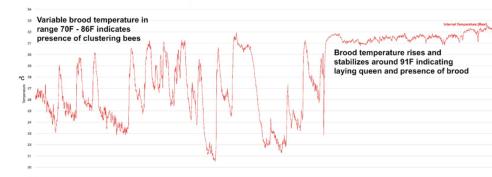


Fig. 2: Using Brood temperature to detect onset of laying queen in late winter/early spring

