



Modular Robotic Beehive

As a Service

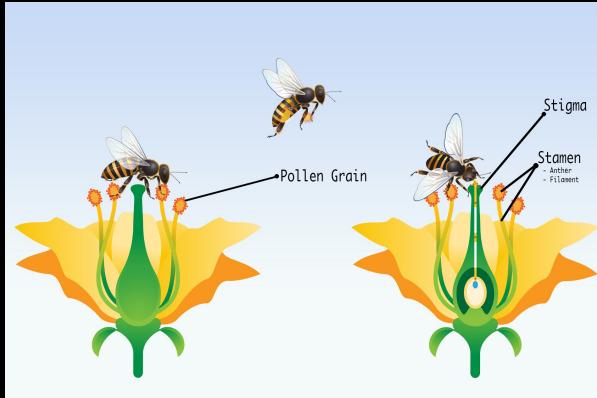


Artjom Kurapov
Founding engineer



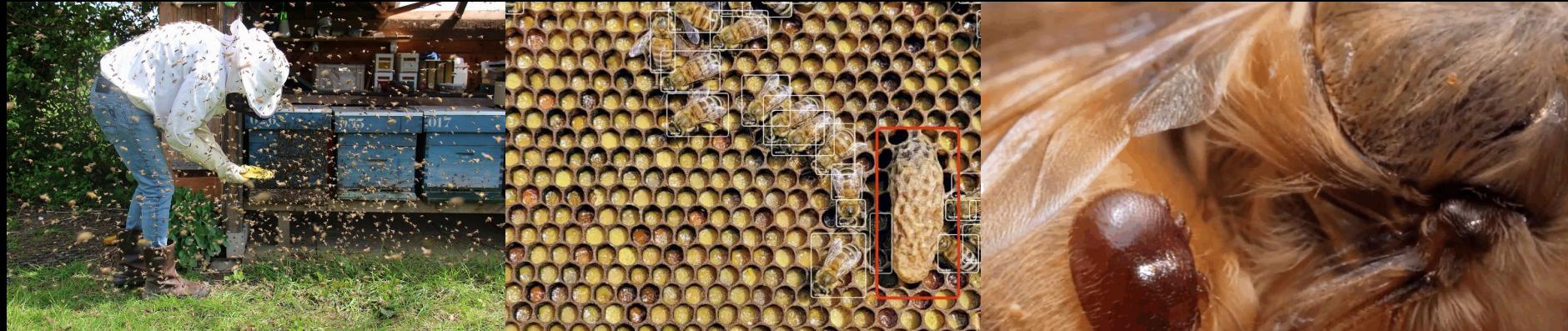
Problem statement - Food security

- 10 Billion world population people, limited resources, poor pollination coverage
- Farmers can increase crop yields by +37% with precise pollination
- **Beekeepers** providing services to **farmers** earn 9x more
(compared to simply selling honey)
- Demand of pollination grows 2x faster than growth of honeybee colonies



Problem statement - Efficiency

- Bees swarm, get infested with mites or can be aggressive
- Beekeepers need to perform weekly inspections
- Beekeepers lose 20-50% of colonies every year, one colony loss impact > 300 EUR
- Common beehives are 150 years old and heavy to inspect
- Physical labour is hard to scale, it is a seasonal activity



Vision

app

Data analytics app for beekeepers

Manages state of the apiary

Performs AI detections and provides advices

Stores IoT telemetry

Tracks weather around apiary

Controls modular beehive hardware

State: openly accessible, in development



Vision



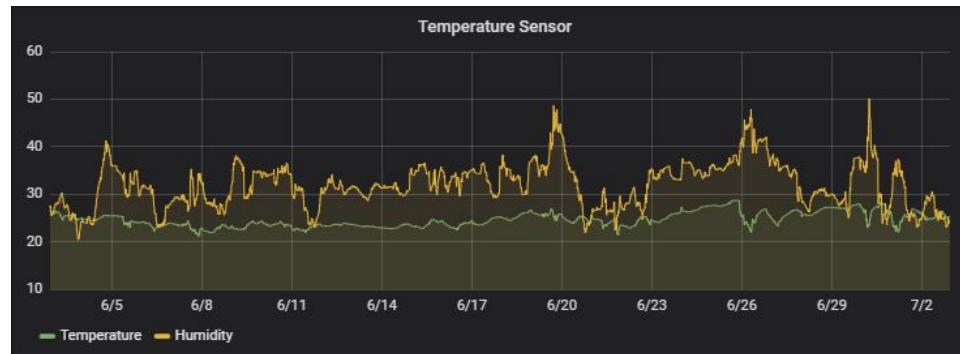
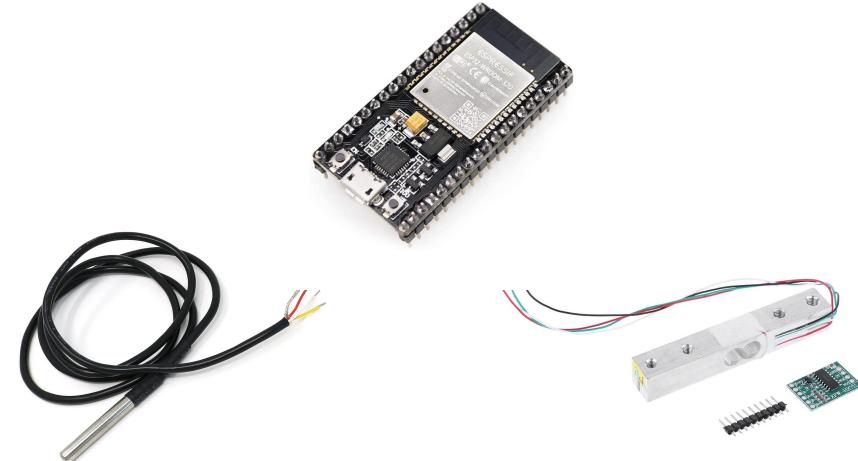
Hardware to send infrequent telemetry data:

Sends hive internal temperature, weight, humidity

Analytics (graphs) to find correlations/anomalies

Sends alerts

Price ~200 EUR



Vision



Hive entrance video monitoring / IoT device

Video streaming & playback
Incoming/Outgoing bee count
Varroa mite, hornet detection

Price ~ 600 EUR



Vision

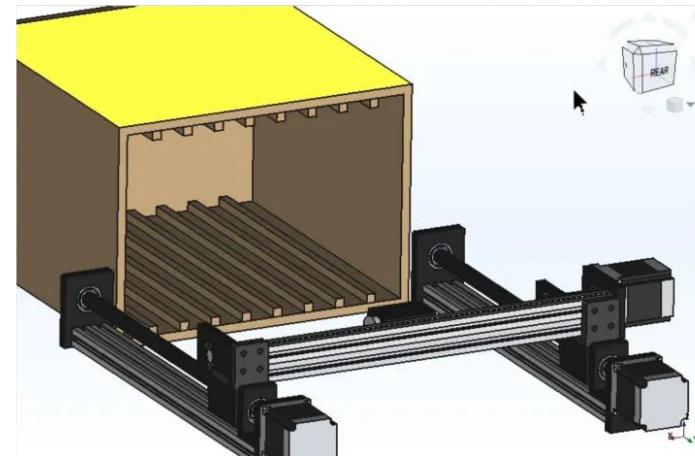


Frame extraction mechanism

Take photos of internal state

Colony demography estimation

Multi-hive robot for cost-effectiveness





Market Opportunity

Target customers:

semi-professional beekeepers (B2B)

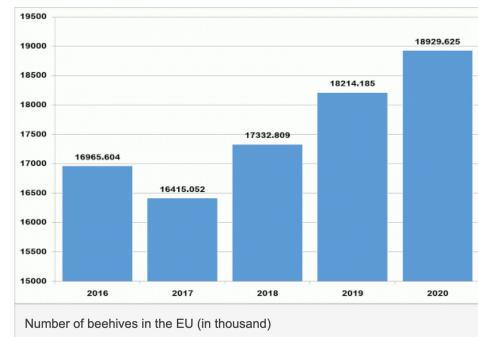
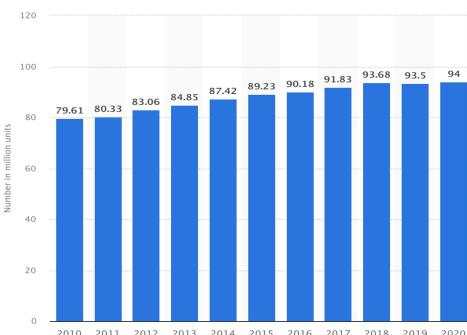
beekeepers selling their services to farmers (B2B2B)

Addressable market - **370 thousand semi-professional beekeepers in Europe**

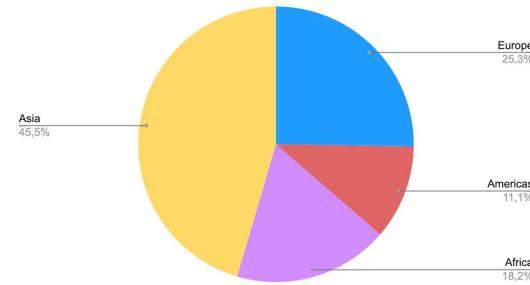
Europe - 620k beekeepers, 19-25M colonies

Estimated ~ 60% beekeepers have > 25 bee colonies

World wide - 2 Million beekeepers



Bee colonies world wide ~100M in 2021



Business model

Subscription model for data management and analytics, usage dependent

Low-margin hardware with open hardware and software to ease adoption and trust

	Community tier	Essential tier	Professional tier
Subscription model for data management and analytics, usage dependent	free	15 EUR / month 2 weeks trial, annual billing	5 EUR per beehive per month + 10 EUR per user per month
Low-margin hardware with open hardware and software to ease adoption and trust	5 hives max	20 hives max	

	🐝 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





Market estimate for IoT sensor product

Estimated EU market penetration = 70%

Essential tier monthly price = 15 EUR/month

Essential tier estimated beekeeper ratio = 80%

$$620k \times 0.7 \times 0.8 \times 15 = \mathbf{62.5M EUR ARR}$$

Pro tier monthly price = 5 EUR/month/hive + 10 EUR/user

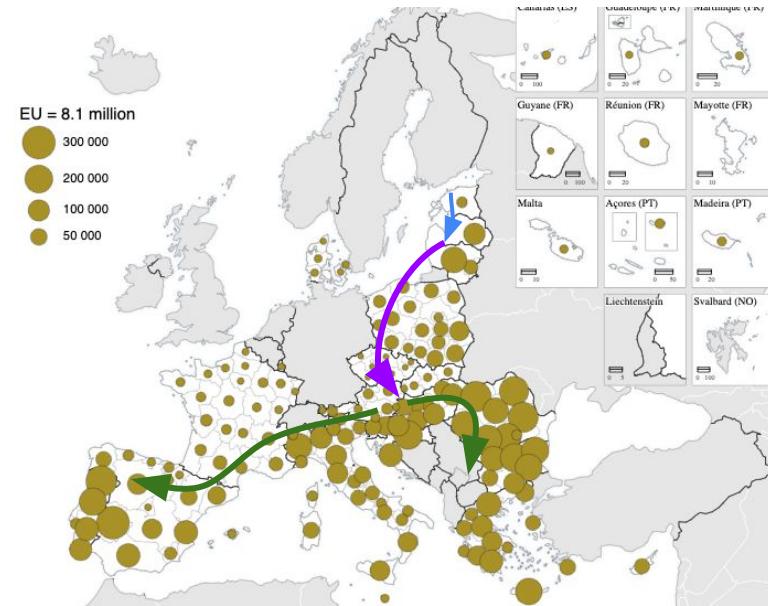
Pro tier estimated beekeeper ratio = 20%

Estimated average hive count = 32

Estimated IoT sensors coverage = 50%

$$620k \times 0.7 \times 0.2 \times (10 + 5 \times 32 \times 0.5) = \mathbf{93.7M ARR}$$

[Go to market strategy by region](#)





Team



Artjom Kurapov

Founding fullstack engineer, beekeeper
(ex-Pipedrive, Clarifai)



Aleksei Prokopov

Robotics, backend engineer
(ex-Fits.me, ex-Coop)



Kurban Ramazanov

UX engineer volunteer

Research advisors, Estonia



Vyatšeslav Kekšin

Researcher, PHD student
TalTech



Šimon Bilík

Researcher, PHD
System engineer / Beekeeper



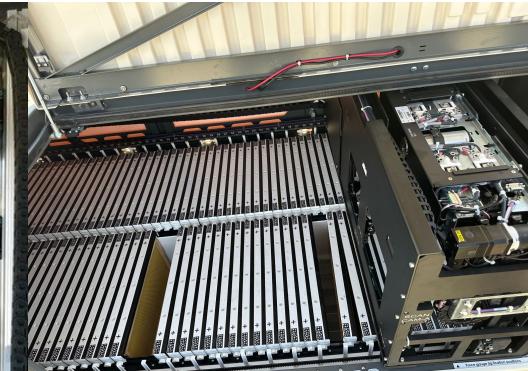
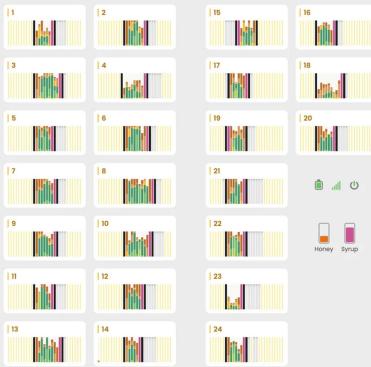
Adam Ligocki

ML engineer, PHD



Competition - Vision AI and hardware

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



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
- Marketing channels
 - Facebook ad for beekeeping communities
 - Telegram channels for beekeepers
 - Local beekeeping group meetups





Raising 1M pre-seed round for 24 months runway

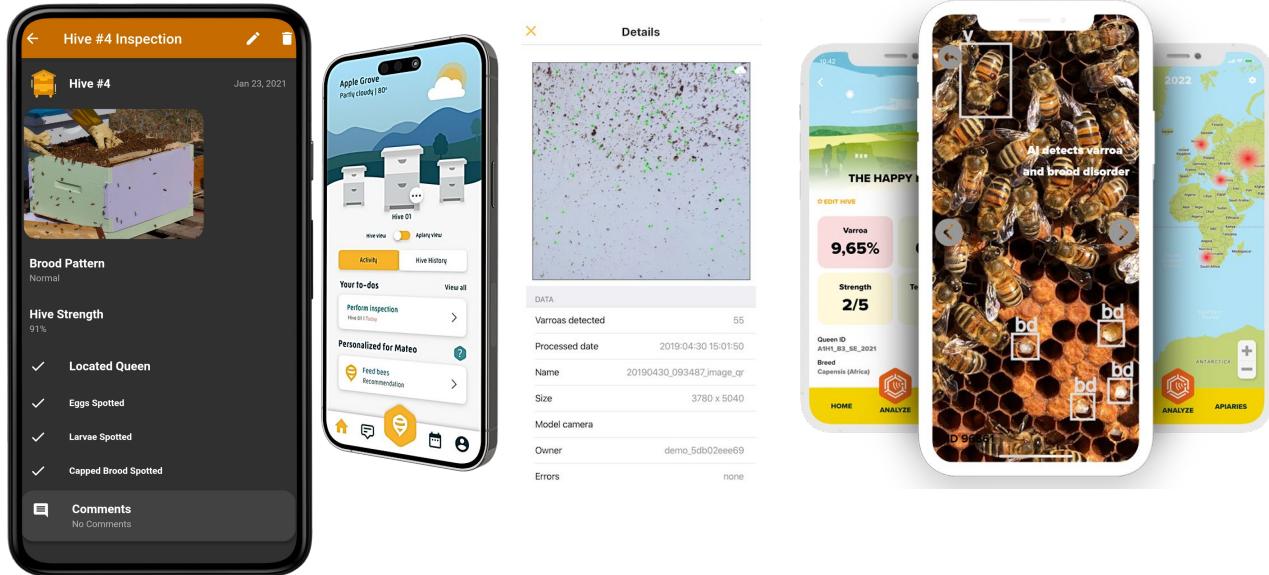
- Min. 2 summers are needed for field testing
- **Team of 4** + external contractors & beekeepers
- IoT sensors product development and release to the market
- Field testing with local beekeepers
- Entrance observer product development
- Robot prototype development

pilot@gratheon.com



Competition - Data organizer apps

- 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

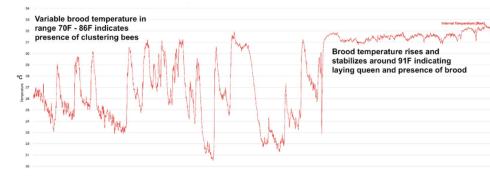


Fig. 2: Using Brood temperature to detect onset of laying queen in late winter/early spring

