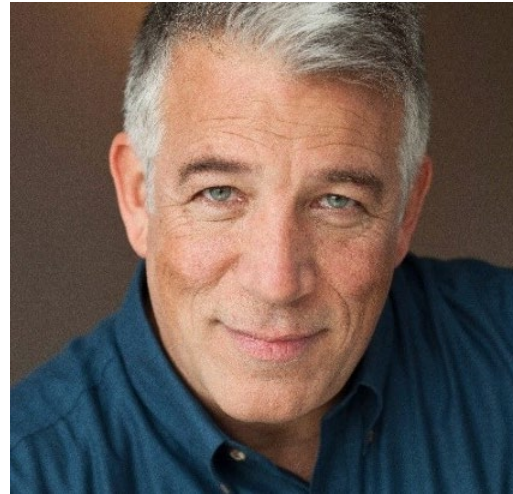# Your hosts

Lukas Sieber

Executive Director North America

Greater Zurich Area Ltd (GZA)

lukas.sieber@greaterzuricharea.com

Matt Julian

Director US

Greater Geneva Bern area (GGBa)

m.julian@ggba-switzerland.ch

Webinar Housekeeping
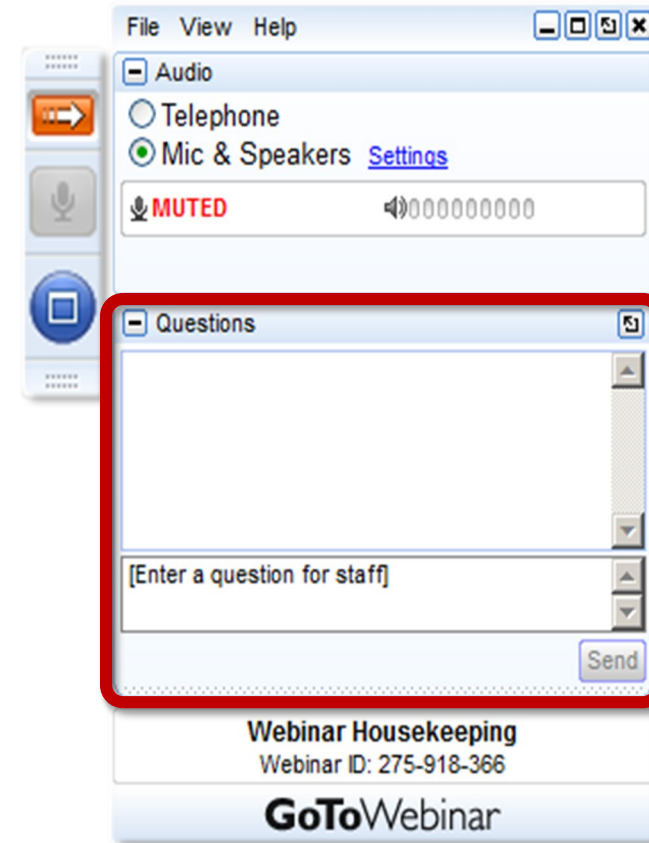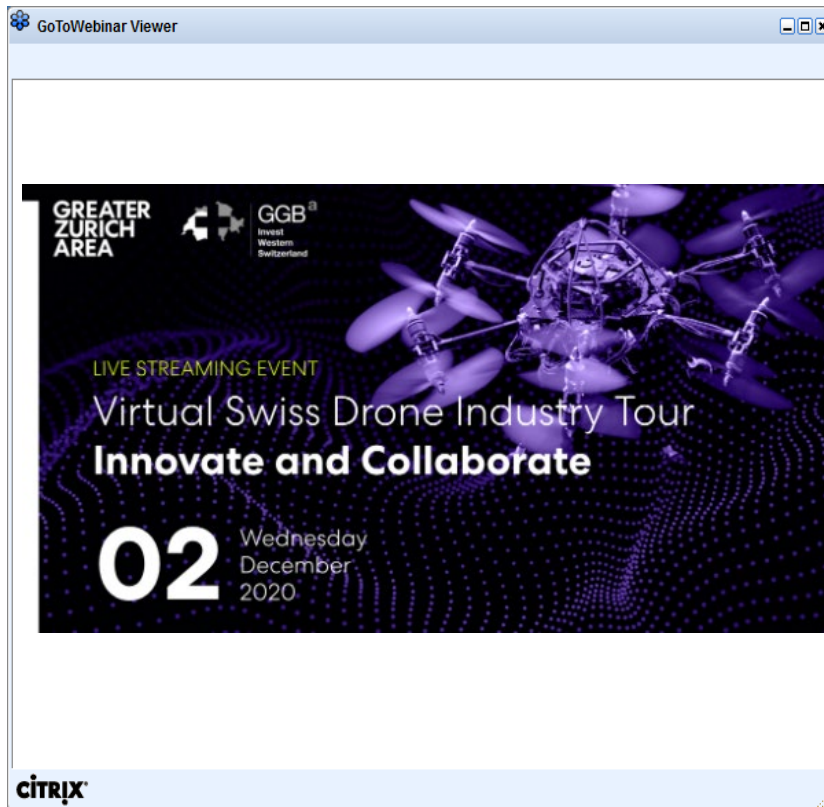
All webinar recordings available on: greaterzuricharea.com/webinars
ggba-switzerland.ch/en/webinars

"The Silicon Valley of Robotics & Autonomous Systems"

Global #: influential research and development

Number of citations per robotics / autonomous systems computing paper

(Bar chart, x-axis: Switzerland, USA, UK, France, Canada, Italy, Germany, Japan, South Korea, China)

Disruptive Companies

MATTERNET · AIRMAP · INVOLI · 3DR · VOLIRO · Auterion · VERITY studios · senseFly · TINAMU · GE Inspection Robotics · WindShape · DAEDALEAN Applied Intelligence · FLYABILITY · WINGS FOR AID · wingtra · AEROTAIN

…world leading institutes & initiatives
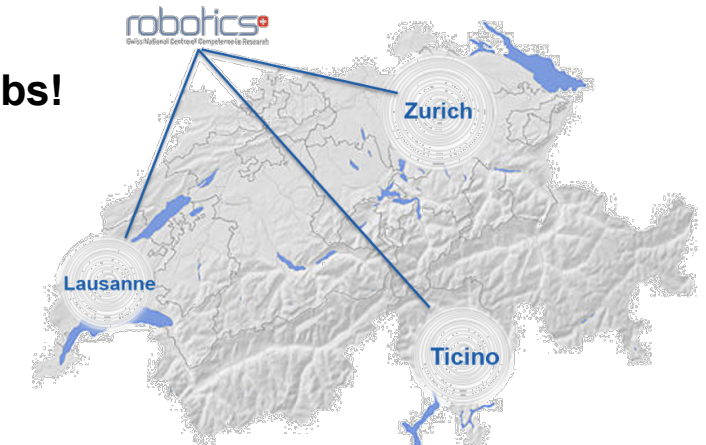
ETH zürich · EPFL · University of Zurich UZH · SWITZERLAND INNOVATION · Wyss Zurich Translating Science into Life · IRIS · USI/SUPSI IDSIA · #Swiss Autonomous Valley · Autonomous Systems Lab · zhaw School of Engineering · swiss aeropole · DIAS Drone Industry Association Switzerland

Biggest Swiss Hubs!

(Map of Switzerland showing hubs: Zurich, Lausanne, Ticino)

Prof. Dr. Roland Siegwart

Professor ETH Zurich,
Head ETH Autonomous Systems Lab
Co-Founder Wyss Zurich

Master and PhD in Mechanical Engineering at ETH Zurich, post doc at Stanford University and NASA Ames

Career: VP ETH Zurich; IEEE Fellow and multiple award holder; one of the most cited scientists in robotics worldwide; co-founder of half a dozen spin-off companies

rsiegwart@ethz.ch

Pioneering Flying Robots

- 2004 - Model F2 (LIS EPFL)
  - 80 cm wingspan, 30 g
  - pioneering ultralight fixed-wing drones

- 2004 - OS4 (ASL EPFL)
  - 70 cm, 650 g
  - pioneering quadrotors

- 2008 - Skysailor (ASL ETH)
  - 3.2 m, 2.3 kg
  - Pioneering solar-powered continuous flights

- 2012 – Skye (ASL ETH)
  - 2.5 m diameter
  - the omnidirectional blimp
  - https://www.youtube.com/watch?v=qXvl3anK3w0
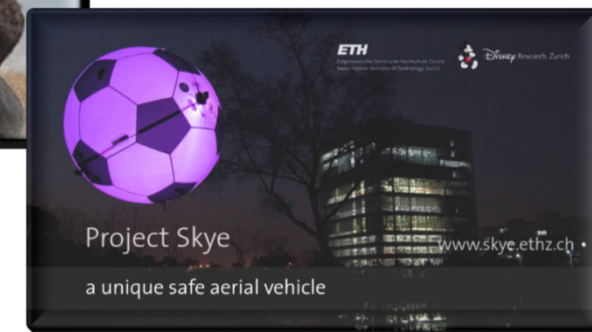
Pioneering Flying Robots │ *pushing agility and control*

- 2009 – Highly Dynamic and acrobatic flight!
  – IDSC ETH

Pioneering Flying Robots | *pushing the flight duration*

wingtra

Spinoff
ETHzürich

| the VTOL UAV (hybrid)

https://www.youtube.com/watch?v=QADvPDWtgFU

Atlantik Solar

| 81 hours non-stop in summer 2015
| 5.64 m, 6.2 kg

https://www.youtube.com/watch?v=8m4_NpTQn0E

https://www.youtube.com/watch?v=wyS6W1t_ryQ

Pioneering Flying Robots | *omnidirectional multi-copter for interaction*

- Goal:
  - Fly in all directions at any attitude of the main body
  - Generate forces in all directions

(external state estimation)

Push-and-Slide Along a Flat Surface (Section V-C)

- Reject disturbances from friction forces
- Accurately and repeatably draw a pattern (3 trials)

https://www.youtube.com/watch?v=9FJn_t-YCwM

VOLIRO **V** | flying robots for inspections in contact

Autonomous Systems Lab
Wyss Zurich
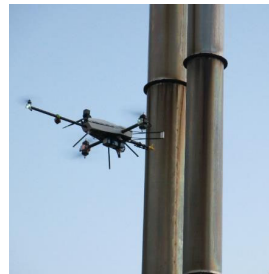
https://www.youtube.com/watch?time_continue=25&v=Qjka4bKqQXA / https://www.voliro.com/

"Seeing" | visual-inertial motion estimation

A Google Tango tablet is used to teach the path of an inspection mission.
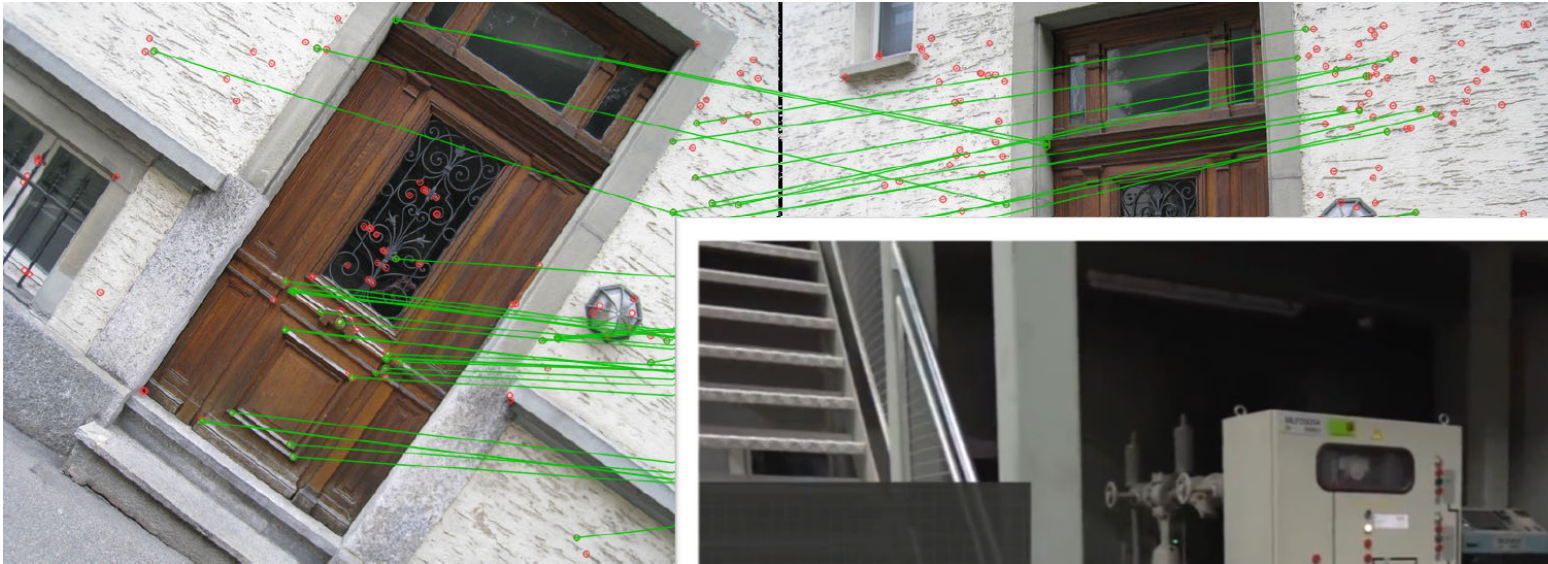
"Seeing" | *flying in cluttered environments*

Forest Experiment 4 - **1x**

https://www.youtube.com/watch?v=rAJwD2kr7c0

Switzerland | a melting pot for drone technology

Roland Siegwart
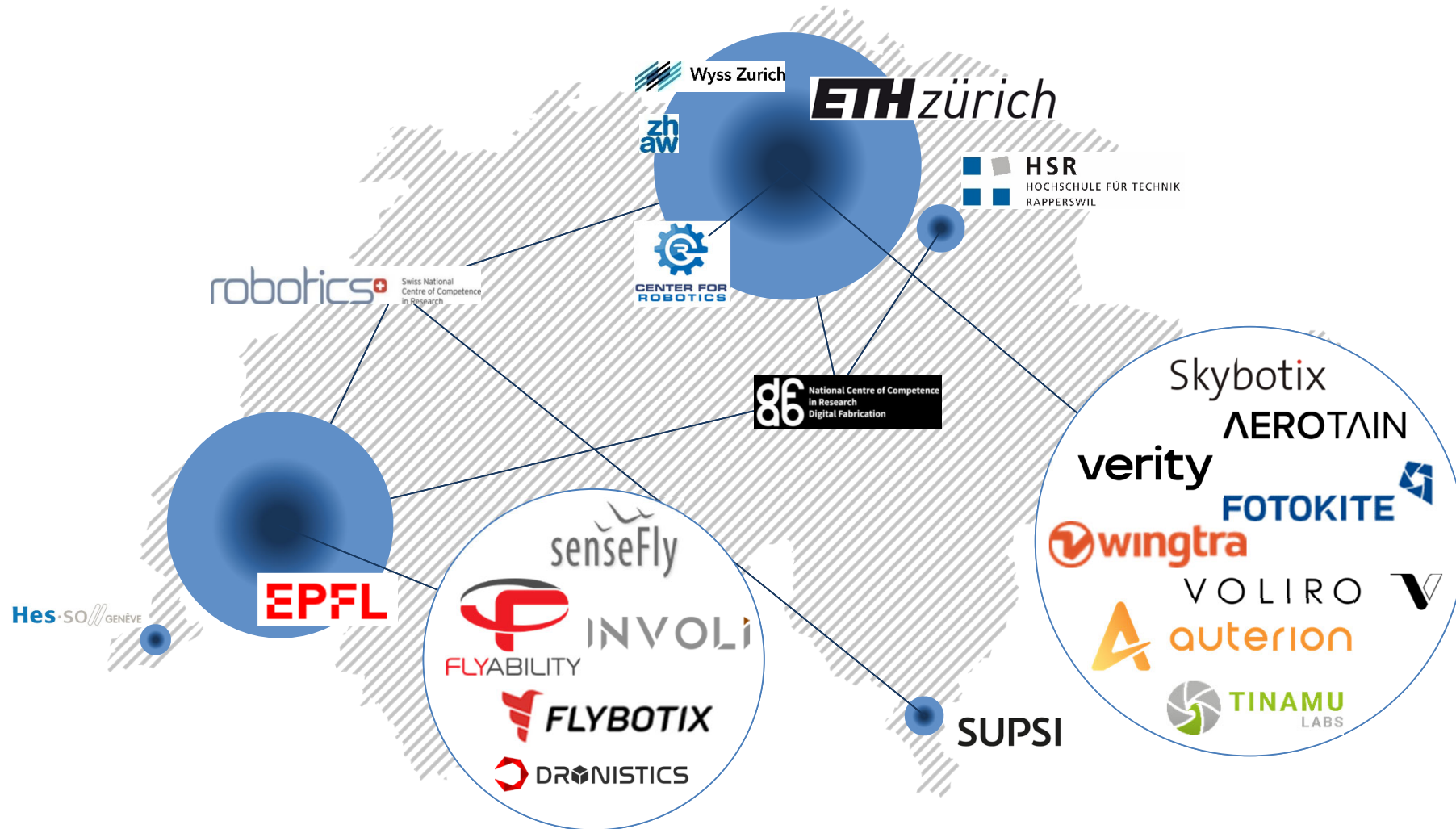
Take Home Message

- In the last two decades, drone technology has evolved from research labs to a fast-growing market

- Thanks to it pioneering work, Switzerland hat grown to the
  HOME OF DR⊕NES

- Novel drone technology is still under fast development
  - On-board 3D reconstruction for autonomous flights in dense environments
  - Physical interaction in flight
  - On-board sense and avoid
  - Seamless integration of drones in public airspace

Mélanie Guittet

Co-Founder and Chief Business Development Officer at INVOLI

Master in Engineering from EPFL, Lausanne

Career: Project Manager and Industry Liaison at the EPFL Energy Center, Project Coordinator at CREM, Treasurer and research promotion at Ingénieur.e.s du Monde; startup support at Swiss StartupAssociation.

melanie.guittet@involi.com

DIFFICULTY OF SAFELY SHARING THE SKY

DRONES   ARE   BLIND   TO   AIR   TRAFFIC

High collision risk between drones, helicopters and other flying objects, and even more if drones are to become fully autonomous or do BVLOS

No existing end-to-end solution for complete flight awareness enabling **scalable commercial drone operations**

Often, no redundancy in air traffic information which is not compatible with aviation requirements and may delay or slow BVLOS adoption

Without redundant, precise and complete flight awareness,
many business opportunities (including BVLOS drones) are hampered

SOLUTION

Giving eyes to drones, through unique air traffic data

Air traffic data affordable, extensively available, accurate and based on state-of-the-art technologies, gathered from a network of ground-based sensors

Unparalleled flight awareness and ability to safely automatize drone missions

INVOLI DATA IS THE CATALYST TO ENABLE REVOLUTIONARY APPLICATIONS SUCH AS BVLOS

AIR TRAFFIC AWARENESS

Thanks to the INVOLI system
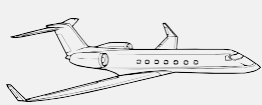
TRAFFIC AWARENESS USING CURRENT RADARS

TRAFFIC AWARENESS **ADDED** BY INVOLI

2000 ft

Installation of air traffic sensors onto existing infrastructure (rooftops, telecom antennas, etc.) with signal validation for real-time air traffic awareness
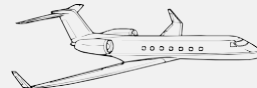
AIRPORT

TECHNOLOGY • Hardware

Ground-based installation of multiple sensors installed as a communicating network which capture aircraft transponder pulses and calculate position and identification

PATENT PENDING
National phases

Air traffic receiver "K-1090"

Extra-light drone trackers

DEPLOYMENT

Deployment onto
existing infrastructure to cover the needed area

Telecom   Rooftops   Railways
Wind turbines   Power lines

Ongoing ISO certifications (ISO 14001 and ISO 27001)

TECHNOLOGY • Software

INNOVATION

Processing & algorithms

All data received from each receiver is gathered onto a centralized server system which runs the computer processing and algorithms

Web interface

After processing, data is displayed onto an intuitive web interface

Web interface
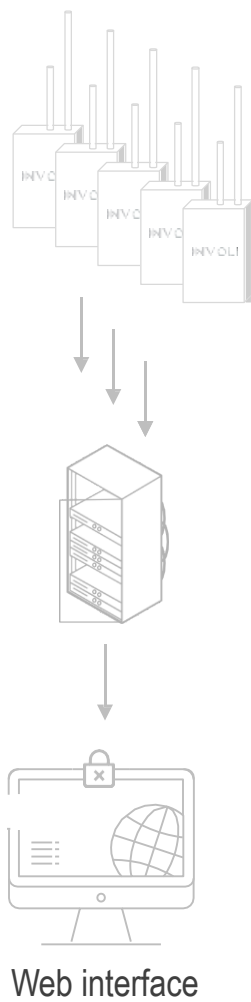
SOME INNOVATION PARTNERS...

swisscom

LA POSTE

skyguide

FLARM

esa business incubation centre

GENÈVE AÉROPORT

AIRMAP

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

ALTITUDE ANGEL

GENÈVE AÉROPORT

senseFly Parrot Group

...AND STARTUP SUPPORT...

swiss aeropole

VAUD

W.A. DE VIGIER STIFTUNG
SUPPORT FOR START-UPS

be advanced

IMD
REAL WORLD. REAL LEARNING.

...FOR INTERNATIONAL REACH

ASTM INTERNATIONAL

FEDERAL AVIATION ADMINISTRATION

NASA

Global UTM Association

AFRICAN DRONE FORUM
LAKE KIVU CHALLENGE

THE WORLD BANK

SOME USE CASES

Safely coordinating drones, helicopters, aicraft…

SAFE MEDICAL DRONE DELIVERIES (BLOOD, TESTS, ORGANS…) BETWEEN HOSPITALS

Delivery

The medical-delivery drone needs to know in advance if there's a helicopter coming or going, anticipate its trajectory and avoid it
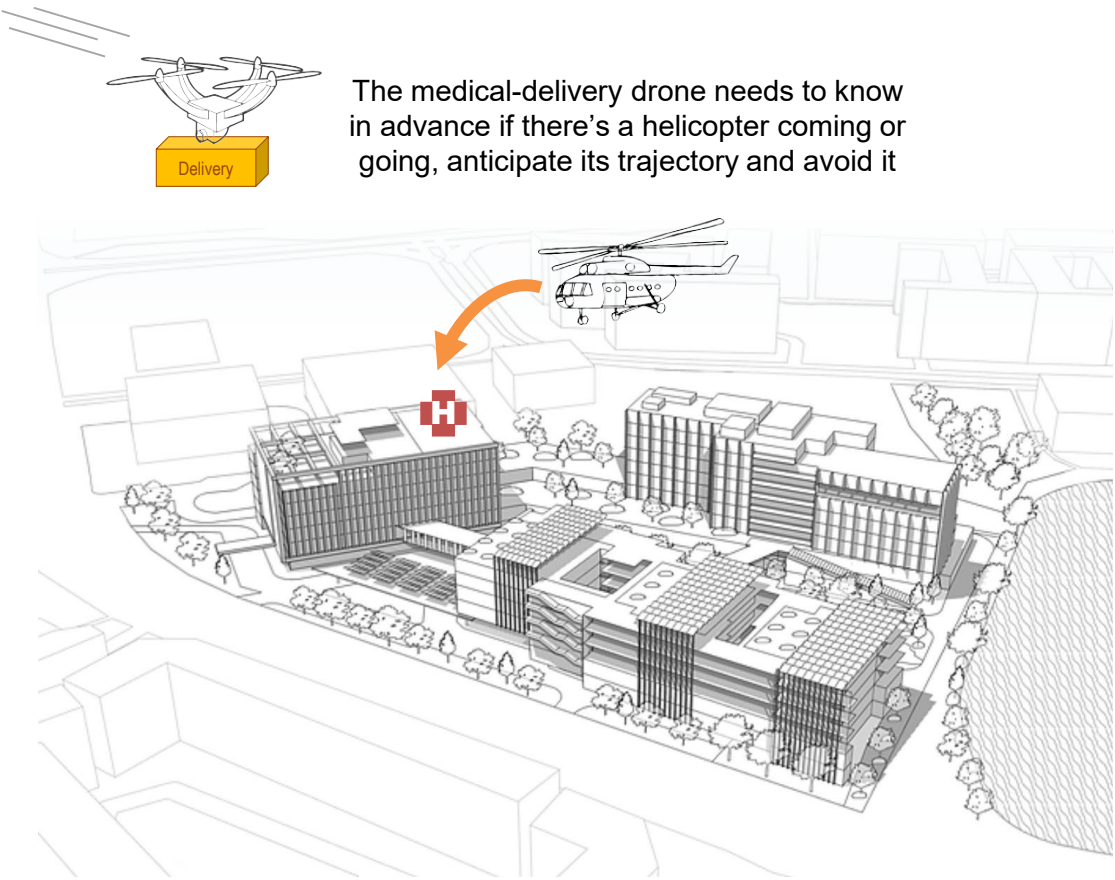
SAFELY COORDINATING DRONES, WATER BOMBERS AND HELICOPTERS DURING A FIRE

(2) INVOLI provides a real time air traffic picture of all flying objects so they can anticipate and avoid collisions

INVOLI Air traffic receivers

(3) Water bombers can proceed to extinguish the fire even with drones still operating

(1) Drone detects the fire
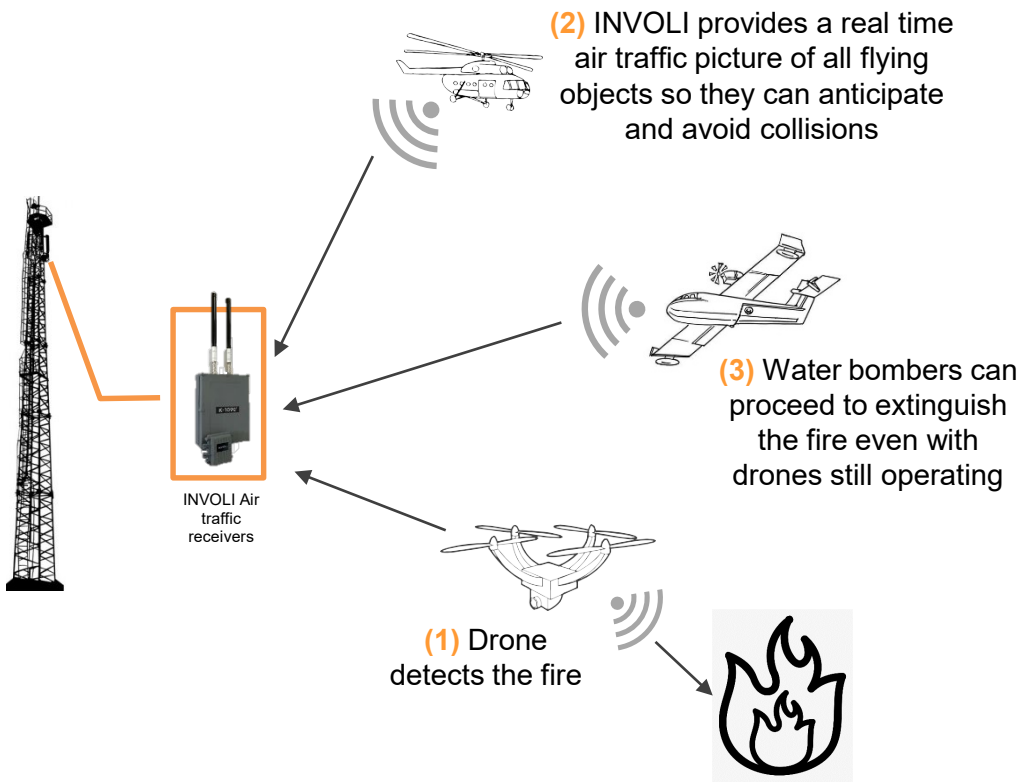
TRACTION & SCALABILITY

More than 20 countries are already interested in INVOLI system

CANADA

Part of a consortium to deliver trials used by Transport Canada to develop regulations for BVLOS drone operations and commercial cellular-enabled UTM services

FINLAND-ESTONIA

Drone tracking and flight awareness during the trials of the SESAR project GOF U-Space
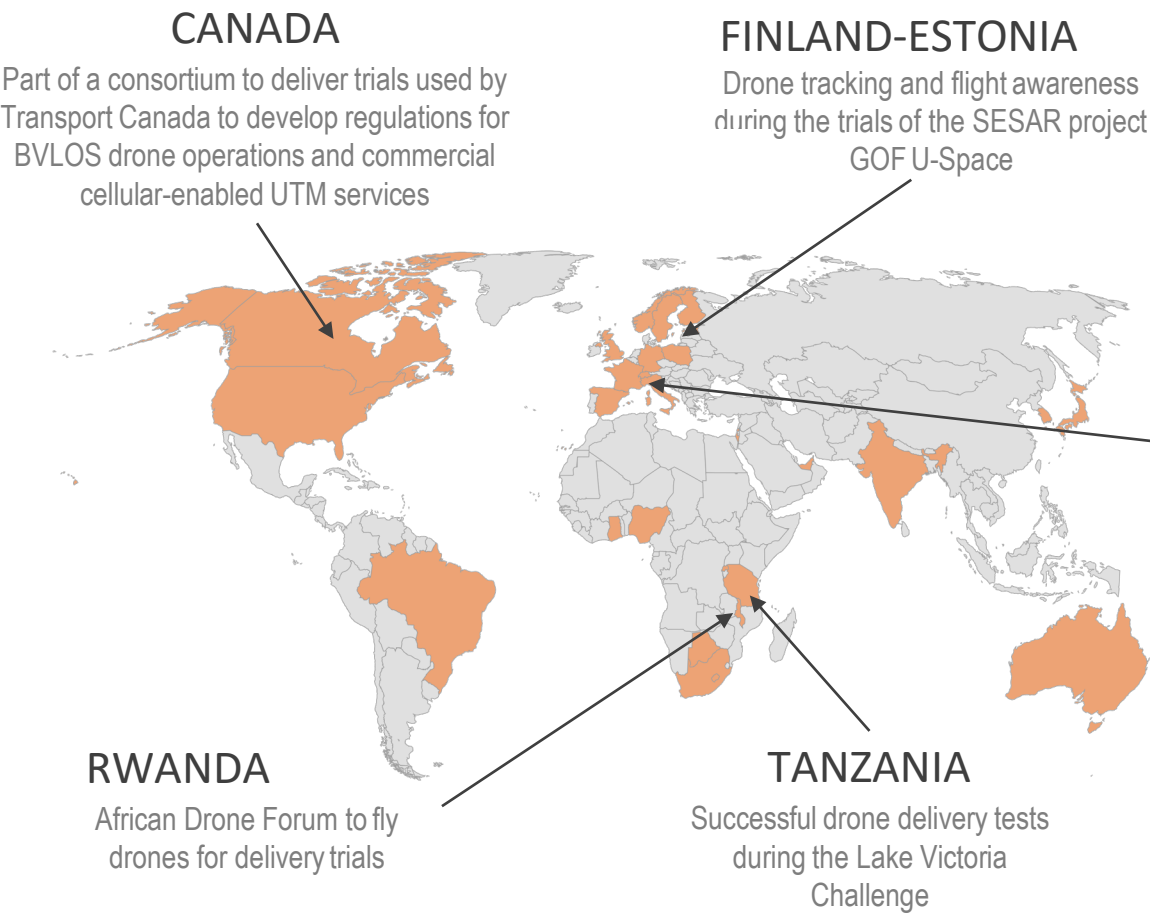
HOME OF DRONES

SWITZERLAND

▸ Member of the "**Swiss U-Space implementation**", initiative launched by the Federal Office of Civil Aviation (FOCA) and led by the ANSP skyguide, which aims to integrate drones into airspace and allow them to coexist with aircraft/helicopters

▸ Full coverage of the sky via a network of INVOLI receivers on the ground

▸ INVOLI provides air traffic data directly to skyguide for UTM traffic management (via Airmap that uses the data)

▸ Tests carried out in partnership with ANSP skyguide and Swisscom, great technical success

▸ Urban and rural areas, mountainous topography, focus on low altitude

▸ Validating all signals through multilateration

RWANDA

African Drone Forum to fly drones for delivery trials

TANZANIA

Successful drone delivery tests during the Lake Victoria Challenge

GENÈVE AÉROPORT   skyguide   FLARM

AIRMAP   Wing   senseFly Parrot Group

swisscom   SWISS PRIME SITE   SWISS POST

■ Direct business developments activities and ongoing projects

LET'S GET IN TOUCH

TO COLLABORATE

INVOLI

Mélanie GUITTET

Co-Founder, Chief Business Development Officer

+41 79 845 64 81   melanie.guittet@involi.com

David Lanter

Co-Founder Tinamu Labs

Master in Management and Technology from EPFL, Lausanne; Master of Science from ETH Zurich

Career: Management Consultant at Deloitte Switzerland; Analyst in Venture Capital at several companies
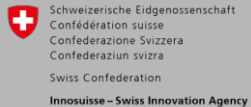
david@tinamu-labs.com

TINAMU

December 2020

Automated drone-based indoor monitoring

Tinamu Labs AG | www.tinamu-labs.com

David Lanter | david@tinamu-labs.com

Spinoff **ETH**zürich

VENTURE KICK

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency

PROBLEM OF INDUSTRIAL CUSTOMERS

TINAMU

Inside Water Dam

travel to remote location

3. create report
4. decide

1. walk through facility
2. take measurements

travel back

Week after week, *teams of two walk* through the facility *to ensure the safety of the dam...*
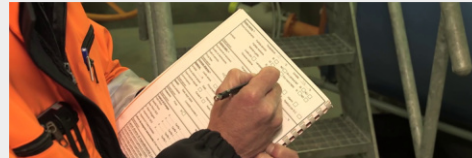
... They visually inspect take measurements and document in a log...

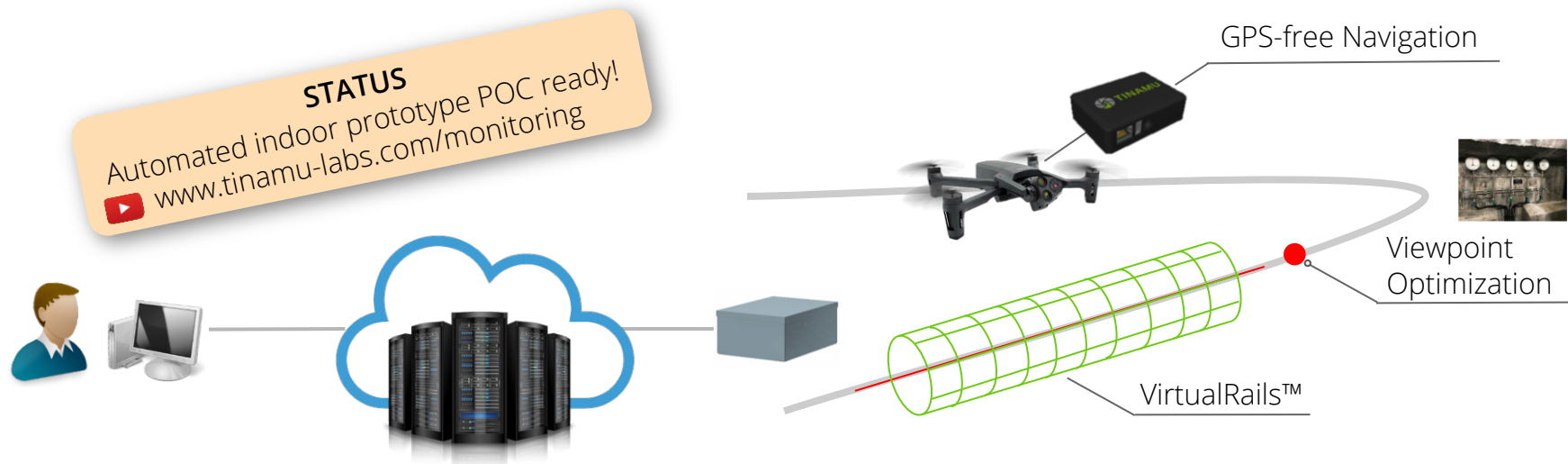Source: NZZ - Unterwegs mit Staudamm-Inspektoren

Time consuming

Expensive

Dangerous

Generalizable across many industries

OUR INNOVATION TO SOLVE THE INDUSTRY PROBLEM

TINAMU

GPS-free Navigation

STATUS
Automated indoor prototype POC ready!
www.tinamu-labs.com/monitoring

Viewpoint
Optimization

VirtualRails™

SOFTWARE
BUILDING
BLOCKS

Interface

Analytics Software

Awareness &
Control

Partner drone

MEET THE TINAMU TEAM

Tobias
PhD ETH, Co-founder

Daniel
MSc ETH, Co-founder

Samuel
MSc ETH, Co-founder

Martin
MSc ETH, Lead Engineer

Stefan
PhD ETH, Robotics

Christoph
PhD ETH, Software

David
MSc EPFL, Co-founder

Disney Research | MIT

NASA AEROTAIN

Disney Research

u-blox

Disney Research

facebook

Deloitte.

Alpana Ventures

dba

SPICEHAUS PARTNERS

WHAT THE SWISS ECOSYSTEM OFFERS TO US

TINAMU

World class research + talent

ETH zürich EPFL

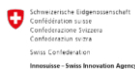Capital access

Alpana Ventures cba SPICEHAUS PARTNERS

Founder support

Spinoff ETH zürich Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation Innosuisse – Swiss Innovation Agency VENTURE KICK

Internationally connected

G f ￼ ￼ accenture

Swiss drone startups tightly connected

Auterion FIXPOSITION VOLIRO

Progressive regulations

Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation Federal Office of Civil Aviation FOCA

6

TINAMU

Automated drone-based indoor monitoring

Contact me for a remote live demo of our system!

Enzo Giannini

President Swiss Drone Base Camp (SDBC), General Manager Propeller Aircraft & UAV at RUAG Aviation

Master in Computer Science and Economics from University of Zurich; PMP Project Management from George Washington University

Career: CEO Finaclear Ltd, Business Unit Manager at TATA Switzerland, Head Client Management at Avaloq

enzo.giannini@sdbc.ch

SDBC

Swiss Drone Base Camp

Enzo Giannini

SAFETY
Tests
Training
Consulting
Information
Certification

DEVELOP
Development Kits
(HW, SW, MW)
Facilities
Specialists
Fab Lab

BROKER
Community
Access to market
Business intelligence
Intermediation
Promotion

EXPLORE
INNOVATE
ENABLE
As facilitator of
drone projects

COACH
Place
for "Startups"
Proof of Concepts
Consulting &
Coaching
Networking &
Promotion

- Existent **market need** for test sites & specific competencies

- SDBC is an **independent** and non profit association
  however is not just another group of companies

- Airport infrastructure (LSZL)
  with **dedicated airspace**, Runway and special facilities

- Existent close **collaboration and support**
  from Authorities, Academy and Industry

- Easy access to **highly qualified competencies**, suppliers, market

- **Central Location** within Europe

FOUNDING MEMBERS

FIRST LETTERS OF INTEREST

SERVICE PROVIDER

AEM — Azienda Elettrica Massagno SA
DRONABILITY
EAGLE EYE Multicopter- Service GMBH
swiss helicopter
INVOLI
NEXT AIRWORTHINESS TECHNICS
Swiss Aerobatics AG — Long Range Vertical Take-off and Landing Drone Specialists
Avilu

MANUFACTURER

FLARM
FIXPOSITION — Precise Navigation for Everyone
wingtra
PM DM — MinebeaMitsumi Group
SKYPULL — WIND FOR ENERGY
sunflower LABS
Aurora — A BOEING COMPANY
MOTOROLA SOLUTIONS
Open Stratosphere

INSTITUTIONAL PARTNER

SWITZERLAND INNOVATION
swiss aeropole
rega
ti Polizia
FCTCP POMPIERI TICINO
esa
business incubation centre
ETH Zürich
EPFL — ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
SCHWEIZERISCHER VERBAND ZIVILER DROHNEN

CONSULTANCY / ADVISORY

space earth water — statlogic.io
SatSure
v₂sky
BELLATRIX AEROSPACE

FURTHERMORE

University of Applied Sciences and Arts of Southern Switzerland
SUPSI
armasuisse
Drone Industry Association Switzerland
zhaw School of Engineering
senseFly — a Parrot company
wingtra
SWISSDRONES
auterion
UMS SKELDAR

+ hunderts of other interested contacts

Positive decision for Innovation Park Ticino
26.11.2020

Positive decision by the Foundation Board of Switzerland Innovation to admit the innovation parks of Ticino and Central Switzerland

On the occasion of its meeting on 25 November 2020, the Board of Switzerland Innovation approved the applications of the Ticino and Central Switzerland innovation parks for entry into the network as associated locations to the Switzerland Innovation Park in Zurich. The prerequisite for definitive admission will be the legally binding signature of an association agreement between the two candidates and the Innovationspark Zürich Foundation, which must take place by 31 March 2021.

Dr. Alessandro Giusti

Head of IDSIA Robotics Lab,
Senior Researcher at the Dalle Molle Institute
for Artificial Intelligence (IDSIA)

PhD in Computer Science from Politecnico di Milano

Career: 15 years of research experience in Robotics,
applied Machine Learning, Computer Vision and Data
Visualization; Over 80 peer-reviewed publications and
recipient of several awards (a.o. for his deep learning
applications)

alessandro.giusti@supsi.ch

Dalle Molle Institute for AI (IDSIA)

A world-class research institute on AI founded in 1988 in Lugano

60 staff researchers + 20 PhD students working on:

- Deep learning
- Statistics and data mining
- Ground and aerial robotics
- Natural language processing
- Operations research

Dalle Molle Institute for AI (IDSIA)

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60 staff researchers + 20 PhD students working on:

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- Statistics and data mining
- Ground and **aerial robotics**
- Natural language processing
- Operations research

IDSIA: Main Research Partner
for the Swiss Drone Base Camp

IDSIA: Main Research Partner
for the Swiss Drone Base Camp

PIONEERS IN
AI RESEARCH

Berkeley
Carnegie Mellon University
The Chinese University of Hong Kong
MIT Massachusetts Institute of Technology
NYU
Stanford University
Université de Montréal
UNIVERSITY OF OXFORD
IDSIA
UNIVERSITY OF TORONTO

Frameworks for Multi-GPU Pascal

Large-scale Deep Learning

Reinforcement Learning

Unsupervised and Transfer Learning

Natural Language Understanding

Autonomous Driving

Medical Applications

NVIDIA

Some recent drone research from the IDSIA Robotics Lab

More information:
http://robotics.idsia.ch

Intuitive pointing-based control of drones
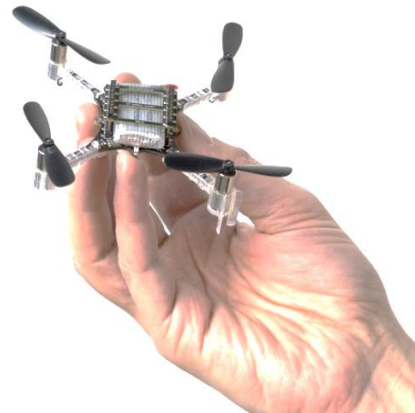

Human-Robot
Interaction conference,
2019, Daegu, Korea
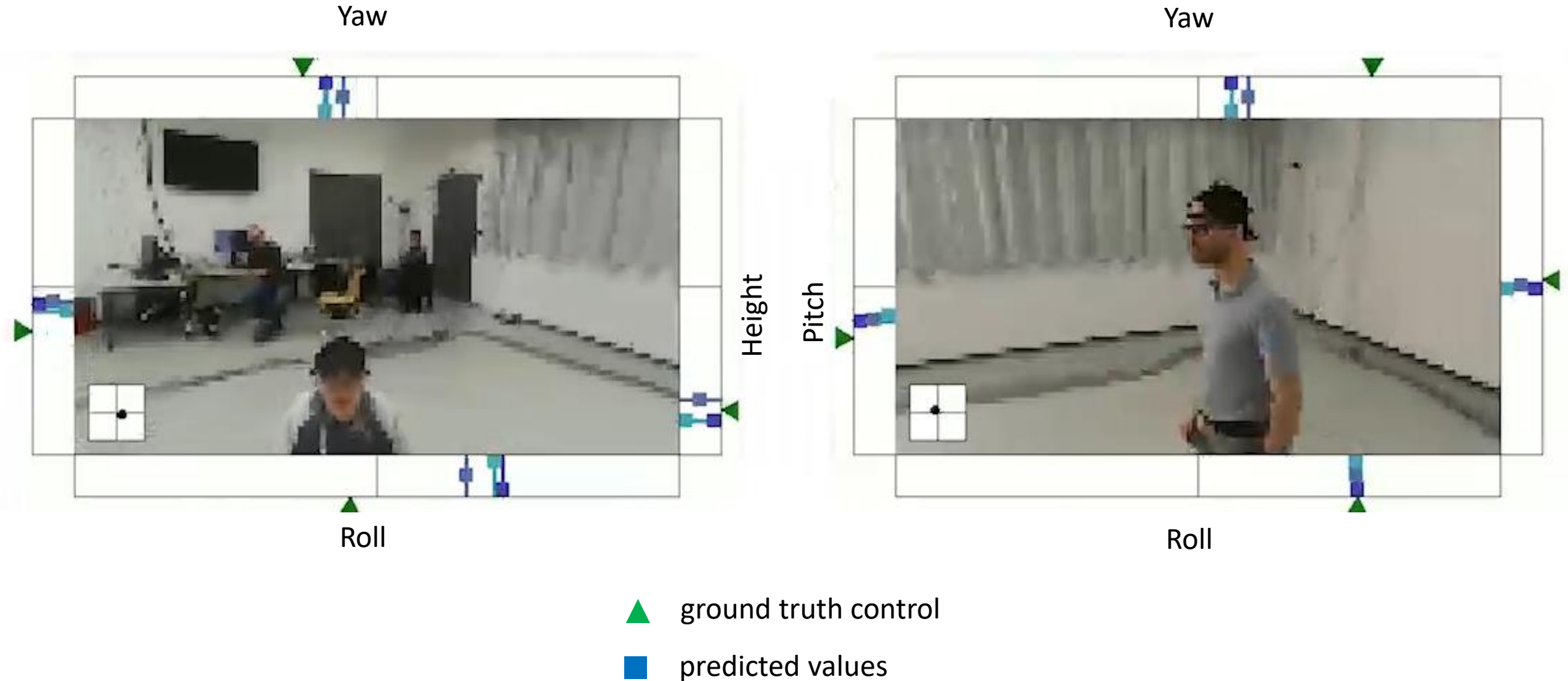
Visual control of nano drones in human proximity
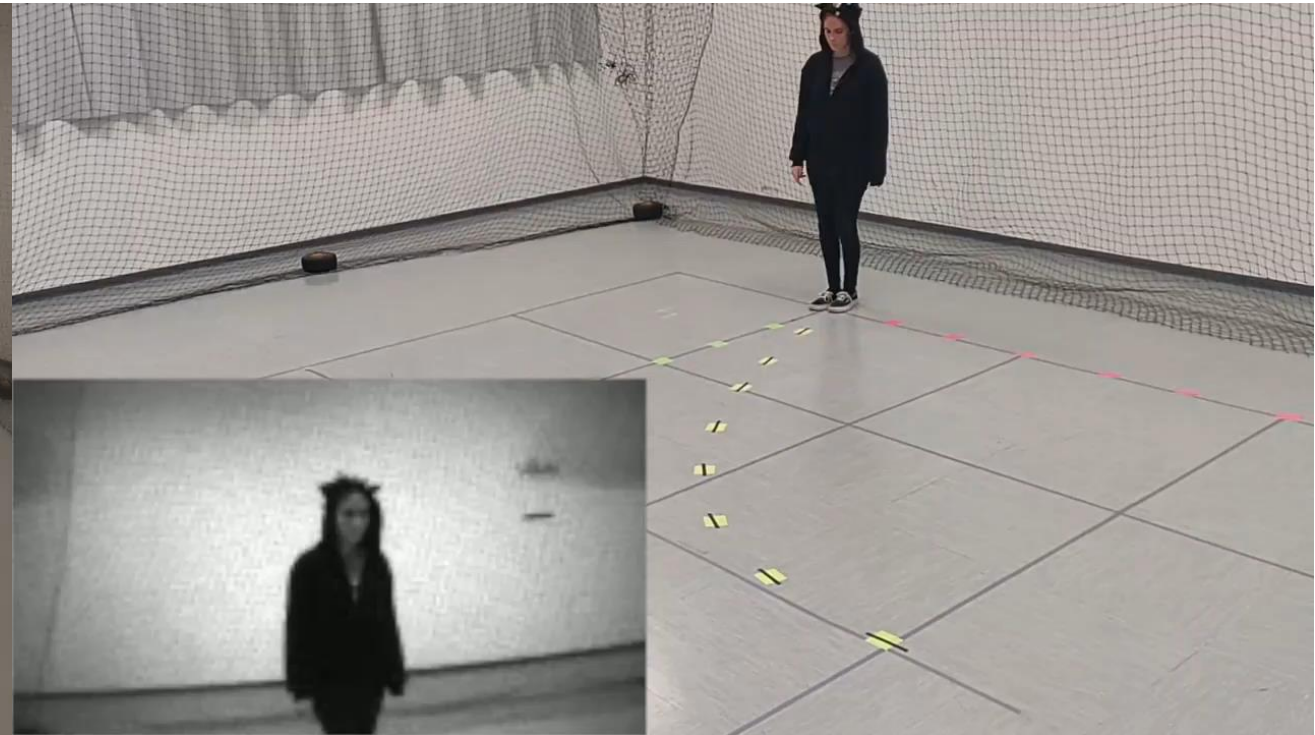
- Full onboard CNN inference and control at **130 frames per second on a 30-gram drone**
- **< 1 mJ per frame** on Parallel Ultra Low Power platform
- **Self-supervised learning** approach improves performance without explicit ground truth

Visual control of nano drones in human proximity

Visual control of drones in forests

QUADCOPTER
NAVIGATION IN THE FOREST

TRAIL FOLLOWING UNDER THE TREE CANOPY

Finalist,
AAAI video awards,
2016, Phoenix, USA

Q&A

Virtual Tour Future Dates

Testing and Refinement

Monday, December 7, 2020 (11am EST / 8am PST / 5pm CET)

Discover how companies are testing and refining their technologies in real-world conditions and find the ideal testing ground.

Partner and Deploy

Monday, December 14, 2020 (11am EST / 8am PST / 5pm CET)

Partner with Swiss companies and regulators and become one of the pioneers in deploying new drone technology.

Have we left one of your questions unanswered?
Contact us and we'll be in touch shortly.

Contact Greater Zurich Area

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info@ggba-switzerland.ch

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ggba-switzerland.ch