Roboter verlassen die Produktionshallen

Roland Siegwart, ETH Zürich

satw

it's all about technology

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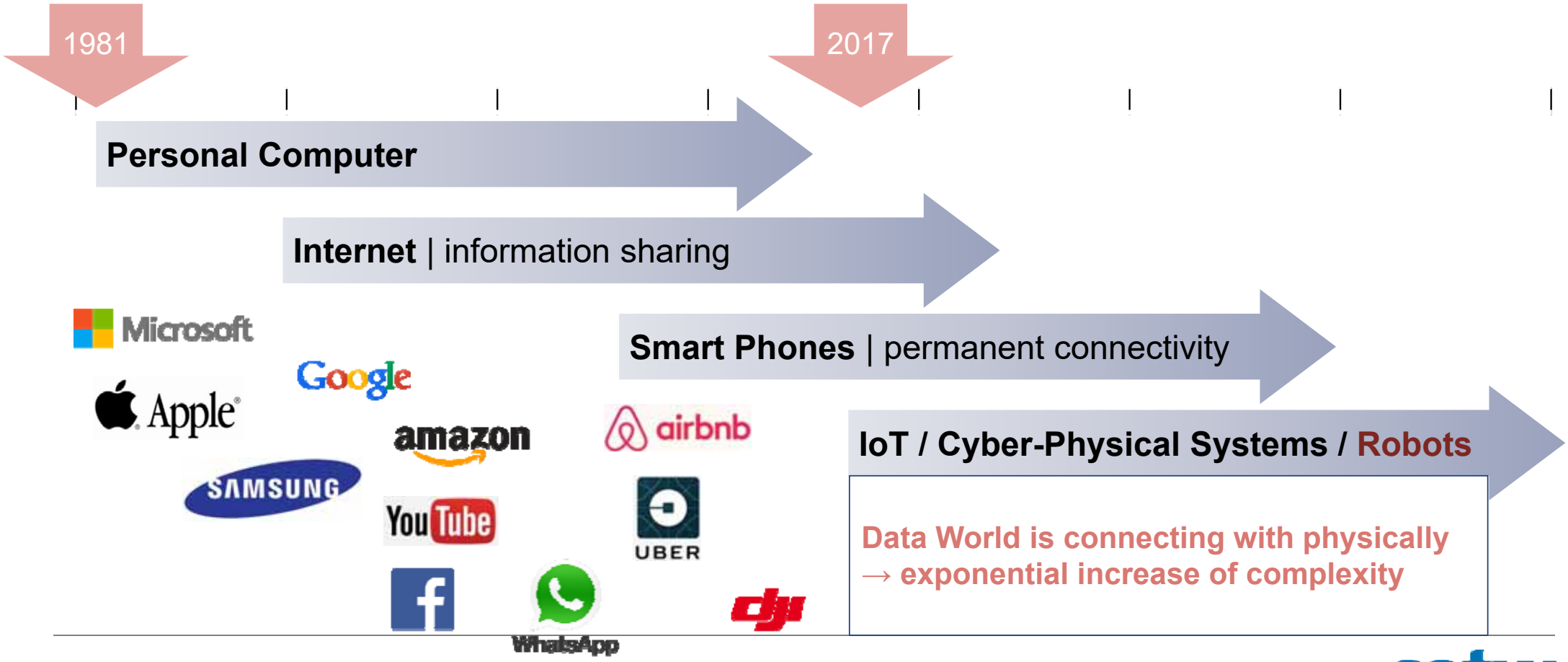
Technologies disrupting services | digitalization / industry 4.0



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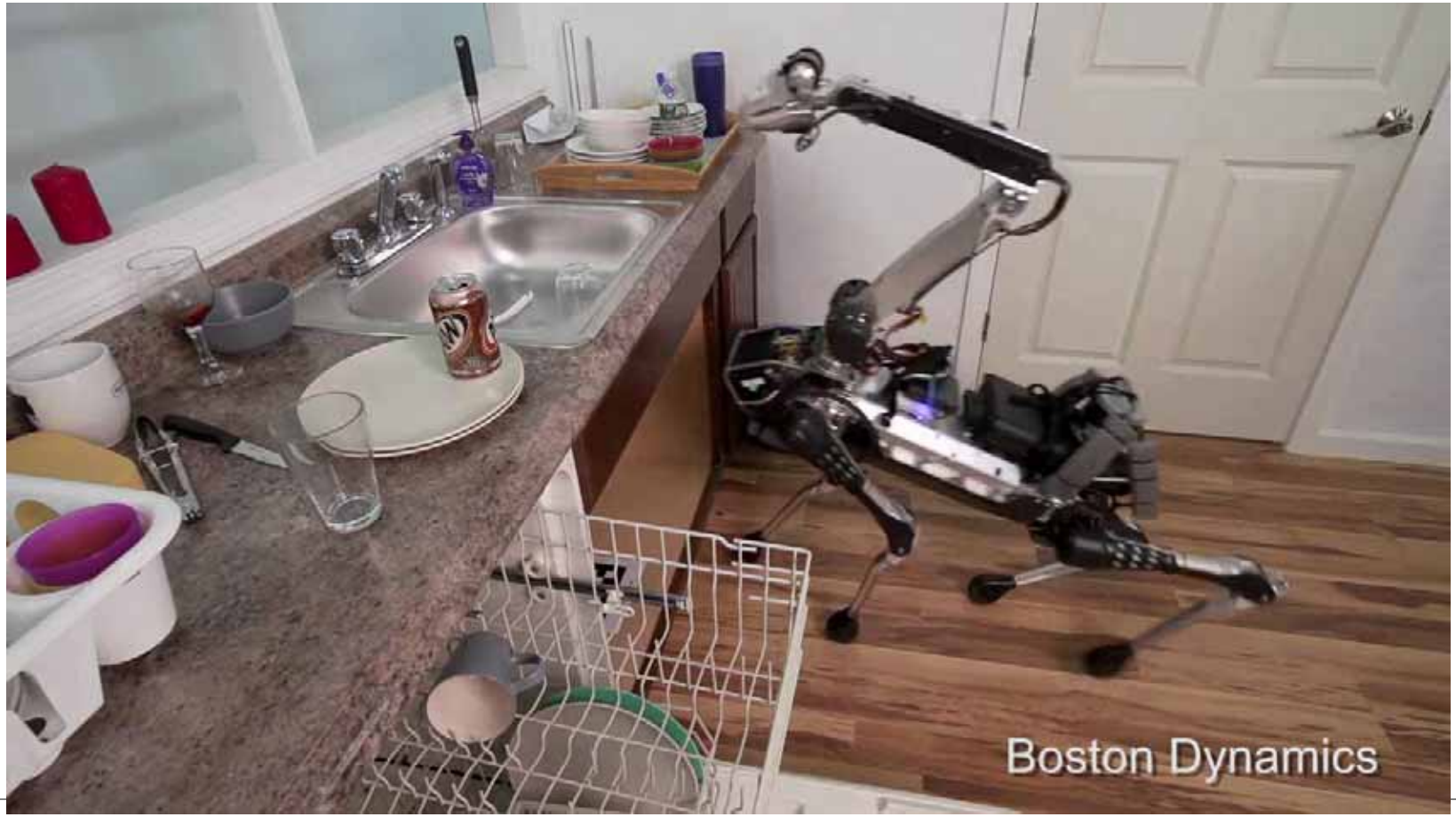
Robots are leaving the production halls



SpotMini | electic quadruped, Boston Dynamics

https://www.youtube.com/watch?v=tf7IEVTDjng

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Service Robots | Key Challenges

- Robots that can ***dealing*** with ***uncertain*** and ***partially available information***
- Robots that ***see, feel*** *and* ***understand*** their environment
- Robots with ***torque*** and ***force*** control for tactile interaction ("soft robots")
- Robots with ***intuitive human-machine interfaces***
- Robots that ***learn*** and ***adapt*** every day

50x speed

https://www.youtube.com/watch?v=gy5g33S0Gzo

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Service Robots – designed for challenging tasks

Vertigo

| the ultimate wall climber

https://www.youtube.com/watch?v=KRYT2kYbgo4

AnyMal

| the ultimate quadruped

Prof. Marco Hutter

https://www.youtube.com/watch?v=EI1zBTYpXW0

Service Robots – designed for challenging tasks

wingtra – developed by students

| the VTOL UAV

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

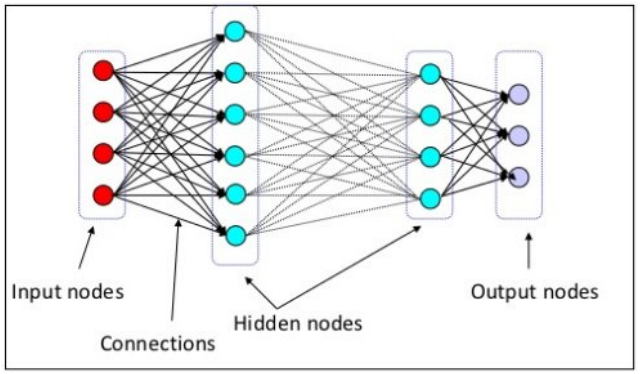
“Seeing” | Visual-Inertial Motion Estimation

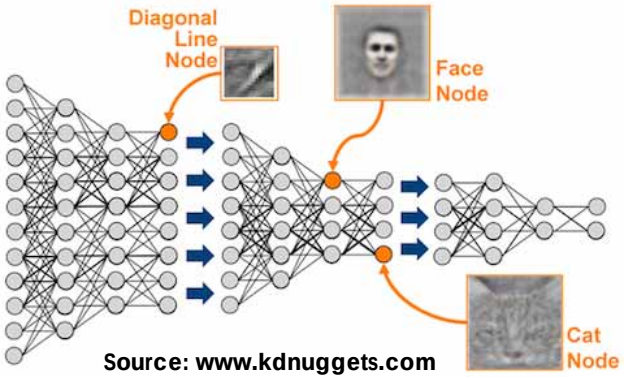
Google Project Tango

https://www.youtube.com/watch?v=yvgPrZNp4So

Deep Learning for Robotics

- Key Idea: mimic behavior of neurons in a human brain in a very simplified way.
- Deep learning methods learn an unknown function from observing numerous exemplary input/output pairs.
- Examples
  - Recognizing object types in images.
  - Recognizing words in a voice recording.
  - Recommending products based on past purchases.
- Challenges involve the generation of a big amount of training data and tackling high computational burden.
  → how to generalize from low amount of data ?
  → how to learn from real world interactions





Source: www.kdnuggets.com

Source: http://mi.eng.cam.ac.uk/projects/segnet/

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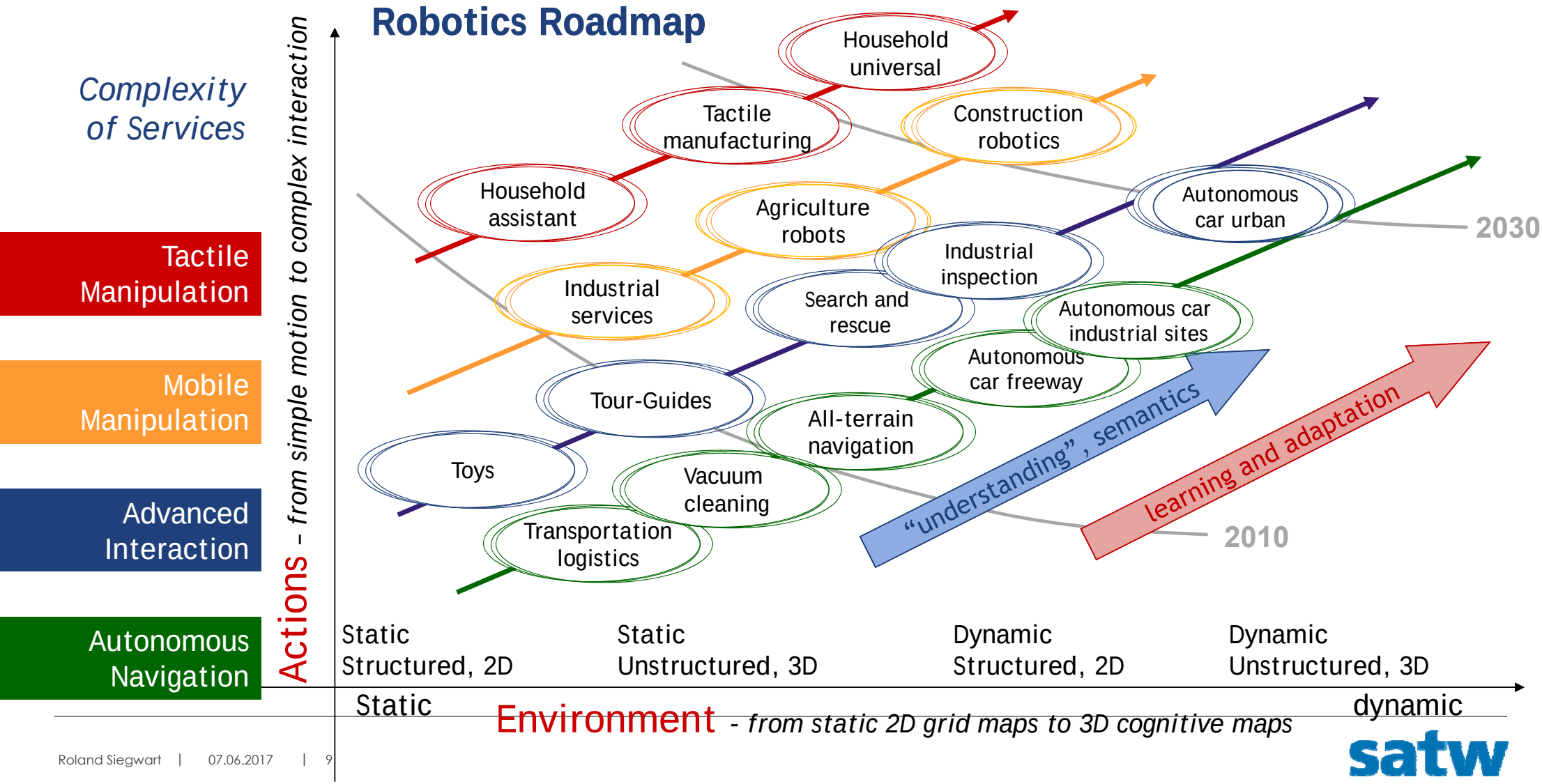
Robotics Roadmap
Complexity of Services
Tactile Manipulation
Mobile Manipulation
Advanced Interaction
Autonomous Navigation
Actions - from simple motion to complex interaction
Household universal
Tactile manufacturing
Construction robotics
Household assistant
Agriculture robots
Autonomous car urban
2030
Industrial inspection
Industrial services
Search and rescue
Autonomous car industrial sites
Autonomous car freeway
Tour-Guides
All-terrain navigation
Toys
Vacuum cleaning
Transportation logistics
"understanding", semantics
learning and adaptation
2010
Static Structured, 2D
Static Unstructured, 3D
Dynamic Structured, 2D
Dynamic Unstructured, 3D
Static
dynamic
Environment - from static 2D grid maps to 3D cognitive maps

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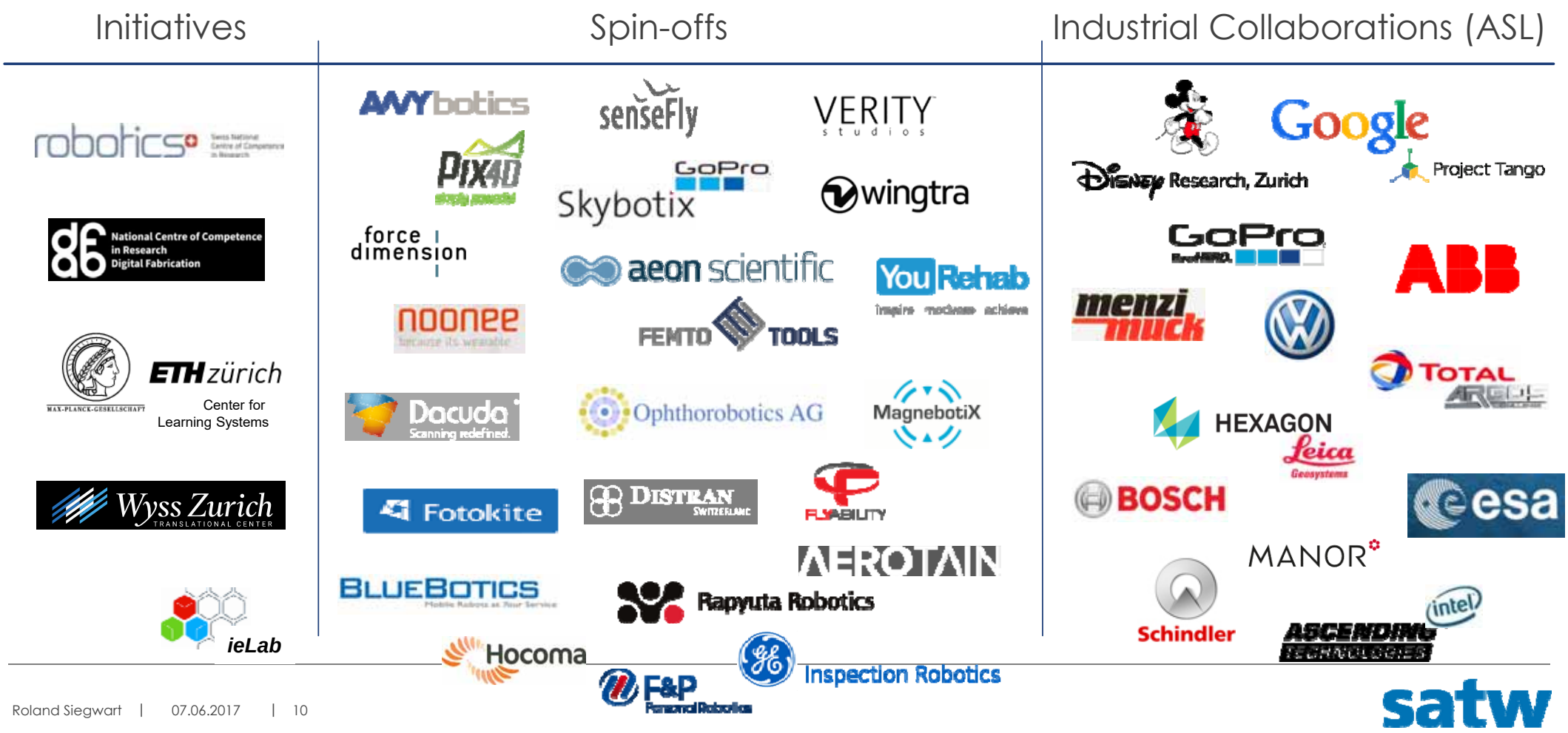
Switzerland | a melting pot for robotics technology



Take Home Message

- Yes, robotics is booming
  - but it will take some time to bring such complex system to market
- Yes, Europe and especially Switzerland has the potential to conquer an important share of this market. It is about:
  - Top research
  - Great talents
  - Innovation and entrepreneurship
- Yes, for scaling robotics technology and startups we need talents, more risk-taking and long-term venture capital (> 10 years)