



**BLUE OCEAN ROBOTICS**

- for humans

## **Opportunities for Robotic in Fire investigations**



# Davide Faconti

## - short intro



- Technology Platform Architect at **Blue Ocean Robotics**.
- Working in robotics since 2003
- Worked in many field of robotics:
  - Low level control
  - Humanoid robotics hardware and software
  - Manipulation
  - Real time systems
  - Navigation
  - Embedded systems
  - Task planning

# What is a service robot?

Industrial Robots



Industrial environments

Service Robots

Professional Use



Non-industrial environments

Personal/domestic



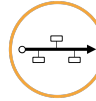
Picture source: Goldbeck, ;KUKA AG, Bosch Bonirob, Hetwin, SMP Robotics, Omron, International Submarine Engineering, Robert Bosch Hausgeräte, Wonder Workshop

# RoBi-X

## DISCOVER



### RoBi-Inspire



- Exponential Growth, Disruption
- Robotic Systems As-Is & To-Be
- Market- & Technology Trends

### RoBi-Roadmap



- System-/Business analysis
- RPA/SLC potentials
- Strategic roadmap

### RoBi-Design



- Robot concept
- Development-/Investment plan
- Business case and -plan

### RoBi-Develop



- Product development
- Lab and first customer testing
- Regulatory approvals

## CREATE

### RoBi-ScaleUp



- Production, distribution
- Global sales and marketing
- Service/Support

## COMMERCIALISE



Supplying the World with Robots

### RoBi-GoToMarket

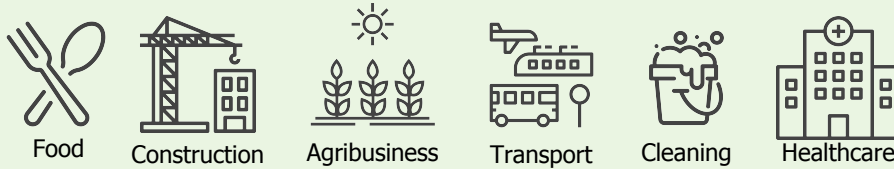


- 1-5 first customer projects
- Marketing, lead generation
- One-by-one production



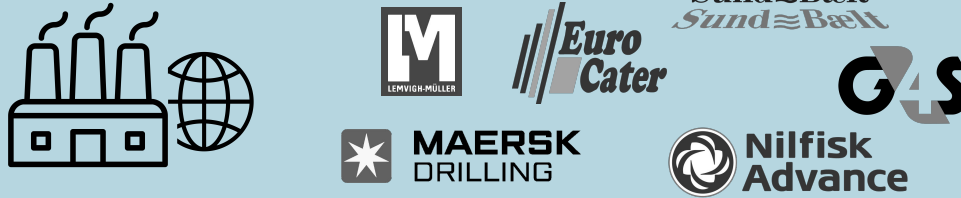
# Markets, Business Model, Value Proposition

## Markets



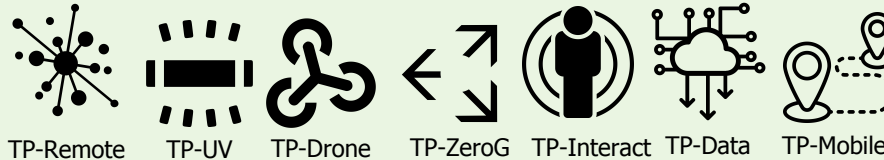
- Productivity
- Working Environment
- Quality (-of-Life)
- Opportunity for Transformation & Disruption

## Large- & Medium Sized Enterprises



- Digital Products
- Services based on Digital Products
- Industry 4.0 / Big Data / AI / IoT
- Innovation from Inside
- Organisation / Competences / Agile Methods

## Robot Technologies



- Fusion of Technologies into Complex Systems
- Systems Engineering / Robotics
- Reusable Components (hardware/software)
- Build on top of Technology Providers

# Markets, Business Model, Value Proposition

## Markets



Food



Construction



Agribusiness



Transport



Cleaning



Healthcare

- Productivity
- Working Environment
- Quality (-of-Life)
- Opportunity for Transformation & Disruption

## Large- & Medium Sized Enterprises



RoBi-X



MAERSK  
DRILLING



Sund≅Bælt  
Sund≅Bælt



Nilfisk  
Advance



- Digital Products
- Services based on Digital Products
- Industry 4.0 / Big Data / AI / IoT
- Innovation from Inside
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## Robot Technologies

TP-X



TP-Remote



TP-UV



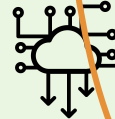
TP-Drone



TP-ZeroG



TP-Interact



TP-Data



TP-Mobile

- Fusion of Technologies into Complex Systems
- Systems Engineering / Robotics
- Reusable Components (hardware/software)
- Build on top of Technology Providers



COMPANIES

ABB, AK L3, ANHELD, AMF-TEC DIVISION, AutomationLab, bom branstech as, BEKIDAN, BILA, BIPA A/S, BLUE OCEAN ROBOTICS, BLUE UNIT, Boelbjerg Maskinværksted, BSS ApS, BUIND, Cabinplant, Ceetec, EDRE DYNAMICS, CT ELTEKNIK, DANA, Danish Aerospace, DAN ROBOTICS, DANISH TECHNOLOGICAL INSTITUTE, EFFIMAT, Ege Matic ApS, eGATEC, ELEMENIT, ENABLED ROBOTICS, EROVA, FANUC, FARMDRUID, FOM, FISHEROBOTICS, FRONTMATEC, GAIN & CO, GEA, GIBOTECH, GLUNZ & JENSEN, HANNOVER MESSE, happtec, HYDAC, inrotech, intego, INVENTIM, Inwatec, JM Engineering AS, JENSEN, KJØRGAARD, KKK-TECH, KOBOTS, KUBO, KUKA, Laptics Ivs, Leica Geosystems, FLWT, LORENZ TECHNOLOGIES, LYALM ELECTRIC, Martiny Automation, HIFLO-JR, SKN, MASKINREKORDER, MCL CO, micro techne, MIR, MA MILLERUP, MRN, Multi Tower, MURR ELECTRONICS, NEW ICON, NEWTEC, Nidec, Nord Modules, NORDD ROBOTICS, ODICO, Oh robot, Optimatic, PFCOON ApS, Polund, Produktionstechnik, ROBINOR, ROBODEND, roboman, ROBOT AT WORK, ROBOT LOGISTICS, ROBOT NOBIC, RobotArkitektur, RobotSort ApS, ROEQ, Roll-o-Matic, RV, SANOVO, SANOVO, Scan Control A/S, Scancomp Sensor and Automation, ScanStore, scanvaegt, SCAPE Technologies, Schindler, SCHUNK, senmatic, sensohive, SETUP-ROBOTICS, SG-TECH, SICK, SKAKO, Smooth Robotics, DDI, SYD DYNAMICS, TEK PRODUCTIONS, tendo, trendlogi, TRIVISION, UNIVERSAL ROBOTICS, LIVO ROBOTS, Velcon, VEGA, LUCOVY, Viggo Hansen A/S, VIKING, VIKING, WallMo, WAMATECH, X-drive Robots ApS, Ztovo, AABO IDEAL

**CLUSTERS AND PARTNERS**

CARENET, DANSK METAL, DIRA, IDA, ODENSE HEALTH INNOVATION & BUSINESS, RoboCluster, UAS DENMARK, WelfareTech, WORK IN DENMARK, SOUTH DENMARK EUROPEAN OFFICE

**PUBLIC SECTOR AND BUSINESS SUPPORT PROVIDERS**

Assens Kommune, Developing Fyn, Invest in Odense, Odense Kommune, Nyborg, Region of Southern Denmark, Svendborg Kommune, Væksthus Syd

**ODENSE ROBOTICS**

WHERE ROBOT HEROES GROW

POWERED BY DEVELOPING FYN

**FINANCING**

SCIENCEVENTURES, SYDDANSK INNOVATION, VÆKSTFONDEN, BOREAN INNOVATION

**ODENSE SEED AND VENTURE**

Public Funding	Family Offices	Venture Funding
Crowd Investors	Business Angels (100+)	Loan and Bank Financing

670 Million EUR invested in robot companies in the cluster since 2015

**EDUCATION**

**SDU UNIVERSITY OF SOUTHERN DENMARK**

**BEng**

- Electrical Power Engineering
- Electronics and Computer Engineering
- Global Management and Manufacturing
- Integrated Design
- Manufacturing Engineering and Management
- Mechanical Engineering
- Mechanics
- Robot Systems
- Software Technology

**MSc**

- Applied mathematics
- Computer science
- Electronics
- Energy Technology
- Engineering Robot Systems (Advanced Robotics Technology and Drone Technology)
- Information Technology - Product Design
- Learning and Experience Technology
- Mathematics

- Mechanical
- Mechatronics
- Operations Management
- Physics and Technology
- Product Development and Innovation
- Software Engineering
- Welfare Technology

**SYDDANSK ERHVERVSSKOLE**

**Academy Profession AP**

- Automation Technology
- Computer Science
- IT Technology
- Multimedia Design and Communication
- Production Engineer

**Bachelor BA**

- E-Concept Development
- PBA Software Development
- Product Development and Technology Integration
- Web Development

**Continuing Education**

- Academic Education
- Diploma

**Electricity Automation and IT**

- Automatics Electrician
- Data Technician (+EUJ)
- Electrician (+EUJ)

**Metal, Industry and Technology**

- Automation Technician (+EUJ)
- Industrial Operator
- Industrial Technician (+EUJ)
- Sheet Metal Worker (+EUJ)
- Technical Designer

**SIMAC**

- Marine Engineer

**OTHERS**

ODENSE TEKNISKE GYMNASIUM

**RESEARCH, DEVELOPMENT AND INNOVATION**

**DANISH TECHNOLOGICAL INSTITUTE**

**Disciplines**

- Advanced robots
- Co-working robots
- Sensors and robots
- Mobile robots
- Drones (UAS)
- Personal care robots
- Industry 4.0 and data
- Augmented reality
- Artificial intelligence
- Safety

**Activities**

- Implementation of solutions
- Classroom learning and education
- Analysis and consultancy

**Faculty of Engineering**

TEK Innovation

- Co-working robot
- Sensors and robots
- SDU Mechatronics
- SDU Innovation and Design Engineering
- SDU Robotics
- The Mærsk Mc-Kinney Møller Institute
- SDU Robotics
- SDU UAS Centre
- SDU Software Engineering
- SDU Electrical Engineering
- SDU Embedded Systems for Robotics and Learning
- SDU Health Informatics and Technology
- SDU Energy Informatics

Department of Technology and Innovation

- SDU Mechanical Engineering
- SDU Engineering Operations Management

**SDU UNIVERSITY OF SOUTHERN DENMARK**

**Faculty of Science**

- Department of Mathematics and Computer Science (MADA)

**Faculty of Health Sciences**

- Department of Sports Science and Clinical Biomechanics
- Department of Clinical Research
- Department of Clinical Health

**SDU Research & Innovation Organisation (RIO)**

- Knowledge Center for Automation and Robotic Technology
- Knowledge Center for Health and Welfare Technology
- Knowledge Center for Automation and Robotic Technology

OUH

**Cluster Management Excellence**

WORLD LEADING CLUSTER CHALLENGE

COMPANIES ARE SELECTED BASED ON AN ASSESSMENT OF THE FOLLOWING PARAMETERS:

- Share of turnover in the robotic and automation industry
- Strategic focus
- Activity in cluster cooperation
- Dedicated technology



BLUE OCEAN ROBOTICS  
- for humans

REGION SJÆLLAND  
SJÆLLANDS UNIVERSITETSHOSPITAL  
*- vi er til for dig*



Multi Tower  
Better Life Robots

- ✓ Strategic RoBi-X Partnership
- ✓ Blue Ocean Robotics:  
Design/Development  
RoBi-X & TP-X
- ✓ Multi-Tower Company ApS:  
Sales/Support/Production  
Strategic partner for global sales

# MULTI TOWER ROBOT

- PATIENT MOVING ROBOT -







OUH  
Odense  
Universitetshospital

 **MARKEDS**  
MODNINGSFONDEN

✓ ✓ UV-DR (UV Disinfection Robot)  
RoBi-X Strategic Partnership

✓ ✓ ✓ ✓ Blue Ocean Robotics:  
Design/Development  
RoBi-X & TP-X  
OUH

✓ ✓ UV-DR Company ApS:  
Sales/Support/Production  
Strategic partner for global sales

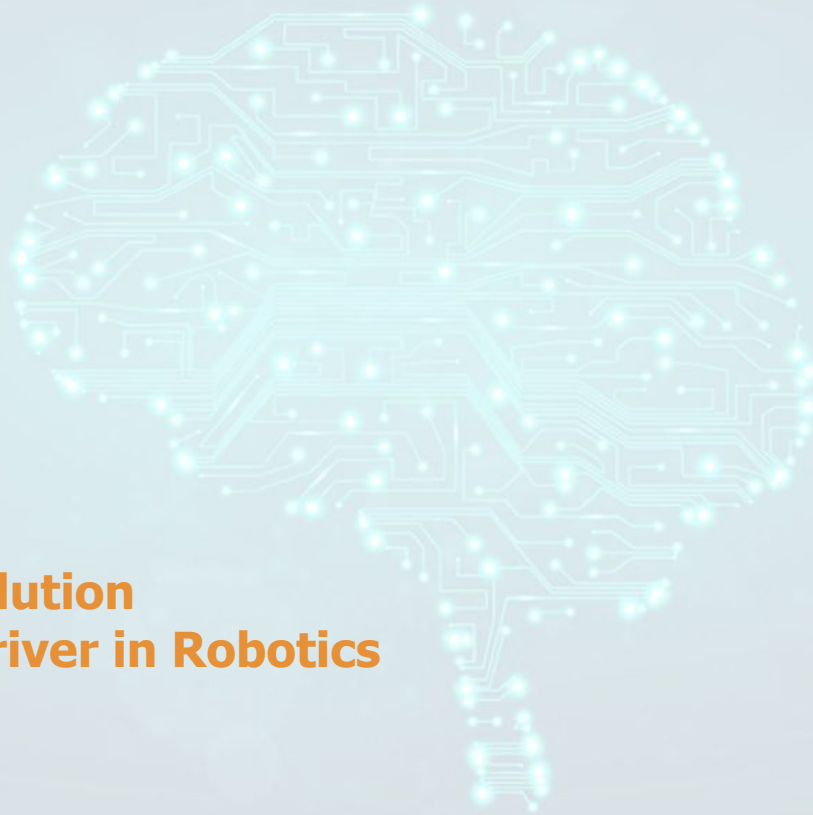


✓ RoBi-X Strategic Partnership

✓ Blue Ocean Robotics:  
GoToMarket  
RoBi-X & TP-X

✓ Beam Co. ApS (pending):  
Sales/Support  
Strategic partners for global sales

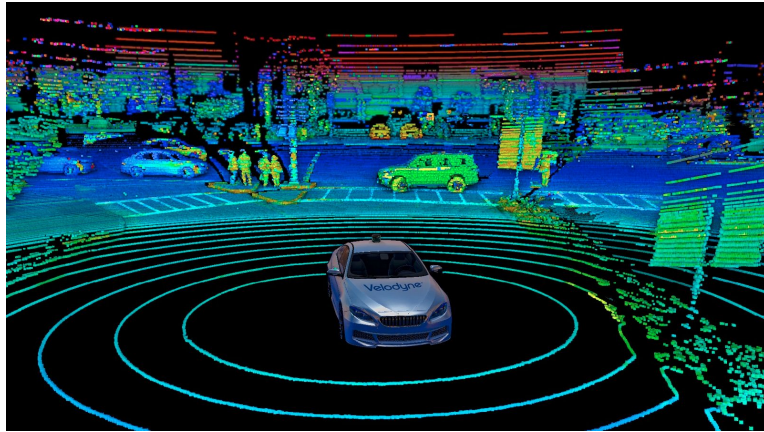




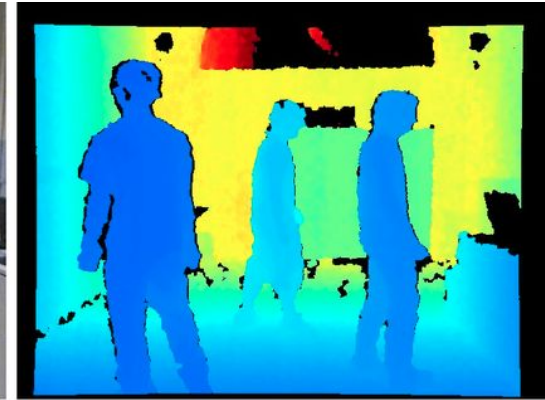
**Digital Revolution  
Exponential Growth Driver in Robotics**

# Innovation in sensing

# 3D LIDARS



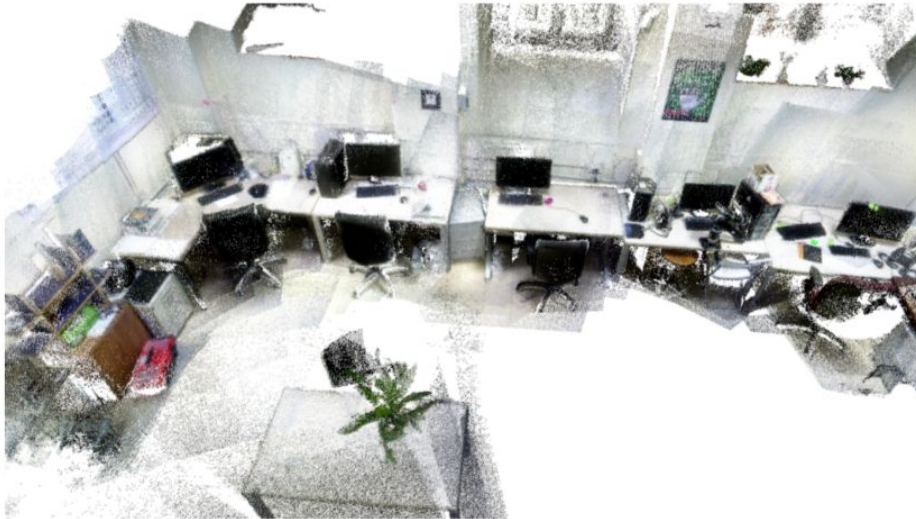
# RGBD CAMERAS





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# We have increasingly better software to do 3D reconstruction





# Metrology grade 3D scanners are used in crime scenes





# Increasing computational power

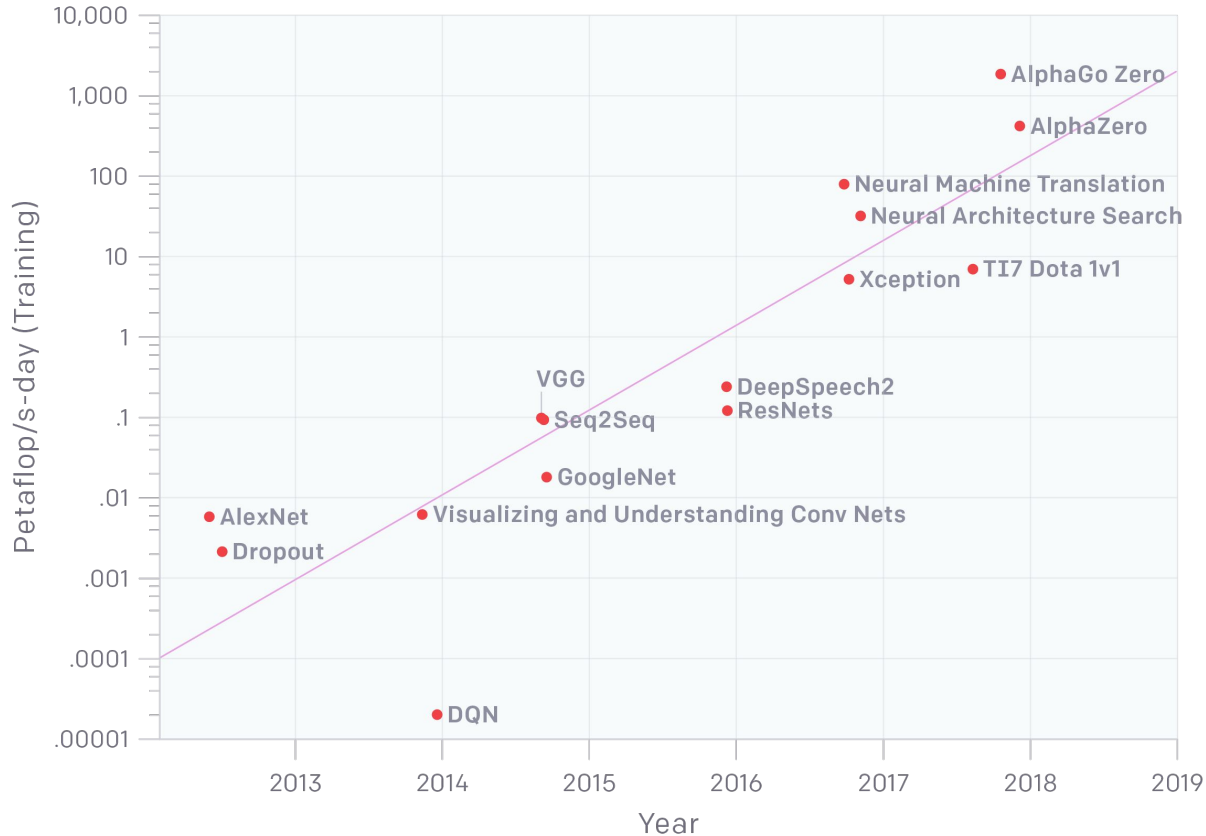
Moore's law might be "dead" in Desktop PC, but in AI optimized and embedded processors we are making great progress!



## JETSON AGX XAVIER

<b>GPU</b>	512-core Volta GPU with Tensor Cores
<b>CPU</b>	8-core ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3
<b>Memory</b>	16GB 256-Bit LPDDR4x   137GB/s
<b>Storage</b>	32GB eMMC 5.1
<b>DL Accelerator</b>	{2x} NVDLA Engines*
<b>Vision Accelerator</b>	7-way VLIW Vision Processor*
<b>Encoder/Decoder</b>	{2x} 4Kp60   HEVC/{2x} 4Kp60   12-Bit Support
<b>Size</b>	105 mm x 105 mm

## AlexNet to AlphaGo Zero: A 300,000x Increase in Compute



Since 2012, the amount of compute used in the largest AI training runs has been increasing exponentially with a **3.5 month-doubling time**.

By comparison, Moore's Law had an 18-month doubling period.

Since 2012, this metric has grown by more than **300,000x**



# Mobility in “Disaster scenarios”





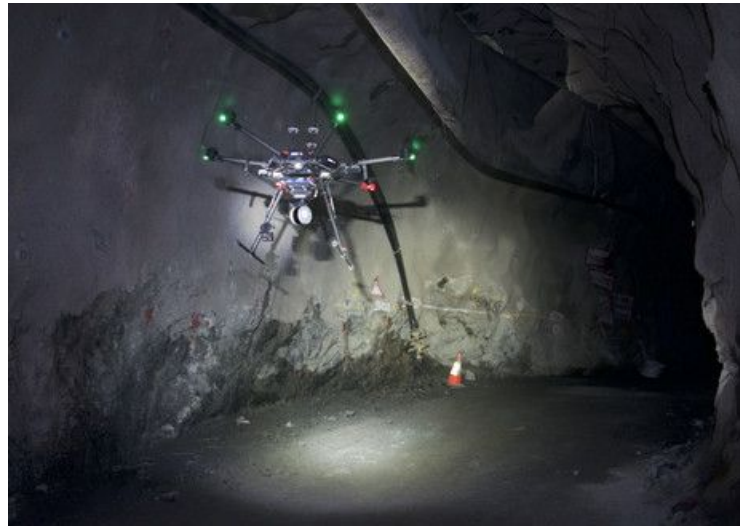
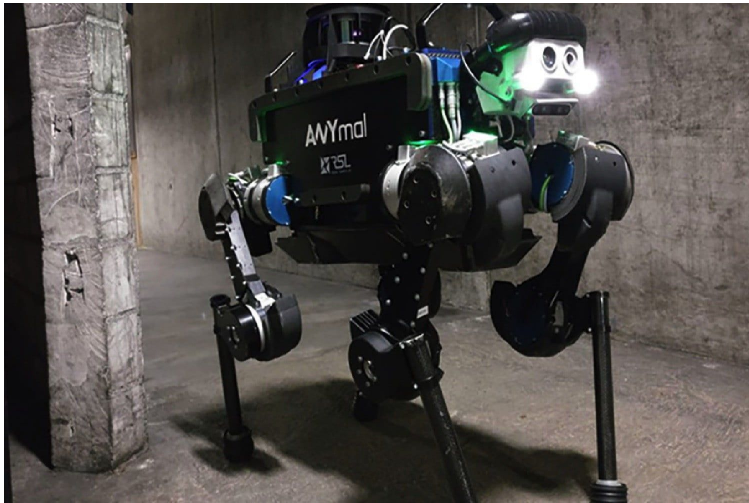




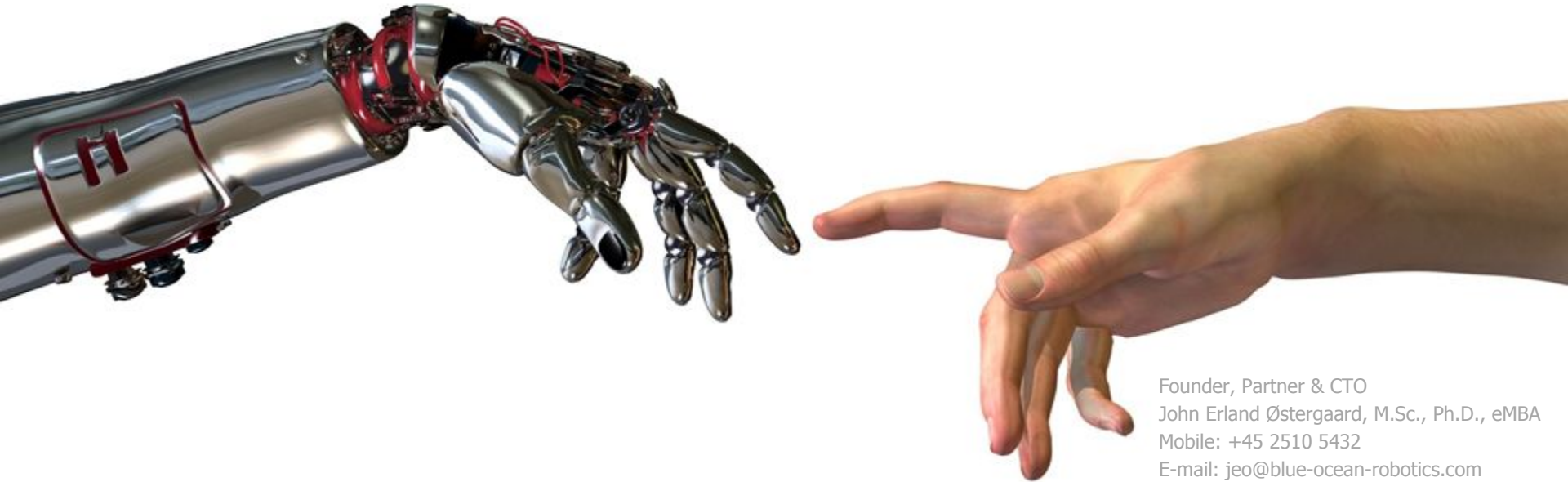
A photograph of a dark, narrow underground tunnel, likely a mine. The tunnel is illuminated by several bright, circular lights mounted on the ceiling. The floor is covered with tracks and debris. The walls are dark and rocky. The overall atmosphere is dim and industrial.

# DARPA Subterranean Challenge





# Thank you for your attention



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