

# Next generation detector operations with augmented reality

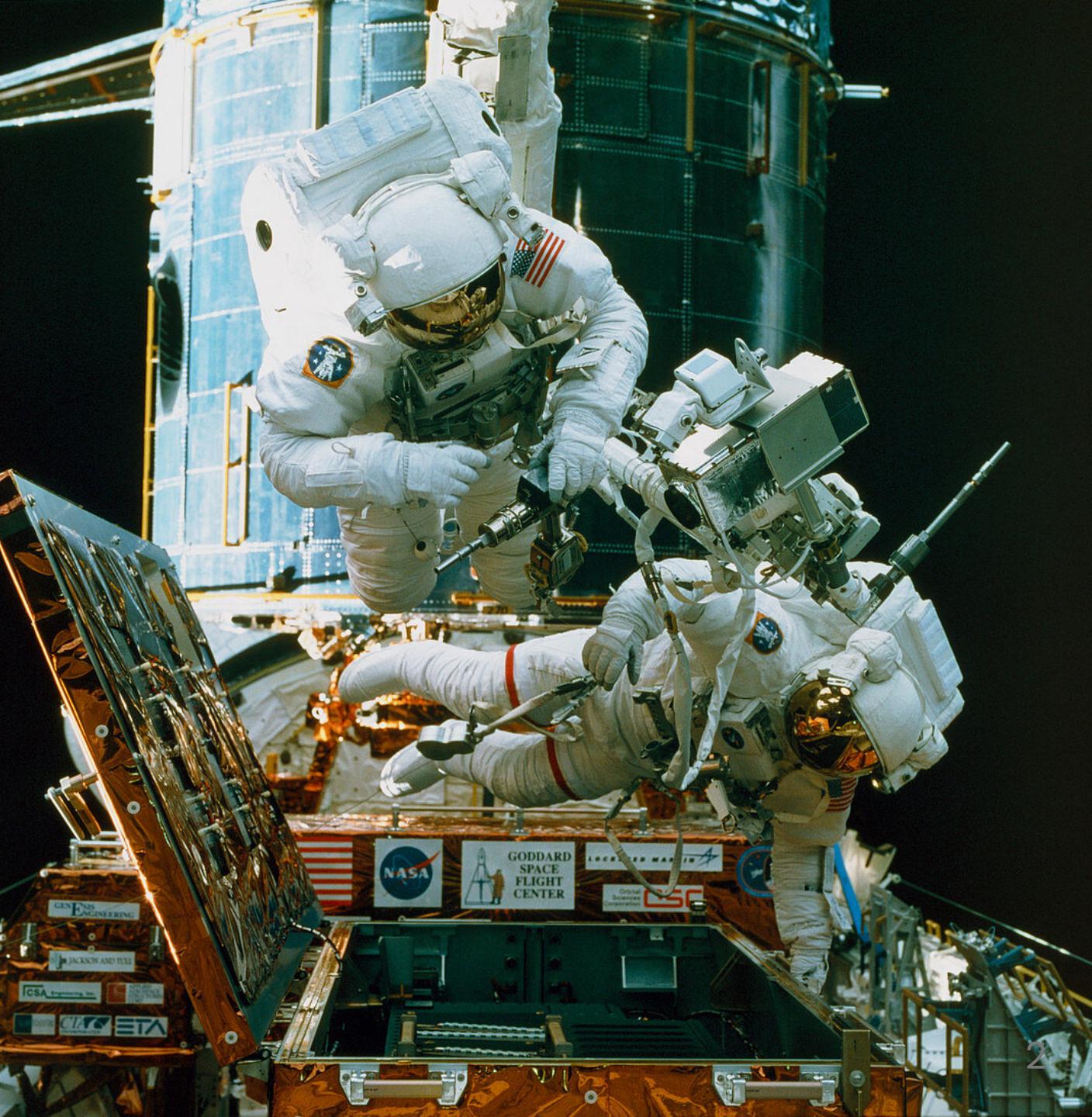
Lorenz Gärtner (LMU) on behalf of  
Thomas Kuhr (LMU), Stephan Paul (TUM),  
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# How to get things fixed?

Does it easily move?

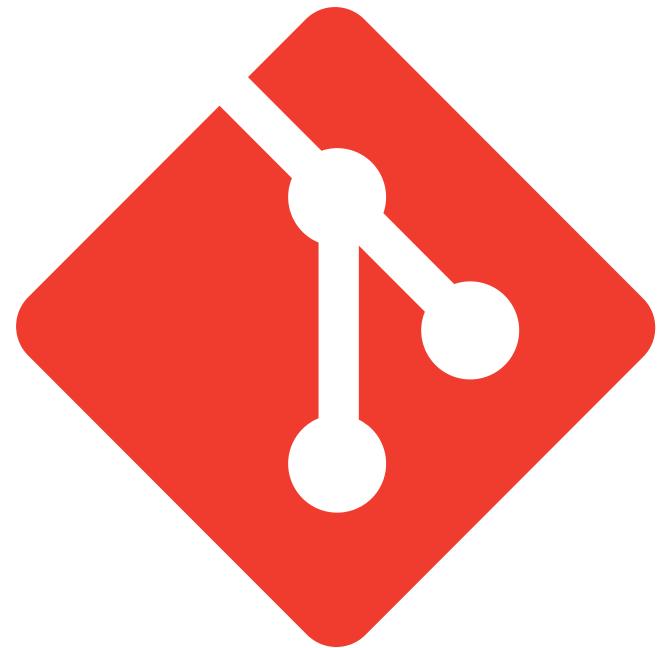
- Yes → send to expert
- No → get expert



# For software



LUDWIG-  
MAXIMILIANS-  
UNIVERSITÄT  
MÜNCHEN

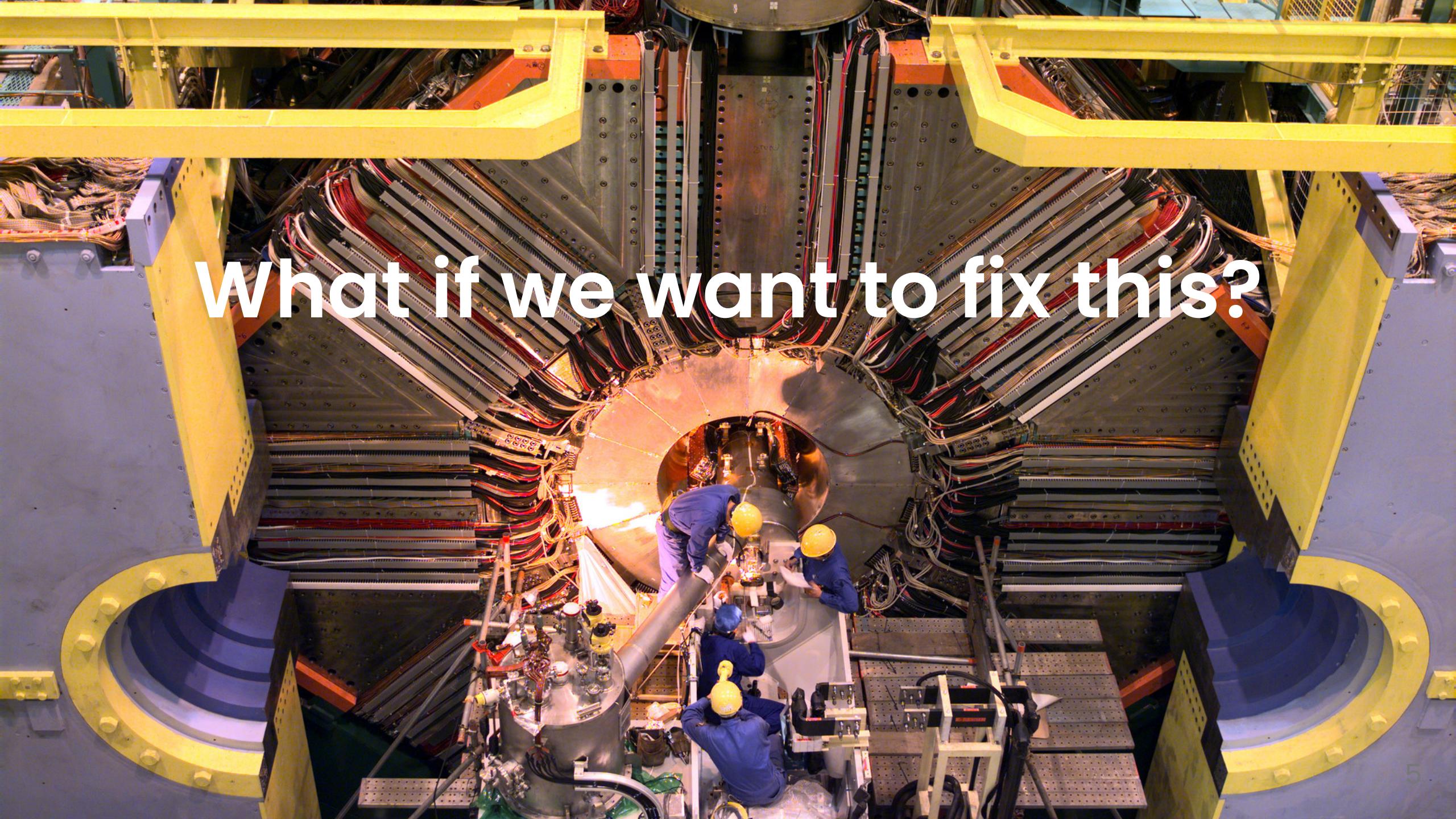


# git

+ remotes

# ... or just screen-share





What if we want to fix this?

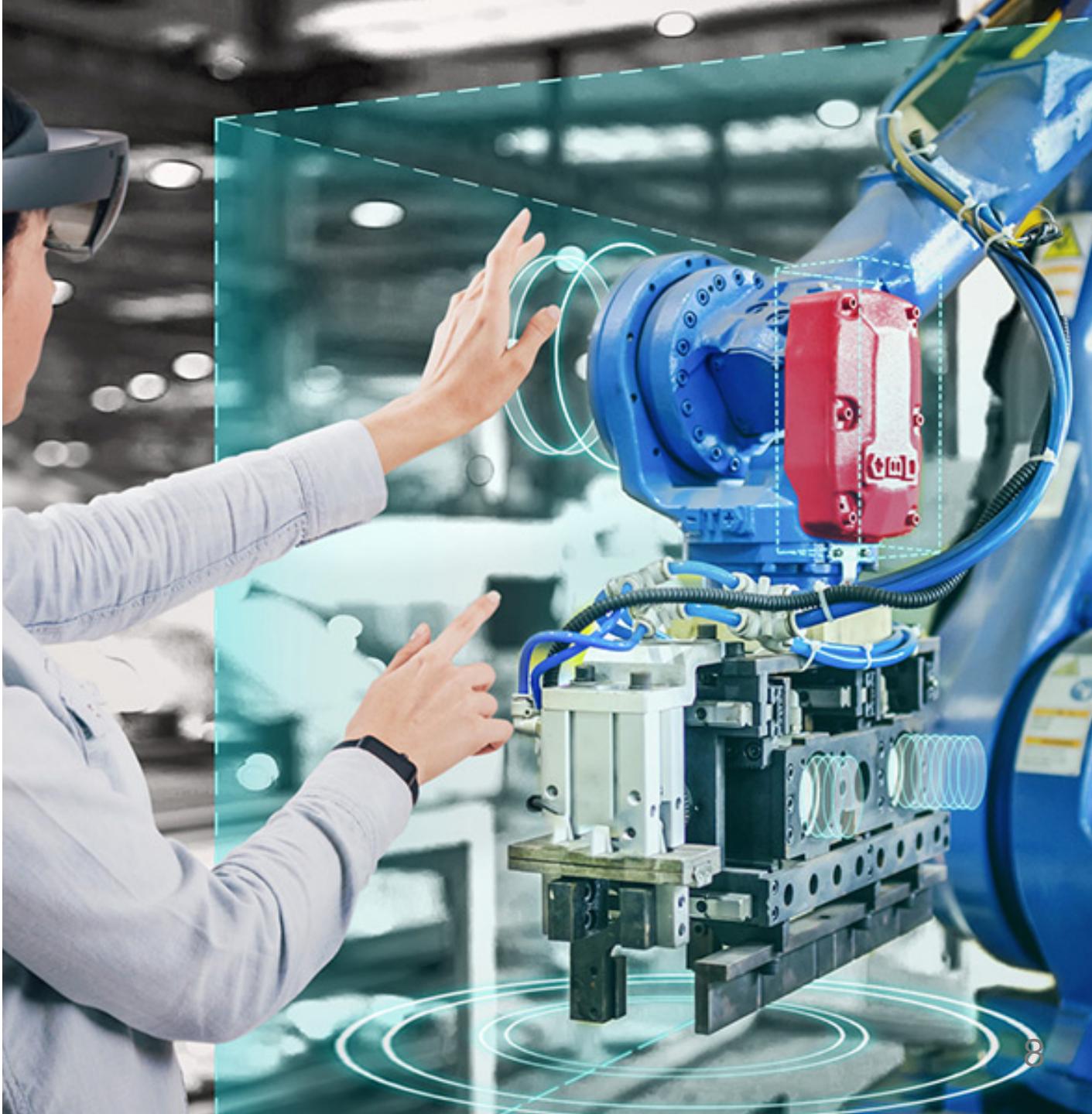


# If something breaks ...

- Bring experts to site – **high cost, time**
- Communication with experts via text / audio – **low quality**

# AR approach

Enhance quality of communication with experts



# Benefits

- Live audio-visual communication
  - Hands-free work
  - Experts can point / draw
- + Efficiency
- + Speed
- + Fewer errors



# Cost comparison

- Experts on-site
  - large travel cost
  - massive environmental impact
  - very time consuming
- AR glasses  
(Trimble XR10 with HoloLens 2)





Fermilab – CERN  
A successful use case

# Scalability

If technology meets the needs for remote assistance...

- AR readily available
- CERN experiments can directly benefit from Belle II test case



# Summary

- Remote detector repairs using AR
  - Build on use-cases in science & industry
  - Potential for massive reduction in time, cost and environmental impact
- ✓ More efficient and reliable detector operation
- ✓ Improved data in particle physics

# Budget plan

<b>Total budget needs</b>	
Trimble XR10 with HoloLens2	5400€
Student assistan (9 months)	4500€
Software liscences	800€
<b>Total</b>	<b>10700€</b>

