QTROBOT

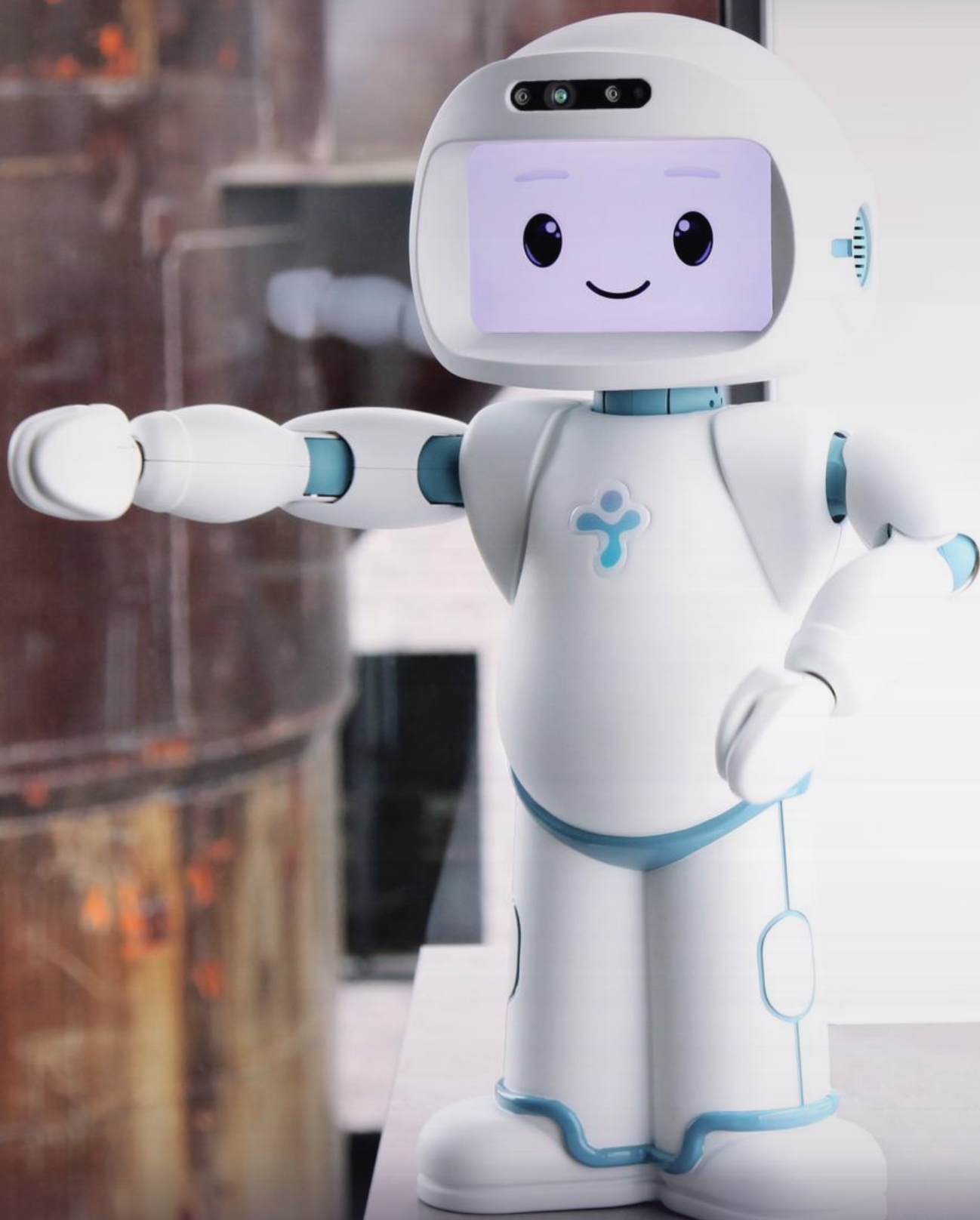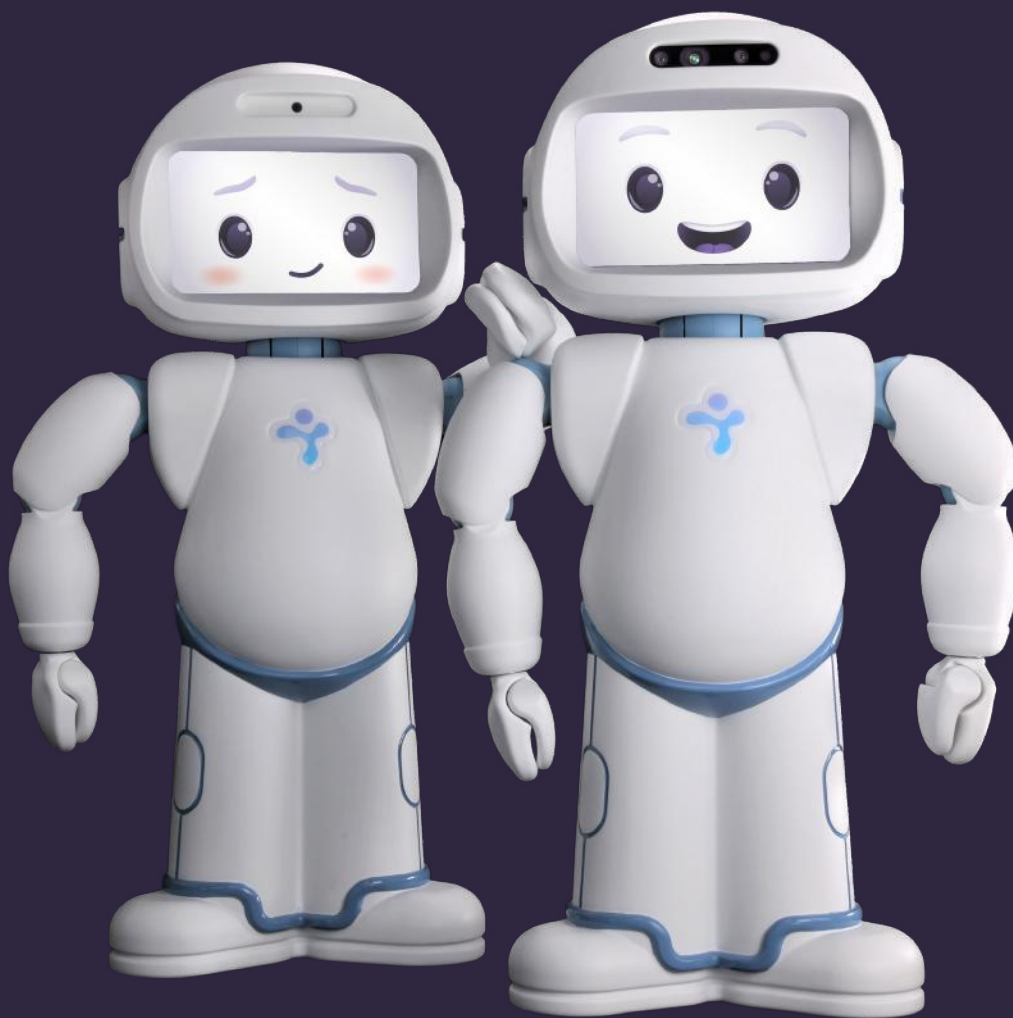## Enabling Human-AI Teaching and Research

Research & Teaching Use-Cases

- Human-centered AI
- Human-robot interaction
- Children's developmental disorders & interventions
- Geriatrics care, coaching and rehabilitation
- STEM education
- Internet of Things
- Teaching computer vision and robotics

Key Values

- Robust platform, designed for intensive working hours & working with children
- Stand-alone platform with high computational power and 3D camera sensing
- Empowered by an integrated Intel NUC computer with the latest Ubuntu desktop OS
- Rich set of native ROS and JavaScript API
- Easy-to-use graphical development environment for non-technical researchers
- Comprehensive documentation and programming tutorials
- Integrated best-in-class software for skeleton tracking, emotion and speech recognition

What QTrobot users think

'' What I like the most about QTrobot is that it doesn't break!
For us, it is very important to have a robot that is reliable. We have been using QTrobot in several research projects, where QTrobot was supposed to work many hours each day and support children to solve problems collaboratively. With QTrobot we conducted the research projects comfortably.''

Dr. Barbara Bruno, CHILI Lab at EPFL

"We have been using the robot in several projects including the iRe-CHeCK project that aims to help children with Agraphia learn handwriting. The robot is very developer-friendly and allows you to use ROS and develop new programs for the research. Also it is very good that the robot is not breaking or overheating frequently"

Dr. Salvatore Anzalone, University of Paris 8

"I have been working with QTrobot first at the University of Southern California and now in Politecnico di Milano. The best thing about QTrobot is that it works with ROS and programming it is very easy. I can easily develop new programs for the robot and use it in various use cases. Also by having a monitor in the face I can use facial expressions to convey emotions and elicit empathy.''

Dr. Micol Spitale, University of Southern California & Politecnico di Milano

QTROBOT

JUST THINK!

The JUSThink project aims to improve the computational thinking skills of children by exercising reasoning graphs, in a setup consisting of a QTrobot and touch screens as input devices.

- Swiss Federal Institute of Technology Lausanne (EPFL)

CoWriter – iReCHeCk

The CoWriter Project and its active follow-up iReCHeCk aim at exploring how a robot can help children with the acquisition of handwriting, with an original approach: the children are the teachers who help the robot to write better!
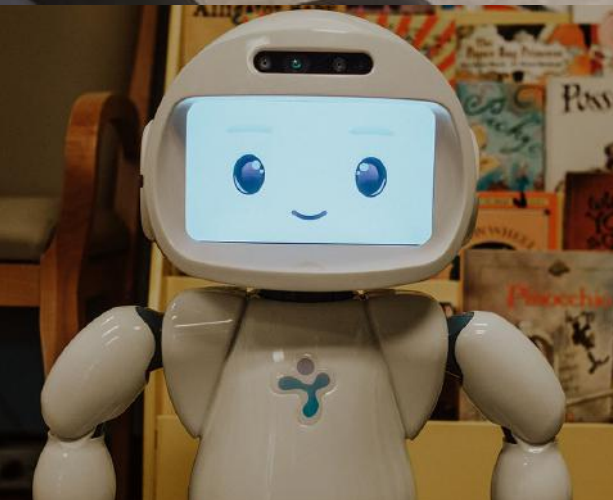
- EPFL & Paris 8

Social Empathetic Robot for Autism - SERA

This research focuses on a long-term randomized clinical trial, focused of the impact of an emotional intervention on children with autism using QTrobot.

- Italian National research center (CNR)

Robots for Social skills in Kids with Autism

In collaboration with the Learning Disability Society of Greater Vancouver, the SIRRL lab of the University of Waterloo is conducting research using QTrobot for social robotics projects to help children with their social skills development.
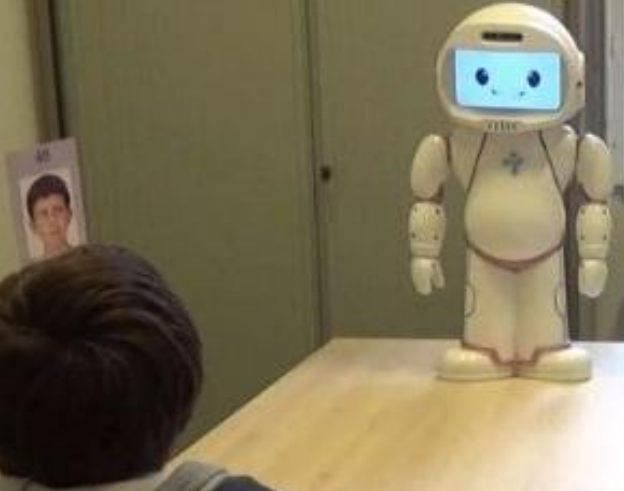
- University of Waterloo

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RESEARCH USE-CASES

Assistive Robots for Speech & Language Therapy

This research project compares the use and effectiveness of a social robot to a virtual tablet-based character in eliciting speech in children receiving speech and language therapy.
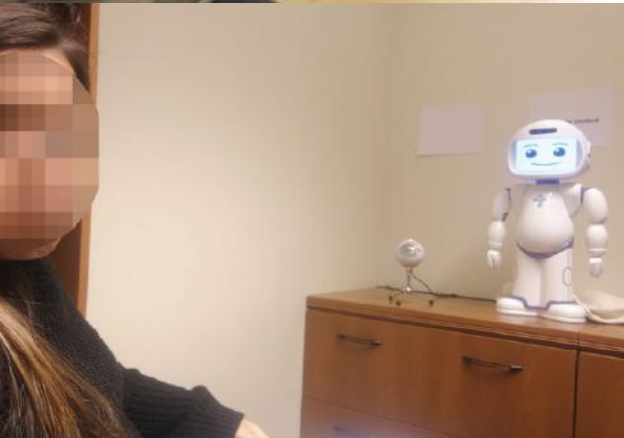
- Politecnico di Milano & University of Southern California

Emotional Training for Children with Autism

This research evaluates the impact of a 7 session emotional ability intervention delivered by QTrobot on the mental health and emotional abilities of children with autism.
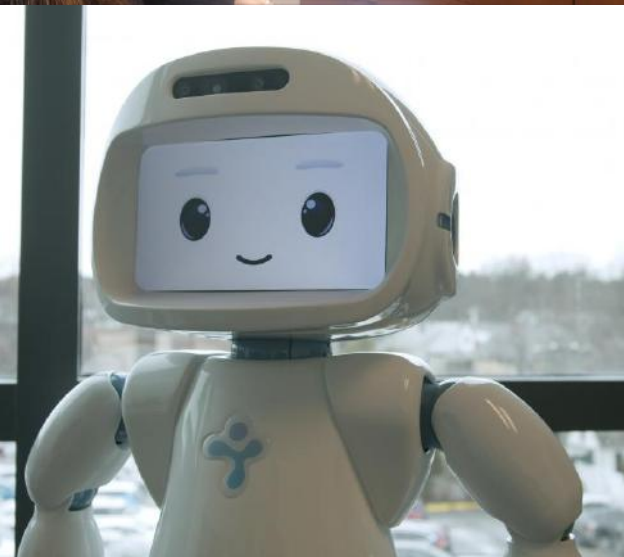
- University of Luxembourg

Socially Assistive Robotics Eliciting Empathy

This research project uses the social robot as a storyteller and examines factors that influence the amount of empathy elicited by a SAR storyteller and users' perceptions of that robot.

- University of Southern California

Socially Assistive Robots For Alzheimer's

The SARA project funded by National Institutes of Health (NIH) develops social robots to enhance the connectedness, caregiving and well-being of adults with Alzheimer's disease and their caregivers.

- Charles River Analytics

www.luxai.com

Exceptional Sensing & Processing

QTrobot platform for research and development combines the best-in-the-market hardware components with a friendly design. QTrobot is a robust platform suitable for intensive working hours and multi-disciplinary research projects on social robotics and human-robot interaction.

Vision

Intel® RealSense™ Depth Camera D455
Depth:
   Field of View (FOV): 87° × 58°
   Resolution: 1280 x 720
   Frame rate: 90 fps
   Range: 6m
   Accuracy: <2% at 4m
RGB:
   Field of View (H × V): 90 × 65°
   Resolution: 1280 x 800
   Frame rate: 30 fps

Motors and Joints:

Full internal metal structure
Heavy duty metal gearbox
Low-temperature robust motors
Flexible joints and compliance controller
Overload protection
Position, velocity and torque feedbacks

Computing

10th Gen Intel® Core™ i5/i7 processor
Up to six 4.7Ghz cores
Up to 32 GB DDR4 RAM
Up to 512 GB M.2 SSD

Microphone

4 High-performance digital microphones
Supports far-field voice capture
Microphones: ST MP34DT01TR-M
Sensitivity: -26 dBFS (omnidirectional)
Acoustic overload point: 120 dB SPL
SNR: 63 dB

Display

8inch TFT 800x480 LCD as the face

Audio

Audio amplifier: stereo 2.8W Class D
Speaker frequency rate: 800~7000 Hz

Electrical

Input: 19 v
Battery: external (not included)

Connectivity

WiFi: IEEE 802.11 b/g/n
USB-C
USB 3.0
Ethernet & HDMI: via USB-C multifunction adaptor Hub (included)

QTROBOT

Pose Tracking

Thanks to its D445 Intel® RealSense™ 3D camera and a cutting edge pose tracking technology, QTrobot can recognize and track human poses with a high precision, allowing it to react to human gestures in interactive games and physical rehabilitation scenarios.

Emotion Detection & Recognition

QTrobot includes a state of the art software to recognize gender, age group and emotions of people with an industry leading performance, all running embedded on QTrobot!

Image Recognition

QTrobot provides a powerful image recognition software. Teaching QTrobot to recognize new images is as simple as uploading your images to the robot!

Face Detection & Recognition

QTrobot can detect and recognize faces, so you can program it to react to the people it knows!

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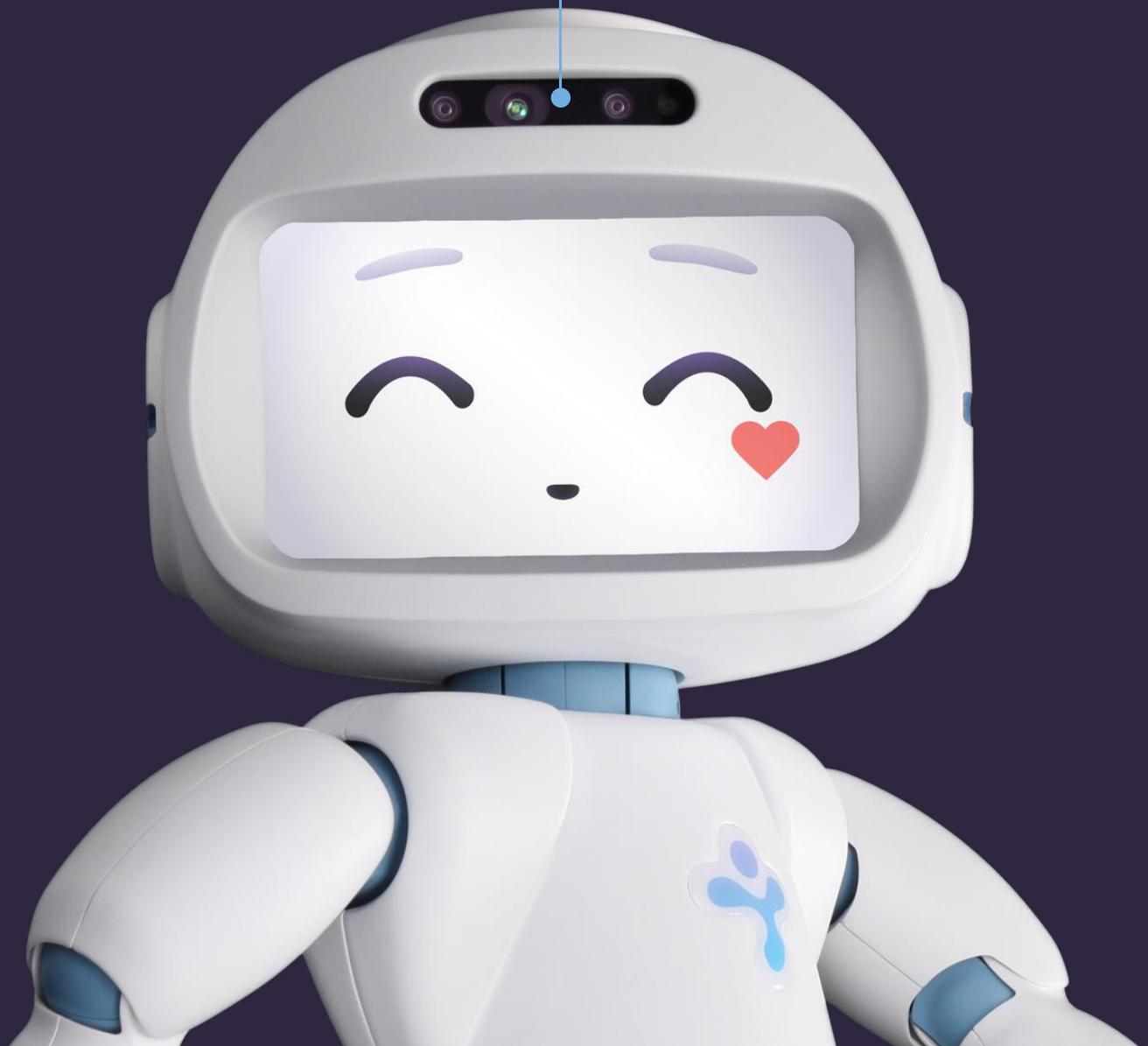
Speech Recognition

QTrobot comes with integrated voice recognition services and corresponding ROS API supporting more than 20 languages. The voice recognition performance is enhanced by leveraging the ASR and noise suppression capabilities of Respeaker far-filed microphone array.

Sound Detection & Localization

A high-performance far-field digital microphone array enables QTrobot to capture and understand voice activities up to 5m away. QTrobot's embedded voice processing module detects the direction of the voice, filters the background noise, and focuses only on sounds that come from the target direction.

Multi-Lingual

QTrobot is equipped with the Acapela Text to speech software, enabling it to naturally speak in more than 30 languages and accents such as American English, British English, German, French, Spanish, Chinese, Dutch, Arabic, Russian and many more. For many of the languages, children voices are available, perfectly fitting the look and feel of QTrobot!
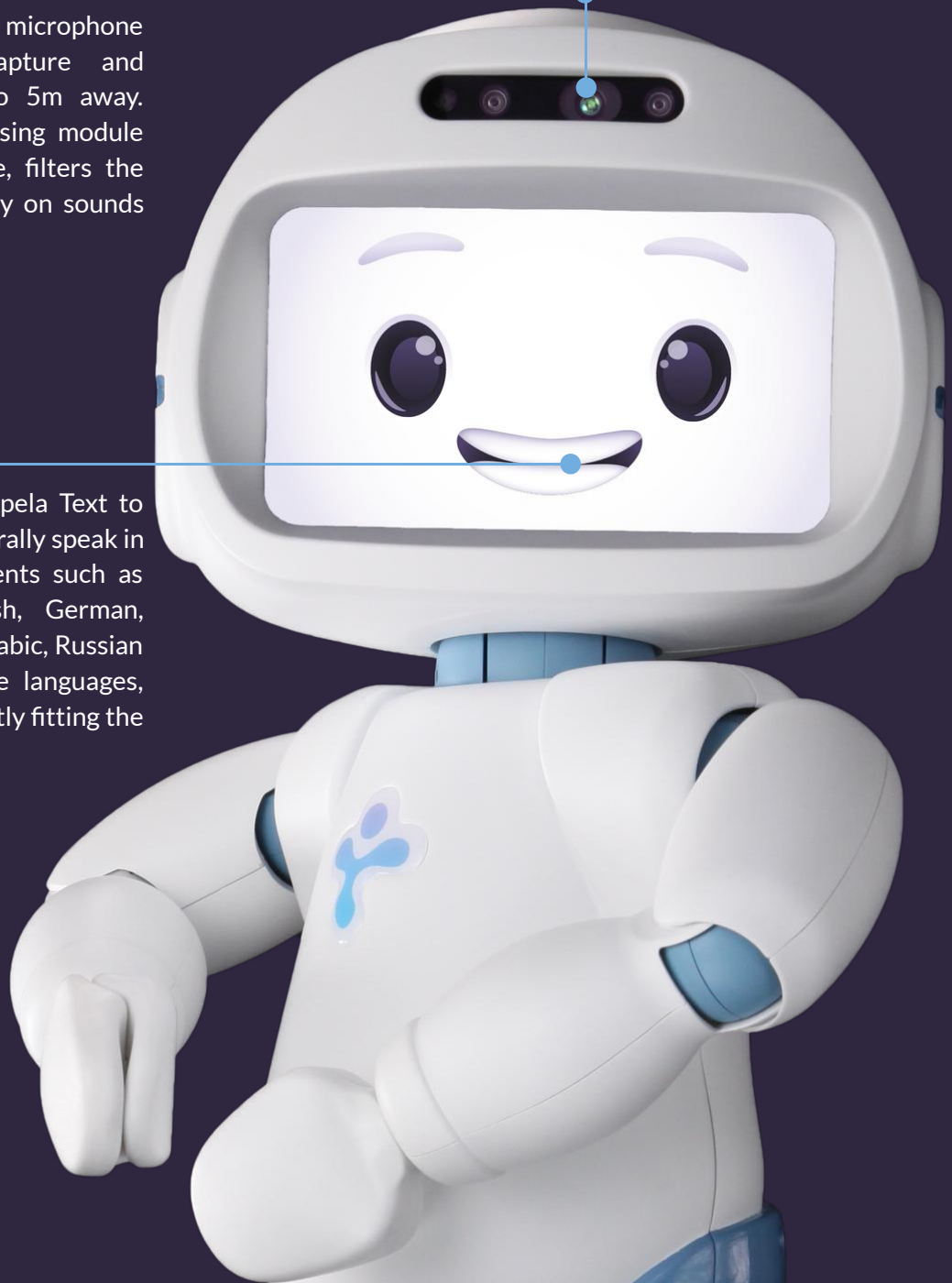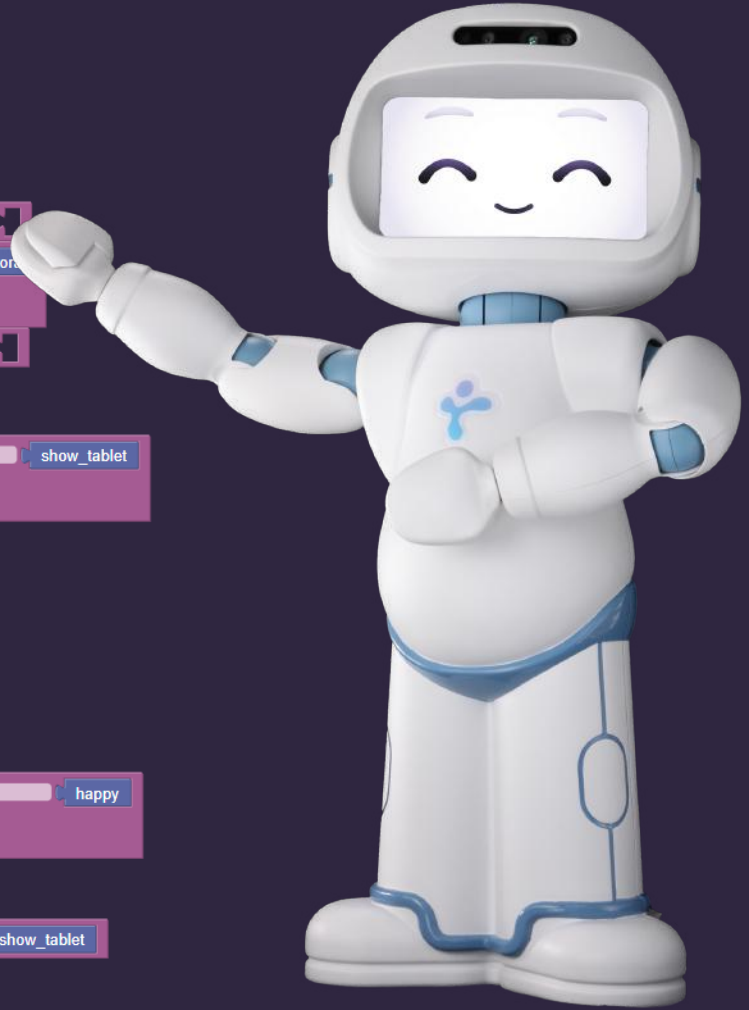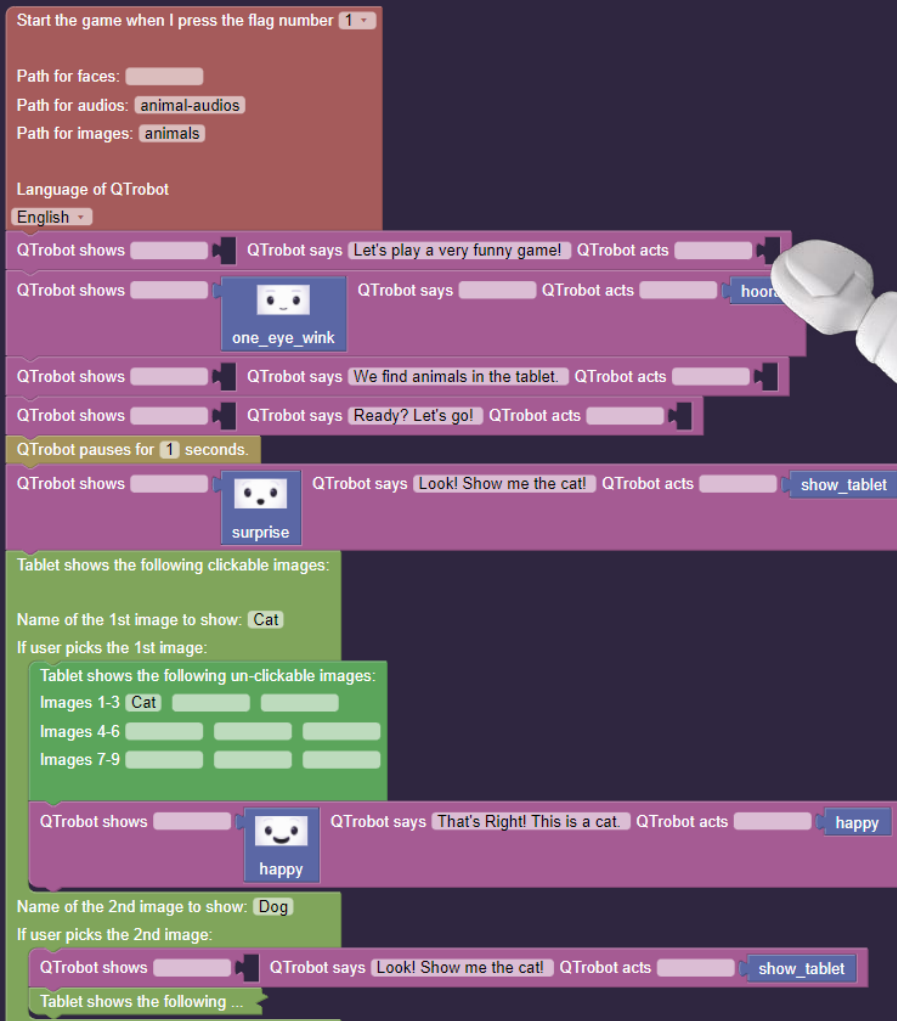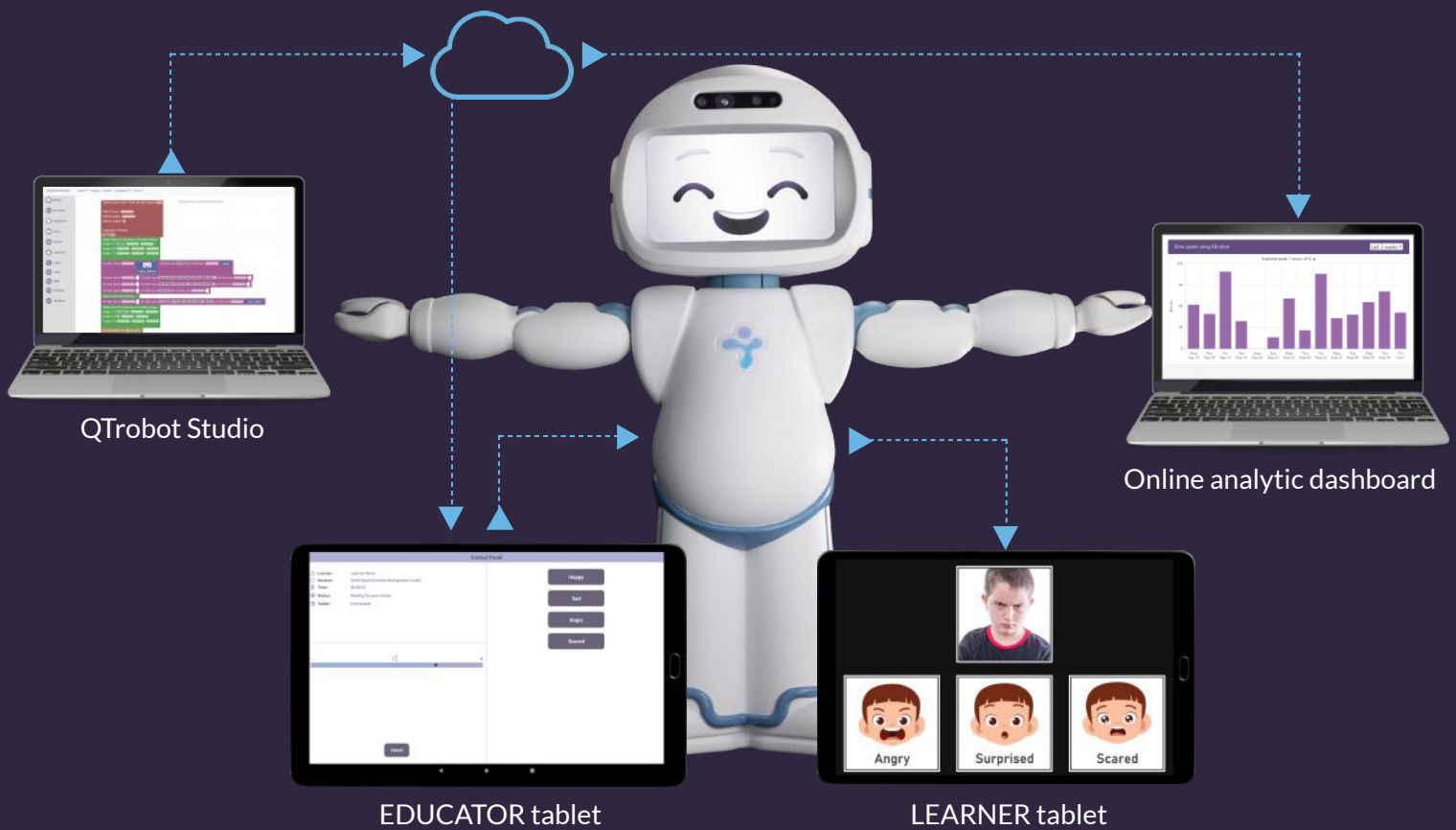
QTROBOT

Empowering non-technical users to create advanced robot programs

QTrobot Studio is an easy-to-use graphical interface designed for non-technical users such as researchers in the fields of psychology, education, and human science who are interested to create their own tailormade research use case. By using simple, easy-to-understand blocks, non-technical researchers are able to create a fully functional program that can be used with the intervention group in just a few clicks.

QTrobot Studio allows non-technical researchers to create programs for

- Robot speech in various languages
- Showing facial expressions & emotions on QTrobot face
- Showing various gestures from the pre-recorded gesture gallery and recording new custom gestures
- Manually controlled, Wizard of Oz conversation & response choices
- Presenting visuals such as images and videos on a tablet screen and creating interactive tablet applications with clickable visuals
- Interactive programs using facial expression recognition, gesture recognition and image recognition
- Autonomous conversation using pre-defined responses
- Generating automated session reports and progress evaluation from the interaction with the robot

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QTrobot Studio

Online analytic dashboard

EDUCATOR tablet

LEARNER tablet

Angry   Surprised   Scared

Using QTrobot Studio in just a few steps

1. Access online studio on qtrobot.luxai.com to create your program using easy-to-use visual blocks, upload custom images, animations, and audios
2. Use the EDUCATOR tablet to run your programs on QTrobot and control the robot during the interaction with the research participants
3. Use LEARNER tablet to show your custom interactive clickable visuals to the research participant
4. Collect the results and create analytic reports

Program examples built by QTrobot Studio

Interactive visual-based tablet application

Interactive image-recognition based activities

Voice interaction & communication

QTROBOT

Developing new programs for QTrobot

Robot programming has never been easier! Program QTrobot:
- Directly on the robot via keyboard, mouse, and display
- Using your laptop connected to QTrobot via the robot's Wi-Fi hotspot
- Using your laptop connected to QTrobot via an internet router

Internet Router

QTrobot
Wi-Fi hotspot

::: ROS   C++
JS   ○

HDMI

Extension

USB-C
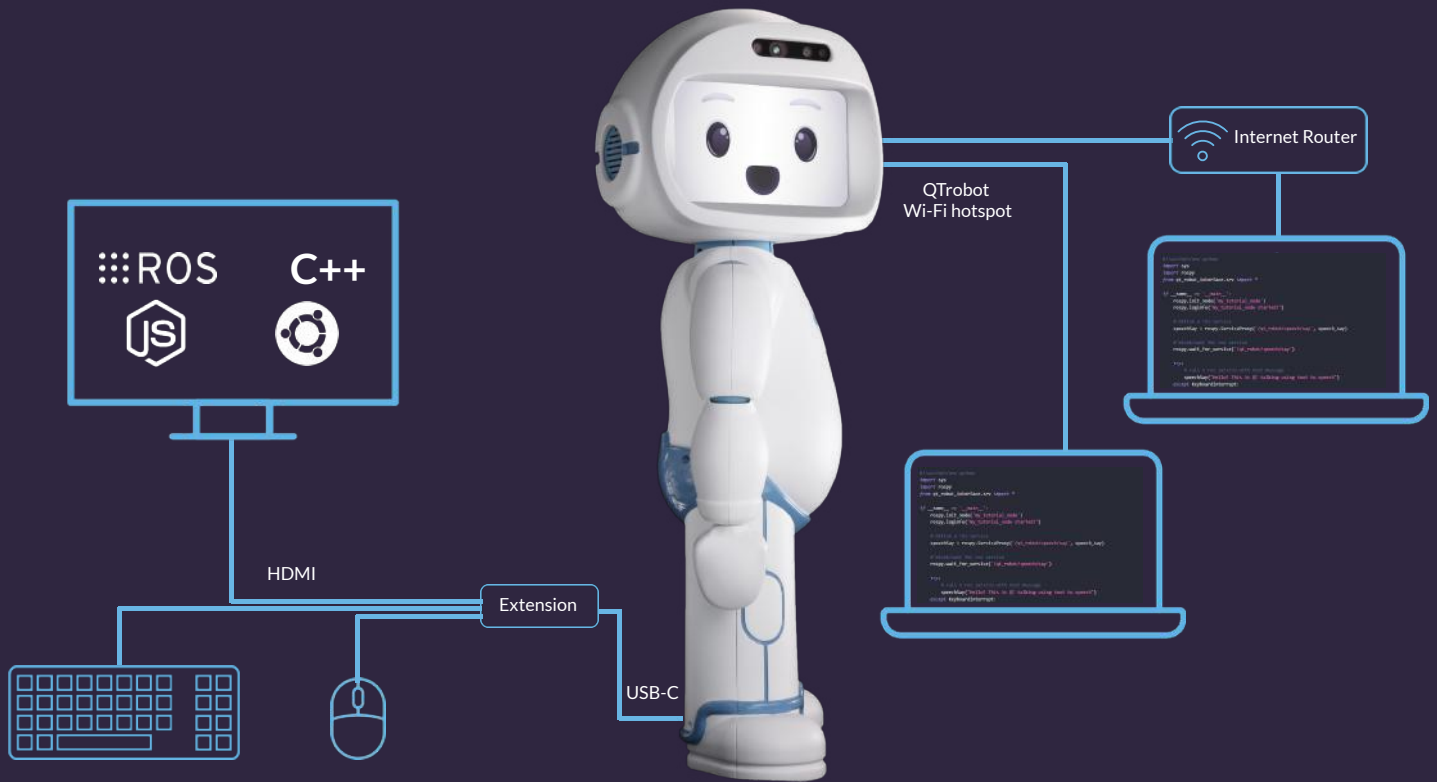
Dual computer with standard Linux distribution

QTrobot comes with two integrated computers:
- A powerful RaspberryPi-4 computer with the latest version of Raspberry Pi OS to control the main hardware
- An Intel® NUC i5/i7 PC with the latest version of Ubuntu Desktop for user's development

Developer friendly API

QTrobot has a comprehensive ROS API:
- Connecting users with the largest open-source robotics community
- Allowing users to program in various languages such as Python, C++, Lua and Java
- Enabling users to create reactive web-based Android or iOS apps using JavaScript API

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Combining the ease of use of graphical programming with the power of ROS

One of the most innovative features of QTrobot Studio is the ability to interact with other software developed using standard programming languages. The QTrobot Studio allows developers and technical researchers to:

- Interconnect ROS functions with easy-to-use visual blocks
- Handle ROS messages and interact with other publishers, subscribers, and services through the QTrobot Studio
- Extend the capabilities of the easy-to-use blocks to Integrate non-technical members of your interdisciplinary team in usecase development
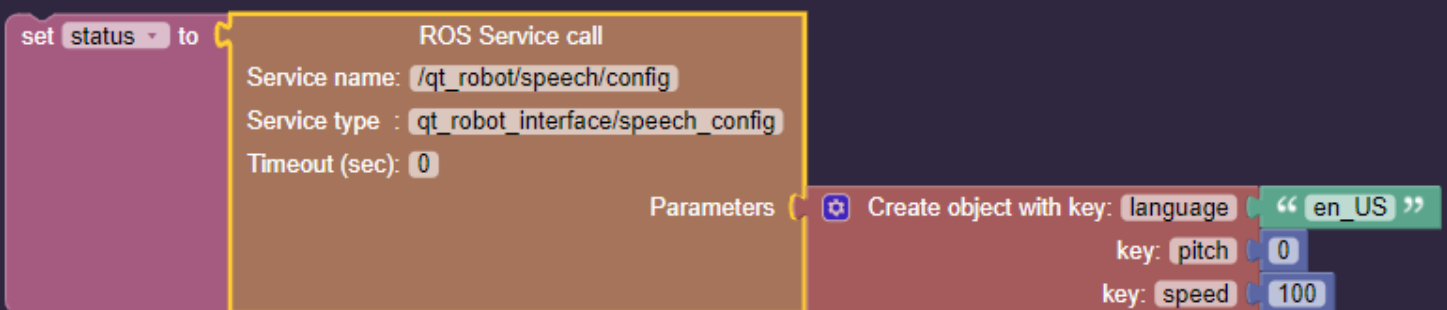
ROS-Block examples
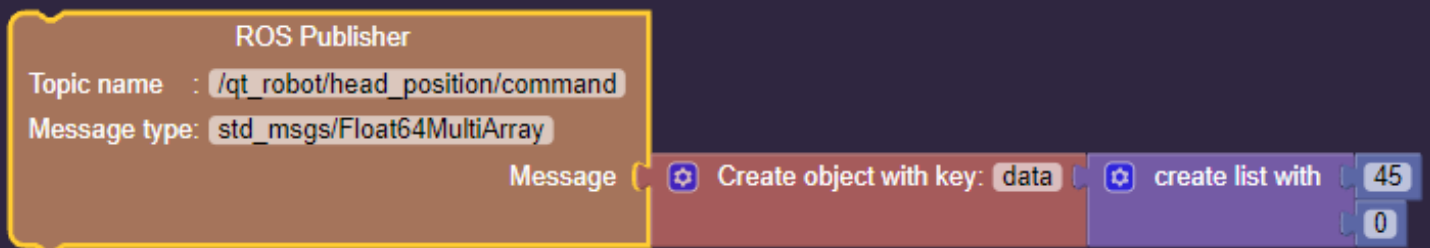
Using LuxAI ROS Publisher block to send position command to QTrobot head joints
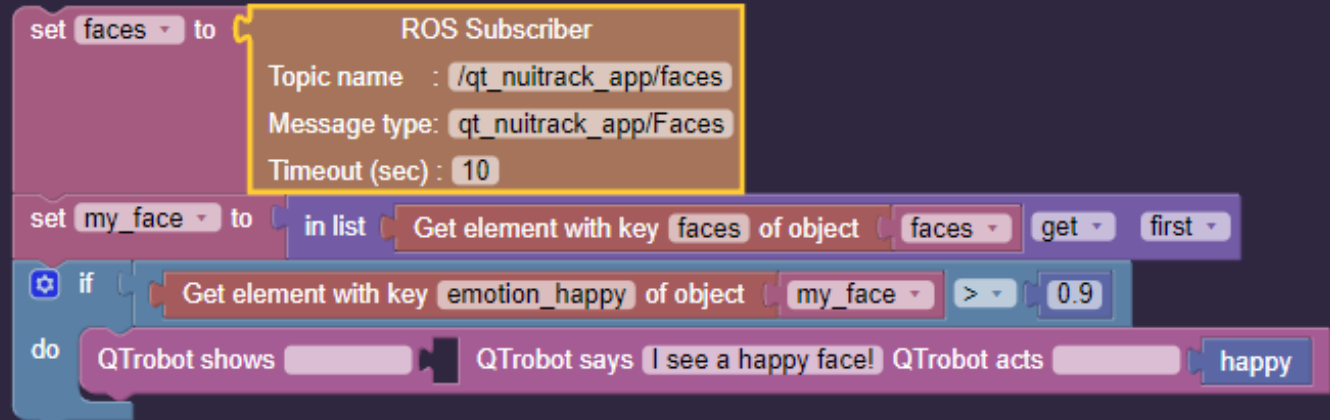
Using LuxAI ROS Subscriber block to read Nuitrack message data and extract the value of specific facial emotions

Using LuxAI ROS service block to configure QTrobot text-to-speech interface via service call

## Comprehensive documentation & tutorials

QTrobot comes with comprehensive documentation, examples and tutorials facilitating your development of new use-cases.

The training materials include:

- Documentations for developers with different programming preferences including Python, C++ and JavaScript
- ROS training from basics of using the framework until advanced features such as kinematic and custom motor controllers
- Step-by-step video tutorials and documentation on QTrobot Studio, covering a wide range of topics from building simple storytelling to making Q&A with the robot, playing audios, demonstrating visuals and creating the interactive applications on a tablet using clickable visuals
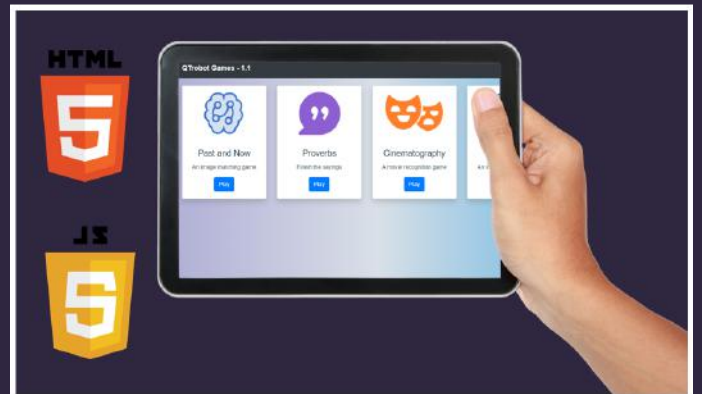

Facial emotions, gender, age recognition
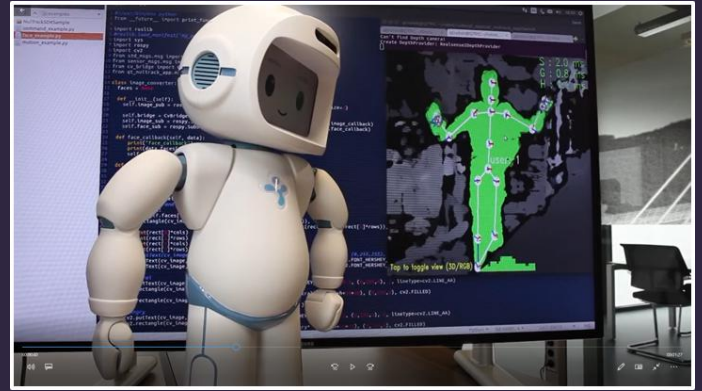
Interactive game using gesture recognition
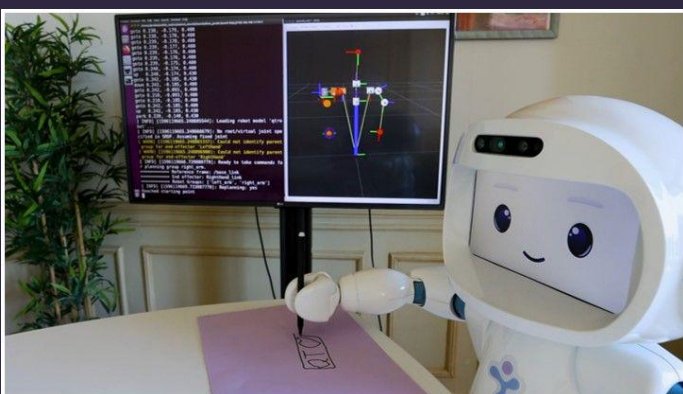
Handwriting and kinematic control

Interactive web, mobile and tablet apps

Interested to see QTrobot live and see if he can be a great tool for your project?
Book a live demo with our team

Interested to have a QTrobot for your team?
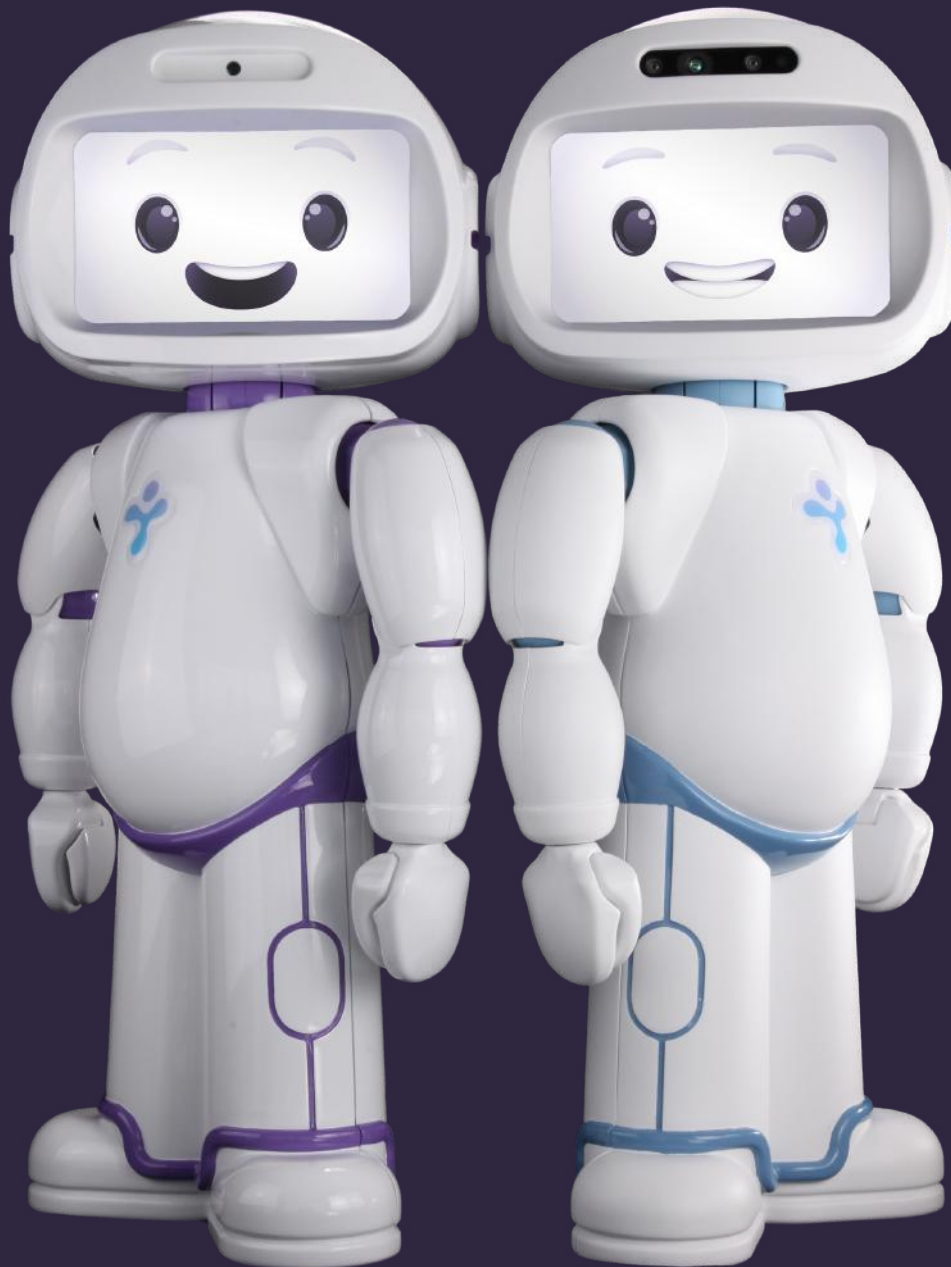**Order your QTrobot & get a month of no question asked return and full refund**

Interested to review QTrobot documentation and tutorials?
Check out the demos, documentations, and video materials

If you have any questions about QTrobot or if you need more information, please contact us with info@luxai.com.

www.luxai.com

QT ROBOT

Powerful, Reliable & Easy to Use

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