April, 2023

Stella

The first robot dog kit designed for research and education

General Contact
info@ahead.io

Sales & Partnerships
sales@ahead.io

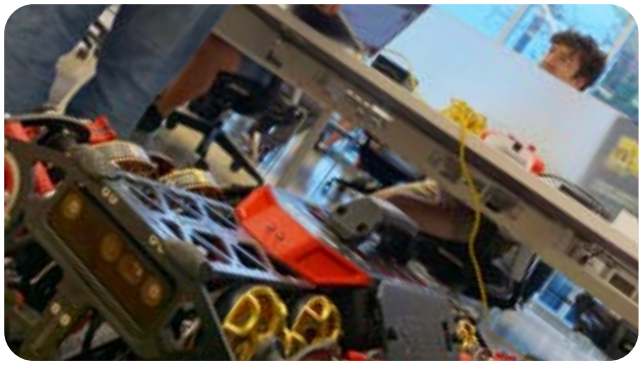
Our **Mission**

We aspire to be the leading provider of open source robotics platforms, tools, and support services.

Our goal is to provide high-quality, reliable, and secure robotics solutions for educators, researchers, and industry professionals, all while maintaining a strong commitment to open source principles and community collaboration.

By providing an open and extensible platform, we aim to foster innovation and facilitate the development of new robotics applications that can benefit society as a whole.

Ultimately, our vision is to be the go-to provider for open source robotics solutions, trusted by educators, researchers, and industry leaders worldwide.



Mila - Quebec AI Institue, August 2022

McGill University Montreal - Department of Electrical and Computer Engineering, April 2022

Partners & **Customers**

CRESCENT

Mila

Université de Montréal

UBC THE UNIVERSITY OF BRITISH COLUMBIA

Penn University of Pennsylvania

NVIDIA

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

ROBOTIS

McGill UNIVERSITY

EUROPEAN ROBOTICS FORUM

LUXonjs

ONTARIO SCIENCE CENTRE

intel

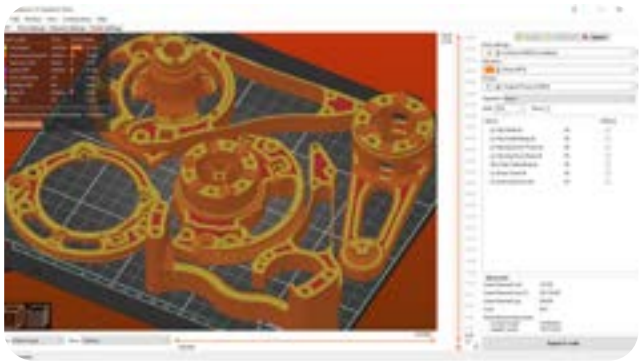
NII Inter-University Research Institute Corporation / Research Organization of Information and Systems National Institute of Informatics

Repairable **Objective**

Researchers and educators need flexible and adaptable platforms for experimentation and learning.

Open source and repairable robots offer several advantages over traditional closed-source robotics systems:

- They are often designed to be repairable with simpler tools, like 3D printers, soldering irons, desk CNC machines, which makes them more accessible and affordable to educators and researchers who may lack access to specialized robotics repair services or equipment.
- Reduce waste and increase sustainability, as broken or outdated parts can be easily replaced or upgraded.

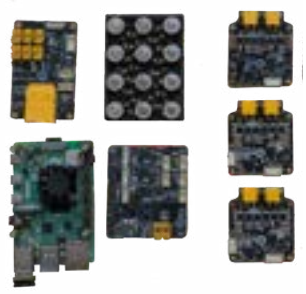


What's in the **Kit?**

3D Printed Parts

FR4 & Aluminum Plates

BLDC Motors



Electronics: Rpi, Power Distribution board and motor controllers

Bearings & Fasteners

Batteries, chargers and charging accessories

All Tools you need to Assemble a Stella

Training Stand

Gamepad (AA batteries not included)

Air safe case with custom foam

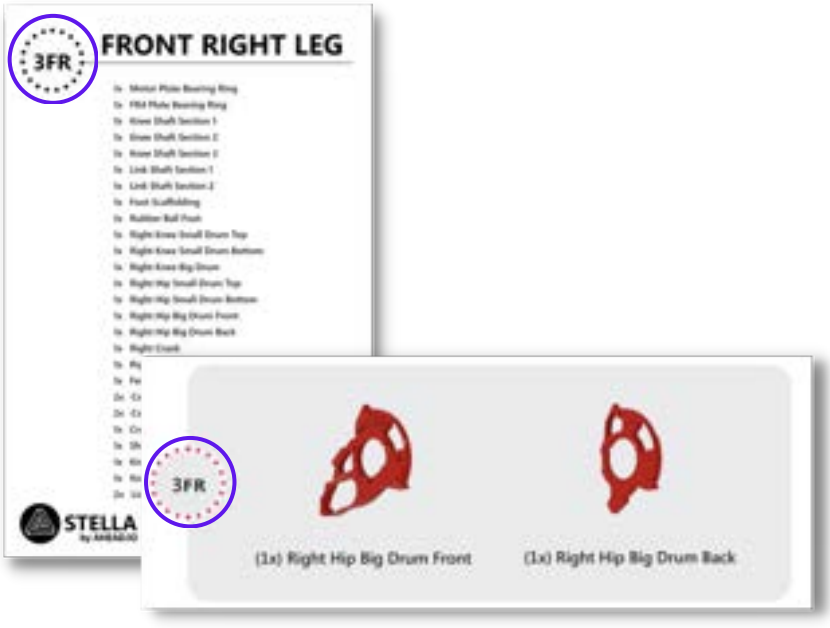
Building **Stella**

Building a robot should be as enjoyable as playing with a large Lego set, only slightly more challenging, but exponentially more rewarding. That's why we designed Stella to be both fun and easy to assemble.

We spent as much time engineering Stella as we did our kit and assembly guide, ensuring that every step of the process is clear, concise, and well-documented.

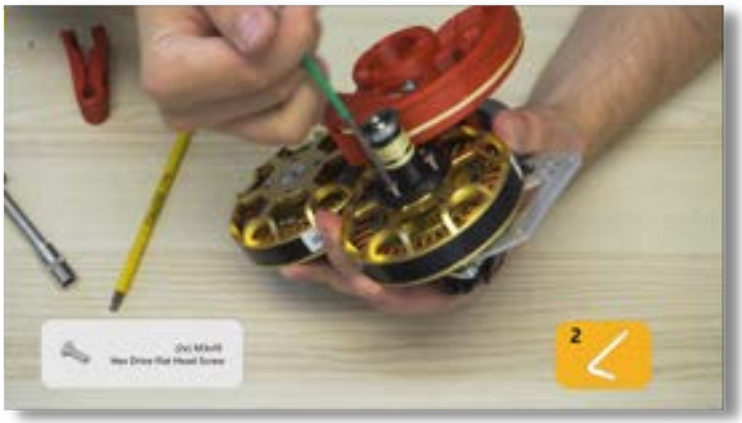
Our kit is composed of several packages containing all the pieces needed to build one Stella. Each package is labelled with the list of parts and caries a reference code. The same reference code can be found in our assembly guide.

Each chapter in the assembly will refer to one or more packages in the kit easily found by matching the reference code.



Our assembly guide is more than just a set of instructions. It's a visual and interactive experience that guides you through the assembly process with the help of QR codes leading you to video tutorials.

This makes it easier than ever to build your own robot, even if you have limited experience with robotics.

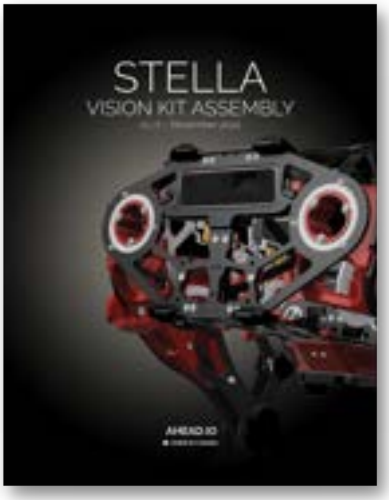


Stella
Documentation

Guidelines on safe operation, battery handling, maintenance, & basic control.

Assemble Stella step-by-step with our interactive assembly guide.

Printing process and access to the 3mf files to re-print your Stella broken parts.



Vision kit, including 2 ir 4 Luxonis Oak-D Pro cameras (Front-back and/or sides).

How to assemble the custom Stella training stand.

Software **Platform**

The user PC can directly connect the robot with Ethernet or wifi.

The open high-level control can directly send high-level motion commands such as forward, backward, left and right movement to the robot.

The developer can use the front camera to map and navigate spaces.

The low-level control can read and control all motors and sensors of the robot in real time, which is convenient to develop proprietary algorithm.

The data transmission and image transmission with low delay can realize the real-time mutual transmission of data.

Applications

Stella is a perfect tool for a variety of research applications, including:

- **Robotics research:** With its powerful legs and programmable software, Stella can be used to develop and test new robotics algorithms and control systems.
- **Computer science research:** Stella can be used to study machine learning, computer vision, and other areas of computer science that require experimentation with robots.

Mila - Quebec AI Institue, April and August 2022

- **Engineering research:** Stella can be used to study the mechanics of locomotion, develop new sensors and control systems, and test new materials for robotics.
- **Education:** Stella can be used as an educational tool to teach robotics, programming, and engineering concepts to students at all levels.

Itis Omar (Italy), September 2022

McGill Robotics Club, October 2022

Stella, the robot dog, can be used in various research fields, including reinforcement learning, robotics control, and locomotion. Here are a few examples:

- **Reinforcement learning:** Stella can be used as a platform for research in reinforcement learning, where the robot can be trained to learn new skills or perform tasks using reward-based learning techniques.

- **Robotics control:** Stella's quadrupedal design allows for research in the area of robotics control, where researchers can experiment with different control algorithms and techniques to achieve stable and efficient locomotion.

Amii - Machine Intelligence Institute, December 2022

UAlberta, November 2022

- **Locomotion:** Stella can also be used to study locomotion in animals and humans, where researchers can gather data on how the robot moves and use that information to better understand bio-mechanics and motor control.

- **Sensor development:** Stella can be used to develop and test new sensors, such as force sensors or pressure sensors, that can be used in other applications.

- **Payload delivery:** Stella's expandable design allows researchers to add their own payloads, which can be used for a variety of research applications, such as carrying sensors or other equipment for data collection.

Overall, Stella's versatility and expandable design make it a valuable platform for a wide range of research applications in robotics, engineering, and biological sciences.

Our open-source code base and 3D printed manufacturing approach empowers researchers to constantly push the limits of the robot, both in simulation and in real-world testing, generating a wide range of skills and capabilities that the robot can leverage.

Technical **Specs**

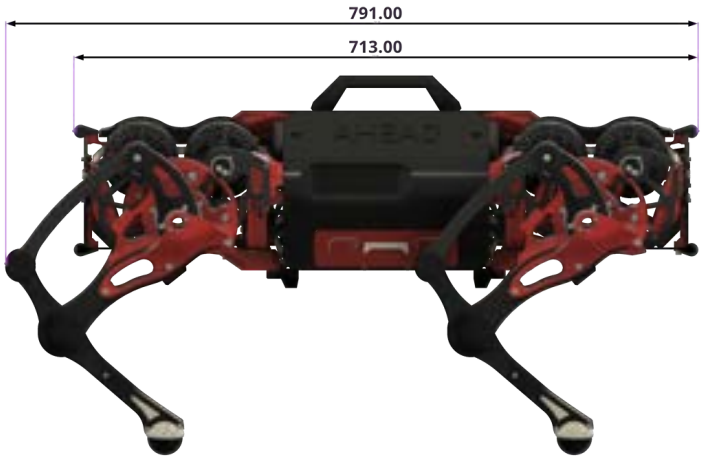
Basic Parameters	
Degrees of freedom	3 per leg
Net weight	14.1 kg (robot) + 1.1 kg (batteries)
Maximum Payload	+ / - 3 kg
Tibia length (all legs)	170 mm
Femur length (all legs)	185 mm
Ground clearance	220 mm
Material	PETG, PLA, Rubber, FR4 and Aluminum plates
Power Input	29.6 V
Power	2x 4s 5000 Mah Li-Po in series
Controller	ADrive - Proprietary
Communication	Bluetooth, WiFi, LTE (optional)

Height when laying down (excluding handle)	202 mm

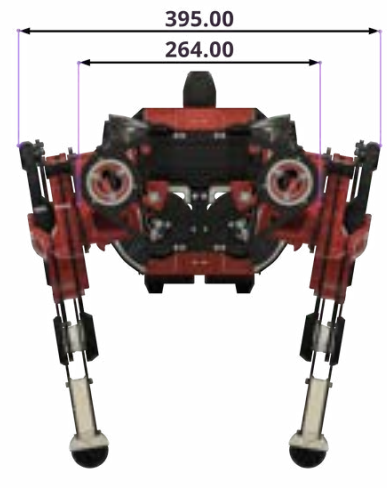
Height in typical stance (excluding handle)	370 mm

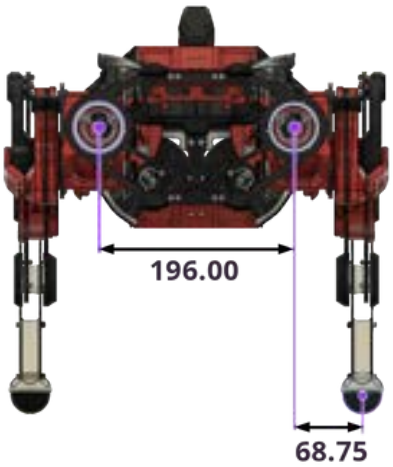
Height maximum extended (excluding handle)	477 mm

Total length (with legs) when standing in typical stance	791mm



Total Width (with legs)	395 mm





Axis Motion Parameters	
Hip angular range of motion	120 deg
Knee angular range of motion	120 deg
ABAD angular range of motion	100 deg
Torque Parameters	
Hip - Max torque / Continuous torque	22.9 Nm / 4.8 Nm
Knee - Max torque / Continuous torque	21.6 Nm / 4.8 Nm
ABAD - Max torque / Continuous torque	21.6 Nm / 4.8 Nm
Hip / Knee / ABAD reduction ratio	1:8.5 / 1:8 / 1:8

MADE IN CANADA

STELLA

DESIGNED AT AHEAD GARAGE BY AHEAD.IO