

Creator's booklet







Meet Wheelson

Wheelson is a small DIY self-driving car that uses electromotors and microcomputers to autonomously navigate while driving.



HOW IT WORKS?

-  **1** Assemble your own autonomous vehicle
-  **2** Take it for a test drive
-  **3** Enable autonomous driving mode
-  **4** Code your own program for Wheelson

What is CircuitMess?



CircuitMess started in 2016 when Albert (our CEO) was 17 years old.

Albert loved tinkering with electronics and one of his first projects was a DIY game console.

People really liked the idea so he decided to launch it on **Kickstarter** where it raised \$100,745!

After that, **CircuitMess** was born.

We are a small and fast-growing team of tech lovers who wish to share our love of creating new technology with the rest of the world!

Behind the name

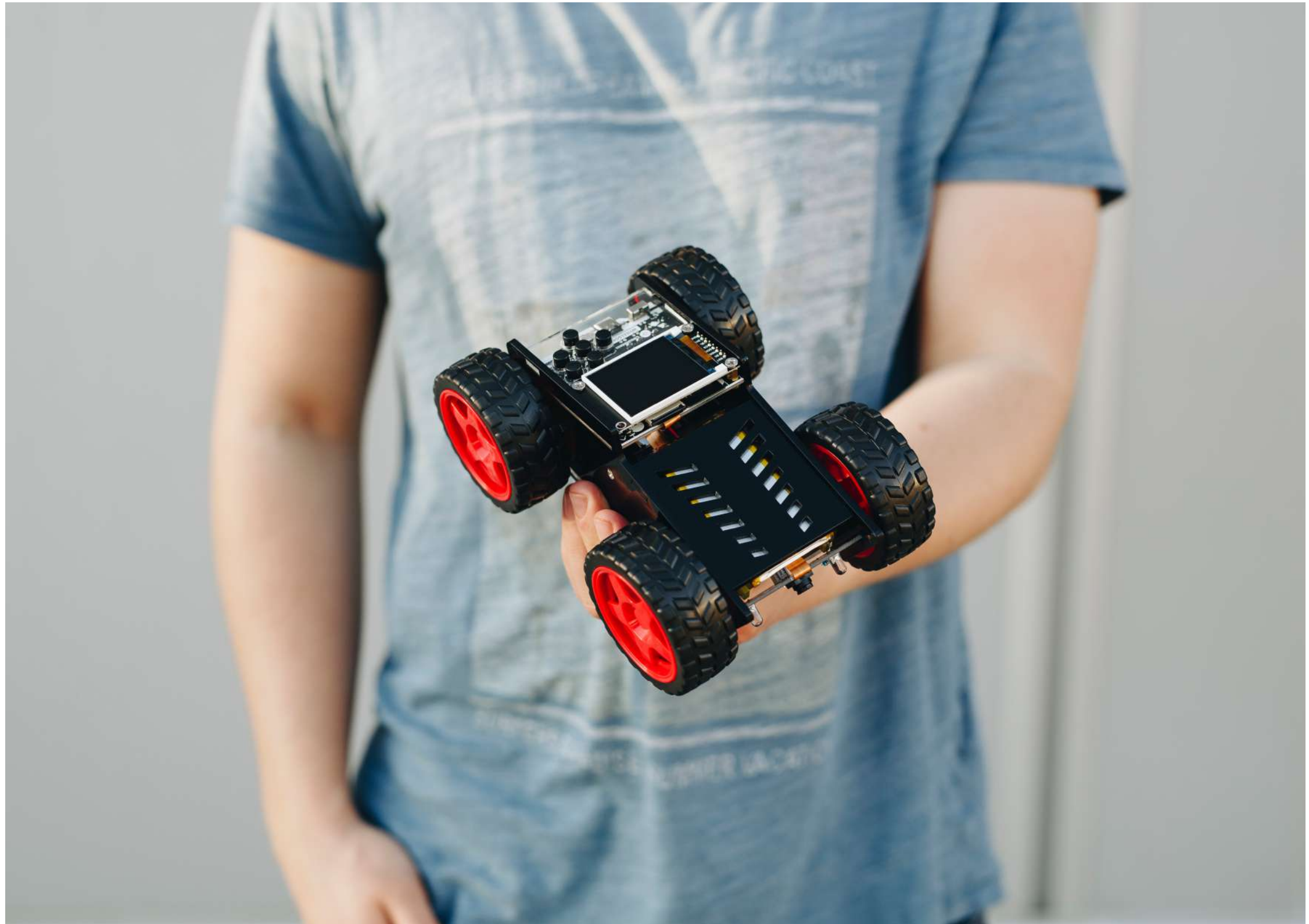
“Circuit” is a reference to electronic circuits. “Mess” is what best describes our workplace. Combine the two and you get CircuitMess!



All of our kits are designed, manufactured, and packed in Croatia!

You can do it!

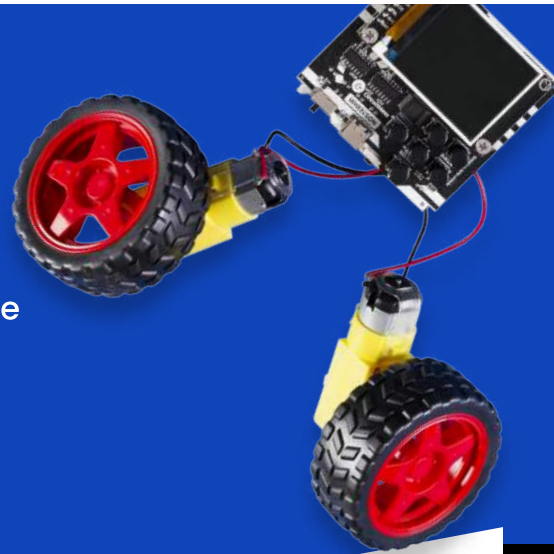




Our mission

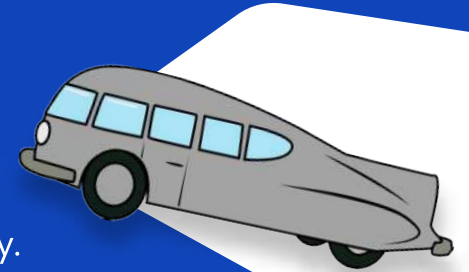
Everybody knows how important technology is, but less than 1% of the population knows

HOW TO MAKE
new technology.



A brief history of autonomous cars

1939: American futurist Norman Bel Geddes exhibited a concept of a self-driving car. It was an electric vehicle guided by radio-controlled electromagnetic fields in the roadway.



We're here to change that!

With our kits, we want to

inspire people to be

CREATORS,

instead of just consumers.



1977: Japan-based Tsukuba Mechanical produced an autonomous passenger vehicle with a camera system that could recognize street markings while traveling at 20 miles per hour.

1980 - 2000: Organizations across the world invest heavily in research and development of electric vehicles and self-driving technologies.



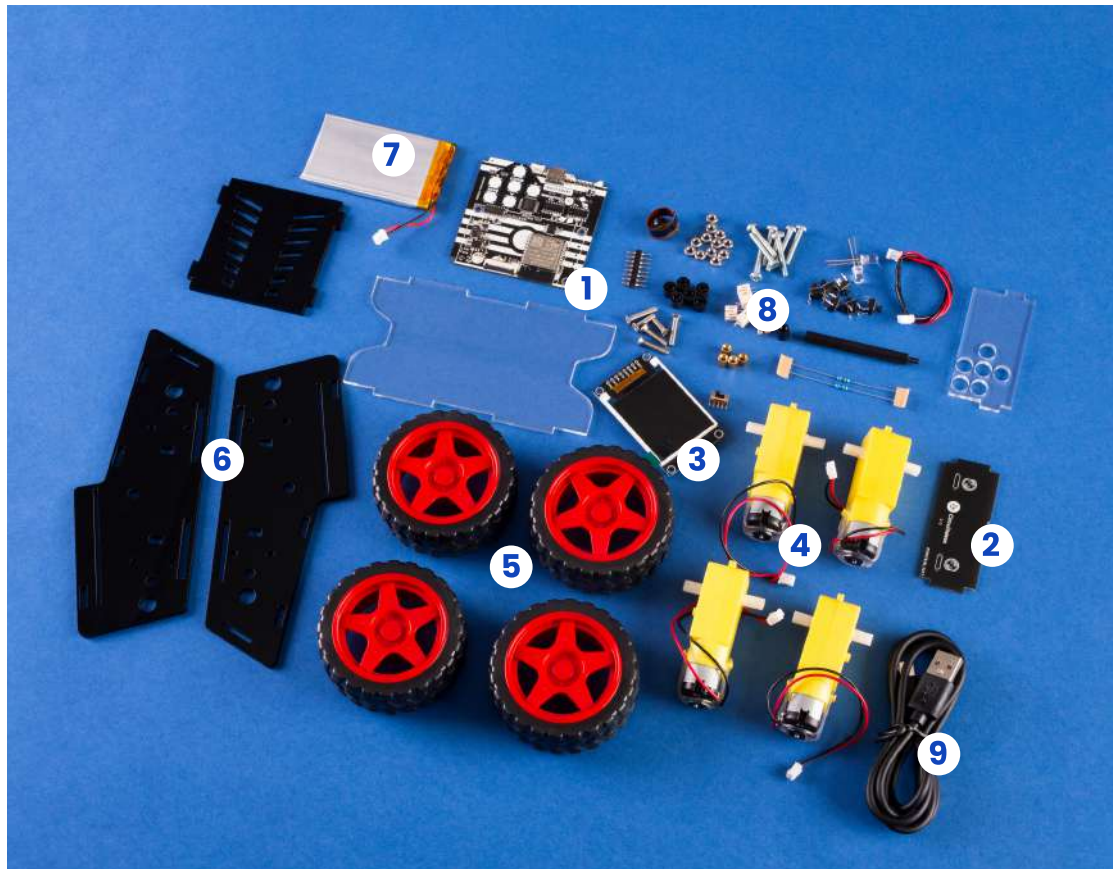
2020: Tesla's Model 3 has become the world's all-time best selling plug-in electric car, with more than 800,000 vehicles delivered through December 2020.

2021: CircuitMess created **Wheelson** - an educational autonomous car



What's inside the box?

- | | | |
|--------------------------------------|-----------------------------|---|
| 1 Main circuit board | 4 Four electromotors | 7 Li-Po battery |
| 2 Camera and headlights board | 5 Wheels | 8 Bag of small components |
| 3 Display board | 6 Plastic chassis | 9 USB-C cable for charging and programming |



What will you learn?



How to assemble a small 4-wheeled robot

How to control an electromotor using a microcomputer



How computer vision works

How to calibrate your robot's camera

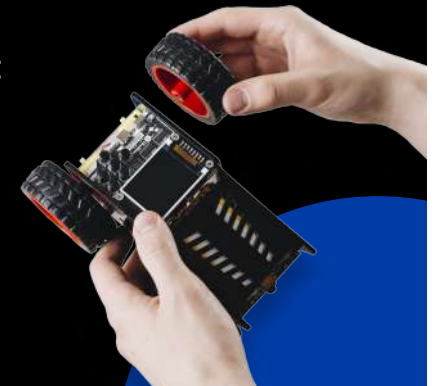


How autonomous cars work and how to make your car navigate a road autonomously

How to recognize and scan a QR code using your robot's camera



How to recognize different simple objects using a camera and image processing algorithms



How do autonomous cars work?

Autonomous cars rely on sensors, actuators, complex algorithms, machine learning systems, and powerful processors to execute software.



Autonomous cars create and maintain a map of their surroundings based on a variety of sensors situated in different parts of the vehicle.

Radar sensors monitor the position of nearby vehicles.

Video cameras detect **traffic lights**, read **road signs**, track other **vehicles**, and look for **pedestrians**.

Lidar (light detection and ranging) sensors bounce pulses of light off the car's surroundings to measure distances, detect road edges, and identify lane markings.

Ultrasonic sensors detect curbs and other vehicles when parking.

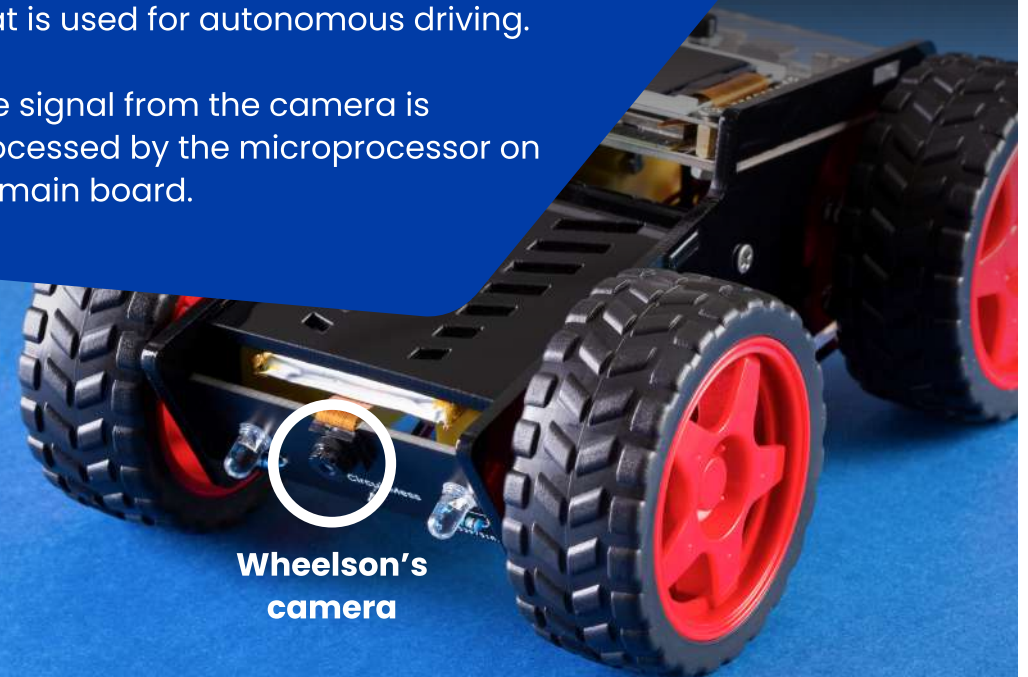


Sophisticated software then processes all the sensory input, plots a path, and sends instructions to the car's actuators, which control acceleration, braking, and steering.

Hard-coded rules, obstacle avoidance algorithms, predictive modeling, and object recognition help the software follow traffic rules and navigate obstacles.

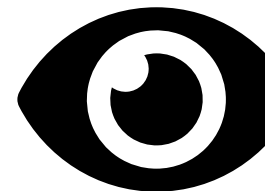
Wheelson has a single **video camera** that is used for autonomous driving.

The signal from the camera is processed by the microprocessor on its main board.



Wheelson's camera

This process is also known as **computer vision** - which is basically a process where a computer needs to use an algorithm to determine a certain action depending on the video feed from a camera.



Where does Wheelson get its power from?

Though it may be small, Wheelson is a real electric car.



Electric cars charge by **plugging into a charge point and taking electricity from the grid.**

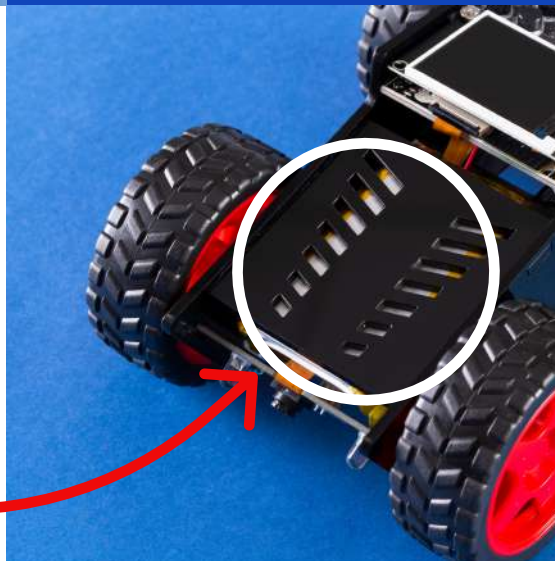
They store electricity in rechargeable batteries that power an electric motor, which turns the wheels.

Electric cars accelerate faster than vehicles with traditional fuel engines – so they feel lighter to drive.

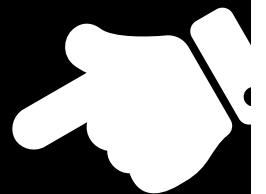
Wheelson has a **single-cell rechargeable Li-Po battery.**

Li-Po stands for lithium polymer battery which describes the composition of the battery.

These batteries are one of the most widely used ones nowadays and can be found in your phone, laptop, smartwatch, etc.



FUN FACT – How do autonomous cars see in the dark?



Computer Vision-Enabled Low-Light Mode

In order to process low-light images and videos, self-driving vehicles use different algorithms than the ones used for daylight.

The images captured in low light may be blurry and such data may not be accurate enough for autonomous driving.



As soon as a computer vision algorithm detects low-light conditions, it can shift to low-light mode.

Autonomous cars navigate in low-light conditions using **Lidar sensors, thermal cameras, and HDR sensors.** These types of equipment can be used to create high-quality images and videos in low-light environments.

Safety first!

Before you start with the assembly, pay attention to the following safety measures:

-  **1** Handling a soldering iron and a screwdriver is **not recommended for children under the age of 9!**
-  **2** **Keep Wheelson away from young children!** This product contains small components that are dangerous to children under the age of 3.
-  **3** If you are a minor, assemble Wheelson strictly with the help of an adult.

Wheelson is not a toy for toddlers.

Closely follow all the instructions you received in this kit and those found on our online pages so that no one gets hurt.

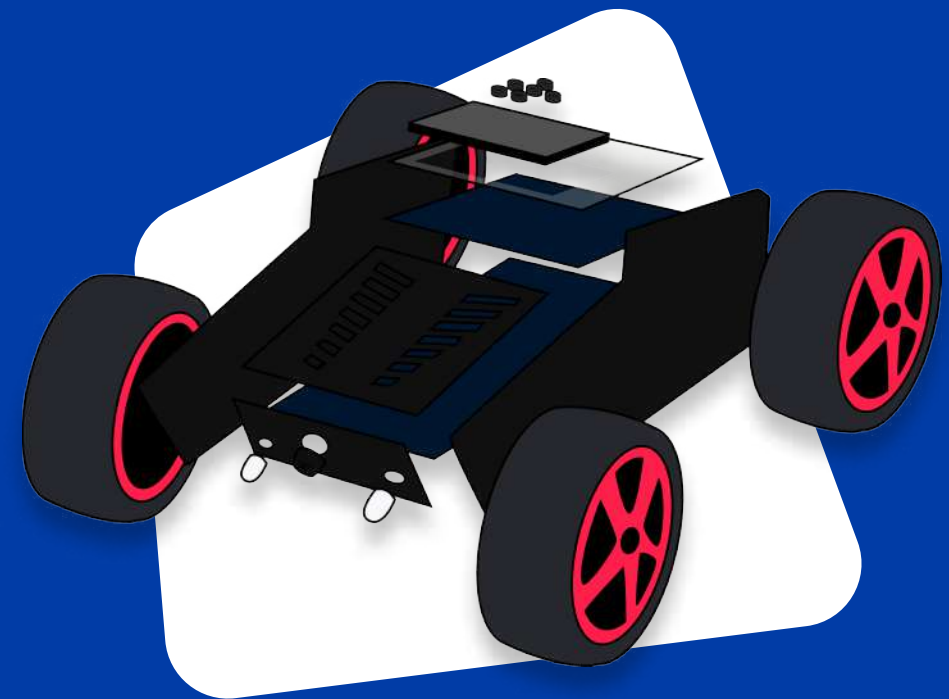
If you have never used a soldering iron or a screwdriver, **carefully follow the assembly instructions** on our website and, if necessary, ask someone more experienced or older than you to help you.

If you are having problems with our kit, contact our customer support via email at contact@circuitmess.com.

Happy soldering!

To build your Wheelson, go to:

 circuitmess.com/build 



 **CircuitMess**

WHEELSON



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