

# Bolinho

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**Solution for data gathering, processing and interaction**

*Hefestus*

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# 1. Home

---

## 1.1 Home

---

Documentation of the FullStack solution **bolinho**.

This documentation automatically generates a **PDF file** from it's content. You can download it [here](#).

### 1.1.1 You can see the React [Front-end HERE!](#)

---

This is a static version of the app, without access to the server, therefore most features won't work.

#### Info

Remember that you need to build the app for it to show on the static page, so run `npm run buildWeb` or something similar to build it.

Use the **Tabs** above to navigate through the documentation.

---

### 1.1.2 Running

---

As for running the program we have a few options:

- Run only the frontend `npm run startWeb`
- Run only the backend `npm run startEel`
- Serve the full application `npm run serve`

This command will start the eel as headless and start the web serve, it doesn't need to build the front end before executing. **Less performant**.

To update the backend ability to call front end functions you should first build the front.

- Run the full application `npm run start`

With this command it will first build the react front end, then run the python script.

- Build the react frontend `npm run buildWeb`
- Build binaries. `npm run buildBin`
- You can build the "binaries", more like a python environment wrapper, it uses [PyInstaller](#) to generate the bins.
- The output path is `bolinho/src/dist/`

Did you like this documentation? You can check out the repo [ZRafaF/ReadTheDocksBase](#) for more info 😊.

## 1.2 Setup

---

This page will define the step-by-step to build this project.

This project assumes you have the latest version of [Python](#), **PIP** and **GIT**,

This project was developed using python version `Python 3.10.x`

### 1.2.1 Clone the repo

---

**Bash**

```
git clone https://github.com/HefestusTec/bolinho  
  
cd bolinho
```

### 1.2.2 Creating a virtual environment

---

The following step isn't mandatory but **recommended**.

**Bash**

```
python -m pip install --user virtualenv  
  
python -m venv venv
```

The a directory `venv` should be created in the root folder.

How to activate:

#### Windows activation

```
venv/Scripts/activate
```

OR

#### Linux activation

```
source venv/bin/activate
```

---

### 1.2.3 Installing dependencies

---

**Bash**

```
npm run installDep
```

---

## 1.2.4 Documentation

The following step is only required for those that want to **edit the documentation**.

### Installing dependencies

**Bash**

```
pip install -r docs/requirements.txt
```

### Build

We have two options to create a build:

- **Serve:**

This option is used for debugging, it will open the static page in one of the localhost ports.

```
mkdocs serve
```

- **Build:**

This option creates a build of the documentation and saves it on the directory `/site/`.

```
mkdocs build
```

#### Note

Be aware of the **Environment Variable** `ENABLE_PDF_EXPORT`, it will only generate the PDF if this variable is set to `1`.

You can change the `mkdocs.yml` file and remove this line if you so choose.

For more info about the documentation please checkout [ZRafaF/ReadTheDocksBase](#).

## 2. Manual do usuário

---

### 2.1 Manual do usuário

---

Aqui você encontrará o manual do usuário da aplicação **Bolinho**.

## 2.2 Inspeccionando

---

Como inspeccionar experimentos já realizados.

## 2.3 Configuração

---

Como configurar.



## 2.4 Calibração

---

Como calibrar.

## 2.5 Controle manual

---

Como controlar o maquinário manualmente.

## 2.6 Novo experimento

---

Como criar um novo experimento.

## 3. Embedded

---

### 3.1 Embedded

---

Bolinho uses a microcontroller [esp32-s3](#) for controlling the hardware.

The microcontroller communicates via serial to the host, and is responsible for reading the load cell and controlling the stepper motor.

## 4. API

---

### 4.1 API

---

In this section you will be able to find every **API call** available.

These **calls** are exposed to the **front-end** via the **eel** object, giving it access to the **data base**, **systems** and **hardware**. This solution makes use of the **eel** library to realize the communication between the front-end and back-end;

This API reference will show the methods being called by the front-end in JavaScript, and every call should be made **asynchronously**.

#### 4.1.1 How to create and expose functions to the backend

---

##### React

```
function myJsFunction(message){
  console.log(`Got this from the back end ${message}`)
}

// This line exposes the function to the back end, note the second argument, it is the name
// that the back end needs to call
window.eel.expose(myJsFunction, "myJsFunction");
```

##### Python

```
try:
    eel.myJsFunction("IT'S WORKING")
except:
    pass
```

## 4.2 Front end API

---

This page gathers all the API calls that can be used by the backend.

Backend -> Front end

### Warning

The functions can only be called if they are available on the `web/build` directory, therefore if you make a change using `npm run serve` won't show it, you will need to rebuild the front end with `npm run buildWeb` or by using `npm run start`.

### Note

These functions can only be called after eel is initiated with `eel.init()`.

### 4.2.1 Core API

---

Collection of all functions/API calls available to the backend. You can find them in the `bolinho_api/core.py` file.

The JavaScript file can be found in the `api` folder.

---

## ping()

### ping()

Tries to ping the bolinho front-end, returns 1 if it worked

#### Python usage example

```
from bolinho_api.core import core_api

while True:
    try:
        if core_api.ping():
            print("got a ping!")
            break
        pass
    except:
        eel.sleep(1)
```

---

## get\_config\_params()

### get\_config\_params()

Tries to ping the bolinho front-end, returns 1 if it worked

#### Python usage example

```
from bolinho_api.core import core_api

config = core_api.get_config_params()
current_save_version = config["configVersion"]
print(current_save_version)
```

This function is located at `src/web/src/App.js`

## go\_to\_experiment\_page()

### go\_to\_experiment\_page()

Asks the front end to go to the experiment page.

Returns 1 if succeeded.

#### Python usage example

```
from bolinho_api.core import core_api

change_pages = True
if change_pages:
    core_api.go_to_experiment_page()
```

## go\_to\_home\_page()

### go\_to\_home\_page()

Asks the front end to go to the home page.

Returns 1 if succeeded.

#### Python usage example

```
from bolinho_api.core import core_api

change_pages = True
if change_pages:
    core_api.go_to_home_page()
```

## set\_is\_connected()

### set\_is\_connected()

Sets the variable "isConnected" on the front-end.

#### Python usage example

```
from bolinho_api.core import core_api

core_api.set_is_connected(True)
```

## refresh\_data()

### refresh\_data()

Sets the variable "isConnected" on the front-end.

#### Python usage example

```
from bolinho_api.core import core_api

add_material_to_db() #Arbitrary function that adds a material to the DB

core_api.refresh_data()
```

## 4.2.2 UI API

Collection of all functions/API calls available to the backend for UI in general. You can find them in the `bolinho_api/ui.py` file.

The JavaScript file can be found in the `api` folder.

## success\_alert(text)

### success\_alert(text)

Uses [React-Toastify](#) to create an success alert.

#### Python usage example

```
from bolinho_api.ui import ui_api

ui_api.success_alert("Success!")
```



## error\_alert(text)

### error\_alert(text)

Uses [React-Toastify](#) to create an error alert.

#### Python usage example

```
from bolinho_api.ui import ui_api

ui_api.error_alert("Error!")
```

## prompt\_user(description, options, callback\_func)

### prompt\_user(description, options, callback\_func)

Prompts the user with a 'description', and shows the 'options' to the user.

The result is passed to the callback\_function

#### Python usage example

```
from bolinho_api.ui import ui_api

def get_result(result):
    if result == "yes":
        print("The user chose yes")
    print("The user chose no")

ui_api.prompt_user(
    description="Do you want to pay 1000?",
    options=["yes", "no"],
    callback_func= get_result,
)
```

## set\_focus(focus\_element: str)

### error\_alert(focus\_element: str)

Focus in an specific element on the frontend.

WARNING Pay attention to the name of the element you are trying to focus

You can find them at <https://github.com/HefestusTec/bolinho/blob/main/src/web/src/api/apiTypes.ts>

#### Python usage example

```
from bolinho_api.ui import ui_api

ui_api.set_focus("connection-component")
```

## 4.2.3 Experiment page API

Collection of all functions/API calls available to the backend for the **experiment** routine. You can find them in the `bolinho_api/experiment.py` file.

The JavaScript file can be found at `web/src/api/contexts/ExperimentPageContext.tsx`.

## set\_time(newValue)

### set\_time(newValue)

Sets the current time of the experiment.

This variable is shown to the user as value and progress bar.

#### Python usage example

```
from bolinho_api.experiment import experiment_api

experiment_api.set_time(22)
```

## set\_delta\_load(newValue)

### set\_delta\_load(newValue)

Sets the current delta load.

This variable is shown to the user as value and progress bar.

#### Python usage example

```
from bolinho_api.experiment import experiment_api

experiment_api.set_delta_load(22)
```

## get\_readings()

### get\_readings()

Asks the front for the current Readings.

Returns an object of type Readings, this object gathers all the current readings of the machine. Such as Current z axis position, current load, and status

#### Python usage example

```
from bolinho_api.experiment import experiment_api

reading_obj = experiment_api.get_readings()

print(reading_obj.status)
```

## set\_readings(newValue)

### set\_readings(newValue)

Sets the current Readings.

Receives an object of type Readings, this object gathers all the current readings of the machine. Such as Current z axis position, current load, and status.

This function dumps the object to a JSON and sends it to the front end

#### Python usage example

```
from bolinho_api.experiment import experiment_api
from bolinho_api.classes import Readings

new_machine_readings = Readings(299, 87, 300, "not good")

experiment_api.set_readings(new_machine_readings)
```

## 4.3 Backend API

---

This page gathers all the API calls that can be used by the front end.

Front end -> Backend

---

### 4.3.1 Global configuration

---

Collection of all functions/API calls available to the front end that handles the global variables.

---

#### saveConfigParams(configParams)

##### saveConfigParams(configParams)

Saves the config parameters to the persistent file

##### React usage example

```
import { saveConfigParams } from "../api/backend-api";

saveConfigParams(globalConfig);
```

#### loadConfigParams()

##### loadConfigParams()

Loads the config parameters from the persistent file

##### React usage example

```
import { loadConfigParams } from "../api/backend-api";

globalConfig = loadConfigParams();
```

### 4.3.2 Data base

---

Collection of all functions/API calls available to the front end that handles the communication with the data base, such as fetching and storing data.

---

## getMaterialList()

### getMaterialList()

#### TODO

##### React usage example

```
import { getMaterialList } from "../api/backend-api";

globalConfig = getMaterialList();
```

## getMaterialAt(index)

### getMaterialAt(index)

Returns the material at an `index` from the database.

##### React usage example

```
import { getMaterialAt } from "../api/backend-api";

const elem21 = getMaterialAt(21);
```

## getExperimentAt(index)

### getExperimentAt(index)

Returns the experiment at an `index` from the database.

##### React usage example

```
import { getExperimentAt } from "../api/backend-api";

const elem21 = getExperimentAt(21);
```

## getDataPointArrayAt(index)

### getDataPointArrayAt(index)

Returns an array of `DataPoint` at an `index` from the database.

#### React usage example

```
import { getDataPointArrayAt } from "../api/backend-api";
import { DataPointType } from "types/DataPointTypes";

const dataPointArrya: DataPointType[] = getDataPointArrayAt(21);
```

## postMaterialJS(material)

### postMaterialJS(material)

Posts a new material to the Data base

#### React usage example

```
import { postMaterialJS } from "../api/backend-api";

postMaterialJS({
  //...
})
```

## patchMaterialByIdJS(patchMaterial)

### patchMaterialByIdJS(patchMaterial)

Patches an existing material in the Data base

#### React usage example

```
import { patchMaterialByIdJS } from "../api/backend-api";

patchMaterialByIdJS({
  id: 2,
  supplier_name: "Meu novo fornecedor",
  supplier_contact_info: "(12) 9 9123-0192",
  extra_info: "Hehe muito legal",
})
```

## deleteMaterialByIdJS(id)

### deleteMaterialByIdJS(id)

Deletes an existing material in the Data base.

#### React usage example

```
import { deleteMaterialByIdJS } from "../api/backend-api";

deleteMaterialByIdJS(22)
```

## postExperimentJS(experiment)

### postExperimentJS(experiment)

Posts a new experiment to the Data base

#### React usage example

```
import { postExperimentJS } from "../api/backend-api";

postExperimentJS({
  // ...
})
```

## patchExperimentByIdJS(patchExperiment)

### patchExperimentByIdJS(patchExperiment)

Patches an existing experiment in the Data base

#### React usage example

```
import { patchExperimentByIdJS } from "../api/backend-api";

patchExperimentByIdJS({
  id: 2,
  name: "Meu novo nome",
  extra_info: "Hehe muito legal",
})
```



## deleteExperimentByIdJS(id)

### deleteExperimentByIdJS(id)

Deletes an existing experiment in the Data base.

#### React usage example

```
import { deleteExperimentByIdJS } from "../api/backend-api";

deleteExperimentByIdJS(22)
```

## 4.3.3 Core

## checkCanStartExperimentJS()

### checkCanStartExperimentJS()

This function calls the `check_can_start_experiment(experiment_id)` on the backend.

The front end will call this function when the user click to start experiment.

The backend **MUST** respond with a 1 if everything is ok or 0 if something is not correct.

In case something is wrong the backend also displays an error to the user telling what went wrong

#### React usage example

```
import { checkCanStartExperimentJS } from "../api/backend-api";

onClick(()=>{
  checkCanStartExperimentJS(2);
});
```

## startExperimentRoutineJS(experimentId)

### startExperimentRoutineJS(experimentId)

This function calls the `start_experiment_routine(experiment_id)` on the backend.

The front end will call this function after everything is correct and ready to change pages.

Receives an `id` to an experiment as parameter.

The backend **MUST** send a command to change to the experiment page.

Returns 1 if succeeded.

#### React usage example

```
import { startExperimentRoutineJS } from "../api/backend-api";

onClick(()=>{
  startExperimentRoutineJS(2);
});
```

## endExperimentRoutineJS()

### endExperimentRoutineJS()

This function calls the `end_experiment_routine()` on the backend.

Usually it should be used to handle when the user press a "end experiment" button or something similar.

#### React usage example

```
import { getMaterialList } from "../api/backend-api";

onClick(()=>{
  endExperimentRoutineJS();
});
```

## setCustomMovementDistanceJS()

### setCustomMovementDistanceJS()

#### Warning

DEPRECATED

This function calls the `set_custom_movement_distance(new_movement_distance)` on the backend.

Sets the movement distance that the z-axis moves when the user is controlling the machine manually.

This distance is set in MILLIMETERS

Returns 1 if succeeded.

#### React usage example

```
import { setCustomMovementDistanceJS } from "../api/backend-api";

onClick(()=>{
  // Sets the movement distance to 50 mm
  setCustomMovementDistanceJS(50);
});
```

## returnZAxisJS()

### returnZAxisJS()

This function calls the `return_z_axis()` on the backend.

Returns the z-axis to the origin.

Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { returnZAxisJS } from "../api/backend-api";

onClick(()=>{
  returnZAxisJS();
});
```

## stopZAxisJS()

### stopZAxisJS()

This function calls the `stop_z_axis()` on the backend. Stops the z-axis. Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { stopZAxisJS } from "../api/backend-api";

onClick(()=>{
  stopZAxisJS();
});
```

## moveZAxisMillimetersJS(distance)

### moveZAxisMillimetersJS(distance)

This function calls the `move_z_axis_millimeters(distance)` on the backend. Moves the z-axis [distance]mm. This distance is set in MILLIMETERS Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { moveZAxisMillimetersJS } from "../api/backend-api";

onClick(()=>{
  moveZAxisMillimetersJS(10);
});
```

## getAvailablePortsListJS()

### getAvailablePortsListJS()

This function calls the `get_available_ports_list()` on the backend. Returns a JSON object containing the available COM ports:

#### JSON

```
{
  "port": x,
  "desc": y,
}
```

#### React usage example

```
import { getAvailablePortsListJS } from "../api/backend-api";

onClick(()=>{
  getAvailablePortsListJS().then((availablePorts)=>{
    if(availablePorts) console.log(availablePorts);
  });
});
```

## connectToPortJS()

### connectToPortJS()

This function calls the `connect_to_port()` on the backend. Connects to a port. The port argument is a string like `COM4`

Returns 1 connection was successful

#### React usage example

```
import { connectToPortJS } from "../api/backend-api";

onClick(()=>{
  connectToPortJS("COM3");
});
```

## disconnectGranuladoJS()

!!! quote "### disconnectGranuladoJS() ()" This function calls the `disconnect_granulado()` on the backend.

#### Text Only

Returns 1 connection was successful

```
``` javascript title="React usage example"
import { disconnectGranuladosJS } from "../api/backend-api";

onClick(()=>{
  disconnectGranuladosJS("COM3");
});
```
```

## tareLoadJS()

### tareLoadJS()

This function calls the `tare_load()` on the backend. Tares the load cell Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { tareLoadJS } from "../api/backend-api";

onClick(()=>{
  tareLoadJS();
});
```

## calibrateKnownWeightJS()

### calibrateKnownWeightJS()

This function calls the `calibrate_known_weight()` on the backend. Calibrates the load cell to the known weight Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { calibrateKnownWeightJS } from "../api/backend-api";

onClick(()=>{
  calibrateKnownWeightJS();
});
```

## calibrateZAxisJS()

### calibrateZAxisJS()

This function calls the `calibrate_z_axis()` on the backend. Calibrates z axis of the machine Returns 1 if succeeded (if the function was acknowledged).

#### React usage example

```
import { calibrateZAxisJS } from "../api/backend-api";

onClick(()=>{
  calibrateZAxisJS();
});
```

## getGranuladolsConnectedJS()

### getGranuladolsConnectedJS()

This function calls the `get_granulado_is_connected()` on the backend. Checks if granulado is connected Returns a `boolean`

#### React usage example

```
import { getGranuladolsConnectedJS } from "../api/backend-api";

onClick(()=>{
  alert(getGranuladolsConnectedJS());
});
```

## 4.4 Data types

---

All different data types will be shown in this page

### ATTENTION

To see a more up to date version of the different data types please see [src/bolinho\\_api/classes.py](#) !

### 4.4.1 DataPoint

---

#### Python

```
class DataPoint:
    def __init__(self, x=0, y=0):
        self.x = x
        self.y = y
```

- **x** : Position at the measure moment
  - type: **float**
  - Unity: **mm**
  - **y** : Force at the measure moment
  - Type: **float**
  - Unity: **N**
-



## 4.4.2 Material

**Python**

```
class Material:
    def __init__(
        self,
        id=0,
        name="NONE",
        batch="",
        supplier_name="",
        supplier_contact_info="",
        extra_info="",
    ):
        self.id = id
        self.name = name
        self.batch = batch
        self.supplier_name = supplier_name
        self.supplier_contact_info = supplier_contact_info
        self.extra_info = extra_info
```

- **id** :
- type: `int`
- Unity: N/A
- **name** :
- type: `string`
- Unity: N/A
- **batch** :
- type: `string`
- Unity: N/A
- **supplier\_name** :
- type: `string`
- Unity: N/A
- **supplier\_contact\_info** :
- type: `string`
- Unity: N/A
- **extra\_info** :
- type: `string`
- Unity: N/A

### 4.4.3 Body

---

## Python

```
class Body:
    def __init__(
        self,
        id=0,
        type=1,
        material=Material(
            id=0,
            name="Base Material",
            batch="",
            supplier_name="",
            supplier_contact_info="",
            extra_info=""
        ),
        param_a=0,
        param_b=0,
        height=0,
        extra_info=""
    ):
        self.id = id
        self.type = type
        self.material = material
        self.param_a = param_a
        self.param_b = param_b
```

```
self.height = height
self.extra_info = extra_info
```

- `id`:
- Type: `int`
- Unity: N/A
- `type`: Body format \* 1 = Rectangle \* 2 = Cylinder \* 3 = Tube \* 4 = Other \* Type: `int` \* Unity: N/A
- `material`:
- Type: `Material`
- Unity: N/A
- `param_a`: Param 'a' of the body
- Rectangle = length
- Cylinder = External diameter
- Tube = External diameter
- Type: `float`
- Unity: `mm`
- `param_b`: Param 'b' of the body
- Rectangle = depth
- Cylinder = NULL
- Tube = Internal diameter
- Type: `float`
- Unity: `mm`
- `height`: Height of the test body
- Type: `float`
- Unity: `mm`
- `extra_info`:
- type: `string`
- Unity: N/A

## 4.4.4 Experiment

---

## Python

```

class Experiment:
    def __init__(
        self,
        id=0,
        name="None",
        body: Body = Body(
            id=0,
            type=1,
            material=Material(
                name="Material",
                batch="Batch",
                supplier_name="",
                supplier_contact_info="",
                extra_info="",
            ),
            param_a=0,
            param_b=0,
            height=0,
            extra_info="",
        ),
        date_time=0,
        load_loss_limit=0,
        max_load=0,
        max_travel=0,
        max_time=0,
        z_axis_speed=0,
        compress=False,
        extra_info="",
        plot_color="#ffffff",
    ):
        self.id = id
        self.name = name
        self.body = body
        self.date_time = date_time
        self.load_loss_limit = load_loss_limit
        self.max_load = max_load
        self.max_travel = max_travel
        self.max_time = max_time
        self.z_axis_speed = z_axis_speed
        self.compress = compress

```

```
self.extra_info = extra_info
self.plot_color = plot_color
```

- **id** :
- Type: **int**
- Unity: N/A
- **name** :
- type: **string**
- Unity: N/A
- **body** :
- Type: **Body**
- Unity: N/A
- **date\_time** : Date and time formatted as **dd/mm/yyyy**
- Type: **string**
- Unity: N/A
- **load\_loss\_limit** : Max load loss to trigger auto-stop.
- Type: **float**
- Unity: **N/s**
- **max\_load** : Max load limit to trigger auto-stop.
- Type: **float**
- Unity: **N**
- **max\_travel** : Max distance the experiment head can travel during the experiment.
- Type: **float**
- Unity: **mm**
- **max\_time** : Experiment time limit.
- Type: **float**
- Unity: **s**
- **z\_axis\_speed** :
- Type: **float**
- Unity: **mm/s**
- **compress** : Is the experiment type of compression? **false** implies expansion.
- Type: **bool**
- Unity: N/A
- **extra\_info** :
- type: **string**
- Unity: N/A
- **plot\_color** : System parameter
- type: **string**
- Unity: N/A

## 5. About

---

### 5.1 About

---

This page will present extra info about the project.

#### 5.1.1 Licenses

---

This software is licensed and distributed under the **GNU General Public License v3.0**

```
Copyright (C) 2023 Hefestus
```

```
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### Included third-party projects

- Python Eel - [see license](#)
- MkDocs - [see license](#)
- Material for MkDocs - [see license](#)
- MkDocs With PDF - [see license](#)
- MkDocs PDF Export Plugin - [see license](#)
- JSX Lexer - [see license](#)
- Roboto family of fonts - [see license](#)
- React - [see license](#)
- rc-slider - [see license](#)
- Chart JS - [see license](#)
- React Chart JS 2 - [see license](#)
- React Long Press Hook - [see license](#)
- React Colorful - [see license](#)
- React Toastify - [see license](#)
- Use Debounce - [see license](#)



- Use Long Press - [see license](#)
  - React Circular Progressbar - [see license](#)
  - React Transition Group - [see license](#)
  - Reactjs popup - [see license](#)
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Agradecemos do fundo do coração todos os autores dos diferentes projetos utilizados, **software livre** é liberdade, muito obrigado a todos.