

IoT and ML Infrastructure for Urban Biodiversity Monitoring

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Mitwelten — Medienökologische Infrastrukturen für Biodiversität

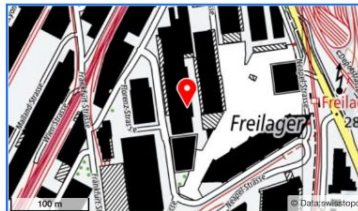
Interdisziplinäres Designforschungsprojekt (SNF, 2020-2024)

Wie können mediale Designinterventionen auf Grundlage des Internets der Dinge ökologisch und kulturell zur Förderung von Biodiversität in lokalen Ökosystemen beitragen?

Zur Beantwortung dieser Leitfrage wird in drei Fallstudien in Mensch-Umwelt-Aushandlungsprozessen medientechnologische Infrastruktur gestaltet und installiert: in der Kulturlandschaft der Merian Gärten bei Basel, im Dreispitzareal Basel und in der Reinacher Heide, einem Naturschutzgebiet in der Agglomeration Basels.



FS1: [Merian Gärten](#), Basel



FS2: [Dreispitzareal](#), Basel



FS3: [Reinacher Heide](#), BL

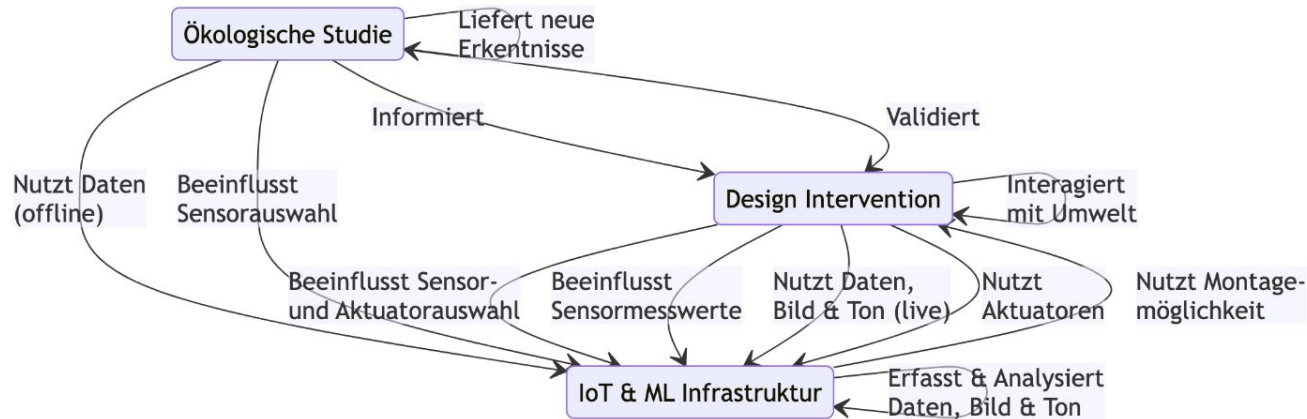


Forschungsfrage

Wie können mediale Designinterventionen auf Grundlage des Internets der Dinge ökologisch und kulturell zur Förderung von Biodiversität in lokalen Ökosystemen beitragen?

Teilprojekte

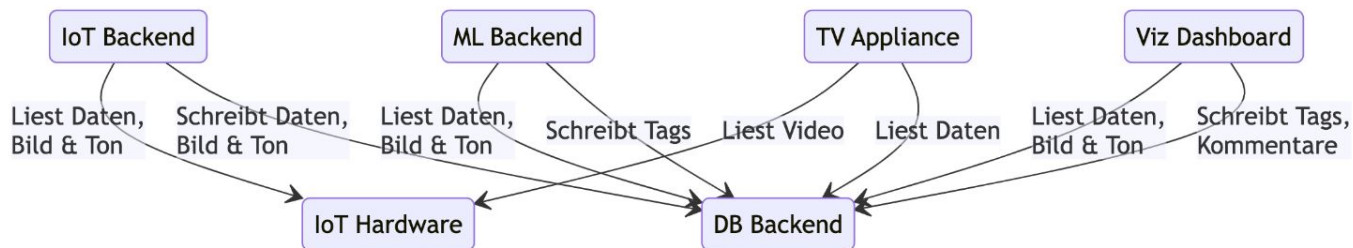
Teilprojekte und deren wichtigste Beziehungen.





IoT & ML Infrastruktur

Hardware und Software, inkl. Betrieb.



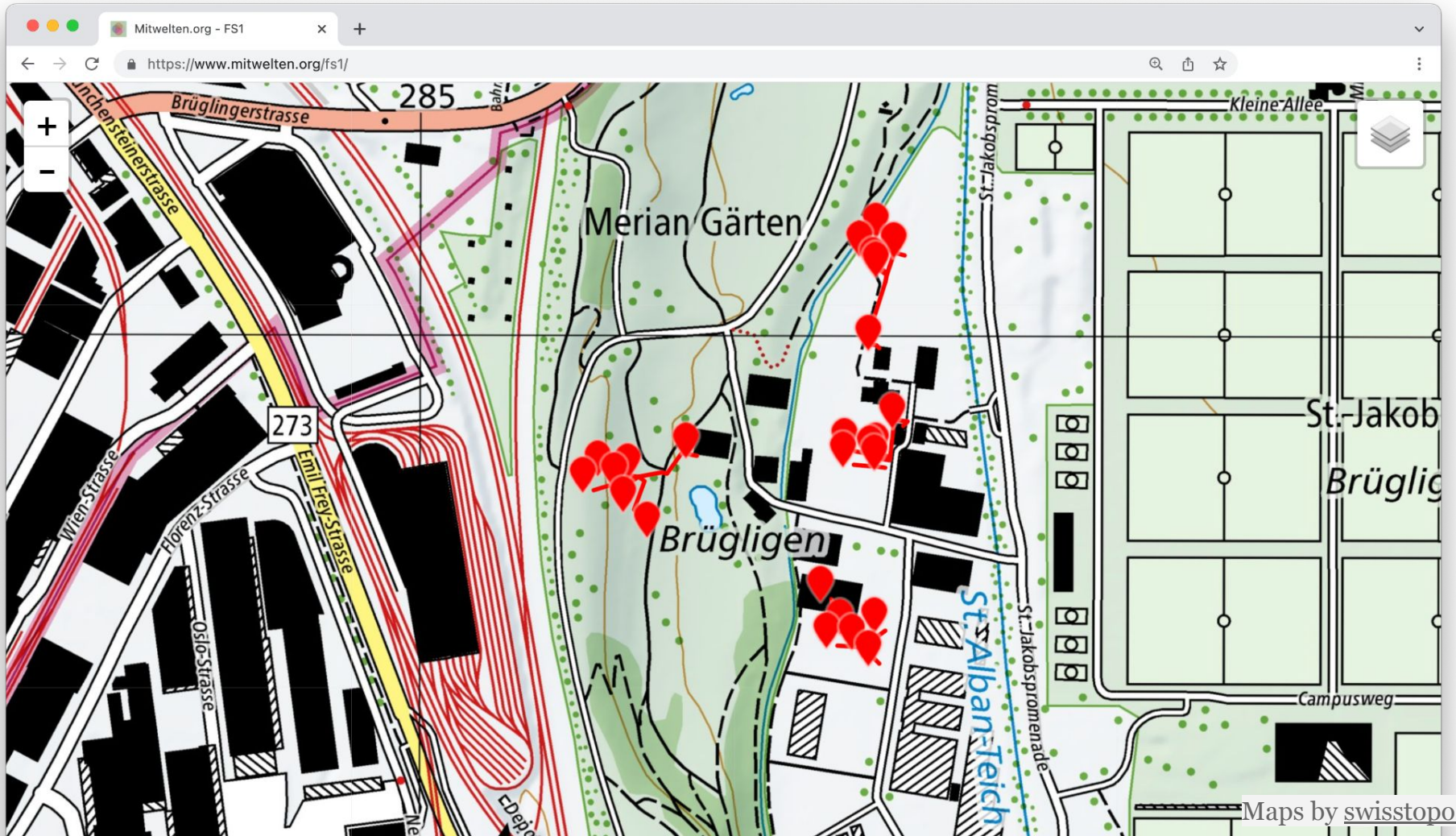
Team

- [Thomas](#) (IMVS)
- Cedric (IXDM)
- Simon (IMVS)
- Timeo (IMVS)

Hardware

- PoE Access Point ([Repo](#), [Tasks](#))
- PoE Pi Cam ([Repo](#), [Tasks](#))

The map and the terrain



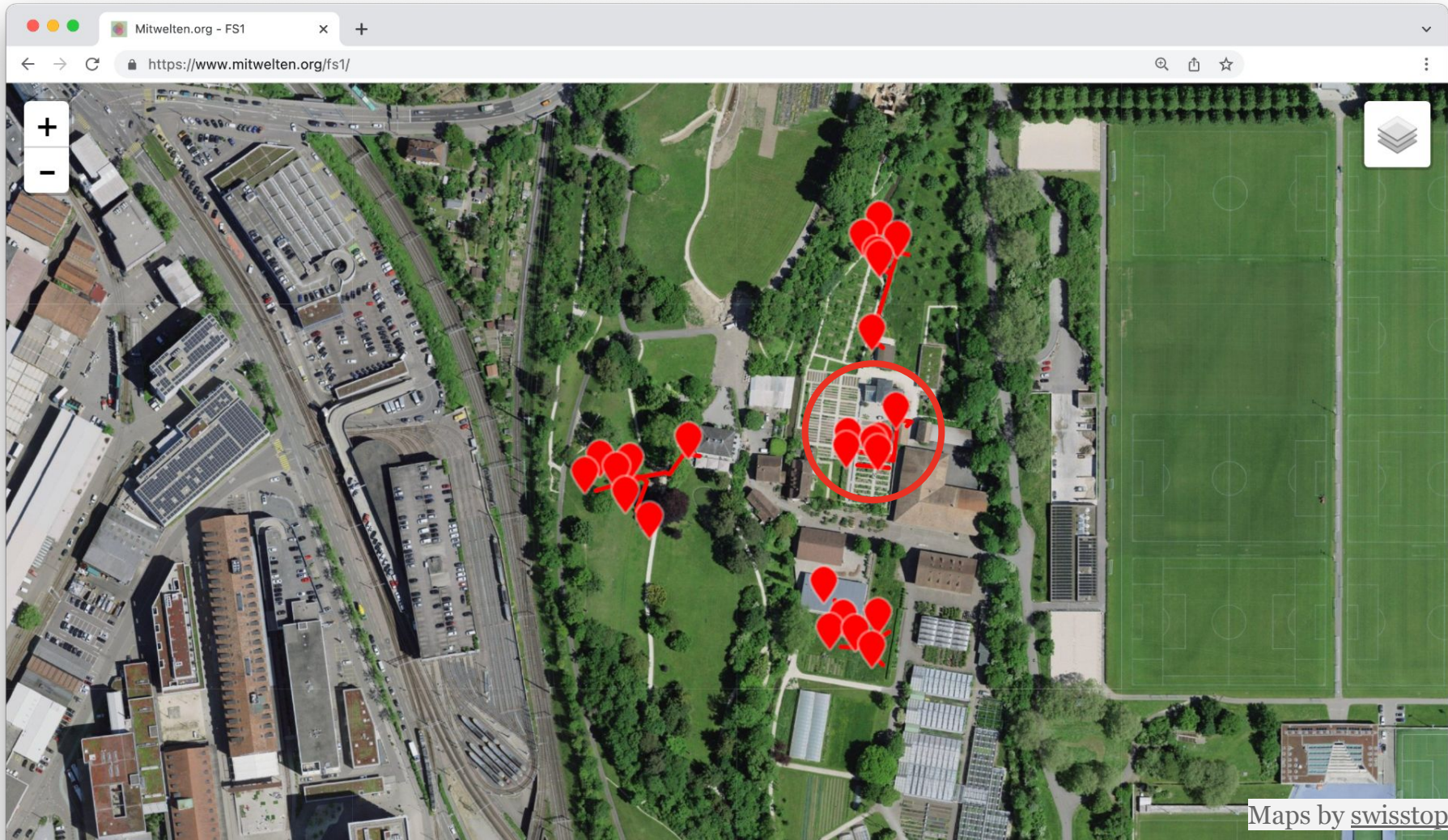
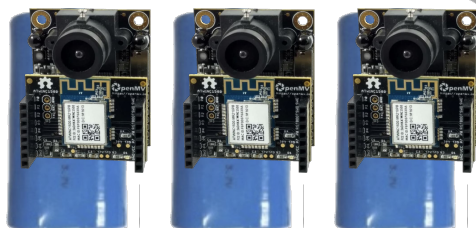






Photo CC BY-SA, @tamberg

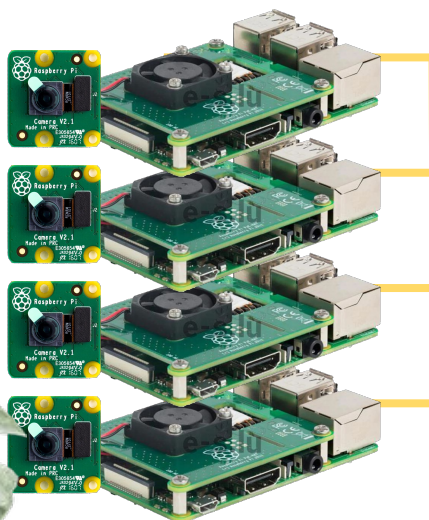
Low-end high tech



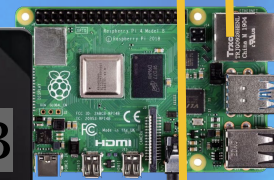
Wi-Fi,
30m



3/4G
uplink

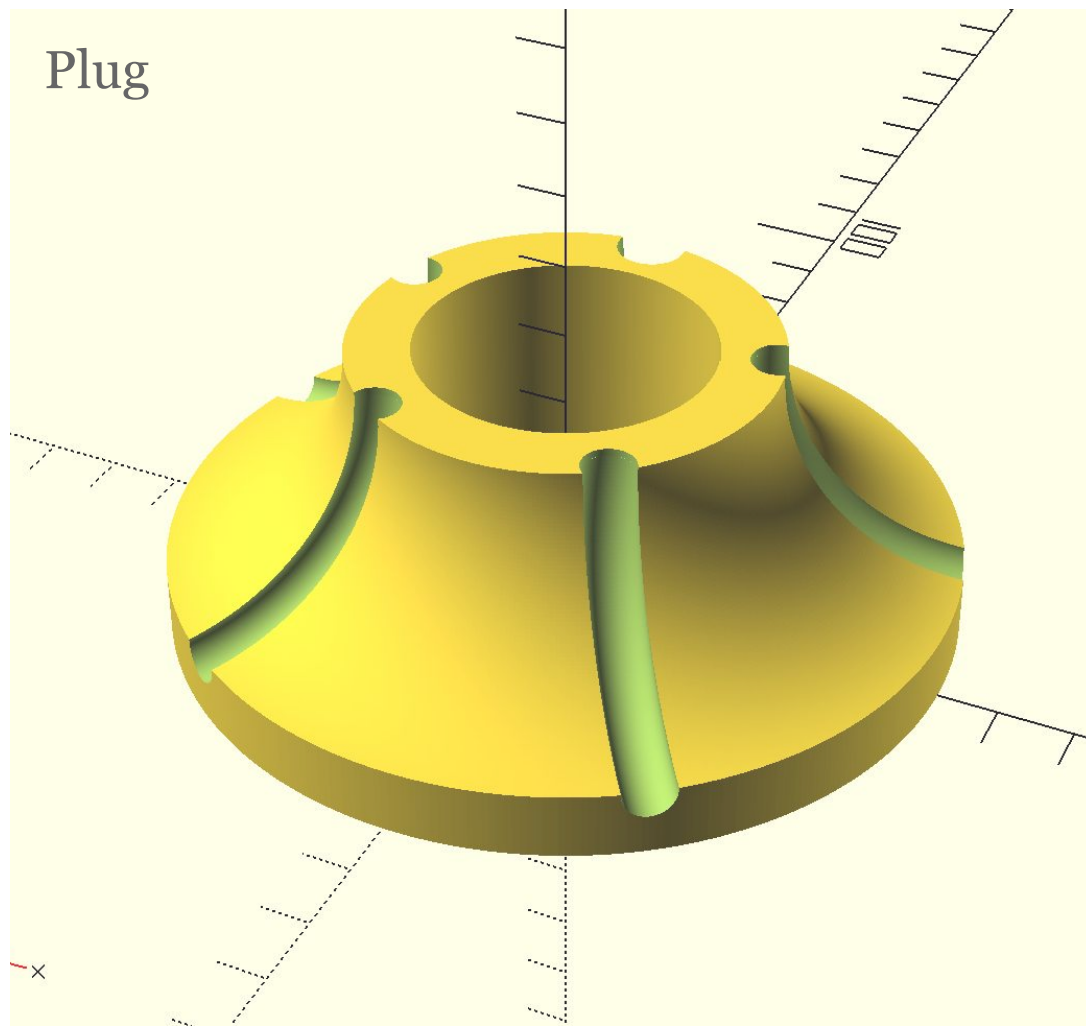


PoE,
20m

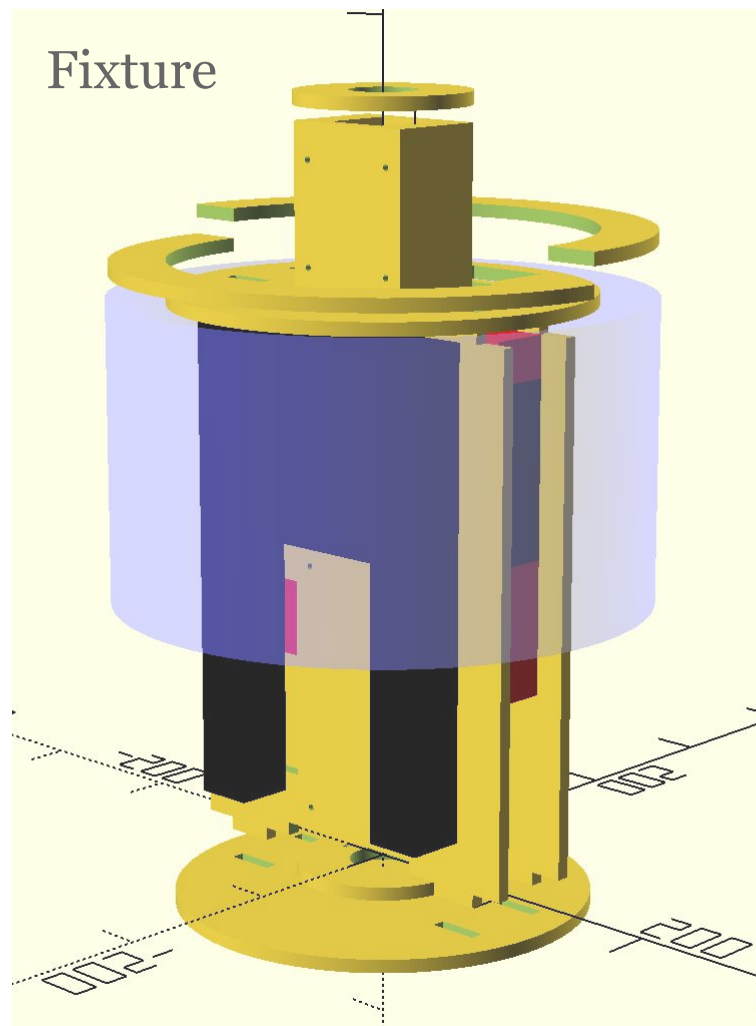


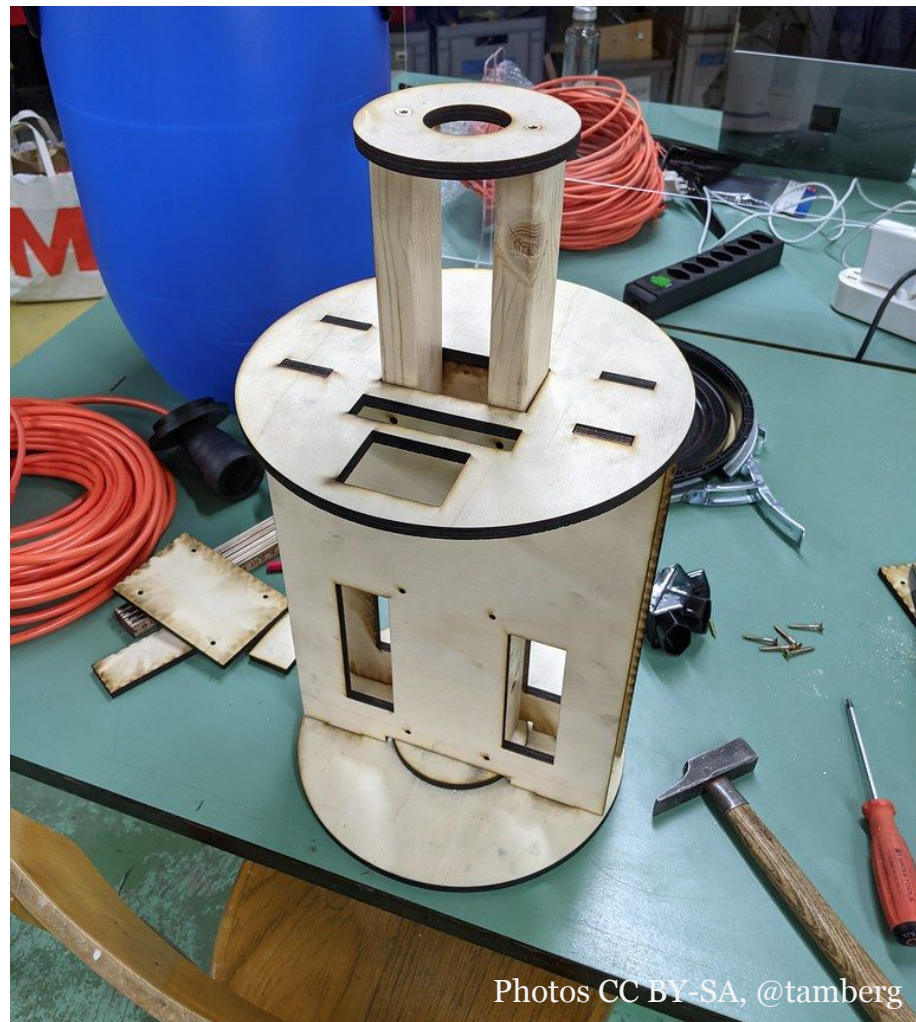
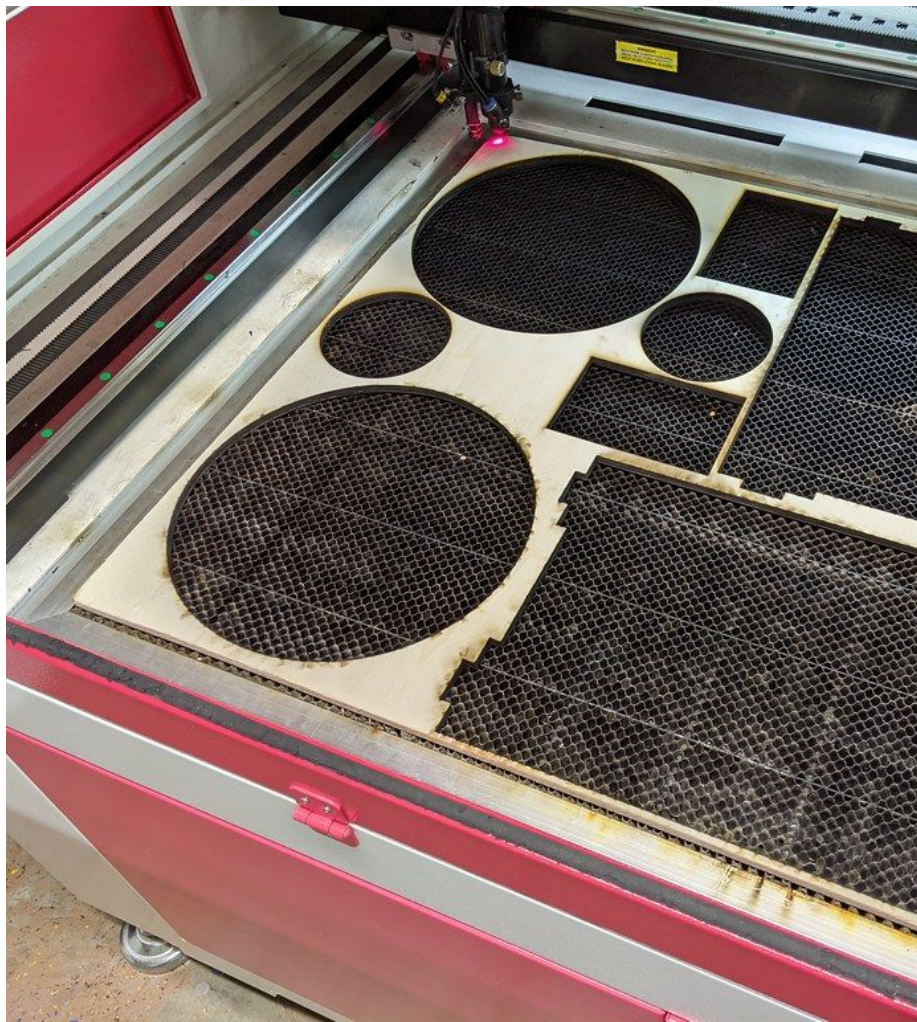
230V,
60m

Plug

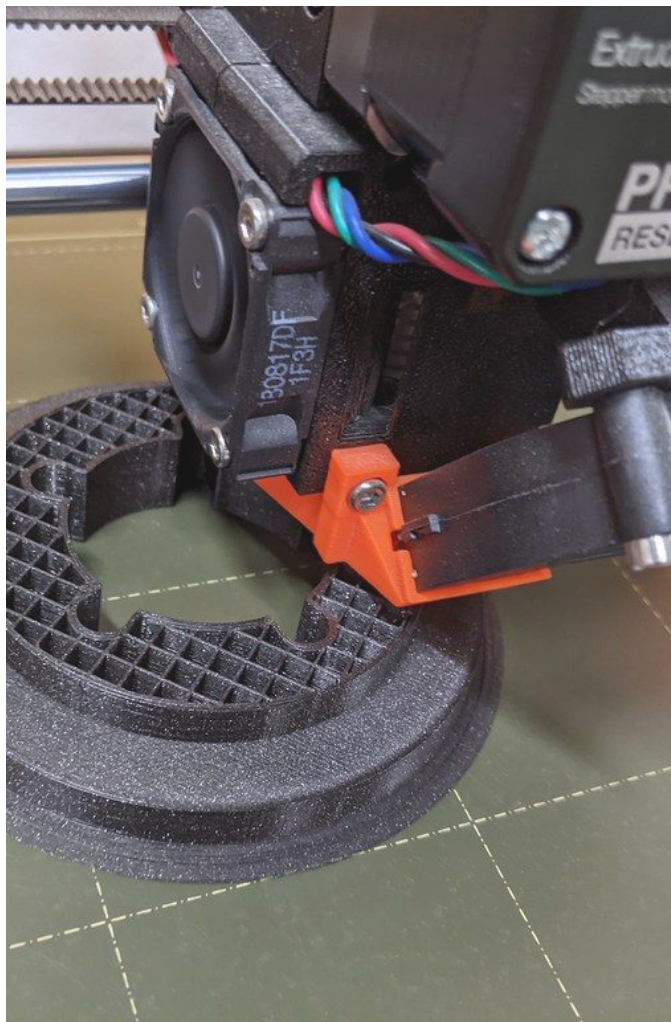


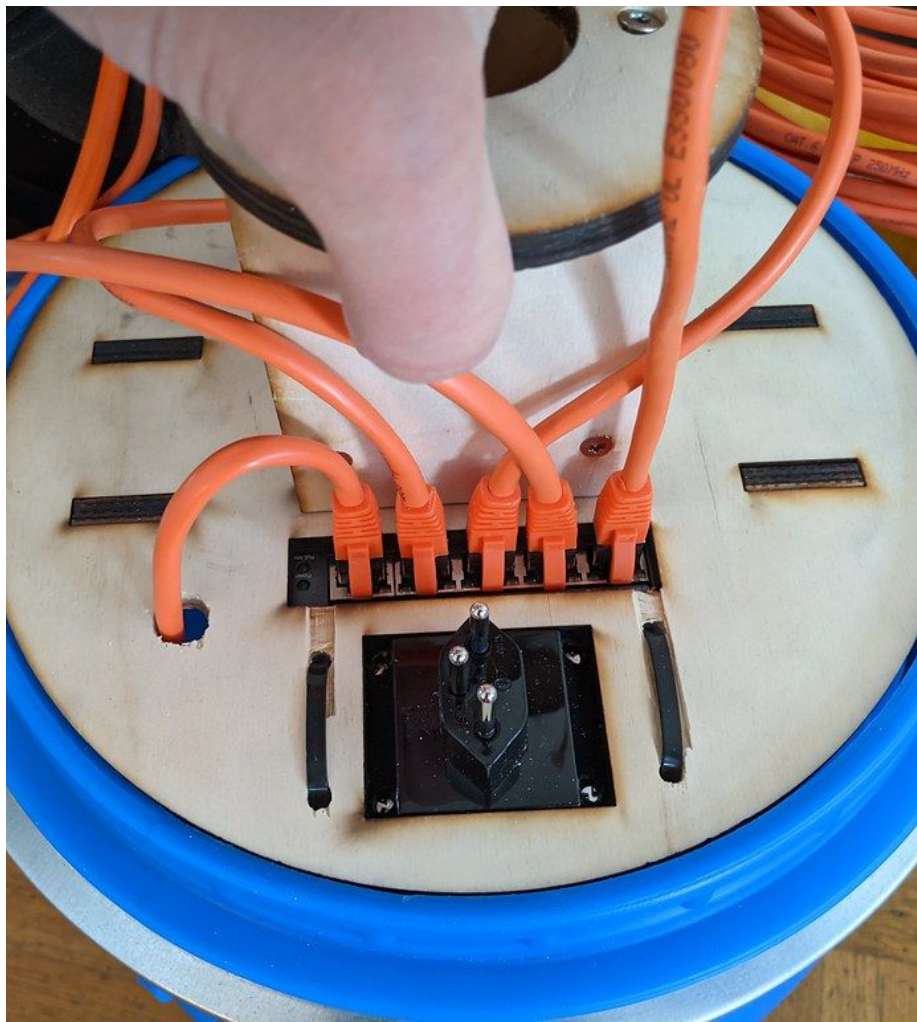
Fixture





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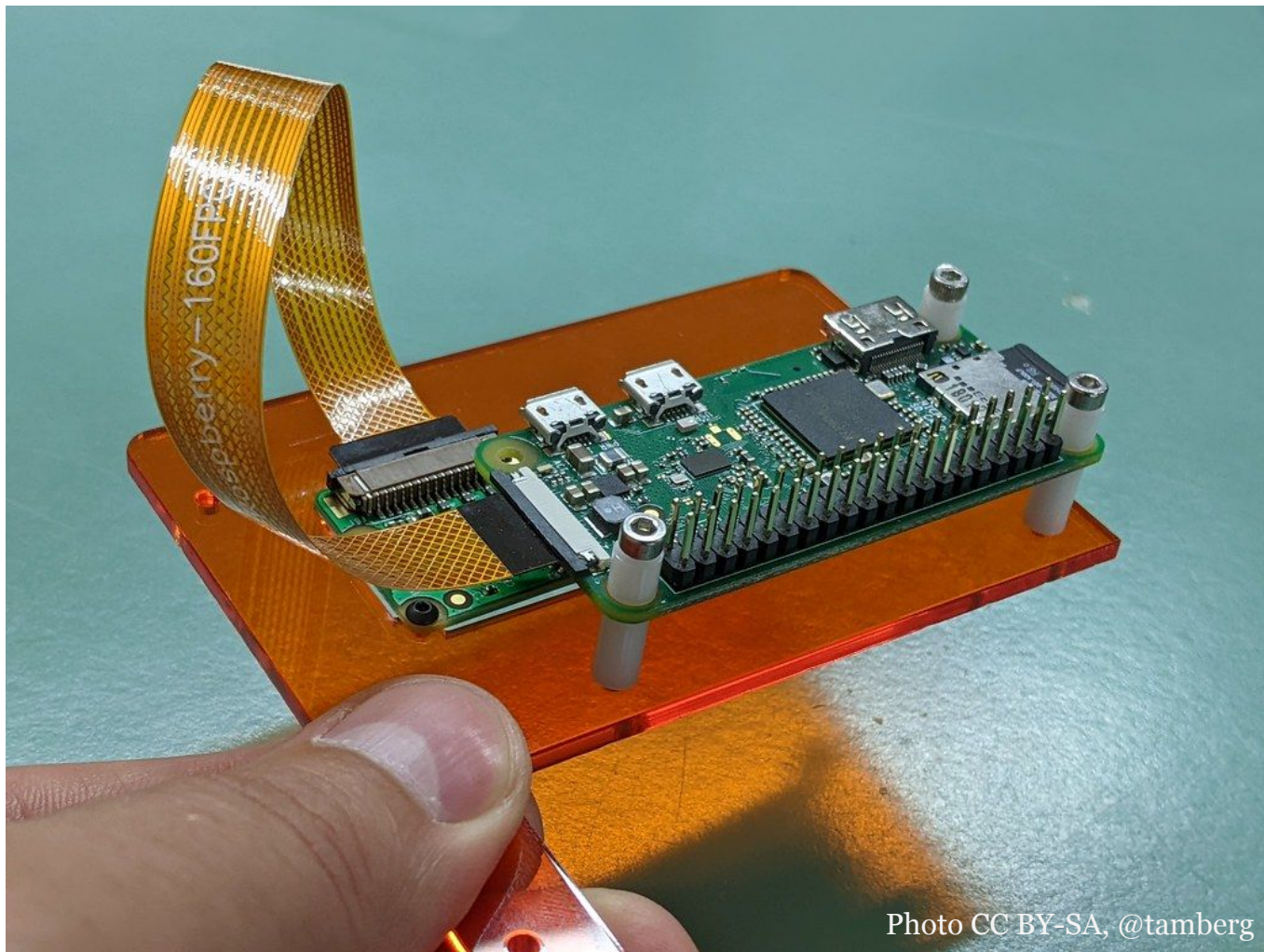


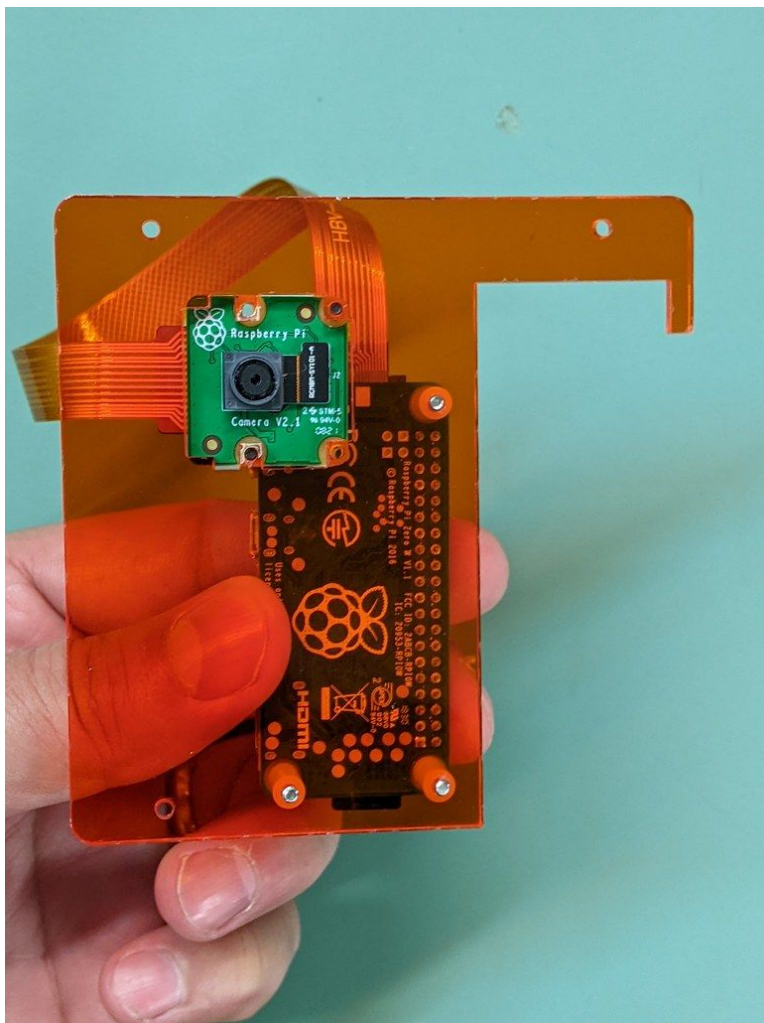




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Keep it simple, iterate

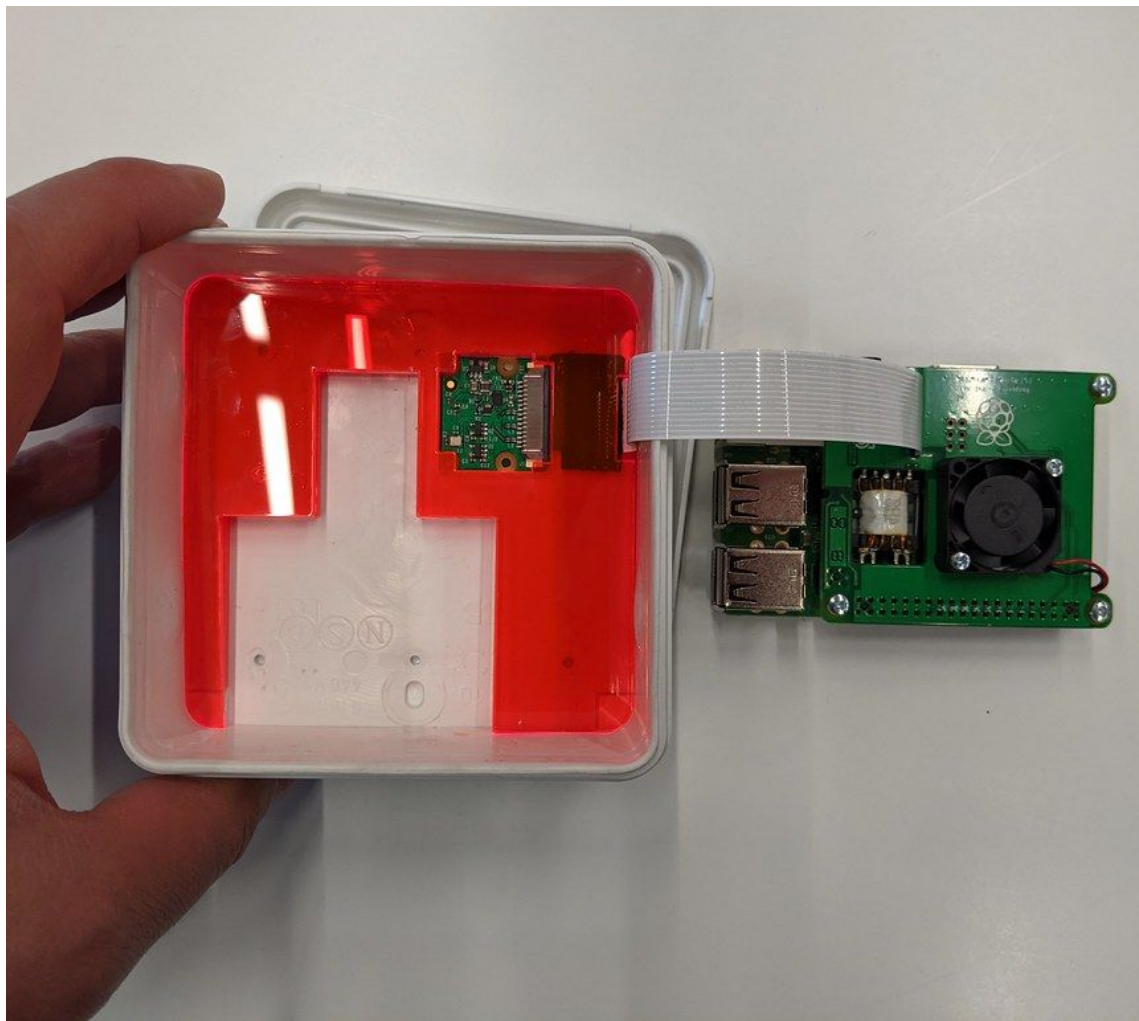




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Do it yourself / with others



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Analysing ~1.5 M photos with ML

Projektdokumentation P8

Timeo Wullschleger

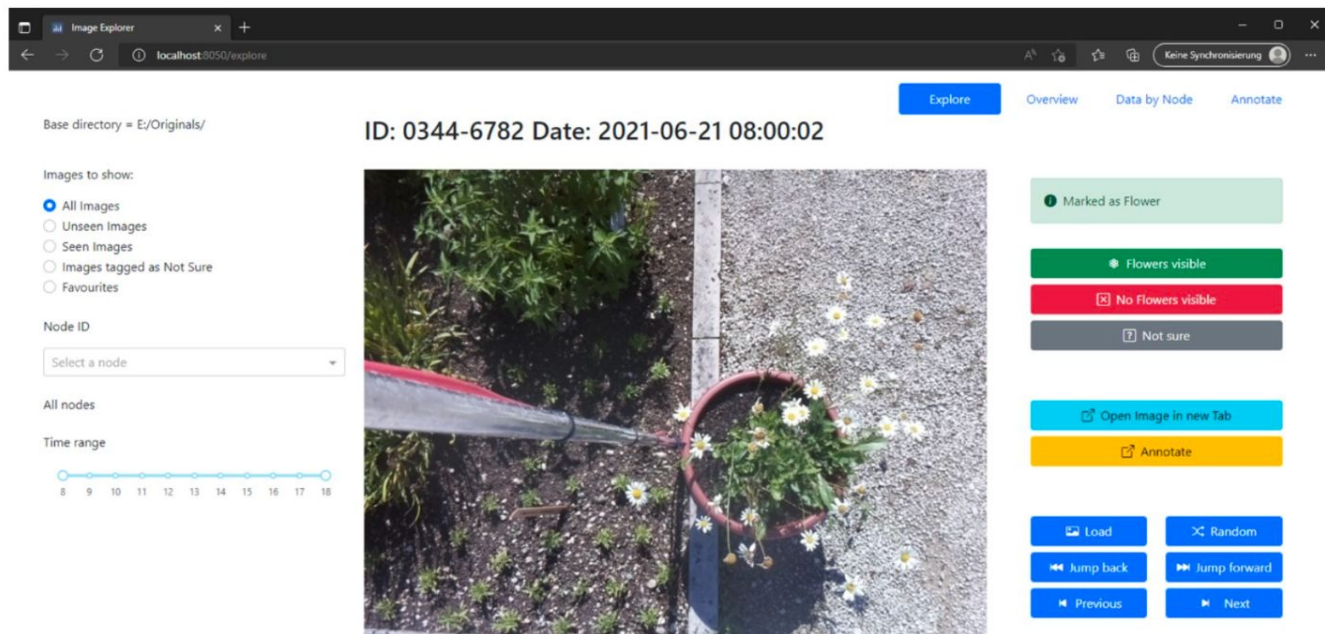


Abbildung 52 User Interface Image Exploration Tool

Knapp 2700 Bilder wurden mit dem Tool klassifiziert. Zeitabschnitte, die für das Projekt brauchbar



Projektdokumentation P8

Timeo Wullschleger

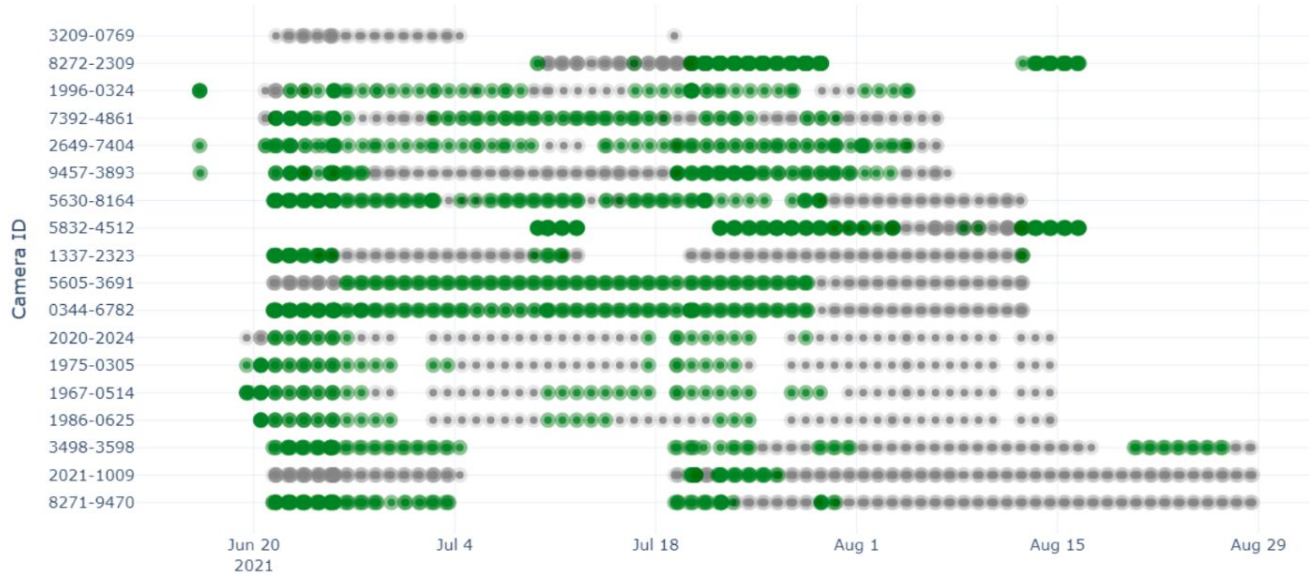


Abbildung 54 Bilder mit Blumen nach Kameras und Aufnahmedatum

3.2 Annotieren der Bilder



Projektdokumentation P8

Timeo Wullschleger

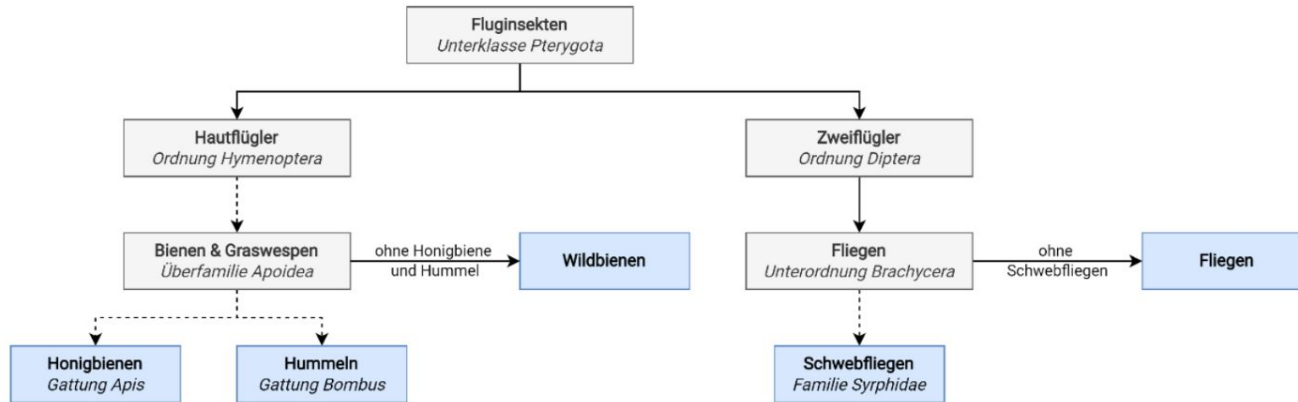


Abbildung 64 Pollinator Dataset: Taxonomie der Bestäuber [43]

Abbildung 65 zeigt die Aufteilung der Bestäuber im Datenset nach Art. Die Größen der Klassen sind nicht gleichmässig. Wildbienen und Honigbienen verfügen über sehr ähnliche optische Merkmale, was eine Unterscheidung schwierig macht. Schwebfliegen, Fliegen und Hummeln sind optisch besser voneinander unterscheidbar, womit die geringere Anzahl Vorkommnisse das Model nicht schwerwiegend beeinträchtigt.



Projektdokumentation P8

Timeo Wullschleger

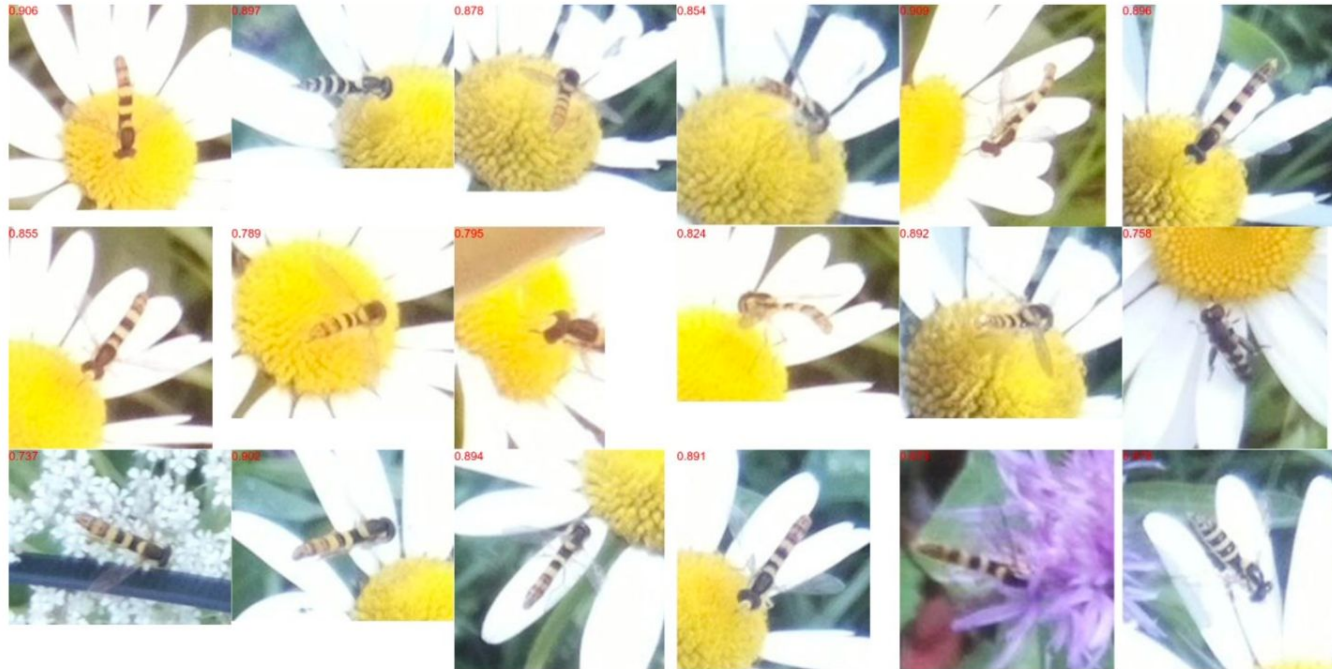


Abbildung 96 Mosaik aus Resultaten der Klasse Schwebfliege

Mit dem report_generator Tool [38] kann aus den Resultaten ein Report im PDF Format gene-



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+

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 [martonmiklos](#) - new branch renamed, ...

Latest commit 559d91e on Nov 10, 2010  [History](#)

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9 Preamble

10

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Borda Add pre-commit CI actions (#4982) ... ✓

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Mitwelten.org IoT Hardware Proof of Concept

Work in progress. Questions? Contact mitwelten.technik@fhnw.ch

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- [AudioMoth Audio Logging Microphone with LiPo Battery](#)
- [LiPo/Li-Ion Charging Station](#)
- [LoRaWAN Gateway with 3G Uplink](#)
- [LoRaWAN Sensor Nodes](#)
- [LoRaWAN Sensor Nodes with Solar Power](#)
- [OpenMV Bug Tracking Camera](#)
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- [Raspberry Pi Streaming Endoscope](#)
- [Wi-Fi and PoE Access Point with 4G Uplink](#)

Contributors 3



tamberg Thomas Amberg



WullT



simsta1

Languages



● G-code 99.9%	● nesC 0.1%
● OpenSCAD 0.0%	● C++ 0.0%
● Python 0.0%	● C 0.0%

Tools for deployment and operations

← Back / Finish drawing ?

Draw & Measure



Marker

T+

Text



Line



Measure

Map saved.

Delete

Export

Share

Your drawing is automatically saved for one year. By using this service, you agree to the [terms of service](#).

Close menu

334.75° / 20.01 m

230V

PiCam

PiCam

AP

PiCam

PiCam

Maps by [swisstopo](#)

Background



Menu

Deployments

Add Deployment

Nodes

Add Node

Log Out

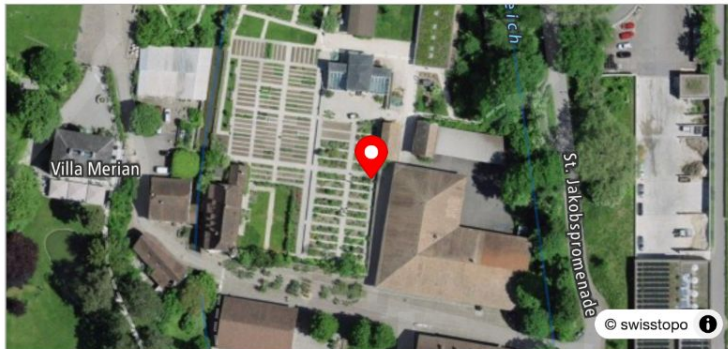
Mitwelten: Nodes Deployment Manager

Deployments

 8776-8942	A	01.03.2021	31.10.2021
 1975-0305	0	01.03.2021	31.10.2021
 1967-0514	0	01.03.2021	31.10.2021
 1337-2323	0	01.03.2021	31.10.2021
 5605-3691	0	01.03.2021	31.10.2021
 5630-8164	0	01.03.2021	31.10.2021
 8632-4498	A	01.03.2021	31.10.2021
 1996-0324	0	01.03.2021	31.10.2021
 7392-4861	0	01.03.2021	31.10.2021
 9457-3893	0	01.03.2021	31.10.2021
 1986-0625	0	01.03.2021	31.10.2021
 3498-	-	-----	-----

Deployment of Node 5605-3691

Node ID 5605-3691
Deployment Period 01.03.2021 - 31.10.2021
Description (Location) (kml-import)



Node Details

Type	Optical	Platform	PiCam
Connectivity	RJ45	Power	PoE
Hardware Version	v0.0.0	Firmware Version	v0.0.0

Edit Deployment

Close

ms per page: 100

1 - 99 of 99

devops-bot - SNF Mitwelten

https://app.slack.com/client/T01BJ4S1QFP/C03SNBY5L3D

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wildcam-tv

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+ Add channels

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Planung Monitoring, Überwachung kritischer Hardware

+ Add a bookmark

mitwelten-watchbot

APP

11:36 AM

Wednesday, August 31st

[FIRING: 1] AP down

Severity: 🔥 Critical

Summary: PiCam capture accesspoint down

ap-9203-9558 (Gleishof) has been down for more than 30 seconds.

[RESOLVED] AP down

Severity: 🔥 Critical

Summary: PiCam capture accesspoint down

ap-9203-9558 (Gleishof) has been down for more than 30 seconds.

mitwelten-watchbot

APP

6:26 PM

[FIRING: 1] AP down

Severity: 🔥 Critical

Summary: PiCam capture accesspoint down

ap-3433-3765 (Reinacher Heide) has been down for more than 30 seconds.

ap-7500-6727 (Gleisbogen) has been down for more than 30 seconds.

B I

Message #devops-bot

+

Bot developed by C. Spindler

Student projects, bachelor and master

21HS_IMVS02: Visualisierung von Biodiversität im Urbanen Raum

22FS_IMVS30: MJPEG Multiplexer Web Service

22FS_IMVS31: Interaktive Darstellung von Biodiversität im Urbanen Raum

Q Simon Matile (in progress)



App
Web

Design
UX

22HS_IMVS35: Audio-Visueller Media Player für Biodiversität im Urbanen Raum

Q (to be done)



App
Web

Design
UX

23FS_IMVS??: Data Storytelling für Biodiversität im Urbanen Raum

Q (to be done)



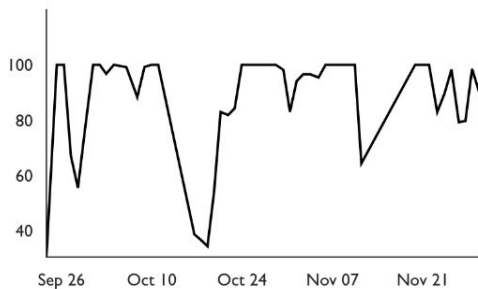
CG
IP

ML
Alg

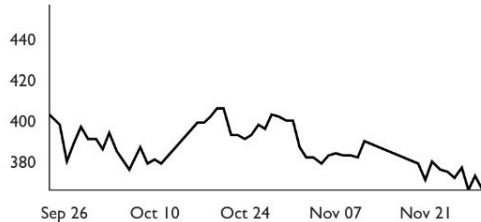
23FS_IMVS??: ML-Kamera für Biodiversität im Urbanen Raum

3340-2993

Humidity

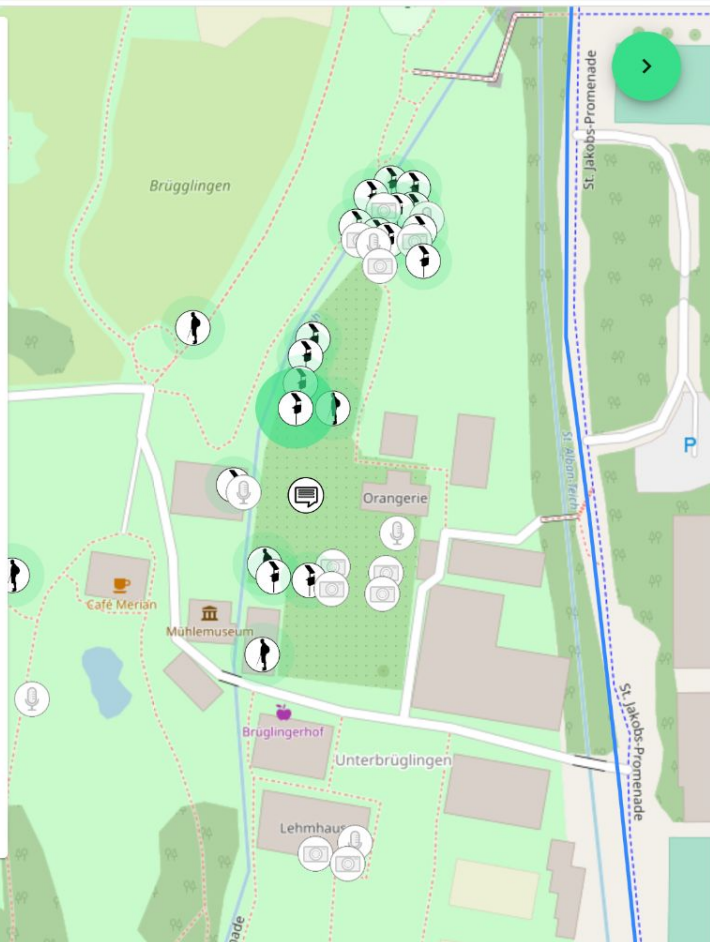


Moisture



Teilen

Exportieren



Mitwelten – Medienökologische Infrastrukturen für Biodiversität

NACH DATUM EINGRENZEN

Startdatum

10.11.2020

BIS

Enddatum

10.11.2022

FILTERN NACH SENSORTYP

- ☒ PAX-Sensoren
- ☒ Umwelt-Sensoren
- ☒ Audio-Sensoren
- ☒ Kameras

FORSCHUNGAREALE

- ☒ Merian Gärten (FS1)
- ☐ Dreispitz Areal (FS2)

NACH KATEGORIEN FILTERN

Developed by IP5/6 teams

Filtern nach Kategorien

Projektdokumentation P7

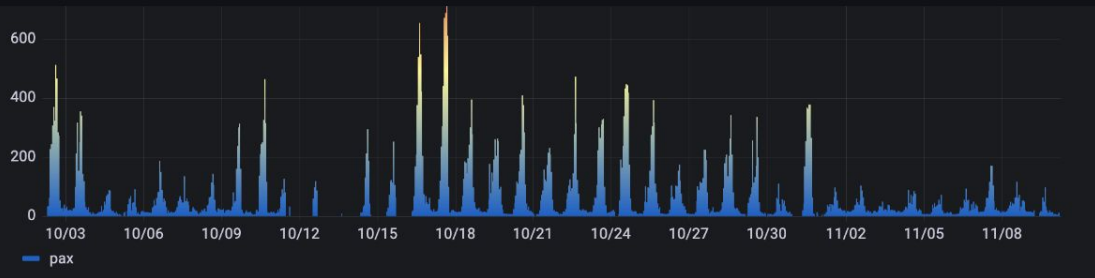
Data Acquisition for Urban Biodiversity Monitoring

Projektdokumentation P8

Automated Analysis for Urban Biodiversity Monitoring

General / PaxCounter

2021-10-02 06:54:49 to 2021-11-10 06:28:25



average

5.10 PAX

maximum

66 PAX

total

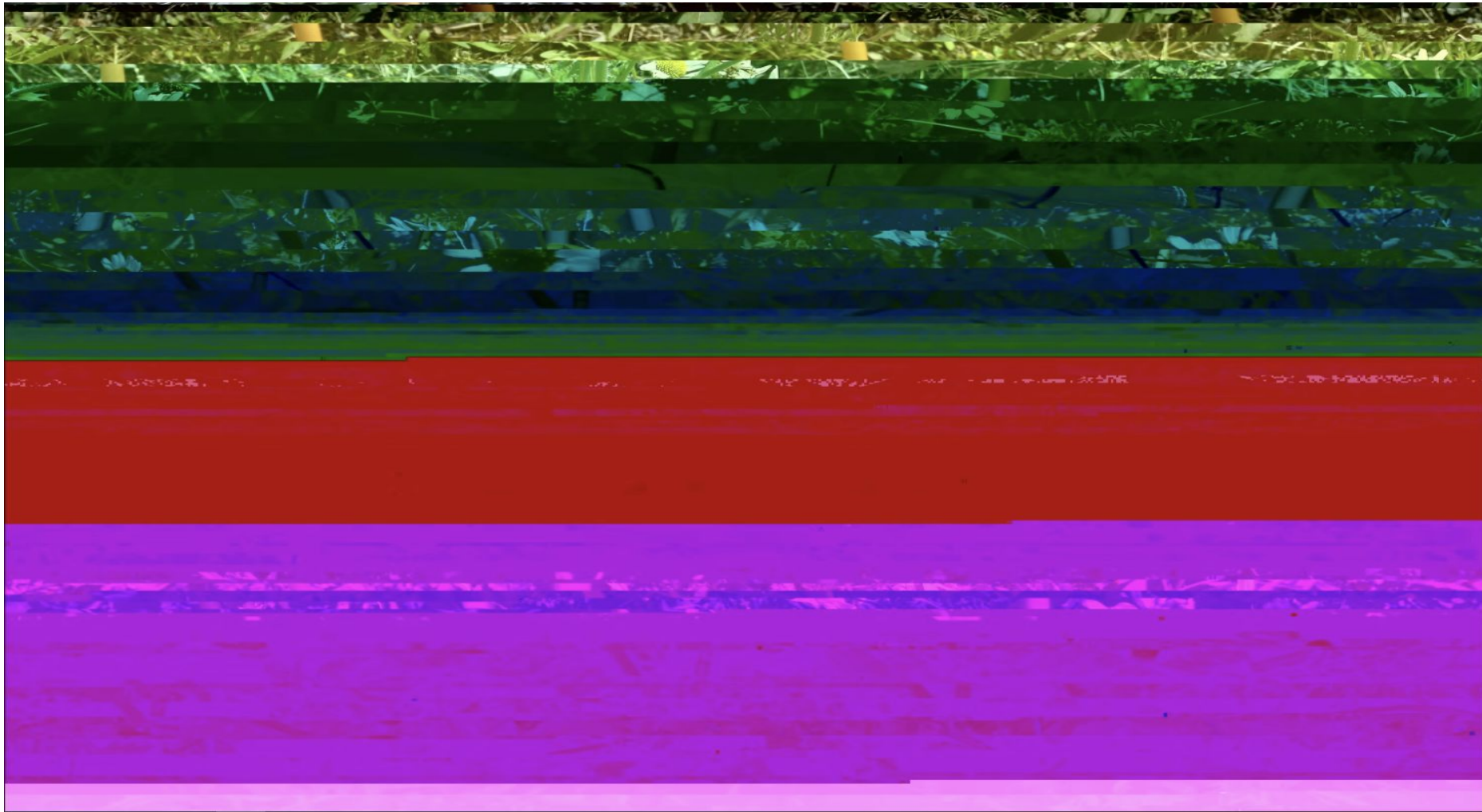
60580 PAX

Selected Nodes

nodeid	start	end	records	description
3426-5375	2021-09-22...	2021-12-01...	4335	(user-addr...
4835-8701	2021-10-01...	2021-12-01...	1279	(user-addr...
4496-3521	2021-10-01...	2021-12-01...	2903	(user-addr...
0694-6129	2021-09-22...	2021-10-13...	788	(user-addr...
9975-8297	2021-10-01...	2021-12-01...	2568	(user-addr...

Average Voltage





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