

December 2025  
Newsletter n°3

# Newsletter



## THE FUTURE OF 3D BODY SCANNING IN ORTHOTICS

Various pathologies require the use of orthoses, medical devices designed to compensate for musculoskeletal disorders. These devices can involve various body parts (arms, hands, knees, ankles, etc.), but all present a common challenge: precise adaptation to the patient's anatomy. In the case of an ankle orthosis, measurements are currently taken using a plaster cast. A Certified Prosthetist-Orthotist (CPO) manually corrects the position of the foot, placing it in an immobilized state, and then creates a mold used for the manufacture of the orthosis. This procedure is time-consuming and can lack precision, sometimes leading to the need to make a second version of the orthosis for improved comfort.

With the introduction of digital methods (computer-aided design, 3D printing), the orthopedic profession expresses the need for a digital alternative to plaster molding. The use of optical scanners for precise measurements is hampered by obstacles created by the technician's hands, covering the foot and making it partially invisible to the optical scanner.

HelpMeWalk consortium proposes an innovative technological solution for measurements: a smart bandage equipped with hundreds of magnetic sensors. These sensors provide a set of digitized points representing the anatomical shape enveloped by the bandage, which is then reconstructed using a software. These measurements can be used to 3D print a personalized orthosis.

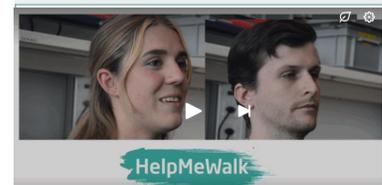
First, the smart bandage and sensor system will be developed by project partners, together with the software for calculating anatomical shapes. The device will then be deployed with orthopedic partners and tested on a group of 200 patients. Finally, the prototype will be manufactured, and documentation will be prepared for certification. This fast and precise technological solution is expected to reduce the time required for orthosis design, facilitate optimal adaptation of the orthosis, and decrease manufacturing costs. In the long term, the goal for the industrial partners is to market the 3D imaging smart bandage so that this innovation can benefit a larger audience. This technology will also contribute strengthening the innovative ecosystem in the Upper Rhine region in the field of orthopedic technology.

**The HelpMeWalk project is part of the Science Offensive of the trinational Upper Rhine Metropolitan Region**



For more information about the *HelpMeWalk* project, please refer to the publications by **Science Pillar**:

- \* **Website:** Interview with the project coordinator, Morgan Madec
- \* **LinkedIn:** Project presentation
- \* **Video:** *HelpMeWalk: Behind the Scenes.*



### IN THIS NEWSLETTER

Project presentation .....	1
Associated partners .....	2
Project partners .....	3
News .....	4-7
Preliminary results.....	8-9
We have recruited.....	10
Contact .....	10
Next meeting .....	10
Funding .....	10

## ASSOCIATED PARTNERS



The main associated partner of the project is the BellwaldTEC GmbH company, a start-up which is a spin-off of the FHNW, that develops and markets innovative solutions for body scan for orthopedic applications.



BellwaldTEC is developing a new and versatile digital measuring system for recording body surfaces.

The measurement principle is based on the determination of the spatial position in a magnetic field generated near the patient.

By using a magnetic field, the CPO's corrective hands are invisible to our scanning textile. When used in orthopedic technology, the corrective position of the limbs can be recorded under palpation, since the corrective hands of the CPO are invisible to magnetic fields.

### CERTIFIED PROSTHETIST-ORTHOTIST

The CPO associated partners will contribute to the definition of the anatomical regions to be precisely measured.

They will carry out the validation study of the orthotic design using the intelligent bandage demonstrator.

Orthopedic centers will recruit patients for whom an orthosis will be made using the 3D scan obtained with the smart bandage.

Patients volunteers that will take part in the study will benefit from orthotics that are better customized and produced faster than the conventional method.

*HelpMeWalk project aims to develop a smart bandage capable of digitizing in a few seconds the shape of a limb*



Duotec is also an associated partner of the project.

It is a global electronics service provider, which works in innovative manufacturing technologies, as well as in basic research and the development of state-of-the-art microelectronics, sensor technology and connectivity solutions.

Duotec will collaborate with HFU in the development of a method of coating electronics to make them washable.

Duotec will be responsible for defining the specifications for the electronics, together with the partners BellwaldTEC, Université de Strasbourg, FHNW and HFU.

## PROJECT PARTNERS

### Strasbourg University - Unistra

The ICube Laboratory of the University of Strasbourg is the project coordinator. ICube is in charge of the design of the multilateration algorithm that accurately computes the position of each sensor from the magnetic field they measure as well as the integration of sensors in the bandage.

### Fachhochschule Nordwestschweiz - FHNW

The FHNW is in charge of the design of the electronic hardware for this project. This encompasses the PCB boards on which magnetic sensors will be soldered as well as the control of the coils that will generate magnetic fields.

### Hochschule Kaiserslautern - HS-KL

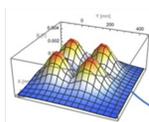
The HS-KL is in charge of the development of the algorithm providing the 3D model of the ankle from the scatter plot of the position of the sensors in the bandage.

### Hochschule Furtwangen - HFU

The HFU is in charge of the encapsulation of sensors and electronic boards in a biocompatible polymer which aims at improving the robustness of the device towards mechanical stresses during usage (torsion,

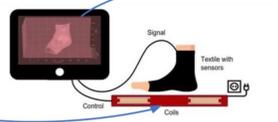
*Intelligent bandage system saves time when taking anatomical measurements during orthosis development, compared with plaster molds*

#### Description of the system



##### Coils

- Create a magnetic field
- Activated sequentially
- Simulated magnetic map



##### Bandages with integrated sensors

- Magneto resistive sensors for localisation
- Battery and Bluetooth for autonomy and comfort
- Silicone coating to protect the electronic components

##### Software

- Calculate the positions of the sensors
- Reconstruct the shape of the foot from the sensor's positions



To take the measurement, we wrap the foot in a bandage containing hundreds of magnetic sensors placed above a plate with integrated coils that generate magnetic fields (1). The magnetic sensors detect the field generated by each coil in the 'induction plate' (2). Based on these measurements, we can determine the position of each sensor, which then allows us to reconstruct a 3D model of the ankle (3).

## PARTNERS' TEAMS

**UNISTRA**  
Strasbourg, France

**Morgan Madec**  
Luc Hebrard  
Manon Lambert  
Sarah Chouchene  
Analbery Monteiro

**FHNW**  
Muttenz, Switzerland

**Joris Pascal**  
Corentin Féry  
Simon Lemoigne  
Thomas Quirin

**HS-KL**  
Kaiserslautern, Germany

**Uwe Tronnier**  
Maximilian Mock  
Dua Shahid  
Fabien Wilhelm

**HFU**  
Furtwangen, Germany

**Volker Bucher**  
Nicolai Simon  
Nicolas Pfaff

**BellwaldTEC**  
Bellwald, Switzerland

**Ralf Schumacher**

**duotec**  
Delémont, Switzerland

**Vincent Aubry**

### 3<sup>RD</sup> CONSORTIUM MEETING

The 3rd meeting of the HelpMeWalk consortium took place at the **Rottweil** research center of **Hochschule Furtwangen** (HFU).



Volker Bucher, project partner and Vice Dean for Research, Transfer, and Continuing Education at HFU, presented his institution: the campuses and academic programs, the research institutes and partnerships with industry, as well as the research projects led by his team.

The new members of the project were introduced: Sarah Chouchene, a data scientist who joined ICube-Unistra in March, and Nicolas Pfaff, who started at HFU in early May and will replace Nicolai Simon, who is now head of the Rottweil center.

**HFU:** Nicolai Simon presented the piston of the semi-automatic dispenser that was created to fill the

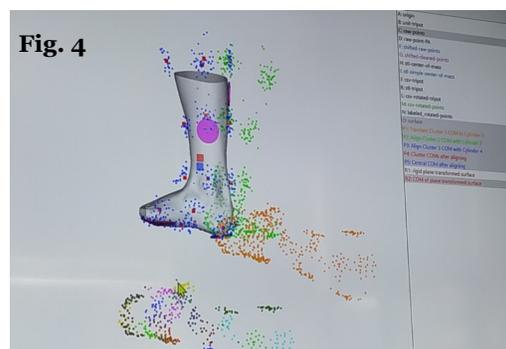
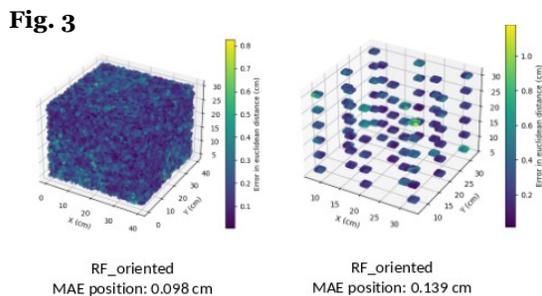
silicone mold for sensor encapsulation. Weaknesses of the system were identified and improvements are planned (Fig. 1).

**FHNW:** Joris presented the new prototype and the flexible sensors they are developing.

They are working on miniaturizing the sensors, which will be used for prototypes designed for children (Fig. 2).

**UNISTRA:** Manon and Sarah presented the progress of their work on applying machine learning and deep learning models for localization of magnetic sensors (Fig. 3).

**HSKL:** the team presented results on cross-reconstruction methods of foot shape. (Fig. 4).



## HELPMEWALK AT VIVATECH 2025

Paris hosted the 9th edition of **VivaTech**, Europe's biggest start-up and tech event, from 11 to 14 June 2025.

The aim of the 2025 edition was to explore the new frontiers of innovation, in technological, economic, geopolitical, societal and environmental terms.

The event brought together the best speakers, start-ups, the private and public sectors to examine technological advances.

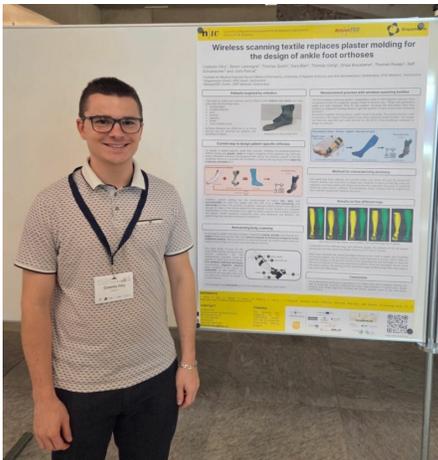
Prof. Dr Joris Pascal and Dr. Thomas Quirin from the **FHNW** took part in the event.

They presented the latest prototype for the faster design of custom-made orthoses and prostheses.



---

## HELPMEWALK AT BMT 2025



You can download the poster presented at the conference on the project website.

Over 500 participants gathered for the **BMT conference** on biomedical engineering, held from September 9 to 11, 2025, at the **Fachhochschule Nordwestschweiz FHNW**.

It was a great chance to learn about the state of research in this field. It was also an opportunity to showcase the performance of the wireless scanning textiles developed by Dr. Joris Pascal team, which aim to replace plaster molding for the design of ankle-foot orthoses.

Corentin had the opportunity to present the latest results during the BMT poster session :

« **Wireless scanning textile replaces plaster molding for the design of ankle foot orthoses** ».

## HELPMEWALK IN WOMAG – OCTOBER 2025



An article about the HelpMeWalk project was published in WOMag – Expertise in Materials and Functional Surfaces (10/2025) :

### HelpMeWalk – The future of 3D body scanning in orthotics

By Nicolas Pfaff, Nicolai Simon and Volker Bucher  
HFU Research Centre Rottweil.

A new approach in orthotic development focuses on the use of magnetic sensors to record/reproduce anatomy.

The measuring electronics used for this purpose are to be coated using a surface technology process, making them washable and optimised for mechanical stress.

The HFU team's task is to identify an optimal encapsulation method that guarantees effective cleaning while ensuring mechanical and chemical protection. In addition, the manufacturing time must be kept to a minimum.

After the encapsulation process, the electronic components are subjected to further tests, such as washing and stress tests.

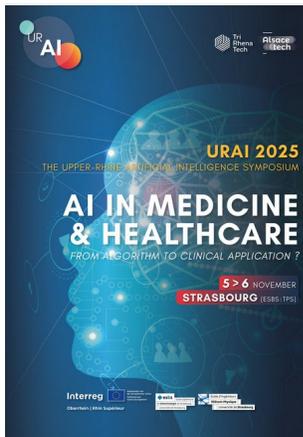
In the future, once all optimisations have been completed, the smart bandage will be tested on the first subjects. The main focus will be on the handling of the bandage and the measurement process itself.

The data obtained will make it possible to further simplify the manufacture of orthoses and improve patient comfort.

*\*More information in the **WOMAG** Magazine - available in the project website*

---

## HELPMEWALK AT URAI 2025



Every year, TriRhenaTech organises the URAI Symposium (Upper Rhine Artificial Intelligence Symposium), a tri-national scientific event dedicated to artificial intelligence.

It takes place in a different country each year, thus underlining the cross-border nature of the alliance.

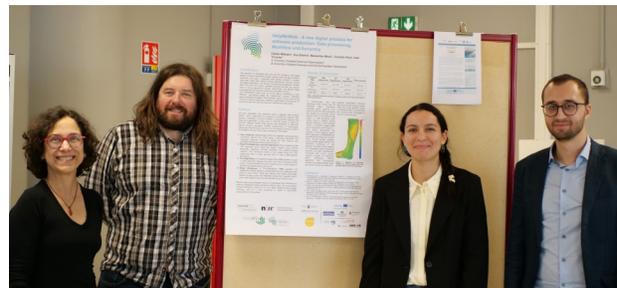
This year, the URAI Symposium took place in France, at TPS (Télécom Physique Strasbourg Engineering School) in Illkirch, from 5 to 6 November.

The theme of this 7<sup>th</sup> edition was: **AI in Medicine and Healthcare: From Algorithm to Clinical Application.**

Two teams from the **HelpMeWalk consortium** took part in URAI 2025 and presented the results of their research –through an oral presentation and a poster:

⇒ **ICube-UNISTRA** : Sarah Chouchene  
**3D morphological reconstruction from magnetic data using deep learning.**

⇒ **HSKL**: Fabien Wilhelm  
**HelpMeWalk - A new digital process for orthoses production: Data processing, Workflow and Accuracy**



## HELPMEWALK AT AIHEALTH 2025

The **2nd Annual International Conference on Artificial Intelligence in Healthcare** (aiHealth2025) took place on 10 and 11 November 2025 at the FHNW (University of Applied Sciences and Arts Northwestern Switzerland) in Muttenz, Switzerland.



Poster available on the projet website.

This conference aims to bring together industry partners, clinicians and academics to explore in depth the transformative role of artificial intelligence (AI).

Sarah Chouchene from ICube-UNISTRA presented a poster: ***Reconstruction of 3D shapes from magnetic data for orthopedic orthoses using deep learning.***

The highlights of Health 2025:

- Opportunity for industry partners, clinicians and academics to collaborate
- Focus on AI applications in diagnosis, treatment and digital twins in healthcare
- Presents insightful talks on AI in traditional and digital medicine
- Engaging discussions on integrating AI applications into digital twins for health
- Interactive panel discussions presenting emerging AI applications

---

## HELPMEWALK AT ISPO FRANCE

**ISPO** (International Society for Prosthetics and Orthotics) is a scientific conference bringing together all professionals in the field of external orthopedics and rehabilitation: surgeons, doctors, Certified Prosthetist-Orthotist, physiotherapists, occupational therapists, and biomechanical engineers.

Prof. **Dr. Joris Pascal** from the FHNW took part in the event, which was held in Lyon on November 13 and 14, where he presented the HelpMeWalk project.

Professionals in the field were enthusiastic about the demonstration of the prototype and the perspectives it opens up for faster design of custom-made orthoses and prostheses. It was an opportunity to answer questions about the new technology.

The conference also provided an opportunity to initiate collaborations with new orthopedic clinics.



---

## HELPMEWALK AT HEALTH TEC DAY



**HealthTech Day**, in collaboration with the **FMTS (Federation of Translational Medicine in Strasbourg)**, took place on Friday 14 November 2025 at the Faculty of Dental Surgery in Strasbourg.

The ICube-UNISTRA team participated in the event:

- ⇒ Dr. Morgan Madec gave an oral presentation : **Magnetic Localization for Biomedical Applications.**
- ⇒ Manon Lambert presented a poster with results from the : ***Reconstruction of 3D shapes from magnetic data for orthopedic orthoses using deep learning.***

## FHNW PRELIMINARY RESULTS

In October 2025, the team led by **Prof. Dr. Joris Pascal** at **FHNW**, in collaboration with **Basler Orthopädie René Ruepp AG** and **BellwaldTEC**, had the opportunity to test the latest version of their innovative magnetic-field-based leg scanning prototype, developed as part of the HelpMeWalk project.

First, the partners reviewed traditional leg casting techniques, carried out using support bandages or plaster casts. These methods require the patient to remain immobile while the cast is opened using a blade and then scissors, a step that can be delicate or even dangerous, particularly for patients with motor impairments.



Three-dimensional measurements of the patient's leg were taken using the prototype, and an orthosis will be manufactured and compared with another one produced using traditional methods.

**Results to follow, with promising outcomes.**

*Many thanks to **Florence Ruepp**, CEO and certified prosthetist-orthotist, for her support of the project and for offering the opportunity to carry out this comparative analysis.*

---

---

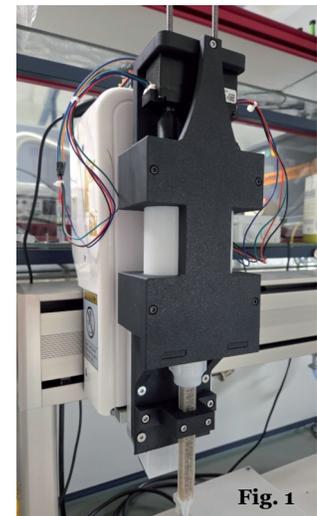
## HFU PRELIMINARY RESULTS

The work of the **HFU** team, coordinated by **Prof. Dr. Volker Bucher**, focuses on identifying an optimal encapsulation method for the sensors integrated into the smart bandage, ensuring effective cleaning while simultaneously providing mechanical and chemical protection.

A central aspect of the project is the **reusability of the sensor** technology. Therefore, the sensor-equipped bandage must be cleaned after use. To protect the sensors from moisture ingress and exposure to cleaning agents, the sensor technology is encapsulated in silicone. In addition, a Parylene C coating is currently under development to prevent corrosion that may occur during repeated cleaning processes.

Furthermore, a device for stress testing has been developed to evaluate the sensor circuit boards prior to encapsulation. A corresponding version of the device for testing after encapsulation is currently under development. The encapsulated electronic components undergo further testing, including washing tests. As part of the testing procedure, all magnetic sensors are read out after each washing cycle.

In addition, manufacturing time must be minimized. For subsequent series production, a semi-automatic process is being developed in which a dosing robot sequentially moves along several moulds and encapsulates the circuit boards in multiple steps. The system is based on a cartridge concept containing 2K silicone, which is pressed through a mixing nozzle during application and thus mixed directly before being placed into the respective mould (Fig. 1). This dispensing system enables a high level of repeatability and ensures consistent encapsulation quality.



**Fig. 1**

*\* More information sur **WOMag** - available in the project website*

## UNISTRA PRELIMINARY RESULTS

The whole system, consisting of bandages equipped with sensors, winding patterns, measurements, reconstruction algorithms and 3D printing, has been validated in terms of geometric accuracy.

The **ICube laboratory** team, coordinated by **Dr. Morgan Madec**, is involved in various aspects of the project :

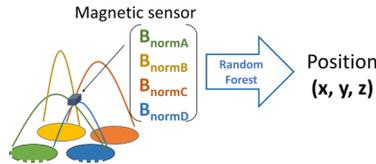
⇒ In the **development of the algorithm for determining the location and orientation of the sensors** (Fig. 1)

### Position of the sensors

- Methods investigated: look up tables, machine learning and deep learning
- Random Forest: best compromise for the system on precision, robustness to noise, speed
- Precision of the position : 2 mm mean euclidean error

### Orientation of the sensors

- Least square optimization
- Precision of the orientation: 2.02 degrees mean error on simulated data

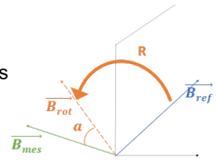


**Fig.1** The robustness and the precision of the point cloud is crucial to reconstruct a reliable leg model

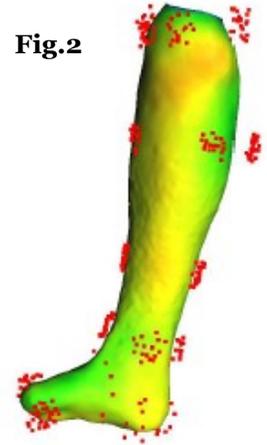
⇒ In the **Development of a graphical interface integrating prediction algorithms using deep learning** (Fig. 2)

The geometric accuracy of the bandaging system and reconstruction algorithm is validated by comparing predictions with scanned data.

The result of 3D reconstruction using machine learning methods is a colour map that visualises the distribution of measurement errors across the limb.



**Fig.2**



## HSKL PRELIMINARY RESULTS

**Prof. Dr. Tronnier's** team uses a point cloud acquired by sensors disposed in the smart bandage to reconstruct and model body structures with high precision from a relatively small number of data points.

The 3D point acquisition was achieved using the magnetic field tracking system, which determines the positions of three-axis magnetic field sensors.

Surface reconstruction is model-based, mapping the acquired point cloud onto a normalized 3D surface model of an average lower leg. The process involves five main steps:

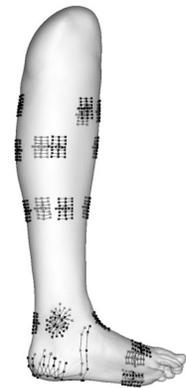
- 1. Error Cleaning:** to remove uncached measurement errors of the 3D coordinate calculation.
- 2. Rigid Pre-Registration and Size adjustment:** the normalized model is adjusted and scaled along the main anatomical axes of lower leg and foot to match patient-specific dimensions.
- 3. Fine Registration:** an iterative Closest Point (ICP) algorithm is used to refine alignment between the point cloud and the scaled surface model.

**4. Shape Adjustment:** through a TPS (Thin-Plate-Spline) algorithm to match the form.

**5. Post-processing:** Finally results were enhanced using (1) a Windowed Sinc Smoothing to remove undetected outliers caused by random noise, (2) a surface shrinking to correct for a 3 mm offset caused by the bandage thickness, and (3) a final smoothing to obtain a high-fidelity representation of the surface.

A reconstruction test was performed, which shows that the individual steps consistently decrease mean distance error down to 2,89 mm when comparing the results to a provided optical surface scan of the reference leg.

First results demonstrate the potential of the magnetic sensor patch approach of HelpMeWalk for accurate 3D reconstruction of lower limbs. Though broader validation across diverse patient groups and real-world conditions is still required.





## WE HAVE RECRUITED

**Fabien Wilhelm** joined the HS-KL team in June 2025.

Fabien is a software developer specialized in 3D reconstruction. He studied at HSKL and has a background in medical informatics, with experience in computer vision and DICOM.

## WHERE TO FIND US

Scan the QR code



to access the agenda of upcoming events that consortium members will attend.

## EXCERPT OF THE INTERVIEW WITH DR MORAGN MADEC

### What is the technology behind HelpMeWalk project?

To carry out the measurement, we wrap the foot in a bandage containing hundreds of magnetic sensors and place it above a plate similar to an induction plate, into which coils generating magnetic fields are integrated. The magnetic sensors in the bandage detect the field generated by each coil of the “induction plate.” Based on these measurements, we can determine the position of each sensor, which then allows us to reconstruct a 3D model of the ankle. The orthosis can then be designed directly on the 3D model and subsequently printed, all using a single software tool.



Full interview on the website : <https://science.rmtmo.eu/actualites>

## Contact



<http://www.helpmewalk.eu>

## CLOSING MEETING

The closing meeting of the HelpMeWalk project will take place in Strasbourg on March 30, 2026.



## PROJECT FUNDING

The HelpMeWalk project is part of the Science Offensive of the trinational Upper Rhine Metropolitan Region, co-financed by the European Union via the Interreg Upper Rhine programme, the Grand Est Region, the Ministerium für Wissenschaft, Forschung und Kunst of the Land of Baden-Württemberg and the Ministerium für Wissenschaft und Gesundheit of the Land of Rhineland-Palatinate.

The Swiss Confederation and the Cantons of North-Western Switzerland are contributing to the funding of the Swiss partners in

Interreg



Cofinancé par l'Union Européenne  
Kofinanziert von der Europäischen Union

Rhin Supérieur | Oberrhein



IKRB



JURA <sup>IE</sup> CH  
RÉPUBLIQUE ET CANTON DU JURA



Kanton Basel-Stadt

BASEL  
LANDSCHAFT