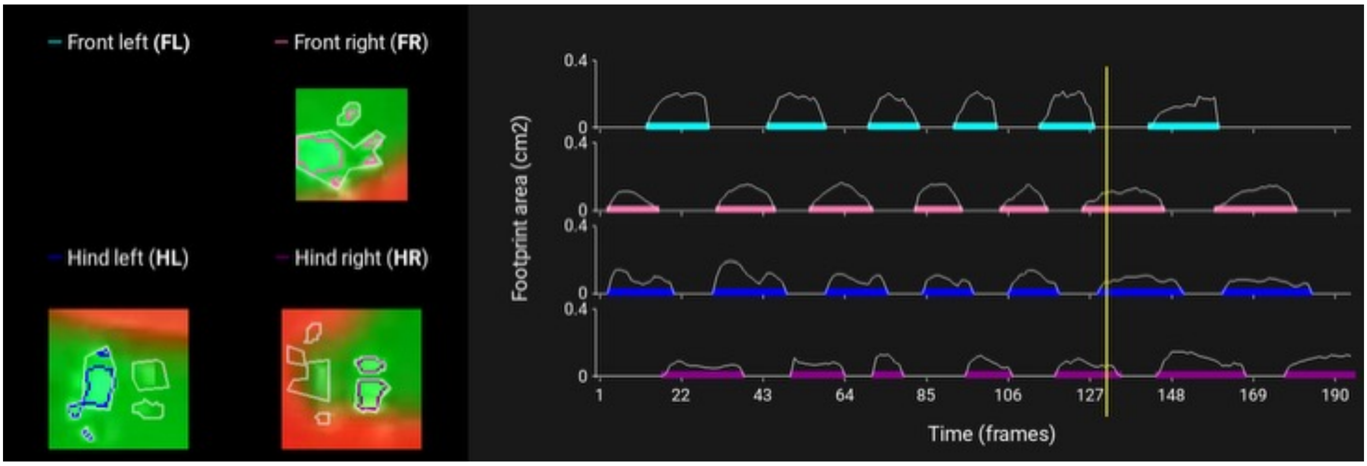
A.I. powered

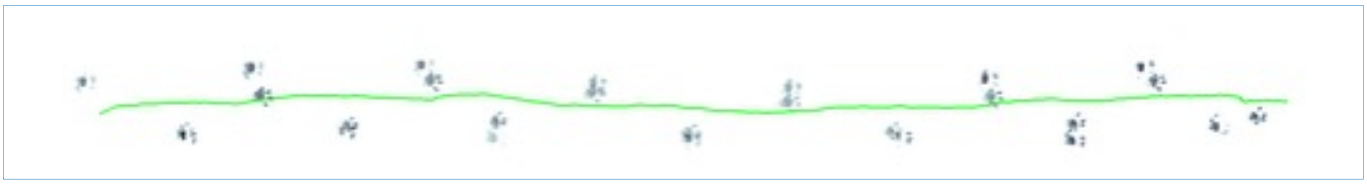
GA.I.T Analysis

for mice

Paw identification accuracy.



Fully automated: temporal, spatial, paw contact and gait parameters.



Digital Ink for immediate gait visualization.

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Gait analysis for mice made simple

A next-gen, table-top system combining A.I. precision and plug & play simplicity: ready to run, right out of the box.

Locomotion is a complex behavior involving the integration of musculoskeletal, neurological and sensory systems to produce coordinated movement. Because of this, **gait is a sensitive marker of pain and motor dysfunction**, widely used in models of neurodegeneration, injury, arthritis and chronic pain (Clark et al., 2019; Sayed-Zahid et al., 2019).

Early approaches to rodent gait analysis, such as inked footprints on paper, provide only coarse information on stride length and paw placement. While still used for basic screening, these methods lack the resolution and objectivity required to detect subtle or early motor deficits. Rodents, as quadrupeds and prey animals, often mask signs of pain or impairment (Mogil, 2015). Their ability to shift weight between limbs (e.g., compensating for hindlimb injury by loading the forelimbs) can further obscure deficits detectable in bipedal species (Saunders et al., 2017).

To overcome these challenges, **automated gait analysis systems have become essential in neuroscience, pharmacology and toxicology**. These tools offer high-resolution, multi-parameter assessments, such as stance duration, stride variability, and interlimb coordination, captured in a naturalistic, unforced walking environment.

The biggest challenge today in automated gait analysis is the correct identification of each paw in order to calculate all parameters automatically without need for the scientist to manually check if the software has correctly identified.

Since the Ugo Basile method is not based on classic video-tracking contrast, but on supervised A.I., paw identification is virtually mistake-free.

1. **Internal Reflection Illumination is coupled to 45° mirror and a frontal high-speed camera**
   Accurate identification of paws in ventral view (2) and simultaneous lateral view (1)
2. **Dedicated camera**
   Pre-calibrated camera ensures high-speed 4K recordings at 119 fps, with no setup required and automatic linear-view correction.
3. **Cages with individual sliding doors**
   Easily removable cages to enable smooth and stress-free animal handling. Moreover, the placement of these two cages changes the way the test is conducted compared to other systems. Valid runs are automatically detected without requiring intervention from the researcher.
4. **A.I. detection and analysis software**
   Image aquistion, comparable run selection and analysis of dozens of gait parameters are all accesible from an intuitive and largely preconigured user interface for the fastest learning curve and reliable result generation. Experiment recording fully automated. Post hoc analysis fast and intuitive, completed in just a few clicks within minutes.

Application

Gait Analysis is a technique with an incredibly broad range of applications. The most common ones include **Motor Neurodegenerative Diseases** (such as Parkinson's Disease [PD], Alzheimer's, Huntington's and Amyotrophic Lateral Sclerosis [ALS]) and **Pain and Inflammation Research**, in addition to complex longitudinal studes like the ones object of **Aging Research**. (Sashindranath et al., 2015; Zhao et al., 2021; Baldwin, 2016).

A common use case involves assessing disease progression or therapeutic response through **changes in dynamic gait parameters**, such as stride length, swing and stance phases, paw placement variability and interlimb coordination. For instance, shortened stride length and increased stance duration are frequently reported in PD, other motor disfunctions, arthritis models, while asymmetric paw pressure and other parameters are indicative of unilateral spinal cord or peripheral nerve injury (Hamers et al., 2006; Kappos et al., 2017).

Gait analysis is also applied longitudinally, enabling detection of early-stage motor changes before overt symptoms emerge. This is particularly valuable in aging models and in evaluating analgesic or neuroprotective drug efficacy.

Additionally, **Ugo Basile system is unique as it simultaneously images ventral and lateral views**, which allow for a full range of parameters directly measured and not just derived or calculated as in ventral only system.

Product Description

The mouse is moving freely starting from a transparent box and is motivated to move toward the dark one, also thanks to the **compact length of the corridor** compared to other systems designed for rats also.

Once the desidered number of comparable runs (*i.e.* similar speed) has been reached **the software will automatically calculate parameters** and prompt to the next animal.

The corridor floor is made of high-quality glass resistant to scratches and easy to clean. Green LEDs on the side of the corridor trigger the **frustrated total internal reflection (fTIR) effect**, which enhances shapes, contact surfaces and pressure, plus all the other temporal and spatial parameters scientists are interested to investigate.

The footprints appearing bright green regardless of the mouse fur color (Hamers et al. 2001) gives complete flexibility and enables step dynamics and semi-quantitative assessment of paw pressure (key in Pain Research and not only).

Two sliding cages are placed on each side of the corridor, each with its own door. They can be easily attached or removed, allowing smooth, stress-free animal handling.

A pre-calibrated GoPro HERO 13 Black is used for recording. The camera is controlled by the software, which handles background removal and **detects valid runs automatically in real-time**.

The **system comes with a preinstalled computer** with dedicated GPU, **delivering automatic detection and labelling of mouse paws with virtually 100% accuracy** (thanks to **tailored A.I. training of thousands of frames**).

The end result is a **huge time-saving** because no **manual paw identification** and no **frame-by-frame manual revision** is needed.

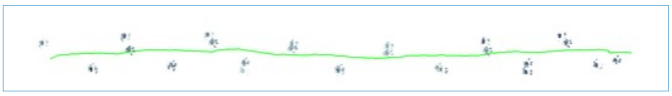
The results are saved in Excel format directly on the PC.

Gait Analysis by Ugo Basile features an intuitive and interactive interface.

Via "Analyze Run" panel users load videos, view raw footage and labeled paw tracking overlays.

The Frame Explorer shows detailed per-frame pose estimation of paws, body and tail, with related time series.

Users can visualize paw intensity and contact area over time. A "digital ink" feature recreates traditional ink-tracking effects.



The software automatically manages belly-touching artifacts and offers single-finger resolution, distinguishing palm and digits even in complex prints.

Numerical analysis of the displayed data is automatically saved and available as a CSV file.

Features	Benefits
Precise paw and body part identification via AI-trained software	Greater accuracy and higher inference speed compared to methods based on contrast. Time saving procedures thanks to tailored AI training. No manual revision needed.
Automatic gait analysis	Objective identification of patterns not detectable with traditional ink-based tools or visual inspection.
Very high spatial resolution	Allows discrimination of single fingers
Compact table top system	Fits any lab bench. Saves space in your laboratory.
Integrated camera (GoPro Hero13 Black)	Sharp, linear and synchronized images without fish-eye distortion.
Complete package (PC + device + camera + preconfigured software + training)	Seamlsess setup: user can immediately focus on the experiment without worrying about hardware and software setting.
Underlying mirror tilted at 45°	Ventral view used to verify symmetry and paw placement.

Main Parameters Analyzed

Motor research	Pain & inflammation	Aging research
Spatial and Temporal Parameters: • Stride Length • Stride Time (variability) • Swing/Stance Time • Paw Angle **Interlimb Coordination:** • Regularity Index • Phase Relationship **Body Parameters:** • Body axis deviation • Lateral body sway • Head-body alignment • Body rotation angle **Tail Parameters:** • Tail-body coordination • Tail movement amplitude	**Load and Support Parameters:** • Duty Cycle • Paw Print Area • Paw Intensity/Pressure • Paw Spread **Compensatory Parameters:** • Base of Support (Step Width)Weight shifting patterns • Body asymmetry index • Guarding posture **Tail Parameters:** • Tail position relative to body • Tail elevation angle • Tail rigidity	**Stability and Coordination Parameters:** • Stride Length • Stride Time variability • Base of Support • Regularity Index • Swing Time **Postural Parameters:** • Duty Cycle • Body stiffness index • Postural stability • Lateral body sway **Tail Parameters:** • Tail position relative to body • Tail movement amplitude

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Specifications - General

Commands	via PC, no interaction needed with Camera
Power requirements	Universal input 100-240 Volt, 50-60Hz, 25W

Specifications - Operation

Start/Stop	Automatic, Via software
Detection	Each run is automatically identified basing on mouse position in the corridor
Data Output	.cvs

Specifications - Physical

Footprint	69 (w) x 56,5 (d) cm
Total dimensions	94 (w) x 56,5 (d) x 45 (h) cm
Ventral view corridor dimensions	66,5 (w) x 5,5 (d) cm
Lateral view glass dimensions	66,5 (w) x 12,5 (h) cm
Lateral cages internal dimensions	12 (w) x 8 (d) x 12,5 (h) cm

Ordering information

48203	Gait Analysis system for mice. Based on AI, includes PC.

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more than 50,000 citations in the main bibliographic search engines.

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