



Bosch Hemoglobin Monitor: Early detection of anemia without blood tests

Artificial intelligence helps determine hemoglobin levels

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- ▶ Non-invasive, safe and rapid detection of hemoglobin value at point-of-care
- ▶ Portable and compact device mainly for use in emerging and developing economies
- ▶ Named CES Innovation Award Honoree
- ▶ Machine learning algorithms help determine hemoglobin levels

Bengaluru, India / Waiblingen, Germany – According to estimations by the WHO 1.6 billion people suffer from Anemia, a condition resulting from the reduced hemoglobin concentration in the blood. This has prompted the WHO to define the fight against anemia as one of its critical sustainable development goals for 2025. Bosch has developed a portable Hemoglobin Monitor Solution (HMS) especially for regions where routine access to medical care tends to be difficult. This HMS allows a large number of people to be screened for anemia rapidly, safely, using a non-invasive approach. The solution has been named a CES Innovation Award Honoree in the “Health and Wellness” category. “Bosch has developed the non-invasive Hemoglobin monitor as an innovative solution and as an alternative to traditional methods for the early detection of anemia. This should offer people better diagnosis options even in resource constrained conditions. The use of artificial intelligence is revolutionizing anemia management, specifically in point-of-care setups and closer to the patient”, explains Dattatri Salagame, President and Managing Director of Robert Bosch Engineering and Business Solutions Private Limited (RBEI).

Hemoglobin is a protein found in red blood cells and is responsible for carrying oxygen and carbon dioxide throughout the body. People with a low hemoglobin count may experience symptoms such as general fatigue, weakness, pale skin, and even serious illnesses. Anemia particularly affects women, even more so when they are pregnant, and also people suffering from malnutrition. In cancer patients undergoing chemotherapy or in palliative care, hemoglobin levels should be checked regularly.

Hemoglobin results in 30 seconds using a non-invasive AI measurement

The intelligent solution by Bosch is designed for use directly at the point-of-care and is completely pain-free with no need for a blood test, as the value is determined by a finger scanner using multi-wavelength spectrophotometry on the surface of the skin. The system uses an optical sensor to precisely and reliably measure the photoplethysmogram (PPG) signals. Photoplethysmography, or PPG, is an optical technique used to detect volumetric changes in blood in peripheral circulation. The device provides a reliable result within 30 seconds even for low hemoglobin concentrations. This is where machine learning comes in: the device's algorithm monitors the wavelength of the light and uses 27 different characteristics to determine and classify the hemoglobin value. The algorithm has been trained with more than 10,000 anemia data points. These clinically collected data along with the corresponding ground truth data, are the basis for the machine learning algorithm. The more validated data sets are put into the continuously learning algorithm, the more precise the results will be.

Lab-free results without risk of infection

A laboratory analysis is not necessary and there is no risk of infection from contaminated needles. Participants receive their test results quickly at the point of care. The device is battery operated, does not need subsequent calibration, and is extremely easy to use. It is intended for use in outlying and remote regions by healthcare professionals. Location-based reporting ensures easy clinical traceability. Organizations that operate multiple devices can draw conclusions through heat maps about specific regions. Patient data remains anonymous. Market release in India is expected by mid-2021.

Press image: #ab8dc58b

Bosch at CES 2021:

- **VIRTUAL PRESS CONFERENCE: Monday, January 11, 2021**, from 8:00 to 8:30 EST (14:00–14:30 CET) with Dr. Michael Bolle, Bosch CTO, CDO, and management board member, and Mike Mansuetti, president of Bosch North America, at the [Bosch Media Service](#).
- **VIRTUAL BOOTH: January 12 – February 15, 2021**, at www.ces.tech
- **FOLLOW** the Bosch CES 2021 highlights on Twitter: [#BoschCES](#)

- **DEEP-DIVE SESSIONS WITH BOSCH-EXPERTS: January 12 – February 15, 2021**, at www.ces.tech
 - *Sustainable #LikeABosch: How a key global industry player drives carbon neutrality at its sites* with **Torsten Kallweit**, Head of Corporate Office Health, Safety, Environmental and Fire Protection as well as Sustainability and Manager CTO Bosch Climate Solutions GmbH, and **Annette Wagner**, Head of Sustainability and Ideas Lab
 - *Move #LikeABosch: Technology for sustainable future mobility* with **Mike Mansueti**, President of Bosch North America, and **Tim Frasier**, Regional President Automotive Electronics North America
 - *Artificial intelligence in use: Application examples from the fields of fitness tracking and well-being to smart cameras* with **Kaustubh Gandhi**, Senior Product Manager, and **Sina Isabell Springer**, Business Development Manager
 - *Perfectly keyless advanced* with **Tim Frasier**, Regional President Automotive Electronics North America, **Daniel Kornek**, Head of Product Area Vehicle Access (Perfectly Keyless), and **Jia Hou**, Business Development Manager

Contact person for press inquiries:

Robert Bosch Engineering and Business Solutions Private Limited

Muthamma Acharya

phone: +91 98456 33932

Twitter: @rbeiindia

Bosch Healthcare Solutions

Thomas Berroth

phone: +49 160 904 37856

The Bosch Group is a leading global supplier of technology and services. It employs roughly 400,000 associates worldwide (as of December 31, 2019). The company generated sales of 77.7 billion euros in 2019. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life."

The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies in 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. Bosch employs some 72,600 associates in research and development at 126 locations across the globe, as well as roughly 30,000 software engineers.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The remaining shares are held by the Bosch family, by a corporation owned by the family, and by Robert Bosch GmbH. The majority of voting rights are held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust.

Additional information is available online at www.bosch.com, www.iot.bosch.com,
www.bosch-press.com,