**Blood Pressure estimation based on PPG using neural network**

Project Submitted By: Dorin Alon & Shirili Shelef

Project Supervisors: Ron Teichner & Dr. Danny Eitan

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**Abstract**

Blood pressure (BP) is a significant vital that is monitored for every patient in intensive care, and could indicate cardiovascular status. Nowadays, BP is measured throughout an invasive manner - catheter directly into an artery.

This form of measurement is not convenient for the patient, and could lead an infection. Photopletysmogram (PPG) is a signal measured in a non invasive manner – a clips on the patient's finger. In this project, we will suggest a way to estimate BP based using neural network (LSTM).

**1. Introduction**

1.1 motivation:

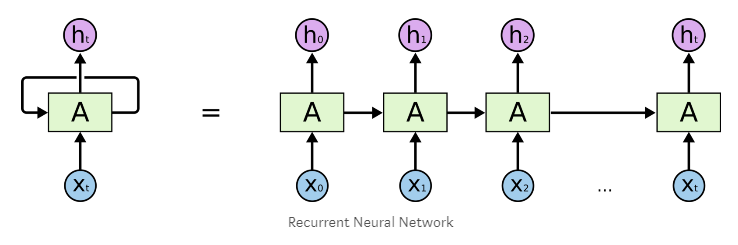
Critically ill patients are monitored continuously with vital physiologic signals. The medical team need to be in control over the patient signals, specifically blood pressure (BP). The way to measure this vital is a catheter into an artery, this way the signal can be presented continuously on a monitor. Another way to measure BP is with a cuff on a patient's limb, but the measurement is taken periodically, and the result is inaccurate enough and not continuously. Therefore the patient BP will be monitored in an invasive way, which can lead to an infection and thrombosis (clot).

There is no direct formula which connect BP values to other vitals that are measured in non-invasive ways, such as electrocardiogram (ECG), respiratory impedance (RI), and PPG. Nevertheless, the connection between the signals exists, so artificial intelligence was required to figure out the connection. In this project we will present the neural network we used to estimate BP using PPG.

*הסבר על חשיבותו של לחץ הדם עבור מטופלים, למה אין דרך אחרת חוץ מהקטטר, ולמה בחרנו ברשת נוירונים שתלמד את המטופל.*

**2. The chosen network**

Long Short-term memory (LSTM) is an artificial Recurrent neural network (RNN) architecture that can process an entire sequence of data, and not a single point. This quality is necessary in order to learn a patient's behavior.

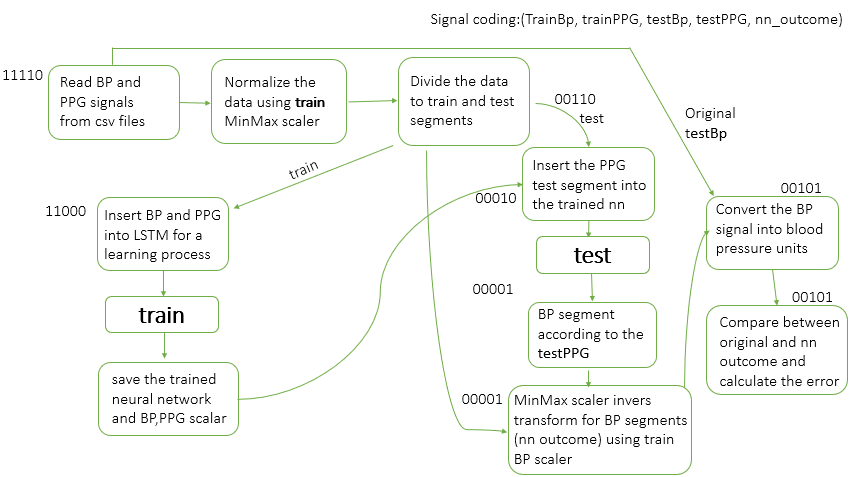


2.1 Architecture:

**1. Block diagram**

In the following diagrams we will show the signal flow from the database to the BP estimation:

**Train and test on the same patient:**

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**Train on one patient and test on another:**

