

PERSPECTIVES OF MACHINE LEARNING APPLICATIONS IN NEAR FUTURE DIAGNOSTICS

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In the world of today health-care is qualitatively evolving into the state, when the rule “Prevention is better than cure” may become reality. Computing powers and batteries capacity of portable electronic devices allows to monitor human-body health indicators continuously, transmit and analyze all this data. The big data technology allows effective storing and data processing.[1] The worldwide market of portable electronic solutions will grow from \$1.9 trillion in 2013 to \$7.1 trillion in 2020 .[2]

This fact gives the possibility for continues analyses of medical data and as a consequence early detection of deviations from the normal state without meeting with medical doctor. However, there is still lack of algorithms, which will analyze this big amount of data fast enough and precise enough. The most developing and promising ideas are: neural networks, support vector machines, group method of data handling. [3]

One of very actual problem, which is going to be resolved with machine learning is diabetic retinopathy automatic diagnostics. The World Health Organization estimates that 347 million people have the disease worldwide. diabetic retinopathy is an eye disease associated with long-standing diabetes. Around 40% to 45% of Americans with diabetes have some stage of the disease. [4]

Currently, detecting diabetic retinopathy is a time-consuming and manual process that requires a trained clinician to examine and evaluate digital color fundus photographs of the retina. The need for a comprehensive and automated method of screening has long been recognized

The computer algorithms requires certain amount of data for building internal model. And the growing volume of medical data is like a grist to the mill of machine learning systems. But, it's necessary to work very consistent and responsibly, in order to not to violate medical ethics.

Working with a big amount of personal data, it's necessary to keep it private. This imposes some strict requirements on data safety techniques. Based on this requirement it's necessary to develop a standard format of medical data representation. This standard should use one of SHA-2 cryptographic algorithms for keeping data safe, and should provide the possibility to represent very different type of data, such as: text, images, audio, video in the same file-container.

The second question, which should be resolved “Primum non nocere” (Eng: "First do no harm"). Computer algorithms can not be held responsible for errors, hence, they have not to mistake – and that it is quit impossible. Also this situation has a flip-side. For example, in a study of x-rays interpreted by emergency department physicians because a staff radiologist was unavailable, up to 16% of plain films and 35% of cranial computed tomography studies were misread.[5] In this field computer may show much better results.

[1] Matthew Herland, T. M. Khoshgoftaar. *A review of data mining using big data in health informatics*, *JBD* **1:2** (2014)

[2] Carrie MacGillivray, Marcus Torchia, *Worldwide Internet of Things Forecast Update* **1** (2016)

[3] Sujun Hua, Zhirong Sun, *Support vector machine approach for protein subcellular localization prediction*, *Bioinformatic*, **17** (2001) 721–728

[4] Yingfeng Zheng, Mingguang He, and Nathan Congdon, *The worldwide epidemic of diabetic retinopathy*, *Indian J Ophthalmol* **60(5)** (2012) 428–431

[5] Eta S. Berner, Mark L. Graber, Overconfidence as a Cause of Diagnostic Error in Medicine, *The American Journal of Medicine* **Vol 121 (5A)** (2008) , S2–S23