MEDICAL DECISION SUPPORT SYSTEM OPTIMIZATION

Maximizing accuracy under additional constraints for cost

CHALLENGES: Health, demographic change and wellbeing

PRODUCTIVE SECTOR: Software R+D

PROBLEM DESCRIPTION

Sightspot Network Ltd. (Hungary) was interested in optimizing the components of image processing-based medical decision support systems to improve their efficiency and accuracy.

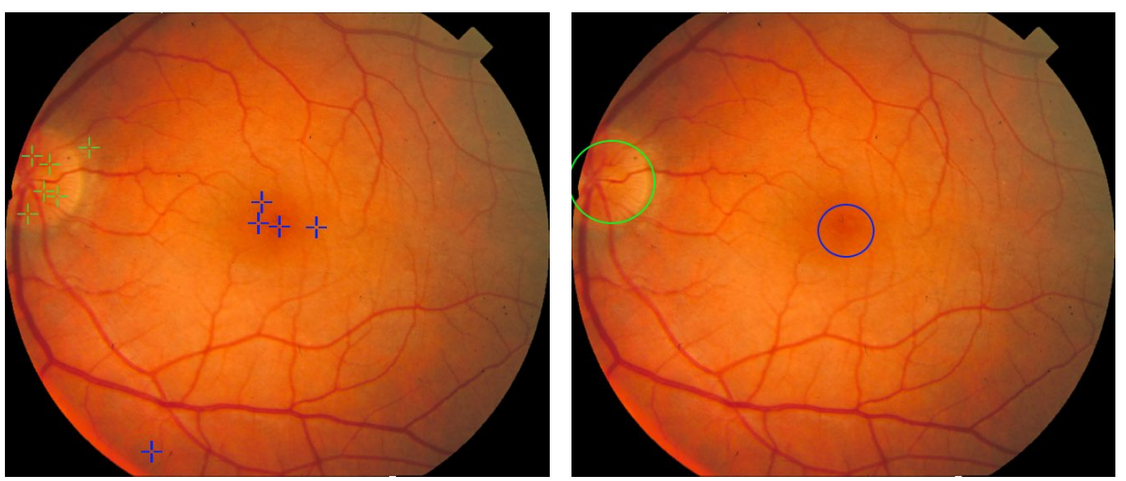
CHALLENGES AND GOALS

To select the optimal components of image processing-based DSS systems and to optimize the parameters of them.

To improve the accuracy of the decision support and to reduce cost and running time of the whole system.

MATHEMATICAL AND COMPUTATIONAL METHODS

The aim was to optimize composite image processing-based decision support systems having the highest performance under an additional constraint on the total cost of the members. This problem led to a knapsack one with non-linear and non-separable objective function. To solve this issue, a stochastic approach was introduced in which the objective function is considered as the joint probability function of the components' accuracy. Additionally, a novel stochastic method was developed to accelerate the parameter optimization of these systems over very large training sets. The proposed method considers only the minimum required portion of the training data to evaluate a parameter setting in each iteration that is sufficient to maintain convergence in probability.



Example application: localizing the optic disc and the macula based on the combined output of different image processing methods for the detection of age-related macular edema

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Results and Benefits

The result is a preliminary strategy that guides the selection of the components of different image processing-based medical decision support systems to maximize their accuracy and performance in terms of running time. Furthermore, an optimization method is available for efficiently optimizing the parameters of the components of the aforementioned systems over large training sets.

The company has a **methodology** to **optimize** image processing systems considering different **cost constraints.**

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SIGHTSPOT NETWORK KFT.

Sightspot Network Ltd.