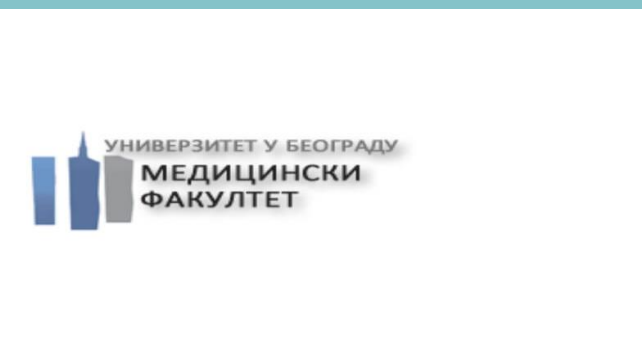


Modeling of the Chemical Dosing Process in Raw Water by An Artificial Neural Network



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INTRODUCTION

Artificial Intelligence and Machine Learning based on Artificial Neural Networks (ANN) and Genetic Algorithms (GA) has application in variety of processes. One of them is raw water treatment by chemicals with the aim to obtain good quality drinking water from physical-chemical, microbiological and biological point of view and to predict the amount of sludge and rinsing water in accordance to raw water quality. The better management of coagulation and flocculation processes. is in focus.

Hygiene and healthy drinking water are the basic preconditions for good health. The World Health Organization has classified the approach to water supply and drinking water quality among 12 basic indicators of the health status of a population



Figure 1. Healthy drinking water

RESULTS AND DISCUSSION

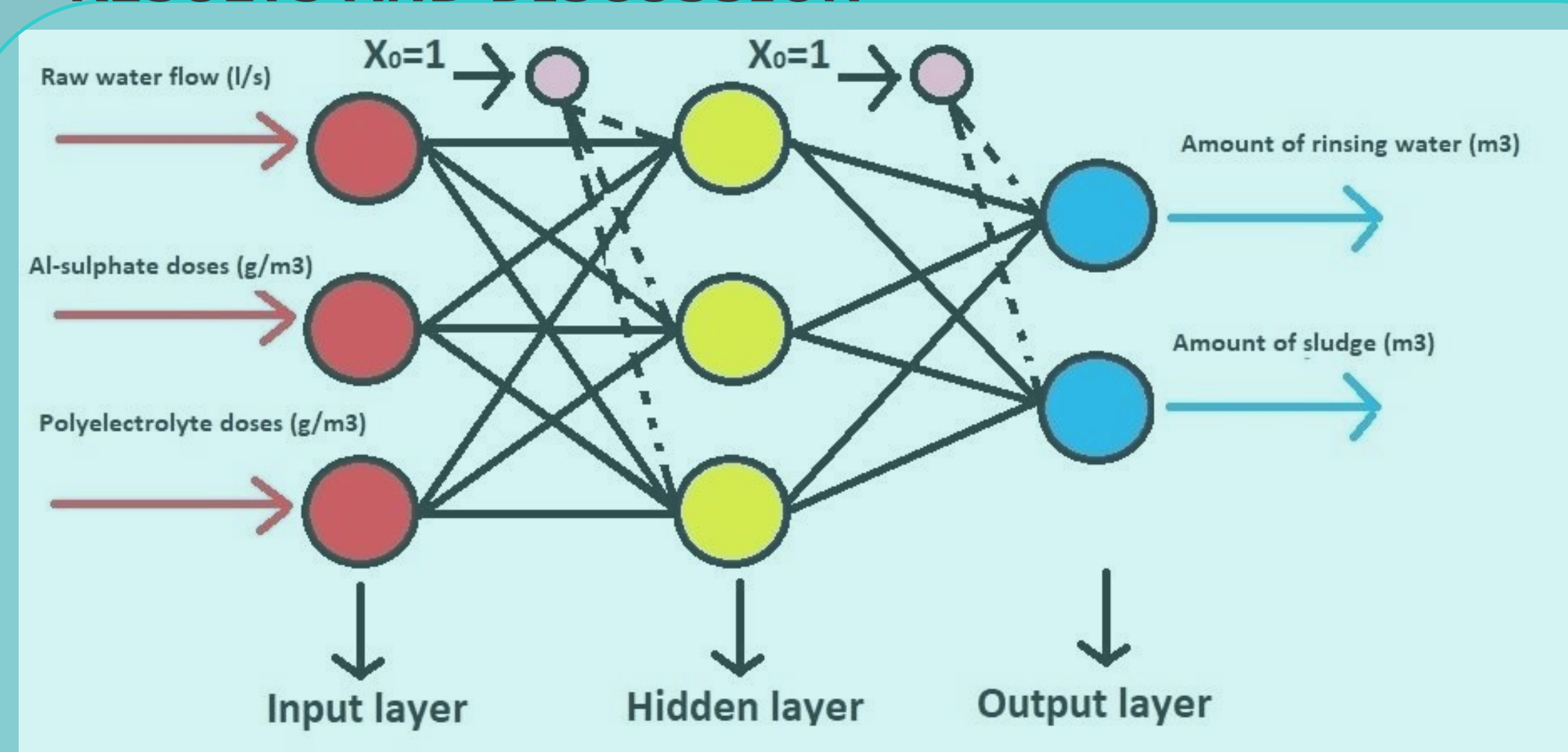


Figure 2. Fully connected multilayer feedforward backpropagation (AAN) network applied to coagulation and flocculation process, in Uzice water plant

The backpropagation model based on AAN is one of the best algorithm. The diagram for amount of sludge has shown convergency after 3500 cycles. After 4000 cycles testing error began to grow up. So learning process has been interrupted after 3500 cycles to avoid overlearning. Similar situation has been for diagrams of learning and testing for amount of rinsing water, but learning process has been interrupted after 3000 cycles, for data during 2017 and 2018 years.

REFERENCES:

- [1] M. R. Cvijovic, M. R. Murić, V. V. Čudić, *Vojnotehnički glasnik*, (2020), 68, 2
- [2] M. Milivojevic, S. Obradovic, V. Stevanetic, D. Drndarevic, 10th Intern. Scient. Conference, "Science and Higher Education in Function of Sustainable Development", 6-7 October 2017, Mečavnik-Drvengrad, Užice, Serbia
- [3] Q. Malik *Applied Water Science*, Springer, (2018), 8, 40
- [4] I. Gržetic, I. Brćeski, *Voda, kvalitet i zdravlje*, Beograd, (1999)
- [5] M. Cvijovic, *Doktorska disertacija*, PMF Kragujevac (2014)
- [6] M. Timotijevic, *Diplomski rad*, Akademija strukovnih studija Užice, (2019)

CONCLUSIONS:

1. The amount of rinsing water and generated sludge in process of drinking water treatment are technological, sanitary and economical important parameters.
2. These two parameters were used as feature descriptors to be predicted by means of AAN and important for future business plan of water plant companies.
3. The problems of overtraining and optimal number of hidden layers nodes and very complex relationship between amount (quality) of sludge and rinsing water and flow rate of raw water, characteristic of raw water (pH, turbidity, water T, dissolved gasses (O₂ and CO₂), level of rainfall, as well as living organisms in water).
4. Generated sludge in accordance to investigation of sludge from 2017. and 2018. year should be used after some metals removal as compost for growing *Coriandrum sativum* in Zlatibor area.

Since the Vrutci lake water has been affected by eutrophication process Sušica source surface water has been used instead of raw water from Vrutci lake from 2014 till 2018 in water plant in Užice. Sušica source surface varies in natural organic and inorganic impurities, biological species and micro-organisms during different seasons. The water need removal of pollutants with coagulants and polyelectrolyte. The coagulants are based on Al-salts so residual Al concentration must be adequately controlled, because excess of aluminium has detrimental effect to human body (Alzheimer diseases, osteomalation, disorder in gastrointestinal tract, bone and lung tissue).



Figure 3 : The dependence of concentration of Al-sulphate and polyelectrolyte on the flow rate of Susicica water during representative months climate affected in 2018. year