

Machine learning in different areas

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INTRODUCTION

My name is Vanesa Andicsova and I am a first-year Ph.D. student at the Faculty of Electrical Engineering and Information Technology at the Slovak University of Technology in Bratislava. I have graduated from Applied Informatics and focused on machine learning in my bachelor and diploma thesis. I am very interested in the application and usability of machine learning models in different areas, which is the main reason why all my final theses have different topics. The following section is a brief summary for all of them.



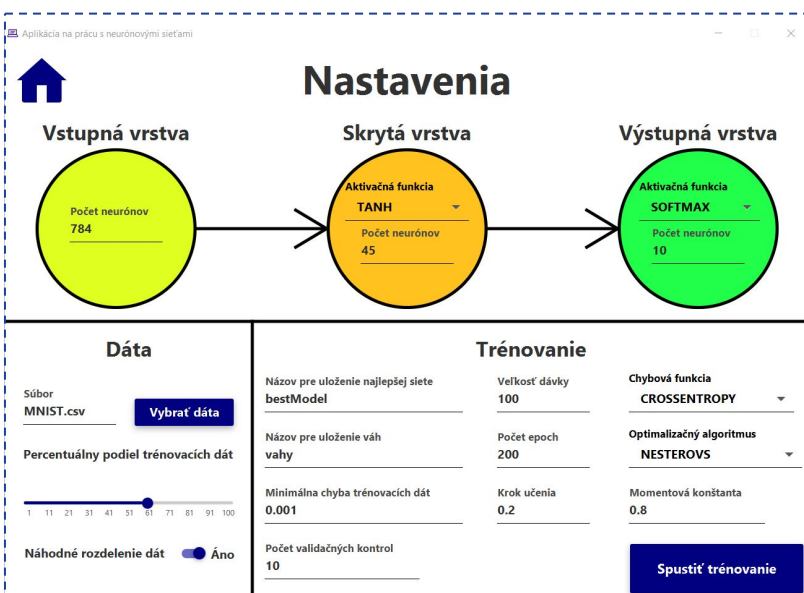
REFERENCES

- Andicsová, Vanesa -- Sopiak, Dominik, *Analyza spracovateľskej stability biopolymérov*. Diplomová práca. Bratislava : 2020. 57 s.
- V. Andicsová and D. Sopiak. "Využitie metód strojového učenia na určenie spracovateľskej stability biopolymérov". In: *Zborník vybraných prác študentskej vedeckej a odbornej činnosti*. ISBN: 978-80-227-5003-5. Slovenská technická univerzita v Bratislave vo Vydavateľstve SPEKTRUM STU, 2020, pp. 42-47.
- Andicsová, Vanesa -- Kajan, Slavomír, *Aplikácie rozpoznávania pomocou neurónových sietí v prostredí Java*. Bakalárska práca. 2018. 42 s.

RESEARCH

Neural networks in Java

My bachelor thesis focused on creating a user-friendly machine learning desktop application in Java. The actual implementation allows the user to train a new neural network model, evaluate a trained neural network model, and predict the output values for non-labeled data. DeepLearning4Java (DL4J) framework was used for building neural network models and working with them. The application saves not only the trained model but its trained weight and bias matrices in separate files. These can be loaded into Matlab by a provided script, which allows analysis and tuning of the saved model. The training process includes live loss curve plotting for training and validation data along with a summary of evaluated metrics. My goal was not only to develop a usable but also a visually appealing, easy-to-use application that works in one of the mentioned modes and allows users with no programming skills to access the power of neural networks.



Analysis of processing stability of biopolymers

The goal of my diploma thesis was to assess the processing stability of bioplastics, i.e. their reaction to thermomechanical tension. We tried to achieve that by constructing a machine learning model that would predict the viscosity of biopolymers that create Nonoilen – a material developed by researchers from FCHPT STU led by prof. Pavol Alexy. The research started with an analysis of data collected by an oscillating rheometer that gathers values of complex torque and phase difference (other parameters such as complex viscosity and its plastic and elastic parts are calculated as a result). It is possible to set the conditions of timed tests performed by the rheometer so that we can model the actual conditions while processing the material - these are the input features for our machine learning models. Our next step was the selection of models suitable for solving regression tasks - finding an accurate mapping of inputs to outputs: support vector regressor, multilayer perceptron network, RBF (Radial Basis Function) network, and LSTM (Long Short-Term Memory) network. We were able to train all of our models to have RMSE under 200Pas, which, from the perspective of biopolymer processing, is considered sufficient accuracy. Further work on this project is required but our results showed the possibility of the application of machine learning models in this area.

Machine learning in financial sector

The topic of my dissertation is the application of machine learning models in the financial sector. The research includes several tasks: detection of outliers, fraud detection, data validation, estimation of the probability of failure, identification of unauthorized activities, analysis of publicly available information to financial institutions and sentiment analyses of the society. The work on this thesis has recently begun and follow up publications will be available in the coming months. The expected areas of interest are unsupervised learning, CNNs, text summarization, regression models, sentiment analysis, natural language processing, text extraction from images, and event prediction.