

Work in progress!



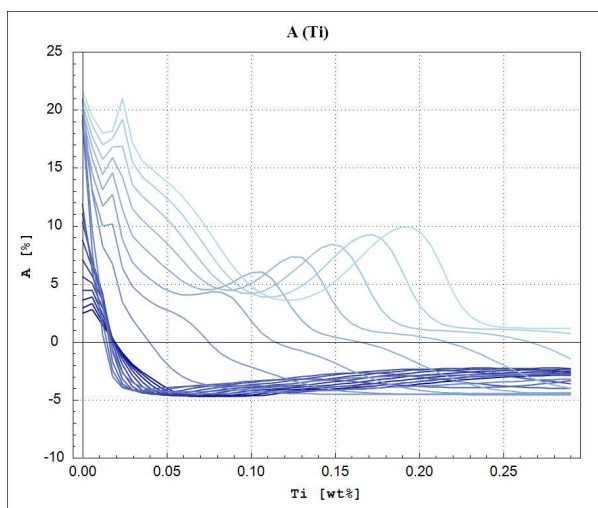
NeuralParametricDemo

Exploring ANN Models Parametric Studies

User Manual

Version 0.0, May 2013.

by Igor Grešovnik & Tadej Kodelja



This software is based on the Investigative Generic Library (IGLib).
It was created as auxiliary tool for performing parametric studies on ANN - based models.



Contents:

1 Introduction..... 1

2 Short User Manual..... 1

2.1 Installation and Use 1

2.2 Calculating Model Output..... 1

 2.2.1..... 2

2.3 Accessing Help and Web Pages..... 2

3 Screenshots..... 3

4 About the Software..... 4

5 Sandbox 8

1 INTRODUCTION

2 SHORT USER MANUAL

2.1 Installation and Use

Installing and using the software is extremely simple. In order to install the software, just grab the archive, expand it, and copy the contained file into some directory. Double-click on the executable file in any file browser (such as the Windows Explorer) in order to execute the software.

In order to start using the software, ...

2.2 Calculating Model Output

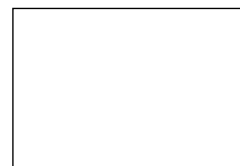


Figure 1: GUI for calculating output values of the model at chosen input parameters.

2.2.1

2.3 Accessing Help and Web Pages

3 SCREENSHOTS

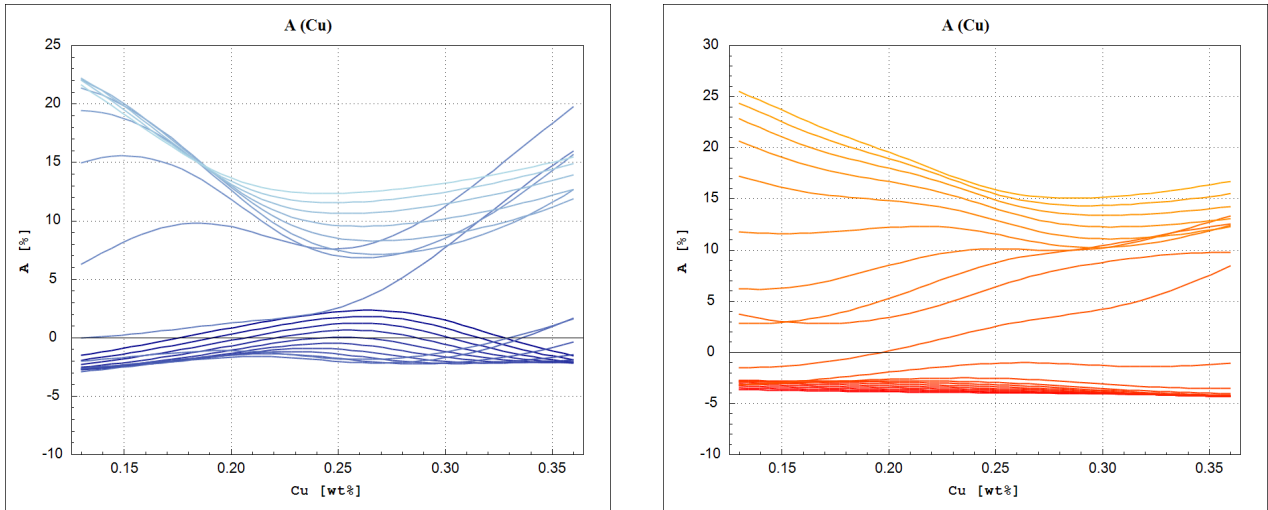


Figure 2: Elongation as a function of the Copper concentration (Cu), calculated by the ANN model on centered verification point (red line) and centered training point (blue line).

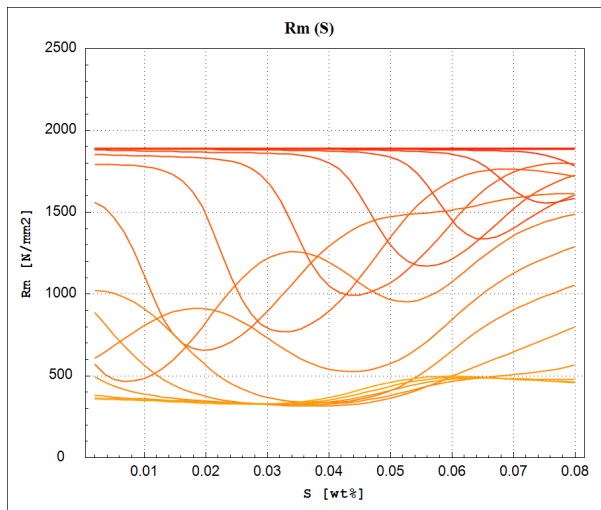
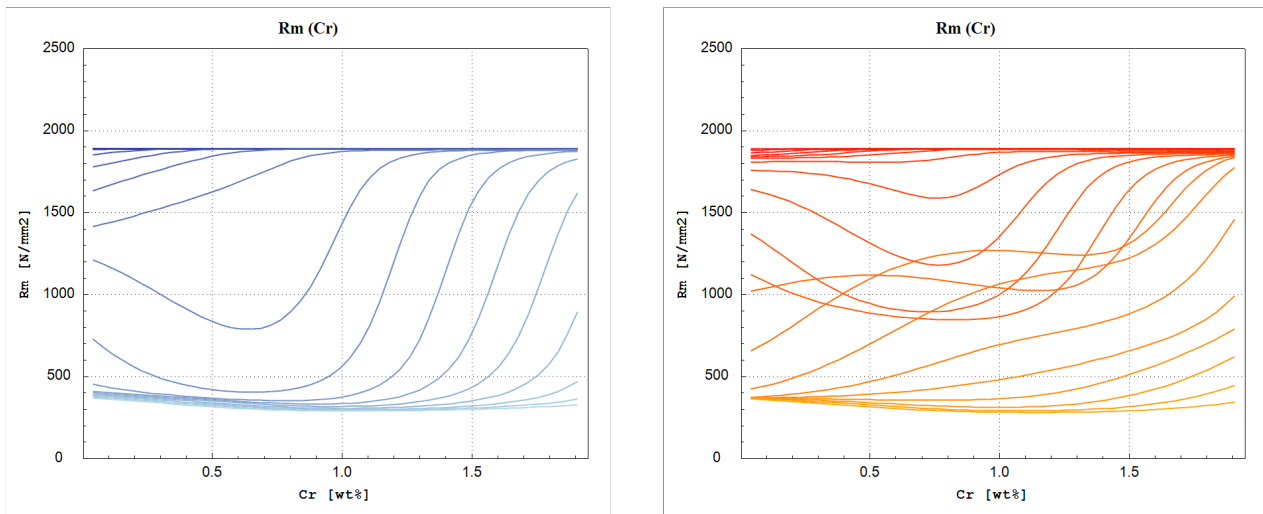


Figure 3: Tensile strength as a function of the Sulphur concentration (S), calculated by the ANN model on centered verification.



4 ABOUT THE SOFTWARE

Software was developed by Igor Grešovnik and Tadej Kodelja as an easy to use and intuitive tool for performing parametric studies on the artificial neural networks (ANNs) - based models. Authors have developed the software while working on ANN-based model of process parameters in material production in the Centre of Excellence for Biosensors, Instrumentation and Process Control ([COBIK](#)). In the scope of his work at COBIK, Tadej Kodelja was also working on his Ph.D. thesis under supervision of Prof. Božidar Šarler and Igor Grešovnik.

The software is based on the *Investigative Generic Library (IGLib)*, a framework library for development of technical applications. The library itself is based on the .NET framework and relies on a number of third party libraries. It has been used by commercial as well as research projects. Among the others, it serves as code base for the software for industrial ANN-based modeling, which is developed by the authors of the application. That is a complex software used as support to tackle most challenging ANN modeling problems in industry. It requires some expertise and skills to use that software, but with the benefit of a powerful and flexible problem solving tool. The software is used internally for performing research and providing services to industry, but authors are open for all kinds of collaboration where the software can be utilized.

Some References

Below there is a collection of selected references and links that are in some way related to the software. They are mainly related to the authors' past work that brought to the situation where the software was created. References [1] - [3] are some papers published within the scope of our work at the Centre of Excellence for Biosensors, Instrumentation and Process Control. [4] - [9] are references related to optimization shell *Inverse*, which is a complex industrial & research optimization software written in C that preceded the *IGLib* library, and where many concepts and ideas used in the *IGLib* library (a framework library for development of technical applications reference developed by Igor Grešovnik, reference [10]) come from. Aforge.Net (reference [11]) is a library that is used as neural networks computation engine in **Error! Reference source not found.**

References [12] and [13] are links to the institution Centre of Excellence for biosensors, instrumentation and process control (COBIK) and the laboratory where the authors currently work. Within COBIK, authors are developing methodologies for application of artificial neural networks to modeling of industrial processes. The problem solving software developed in the scope of this work is based on the *IGLib* ([10]). This is also the case with this software, which is a side product of the above work initially developed as a simple tool for inspecting features of ANN-based models.

The more professional software used for actual research & industrial work is quite complex and requires a high level of expertise from the user, and it is interpreter - centered rather than a GUI - based. It is used internally for performing research tasks and to offer services to industry, with interfaces to a number of partner software and with some specialized interfaces for users in partner institutions. This software is designed to be highly flexible and quickly adaptable to new problems and customer requirements. It does not target any specific range of tasks, but is a good base for a wide range of specialized modules or applications for specific and well defined tasks. The software is not available for purchase, but authors will welcome any suggestion for collaboration on research, development or industrial projects or request for development of software needed, where they can provide reliable and professional service.

- [1] Grešovnik, I.; Kodelja, T.; Vertnik, R.; Šarler, B. (2012): A software Framework for Optimization Parameters in Material Production. *Applied Mechanics and Materials*, vol. 101-102, pp. 838-841. Trans Tech Publications, Switzerland.
- [2] Grešovnik, I.; Kodelja, T.; Vertnik, R.; Šarler, B. (2012): Application of artificial neural networks to improve steel production process. Bruzzone, A. G.; Hamza, M. H. *Proceedings of the 15th International Conference on Artificial Intelligence and Soft Computing*, Napoli, Italy, pp. 249-255.
- [3] Grešovnik, I.; Kodelja, T.; Vertnik, R.; Senčič, B.; Kovačič, M.; Šarler, B. (2012): Application of artificial neural networks in design of steel production path. *Computers, Materials and Continua*, vol. 30, pp. 19-38.

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- [4] Gresovnik, I. (2000): A General Purpose Computational Shell for Solving Inverse and Optimisation Problems - Applications to Metal Forming Processes, Ph. D. thesis, University of Wales Swansea, U.K.
 - [5] Grešovnik, I. (2012): Optimization shell Inverse, <http://www2.arnes.si/~ljc3m2/inverse/>.
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 - [8] Grešovnik, I. (2009): Simplex Algorithms for Nonlinear Constrained Optimization Problems, technical report. Available at: <http://www2.arnes.si/~ljc3m2/igor/doc/rep/optalgsimplex.pdf>.
 - [9] Grešovnik, I. (2012): IOptLib – library for solving inverse and optimization problems. Available at: <http://www2.arnes.si/~ljc3m2/igor/iptlib/>
 - [10] Grešovnik, I. (2012): IGLib.net - investigative generic library. Available at: <http://www2.arnes.si/~ljc3m2/igor/iglib/>.
 - [11] Aforge.Net. (2012): Artificial intelligence library. Available at: <http://www.aforogenet.com/>.
 - [12] Centre of Excellence for biosensors, instrumentation and process control (COBIK) <http://www.cobik.si/index?lang=eng>.
 - [13] Laboratory for Advanced Materials Systems, COBIK: <http://www.cobik.si/laboratoriji/laboratorij-za-sisteme-z-naprednimi-materiali?lang=eng>

To do:

1D forma:

Ni jasno, kaj so to Verification Error-ji (kako točno so pridobljene verifikacijske točke) – to je treba napisati v navodilih.

2D forma:

Če ne zapreš okna z originalno funkcijo in podatkov za trening, se program sesuje, ko prikažeš še rezultate (aproksimacijo) v novem oknu.

Če dvakrat zaporedoma izrišeš graf (npr. aproksimacije), so grafični objekti podvojeni. To rešiš le, če pritisneš vmes gumb Reset. Morda bi bilo bolje, če ne bi uporabil starih objektov in bi objekte in morda grafično okno naredil vsakič na novo.

5 *SANDBOX*

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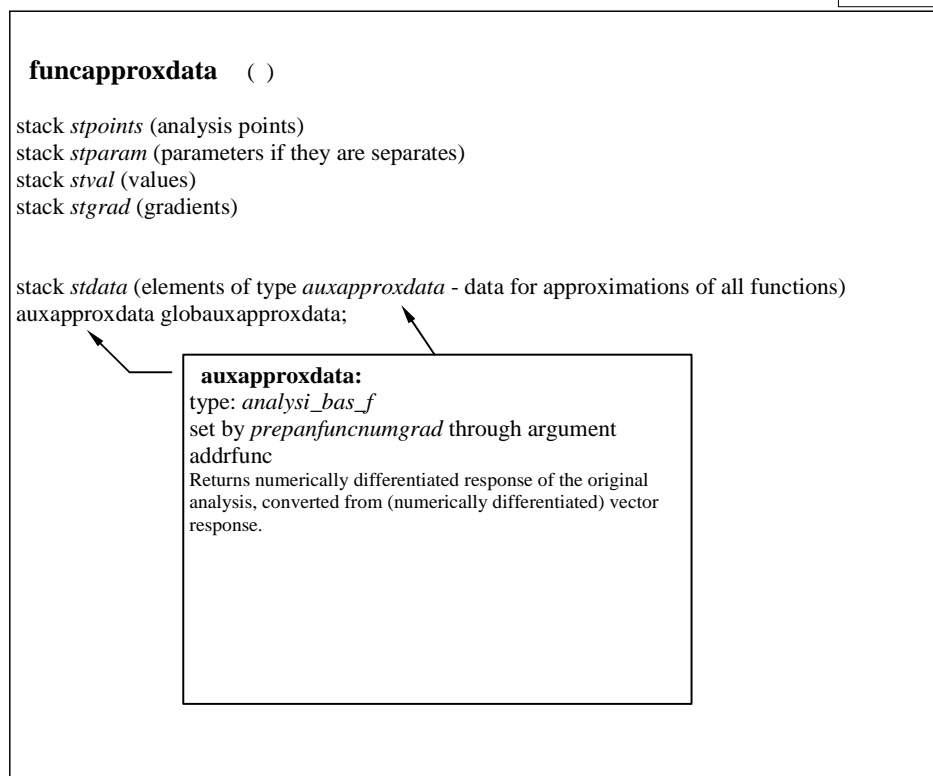


Figure 4: xxx.

