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RYSZARD MICHALSKI – FATHER OF MACHINE LEARNING

RYSZARD MICHALSKI – OJCIEC UCZENIA MASZYNOWEGO

Professor Ryszard Michalski was the Pole who had very big achievements in the currently fashionable area, i.e. machine learning, being the key to artificial intelligence (AI).

The mentioned scholar gained mainly his reputation and a wide influence on the modern science in the USA where he worked and lectured at University of Illinois in Urbana-Champaign and since 1988, at George Mason University where he created Machine Learning Laboratory (Fig. 1), one of the leading scientific centres of this type in the world.

Before it happened, he had obtained education and his way to the first professional titles and scientific degrees was somewhat untypical.

Fig. 1. Professor Ryszard Michalski at his work place.
Source: Wikipedia

He commenced the studies in 1954 at Krakow University of Technology which did not have then the Faculty of Electric Engineering. As the interests of Ryszard Michalski were definitely aimed at electrical engineering and, later, computer science, he moved to Warsaw University of Technology and in 1959 he obtained there the BSc. degree in electrical engineering. His further studies were continued in Petersburg (being called then Leningrad) where he obtained the MSc degree (1961) at the University of Technology. After coming back to Poland, he began to work (1962) at the Institute of Computer Science of Polish Academy of Sciences (PAN). In 1969, Ryszard Michalski defended successfully his doctoral thesis at Silesian University of Technology and commenced his work at the Institute of Automation of PAN.

During the mentioned above period, together with Jacek Karpiński (being known as constructor of minicomputer K-202) he constructed the first Polish Perceptron - the learning system, intended for recognition of manually written letters. I was also involved in construction of learning perceptrons (for recognition of Polish speech) and when I had the opportunity to meet personally Prof. Michalski, I asked him some questions concerning the mentioned device. He had a very modest and self-critical approach to his work, oppositely to Jacek Karpiński who praised his own achievements in his numerous autobiographies as being the global range event. The future appreciated, however, Prof. Michalski... When Prof. Jerzy Pniewski from Physics Faculty of Warsaw University instructed him with the task of constructing perceptron for recognition of

Fig. 2. The first visit of Prof. Michalski at AGH.
Photography from the private collection of the author of this paper

photos connected with the reactions of elementary particles (which Prof. Pniewski received as a result of cooperation with CERN) which had to be analysed and classified, Karpiński constructed the system KAR-65 but it did not meet the expected hopes.

Prof. Ryszard Michalski could not see the possibility of "spreading the scientific wings" in Poland and in 1970, he migrated for the United States of America where, initially, he worked at Illinois University in Urbana-Champaign and since 1988 at George Mason University. In the both mentioned universities, he created the teams of scientists, developing different methods of machine learning. Many methods of machine learning, as developed and utilized until now, have been created just in the mentioned above teams, and Professor Ryszard Michalski gained the commonly used title of "father of machine learning".

His work commenced opening of new areas in the field of learning strategy and the representation of knowledge. The important area of discoveries by Prof. Michalski included combination of genetic algorithms introduced to computer science by John Henry Holland, the processes of simulated evolution and the problems of machine learning. The class of evolutionary calculation process, as introduced by Prof. Michalski, being called *Learnable Evolution Model* has been a very meaningful scientific achievement, being imitated later and cited by many researchers all over the world. Theory and methodology of induction learning was another known and appreciated scientific achievement of Prof. Michalski. The mentioned theory perceives induction learning as heuristic search in space for symbolic descriptions, generated by the application of various rules of concluding in the initial observation statements. Prof. Michalski created the mentioned above theory and then, he employed it in the area of conceptual analysis of data what was undoubtedly a pioneer work.

His original ideas, undertaken later by many researchers, was introduction of conceptual grouping and also, ingenious integration of quantitative and qualitative discoveries, utilized later in widely known ABACUS system.

When looking at the list of publications of Prof. Michalski deriving from the discussed period, it is easy to notice that almost all these papers contain the Polish-sounding names of Professor's co-authors. It is not accidental – many Polish IT specialists who left for US for a permanent stay or for the time-limited practice, sought the help at Professor Michalski – and he gave them his generous assistance, including them, *inter alia*, to his research teams and to his publications.

At a certain moment, Prof. Michalski noticed that many of his young Polish protégés were my pupils: they wrote their MSc. and also, some of them, PhD dissertations under my guidance. It is worthy to mention that in the period of 1980–2000, there were developed more than MSc papers and 38 PhD dissertations under my guidance; the so-called "injection of a fresh blood" was noticeable and young, clever and well-educated people took an advantage from the possibilities which were generated after the political transformations in Poland (1989). They left for abroad, mainly to the US where they had undoubtedly the greatest chance to make the scientific career.

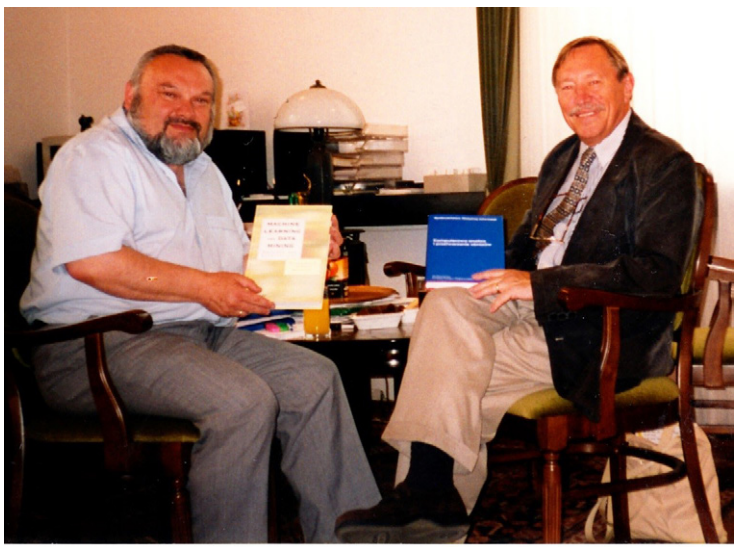

Fig. 3. Exchange of the authors' books.
Photography from the private collection of the author of this paper

The mentioned above phenomenon had caused that Prof. Michalski assumed creation of a new AI in Krakow AGH and decided to visit it. He wrote a letter to me and then, he arrived to Krakow and visited AGH – the university which he heard much about but he has never got to know it earlier.

He came for the first time in 2001 (Fig. 2) and met with the scientists and doctoral candidates of AGH; the mentioned meetings had a character of seminars.

Fig. 4. Meeting with Professor Michalski in Washington (Lincoln Mausoleum in the background). Photography from the private collection of the author of this paper

I helped to facilitate these contact as I was then the Rector of AGH, and, additionally, the tutor of doctoral studies at the Faculty of Computer Science. The mentioned contact occurred to be very successful, so in the 2000, Prof. Michalski visited AGH again. We exchanged then the books: Prof. Michalski gave me his book: "*Machine Learning and Data Mining*" (it is presented at Fig. 3 and is recognisable in the lists of the most important publications on AI). I offered him my book "*Computer-based analysis and image processing*" which was the first Polish handbook on the problems concerning *computer vision*, being very interesting for Prof. Michalski.

We corresponded later intensively on scientific problems although, unfortunately, I didn't manage to write a publication jointly with Prof. Michalski. I regret very much because it would be a great ennoblement for me. Unfortunately, it happened so that always when a new, unusual scientific concept was born in our correspondence, then, a young scientist appeared immediately (at AGH or in USA) and he needed urgently a well promising subject for doctoral dissertation as it was the conditions of his/her further career... It was the period when more and more talented women appeared in the field of computer science. Summing up, we have not created any joint publication although we were very close to the so-called "dotting the i's.

The joint work was implemented, however, in another area, because Prof. Michalski was the follower of the comprehensive transfer of the resources of Polish libraries to computer databases to which the readers could have an access *via* Internet website. Meanwhile, I performed similar practical activity in the Chief Library of AGH. Owing to the mentioned exchange of ideas with Prof. Michalski and mutual stimulation, many valuable books (especially of those ones, being "read out" frequently by the students almost to the physical destruction) were collected in a digital form in the computers, functioning at the library of the Krakow University of Science and Technology (AGH). It is worthy to mention that the first book which was publicly available in the mentioned above manner was my monograph: "*Neuron networks*" (1993). It is up to now available in the Internet under the address: http://winntbg.bg.agh.edu.pl/skrypty/0001. It deserves attention that the number found in the above address is 0001 – it is evidence that just this book commenced everything!

The total activity of digitalization of paper books at AGH and other Polish universities (libraries' cooperation is very effective!) resulted from the advices and suggestions of Prof. Michalski – it is the reason for mentioning this fact in the present paper.

After the series of Prof. Michalski visits in Poland, the time for revisits came. In the summer of 2004, I managed to place some my lectures at the scientific conferences which were held in the USA in nearby cities and in the favourable time coincidence. So, I arrived to Washington and met Prof. Michalski on the American land (Fig. 4).

Prof. Michalski's laboratory in George Mason University was situated only 20 miles (30 minutes by car) from the city, so there was also sufficient time for scientific problems as well as for visiting of tourism objects.

Unfortunately, it was our last meeting... In 2007, Prof. Michalski passed away. But he left a significant group of his pupils and graduates, so the scientific contacts with my group at AGH lasted after his death and they are alive today. His silhouette deserves undoubtedly the cognition and respect. That is why I have developed the present paper.