Tokeya Deep Data Dive GmbH & Co. KG – What we offer

Starting situation

With the advent of *deep learning,* artificial intelligence (AI) has become **the** future technology beyond comparison. Nowadays, AI embraces more and more domains of the economy at a rapid pace, even of the whole social life worldwide. AI **is** already included in a variety of products, for instance in personal assistants such as Siri, Bixby, Cortana or in products by Google like Gmail, Maps, Photos and Translate, but also in Spotify, Pinterest, Snapchat, Tinder and Instagram as well as in companies like Facebook, Uber and LinkedIn, see the first link on our website www.tokeya.de .

„In 50 years, this 18 month-period we are in now will be seen as being crucial for the future of the A.I. community....It is when the A.I. community finally woke up and took itself seriously and thought about what to do to make the future better."
(**Stuart Russell**, Prof. of Computer Science at the University of California, Berkeley, USA; AI-Pioneer)

China, for instance, has recently drawn the political and business conclusion from the triumphal march of AI. A "national AI plan" has been presented to demand leadership in AI by the year 2025, see the second link on our website.

Leading technology companies in Germany like Daimler, Audi, BMW, Bosch and Siemens, as well as international companies such as Apple, Google, Facebook, Microsoft, Amazon, IBM, Samsung, Toyota, Softbank and Nvidia completely focus on **AI**.

Leading management consulting, technology and outsourcing companies like Accenture, McKinsey or PricewaterhouseCoopers (PwC) view AI as **the key** technology for the future, which will enable growth by "*digital transformation*" (digitization, industry 4.0) in a way that was hardly imaginable up to now.

Due to the growth of the internet of things (IoT), where *industry 4.0* will capture the industrial segment, the yearly worldwide spending will reach about $1.4 trillion by 2021, according to IDC Forecasts, see the third link on our website.

Digitization usually starts as a network of sensors of varying origin, whose purpose is the surveillance and optimization of, e.g., a production line in a medium-sized enterprise. The abundancy of the gathered data (*big data*) allows for an *intelligent analysis* with methods of established data science and of AI, gaining information that will directly increase productivity and reduce costs. This is accomplished by uncovering hidden data and process relationships which will enable an optimization of the production.

By combining and communicating with additional sensors and AI programs, a company will get connected step by step - from production right up to the executive floor. The gained new information will help to reinforce the competitiveness of a company and to secure its future. This is the main idea behind industry 4.0.

Conclusion: If *big data* is the **fuel** of *industry 4.0*, then *artificial intelligence* is its **engine**!

A prime objective of the automotive industry is *self-driving (autonomous) cars*. The future viability, in particular of Germany's most important industry branch, depends on whether the industry succeeds in developing AI solutions which are enabling autonomous driving.

Likewise, It will be important that customers accept this technology and that their personal data are safe and remain safe despite a plethora of intelligent networking.

The problem: Not only the automotive industry fully banks on AI. Every other technology, trading and financial company is desperately looking for AI experts. However, the current demand for well-trained AI-specialists is far beyond their availability. As a consequence there are in no way enough AI-specialists left for every company.

In this period of change and upheaval of whole industry branches, **we founded a company** which is fully committed to AI.

What are we working on? – Focus on the following segments

- **Services** in the application of data mining, data analysis, and AI-based data science for industrial corporate data.

  Keywords: Big data, deep learning, predictive analysis, industry 4.0, digitization, intelligent sensor systems, intelligent autonomous systems, industrial internet of things (IIoT).

- **Proprietary software development**:
  - Development of a VAIS (*virtual autonomous intelligent system*) with the ability to generalize with the aid of concepts from statistical learning theory.
  - Development of compact, high-performance deep neural networks by modeling of input values (complex-valued for signals) and nonlinear correlations (functional links) in the input layer.
  - Development of unsupervised deep-learning methods for the analysis of unknown ("unlabeled") data.
    Keyword: Deep SOM - "deep self-organizing feature map".

- **Development of customer-oriented sensor-software combinations and software as a service (SaaS)**
  - Linkage of AI methods with multivariate statistics in interconnected sensor systems.
    Keywords: Real-time evaluation, time-series analysis, evaluation of emerging big-data streams.
  - Predictive maintenance of crucial operating equipment for, e.g., power supply utilities.
  - Development of software for condition assessment of operating resources for power supply utilities by AI
    Keywords: AIHI (artificially intelligent health index) and RAIV (remote assessment and intelligent visualization) – on demand.

- **Consulting** for industrial companies:
  - Introduction of AI
    - In industrial companies in general (top-level)
    - In planned new developments and innovations (medium-level)
    - In new or already existing projects (low-level)
  - Evaluation of AI business concepts

Who are we and where do we come from?

We are a team of experienced mathematicians, physicists, and computer scientists with a strong background in artificial intelligence (AI), data analysis and their application. The majority of us formerly worked for Yucoya Energy Safety GmbH, a company which had the goal of precisely diagnosing operational equipment (especially of power transformers) of power supply utilities with a multitude of sensors (in particular ultrasound). To this end methods of AI (e.g., neural networks) as well as multivariate analysis were deployed. Yucoya's reference projects were the successful development, test and multiple installation of a prototype test system together with A. Eberle GmbH & Co. KG (Nuremberg, Germany) at transformers in the power grids of Westnetz GmbH (a subsidiary of RWE) in Wesel in Germany, Electrica Transilvania Nord S. A. Substation Cluj in Romania, and in Italy in the power grid of Trasmissione Elettricità Rete Nazionale S.p.A. (TERNA) in Venice. The business relations with partners and customers of Yucoya Energy Safety GmbH in Germany, Austria, Switzerland, Slovakia, Hungary, Romania and Italy as well as in China will be kept up by Tokeya Deep Data Dive GmbH & Co. KG with a new business perspective.

Thomas Fritsch, PhD, is the founder and CEO of Tokeya Deep Data Dive GmbH & Co. KG. He is a pioneer in the field of neural networks. He already wrote his diploma thesis in mathematics ("*Investigations of artificial neural networks and their sensitivity on element reduction*") on the topic of neural networks in 1989 and finished his PhD ("*Neural networks in planning and optimization of mobile communication networks*") in 1995 in the same field. Working at the University of Würzburg and as a freelancer, he supervised 20 diploma theses and project works, a large number of industry co-operations (IBM, Daimler, medical technology and IT content management companies and measurement engineering for power supply utilities), all in the field of neural networks. From 2009 to 2017 he was CEO of an innovative company: Yucoya Energy Safety GmbH.

Frank Wirner, PhD, is the deputy of the CEO Dr. Fritsch and CTO with focus on data analysis and software development. He finished his PhD in microfluidics and experimental statistical physics at the University of Stuttgart in 2015. He worked for Yucoya Energy Safety GmbH from 2015 to 2017 where he was responsible for remote data analysis of highly multivariate data which were transmitted in real time by the prototype systems mentioned above. He made essential contributions to the development of these systems. Dr. Wirner is responsible for contract project management and technical execution of internal development projects.

In the current situation, where demand for AI experts vastly exceeds supply, we see it as one of our major advantages that we have the ability to train scientifically experienced associates in the different areas of AI and their practical application to enable them to contribute to the development in ongoing projects.

What can we do for you? – Skill profile of our work

We *offer solutions for*

- IIoT data mining (especially but not exclusively for power supply utilities)
- Deep learning and data analysis for research, development, monitoring
- Predictive maintenance of crucial operational equipment
- Intelligent human-computer communication ("chatbots") in the *industrial field*

We *develop, design, optimize and program* customized AI-based solutions for:

- Deep neural networks (supervised learning)
- Deep self-organizing seature maps – deep SOM (unsupervised learning)
- Multivariate analysis of multidimensional data (linear, nonlinear)
- Visualization of multidimensional data
- Application of further machine-learning methods (e.g., cluster analysis)

We mainly *employ*:

- Computer languages like

  R, Python, C/C#/C++, script languages (e.g., Lua, Java)
- Libraries like

  Tensorflow, t-SNE, Keras, Torch, MS Azure, Theano, Caffe

We can, given the need, use scientifically oriented development tools such as Matlab, Maple, Mathematica, SIMCA, BayesiaLab, Comsol, CAMO-Software, ProSensus for data analysis.

We are, needless to say, familiar with standard software such as Excel and Excel-based tools, e.g., for PLS analysis (Partial least squares method).

We *deliver* systemic solutions:

- customized, stand-alone
- embedded in already existing software via defined APIs
- as adaptation/extension of already existing software with AI-based applications

We can *provide* these solutions as:

- Software as a service (on demand, remote) – SaaS
- Desktop/network solutions
- Web-based solutions
- App solutions

We are looking forward to working with you. Please contact us if you like our offer. We thank you for your interest.

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