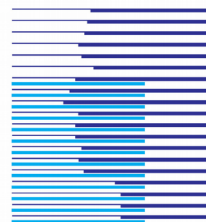


AIDD Kickoff Meeting

Dalle Molle Institute for Artificial Intelligence (IDSIA)
USI & SUPSI
Lugano, Switzerland

Dr.-Ing. Michael Wand
Prof. Jürgen Schmidhuber

USI/SUPSI



Istituto
Dalle Molle
di studi
sull'intelligenza
artificiale

IDSIA

The IDSIA



- The Swiss AI Lab IDSIA (Istituto Dalle Molle di Studi sull'Intelligenza Artificiale) in Lugano, Ticino, Switzerland
 - non-profit research institute for artificial intelligence (AI)
 - founded 1988, now affiliated with the University of Lugano (USI) and the University of Applied Sciences of Southern Switzerland (SUPSI)
 - I am a senior researcher in the group of Jürgen Schmidhuber
 - Group topics: Neural network based machine learning, reinforcement learning, AI, robotics, ...
 - Michael's topics: applied machine learning on complex real-world datasets

Academic Landscape of Ticino

- IDSIA: ~70 researchers (including PhD students)
- SUPSI: ~ 700 academic staff members
- USI: ~ 870 academic staff members
- High-level academic environment in beautiful Ticino!
- Strong collaboration between schools and institutions



Bio Jürgen Schmidhuber

- Born 1963 in Munich, Germany.
- Scientific Director of IDSIA (since 1995), Professor at USI and SUPSI, chief scientist of NNAISENSE.
- His work in AI/ML has revolutionized connected handwriting recognition, speech recognition, machine translation, optical character recognition, and image caption generation, and is now in use at Google, Microsoft, IBM, Baidu, and many other companies.
- His publications have been cited >80,000 times.
- Numerous awards, invited talks, keynotes, etc.

Bio Jürgen Schmidhuber



Our *Annus Mirabilis 1990-91* at TU Munich: first very deep recurrent neural nets (NNs) with unsupervised pre-training, artificial curiosity (GANs as special case), self-invented problems, distilling NNs, vanishing gradients II Long Short-Term Memory (LSTM), learning sequential attention, recurrent world models for planning, learning to control fast weights, hierarchical reinforcement learning, deterministic policy gradients for RNNs, synthetic gradients... by the 2010s, much of this was widely used

<http://people.idsia.ch/~juergen>
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LSTM trained by policy gradients
Wierstra, Förster, Peters, Schmidhuber.
Solving Deep Memory POMDPs with Recurrent Policy Gradients.
ICANN 2007.



2018: PG-trained LSTM is core of OpenAI's *Dactyl*: learning to control dextrous robot hands without a teacher
LSTM is also the core of *OpenAI Five* which learned to defeat human experts in the Dota 2 video game, and of DeepMind's *Starcraft* player *AlphaStar* (2019)

Bio Michael Wand

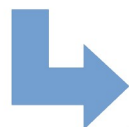
- Born and raised in Göttingen
- ←
- Studied Mathematics and Computer Science in Karlsruhe, Diploma (Mathematics) 2007



- Doctoral studies in Computer Science at Cognitive Systems Lab of Prof. Tanja Schultz, (then) Karlsruhe Institute of Technology, completed Dr.-Ing. 2014
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- Since spring 2014: Researcher at the Swiss AI Lab IDSIA, Lugano; group of Prof. Jürgen Schmidhuber



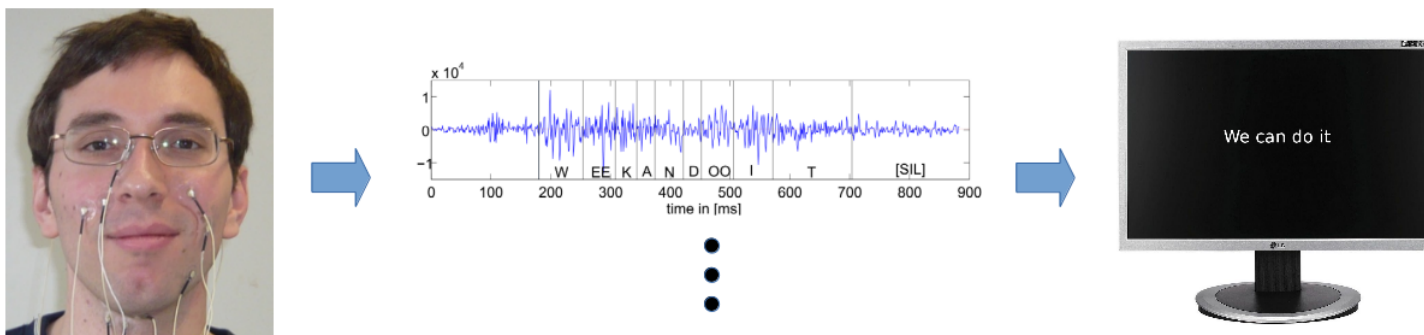
(Images: Wikipedia)



Bio Michael Wand

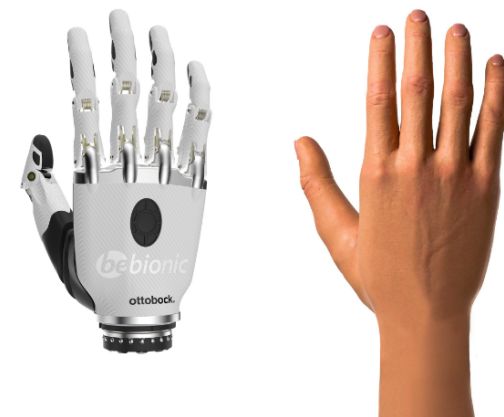
Processing electromyographic (muscle) activity

- for speech recognition



- for versatile hand prosthesis control

Algorithmic methods for dealing
with highly complex, realistic data



IDSIA and AIDD

- ESR12: End-to-end learning of outcomes of organic chemistry reactions (with Bayer)
- Goal: prediction of the outcome (products) of a reaction with a given set of reactants and reagents
- Idea: Approach the task by taking inspiration from ML tasks like speech translation
 - highly versatile modeling approach
 - sequence-to-sequence and beyond