

International Association for Pattern Recognition

TC 3 Neural Networks and Computational Intelligence

Report to the
Executive Committee and Governing Board

September 2014- June 2015

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TC3 website

www.icpr-tc3.org

1. Activities in the last months

- a. A domain name for TC3 website was purchased (www.icpr-tc3.org). The website has been re-organized and valuable educational material added.
- b. The 6th TC3 IAPR Workshop on Artificial Neural Networks for Pattern Recognition (ANNPR 2014) was held in October 6-8 2014 in Montreal, Canada. The proceeding was published in the Springer Lecture Notes on Artificial Intelligence No 8774. The workshop was organized by Prof. Ching Suen (Concordia University, Canada), Dr. Neamat El Gayar (Cairo/Concordia University) and Dr. Friedhelm Schwenker (Ulm University, Germany). In ANNPR 2014, a total of 24 high-quality papers presented original research on neural networks, machine learning and pattern recognition focusing on both theoretical and applied aspects. Participants from different part of the world (Europe, Asia, North America and Africa) attended the workshop. During three days, the attendees presented their work organized in multiple focused sessions on Learning and Architectures, Ensembles, Support Vector Machines, Character Recognition and Image Processing. Additionally three enriching invited talks were given by Prof. Zhi-Hua Zhou (Nanjing University, China), Prof. Dr. Yoshua Bengio (University of Montreal, Canada) and Dr. J. Michael Herrmann (University of Edinburgh, UK). www.annpr2014.com
- c. A report on [ANNPR](#) 2014 was published in the IAPR 2015 April's [newsletter](#).
- d. The leadership board met in October 2014 during the ANNPR 2014 workshop and identified the following research field as a main focus for TC3 in the next years:
 - Deep Learning
 - Recurrent Networks
 - Large scale learning and Big data challenges
 - Biologically inspired robot learning

Relevant educational material including tutorials, demos and interesting applications have been collected and included in the TC3 website.

e. TC3 has helped to promote following events:

- MCS2015, 12th International Conference on Multiple Classifier Systems, Reisenburg Castle (Günzburg, Germany), Ulm University, June 29 - July 1, 2015 <http://mcs.diee.unica.it>
- CIDM 2015, IEEE Symposium on Computational Intelligence and Data Mining December 7-10, 2015, Cape Town, South Africa <http://neuro.informatik.uni-ulm.de/CIDM2015/>

f. A call for proposals for hosting ANNPR 2016 is sent out. The proposals will be evaluated by the steering committee of TC3 and the decision will be finalized by September 15th 2015.

3. Plans & Recommendations (until ICPR2016 and beyond)

a. Important events to be organized during this period are:

- ANNPR 2016

b. A third edition of the PSL workshop is planned for the year 2015/2016.

c. Website updates:

Following educational information and resources have been added related to current hot topics in the area of computational intelligence

- **Research Directions:**

1. Deep learning has become a popular variant of neural networks typically possessing multiple representation layers, with higher-levels representing more abstract concepts. Deep learning is related to cognitive computing and has shown successes in applications involving sets of Big Data.

- Nature paper on Deep Learning by Yann LeCun, Yoshua Bengio and Geoff Hinton
www.nature.com/nature/journal/v521/n7553/full/nature14539.html
- [Deep Learning - an MIT Press book in preparation](#)
- [Representation Learning: A Review and New Perspectives](#), Yoshua Bengio, Aaron Courville and Pascal Vincent, U.
- [Geoffrey Hinton talks about Deep Learning](#), Google, and Everything...

2. Recurrent Nets

- [Jürgen Schmidhuber's page on Recurrent Neural Networks](#)
- [A deep LSTM model to do machine translation](#)

3. Large scale learning and big data challenges:

- [Google's map-reduce paradigm](#) to speed up learning algorithms including locally weighted linear regression (LWLR), k-means, logistic regression (LR), naive Bayes (NB), SVM, ICA, PCA, gaussian discriminant analysis (GDA), EM, and backpropagation (NN)
- Yurii Nesterov's talk about how to solve certain optimization problems that arise from ML in time that is [logarithmic in the number of parameters](#)
- [A method of performing distributed feature selection](#)

4. Biologically inspired robot learning

- **Tutorial and Teaching Material/Demos**

- Deep Learning: [Talks and Tutorials by Yoshua Bengio](#)
- [Where to Learn Deep Learning – Courses, Tutorials, Software](#)
- [Research Network for Self-Organization of Robot Behavior](#)

- **Data Sets and Evaluation Tools**

- [Popular Deep Learning Tools - a review](#)
- Recurrent Neural Networks (RNNs) and their application to Pattern Recognition LSTM Tutorial and open source toolkits <http://lstm.iupr.com>
- [A benchmark of recognizing objects in images](#): ImageNet Large Scale Visual Recognition Challenge (Application of Deep learning)
- [UC Irvine Machine Learning Repository](#)

d. Recommendations:

- For the TC3 website we are still planning to work on restructuring and adding more material related to application areas and successful projects. The support of IAPR is appreciated to fund some web space and restructuring expenses.
- We are studying organizing a summer school for graduate students in some promising trends of computational intelligence and neural networks. We seek the support and endorsement of IAPR for that.