

# Newsletter # 1, March 2021

## Announcements



*Welcome to this first edition of our EDL Newsletter! It's already more than 2 years ago that we had the EDL kick-off in Soesterberg. The EDL program connects academia, both the machine learning and the computer experts, with more than 30 companies, spread all over The Netherlands. We have 7 nice projects up and running, with more than 25 researchers performing excellent research, which resulted already in numerous good publications (see below). Our last plenary program meeting sadly had to be online, but hopefully you experienced still the good atmosphere of being connected to many colleagues; use of a nice poster presentation tool (all set-up by Victor) helped a lot.*

*One of the plans we announced was to regularly email a Newsletter, that informs you on the latest information on the EDL program, upcoming events and highlighted individual projects; this is the first one! As you know EDL has its own [website](#). It has recently been updated, have a look. Your contributions or updates for the website as well as for this Newsletter are welcome at any time! To all EDL researchers, don't forget to send your template for your [personal page](#) on the website to Marja. There are still pages missing. For an overview of offered EDL related courses that may be of interest to you, you best visit the [Course overview](#) at the EDL repository. See also the item on upcoming conferences at the end of this letter. As mentioned, in every Newsletter we want to put the research of one or more EDL researchers in the spotlight. In this first Newsletter **Sherif Eisa** will kick-off. Sherif started research on neuromorphic computing which in the long run could be more energy-efficient than the current deep learning networks. Wish all of you productive research, although it will be largely online for the coming period. Hopefully, the situation on COVID improves soon such that we can continue with the plans for organizing some interesting workshops and a Summer School at location. Stay healthy!*

*Regards,  
Henk Corporaal  
EDL program leader*

## Recent EDL Publications

**Real-time small-object detection from ground vehicles using a siamese convolutional neural network.** Sander R. Klomp, Dennis W.J. van de Wouw, Peer H.N. de With, Journal of Imaging Science and Technology, 2019.

**ECDNet: Efficient siamese convolutional network for real-time small object change detection from ground vehicles.** Klomp, S. van de Wouw, D. de With, P. Electronic Imaging: Intelligent Robotics and Industrial Applications using Computer Vision 2019; Conference proceedings.

**Rare-class extraction using cascaded pretrained networks applied to crane classification.** S.R. Klomp, G. Brouwers, R.G.J. Wijnhoven, & P.H.N. de With, Electronic Imaging, Intelligent Robotics and Industrial Applications using Computer Vision 2020; Conference proceedings.

**Deep learning assisted data inspection for radio astronomy.** Michael Mesarcik, Albert-Jan Boonstra, Christiaan Meijer, Walter Jansen, Elena Rangelova, Rob V. van Nieuwpoort. Monthly Notices of the Royal Astronomical Society, Volume 496, Issue 2, August 2020. Journal publication.

**Clownfish: Edge and Cloud Symbiosis for Video Stream Analytics.** Vinod Nigade, Lin Wang, Henri Bal. ACM/IEEE Symposium on Edge Computing (SEC), 2020. Conference proceedings.

**Effective and Efficient Computation with Multiple-timescale Spiking Recurrent Neural Networks.** Bojian Yin, Federico Corradi, Sander Bohte. ICONS. Conference proceedings, 2020.

**Geographically Local Representation Learning with a Spatial Prior for Visual Localization.** Zimin Xia; Olaf Booij; Marco Manfredi; Julian F. P. Kooij; ECCV 2020 Workshop on Map-based Localization for Autonomous Driving.

EDL has received funding from NWO, the Dutch Organisation for Scientific Research which falls under the responsibility of the Ministry of Education, Culture and Science. Next to the support of NWO-TTW, EDL is also financially and in-kind supported by 35 Dutch companies. This scientific research program is a cooperation of 7 Dutch Universities, 1 German University and 5 NWO research institutes.

**Co-Attentive Equivariant Neural Networks: Focusing Equivariance on Transformations Co-Occurring in Data.** D.W. Romero, M. Hoogendoorn. International Conference on Learning Representations (ICLR), 2020. Conference proceedings.

**Attentive Group Equivariant Convolutional Networks.** D.W. Romero, E.J. Bekkers, J.M. Tomczak, M. Hoogendoorn. International Conference on Machine Learning (ICML), 2020. Conference proceedings.

**Wavelet Networks: Scale Equivariant Learning From Raw Waveforms.** D.W. Romero, E.J. Bekkers, J.M. Tomczak, M. Hoogendoorn. ArXiv Preprint, 2020.

**Group Equivariant Stand-Alone Self-Attention For Vision.** D.W. Romero, J.B. Cordonnier, International Conference on Learning Representations (ICLR), 2021. Conference proceedings.

**CKConv: Continuous Kernel Convolution For Sequential Data.** D.W. Romero, A. Kuzina, E.J. Bekkers, J.M. Tomczak, M. Hoogendoorn. Conference proceedings, ArXiv Preprint, Open access-green, publicly available at ArXiv, 2021.

**EDEN: Multimodal Synthetic Dataset of Enclosed GarDEN Scenes.** HA Le, T. Mensink, P. Das, S. Karaoglu, T. Gevers. Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision, 2020.

**Novel View Synthesis from Single Images via Point Cloud Transformation.** HA Le, T. Mensink, P. Das, S. Karaoglu, T. Gevers. Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision, 2020

## Individual project in the spotlight: Sherif Eissa

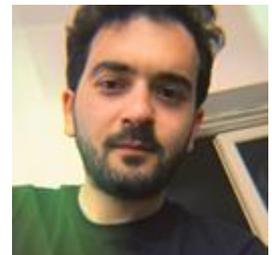
Hello EDL community, my name is Sherif Eissa. I am a new researcher at TU/e and EDL since a bit over 1 year now. I was born in Cairo, Egypt where I earned my BSc. in electronics from German University in Cairo (GUC). I did my bachelor thesis research as well as my masters at the University of Stuttgart in Embedded Systems with the focus on digital system design. My master thesis was about sparsity utilization for CNN accelerators, at Bosch research campus. Besides research work I also did some teaching at both universities. Now, I am tackling deep learning efficiency problems again, but from a new perspective, which is neuromorphic computing.

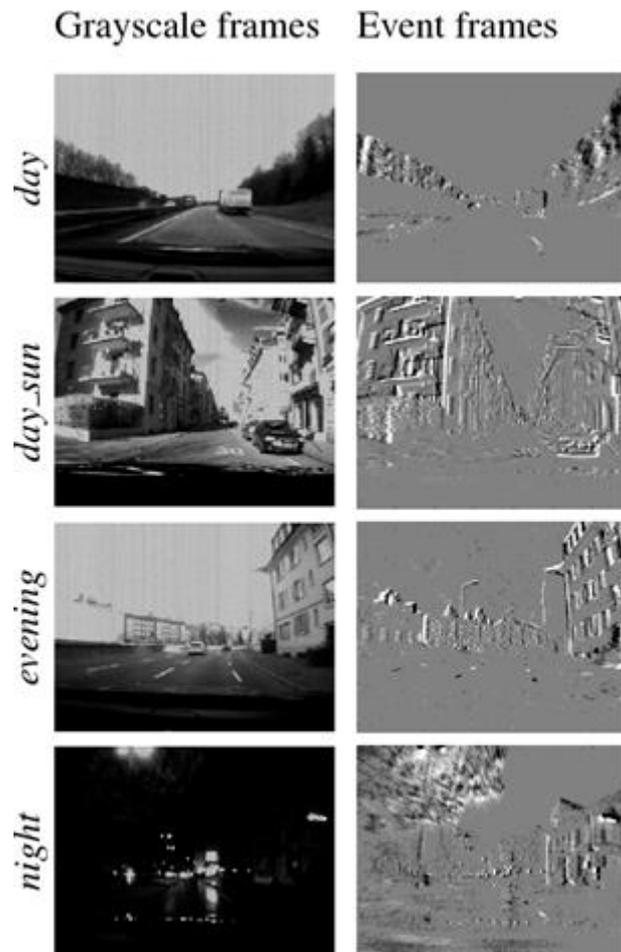
The application of spiking neural networks (SNNs) using neuromorphic hardware started off naively as an attempt to replace ANNs (Artificial Neural Networks) and DL (Deep Learning) hardware.

However, I see now that SNNs are not a de-facto answer towards efficient DL. Instead, neuromorphic computing seems to me more suitable for real-time data (batch size = 1 problems) that involves temporal relationships like natural language processing. Due to the inherent stateful nature of SNNs, they are also suitable candidates for efficient temporal sparsity utilization. SNNs demonstrates superior capabilities in representing and inferring temporal and spatio-temporal patterns, compared to conventional DL accelerators. In other applications where data is static, neuromorphic computing doesn't seem to have a real edge over sparsity utilizing classical ANNs mapped to DL accelerators or conventional GPUs; these solutions also show performance gains from input batching.

Hence, I am inclining now towards two sets of problems for SNNs; 1- Inferring dynamic data with temporal sparsity (e.g., Dynamic Vision Cameras DVS; see picture below). 2- problems which require recurrency or favours reservoir computing such as LSTM networks and Legendre Memory Unit networks. Such applications seem to me as viable candidates for neuromorphic computing.

Incorporating time as a computational domain, and not only as a reference, is key for the efficiency of SNNs. Although the application scope of DL on neuromorphic computers is getting narrower, the algorithmic scope is still wide open, with no clear winner architecture and no clear theory on learning and biological intelligence. However, I will focus on convolutional connectivity, for its strength in computer vision applications, and recurrent/feedback networks, for its strength in biology and viability in neuromorphic computing. In my next years, I will work on designing an accelerator for event-based inference to compute temporally sparse inputs with focus on supporting recurrent and convolutional connections.





## Upcoming conferences/workshops

March 2021/ t.b.d.

### **Workshop on anomaly detection/system health management/ predictive maintenance**

Open to anyone.

Host: UvA (for information contact [Rob van Nieuwpoort](#))

Q4 2021 (tentative)

### **Summer School**

After COVID-19, hopefully in Q4 2021.

Host: TU/e (for information contact [Henk Corporaal](#) or [Victor Sanchez](#))

11-17 October 2021

### **2021 ECCV special session**

Open to anyone.

See: <http://iccv2021.thecvf.com/>

Q2 2021

### **Workshop on Edge computing for real-time machine learning**

Host: VU (for information contact [Henri Bal](#))

2022

### **Workshop on Efficient DNN implementation**

Open to anyone.

Host: TU/e (for information contact [Henk Corporaal](#) & [Sander Stuijk](#))