



SVENSKA
SÄLLSKAPET
FÖR
AUTOMATISERAD
BILDANALYS

MEMBER OF THE INTERNATIONAL SOCIETY OF PATTERN RECOGNITION

SWEDISH
SOCIETY
FOR
AUTOMATED
IMAGE ANALYSIS

SSBAktuell

»»» nr 63 december 2020



www.ssba.org.se

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››› Ordförandes ord



Hej!

Vet inte riktigt vad man ska skriva på ett sådant här ställe om ett så annorlunda år som detta. Det känns som man läst och hört det mest om det förbaskade Corona virusets framfart och därpå tolkningar och analyser till leda men ändå – håll i och håll ut! Jag väljer att ta med mig det positiva jag trots allt upplevt - hur snabbt det går att ställa om och ändra rutiner och metoder när alla hjälps åt, och vilken drivkraft det finns att forska och utveckla trots trassliga ytter omständigheter.

Som paus från allt Corona relaterat, här kommer ett nummer med lite sammanfattningar från händelser det sista halvåret av 2020, lite framåtblickar för 2021, en företagspresentation från Imint och som vanligt lite annat smått och gott. En nyhet i innehållslistan är en exjobbspresentation- skicka gärna fler till nästa nummer. Grattis säger vi också till HASTE laget från Uppsala som vann AI Swedens och Astra Zenecas "cell imaging challenge".

Glöm inte anmäla/återanmäla er till SSBA/SSDL symposiet och att nominera avhandlingar till bästa svenska avhandling inom vårt ämnesområdet!

Jag ser med tillförsikt och förväntan fram emot nästa år och inte minst en bra start med ICPR i januari. Hoppas på att se många av er där!

God Jul och Gott Nytt År!

A handwritten signature in blue ink, appearing to read "Ida-Maria Sintorn".

>>> SSBA/SSDL 2020+1



Call for Participation

SSDL/SSBA 2020+1 will take place **ONLINE** from March 15 to March 17, 2021. The event replaces the two 2020 symposia which unfortunately had to be cancelled due to the ongoing Covid pandemic. **Participation will be free of cost.** The symposia is again organized by the Mathematical Imaging Group at Lund University.

Those who submitted papers or posters to the cancelled event are encouraged to either re-submit their contribution or to submit entirely new research.

Additional information will soon be made available on the symposium website
<http://ssba.org.se/ssba2020/>.

>>> Nomineringar till Sveriges bästa avhandling i bildanalys och mönsterigenkänning 2019-2020

Vi öppnar nu för nomineringar till priset för Sveriges bästa avhandling i bildanalys och mönsterigenkänning 2019-2020. Nomineringar görs av huvudhandledare till avhandlingar som försvarats under något av åren 2019 och 2020. För att effektivisera granskningsarbetet ber vi att endast en student per handledare nomineras.

Har du en student som disputerat under perioden och som skrivit en exceptionellt bra avhandling, som står sig bra även i internationell konkurrens?

Nominerar kandidaten genom att skicka följande till robin.strand@it.uu.se:

1. En länk till en PDF av hela avhandlingen (inte bara sammanläggningsdelen/kappan)
2. Studentens namn
3. Avhandlingens titel
4. Disputationsdatum
5. Huvudhandledare
6. Examinerande lärosäte

Sista datum för att nominera är **31 januari 2021**.

Avhandlingarna kommer bedömas av en kommitté som utses av SSBAAs styrelse. Bedömningen kommer ta hänsyn till arbetets relevans (inflytande/nyhetsvärde), presentation (litterär kvalitet/områdesöverblick), samt även teoretiska och experimentella kvaliteter.

Vi har beslutat att utse Sveriges bästa avhandling 2019-2020 istället för bästa nordiska avhandling 2019-2020 eftersom 2021 års upplaga av SCIA är inställd på grund av pandemin. Priset för bästa nordiska avhandling delas i vanliga fall ut under SCIA-konferensen.

Vänliga hälsningar,
SSBAAs styrelse

>>> Sammanfattning från SSBA:s workshop



Ida-Maria Sintorn

I början på december så hade SSBA en eftermiddagsworkshop via zoom som en Covid-anpassad variant av det numera sedvanliga SSBA internatet. Styrelsen och medlemmar som anmält intresse var med. Totalt var vi 13 deltagare av väl blandad senioritet från olika universitet, myndigheter och företag. Syftet med workshopen var att diskutera idéer för att få till ett så meningsfullt SSBA symposium 2021 som möjligt samt hur vi bäst ska underhålla och utveckla föreningens aktiviteter och nätverk inom akademi och industri.

Mötet hölls i formatet "lean coffee" som styrelseledamot Andreas Wrangsjö guidade oss igenom. Det innebär att alla i tur och ordning först får komma med förslag på diskussionsämnen och presentera dessa. Korta presentationer var nog tanken men diskussioner uppstod direkt...Alla fick sedan rösta (man fick några röster var) på vilka ämnen man ville diskutera mer och de mest flest röster diskuterades sedan i tur och ordning under en viss förutbestämd tid i först hela gruppen och sedan också i speciella fokussessioner i mindre grupper.

De förslag på ämnen som diskuterades (mest) var: format på symposiet och speciellt under Covid 19; en SSBA seminarieserie; hur kan vi öka interaktionen mellan industri och akademi och arbeta tillsammans för att framhäva vårt ämne (lite upplivning av förra års internats "Blue Sky Disruptive Thinking" diskussion); varför är det så få utländska studenter som får ex-jobb i industrin?; gästföreläsare mellan universiteten; examinationsformer.

Sammanfattningsvis så var det entydiga svaret att SSBA symposiet är mycket värdefullt för att upprätthålla och utöka nationella kontakter, för våra doktorander att öva sig att presentera forskning, se vad akademiska grupper och företag i Sverige gör, och för företag att hålla sig a jour med trender och forskningsfronten inom området. Många idéer och erfarenheter diskuterades också kring format och utformning av ett digitalt symposium och eventuellt en seminarieserie, som tex. halvdagar istället för heldagar, seminarier/workshops kring speciella ämnen, "ask me anything" sessioner med experter, sessioner för mer vardagliga ämnen (jobbsituation, hur gör ni?) för att lära känna varandra och utbyta erfarenheter osv.

Alla var också överens om vikten av starkt samarbete mellan industri och akademi och att vi tillsammans bör jobba för att lyfta fram vårt område. Det vore bra att etablera en målstyrd fokusgrupp kring detta som rapporterar till SSBA:s styrelse för att hantera och agera på olika initiativ som t.ex. hur synliggöra området? hur attrahera forskningsmedel?, nya forskningsinriktningar. Vi diskuterade också vikten av att öka industrins delaktighet under utbildningarna i form av projektarbeten osv., för att minska tröskeln till att ge utländska studenter chansen när det är dags för ex-jobb.

Att undervisa digitalt öppnar en möjlighet att enkelt utbyta tjänster och expertis mellan universiteten. Att tex. ge samma föreläsning i kurser på olika kurser innebär ofta mindre jobb än att förbereda två lika föreläsningar och det är också ett enkelt sätt att få in mer expertis inom olika delområden. En inventering av vilka kurser inom vårt område som ges på våra olika universitet behövs för att se vilka möjligheter till gästföreläsare och utbyte som finns. SSBA:s styrelse tog på sig att driva en sådan inventering och sprida i tex. SSBAktuellt. Digital undervisning ställer också nya krav och möjligheter kring examinering. Det vore önskvärt med en workshop kring det i just vårt ämne t.ex. i samband med symposiet som ju tidigare gjorts med lyckat resultat.

>>> Notis om nätverksträffen 13 oktober

 Per-Erik Forssén

Den 13 oktober hölls den tidigare påannonserade mötet "Nätverk inom mätteknik och dataanalys inom processindustrin". Mötet hade 24 deltagare från nästan lika många företag och institut, och som de flesta evenemang nu förtiden hölls även detta över video (i Teams).

Under dagen hölls sex föredrag, bl.a. informerade undertecknad om vår förening SSBA. Det var även två föredrag från RISE, ett av Charlotte Ireholm, om forskningsprojektet VIST som handlade om just visuell mätteknik i processindustrin, samt ett av Anna Larsson, om RISE Mätteknik och deras standardisering av mätprocedurer. Från Swerim höll David Olevik ett föredrag om snabba formmätningar på varmvalsade produkter med hjälp av strukturerat ljus. Elena Larsson berättade om LKABs pelletiseringsprocess och de mätbehov de har.

Jörgen Ahlberg från Termisk systemteknik höll ett föredrag om värmekameror och deras användning inom industrin, och Jan Lundgren från Mittuniversitetet gav en översikt av deras forskning inom visuella mätsystem.

Under eftermiddagen hölls även en workshopdel, där deltagarna diskuterade former och innehåll i nätverket, samt önskemål och idéer för framtida nätverksträffar.

Under dagen var det en del intressanta diskussioner, och vissa saker underlättas av videoformatet, t.ex. gick Elena Larsson och visade nygjorda pellets under sitt föredrag. Förhoppningen är dock att nästa möte skulle kunna ske på plats, kanske i form av ett studiebesök. Vi får se.

>>> Adipocyte Cell Imaging Challenge



Håkan Wieslander

At the beginning of November AI Sweden, in collaboration with AstraZeneca, hosted the Adipocyte cell imaging challenge. The challenge aimed at utilizing machine learning to combine the advantages of bright field and fluorescent imaging, specifically by predicting the content of the fluorescent images directly from the bright field images. The main advantages of this approach is that the toxic effects of cell labeling can be avoided and it can open up imaging channels in the microscope to explore other objects of interest. The data consisted of adipocyte cells stained with three fluorescent dyes, one for the nuclei, one for the cytoplasm, and one for the lipid droplets. The competition was arranged as a hackathon that ran for two weeks. Eight teams were selected to compete and each team had (on average) four participants. The teams' solutions were evaluated based on two quality metrics: the mean absolute difference between the pixels in the generated images and the ground truth images; and the differences between these two sets of images for feature metrics, based on intensity and shape, extracted from CellProfiler. The winning team was selected by a jury comprised of representatives from AstraZeneca, Vinnova and AI Sweden. The jury's decisions were based on the quantitative results and also on the final presentations each team gave about their final solutions.

The winning team (the HASTE team) consisted of five PhD students from Uppsala University working at the department of information technology and the department of pharmaceutical biosciences. The winning solution combined generative adversarial networks (GAN) and multi-task learning under privileged information (LUP). LUP was applied to the nuclei channel to enable improved prediction of the shape and location of the nuclei. This was achieved by collecting additional information about the nucleus in the form of segmentation masks. The network was then trained to both reconstruct the nuclei channel and to predict the segmentation of the nuclei channel. The network was an extension of a dense UNet architecture to have two decoders instead of one. In the training process information about the nuclei segmentation is fed from the segmentation decoder to the nuclei reconstruction decoder. For the two remaining channels, the solutions were achieved with the same base dense UNet architecture but used only the one conventional image decoder. These networks were then trained with adversarial loss in combination with a gradient based loss function to better reconstruct defects and other variations that can be difficult to capture with purely intensity based losses.

You can read more about the challenge at: <https://www.ai.se/en/challenge>

and the official press release: <https://via.tt.se/pressmeddelande/sa-kan-maskininlarning-forbattra-processen-for-framtagande-av-lakemedel?publisherId=3236039&releaseId=3287409>

The HASTE team

First row (from left): Philip J Harrison,
Ebba Bergman, Erik Hallström



Second row (from left): Ankit Gupta,
Håkan Wieslander



>>> Företagspresentation: Imint Image Intelligence



Jan Nyrén/Imint

Imint is a Swedish senior software enterprise in intelligent sensor and data analysis. For the last 15 years Imint has developed visionary products and cutting edge solutions that today are the very foundation for many leaders of innovation. The Vidhance video enhancement software platform by Imint serves the majority of the world's smartphone OEMs and is currently integrated into more than 400 millions of video recording devices, lifting video quality and experience to unprecedented heights.

Imint's passion is around image- and video enhancement and they are experts in sensor data and optimization, targeting all moving cameras, both in the consumer and industrial market.

Imint with its team of about 35 people has its head office in Uppsala and branch offices in Shanghai, Tokyo and Singapore and in December 2020 it was ranked 7th on [Deloitte's Sweden Technology Fast 50](#) - the fastest growing tech companies in Sweden.

"Imint's algorithms are the best in the world for smartphones but they can also solve the problems that any moving camera faces and therefore Imint is currently broadening its target market and reaching out with its offering to new market segments such as smart glasses, smart watches and drones, etc. This means that we will need to increase our staff of scientists and engineers to address all the opportunities that lay in front of us in all these industries." Says Andreas Lifvendahl, CEO of Imint

Imint is partnering with some of the biggest chipset companies in the industry such as Qualcomm and MediaTek and they develop many of its products in close collaboration with these companies.

"Our engineering teams are deeply focused on AI-based vision applications such as Face Detection (Object Detection) Scenery Classification, Image Tagging, Noise Reduction etc. They are also focusing on the problems of taking many of the classical image and video enhancement algorithms into its 2.0 versions by solving them through AI-algorithms." says Johan Svensson, CTO of Imint.



>>> Report from NeurIPS 2020 - a fully virtual event



Nadezhda Koriakina

This year the whole research community was restricted to participate in conferences and many of them, well known or not, were organised virtually with a lower fee or even for free. NeurIPS was one of the conferences you could attend online for a lower fee and more than 20k+ attendees took advantage of it. Worthy to mention that it is a hardly possible endeavor to get a place at the physical NeurIPS conference, as it becomes fully booked in the blink of an eye. On the contrary, the virtual event allowed attendance of several thousand interested people. Moreover, the fee for students was 25\$, which differs a lot from the fee for the physical NeurIPS conference. Besides, it was much more affordable in comparison to the virtual CVPR 2020 which was offered for 200\$.

Many colleagues of mine at Uppsala University attended the online NeurIPS and everyone found parts highly relevant to one's research. Some of them, Nicolas Pielawski and Elisabeth Wetzer, not only attended but also presented an inviting poster and made a nice introductory video about their own work. If you are interested in registration, please check the preprint¹ of the CoMIR paper that will be released in the NeurIPS proceedings 2020 shortly.

The program was rich: one could enjoy invited talks, tutorials, oral presentations, posters, workshops, industrial expo and a speciality of this year, COVID19 symposium. Some of the big names in the AI community I encountered during the conference are Jann LeCun, Christopher Bishop, Alexei A. Efros, Francois Fleuret and Christian Szegedy.

I took a home message regarding preparation for such conferences from watching prerecorded videos of some tutorials and oral presentations: it is not attractive when someone is blindly reading the content without even attempting to tell the story as if one were not reading. Instead, one can get inspiration from, for example, Christopher Bishop or Charles Isbell who gave fantastic invited talks (but most likely used the text).

The recorded materials for NeurIPS conference will be publicly available so take a chance to feel the taste of one of the top conferences in AI!

Nadezhda Koriakina,
PhD student in Computerised Image Processing,
Uppsala University

¹ Pielawski N, Wetzer E, Öfverstedt J, Lu J, Wählby C, Lindblad J, Sladoje N. CoMIR: Contrastive Multimodal Image Representation for Registration. arXiv preprint [arXiv:2006.06325](https://arxiv.org/abs/2006.06325). 2020 Jun 11.

>>> Master's Thesis from Lund: Clustering and Anomaly Detection in Financial Trading Data (Popular abstract)



Erik Norlander

Recently, financial crime has become a major issue for financial institutions. Whether it being money laundering, insider trading or related crimes, it strongly undermines the trust and stability of the financial system. As methods of committing crimes become more sophisticated, so are the methods for detecting them. Like many difficult problems these days, this might be approached with machine learning.

We have a dataset from Handelsbanken Capital Markets consisting of trades made by the traders at the bank. There is a very large amount of features many being categorical, meaning that no traditional technique to reduce the number of features was possible, so a new approach must be utilized.

In order to detect some strange behavior we want to separate what would be considered normal from anomalous. This could be done with an algorithm called Isolation Forest. It tries to divide the dataset up into as small a chunks as possible. This process continues for each point and eventually when each trade has been divided up you can measure how many divides had to be made. If there was not many divides, the data point was easy to separate, and therefore will be considered anomalous.

An issue with this approach is that it is very dependent on the *shape* of the data. That is, if the shapes are irregular and unpredictable it will have a harder time telling normal and anomalous behaviour apart. Therefore, we must prepare the data in a helpful way for this algorithm.

This is where the Variational Autoencoder (VAE) comes in. It is actually a generative model, meaning that you can estimate the distribution of some data and then generate new samples that look like they came from the original dataset. In order to do this the VAE takes some input sample, reduces it to a smaller space called the latent space and then tries to reconstruct the data from the latent space using neural networks.

This would be true for the simpler, regular autoencoder as well but the VAE has a statistical spin to it. Instead of just training the algorithm to recreate the input data, you also want the samples in the latent space to be close to some probability distribution that you choose yourself. For simplicity, you usually choose a Normal distribution. An issue with this is that there's only so much room in a normal distribution. Often the classes that do form overlap and create strange shapes that can be hard to interpret.

Instead, we propose the CL-VAE which stands for Conditional Latent Space-VAE. This approach gives each trader their own Normal distribution that can then move around freely in the latent space as the algorithm learns where it fits in relation to all other traders. With this approach we find that traders that work in similar markets end up close to each other, far away from other categories that form. The trades also end up having predictable shapes that are easier for the Isolation Forest algorithm to work with as seen in Figure 1.

By using this method a system can be developed that learns the regular behavior of a trader and as new trades come in they will be scored on their "degree-of-abnormality".

Full thesis: <https://lup.lub.lu.se/student-papers/search/publication/8983838>

>>> Upcoming Conferences

[Winter Conference on Applications in Computer Vision \(WACV2021\)](#)

Date: Jan 5 - 9, 2021, online

[International Conference on Pattern Recognition \(ICPR2021\)](#)

Date: Jan 10 - 15, 2021, online

[AAAI Conference on Artificial Intelligence \(AAAI2021\)](#)

Date: Feb 2 - 9, 2021, online

[International Conference on Pattern Recognition Applications and Methods \(ICPRAM2021\)](#)

Date: Feb 4 - 6, 2021, online

[International Conference on Pattern Recognition Systems \(ICPRS2021\)](#)

Date: March 17 - 19, 2021, online

[International Symposium on Biomedical Imaging \(ISBI2021\)](#)

Date: April 13 - 16, 2021, online

[International Conference on Learning Representations \(ICLR2021\)](#)

Date: May 4 - 7, 2021, online

[International Conference on Digital Image Processing \(ICDIP2021\)](#)

Date: May 20 - 23, 2021, online

[International Conference on Discrete Geometry and Mathematical Morphology \(DGMM2021\)](#)

Date: May 24 - 27, 2021, online

[Computer Vision and Pattern Recognition \(CVPR2021\)](#)

Date: June 19 - 25, 2021, online

[Information Processing in Medical Imaging \(IPMI2021\)](#)

Date: June 27 - July 2, 2021, Bornholm, Denmark

[Content-Based Multimedia Indexing \(CBMI2021\)](#)

Date: June 28 - 30, 2021, Lille, France

Submission Deadline: **15th January 2021**

[Medical Image Understanding and Analysis \(MIUA2021\)](#)

Date: July 12 - 14, 2021, Oxford, United Kingdom

Submission Deadline: **19th March 2021**

[International Conference on Machine Learning \(ICML2021\)](#)

Date: July 18 - 24, 2021, online

Submission Deadline: 4th February 2021 (abstracts: 28th January 2021)

[International Conference on Machine Vision Applications \(MVA2021\)](#)

Date: July 25 - 27, 2021, Nagoya, Japan

Submission Deadline: **31st March 2021**

[International Conference on Document Analysis and Recognition \(ICDAR2021\)](#)

Date: Sept 5 - 10, 2021, Lausanne, Switzerland

Submission Deadline: **8th February 2021**

>>> Upcoming Conferences cont'd

International Conference on Image Processing (ICIP2021)

Date: Sept 19 - 22, 2021, Anchorage (Alaska), USA

Submission Deadline: **13th January 2021**

International Conference on Computer Vision (ICCV2021)

Date: Oct 11 - 17, 2021, Montreal, Canada

Submission Deadline: **17th March 2021** (paper registration: 10th March)

Medical Imaging with Deep Learning (MIDL2021)

Date: July 7 - 9, 2021, hybrid, Lübeck, Germany

Submission Deadline: **17th February 2021** (full papers), 13th April 2021 (short papers)

International Conference on Image Analysis and Processing (ICIAP2021)

Date: Sept 15 - 17, 2021, Lecce, Italy

Submission Deadline: **5th May 2021**

International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI2021)

Dates: Sept 27 - Oct 1, 2021, Strasbourg, France

Submission Deadline: **3rd March 2021** (paper registration: 19th February 2021)

>>> Upcoming PhD Student Courses

Graduate course in Graph Based Image Processing and Combinatorial Optimization

Spring 2021

Due to its discrete nature and mathematical simplicity, graph based image representation lends itself well to the development of efficient, and provably correct, methods for image processing. In this course, we will specifically study combinatorial optimization problems, formulated on graphs, arising in a wide range of applications of image analysis and computer vision.

The course will be given entirely as a distance course, so it is possible to attend the course remotely. If you are interested in attending the course, please contact course director Filip Malmberg (filip.malmberg@it.uu.se).

Graduate course in Deep Learning

Start date: March 17, 2021

Data is becoming more widely available which opens up for game changing possibilities to teach machines to autonomously analyze, learn, and act based this data without human intervention. The most popular and successful set of methods driving this revolution is called deep learning and is relevant for most scientific fields dealing with large datasets.

The course is worth 5hp with an additional 3hp for an optional project. The weekly lectures will focus on theoretical aspects and the mandatory hand-in assignments on the implementation of deep learning methods. The course will therefore deal less with particular applications within the field. That is where the optional project comes into the picture, where you can use the foundation provided for an application from your own scientific area.

Sign up for the course by sending an email to niklas.wahlstrom@it.uu.se no later than **March 1, 2021**.

To attend the course you are also requested to submit the solution to the **pre-course assignment**, which can be found at the course homepage: <https://uppsala.instructure.com/courses/38705>.

»»» Aktuella avhandlingar



Här presenteras de avhandlingar som publiceras sedan senaste numret av SSBAktuell och kommit redaktionen till känna. Meddela redaktionen om aktuella avhandlingar.

Doktorsavhandlingar

Chenjie Ge, Chalmers

Machine Learning Methods for Image Analysis in Medical Applications, from Alzheimer's Disease, Brain Tumors, to Assisted Living

Florian Westphal, Blekinge Institute of Technology
Data and Time Efficient Historical Document Analysis

Gustav Zickert, KTH

Analytic and data-driven methods for 3D electron microscopy

Gabriele Partel, Uppsala University

Analytic and data-driven methods for 3D electron microscopy

Simon Ekström, Uppsala University

Efficient GPU-based Image Registration: for Detailed Large-Scale Whole-body Analysis