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POSITIONS

Assistant Professor, University of Debrecen, Faculty of Informatics (2013 -)
Co-Founder, Co-Director, Chief Technology Officer, CL-IC Technologies Ltd, UK (2014 -)

PREVIOUS POSITIONS

College Research Associate, Homerton College, University of Cambridge (2014 - 2015)
Research Associate, University of Cambridge, Department of Genetics / Gurdon Institute (2013 - 2015)
Assistant Lecturer, University of Debrecen, Faculty of Informatics (2012 - 2013)
Software Engineer, Kripto Research inc., Debrecen, Hungary (2009)

OTHER AFFILIATIONS

Lecturer, supervisor, University of Debrecen, Doctoral School of Informatics (2015-)
Associate Staff, University of Dundee, College of Life Sciences**,** Centre for Gene Regulation and Expression (2015 -)
Secretary, Hungarian Association for Image Processing and Pattern Recognition (2015 -)
Researcher, founding member, Bioinformatics Research Group, University of Debrecen, Faculty of Informatics (2010 -)
Researcher, Image Processing Group, University of Debrecen, Faculty of Informatics (2007 -)

EDUCATION

PhD in Informatics, University of Debrecen, Faculty of Informatics, Hungary (2009-2012). Date of defence: 22/03/13. Title of the thesis: Ensemble Methods in Medical Decision Making. Grade: Summa cum Laude
MSc in Computer Science, University of Debrecen, Faculty of Informatics, Hungary (2004-2009).

RESEARCH FELLOWSHIPS

1. János Bolyai Research Fellowship (2016 – 2019). Title: Automatic annotation of large biological datasets using representation learning. Amount: 4.482 million HUF
2. NVIDIA Research Fellowship (2016)
3. Zoltán Magyary Postdoctoral Fellowship of Hungary (2013). Title: Advanced machine learning techniques in biomedical image processing. Amount: 4.2 million HUF

4. Ányos Jedlik Predoctoral Fellowship of Hungary (2013). Title: Advanced machine learning techniques in biomedical image processing. Amount: 2.4 million HUF

AWARDS, SCHOLARHIPS

1. National Talent Program Scholarship (2016)
2. Finalist at the ERCIM Cor Baayen Award (2014)
3. János Kemény Price of the John Neumann Society (2013)
4. Young Researcher Award of the Debrecen Branch of the Hungarian Academy of Sciences (2012)
5. Student Publication of the Year, Centre of Arts, Humanities and Sciences, University of Debrecen, Hungary (2012)
6. Outstanding PhD Student of the Faculty of Informatics, University of Debrecen, Hungary (2011)
7. ICIP Travel Grant (2011)
8. Universitas scholarship of the University of Debrecen (2010)
9. Scholarship of the Hungarian Republic (2008 - 2009)
10. Professional scholarship of the University of Debrecen (2007 - 2009)
11. Summer professional scholarship of the University of Debrecen (2007, 2008)
12. Excellent Talk Award, CSCS 2010, Szeged, Hungary (2011)
13. 1st place on Retinopathy Online Challenge (2010-)

RESEARCH PROJECTS

2015 - **Image Data Repository**

A resource to store, handle and present big image based biological data.
BBSRC grant. Project leader: Jason Swedlow (University of Dundee, UK, Open Microscopy Enviroment), Alvis Brazma (EMBL-EBI, UK), Rafael E. Carazo Salas (Department of Genetics, University of Cambridge, UK)
http://idr-demo.openmicroscopy.org/about/

2014 - **Automatic hit detection on high-throughput microscopy screens**

Unsupervised representation learning to classify phenotypical changes in multi-process high-throughput microscopy screens using deep neural networks
Project leader: Rafael E. Carazo Salas (Department of Genetics, University of Cambridge, UK),

2014 - **Tracking of differentiating and pluripotent human stem cells in time-lapse microscopy**

Image processing to measure the spatiotemporal changes of stem cells regarding multiple biological processes
Project leader: Rafael E. Carazo Salas (Department of Genetics, University of Cambridge, UK), Ludovic Vallier (Sanger Institute, Cambridge, UK)

2013- **Mineotaur: an interactive visual analytics tool for high-throughput microscopy screens**
An open source web application to handle big functional genomics data using graph data model. Project website: http://www.mineotaur.org
SYSGRO ERC grant. Project leader: Rafael E. Carazo Salas (Department of Genetics, University of Cambridge, UK)
http://www.mineotaur.org

2013 **False labelling ensemble creation for high-dimensional biological data classification**
Generating optimal classification ensembles via false labelling to improve the accuracy of high-dimensional biological data classification
Project Leader: Balint Antal

2013 **Transfer learning for microscope video sequences**
Transfer learning for classification based cell tracking to overcome differences in low quality microscopy video sequences.
Anyos Jedlik and Zoltan Magyary grants. Project Leader: Balint Antal

2012 - **Cell tracking and measurement in microscope video sequences**
Segmentation and tracking of Hela cells using Markov Random Fields.
Project leader: Laszlo Bene (Department of Biophysics and Cell Biology, University of Debrecen, Hungary)

2009 – **An automatic screening system for diabetic retinopathy.**
Development of microaneurysm detection ensembles. Development of decision support system using machine learning.
NKTH Grant. Project leader: Andras Hajdu (Faculty of Informatics, University of Debrecen, Hungary)

2008 **Chromosome set detection for microscope images.**
Preprocessing and segmentation of chromosome sets from large microscope images.
Project leader: Attila Fazekas (Faculty of Informatics, University of Debrecen, Hungary)

2007 **Facial gesture classification**
Classification of facial gestures from images using machine learning.
Project leader: Attila Fazekas (Faculty of Informatics, University of Debrecen, Hungary)

TEACHING, SUPERVISION

1. Bioimage data analysis and informatics course, University of Cambridge, 2015, (with *Rafael Carazo Salas, Anatole Chessel, Richard Butler, Alex Sossick, Leila Muresan*, University of Cambridge, *Mark Bray*, Broad Institute, *Jason Swedlow*, University of Dundee)
2. Various computer science courses (e.g. Image processing, Programming, Database Systems, Web Application development), University of Debrecen (2007 – 2013)
3. PhD supervision, University of Debrecen:
   Tamás Katona (topic: Biological data processing using deep learning)
4. Thesis supervision, University of Debrecen:
   Eszter Krasznai (ongoing, topic: Ensemble learning, Business Informatics BSc),
   Robert Kovacs (ongoing, topic: Medical Image Analysis, Computer Science Engineer BSc),
   Marton Nuszer (ongoing, topic: NoSQL database management systems, Computer Science Engineer BSc),
   Zoltan Szaszi (ongoing, topic: Distributed Bioinformatics algorithms, Computer Science BSc),
   Norbert Barócsi (ongoing, topic: Web application development in Java, Business Informatics BSc),
   Péter Hegyes (ongoing, Data validation tool for Mineotaur, Business Informatics BSc),
   Máté Mlinkó (ongoing, Application development in Python with Kivy, Business Informatics BSc),
   Bence Auer (2015, *Distributed processing of biological interactions using Hadoop*, Computer Science Engineer BSc),
   Gergely Bod (2014, *Self-taught learning: Implementation using MATLAB*, Computer Science BSc),
   Tamas Szekusan (2014, *Quantitiave comparison of the MongoDB and the MYSQL database management systems*, Computer Science BSc),
   Bence Remenyik (2013, *Performance evaluation of object tracking methods*, Computer Science MSc)
5. Scientific Conference for Students (TDK) supervision:
   Bence Auer (2014-15, Distributed processing of biological interactions using Hadoop)
6. Member of comprehensive PhD exam board, University of Debrecen:
   Ramin Karimi (2015, PhD in Informatics)
7. Computer Science BSc. state exam board member, University of Debrecen (2015 -)

REVIEWING

1. IEEE Transactions on Medical Imaging
2. IEEE Transactions on Signal Processing
3. IEEE Transactions on Neural Networks and Learning Systems
4. IEEE/ACM Transactions on Computational Biology and Bioinformatics
5. IEEE Transactions on Knowledge and Data Engineering
6. IEEE Signal Processing Letters

7. IEEE Journal of Biomedical and Health Informatics
8. Artificial Intelligence in Medicine (Elsevier)
9. Computers in Biology and Medicine (Elsevier)
10. Journal of Computational Science (Elsevier)
11. Computer Methods and Programs in Biomedicine (Elsevier)
12. Knowledge Based Systems (Elsevier)
13. Expert Systems with Applications (Elsevier)
14. Biomedical Signal Processing and Control (Elsevier)
15. International Journal of Biomedical Imaging (Hindawi)
16. 8th International Symposium on Image and Signal Processing and Analysis, Trieste, Italy, 4th-6th September, 2013 (IEEE Conference)
17. ISBI 2015, New York, USA (IEEE Conference)
18. CoginfoCom 2015, Gyor, Hungary (IEEE Conference)
19. ISBI 2016, Prague, Czech Republic (IEEE Conference)

CONFERENCE PROGRAM COMMITTEE MEMBER

1. International Conference on Pervasive and Embedded Computing and Communication Systems, Lisbon, Portugal, 25-27 July, 2016
2. International Conference on Pervasive and Embedded Computing and Communication Systems, Angers, France, 13-13 February, 2015
3. International Conference on Pervasive and Embedded Computing and Communication Systems, Lisbon, Portugal, 7th-9th January, 2014
4. 7th International Conference on Hybrid Artificial Intelligence Systems, Salamanca, Spain, 28th - 30th March, 2012

CONFERENCE SESSION CHAIR

1. International Conference on Pervasive and Embedded Computing and Communication Systems, Lisbon, Portugal, 25-27 July, 2016

CONFERENCE SESSION ORGANIZER

1. Frontiers in Fungal Systems Biology, EMBL Heidelberg, Germany, 28 September - 30 September 2014
2. Unravelling Biological Secrets by Single-Cell Expression Profiling,EMBL Heidelberg, Germany, 25 September - 26 September 2014
3. EMBL 40th Anniversary Reunion, EMBL Heidelberg, Germany, 18 July - 19 July 2014

SCIENTOMETRIC DATA

Number of citations: 302 independent (355 altogether)
H index: 9 (10)
I10 index: 9 (10)
Complete list of citations:
https://vm.mtmt.hu/www/index.php?AuthorID=10034601#

LIST OF PUBLICATIONS

Refereed Full Papers

1. B. Antal, A. Chessel, and R. E. Carazo Salas: *Mineotaur: A Visual Analytics Tool for High-throughput Microscopy Screens*, Genome Biology, 16(283) pp. 1-5. (IF=10.8)
2. B. Antal: *Classifier ensemble creation via false labelling*, Knowledge-Based Systems, Elsevier, Elsevier, Volume 89, November 2015, Pages. 278-287. (IF=2.947)
3. B. Antal, A. Hajdu: *An ensemble-based system for automatic screening of diabetic retinopathy*, Knowledge-Based Systems, Elsevier, Volume 60, April 2014, Pages 20–27. (IF = 4.104)
4. B. Antal, A. Hajdu: *Improving microaneurysm detection in color fundus images by using context-aware approaches*, Computerized Medical Imaging and Graphics, Elsevier, Volume 37, Issue 5, Pages 403-408, July 2013. (IF = 1.664)
5. B. Antal, A. Hajdu: *An Ensemble-based System for Microaneurysm Detection and Diabetic Retinopathy Grading*, IEEE Transactions on Biomedical Engineering, vol.59, no.6, pp. 1720-1726, June 2012. (IF = 2.278) Independent citations: 134
6. B. Antal, A. Hajdu: *Improving Microaneurysm Detection Using an Optimally Selected Subset of Candidate Extractors and Preprocessing Methods*, Pattern Recognition, Elsevier, 45 (2012), 255-261. (IF = 2.607) Independent citations: 34
7. B. Antal, A. Hajdu, Zs. Szabó-Maros, Zs. Török, A. Csutak, T. Pető: *A Two-phase Decision Support Framework for the Automatic Screening of Digital Fundus Images*, Journal of Computational Science, Elsevier, Volume 3, Issue 5, September 2012, Pages 262-268.
8. B. Antal, A. Hajdu: *A stochastic approach to improve macula detection in retinal images*, Acta Cybernetica, 20, (2011), 5-15.

Refereed Full Papers (under submission)

9. B. Antal, A. Hajdu, T. Ungvári, L. Damjanovich, L. Bene: *Cell steering by weak polarized light*, under submission
10. B. Antal, V. Graml, X. Studera,, J. L. D. Lawson, M. Bortfeld-Miller, A. Chessel, R. E. Carazo Salas: *SMC MINEOTAUR: A genomic resource of single-cell data about cell shape, microtubule organization and cell cycle progression*, Nature Scientific Data, under submission
11. B. Antal[*], A. Csutak[*], L. Kovacs[*], B. Harangi, I. Lazar, B. Nagy, J. Szakacs, J. Toth, T. Peto, A. Hajdu: *Efficiency of a computer-aided automatic screening system for diabetic retinopathy in a clinical setting*, under submission

Refereed Conference Publications

1. B. Antal: Automatic 3D Point Set Reconstruction from Stereo Laparoscopic Images using Deep Neural Networks, SPCS 2016, accepted
2. Bence Auer, Balint Antal: *Distributed processing of biological interactions using Hadoop*, Proceedings of 6th IEEE Conference on Cognitive Infocommunications. Győr, 2015.10.19-2015.10.21. pp. 175-178.
3. B. Antal, B. Remenyik, A. Hajdu: *An Unsupervised Ensemble-based Markov Random Field Approach to Microscope Cell Image Segmentation*, 10th International Conference

on Signal Processing and Multimedia Applications (SIGMAP 2013), Reykjavik, Iceland, 2013, pp. 94-99.
4. B. Antal, A. Hajdu: *Evaluation of Preprocessing Methods for Microaneurysm Detection*, 8th Int'l Symposium on Image and Signal Processing and Analysis, Trieste, Italy, 2013, pp. 723-726.
5. B. Nagy, B. Antal, A. Hajdu: *Image Database Clustering To Improve Exudate Detection In Color Fundus Images*, 8th Int'l Symposium on Image and Signal Processing and Analysis, Trieste, Italy, 2013, pp. 727-731.
6. B. Antal, I. Lázár, A. Hajdu: *An adaptive weighting approach for ensemble-based detection of microaneurysms in color fundus images*, 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2012), San Diego, USA, 2012, pp.5955-5958, Aug. 28 2012-Sept. 1 2012.
7. B. Nagy, B. Antal, A. Hajdu: *Image Database Clustering To Improve Microaneurysm Detection In Color Fundus Images*, 25th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2012), Rome, Italy, pp.1-6, 20-22 June 2012.
8. B. Harangi, B. Antal, A. Hajdu: *Automatic Exudate Detection with Improved Naïve-Bayes Classifier*, 25th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2012), Rome, Italy, pp.1-4, 20-22 June 2012.
9. B. Antal, I. Lázár, A. Hajdu, Zs. Török, A. Csutak, T. Pető: *Evaluation of the grading performance of an ensemble-based microaneurysm detector*, 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2011), Boston, USA, 2011, 5943-5946.
10. B. Antal, A. Hajdu: *An Ensemble-based microaneurysm detector for retinal images*, IEEE 18th International Conference on Image Processing (ICIP 2011), 11 - 14 September 2011, Brussels, Belgium, 1621-1624.
11. B. Nagy, B. Harangi, B. Antal, A. Hajdu: *Ensemble-based exudate detection in color fundus images*, 7th International Symposium on Image and Signal Processing and Analysis (ISPA 2011), Dubrovnik, Croatia, 2011, 700-703.
12. B. Antal, I. Lázár, A. Hajdu: *Mikroaneurizma-detektálás összetett rendszerrel*, Képfeldolgozók és Alakfelismerők Országos Konferenciája (KEPAF), Szeged, Hungary, 2011. (In Hungarian)
13. B. Antal, I. Lázár, A. Hajdu, Zs. Török, A. Csutak, T. Pető: *A multi-level ensemble-based system for detecting microaneurysms in fundus images*, 4th IEEE International Workshop on Soft Computing Applications (SOFA 2010), Arad, Romania, 2010, 137-142.
14. B. Antal, A. Hajdu: *Improving microaneurysm detection in color fundus images by using an optimal combination of preprocessing methods and candidate extractors*, 18th European Signal Processing Conference (EUSIPCO 2010), Aalborg, Denmark, 2010, 1224-1228.
15. B. Antal, I. Lázár, A. Hajdu: *An optimal voting scheme for microaneurysm candidate extractors using simulated annealing*, 5th International Conference on Signal Processing and Multimedia Applications (SIGMAP 2010), Athens, Greece, 2010, 80-87.
16. B. Antal, A. Csutak, T. Pető, A. Hajdu: *A two-phase pre-filtering approach to the automatic screening of digital fundus images*, 5th International Conference on Signal Processing and Multimedia Applications (SIGMAP 2010), Athens, Greece, 2010, 155-158.

17. B. Antal, I. Lázár, A. Hajdu: *Novel approaches to improve microaneurysm detection in retinal images*, 8th International Conference on Applied Informatics (ICAI 2010), Eger, Hungary, 149-156.
18. B. Antal, A. Hajdu: *A prefiltering approach for an automatic screening system*, 6th IEEE International Symposium on Intelligent Signal Processing (WISP 2009), Budapest, Hungary, 2009, 265 - 268.

Conference Abstracts

1. B. Antal, A. Chessel, R. E. Carazo Salas: *Mineotaur: an open source tool to share and re-analyze high-content microscopy screens,*, Publishing Better Science through Better Data, London, UK, October 23, 2015.
2. B. Antal, A. Chessel, R. E. Carazo Salas: *Mineotaur: interactive visual analytics for high-content microscopy screens*, Big Data in Medicine: Exemplars and Opportunities in Data Science, Cambridge, UK, June 19, 2015.
3. B. Antal, A. Chessel, R. E. Carazo Salas: *Mineotaur: interactive visual analytics for high-content microscopy screens*, 10th Open Microscopy Environment Meeting, Paris, France, June 5-6, 2015.
4. B. Antal, A. Chessel, R. E. Carazo Salas: *Mineotaur: interactive visual analytics for high-content microscopy screens*, 6th International meeting on Visualizing Biological Data (VIZBI 2015), Boston, USA, March 25-27 2015.
5. B. Antal, A. Chessel, R. E. Carazo Salas: *Community mining of high-throughput microscopy screens*, 9th Open Microscopy Environment Meeting, Paris, France, June 5-6, 2014.
6. B. Antal, A. Chessel, R. E. Carazo Salas: *Community mining of high-throughput microscopy screens*, British Yeast Group Meeting, Exeter, UK, April 7-9, 2014.
7. B. Antal, A. Chessel, R. E. Carazo Salas: *Community mining of high-throughput microscopy screens*, 2nd EMBO Conference on Visualizing Biological Data (VIZBI 2014), Heidelberg, Germany, March 5-7 2014.
8. B. Antal, A. Hajdu: *Component reuse in ensemble-based medical image processing applications*, 12th Symposium on Programming Languages and Software Tools (SPLST 2011), Tallinn, Estonia, October 5-7, 2011, invited paper.
9. B. Antal: *Automatic decision on diabetic retinopathy in the DRSCREEN system*, DRSCREEN conference, Debrecen, 2011
10. A. Csutak, B. Antal, I. Lázár, T. Pető, Zs. Török, A. Hajdu: *Diabetic retinopathy screening with computational support*, European Association for Vision and Eye Research Congress (EVER 2011), Crete, Greece, Oct 5-8, 2011.
11. B. Antal: *Ensemble methods in biomedical data processing*, IT Service Management for SMEs: Challenges and Opportunities, Debrecen, 2011.
12. B. Antal: *An ensemble-based system for improved microaneurysm detection*, DRSCREEN workshop, Debrecen, 2010.
13. J. Tóth, B. Antal: *Classification of retinal images based on image-level descriptiors*, DRSCREEN workshop, Debrecen, 2010.
14. B. Antal: *Approaches to Improve Macula Detection in Retinal Images*, The 7th Conference of PhD Students in Computer Science (CSCS 2010), Szeged, Hungary, 2010.

15. B. Antal, I. Lázár: *Klinikai elváltozások detektálása összetett rendszerekkel*, IV. Informatikai Szakmai Napok, Debrecen, 2010.
16. B. Antal: *Ensemble Methods in Diabetic Retinopathy Screening*, Number Theory and its Applications, Debrecen, October 4-8, 2010.

Book chapters

1. B. Antal, I. Lázár, A. Hajdu: *An Ensemble Approach to Improve Microaneurysm Candidate Extraction*, ICETE 2010, Obaidat, Mohammad S.; Tsihrintzis, George A.; Filipe, Joaquim (Eds.), Communications in Computer and Information Science, Vol. 222, Springer Verlag, pp. 378-394, Heidelberg, 2012.

Other

Technical reports

1. I. Lázár, B. Antal, and A. Hajdu: *Microaneurysm detection in digital fundus images*, Tech. Rep. 2010/14(387), University of Debrecen, Hungary, 2010.
2. B. Antal, I. Lázár, and A. Hajdu: *An ensemble-based system for microaneurysm detection*, online.

Invited talks

1. B. Antal: Mineotaur: *A Visual Analytics Tool for High-throughput Microscopy Screens*, University of Dundee, UK, 17 Dec 2014. Host: Jason Swedlow
2. B. Antal: *Advanced image processing and machine learning techniques for medical applications*, Gurdon Institute, University of Cambridge, UK, 21 June 2013. Host: Rafael Carazo Salas