Atılım Güneş Baydin

Postdoctoral Researcher
Department of Engineering Science, University of Oxford
Parks Road, Oxford OX1 3PJ, United Kingdom
☎ +44 1865 273000 • ✉ gunes@robots.ox.ac.uk
http://www.robots.ox.ac.uk/~gunes/

Research Interests

I am currently working on bringing advanced nested automatic differentiation (AD) techniques into machine learning, for designing compositional learning algorithms, complex objective functions, and exact hypergradients for hyperparameter optimization.

I am the author of **DiffSharp** (http://diffsharp.github.io/DiffSharp/), a differentiable functional programming library, and **Hype** (http://hypelib.github.io/Hype/), a Torch-like system for nested AD and deep learning, emphasizing higher-order functions and composition.

Degrees

PhD summa cum laude, Universitat Autònoma de Barcelona, Spain, November 2013
MS, Chalmers University of Technology, Göteborg, Sweden, 2008
BS, Middle East Technical University, Ankara, Turkey, 2005

Experience

University of Oxford, Oxford, United Kingdom
Department of Engineering Science
Postdoctoral Researcher, Apr 2016 – Present
Working with Prof. Frank Wood, Machine Learning Research Group
http://www.robots.ox.ac.uk/~fwood/

National University of Ireland Maynooth, Ireland
Hamilton Institute & Department of Computer Science
Postdoctoral Researcher, Sep 2013 – Dec 2015
Within Prof. Barak Pearlmutter's Brain and Computation Lab, http://www.bcl.hamilton.ie

Spanish National Research Council (CSIC)
Artificial Intelligence Research Institute (IIIA), Barcelona, Spain
Doctoral Researcher, Nov 2008 – Jun 2013
Research on structure mapping theory from psychology, evolutionary computation, analogical and commonsense reasoning. Part of EU COST action Agreement Technologies
Advisor: Prof. Ramon López de Mántaras, http://www.iiia.csic.es/~mantaras/

University of Pittsburgh, Pittsburgh, Pennsylvania, United States
Learning Research and Development Center (LRDC)
Visiting Scholar, Feb – May 2012
Within Prof. Kevin Ashley's group for case-based reasoning, law, and AI

Chalmers University of Technology, Göteborg, Sweden
Department of Applied Physics
Complex Adaptive Systems Master's Programme
Thesis on computational physics and dissipative (Langevin) particle dynamics, part of the EU FP6 Programmable Artificial Cell Evolution project, http://www.istpace.org//index.html
Courses in neural networks, nonlinear dynamical systems, chaos theory, computational biology, information theory, bioinformatics. Extra courses in living state physics, nanotechnology, humanoid robotics. Advisor: Prof. Martin Nilsson Jacobi

Visits / Courses

Université de Montréal, Centre de recherches mathématiques (CRM), Montréal, Canada
Deep Learning Summer School 2015, 3 – 12 Aug 2015
Organizers: Yoshua Bengio, Roland Memisevic, Yann LeCun

Sheffield Institute for Translational Neuroscience, Sheffield, United Kingdom
Gaussian Process Summer School 2015, 14 – 17 Sep 2015
Organizers: Neil Lawrence, Javier Gonzalez

Trinity College Institute of Neuroscience (TCIN), Dublin, Ireland
MRI/fMRI Theory & Practical Course, 8 – 13 Jun 2015
Introduction to practical functional brain imaging, data collection, and analysis

Brown University, Providence, Rhode Island, United States
Wolfram Science Summer School 2005, 20 Jun – 8 Jul 2005

Universidad de Oviedo, Asturias, Spain
Engineering Projects Division, Aug – Oct 2003

Awards / Scholarships

PhD awarded with *sobresaliente cum laude (summa cum laude)* by unanimous vote of the jury, for "the exceptional novelty and interdisciplinary nature of the research"
Universitat Autònoma de Barcelona, 2013

Best Student Paper Award, International Conference on Computational Creativity
Cognitive Science Society, 2012

JAE Predoc Doctoral Research Grant (four years)
Spanish National Research Council (CSIC), Spanish Ministry of Science and Innovation, 2008

Adlerbertska Hospitiefonden Scholarship (two terms)
Adlerbertska Foundation, Göteborg, Sweden, 2006

Selected Talks

"Automatic Differentiation and Machine Learning"
University of Oxford, Department of Statistics, Oxford, United Kingdom, 9 Mar 2015
Host: Prof. Yee Whye Teh

"Automatic Differentiation and Machine Learning"
Microsoft Research Cambridge, Cambridge, United Kingdom, 6 Mar 2015
Hosts: Don Syme, Andrew Fitzgibbon

Publications

Baydin, A. G., Pearlmutter, B. A., and Siskind, J. M. (Accepted). Tricks from Deep Learning. In *7th International Conference on Algorithmic Differentiation, Christ Church Oxford, UK, September 12–15 2016.*

Baydin, A. G., Pearlmutter, B. A., and Siskind, J. M. (Accepted). DiffSharp: An AD Library for .NET Languages. In *7th International Conference on Algorithmic Differentiation, Christ Church Oxford, UK, September 12–15 2016.*

Baydin, A. G., Pearlmutter, B. A., Siskind, J. M. (Under revision). DiffSharp: automatic differentiation library [arXiv: 1511.07727]

Baydin, A. G., Pearlmutter, B. A., Radul, A. A., and Siskind, J. M. (Under revision). Automatic differentiation in machine learning: a survey. [arXiv:1502.05767]

Baydin, A. G., López de Mántaras, R., and Ontañón, S. (2015). A semantic network-based evolutionary algorithm for computational creativity. *Evolutionary Intelligence.* 8(1):3–21. [arXiv:1404.7765] [doi:10.1007/s12065-014-0119-1]

Baydin, A. G. and Pearlmutter, B. A. (2015). DiffSharp: Automatic Differentiation Library. In *ICML Workshop on Machine Learning Open Source Software 2015: Open Ecosystems, Lille, France, July 10, 2015.*

Baydin, A. G. and Pearlmutter, B. A. (2014). Automatic differentiation of algorithms in machine learning. In *Proceedings of the AutoML Workshop at the International Conference on Machine Learning (ICML), Beijing, China, June 21–26, 2014.* [arXiv:1404.7456]

Baydin, A. G. (2013). *Evolutionary Adaptation in Case-Based Reasoning: An Application to Inter-Domain Analogies for Mediation.* PhD thesis, Institut d'Investigació en Intel·ligència Artificial, IIIA, Consejo Superior de Investigaciones Científicas, CSIC & Departament de Ciències de la Computació, Universitat Autònoma de Barcelona, Barcelona, Spain. [doi:10803/129294]

Baydin, A. G., López de Mántaras, R., and Ontañón, S. (2012). Automated generation of cross-domain analogies via evolutionary computation. In Maher, M. L., Hammond, K., Pease, A., Pérez y Pérez, R., Ventura, D., and Wiggins, G., editors, *Proceedings of the Third International Conference on Computational Creativity, Dublin, Ireland, May 30–June 1, 2012,* pages 25–32. University College Dublin. [arXiv:1204.2335] (**Best Student Paper Award**, Cognitive Science Society)

Baydin, A. G. and López de Mántaras, R. (2012). Evolution of ideas: A novel memetic algorithm based on semantic networks. In *Proceedings of the IEEE Congress on Evolutionary Computation, CEC 2012, IEEE World Congress On Computational Intelligence, WCCI 2012, Brisbane, Australia, June 10–15 2012,* pages 2653–2660. IEEE Press. [arXiv:1201.2706] [doi:10.1109/CEC.2012.6252886]

Baydin, A. G. (2012). Evolution of central pattern generators for the control of a five-link bipedal walking mechanism. *Paladyn Journal of Behavioral Robotics*, 3(1):45–53. [arXiv:0801.0830] [doi:10.2478/s13230-012-0019-y]

Baydin, A. G., López de Mántaras, R., Simoff, S., and Sierra, C. (2011). CBR with commonsense reasoning and structure mapping: An application to mediation. In Ram, A. and Wiratunga, N., editors, *Proceedings of the 19th International Conference on Case Based Reasoning, Greenwich, London, September 12–15, 2011,* pages 378–392, Heidelberg. Springer. [arXiv:1108.0039] [doi:10.1007/978-3-642-23291-6_28]

Baydin, A. G. (2008). *Dissipative Particle Dynamics and Coarse-Graining: Review of Existing Techniques, Trials with Evolutionary Computation.* Master's thesis, Department of Applied Physics, Chalmers University of Technology, Göteborg, Sweden.

Tendürüs, M., Baydin, A. G., Eleveld, M. A., and Gilbert, A. J. (Submitted). City versus wetland: Predicting urban growth in the vecht area with a simple cellular automaton model. [arXiv:1304.1609]

Languages

Fluent:	English
Proficient:	German (7 years secondary education), Swedish (SFI-D, SAS-G), Classical Latin
Basic:	Spanish, Catalan (UAB Idiomes Basic Cert)
Native:	Turkish

Professional Activities

Memberships:	Cognitive Science Society, Institute of Electrical and Electronics Engineers (IEEE), IEEE Communications Society, Catalan Association for Artificial Intelligence (ACIA), Swedish Artificial Intelligence Society (SAIS)
Organizing:	Student volunteer during the 35th Annual Meeting of the Cognitive Science Society, "Cooperative Minds: Social Interaction and Group Dynamics", COGSCI 2013, Berlin, Germany, 31 Jul – 3 Aug 2013
Refereeing:	Complex Systems Journal, IEEE Transactions on Neural Networks, Genetic Programming and Evolvable Machines, Advances in Applied Clifford Algebras
Funding:	Assisted in preparing a European Research Council Advanced Grant application (ERC-ADG), 5 years duration, €2.5M budget

Additional Information

Programming:	F#, C#, Python, Torch (Lua), Mathematica, MATLAB, Java
Robotics:	Experience with electronics, PCB design, microcontroller programming (PIC, BASIC Stamp, Arduino), embedded programming with Java ME
Lab experience:	Introductory level cleanroom experience for microchip production, Chalmers MC2 Nanofabrication Laboratory, Göteborg, Sweden
Test scores:	GRE (2006) quantitative: 800 (max. score)
Interests:	All fields of science, opera, history, linguistics

Referees

Prof. Barak Pearlmutter
Principal Investigator
Brain and Computation Lab, Hamilton Institute, Maynooth University

Hamilton Institute, Maynooth University
Maynooth, Co. Kildare, Ireland
`http://www.bcl.hamilton.ie/`
`barak@cs.nuim.ie`
+353 1 7086394

Prof. Ramon López de Mántaras
Director
Artificial Intelligence Research Institute (IIIA-CSIC)

IIIA-CSIC, Campus Universitat Autonoma de Barcelona
08193 Bellaterra, Spain
`http://www.iiia.csic.es/~mantaras`
`mantaras@iiia.csic.es`
+34 93 580 95 70

Prof. Simeon Simoff
Dean
School of Computing and Mathematics, University of Western Sydney

UWS Marcs Institute, Building 1 (Room 130)
Bullecourt Av, Milperra, New South Wales 2214, Australia
`http://marcs.uws.edu.au/people/simeon-simoff`
`s.simoff@uws.edu.au`
+61 2 9685 9179

Dr. Santiago Ontañón Villar
Assistant Professor
College of Computing & Informatics, Drexel University

Drexel University, College of Comp. & Informatics
3141 Chestnut St., Philadelphia, PA 19104, United States
`http://drexel.edu/cci/contact/Faculty/Ontanon-Santiago/`
`santi@cs.drexel.edu`
+1 215 571 4109