SAMY BENGIO

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Apple
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Languages: french and english
Citizenship: canadian

Education

Doctorate: Ph.D. in Computer Science — Université de Montréal, 1989–1993

Subject: *Optimization of a Parametric Learning Rule for Neural Networks.*

Master: M.Sc. in Computer Science — Université de Montréal, 1986–1989

Subject: *Integration of Traditional and Intelligent Tutoring Systems.*

Diploma: B.Sc. in Computer Science — Université de Montréal, 1983–1986

Professional Experience

EPFL — 2024–

Position: Adjunct Professor.

Apple Inc — 2021–

Description: Consumer electronics, computer software and online services.
Position: Senior Director, AI and Machine Learning Research.
Activity: Fundamental research on machine learning algorithms.
Main Research Tracks Long term curiosity-based foundational research in machine learning.

Google Inc — 2007–2021

Description: Search Engine and Advertising Company.
Position: Research Scientist in Machine Learning.
Activity: Fundamental and applied research on machine learning algorithms.
Main Research Tracks Deep Learning; Ranking algorithms for large scale problems; Applications to images, videos, speech, text, etc.

IDIAP Research Institute — 1999–2007

Description: Swiss research center affiliated to EPFL devoted to multimodal interactions, speech processing, vision processing, and machine learning.
Position: Senior Researcher, Head of the Machine Learning group.
Activity: Fundamental and applied research on machine learning algorithms. Supervision of Ph.D. students and postdoctoral fellows. European and Swiss national research projet proposal and management. Organization of international workshops and conferences. Teaching at the doctoral level. Development of machine learning tools. Collaboration with other IDIAP and EPFL researchers (in speech, vision and multimodal processing).

Main Research Tracks Various complex graphical models for speech and multimodal/multi-channel analysis; Various text representation and information retrieval approaches; Efficient algorithms for large scale databases; Various person authentication approaches.

Microcell Labs 1997–1999

Description: Research center of a Canadian mobile telecommunication company using the GSM standard.

Position: Research Director.

Activity: Direction of a research team focusing on the development and the application of various learning algorithms to exploit many dataware houses regarding the internal processes and client behaviors of a telecommunication company. Problems tackled: fraud dectection, churning and traffic prediction.

Centre Interuniversitaire de Recherche en ANalyse des Organisations 1996–1997,1999

Description: Canadian academic research center with many industrial partnerships devoted to the economical aspects of the organizations.

Position: Researcher.

Activity: Development of various machine learning and statistical models that make predictions and take decisions on financial markets: portfolio management, asset prediction, portfolio selection. In an other project, development of a machine learning model that simulates an agent on various types of auctions (buy at the best price given known information).

Institut National de la Recherche Scientifique - Télécommunications 1995–1996

Description: Canadian academic research center on telecommunications.

Position: Postdoctoral Fellow.

Activity: Development and use of an Asynchronous Input/Output Hidden Markov Model (which can also be viewed as a connectionist recurrent mixture of experts) for speech recognition. This model was particularly well suited for non-stationary temporal problems.

Centre National d'Études des Télécommunications, France Télécom 1994–1995

Description: Research center of the french national telecommunication company.

Position: Postdoctoral Fellow.

Activity: Time series prediction with Neural Networks. Series were taken from a physical domain (sunspot-related) as well as a telecommunication domain. Various mixture models were proposed.

Centre de Recherche sur les Transports, Université de Montréal 1993

Description: Canadian academic research center on all aspects of transports.

Position: Research Assistant.

Activity: Use of Genetic Algorithms and Tabu Search for a Combinatorial Optimization Problem: *the Vehicle Routing Problem with Time Windows*.

Computer Science Technical Knowledge

- **Development of several simulators** of machine learning algorithms, including many types of neural networks, support vector machines, [input/output] hidden Markov models, Gaussian mixture models, and other statistical models, genetic algorithms, genetic programming, simulated annealing, tabu search, and expert systems. See for instance `http://www.Torch.ch`.
- Many years experience in system administration on multi-platform environments (Linux, Macintosh, Unix, Windows, etc).
- **Known computer languages:** C, C++, Java, Lisp, Mathematica, Matlab, Objective C, Pascal, Prolog, Splus, Smalltalk.

Doctoral Students

PhD thesis obtained under joint supervision:

- Françoise Fessant, Université de Rennes, 1995
- Miguel Moreira, EPFL Lausanne, 2001
- Nicolas Gilardi, Université de Lausanne, 2002
- Katrin Weber, EPFL Lausanne, 2003
- Ronan Collobert, Université de Paris, 2004
- Fabien Cardinaux, EPFL Lausanne, 2005
- Silvia Chiappa, EPFL Lausanne, 2006
- Johnny Mariéthoz, Université de Lyon 2, 2006
- Norman Poh, EPFL Lausanne, 2006
- Alexei Pozdnoukhov, EPFL Lausanne, 2006
- Mikaela Keller, EPFL Lausanne, 2006
- Christos Dimitrakakis, EPFL Lausanne, 2006
- Yann Rodriguez, EPFL Lausanne, 2006
- Dong Zhang, EPFL Lausanne, 2006
- David Grangier, EPFL Lausanne, 2008
- Jean-Francois Paiement, EPFL Lausanne, 2008

Member of other PhD thesis juries:

- Sébastien Marcel, Université de Rennes, 2000
- Pierre-Edouard Sottas, EPFL Lausanne, 2002
- Todd Stephenson, EPFL Lausanne, 2003
- Torsten Butz, EPFL Lausanne, 2003
- Liva Ralaivola, Université de Paris 6, 2003
- Vlad Popovici, EPFL Lausanne, 2004
- Mathieu Ben, Université de Rennes, 2004
- Serghei Kosinov, Université de Genève, 2005
- Jean-Julien Aucouturier, Université de Paris 6, 2006
- Sylvain Ferrandiz, Université de Caen, 2006
- Gianluca Monaci, EPFL Lausanne, 2007
- Ivana Arsic, EPFL Lausanne, 2007
- Marie Szafranski, Université de Technologie de Compiègne, 2008
- Mihai Gurban, EPFL Lausanne, 2008
- Jie Luo, EPFL Lausanne, 2011

- Majid Yazdani, EPFL Lausanne, 2013
- Pierre-Michel Bousquet, Université d'Avignon, 2014
- Seungyeon Kim, Georgia Tech, 2015
- Dimitri Palaz, EPFL Lausanne, 2016
- Hieu Pham, CMU, 2021
- Paul Best, University of Toulon, 2022

Member of other academic juries:

- Hervé Glotin, HDR, Université Sud Toulon Var, 2007
- Vincent Lemaire, HDR, Université de Paris Sud, 2008

Teaching Activities

EPFL Lausanne 2005-2006

Activity: Course **IC-49**, on *Statistical Machine Learning from Data* given in the *I&C Computer, Communication and Information Sciences Doctoral Program*

- Lecture notes available at `http://bengio.abracadoudou.com/lectures`.

IDIAP Research Institute 2002-2003

Activity: Advanced lectures on *statistical machine learning*

- Lecture notes available at `http://bengio.abracadoudou.com/lectures/old`.

Université de Montréal 1992,1993,1996

Activity: Teaching replacement for M.Sc./Ph.D. courses.

- Artificial Neural Networks.
- Genetic Algorithms.
- Hidden Markov Models.

Activity: Spring School (1996) on Learning Algorithms.

- Introduction to (Input/Output) Hidden Markov Models.

Funding Record

Swiss National Science Foundation Projects:

IM2.{ACP,MI,BMI,MPR} – Interactive Multimodal Information Management.
4 PhD and 2 postdoc, 280kCHF/year for 10 years.

MULTI – Multimodal Interaction and Multimedia Data Mining.
several PhD thesis, 290kCHF/year for 3 years.

KerSpeech – Kernel Methods for Speech and Video Sequence Analysis.
1 PhD, 2 years, in the context of the Indo Swiss Joint Research Programme (ISJRP).

ADASEQ – Ensemble Methods for Sequence Processing.
1 PhD, 40kCHF/year for 4 years.

CARTANN – Cartography by Artificial Neural Networks.
1 PhD thesis finished, 40kCHF/year for 4 years.

Divide and Learn I – Various mixture models proposed.
1 PhD thesis finished, 40kCHF/year for 4 years.

Divide and Learn II – Mixture models for large datasets.
2 PhD, 100kCHF/year for 4 years done.

GLAD – Use of Boolean Methods for Classification.
1 PhD finished, 40kCHF/year for 4 years.

KERNEL – Kernel Methods for Sequence Processing.
1 PhD, 40kCHF/year for 4 years.

SCRIPT – Cursive Handwriting Recognition.
1 PhD thesis finished, 40kCHF/year for 4 years.

European Projects

PASCAL – Pattern Analysis, Statistical Modelling and Computational Learning, 6th Framework Programme, Information Society Technology, Network of Excellence, 6th Framework Programme, Information Society Technology, Network of Excellence, 4 years. Member of the steering committee.

BANCA – Biometric Access Control for Networked and e-Commerce Applications, 5th Framework Programme, Information Society Technology.
2 researchers, 200kCHF/year for 3 years.

EDAM – Environmental data mining: machine Learning algorithms and statistical tools for monitoring and forecasting, INTAS foundation.
1 invited researcher, 40kCHF/year for 2 years.

LAVA – Learning for Adaptable Visual Assistants.
1 postdoc and 2 PhD, 200kCHF/year for 3 years.

COST-275 – Biometric-Based Recognition of People over the Internet.
1 PhD, 40kCHF/year for 3 years.

Innovation, Technology Transfer, Patents

Patents

- S. Bengio, F. Clerot, A. Gravey, D. Collobert. Process for the renewal -during communication- of the traffic parameters of an ATM network. France Telecom. United States Patent 6018517. International Patent WO 97/31456. 1997.

Technology Transfer

- Release of the popular Support Vector Machine software SVMTorch on the web for academic research (see `http://bengio.abracadoudou.com/SVMTorch.html`).
- Release of the complete machine learning library Torch on the web (see `http://www.Torch.ch`).

Other Professional Activities

Action Editor for the Journal of Machine Learning Research since 2012

Member of the Editorial Board for the Journal of Machine Learning Research, 2009-2012

Member of the Editorial Board for the Machine Learning journal, 2010–2020

Associate Editor for the Journal of Computational Statistics, 2002-2011

Associate Editor for the Journal of Selected Topics in Signal Processing, 2009

Member of the Scientific Advisory Board of the Simons Institute for the Theory of Computing, 2018–2020

Member of the External Advisory Board of the NSF ID4: Institute for Data Driven Dynamical Design, 2022–

Member of the University of Montreal International Advisory Committee to the Rector, 2022–

Organization of Conferences and Workshops:

- Member of the Board:
  - ICLR (2018-2020)
  - NeurIPS (2019-)
- Chair:
  - NeurIPS: Ethics review chair (2021).
  - NeurIPS: General chair (2018); senior programme chair (2017).
  - ICLR: co-programme chair (2015, 2016).
  - BayLearn: a new Workshop in Machine Learning in the Bay Area (BayLearn'2012-2016).
  - BigVision 2014, 2015: a CVPR Workshop on Big Data for Computer Vision (CVPR'2014, 2015).
  - BigVision 2012: a NIPS Workshop on Big Data for Computer Vision (NIPS'2012).
  - NIPS Demonstration Chair (NIPS'2011)
  - NIPS Workshop on Efficient Machine Learning (NIPS'2007)
  - NIPS Workshop on Learning to Compare Examples (NIPS'2006)
  - NIPS Workshop on Multimodal Signal Processing (NIPS'2004)
  - WebVision: ECCV Workshop on Computer Vision for the Web (ECCV'2012)
  - Workshop on Multimodal Interaction and Related Machine Learning Algorithms (MLMI'2004, 2005, 2006)
- Programme Committee Chair - Senior Area Chair:
  - International Conference on Learning Representations (ICLR'2022, '2023, '2024)
  - International Conference on Machine Learning (ICML'2019, '2021, '2022, '2023, '2024)
  - Neural Information Processing Systems (NeurIPS'2020, '2022, '2023, '2024)
- Programme Committee Chair - Area Chair:
  - European Conference on Machine Learning (ECML-PKDD'2010)
  - IEEE Workshop on Neural Networks for Signal Processing (NNSP'2002)
  - International Conference on Learning Representations (ICLR'2019, '2021)
  - International Conference on Machine Learning (ICML'2009, 2012, 2015, 2016, 2020)
  - International Joint Conference on Artificial Intelligence (IJCAI'2011), Senior Program Committee
  - International Joint Conference on Artificial Intelligence (IJCAI'2005), Poster Track
  - Neural Information Processing Systems (NIPS'2003, 2006, 2012, 2014, 2015)
- Reviewer - Programme Committee Member - International Conferences:
  - European Symposium on Artificial Neural Networks (ESANN)
  - Extraction et Gestion des Connaissances (EGC)
  - IEEE Conference on Face and Gesture Recognition (FG)
  - IEEE Conference on Machine Learning for Signal Processing, (NNSP, MLSP)
  - IEEE International Conference on Acoustic, Speech and Signal Processing (ICASSP)
  - IEEE International Conference on Robotics and Automation (ICRA)
  - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
  - International Conference on Artificial Intelligence and Statistics (AISTATS)
  - International Conference on Audio and Video Based Biometric Person Authentication (AVBPA)
  - International Conference on Biometrics (ICB)
  - International Conference on Computer Vision and Pattern Recognition (CVPR)
  - International Conference on Machine Learning (ICML)
  - International Conference on Pattern Recognition (ICPR)
  - International Conference on Biometrics Authentication (ICBA)
  - International Conference on Learning Representations (ICLR)
  - International Joint Conference on Neural Networks (IJCNN)

  - International Workshop on Multiple Classifier Systems (MCS)
  - Neural Information Processing Systems (NIPS, NeurIPS)
- Reviewer - Programme Committee Member - International Workshops:
  - AAAI Spring Symposium on Knowledge Representation and Reasoning (2015)
  - AAAI Spring Symposium on Human Behavior Modeling (2009)
  - ACM Symposium on Applied Computing - Special Track on Applied Biometrics (2010)
  - CVPR Workshop on Multi-biometrics (CVPR'2006)
  - CVPR Workshop on Beyond Patches (CVPR'2006)
  - International Workshop on Biometric Recognition Systems (IWBRS'2005)
  - ICML Extreme Classification Workshop (2015)
  - Morpho Challenge Workshop (2005, 2007)
  - SIGIR 2007 Workshop on Searching Spontaneous Conversational Speech
  - Workshop on Multimodal Interaction and Related Machine Learning Algorithms (MLMI'2007, 2008, 2009)
  - Multimodal User Authentication Workshop (MMUA'2006)
  - NIPS Workshop on Machine Learning for Implicit Feedback and User Modeling (NIPS'2005)
  - Spatial Interpolation Comparison (SIC'2004)
- Member of Advisory Boards: MLMI
- Session Chair: Eurospeech'2003, NNSP'2002, ICASSP'2006, ICML'2012

Reviewer for many Journals:

- Computer Speech and Language
- EURASIP Journal of Applied Signal Processing
- IEEE Transactions on Biomedical Engineering
- IEEE Transactions on Image Processing
- IEEE Transactions on Evolutionary Computation
- IEEE Transactions on Neural Networks
- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Speech and Audio Processing
- IEEE Transactions on Systems, Man and Cybernetics - Part B
- Information Fusion
- International Journal of Neural Systems
- International Journal of Pattern Recognition and Artificial Intelligence
- Journal of Machine Learning Research
- Journal of Pattern Recognition Letters
- Machine Learning Journal
- Neural Computing Surveys
- Neural Computation
- Neural Networks
- Neurocomputing Journal
- Pattern Recognition
- Pattern Recognition Letters
- Signal Processing
- Speech Communication

Publication List

Articles in Peer Reviewed Journals

[1] E. Abbe, S. Bengio, A. Lotfi, and K. Rizk. Generalization on the unseen, logic reasoning and degree curriculum. *Journal of Machine Learning Research, JMLR*, 25(331):1–58, 2024.

[2] C. Zhang, S. Bengio, and Y. Singer. Are all layers created equal? *Journal of Machine Learning Research, JMLR*, 23:1–28, 2022.

[3] B. Kim, E. Reif, M. Wattenberg, S. Bengio, and M. C. Mozer. Neural networks trained on natural scenes exhibit gestalt closure. *Computational Brain and Behavior*, 4(3):251–263, 2021.

[4] C. Zhang, S. Bengio, M. Hardt, B. Recht, and O. Vinyals. Understanding deep learning (still) requires rethinking generalization. *Communications of the ACM*, 64(3):107–115, 2021.

[5] S. Bengio, K. Dembczynski, T. Joachims, M. Kloft, and M. Varma. Extreme Classification (Dagstuhl Seminar 18291). *Dagstuhl Reports*, 8(7):62–80, 2019.

[6] J. Chorowski, R. J. Weiss, S. Bengio, and A. van den Oord. Unsupervised speech representation learning using wavenet autoencoders. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 27:2041–2053, 2019.

[7] O. Vinyals, A. Toshev, S. Bengio, and D. Erhan. Show and tell: Lessons learned from the 2015 mscoco image captioning challenge. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 39(4):652–663, 2017.

[8] J. Lee, S. Kim, G. Lebanon, Y. Singer, and S. Bengio. LLORMA: Local low-rank matrix approximation. *Journal of Machine Learning Research, JMLR*, 17:1–24, 2016.

[9] M. R. Gupta, S. Bengio, and J. Weston. Training highly multiclass classifiers. *Journal of Machine Learning Research, JMLR*, 15:1461–1492, 2014.

[10] S. Bengio, L. Deng, H. Larochelle, H. Lee, and R. Salakhutdinov. Guest editors' introduction: Special section on learning deep architectures. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 35:1795–1797, 2013.

[11] H. Elmlund, D. Elmlund, and S. Bengio. PRIME: Probabilistic initial 3d model generation for single-particle cryo-electron microscopy. *Structure*, 21:1299–1306, 2013.

[12] C. Dimitrakakis and S. Bengio. Phoneme and sentence-level ensembles for speech recognition. *EURASIP Journal on Audio, Speech, and Music Processing*, 2011, 2011.

[13] J. Weston, S. Bengio, and P. Hamel. Multi-tasking with joint semantic spaces for large-scale music annotation and retrieval. *Journal of New Music Research*, 40:337–348, 2011.

[14] G. Chechik, V. Sharma, U. Shalit, and S. Bengio. Large scale online learning of image similarity through ranking. *Journal of Machine Learning Research, JMLR*, 11:1109–1135, 2010.

[15] D. Erhan, Y. Bengio, A. Courville, P.-A. Manzagol, P. Vincent, and S. Bengio. Why does unsupervised pre-training help deep learning? *Journal of Machine Learning Research, JMLR*, 11:625–660, 2010.

[16] R. F. Lyon, M. Rehn, S. Bengio, T. C. Walters, and G. Chechik. Sound retrieval and ranking using sparse auditory representations. *Neural Computation*, 22(9):2390–2416, 2010.

[17] J. Weston, S. Bengio, and N. Usunier. Large scale image annotation: Learning to rank with joint word-image embeddings. *Machine Learning Journal*, 81(1):21–35, 2010.

[18] J. Keshet, D. Grangier, and S. Bengio. Discriminative keyword spotting. *Speech Communication*, 51:317–329, 2009.

[19] J.-F. Paiement, S. Bengio, and D. Eck. Probabilistic models for melodic prediction. *Artificial Intelligence Journal*, 173(14):1266–1274, 2009.

[20] J.-F. Paiement, Y. Grandvalet, and S. Bengio. Predictive models for music. *Connection Science*, 21(2 & 3):253–272, 2009.

[21] D. Grangier and S. Bengio. A discriminative kernel-based model to rank images from text queries. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 30(8):1371–1384, 2008.

[22] H. Paugam-Moisy, R. Martinez, and S. Bengio. Delay learning and polychronization for reservoir computing. *Neurocomputing*, 71(7–9):1143–1158, 2008.

[23] J. MariÃ©thoz and S. Bengio. A kernel trick for sequences applied to text-independent speaker verification systems. *Pattern Recognition*, 40:2315–2324, 2007.

[24] N. Poh, A. Martin, and S. Bengio. Performance generalization in biometric authentication using joint user-specific and sample bootstraps. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 29(3):492–498, 2007.

[25] S. Sonnenburg, M. L. Braun, C. Soon Ong, S Bengio, L. Bottou, G. Holmes, Y. LeCun, K.-R. MÃ¼ller, F. Pereira, C. E. Rasmussen, G. RÃ¤tsch, B. SchÃ¶lkopf, A. Smola, P. Vincent, J. Weston, and R. Williamson. The need for open source software in machine learning. *Journal of Machine Learning Research, JMLR*, 8:2443–2466, 2007.

[26] F. Cardinaux, C. Sanderson, and S. Bengio. User authentication via adapted statistical models of face images. *IEEE Transactions on Signal Processing*, 54(1):361–373, 2006.

[27] N. Poh and S. Bengio. Database, protocol and tools for evaluating score-level fusion algorithms in biometric authentication. *Pattern Recognition*, 39(2):223–233, 2006.

[28] A. Pozdnoukhov and S. Bengio. Invariances in kernel methods: From samples to objects. *Pattern Recognition Letters*, 27(10):1087–1097, 2006.

[29] Y. Rodriguez, F. Cardinaux, S. Bengio, and J. MariÃ©thoz. Measuring the performance of face localization systems. *Image and Vision Computing*, 24(8):882–893, 2006.

[30] C. Sanderson, S. Bengio, and Y. Gao. On transforming statistical models for non-frontal face verification. *Pattern Recognition*, 39(2):288–302, 2006.

[31] D. Zhang, D. Gatica-Perez, S. Bengio, and I. McCowan. Modeling individual and group actions in meetings with layered HMMs. *IEEE Transactions on Multimedia*, 8(3):509–520, 2006.

[32] C. Dimitrakakis and S. Bengio. Online adaptive policies for ensemble classifiers. *Neurocomputing*, 64:211–221, 2005.

[33] J. MariÃ©thoz and S. Bengio. A unified framework for score normalization techniques applied to text independent speaker verification. *IEEE Signal Processing Letters*, 12(7):532–535, 2005.

[34] I. McCowan, D. Gatica-Perez, S. Bengio, G. Lathoud, M. Barnard, and D. Zhang. Automatic analysis of multimodal group actions in meetings. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 27(3):305–317, 2005.

[35] N. Poh and S. Bengio. How do correlation and variance of base classifiers affect fusion in biometric authentication tasks? *IEEE Transactions on Signal Processing*, 53(11):4384–4396, 2005.

[36] V. Popovici, S. Bengio, and J.-P. Thiran. Kernel matching pursuit for large datasets. *Pattern Recognition*, 38(12):2385–2390, 2005.

[37] S. Bengio. Multimodal speech processing using asynchronous hidden markov models. *Information Fusion*, 5(2):81–89, 2004.

[38] F. de Wet, K. Weber, L. Boves, B. Cranen, S. Bengio, and H. Bourlard. Evaluation of formant-like features for automatic speech recognition. *Journal of the Acoustical Society of America, JASA*, 116(3):1781–1792, 2004.

[39] A. Vinciarelli, S. Bengio, and H. Bunke. Offline recognition of unconstrained handwritten texts using HMMs and statistical language models. *IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI*, 26(6):709–720, 2004.

[40] R. Collobert, Y. Bengio, and S. Bengio. Scaling large learning problems with hard parallel mixtures. *International Journal on Pattern Recognition and Artificial Intelligence, IJPRAI*, 17(3):349–365, 2003.

[41] K. Weber, S. Ikbal, S. Bengio, and H. Bourlard. Robust speech recognition and feature extraction using HMM2. *Computer, Speech and Language*, 17(2-3):195–211, 2003.

[42] S. Bengio, C. Marcel, S. Marcel, and J. MariÃ©thoz. Confidence measures for multimodal identity verification. *Information Fusion*, 3(4):267–276, 2002.

[43] R. Collobert, S. Bengio, and Y. Bengio. A parallel mixture of SVMs for very large scale problems. *Neural Computation*, 14(5):1105–1114, 2002.

[44] A. Vinciarelli and S. Bengio. Writer adaptation techniques in HMM based off-line cursive script recognition. *Pattern Recognition Letters*, 23(8):905–916, 2002.

[45] R. Collobert and S. Bengio. SVMTorch: Support vector machines for large-scale regression problems. *Journal of Machine Learning Research, JMLR*, 1:143–160, 2001.

[46] S. Bengio and Y. Bengio. Taking on the curse of dimensionality in joint distributions using neural networks. *IEEE Transaction on Neural Networks, special issue on data mining and knowledge discovery*, 11(3):550–557, 2000.

[47] N. Gilardi and S. Bengio. Local machine learning models for spatial data analysis. *Journal of Geographic Information and Decision Analysis*, 4(1):11–28, 2000.

[48] S. Bengio, Y. Bengio, J. Robert, and G. BÃ©langer. Stochastic learning of strategic equilibria for auctions. *Neural Computation*, 11(5):1199–1209, 1999.

[49] S. Bengio, F. Fessant, and D. Collobert. Use of modular architectures for time series prediction. *Neural Processing Letters*, 3(2):101–106, 1996.

[50] F. Fessant, S. Bengio, and D. Collobert. On the prediction of solar activity using different neural network models. *Annales Geophysicae*, 14:20–26, 1996.

[51] J.-Y. Potvin and S. Bengio. The vehicle routing problem with time windows - part II: Genetic search. *INFORMS Journal on Computing*, 8(2):165–172, 1996.

[52] S. Bengio, Y. Bengio, and J. Cloutier. On the search for new learning rules for ANNs. *Neural Processing Letters*, 2(4):26–30, 1995.

[53] S. Bengio, G. Brassard, Y. Desmedt, C. Goutier, and J.-J. Quisquater. Secure implementation of identification systems. *Journal of Cryptology*, 4(3):175–183, 1991.

Articles in Peer Reviewed Conferences

[54] I. Mirzadeh, K. Alizadeh, H. Shahrokhi, O. Tuzel, S. Bengio, and M. Farajtabar. GSM-Symbolic: Understanding the limitations of mathematical reasoning in large language models. In *International Conference on Learning Representations, ICLR*, 2025.

[55] Y. Zhang, R. Bai, Z. Gu, R. Zhang, J. Gu, E. Abbe, S. Bengio, and N. Jaitly. Reversal blessing: Thinking backward may outpace thinking forward in multi-choice questions. *ArXiv*, 2502.18435, 2025.

[56] E. Abbe, S. Bengio, A. Lotfi, C. Sandon, and O. Saremi. How far can transformers reason? the globality barrier and inductive scratchpad. In *Advances In Neural Information Processing Systems, NeurIPS*, 2024.

[57] E. Boix-Adsera, O. Saremi, E. Abbe, S. Bengio, E. Littwin, and J. Susskind. When can transformers reason with abstract symbols. In *International Conference on Learning Representations, ICLR*, 2024.

[58] A. Lotfi, E. Fini, S. Bengio, M. Nabi, and E. Abbe. Visual scratchpads: Enabling global reasoning in vision. *ArXiv*, 2410.08165, 2024.

[59] H. Zhou, A. Bradley, E. Littwin, N. Razin, O. Saremi, J. Susskind, S. Bengio, and P. Nakkiran. What algorithms can transformers learn: A study in length generalization. In *International Conference on Learning Representations, ICLR*, 2024.

[60] E. Abbe, S. Bengio, A. Lotfi, and K. Rizk. Generalization on the unseen, logic reasoning and degree curriculum. In *International Conference on Machine Learning, ICML*, 2023. Outstanding Paper Award.

[61] S. Abnar, O. Saremi, L. Dinh, S. Wison, M. A. Bautista, C. Huang, V. Thilak, E. Littwin, J. Gu, J. Susskind, and S. Bengio. Adaptivity and modularity for efficient generalization over task complexity. *ArXiv*, 2310.08866, 2023.

[62] D. Berrebbi, R. Collobert, S. Bengio, N. Jaitly, and T. Likhomanenko. Continuous pseudo-labeling from the start. In *International Conference on Learning Representations, ICLR*, 2023.

[63] E. Boix-Adsera, E. Littwin, E. Abbe, S. Bengio, and J. Susskind. Transformers learn through gradual rank increase. In *Advances In Neural Information Processing Systems, NeurIPS*, 2023.

[64] S. d'Ascoli, S. Bengio, J. Susskind, and E. Abbe. Boolformer: Symbolic regression of logic functions with transformers. *ArXiv*, 2309.12207, 2023.

[65] E. Abbe, S. Bengio, E. Cornacchia, J. Kleinberg, A. Lotfi, M. Raghu, and C. Zhang. Learning to reason with neural networks: Generalization, unseen data and boolean measures. In *Advances In Neural Information Processing Systems, NeurIPS*, 2022.

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