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Knowledge Inn (in nature)

📖 *Research Profile of Geoffrey Hinton*

📖 *Knowledge based Robots in Chemical Research*

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rsr.chem1979

Research Profile *Geoffrey Hinton*

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	All	Since 2014
Citations	2,79,631	1,74,905
h-index	145	109
# Publications	Approx. 620	

Accessed on 25-05-2019

Geoffrey Hinton

Born on 6th December 1947
Wimbledon, London, UK

PRESENT POSITION

- Emeritus Prof. Comp Sci., U.Toronto &
- Engineering Fellow, Google

Department of Computer Science
University of Toronto
10 Kings College Road
Toronto, Ontario, M5S 3G4
Canada

Expertise of *Geoffrey Hinton*

Neural networks o Boltzmann machines o Distributed representations, o Time-delay neural nets, o Mixtures of experts	**Major breakthroughs** o variational learning o deep learning	**Revolutionized Applications** o Speech recognition o Objectclassification.

- Geoffrey Hinton was one of the researchers who introduced backpropagation algorithm
- Hinton Was the first to use backpropagation for learning word embeddings

Typical titles ofresearch output of Geoffrey Hinton high impact (# citations) publications	# Citations	Year of pub
Learning internal representations by error-propagation DE Rumelhart, GE Hinton, RJ Williams Parallel Distributed Processing: Explorations in the Microstructure of …	60731	1986
Learning representations by back-propagating errors DE Rumelhart, GE Hinton, RJ Williams Nature 323, 533-536	41037	1986
Imagenet classification with deep convolutional neural networks A Krizhevsky, I Sutskever, GE Hinton Advances in neural information processing systems, 1097-1105	40140	2012
The appeal of parallel distributed processing. JL McClelland, DE Rumelhart, GE Hinton Parallel distributed processing: Explorations in the microstructure of …	25201	1986
Learning internal representations by error propagation DE Rumelhart, GE Hinton, RJ Williams CALIFORNIA UNIV SAN DIEGO LA JOLLA INST FOR	24659	1985
Learning representations by back-propagating errors DE Rumelhart, GE Hinton, RJ Williams Cognitive modeling 5 (3), 1	17346	1988
Deep learning Y LeCun, Y Bengio, G Hinton nature 521 (7553), 436	14994	2015

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Dropout: a simple way to prevent neural networks from overfitting N Srivastava, G Hinton, A Krizhevsky, I Sutskever, R Salakhutdinov The Journal of Machine Learning Research 15 (1), 1929-1958	11941	2014
A fast learning algorithm for deep belief nets GE Hinton, S Osindero, YW Teh Neural computation 18 (7), 1527-1554	10403	2006
Reducing the dimensionality of data with neural networks GE Hinton, RR Salakhutdinov science 313 (5786), 504-507	9373	2006
Visualizing data using t-SNE L van der Maaten, G Hinton Journal of Machine Learning Research 9 (Nov), 2579-2605	8046	2008
Rectified linear units improve restrictedboltzmann machines V Nair, GE Hinton Proceedings of the 27th international conference on machine learning (ICML …	5837	2010
Deep neural networks for acoustic modeling in speech recognition G Hinton, L Deng, D Yu, G Dahl, A Mohamed, N Jaitly, A Senior, ... IEEE Signal processing magazine 29	5729	2012
Learning multiple layers of features from tiny images A Krizhevsky, G Hinton Technical report, University of Toronto 1 (4), 7	4010	2009
Adaptive mixtures of local experts. RA Jacobs, MI Jordan, SJ Nowlan, GE Hinton Neural computation 3 (1), 79-87	3926	1991
A learning algorithm for Boltzmann machines DH Ackley, GE Hinton, TJ Sejnowski Cognitive science 9 (1), 147-169	3825	1985
Training products of experts by minimizing contrastive divergence GE Hinton Neural computation 14 (8), 1771-1800	3812	2002
Improving neural networks by preventing co-adaptation of feature detectors GE Hinton, N Srivastava, A Krizhevsky, I Sutskever, RR Salakhutdinov arXiv preprint arXiv:1207.0580	3754	2012
Speech recognition with deep recurrent neural networks A Graves, A Mohamed, G Hinton 2013 IEEE international conference on acoustics, speech and signal …	3688	2013
Phoneme recognition using time-delay neural networks A Waibel, T Hanazawa, G Hinton, K Shikano, KJ Lang Backpropagation: Theory, Architectures and Applications, 35-61	2743	1995

Typical titles ofresearch output of Geoffrey Hinton high impact (# citations) publications	# Citations	Year of pub
A view of the EM algorithm that justifies incremental, sparse, and other variants RM Neal, GE Hinton Learning in graphical models, 355-368	2682	1998
A practical guide to training restricted boltzmann machines G Hinton Momentum, 1	2310	2010
Lecture 6.5-rmsprop: Divide the gradient by a running average of its recent magnitude T Tieleman, G Hinton COURSERA: Neural networks for machine learning 4 (2), 26-31	2255	2012

Basic papers on deep learning

Hinton, G. E., Osindero, S. and Teh, Y. (2006)
A fast learning algorithm for deep belief nets.
Neural Computation, **18**, pp 1527-1554.
Movies of the neural network generating and recognizing digits

Hinton, G. E. and Salakhutdinov, R. R. (2006)
Reducing the dimensionality of data with neural networks.
Science, Vol. 313. no. 5786, pp. 504 - 507, 28 July 2006.
[Matlab code]

LeCun, Y., Bengio, Y. and Hinton, G. E. (2015)
Deep Learning
Nature, Vol. 521, pp 436-444

Papers on deep learning with less maths

Hinton, G. E. (2007)
To recognize shapes, first learn to generate images
In P. Cisek, T. Drew and J. Kalaska (Eds.)
Computational Neuroscience: Theoretical Insights into Brain Function. Elsevier

Hinton, G. E. (2007)
Learning Multiple Layers of Representation.
Trends in Cognitive Sciences, Vol. 11, pp 428-434.

Hinton, G. E. (2014)
Where do features come from?.
Cognitive Science, Vol. 38(6), pp 1078-1101.

Academic profile of ofGeoffrey Hinton		
UnderGraduation		
B.A. Hons (Experimental Psychology	Cambridge University	1967 - 1970
Doctoral research		
PhD. in Articial Intelligence (awarded 1978)	Edinburgh University, PhD. in Artificial Intelligence	1972 – 1975

Post-Doctoral research/ Training	Institute
postdoctoral work	o Sussex University o University of California San Diego

Employment / Academic positions of*Geoffrey Hinton*	
Faculty member	Carnegie-Mellon
Fellow of the Canadian Institute for Advanced Research	Department of Computer Science, University of Toronto, Canada
Emeritus DistinguishedProfessor	
Vice President & Engineering Fellow	Google
Chief Scientific Adviser	Vector Institute

- From 2004 until 2013 he was the director of the program on “Neural Computation and Adaptive Perception,” funded by the Canadian Institute for Advanced Research.
- In 2013, Google acquired Hinton’s neural networks start-up, DNNresearch, which was developed out of his research at U of T.

Year	Awards (to) Geoffrey Hinton
2019	ACM A. M. Turing Award (jointly with YoshuaBengio and Yann LeCun)
2018	Companion of the Order of Canada (Canada's highest honour)
2016	IEEE/RSE James Clerk Maxwell Gold Medal
2014	IEEE Frank Rosenblatt Medal
2005	IJCAI Research Excellence Award
2001	The David E. Rumelhart Prize
1998	IEEE Neural Networks Pioneer Award
1992	ITAC/NSERC award for academic excellence.
1990	IEEE Signal Processing Society Senior Award

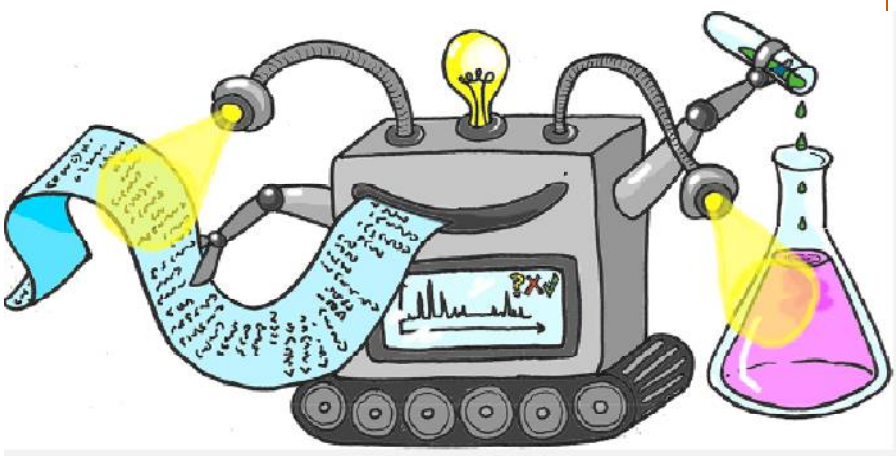
Knowledge based Robots in Chemical Research.

Ti: Designing Algorithms to Aid Discovery by Chemical Robots

Au: Alon B. Henson, Piotr S. Gromski, Leroy Cronin

JO: ACS Central Sci; **DOI :** 10.1021/acscentsci.8b00176

Chemical robot



Information Source (is) ACS.org

- Chem.Knowledge
- Chem.Intelligence
- Chem.Information
- Chem.Data
- Chem.Methods
- Chem.Tools
- Chem.Computations
- ? Expert systems
- ? Knowledge based systems
- ? Intelligent systems
- ? Smart systems

Modular Machines capable of performing chemistry with command, control, and communication (C^3)

Chemical research → Reliable data → Knowledge

Statistics + Knowledge.Stat→

Chemical Data
- Interpretation
- Prediction
- Discovery
- Higher level abstraction

Quality of
- Data
- Knowledge
- Methods

✓ Low quality (bad) data yields→ Erroneous or upside down (precarious) output

Knowledge

✓ Domain
- ✓ Dependent
- ✓ Independent

✓ Meta

Knowledge Level
- ! Novice
- ! Initiative
- ! Apprentice
- \+ Journeyman
- \+ Expert
- \+ Master

Modules
- Sensor systems
- Algorithms

Applications
- ✓ Drug research
- ✓ Materials synthesis
- ✓ Environment
- ✓ Detection, Quantitation

Today's science paves way for tomorrow's technology

– Edward Teller

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