

Andrew O. Arnold

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PROFILE

Machine learning researcher and director, quantitative portfolio manager, business builder and team leader, with expertise building systematic machine learning based high and medium frequency futures and equities strategies, teams and businesses.

EDUCATION

Carnegie Mellon University, *School of Computer Science, Machine Learning Department*, Advisor: **William W. Cohen**

Ph.D. Machine Learning: *Exploiting Domain and Task Regularities for Robust Named Entity Recognition*, 2009

M.Sc. Knowledge Discovery & Data Mining: *A Comparison of Methods for Transductive Transfer Learning*, 2007

Developed unsupervised transfer learning techniques for natural language processing and structure comprehension.

Columbia University, *Columbia College*

B.A. Computer Science/Artificial Intelligence, Advisor: **Salvatore J. Stolfo**, 2003

Magna Cum Laude, Phi Beta Kappa, John Jay Scholar, Computer Science Departmental Award, Dean's List

Developed one-class support vector machine techniques for non-signature intrusion detection.

EXPERIENCE

Google

July 2018 – Present

Robust machine learning.

Research

New York, NY, USA

Cubist Systematic Strategies (Point72)

June 2015 – June 2018

Created first of its kind hybrid research and trading group focused on researching, developing and trading proprietary machine learning based signals and strategies, with particular focus on bridging the gap from theoretical results to trading performance.

Portfolio Manager; Research Director: Advanced Methods Group

New York, NY, USA

- Developing high sharpe, high capacity, high and medium frequency futures signals and strategies, managing all aspects of the research, development and trading processes, including idea generation, validation, optimization and execution.
- Creating novel machine learning techniques as well as adapting existing academic techniques to the trading domain.
- Building top-tier machine learning research team. Developing machine learning recruitment pipeline from scratch. Recruiting, hiring, training, managing and developing collaborative team of tier-1 machine learning researchers. Establishing effective recruiting presence at top tier conferences and universities. Encouraging team development and close academic relationships by hosting firm-wide seminars and collaborations with high profile academic speakers.
- Providing machine learning leadership and expertise throughout the firm, helping to introduce other PM's to novel techniques along with guidance on how to use those techniques most effectively in a trading environment.

New York University

Fall 2018

Teaching course related to machine learning, natural language processing and quantitative trading.

Adjunct Professor

New York, NY, USA

Ophir Partners, LLC

July 2013 – February 2015

Built and co-ran all research and trading aspects of high sharpe, high capacity medium frequency equities quantitative hedge fund. Developed core alphas, strategies and platform based on diverse set of data sources, signal construction and portfolio optimization techniques. Co-managed research team. Focused on robust, differentiated, diverse, neutral, and scalable sources of alpha and risk.

Co-founder; Partner; Portfolio Manager

New York, NY, USA

TrexQuant Management, LLC

Fall 2011 – May 2013

Co-built and co-ran all research and trading aspects of \$1B high sharpe, high capacity medium frequency equities quantitative hedge fund, including alphas, strategies and platform. Designed, built and managed all research and technology. Co-managed team of researchers in collaborative environment.

Partner; Portfolio Manager; Chief Technology Officer

Stamford, CT, USA

WorldQuant, LLC (Millennium Partners)

June 2009 – August 2011

Researched, developed and traded profitable medium frequency quantitative equity portfolios. Developed techniques for combining disparate trading signals into highly uncorrelated high-sharpe portfolios. Extracted novel features from large, noisy structured and unstructured datasets and developed into uncorrelated, high-sharpe trading signals. Researched and sourced novel data sources.

Portfolio Manager; Alpha Researcher

New York, NY, USA

Merrill Lynch (QSA)

Summer 2008

Researched, developed and tested novel natural language and statistical techniques for modeling news feeds into tradeable signals on a high-frequency quantitative equities prop trading desk. Investigated performance benefits of non-linear learning methods.

Summer Associate, High Frequency Proprietary Trading (QSA/GSRG, former ETL)

New York, NY, USA

Microsoft Research Asia

Summer 2007

Developed semi-supervised and transfer learning based methods for improving internet search through query-dependent ranking.

Research Intern, Web Search and Mining Group

Beijing, China; Supervisor: **Hang Li**

IBM Research Research Intern, Data Analytics & Math, Thomas J. Watson Center
 Summer 2006 Yorktown Heights, NY, USA; Supervisors: **Chid Apte**, **Naoki Abe**
 Developed techniques for learning temporal causal networks for anomaly detection, corporate profiling, and process engineering.

Google Software Engineer (full time), Local Search/Maps
 March 2004 – July 2004 New York, NY, USA; Supervisor: **Craig Nevill-Manning**
 Developed automated location submission and verification system for increased coverage and accuracy of early local.google.com

Bloomberg L.P. Researcher & Developer, Network Design & Information Security
 June 2003 – February 2004 New York, NY, USA
 Developed designs and policies to increase performance of 50,000+ access-points network. Assessed and adapted new security technologies to existing infrastructure.

Microsoft Corporation Intern, Natural Language Group
 Summer 2002 Redmond, WA, USA; Supervisor: **Maria Katsova**
 Researched and developed transformation based learning algorithm to improve relevancy and decrease cost of search using normalization within a natural language framework.

Lehman Brothers Japan Assistant Database Programmer, Database Group
 Summer 2001 Tokyo, Japan
 Developed information systems used in critical business operations throughout Asia, including database forms, queries and JSP/SQL web interfaces.

PUBLICATIONS

Andrew Arnold and William W. Cohen (2009). "**Information Extraction as Link Prediction: Using Curated Citation Networks to Improve Gene Detection.**" In proceedings of the *AAAI Conference on Weblogs and Social Media (ICWSM)*, May 17-20, 2009, San Jose, CA.

Amr Ahmed, Andrew Arnold, Luis Pedro Coelho, Joshua Kangas, Abdul-Saboor Sheikh, Eric Xing, William Cohen and Robert F. Murphy (2009). "**Structured Literature Image Finder.**" In proceedings of the Annual Meeting of The ISMB BioLINK Special Interest Group (BioLINK), June 28-29, 2009, Stockholm, Sweden.

Andrew Arnold and William W. Cohen (2008). "**Intra-document Structural Frequency Features for Semi-supervised Domain Adaptation.**" In proceedings of the *Association for Computing Machinery Conference on Information and Knowledge Management (CIKM)*, October 26-30, 2008, Napa Valley, CA.

Xiubo Geng, Tie-Yan Liu, Tao Qin, Andrew Arnold, Hang Li and Harry Shum (2008). "**Query Dependent Ranking Using K-Nearest Neighbor.**" In proceedings of the *Association for Computing Machinery International Conference on Information Retrieval (SIGIR)*, July 20-24, 2008, Singapore. Incorporated into U.S. patent application 20100169323 A1.

Andrew Arnold, Ramesh Nallapati and William W. Cohen (2008). "**Exploiting Feature Hierarchy for Transfer Learning in Named Entity Recognition.**" In proceedings of the *Association for Computational Linguistics: Human Language Technologies (ACL:HLT)*, June 15-20, 2008, Columbus, OH.

Andrew Arnold, Ramesh Nallapati and William W. Cohen (2007). "**A Comparative Study of Methods for Transductive Transfer Learning.**" In proceedings of the *IEEE International Conference on Data Mining Workshop on Mining and Management of Biological Data (ICDM)*, October 28, 2007, Omaha, NE.

Andrew Arnold, Yan Liu and Naoki Abe (2007). "**Temporal Causal Modeling with Graphical Granger Methods.**" In proceedings of the *Association for Computing Machinery International Conference on Knowledge Discovery and Data Mining (KDD)*, August 12-15, 2007, San Jose, CA.

Andrew Arnold, Joseph E. Beck and Richard Scheines (2006). "**Feature Discovery in the Context of Educational Data Mining: An Inductive Approach.**" In proceedings of the *Association for the Advancement of Artificial Intelligence Workshop on Educational Data Mining (AAAI)*, July 16-20, 2006, Boston, MA, 7-13.

Kristinn R. Thórisson, Hrvoje Benko, Denis Abramov, Andrew Arnold, Sameer Maskey, and Aruchunan Vaseekaran (2004). "**Constructionist Design Methodology for Interactive Intelligences.**" In *AI Magazine* 25(4): Winter 2004, 77-90. Association for the Advancement of Artificial Intelligence (AAAI).

Eleazar Eskin, Andrew Arnold, Michael Prerau, Leonid Portnoy and Sal Stolfo (2002). "**A Geometric Framework for Unsupervised Anomaly Detection: Detecting Intrusions in Unlabeled Data.**" In Daniel Barbara and Sushil Jajodia (editors), *Applications of Data Mining in Computer Security*, Kluwer. Incorporated into U.S. patent 8544087 B1.

PATENTS

Methods of unsupervised anomaly detection using a geometric framework. U.S. patent granted #8544087 B1, 2013.

Query-Dependent Ranking Using K-Nearest Neighbor. US patent application #20100169323 A1, 2008.

SKILLS

Computer Languages: Python, Matlab, Java, C++, C, R, Scala, Perl, SQL, C#, VB, BASH
Environments: Linux, Windows, AWS, Condor, Airflow
Registrations: Series 7/63 (lapsed)

COURSES TAUGHT

- *News Analytics and Machine Learning Strategies*, New York University.
- *Machine Learning* with **Tom Mitchell** and **William W. Cohen**, Carnegie Mellon University.
- *Multimedia Databases and Data Mining* with **Christos Faloutsos**, Carnegie Mellon University.
- *Honors Introduction to Computer Science* with **John R. Kender**; *Distinguished Teaching Assistant Award*, Columbia University.

INVITED TALKS

"Machine Learning and Trading," Career Speaker Series. Bendheim Center for Finance, Princeton University, Princeton, NJ (March 29, 2017).

"Exploiting Document Structure and Feature Hierarchy for Semi-supervised Domain Adaptation." Machine Learning Lunch. Carnegie Mellon University, Pittsburgh, PA (September 29, 2008).

"A Comparison of Methods for Transductive Transfer Learning." Information Retrieval and Mining Seminar. Microsoft Research Asia, Beijing, China (May 30, 2007).

"Feature Discovery in the Context of Educational Data Mining: An Inductive Approach." IBM Mathematical Sciences Department Seminar. IBM Watson Research, Yorktown Heights, NY (July 6, 2006).

"Causal Modeling for Anomaly Detection." IBM Mathematical Sciences Department 2006 Summer Student Seminar Series. IBM Watson Research, Yorktown Heights, NY (June 23, 2006).

AWARDS & HONORS

2009	<i>Finalist, Elsevier Grand Challenge: Knowledge Enhancement in the Life Sciences</i>
2008	<i>Presidential Fellow in the Life Sciences, Richard King Mellon Foundation</i>
2003	<i>Computer Science Department Award, Columbia University</i>
2002	<i>Distinguished Teaching Assistant Award, Columbia University, Computer Science Department</i>
1999 – 2003	<i>John Jay Scholar, Columbia University</i>
1999 – 2003	<i>Dean's List, Columbia College, Columbia University</i>

SERVICE

Volunteer machine learning consultant	Solutions Journalism Network
Program Committee	European Conference on Machine Learning (ECML) Principles and Practice of Knowledge Discovery in Databases (PKDD) North East Student Colloquium on Artificial Intelligence (NESCAI)
Moderator	Text-based Machine Learning Reading Group
Reviewer	International Conference On Machine Learning (ICML) Florida Artificial Intelligence Research Society Conference (FLAIRS) World Wide Web Conference (WWW)
Member	American Association for Artificial Intelligence (AAAI) Association for Computational Linguistics (ACL) Association for Computing Machinery (ACM)

HOBBIES & INTERESTS

- (Automated) poker
- Vinyl records