CURRICULUM VITAE

Jim Davies
Assistant Professor
Institute of Cognitive Science

EDUCATION

Ph.D. Computer Science (2004)
Georgia Institute of Technology
Title: *Visual Analogical Problem Solving*
Advisors: Profs. Ashok K. Goel and Nancy J. Nersessian
Committee: Profs. Ronald W. Ferguson, Richard Catrambone
Certificate: Cognitive Science

M.S. Psychology (1997)
Georgia Institute of Technology
Title: *Correlation and Consistent Contrast Biases Shown in Free Sort Categorization*
Advisor: Dr. Dorrit O. Billman
Committee: Dr. Tony J. Simon, Prof. Timothy A. Salthouse

B.A. Philosophy (1993)
State University of New York College at Oswego

EMPLOYMENT
Academic employment

Fall 2006 – Present
Carleton University, Institute of Cognitive Science
Assistant Professor

Fall 2004 – 2006
Queen's University, School of Computing
Postdoctoral Fellow
Supervisor: Prof. Janice Glasgow

CURRENT RESEARCH INTERESTS

My current research focuses on regularities in human imagination. I approach cognitive science through artificial intelligence: I create computer models of visualization. My goal is to create a computer program that imagines visual scenes the same way people do, with the same content in the same places.

PUBLICATIONS

Chapters in edited books

Goel, A. K. & **Davies, J.** (accepted December, 2009). Artificial Intelligence. In S. B. Kaufman and R. Sternberg (Eds.) *The Cambridge Handbook of Intelligence* (3rd Edition).

Nersessian, N. J., Kurz-Milcke, E. & **Davies, J.** (2005). Ubiquitous computing in science and engineering labs: A case study of a biomedical engineering lab. In G. Kouzelis, M. Pournari, M. Stoeppler and V. Tselfes, (Eds.), *Knowledge in the New Technologies*. Peter Lang: Berlin: 167-195.

Davies, J. R. (2001). Ocelots are endangered South American wild cats. In J. Ohler (Ed.) *Future Courses: A Compendium of Thought About the Future of Technology and Education.* Technos Press. 79-83.

Articles in refereed journals

Gagné, J. & **Davies, J.** (accepted August, 2009) Visuo: A model of visuospatial instantiation of quantitative magnitudes. *Knowledge Engineering Review. Special Issue on Visual Reasoning.*

Davies, J., Goel, A. K., & Nersessian, N. J. (2009). A Computational Model of Visual Analogies in Design. *Cognitive Systems Research: Special Issue on Analogies,* 10, 204-215.

Davies, J., Goel, A. K. & Yaner, P. W. (2008). Proteus: Visuospatial analogy in problem-solving. *Knowledge-Based Systems.* 27(7), 636-654.

Davies, J., & Goel, A. K. (2008). Visual representations and re-representation in analogical reasoning. *The Open Artificial Intelligence Journal,* 2, 11-20.

Davies, J., & Goel, A. K. (2007). Transfer of Problem-Solving Strategy Using Covlan. *Journal of Visual Languages and Computing*: 18, 149-164.

Glasgow, J., Kuo, T. & **Davies, J.** (2006). Protein structure from contact maps: A case-based reasoning approach. *Information Science Frontiers, Special Issue on Knowledge Discovery in High-Throughput Biological Domains*. 8: 29-36

Davies, J., Glasgow, J. & Kuo, T. (2006). Visio-spatial case-based reasoning: A case study in prediction of protein structure. *Computational Intelligence,* 22:3/4, 194-207.

Davies, J., Nersessian, N. J. & Goel, A. K. (2005). Visual models in analogical problem solving. *Foundations of Science, Special Issue on Model-Based Reasoning: Visual, Analogical, Simulative.* L. Magnani & N. J. Nersessian (Eds.) 10, 133-152.

Billman, D. O. & **Davies, J.** (2005). Consistent contrast and correlation in free sorting. *American Journal of Psychology*. 118(3) 353-383.

Under Review

Davies, J., & Matheson, D. (under review). The cognitive importance of testimony. Submitted to *The Canadian Journal of Philosophy*.

Formally Refereed Abstracts

Abelson, A., **Davies, J.**, Fraser, R., Kuo, T., Zuviria, E. & Glasgow, J. (2005). Protein structure from contact maps: An hierarchical approach. Intelligent Systems for Molecular Biology (ISMB05).

Articles in Refereed Conference Proceedings

Davies, J. & Gagné, J. (2010). Estimating quantitative magnitudes using semantic similarity. *Conference of the American Association for Artificial Intelligence workshop on Visual Representations and Reasoning* (AAAI-10-VRR) 14--19.

Davies, J. & Yaner, P. W. (2010). Analogical mapping through visual abstraction. *the Annual Conference of the Cognitive Science Society* (CogSci 2010), 1553—1558.

Bell, J. & **Davies, J.** (2010). Pixel graphs are better at representing large quantities of information than pie graphs. *Theory and Application of Diagrams* (Diagrams-2010), 288-291.

Smith, C., Van Bentham, K., Nuttall, J., Musca, J., MacDougall, K., Miller, X., Li, J., Fitzpatrick, J., Di Noia, N., Cybulskie, A., & **Davies, J.** (2010). Modeling English spatial preposition detectors. *Theory and Application of Diagrams* (Diagrams-2010), 328—330.

Gagné, J. & **Davies, J.** (2009). Analogical estimation of quantitative magnitudes. *New Frontiers of Analogy Research: Proceedings of Analogy 09*, 155-164, Sophia, Bulgaria.

Thomson, R. & **Davies, J.** (2009). Distance estimation as a process of generating Ad-Hoc Metrical Systems. *Proceedings of the Thirty-First Annual Conference of the Cognitive Science Society.* 2932-2937.

Davies, J. (2009). Experience-based reasoning as the basis of a general artificial intelligence architecture. *IJCAI Workshop on Grand Challenges for Reasoning from Experiences.* 1-6. Pasadena, California, July 11, 2009.

Davies, J., Glasgow, J. & Kuo, T. (2007). Protein structure prediction with visuospatial analogy. In T. Barkowsky, C. Freksa, M. Klnauff, & B. Krieg-Bruckner (Eds.) *Proceedings of Spatial Cognition 2006*, 127-139, Bremen, Germany.

Davies, J., Goel, A. K. & Nersessian, N. J. (2005). Transfer of problem-solving strategy using the Cognitive Visual Language. *Proceedings of the International Workshop on*

Visual Languages and Computing (VLC05). 293-298.

Davies, J., Goel, A. K. & Nersessian, N. J. (2005). Transfer in visual case-based problem-solving. In H. Munoz-Avila & F. Ricci (Eds.) *Proceedings of the 6th International Conference on Case-Based Reasoning*. LNAI 3620. Springer-Verlag. Berlin Heidelberg. 163-176.

Davies, J., Goel, A. K. & Nersessian, N. J. (2005). A Cognitive Model of visual analogical problem-solving transfer. In L. P. Kaelbling & A. Saffioti (Eds.) *Proceedings of the Nineteenth Annual International Joint Conference on Artificial Intelligence*. Professional Book Center, Denver, Colorado. 1556-1557.

Nersessian, N. J., Kurz-Milke, E., Newstetter, W. C. & **Davies, J.** (2004). Research laboratories as evolving distributed cognitive systems. In A. Markman & L. Barsalou (Eds.) *Proceedings of the 25th Annual Conference of the Cognitive Science Society*. Erlbaum. Hillsdale, New Jersey. 857-862.

Davies, J. & Goel, A. K. (2003). Representation Issues in visual analogy. In R. Alternam & D. Kirsh (Eds.) *Proceedings of the 25th Annual Conference of the Cognitive Science Society*. Erlbaum. Hillsdale, New Jersey. 300-305.

Davies, J., Goel, A. K., & Nersessian, N. J. (2003). Visual re-representation in creative analogies. In A. Cardoso & J. Gero (Eds.) *The Third Workshop on Creative Systems, International Joint Conference on Artificial Intelligence*. 1-12.

Davies, J. & Goel, A. K. (2003). Visual case-based reasoning I: Transfer and adaptation. *Proceedings of the First Indian International Conference on Artificial Intelligence*. Hyderabad, India.

Nersessian, N. J., Newstetter, W. C., Kurz-Milcke, E. & **Davies, J.** (2002). A Mixed-method Approach to Studying Distributed Cognition in Evolving Environments. *Proceedings of the International Conference on Learning Sciences*. 307-314.

Davies, J., & Goel, A. K. (2001). Visual analogy in problem solving. *Proceedings of the International Joint Conference on Artificial Intelligence*. 377-382. Morgan Kaufmann publishers.

Davies, J. R., Lesh, N., Rich, C., Sidner, C. L., Gertner, A. S., & Rickel, J. (2001). Incorporating tutorial strategies into an intelligent assistant. Proceedings of the 2001 *International Conference on Intelligent User Interfaces*. 53-65.

Davies, J. R., Nersessian, N.J. & Goel, A.K. (2001). The role of visual analogy in scientific discovery. *Model-Based Reasoning: Scientific Discovery, Technological Innovation, Values.* Pavia Italy.

Murdock, W. J., Simina, M., **Davies, J.**, & Shippey, G. (1998). Modeling Invention by

Analogy in ACT-R. *Proceedings of the Twentieth Annual Conference of the Cognitive Science Society*, Madison, WI. 740-745.

Technical reports

Davies, J. (2009). Don't waste student work: Using classroom assignments to contribute to online resources. Carleton University Cognitive Science Technical Report 2009-01, http://www.carleton.ca/ics/TechReports

Davies, J., Nersessian, N. J., Goel, A. K. (2001). Visual models in analogical problem solving. Georgia Institute of Technology Cognitive Science technical report GIT-COGSCI-2001/03.

Davies, J. R., Lesh, N., Rich, C., Sidner, C. L., Gertner, A. S., & Rickel, J. (2000). Incorporating tutorial strategies into an intelligent assistant. Mitsubishi Electric Research Labs. Technical report TR-2000-30. Cambridge, MA.

Davies, J. R., Goel, A. K., Murdock, J. W., Simina, M., & Shippey, G. (2000). Three Cognitive Models. Georgia Institute of Technology Cognitive Science Report Series GIT-COGSCI-2000/03. Atlanta, Georgia.

Davies, J. (1998) Correlation and consistent contrast biases shown in free sort categorization. Georgia Institute of Technology Cognitive Science Report Series GIT-COGSCI-98/02. Atlanta, Georgia.

Other Publications

Editor of *Cognitive Science Summaries* website:
URL: http://www.jimdavies.org/summaries/

Editor of *Brain Areas Mnemonics Wiki* website:
URL: http://brainareas.pbwiki.com/

Galassi, M., **Davies, J.**, Theiler, J., Gough, B., Jungman, G., Booth, M. & Rossi, F. (2001, 2003) *GNU Scientific Library.* First and Second Editions. Network Theory Ltd.

EDITORIAL RESPONSIBILITIES

Reviewing for Journals

Journal of Cognitive Systems Research
Software Practice and Experience
Journal of Digital Information
Journal of Human-Computer Interaction

Reviewing For Conferences

Annual Conference of the Cognitive Science Society
Program committee member for Diagrams 2010

INVITED PAPERS PRESENTED
to learned societies

Davies, J. (2010). *The Science of Imagination.*
Pacific Northwest National Laboratories, August 16.
Google (Mountain View Campus), August 3.
TEDxCarletonU, March 30.

Davies, J. (2010). *A Vision for the Science of Imagination*. A. Louis Medin Modeling & Simulation Seminar Series and Cognitive Sciences Student Association at the University of Central Florida Visiting Scholar Series. Talk, panel discussion, student forum. February 16.

Davies, J., & Gagné, J. (2010). *Visuo: A Model of Visuospatial Instantiation of Quantitative Magnitudes.* National Research Council Canada Featured Speaker. January 22.

OTHER PAPERS PRESENTED
to learned societies

Schoenherr, J. R. & **Davies, J.** (2009). Complexity Effects in Judgments of Maps of Science. *The 12th International Converence on Scientometrics and Infometrics.* Rio de Janiero, Brazil.

Schoenherr, J. R., **Davies, J.**, Burch, H., Thomson, R. (2009). The believability of anthropomorphic explanations. Poster presentation at the 31st Annual Conference of the *Societe Quebecoise Pour La Recherche En Psychologie (SQRP09).* Ottawa, Ontario, March 22, p151.

Davies, J., Schoenherr, J. R., Thompson, R. & Burch, H. (2009). Visuospatial Imagination of Geometric Shape: Regularities and Inconsistencies. Poster and Member abstract in the *Proceedings of the Cognitive Science Society.*

Davies, J., Schoenherr, J. R., & Bell, J. (2009). Psychological Dimensions of Graphical Representation of Science. *2009 Annual Convention of the Canadian Psychological Association,* June 11 – 13, Montréal, Québec.

Schoenherr, J. R., **Davies, J.**, & Burch, H. (2009). Regularities in Human Visuospatial Imagination. *2009 Annual Convention of the Canadian Psychological Association,* June 11 – 13, Montréal, Québec.

Burch, H., **Davies, J.**, & Schoenherr, J.R. (2009). The believability of anthropomorphic explanations. *2009 Annual Convention of the Canadian Psychological Association,* June 11 – 13, Montréal, Québec.

Davies, J., Nersessian, N. J. & Goel, A. K. (2001). Visual analogy in scientific discovery. *Cognitive Studies of Science and Technology Workshop*, University of Virginia, March

24-27.

Davies, J.R., Lesh, N., Rich, C., Sidner, C. L., Gertner, A. S., & Rickel, J. (2001). Demonstration of collaborative interface agents using COLLAGEN. The 2001 *International Converence on Intelligent User Intervaces.*

Davies, J. (1999). An evaluation of SIRRINE2 as a cognitive architecture based on a model of human arithmetic. Twenty-first Annual Conference of the Cognitive Science Society, Vancouver, BC.

Galassi, M., **Davies, J.**, Theiler, J., Gough, B., Priedhorsky, R., Jungman, G., & Booth, M. (1999). The GNU scientific library. October 1999, *Open Source/Open Science Conference*, Brookhaven National Laboratory.

Billman, D., Davila, D. & **Davies, J.** (1996). Hierarchy and consistent contrast aid supervised and unsupervised concept learning. November 1996, Accepted talk, *Conference of the Psychonomics Society*.

Davies, J. & Billman D. (1996) Hierarchical categorization and the effects of contrast inconsistency in an unsupervised learning task. *Proceedings of the Eighteenth Annual Conference of the Cognitive Science Society.* Lawrence Erlbaum, Mahwah, NJ. p.750.

To Other Academic Bodies

Davies, J., Bicknell, J. (2010). *The Microtheory Model of Belief Quarantine*. Carleton University Cognitive Science Colloquium Series. January 21.

Davies, J., Matheson, D. (2010). *The Cognitive Importance of Testimony*. Carleton University Philosophy Department Public Lecture. January 15.

Davies, J. (2009). *Using Assignments for Web Educational Materials.* Part of the Carleton University Educational Development Centre \Classroom Strategies: One Cool Thing I'm Doing..." December 8.

Davies, J. (2009). Don't waste student work: Using class assignments to further research and wider educational goals. Carleton University Educational Development Centre *Teaching Technology Roundtable*, September 25. Talk available online at http://granny.carleton.ca/media/edc/jimdavies.mp4

Schoenherr, J. & **Davies, J.** (2009). *Dissociating perceptual complexity in graphical representations of science.* Carleton University Cognitive Science Colloquium Series, October 22.

Davies, J., & Gagné, J. (2009). *Visuo: A Model of Visuospatial Instantiation of Quantitative Magnitudes*. Carleton University Cognitive Science Colloquium Series, October 8.

Davies, J. (2009). *Don't waste student work: Using class assignments to further research and wider educational goals.* Carleton University Educational Development Centre Teaching Technology Roundtable, September 25.

Davies, J. (2007). A.I. past and future. *Institute on Biotechnology and the Human Future's (IBHF) Conference, "The Spotless Mind? Policy, Ethics & the Future of Human Intelligence,"* February 16: The National Press Club, Washington, D.C. http://www.thehumanfuture.org/events/webcast_021607.html

Davies, J. (2006). *The role of visual reasoning in analogical problem solving*.
University of California at Merced. February 16.
Institute of Cognitive Science, Carleton University. February 13.

Abelson, A., **Davies, J.**, Fraser, R., Kuo, T., Zuviria, E. & Glasgow, J. (2006). Protein structure from contact maps: An hierarchical approach. Poster at First Canadian Student Conference on Biomedical Computing (CSCBC06). Kingston, Ontario.

Davies, J. (2006) Visualization in Human Imagination. HOT Lab presentation. Carleton University. December 1.

Davies, J. (2006) Visualization in Human Imagination. Carleton University Cognitive Science Colloquium Series. October 13.

Davies, J. (2004). *Constructive adaptive visual analogy.* Cognitive Science Student Conference. Georgia Institute of Technology. April 23.

Davies, J. (2004). *Constructive adaptive visual analogy*.
School of Information Science & Learning Technologies, U of Missouri. May 19.
School of Computing, Queen's University. May 13.
University College Dublin. April 27.
University of Wisconsin at Green Bay. March 24.

Nersessian, N. J., Newstetter, W. C., Kurz-Milcke, E., **Davies, J.** & Malone, K. (2003) Laboratory learning: Cognition and learning in biomedical engineering labs. NSF Presentation.

Newstetter, W. C., Nersessian, N. J., **Davies, J.**, Kurz-Milke, E. & Malone, K. (2002) Biomedical Engineering Thinking and Learning: Phase 1--Reasoning in the lab. NSF presentation.

RESEARCH GRANTS
Government or extra-university

Davies, J. (2009). *Visuospatial Scene Generation.* National Science and Engineering Research Counsel (NSERC) Discovery Grant. $95,000 CAD ($19,000 per year for five years).

Davies, J. (2008). *Graphical Representations of Scientific Inter-relationships*. SciTech Strategies, Inc. grant. $10,765 USD.

Ferres, L. & Davies, J. (2006). Interaction between Linguistic & Visual Cues During Graph Comprehension Tasks. Statistics Canada. $18,000 CDN.

Davies, J., Essa, I., & Maple, T. (1998-1999) The Primatech project: An interactive simulation of a signing orangutan. Seed Grant. GVU, Georgia Institute of Technology.

University

Davies, J. (2010). *Quanty Game.* Carleton University Foundry Program. $5,000 CAD.

Davies, J. (2008). *Toward a Theory of Visual Instantiation.* Carleton University Internal Research Grant from the NSERC General Research Fund. $7,000 CAD.

Davies, J. (2007). *Toward a Theory of Visual Instantiation.* Carleton University Internal Research Grant from the NSERC General Research Fund. $5,000 CAD.

SERVICE TO THE PROFESSION

Programme committee membership

Analogy 09
Diagrams 2010
Graduate Symposium Chair

ACADEMIC RESPONSIBILITIES

Graduate courses taught

[CGSC5102] Computational Methods
Carleton University
Instructor
Fall 2010
[CGSC6800] Proseminar in Cognitive Science
Carleton University
Instructor
Winter 2007, 2008, Fall 2008, 2009
[CGSC 5001] Artificial Intelligence for Cognitive Science
Carleton University
Instructor
Fall, 2008, 2009

[CGSC 4001/5001] Special Topics in Cognitive Science
Carleton University
Instructor
Fall 2006, 2007, Winter 2011

Undergraduate courses taught

[CGSC 3001] Honours Seminar in Cognitive Science I
Carleton University
Instructor (one half)
Fall 2009, 2010
[CGSC 4001] Artificial Intelligence for Cognitive Science
Carleton University
Instructor
Winter, 2009, 2010
[CGSC 2002]
Theories and Methods in Cognitive Science
Carleton University
Instructor
Winter 2007, 2008, 2009, 2010, 2011
[CISC 453] Advanced Artificial Intelligence
Queen's University
Instructor (one-third)
Spring 2006

Teaching Record

Year	**Undergraduate**	**Graduate**
2010-2011	CGSC 3001**, CGSC 2002, CGSC 4001/5001	CGSC 5102
2009 – 2010	CGSC 4001, CGSC 3001**, CGSC 2002	CGSC 6800*, CGSC 5001
2008 – 2009	CGSC 4001, CGSC 2002	CGSC 6800*, CGSC 5001
2007 – 2008	CGSC 4001/5001, CGSC 2002	CGSC 6800*
2006 - 2007	CGSC 4001/5001, CGSC 2002	CGSC 6800*

*Taught for 1 term (two term course).
** Shared course with another instructor

Supervision

Years	**Student**	***Thesis/Project Title***
Ph.D. Dissertation Supervision		
09-	Sterling Somers	*In progress*
10-	Matthew Kelly	*In progress*
Honours Thesis Supervision		

09-10	Peter Welch	*Developing an understanding of the biological emergence of mind; an analysis of the distributed information processing of the superorganism*
09-10	Geoffrey Johnson	*The Expansion of Galatea to Include L12, L11, and L13*
09-10	Connor Smith	*The Retrieval of Images Using Spatial Relationship Detectors*
09-10	Jessica Cockbain	*What if Da Vinci Had A Computer? Investigating the Influence of Technology On Creativity*
08-	James MacAulay	*In progress*
08-10	Nicolas Di Noia	*The Categorical Similarity Mapping Engine (CSME), The Abstract Relation Mapping Engine (ARME), and the Direct Structure Mapping Engine (DSME): Investigating Category-based Approaches To Analogy Mapping*
08-10	Geoffrey Johnson	*The Expansion of Galatea To Include L12, L11, and L13*
08-09	Alexander Miller	*Rethinking Machine Ethics: Functionally Defined Artificial Intelligent Agent Ethics*
07-08	Jonathan Gagne	*Analogical Inference of Visual Properties*
07-08	Tyler Mair	*Finding Fun: Examining the Source of Fun in Games*

Master's Theses Examined for other Departments at Carleton University

Date	**Department**	**Student**	**Title**
2010, Sept 3	Film Studies	Jake Dole	*The Curious Eye: Symmetry, Neo-Baroque Aesthetics and the Hollywood Spectacle*
2008, Jan 28	Psychology	Michael Henighan	*Working Memory and Arithmetic*
2008, Jan 9	Psychology	Jordan Schoenherr	*The Dependency of Confidence Processing on Working Memory*
2008, May 20	Psychology	Joey Theberge	*A Distributional Analysis of Reaction Times in Mental Rotation*

ADMINISTRATIVE RESPONSIBILITIES

Departmental Service

Technical Report Manager (2009-Present)

Graduate Committee (2009-2010)

OGS Appraisal Committee (2009)

Member, Institute of Cognitive Science Faculty Hiring Committee (2008-2009)

Member, Institute of Cognitive Science Graduate Admissions Committee (2009)

Cognitive Science / Psychology Promotion Committee (2008-2009)

Cognitive Science / Linguistics Promotion Committee (2008-2009)

Member, Faculty of Arts and Social Sciences Tenure Review Committee
(2007)

Member, Institute of Cognitive Science Director Search Committee
(2007)

Cognitive Science Distinguished Lecture Series, coordinator,
(Fall 2006 – Summer, 2009)

Faculty of Arts and Social Sciences Service

Member, Faculty of Arts and Social Sciences Promotion Review Committee (2008)

Other

Director, Science of Imagination Laboratory, Carleton University
Founder, Creative Automated Design of Experience Group (CADOE)
Co-Founder, VSIM Computational Cognitive Science Laboratory (with R. West)

Membership in Professional Societies

American Association for Artificial Intelligence (lifetime member)
Cognitive Science Society
American Psychological Society