David C. Noelle

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RESEARCH INTERESTS

Computational cognitive neuroscience, connectionism, cognitive control, learning from direct instruction, rule-guided behavior, concept formation, working memory, implicit/explicit learning, cognitive neuroscience, computational neuroscience, cognitive psychology, artificial neural networks, machine learning, artificial intelligence.

EDUCATION

Ph.D., Cognitive Science & Computer Science — University of California, San Diego
October, 1997 — La Jolla, California
GPA 4.00

Interdisciplinary focus on connectionist cognitive psychology. Thesis advisor was Garrison W. Cottrell. Dissertation research on modeling integrated implicit/explicit learning, entitled *A Connectionist Model Of Instructed Learning*.

M.S., Computer Science — University of California, San Diego
June, 1992 — La Jolla, California
GPA 4.00

Computer science comprehensive examination passed with distinction.

B.S., *cum laude*, Computer Science & Engineering — University of California, Los Angeles
June, 1987 — Los Angeles, California
GPA 3.62

Curriculum encompassed foundations of computer science and electrical engineering. Courses included artificial intelligence, natural language processing, and psychobiology.

EXPERIENCE

University of California, Merced — Merced, California
Associate Professor — July, 2013 – Present

Appointment in Cognitive and Information Sciences. Member of the Electrical Engineering and Computer Science graduate group. UCM CITRIS core faculty member. Elected faculty of the UCB Institute of Cognitive and Brain Sciences.

University of California, Merced — Merced, California
Assistant Professor — July, 2006 – June, 2013

Split appointment in Computer Science and Cognitive Science. Member of UCM CITRIS and the UCB Institute of Cognitive and Brain Sciences.

EXPERIENCE
(continued)

Vanderbilt University Nashville, Tennessee
Assistant Professor October, 2001 – June, 2006

Primary appointment in the Department of Electrical Engineering and Computer Science. Secondary appointment in the Department of Psychology. Investigator at the Center for Integrative & Cognitive Neuroscience. Member of the Neuroscience Graduate Program faculty. Investigator at the Learning Sciences Institute.

The Center for the Neural Basis of Cognition Pittsburgh, Pennsylvania
Postdoctoral Researcher October, 1997 – September, 2001

Conducted research on instructed category learning, confidence reports, and connectionist models of instruction following, category learning, cognitive control, working memory, conflict monitoring, and prefrontal cortex. Advised by James L. McClelland and Jonathan D. Cohen.

Carnegie Mellon University Psychology Department Pittsburgh, Pennsylvania
Instructor January, 1999 – May, 1999

Taught the combined undergraduate and graduate course "Introduction to Parallel Distributed Processing" which covers the fundamentals of artificial neural network modeling and the application of such modeling techniques to the understanding of cognitive processes.

UCSD Cognitive Science Department San Diego, California
Seminar Leader April, 1997 – June, 1997

Organized and led a ten week research seminar on the dynamical systems hypothesis in cognitive science.

UCSD Computer Science & Engineering Department San Diego, California
Senior Teaching Assistant April, 1993 – September, 1996

Produced and maintained instructional resources for computer science teaching assistants. Actively participated in hiring, training, and evaluation of teaching assistants. Student member of faculty committee on graduate education.

UCSD Computer Science & Engineering Department San Diego, California
Teaching Assistant September, 1991 – December, 1996

Taught courses on Artificial Intelligence, Computer Graphics, Programming In C, Introduction to Computer Science Using C++, Basic Data Structures and Object-Oriented Programming, graduate level Computer Architecture, and Digital Systems Design.

HNC Software San Diego, California
Staff Scientist June, 1994 – September, 1995

Developed statistical models for the Falcon artificial neural network based system for early detection of credit card fraud. Investigated modular network architectures and preprocessing strategies for time series data.

UCSD Summer Session San Diego, California
Instructor July, 1993 – August, 1993

Taught upper division Computer Science & Engineering core course on the "Analysis of Algorithms", a ten week class condensed to five weeks for Summer Session.

David Noelle Consulting San Diego, California
Senior Consultant September, 1990 – September, 1992

Generated software system components for expert system shells, using proprietary OOP languages and Lisp.

EXPERIENCE
(continued)

Inference Corporation Los Angeles, California
Senior Computer Scientist September, 1987 – September, 1990

Developed and maintained components of the ART (Automated Reasoning Tool) expert system shell including the object-oriented programming subsystem, code for rule/object integration, and user-interface development tools.

Great American Life Insurance Company Los Angeles, California
Agency Intern July, 1986 – September, 1986

Diagnosed and corrected errors in agent payment system using CICS and TSO on an IBM mainframe.

MAL Associates Goleta, California
Software Developer July, 1985 – September, 1985

Generated routines for database access and data preprocessing for IBM PC compatible expert system for armored vehicle fire control system design.

Raytheon Company Goleta, California
Summer Intern July, 1984 – September, 1984

Performed system administration duties for electronic counter-measures software development project.

INSTRUCTIONAL ACTIVITIES

Spring, 2002 —

CS 269	*Project in Artificial Intelligence*	(9 students)
CS 396	*Computational Modeling Methods for Cognitive Neuroscience*	(9 students)
EECE 225	*The Visual System*	(team taught)

Fall, 2002 —

CS 360	*Advanced Artificial Intelligence*	(15 students)

Spring, 2003 —

EECE 350	*Neural Networks*	(11 students)
EECE 225	*The Visual System*	(team taught)
PSY 232	*Mind and Brain*	(guest lecturer)

Fall, 2003 —

CS 360	*Advanced Artificial Intelligence*	(14 students)

Spring, 2004 —

CS 396	*Computational Modeling Methods for Cognitive Neuroscience*	(13 students)
EECE 225	*The Visual System*	(team taught)

Fall, 2004 —

CS 360	*Advanced Artificial Intelligence*	(13 students)
NURO 340	*Systems Neuroscience*	(team taught)
CS 364	*Intelligent Learning Environments*	(guest lecturer)

Spring, 2005 —

CS 350	*Artificial Neural Networks*	(26 students)
EECE 225	*The Visual System*	(team taught)

INSTRUCTIONAL ACTIVITIES
(continued)

Fall, 2005 —

CS 360	*Advanced Artificial Intelligence*	(10 students)

Spring, 2006 —

CS 269	*Project in Artificial Intelligence*	(7 students)
CS 340	*Computational Cognitive Neuroscience*	(9 students)
EECE 225	*The Visual System*	(team taught)

Fall, 2006 —

CSE 31	*Introduction to Computer Science & Engineering II*	(3 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(9 students)
COGS 1	*Introduction to Cognitive Science*	(guest lecturer)
COGS 250	*Cognitive Science Graduate Seminar*	(guest lecturer)

Spring, 2007 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(10 students)
COGS 190	*What Is Rational?*	(guest lecturer)

Fall, 2007 —

CSE 176 / 276	*Machine Learning*	(5 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(17 students)
COGS 1	*Introduction to Cognitive Science*	(guest lecturer)
PSY 200	*Psychology Professional Seminar*	(guest lecturer)

Spring, 2008 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(11 students)
COGS 250	*Cognitive Science Graduate Seminar*	(11 students)

Fall, 2008 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(28 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(20 students)
COGS 1	*Introduction to Cognitive Science*	(guest lecturer)
COGS 101	*Mind, Brain, and Computation*	(guest lecturer)
COGS 201	*Cognitive Science Foundations I*	(guest lecturer)

Spring, 2009 —

CSE 176 / 276	*Machine Learning*	(17 students)

Fall, 2009 —

COGS 250	*Cognitive Science Graduate Seminar*	(guest lecturer)

Spring, 2010 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(22 students)
EECS 290	*EECS Seminar*	(18 students)

Fall, 2010 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(44 students)
CSE 176 / EECS 276	*Machine Learning*	(16 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(20 students)

Spring, 2011 —

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INSTRUCTIONAL ACTIVITIES
(continued)

Fall, 2011 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(50 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(30 students)

Spring, 2012 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(39 students)

Fall, 2012 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(53 students)
COGS 1	*Introduction to Cognitive Science*	(guest lecturer)

Spring, 2013 —

CSE 176 / EECS 276	*Machine Learning*	(21 students)
COGS 250	*Cognitive Science Graduate Seminar*	(19 students)

Fall, 2013 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(59 students)
CORE 90X	*Am I My Brain? Neuroscience and Deep Questions*	(25 students)

Spring, 2014 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(34 students)

Fall, 2014 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(72 students)

Spring, 2015 —

COGS 269	*Cognitive Control & Prefrontal Cortex*	(4 students)

Fall, 2015 —

Sabbatical

Spring, 2016 —

Sabbatical

Fall, 2016 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(116 students)

Spring, 2017 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(52 students)
COGS 250	*Cognitive Science Graduate Seminar*	(25 students)

Fall, 2017 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(115 students)

Spring, 2018 —

COGS 123 / 223; CSE 173 / 273	*Computational Cognitive Neuroscience*	(59 students)

Fall, 2018 —

COGS 125 / CSE 175	*Introduction to Artificial Intelligence*	(101 students)

Spring, 2019 —

COGS 13	*Scientific Thinking*	(17 students)

PUBLICATIONS

(student names are underlined)

Journal Articles

McKenzie, C. R. M., Wixted, J. T., **Noelle, D. C.**, and Gyurjyan, G. (2001). Relation between confidence in yes-no and forced-choice tasks. *Journal of Experimental Psychology: General*, 130(1), 140–155.

> *This paper examined the mathematical relationship between human confidence judgments under yes-no versus forced-choice conditions. While yes-no and forced-choice tasks are ubiquitous in psychological experiments, this work represents the first attempt to formalize confidence across task types in a general way. The motivation for this work arose from a conversation between the first author and myself, in which I suggested a novel normative modeling perspective on the confidence phenomena he was studying. I contributed the mathematical modeling work to this paper, which is central to the work, including the derivation of a Bayesian normative model for this relationship. My co-authors, who are at the University of California, San Diego, conducted the experiments necessary to test the models against human performance. This effort was almost entirely conducted as a long-distance collaboration, after I had left San Diego.*

O'Reilly, R. C., **Noelle, D. C.**, Braver, T. S., and Cohen, J. D. (2002). Prefrontal cortex and dynamic categorization tasks: Representational organization and neuromodulatory control. *Cerebral Cortex*, 12(3), 246–257.

> *This paper demonstrated, through computational simulations of a model of prefrontal cortex, that the results of frontal lesion studies are consistent with a single-mechanism account of prefrontal function. The described computational model offered the first mechanistic explanation of apparent dissociations of function in different regions of frontal cortex using homogeneous biophysical processes. All authors were intimately involved in the design and analysis of the reported simulations, with the bulk of the model construction work falling on the shoulders of the first author and myself. This project was conducted as a long-distance collaboration, with O'Reilly at the University of Colorado, Boulder, Braver at Washington University in St. Louis, and Cohen at Princeton University.*

McKenzie, C. R. M., Wixted, J. T., and **Noelle, D. C.** (2004). Explaining purportedly irrational behavior by modeling skepticism in task parameters: An example examining confidence in forced-choice tasks. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30(5), 947–959.

> *This paper continued an earlier examination of the mathematical relationship between human confidence judgments under yes-no versus forced-choice conditions. Our previous paper demonstrated the inadequacy of one Bayesian normative model to account for this relationship , while this paper presented an innovative augmented normative model which included a parameterization of the level of "trust" that learners had in experimental instructions. This augmented model is shown to capture human performance well, suggesting that human behavior in this domain may be more rational than previously hypothesized. Building on my work on instructed learning, I independently conceived and derived this augmented model, and my long-distance collaborators, at the University of California, San Diego, conducted new experiments to test the model.*

PUBLICATIONS
(continued)

Journal Articles

Rougier, N. P., **Noelle, D. C.**, Braver, T. S., Cohen, J. D., and O'Reilly, R. C. (2005). Prefrontal cortex and the flexibility of cognitive control: Rules without symbols. *Proceedings of the National Academy of Sciences*, 102(20), 7338–7343.

This paper presents the first computational model of prefrontal cortical function that offers a mechanism capable of explaining the development of prefrontal representations. It is also the first biologically grounded computational model capable of performing multiple standardized neuropsychological tests, including the Wisconsin Card Sorting Test (WCST) and the Stroop task. This work emerged from a long and close long-distance collaboration between myself, Rougier (Loria, France), Braver (Washington University in St. Louis), Cohen (Princeton University), and O'Reilly (University of Colorado, Boulder). All authors were involved in every stage of this work. The actual development of simulation software was largely conducted by myself and Rougier.

Kriete, T., House, M., Bodenheimer, B., and **Noelle, D. C.** (2005). NAV: A tool for producing presentation-quality animations of graphical cognitive model dynamics. *Behavior Research Methods*, 37(2), 335–339.

Computational models of human cognition and brain function are often complex dynamical systems, making it difficult to effectively illustrate the behavior of such models to research colleagues and to students. Under my direction, two Vanderbilt computer science graduate students designed and implemented an open source software tool for the generation of explanatory animations of cognitive model dynamics. Prior to this effort, such a general-purpose tool was not available to computational neuroscientists and cognitive modelers. With the help of Vanderbilt's Dr. Bodenheimer, a usability study was conducted. This paper introduced the developed software system and reported on assessments of its ease-of-use.

Racine, C. A., Barch, D. M., Braver, T. S., and **Noelle, D. C.** (2006). The effect of age on rule-based category learning. *Aging, Neuropsychology, and Cognition*, 13, 411–434.

A large fraction of my research has involved studying the interactions between rule-based category learning and category learning based on performance feedback. In this work, an instructed category learning task that I had previously designed and investigated, both in the human learning laboratory and using computational models, was presented to older learners in order to discern the effects of age on these category learning processes. My experimental design is well suited to examine the effects of both frontal development and degeneration, and this paper marks the first time it was used in such a way. This work stemmed from a long-distance collaboration with colleagues at Washington University in St. Louis.

Noelle, D. C. (2008). Teaching cognitive modeling using PDP++. *Brains, Minds, & Media*, 3(1).

This review article critically assess the utility of the `PDP++` software package for teaching university undergraduate and graduate students the skills needed to construct, analyze, and evaluate computational cognitive neuroscience models. Drawing on my classroom experience, training students in these research skills, this report characterizes the strengths and weaknesses of `PDP++` as a pedagogical tool. Specific suggestions to instructors intending to use this software in the classroom are provided.

Journal Articles

McClelland, J. L., Botvinick, M. M., **Noelle, D. C.**, Plaut, D. C., Rogers, T. T., Seidenberg, M. S., and Smith, L. B. (2010). Letting structure emerge: Connectionist and dynamical systems approaches to cognition. *Trends in Cognitive Sciences*, 14(8), 348–356.

> *This article critiques the use of normative probabilistic models for understanding cognition, arguing that careful attention to the complex emergent properties of interacting mechanisms provides a better guide to the causal structure of mind. Authors contributed equally to this paper and are listed in alphabetical order, with the exception of McClelland, who led the collaboration.*

Kriete, T. and **Noelle, D. C.** (2011). Generalisation benefits of output gating in a model of prefrontal cortex. *Connection Science*, 23(2), 119–129.

> *This article reports the results of a systematic computational investigation into the learning benefits of incorporating a bistable gate on the backward projections from the working memory circuits of prefrontal cortex. Such a gate on the forward input projections to prefrontal cortex had been previously explored. This paper extends past work by demonstrating that the incorporation of a similar gating mechanism on prefrontal outputs greatly facilitates generalization when learning componentential tasks. The research was conducted by Ph.D. student Kriete, under my direction.*

Gupta, A., Vig, L., and **Noelle, D. C.** (2011). A dual association model for the extinction of animal conditioning. *Neurocomputing*, 74(17), 3531–3542.

> *If a simple association (e.g., between an act and reward) is repeatedly conditioned and then extinguished, the time to reacquire the behavior and the time to extinguish it both fall over repeated trials. This article demonstrates that this basic phenomenon of learning arises naturally from fundamental principles of neural computation. The work reported in this paper was conducted by Gupta, under my supervision, with Vig contributing to the presentation of the results.*

Gupta, A., Vig, L., and **Noelle, D. C.** (2011). A cognitive model for generalization during sequential learning. *Journal of Robotics*, 2011, Article ID 617613.

> *Many artificial neural network learning mechanisms suffer from* catastrophic interference*, where the sequential learning of a new task destroys knowledge of previously learned tasks. In this paper, fast lateral inhibition (producing sparse representations) along with correlational learning, as embodied in the Leabra modeling framework, are shown to largely overcome this interference problem when sequentially learning multiple motor skills in a simulated robotic arm. The work reported in this paper was conducted by Gupta, under my supervision, with Vig contributing to the presentation of the results.*

Gupta, A., Vig, L., and **Noelle, D. C.** (2012). A neurocomputational approach to automaticity in motor skill learning. *Biologically Inspired Cognitive Architectures*, 2, 1–12.

> *Leading theories of* automaticity *in motor skill learning view skill knowledge as being initially represented in a declarative form and being transformed into producedural knowledge with practice. This article presents a computational cognitive neuroscience model of motor skill learning that captures this transition in a relinquishment of cognitive control, mediated by the prefrontal cortex, with extensive learning. The work reported in this paper was conducted by Gupta, under my supervision, with Vig contributing to the presentation of the results.*

PUBLICATIONS
(continued)

Journal Articles

Kello, C. T., Rodny, J., Warlaumont, A. S., and **Noelle, D. C.** (2012). Plasticity, learning, and complexity in spiking networks. *Critical Reviews in Biomedical Engineering*, 40(6), 501–518.

> *This review and position paper discusses interactions between the mathematical complexity of neural spike timing patterns and mechanisms for synaptic learning. The article includes an overview of a spiking reinforcement learning model explored by Ph.D. student Rodny, under my supervision.*

Noelle, D. C. (2012). On the neural basis of rule-guided behavior. *Journal of Integrative Neuroscience*, 11(4), 453–475.

> *This paper describes how computational cognitive neuroscience accounts of interactions between the prefrontal cortex, the hippocampus, the basal ganglia, and other brain areas can explain much of the behavioral, neuropsychological, and brain imaging data on rule-guided behavior in humans.*

Kriete, T., **Noelle, D. C.**, Cohen, J. D., and O'Reilly, R. C. (2013). Indirection and symbol-like processing in the prefrontal cortex and basal ganglia. *Proceedings of the National Academy of Sciences*, 110(41), 16390–16395.

> *This article presents a biologically plausible solution to the long-standing variable binding problem, showing how neural circuits in the prefrontal cortext can learn componential representations that support combinatoric generalization. This is accomplished through a form of* indirection*, in which some frontal areas represent references, or* pointers*, to another frontal areas. This approach was developed jointly by all of the authors, with detailed computer simulation work being conducted by Ph.D. student Kriete, under my supervision.*

St. Clair, W. B. and **Noelle, D. C.** (2015). Implications of polychronous neuronal groups for the continuity of mind. *Cognitive Processing*, doi:10.1007/s10339-015-0645-5.

> *This article discusses how some brain systems might encode conceptual information in reproducible, time-locked, spatiotemporal spike-time patterns over a collection neurons. These patterns are called polychronous neuronal groups. The paper shows that important aspects of neural firing-rate accounts of conceptual transitions are challenged by polychronous neuronal groups. In particular, representations based on spike-timing patterns allow for discontinuous transitions from one concept to the next. This work was developed by Ph.D. student St. Clair, under my guidance.*

Kriete, T. and **Noelle, D. C.** (2015). Dopamine and the development of executive dysfunction in autism spectrum disorders. *PLoS ONE*, 10(3), e0121605, doi:10.1371/journal.pone.0121605.

> *This article presents the application of a developmental computational model of prefrontal cortex and its modulation by the dopamine system to the problem of explaining the biological basis of executive dysfunction, and spared function, in individuals on the autism spectrum. This work was conducted by Ph.D. student Kriete, under my supervision.*

PUBLICATIONS
(continued)

Journal Articles

Kyrilov, A. and **Noelle, D. C.** (2016). Do students need detailed feedback on programming exercises and can automated assessment systems provide it? *Journal of Computing Sciences in Colleges*, 31(4), http://dl.acm.org/citation.cfm?id=2904127.2904147

> *This article presents an analysis of computer programming exericse performance of students enrolled in an introductory programming class. The students were provided with simple formative feedback (correct vs. incorrect), generated by an automated assessment system. The analysis showed that, while some students can make use of such feedback, a substantial fraction of students do not benefit from it. Further analysis showed that these students made a small number of distinct errors on each exercise, suggesting that a case-based learning approach could be effectively be used to provide better formative feedback to such students. This work was conducted by Ph.D. student Kyrilov, under my supervision.*

Gordon, C. L., Shea, T. M., **Noelle, D. C.**, and Balasubramaniam, R. (2019). Affordance compatibility effect for word learning in virtual reality. *Cognitive Science*, 43(6), doi:10.1111/cogs.12742

> *This article presents results from a word learning experiment conducted in a virtual reality environment. The results provide evidence that motor actions taken to manipulate novel named objects influence the later processing of the corresponding learned names. Specifically, experimental participants were faster to respond during a matching task involving the newly learned names when the response hand was compatible with the hand used to interact with the named object during learning. This work was conducted by Ph.D. students Gordon and Shea in my laboratory, under the guidance of Dr. Balasubramaniam and myself.*

Conference Papers

Noelle, D. C. and Cottrell, G. W. (1995). A connectionist model of instruction following. In J. D. Moore & J. F. Lehman (Eds.), *Proceedings of the 17th Annual Conference Of The Cognitive Science Society* (pp. 369–374). Pittsburgh: Lawrence Erlbaum.

> *This paper introduced a novel technique that I had developed for modeling explicit instruction-following in connectionist networks. This technique was demonstrated in simple stimulus-response and algorithmic task domains. This effort formed part of my Ph.D. dissertation work, and my co-author is my thesis adviser. The conference acceptance rate was about 35%.*

Noelle, D. C. and Cottrell, G. W. (1995). A unified connectionist model of instruction following. In R. Sun & F. Alexandre (Eds.), *Working Notes of the Workshop On Connectionist-Symbolic Integration: From Unified To Hybrid Approaches* (pp. 44–49). Montréal: AAAI Press.

> *This paper used the results of connectionist simulations that I had conducted to argue that a hybrid-systems approach was not necessary to account for the integration of implicit and explicit learning in humans, counter to the claims of other researchers. This effort formed part of my Ph.D. dissertation work, and my co-author is my thesis adviser. The paper was accepted based on the reviews of the workshop program committee.*

PUBLICATIONS
(continued)

Conference Papers

Noelle, D. C. and Cottrell, G. W. (1996). In search of articulated attractors. In G. W. Cottrell (Ed.), *Proceedings of the 18th Annual Conference Of The Cognitive Science Society* (pp. 329–334). La Jolla: Lawrence Erlbaum.

> *This paper reported on my investigations into the ability of standard recurrent connectionist network learning algorithms to produce articulated or componential internal representations. While many previous analyses have investigated the theoretical capacity of recurrent networks, this was the first study to systematically examine the problem of learning such articulated representations. This effort formed part of my Ph.D. dissertation work, and my co-author is my thesis adviser. The conference acceptance rate was about 30%.*

Noelle, D. C. and Cottrell, G. W. (1996). Modeling interference effects in instructed category learning. In G. W. Cottrell (Ed.), *Proceedings of the 18th Annual Conference Of The Cognitive Science Society* (pp. 475–480). La Jolla: Lawrence Erlbaum.

> *This paper described a new connectionist model of instructed category learning that I had developed, and it provided an initial comparison between the performance of this model and human learning performance. The model that was presented is the first to address instructed category learning using neurally plausible mechanisms. This effort formed part of my Ph.D. dissertation work, and my co-author is my thesis adviser. The conference acceptance rate was about 30%.*

Noelle, D. C. and Zimdars, A. L. (1999). Methods for learning articulated attractors over internal representations. In M. Hahn & S. C. Stoness (Eds.), *Proceedngs of the 21st Annual Conference of the Cognitive Science Society* (pp. 480–485). Vancouver: Lawrence Erlbaum.

> *This paper provided novel augmentations to standard recurrent connectionist network learning methods which I designed to encourage the formation of articulated or componential internal representations in such networks. Andy Zimdars was an undergraduate student at Carnegie Mellon University who assisted me with the running of simulations. The conference acceptance rate was unreported, but is expected to have been about 30% based on conference trends.*

Noelle, D. C. and Cottrell, G. W. (2000). Individual differences in exemplar-based interference during instructed category learning. In L. R. Gleitman & A. K. Joshi (Eds.), *Proceedings of the 22nd Annual Conference of the Cognitive Science Society* (pp. 358–363). Philadelphia: Lawrence Erlbaum.

> *This paper reported the results of a human instructed category learning experiment that I had performed, as well as an analysis of the fit of a modified version of my connectionist model of instructed category learning to these data. Special attention was paid to individual differences in performance. This paper offered the first evidence that similarity-based processing can intrude upon explicit instruction following even for very simple categorization tasks. This effort was an extention of my Ph.D. dissertation work, and my co-author is my thesis adviser. The conference acceptance rate was about 30%.*

Noelle, D. C. (2001). On the normativity of failing to recall valid advice. In J. D. Moore & K. Stenning (Eds.), *Proceedings of the 23rd Annual Conference of the Cognitive Science Society* (pp. 704–709). Edinburgh: Lawrence Erlbaum.

> *This paper described a number of new Bayesian mathematical models of exemplar-based interference in instructed category learning and compared the performance of these models to previously reported human performance. Normative accounts of instructed category learning had not been considered prior to this work. The paper was accepted based on the reviews of three experts. The conference acceptance rate was unreported, but is expected to have been about 30% based on conference trends.*

PUBLICATIONS
(continued)

Conference Papers

Kawamura, K. and **Noelle, D.** (2002). Requirements for cognitive robots. *The Third IARP International Workshop on Humanoid and Human Friendly Robotics*. Tsukuba, Japan.

> *This paper described my innovative proposal for incorporating reflective reasoning abilities into the cognitive architecture that had been used in the robotics laboratory of Kaz Kawamura. It also included a taxonomy of design issues that arise when incorporating reflective processes into multi-agent architectures, which was also of my design. This work was largely motivated by an interest in reflective processes at DARPA IPTO. The paper was accepted based on the reviews of the workshop organizers.*

Kawamura, K., **Noelle, D. C.**, Hambuchen, K. A., Rogers, T. E., and Turkay, E. (2003). A multi-agent approach to self-reflection for cognitive robotics. *The 11th International Conference on Advanced Robotics (ICAR)* (pp. 568–575). Coimbra, Portugal.

> *This paper outlined my proposal for incorporating reflective reasoning abilities into a new hybrid cognitive architecture proposed for use in the robotics laboratory of Kaz Kawamura. It also revisited my taxonomy of design issues that arise when incorporating reflective processes into multi-agent architectures. No acceptance rate information for this conference is available.*

Phillips, J. L. and **Noelle, D. C.** (2004). Reinforcement learning of dimensional attention for categorization. In K. Forbus, D. Gentner, & T. Regier (Eds.), *Proceedings of the 26th Annual Conference of the Cognitive Science Society* (pp. 1101–1106). Chicago: Lawrence Erlbaum.

> *This paper proposed a radical modification to the ALCOVE model of human category learning. ALCOVE's biologically unrealistic gradient-based learning algorithm for the focusing of attention on particular stimulus dimensions was replaced with a reinforcement-based learning mechanism grounded in the brain's dopamine system. The modified model was shown to account for human performance on a number of category learning tasks about as well as the original ALCOVE model. This work formed the centerpiece of the M.S. thesis work of Vanderbilt computer science student, Phillips, which was completed under my supervision. The paper was accepted based on the reviews of three experts. The program committee opted to have the bulk of category learning work presented as posters at this meeting. About 40% of submissions were accepted for poster presentation.*

Skubic, M., **Noelle, D.**, Wilkes, M., Kawamura, K., and Keller, J. M. (2004). A biologically inspired adaptive working memory for robots. In *The Intersection of Cognitive Science and Robotics: From Interfaces to Intelligence — Papers from the 2004 AAAI Fall Symposium* (pp. 68–75). Washington, D. C.: AAAI Press.

> *This paper reviewed some preliminary results of efforts to transform computational neuroscience models of human working memory systems into modular robot control system components. Progress in the development of supporting perceptual and motor systems was also reported. My work on robotic working memory systems formed the core of this paper. My co-authors are all roboticists who are the other investigators on a currently funded NSF project on robotic working memory. Wilkes and Kawamura are Vanderbilt researchers, while Skubic and Keller are located at the University of Missouri at Columbia. No acceptance rate information for this workshop is available.*

PUBLICATIONS
(continued)

Conference Papers

Gupta, A. and **Noelle, D. C.** (2005). The role of neurocomputational principles in skill savings. In B. G. Bara, L. Barsalou, & M. Bucciarelli (Eds.), *Proceedings of the 27th Annual Conference of the Cognitive Science Society* (pp. 863–868). Stresa, Italy: Lawrence Erlbaum.

> *This paper examines the degree to which biological constraints built into the Leabra framework for computational cognitive neuroscience modeling are sufficient to account for behavioral phenomena surrounding the learning of one skill after another. This work was conducted by Vanderbilt Ph.D. student Gupta, under my supervision. About 50% of submissions were accepted for poster presentation.*

Kriete, T. E. and **Noelle, D. C.** (2005). Impaired cognitive flexibility and intact cognitive control in autism: A computational cognitive neuroscience approach. In B. G. Bara, L. Barsalou, & M. Bucciarelli (Eds.), *Proceedings of the 27th Annual Conference of the Cognitive Science Society* (pp. 1190–1195). Stresa, Italy: Lawrence Erlbaum.

> *This paper reports on the first computational model of cognitive flexibility deficits in autism grounded in known neurobiological properties of prefrontal cortex. Patterns of autistic performance on tests of cognitive flexibility and cognitive control are explained by the model as a disregulation of prefrontal circuits by the dopamine system. This work was performed by Kriete, under my direction, as part of his Vanderbilt M.S. thesis work. About 25% of submissions were accepted for oral presentation.*

Phillips, J. L. and **Noelle, D. C.** (2005). A biologically inspired working memory framework for robots. In B. G. Bara, L. Barsalou, & M. Bucciarelli (Eds.), *Proceedings of the 27th Annual Conference of the Cognitive Science Society* (pp. 1750–1755). Stresa, Italy: Lawrence Erlbaum.

> *This paper reports on the development of an adaptive working memory toolkit for use in robot control systems, based on computational neuroscience models of prefrontal cortex. The utility of this toolkit is demonstrated with a simulation of a classic measure of working memory performance: the "delayed saccade task". This work was conducted by Vanderbilt Ph.D. student Phillips, under my guidance. About 50% of submissions were accepted for poster presentation.*

Ratanaswasd, P., Dodd, W., Kawamura, K., and **Noelle, D. C.** (2005). Modular behavior control for a cognitive robot. In *Proceedings of the 12th International Conference on Advanced Robotics (ICAR)* (pp. 713–718). Seattle, WA: IEEE Press.

> *This paper describes a novel control system for the learning of general motor control patterns by a humanoid robot. The proposed system integrates insights from computational neuroscience models of motor control with my models of adaptation in working memory systems. Ratanaswasd and Dodd were electrical engineering graduate students, while Phillips was a computer science graduate student who was working directly under my direction. These Vanderbilt students were supervised in this work by Dr. Kawamura and myself.*

PUBLICATIONS
(continued)

Conference Papers

Phillips, J. L. and **Noelle, D. C.** (2005). A biologically inspired working memory framework for robots. In *Proceedings of the 2005 IEEE International Workshop on Robots and Human Interactive Communication* (pp. 599–604). Nashville: IEEE Press.

> *This paper reports on the development and continued evaluation of an adaptive working memory toolkit for use in robot control systems, based on computational neuroscience models of prefrontal cortex. The idea of using the Player/Stage/Gazebo robot simulation environment as a testbed for the toolkit is discussed. This work was conducted by Vanderbilt Ph.D. student Phillips, under my guidance. About 60% of submissions were accepted for presentation.*

Wilkes, D. M., Tugcu, M., Hunter, J. E., and **Noelle, D.** (2005). Working memory and perception. In *Proceedings of the 2005 IEEE International Workshop on Robots and Human Interactive Communication* (pp. 686–691). Nashville: IEEE Press.

> *This paper proposes a robotic control architecture integrating an adaptive working memory system with a pre-attentive perception system in order to learn scene segmentation and labeling strategies that lead to reward. This work reflects a collaboration between my laboratory and the Wilkes laboratory. About 60% of submissions were accepted for presentation.*

Gupta, A. and **Noelle, D. C.** (2005). Neurocomputational mechanisms for generalization during the sequential learning of multiple tasks. In B. Prasad (Ed.), *Proceedings of the 2nd Indian International Conference on Artificial Intelligence* (pp. 2699–2711). Pune, India.

> *This paper uncovers an essential conflict between skill retention and cross-skill generalization in neurocomputational models of sequential skill acquisition, and it demonstrates a solution to this conflict in terms of a balance between contextual cue strength and the strength of lateral inhibition. This work was conducted by Vanderbilt Ph.D. student Gupta, under my supervision. About 35% of submissions were accepted for presentation.*

Kriete, T. E. and **Noelle, D. C.** (2006). Dopamine and the development of executive dysfunction in autism. In *Proceedings of the Fifth International Conference on Development and Learning (ICDL)*. Bloomington, Indiana.

> *This paper extends our previous work on the modeling of executive dysfunction in autism by simulating the effects of dopamine irregularities early in the development of prefrontal cortex. This developmental model offers an explanation for why signs of executive dysfunction appear developmentally late in individuals with autism. This work was conducted by Ph.D. student Kriete, under my supervision. No acceptance rate information for this conference is available.*

Phillips, J. L. and **Noelle, D. C.** (2006). Working memory for robots: Inspirations from cognitive neuroscience. In *Proceedings of the Fifth International Conference on Development and Learning (ICDL)*. Bloomington, Indiana.

> *This paper reports on the continued augmentation and assessment of an adaptive working memory toolkit for use in robot control systems, based on computational neuroscience models of prefrontal cortex. Initial results of incorporating the toolkit into the Player/Stage/Gazebo robot simulation environment are discussed. This work was conducted by Vanderbilt Ph.D. student Phillips, under my guidance. No acceptance rate information for this conference is available.*

Conference Papers

Gupta, A. and **Noelle, D. C.** (2006). Lateral inhibition explains savings in conditioning and extinction. In R. Sun (Ed.), *Proceedings of the 28th Annual Conference of the Cognitive Science Society* (pp. 309-314). Vancouver, Canada: Lawrence Erlbaum.

> *This paper describes a simple computational cognitive neuroscience model that captures the experimentally observed phenomena of speeded acquisitions and extinctions when a behavior is repeatedly conditioned and driven to extinction. Previous models have been able to explain increased speed during reacquisitions but not during subsequent extinctions. The provided model explains these phenomena in terms of known fundamental properties of neural circuits — most notably the widespread presence of fast lateral inhibition. This work was conducted by Vanderbilt student Gupta, under my guidance. About 26% of submissions were accepted for presentation.*

Gupta, A. and **Noelle, D. C.** (2007). A dual-pathway neural network model of control relinquishment in motor skill learning. In M. M. Velosos (Ed.), *Proceedings of the 2007 International Joint Conference on Artificial Intelligence (IJCAI-2007)* (pp. 405–410). Hyderabad, India.

> *This paper presents a novel computational cognitive neuroscience account of the modulation and relinquishment of cognitive control during the learning of a motor skill, resulting in automaticity of skill performance. The provided model demonstrates how excessive cognitive control can interfere with skill learning. This work was conducted by Vanderbilt student Gupta, under my supervision. Less than 16% of submissions were accepted for presentation.*

Wright, J., Carpin, S., Cerpa, A., Gavilan, G., Kallmann, M., Laird, C., Laird, T., Newsam, S., and **Noelle, D.** (2007). Collaboratory: An open source teaching and learning facility for computer science and engineering education. In *Proceedings of the 2007 International Conference on Frontiers in Education: Computer Science and Computer Engineering (FECS'07)* (pp. 368–373). Las Vegas, Nevada.

> *This paper presents an innovative laboratory environment designed to support interactive education in computer science and engineering. The facility gathers a variety of technologies to grant students extensive access to networked laboratory computers, without introducing security problems. Extensive support for distance learning is also provided. In addition to presenting this work at the conference, I did the necessary background research to relate this project to previous efforts in computer science education. I also penned approximately one third of the paper. No acceptance rate information for this conference is available.*

Tugcu, M., Wang, X., Hunter, J. E., Phillips, J., **Noelle, D.**, and Wilkes, D. M. (2007). A computational neuroscience model of working memory with application to robot perceptual learning. In R. Andonie (Ed.), *Proceedings of the Third IASTED International Conference on Computational Intelligence*. Banff, Canada.

> *This paper applies the Working Memory Toolkit, which was developed in my laboratory, to two perceptual learning problems, involving landmark detection and navigation in a mobile robot. This work reflects a collaboration between my laboratory and the Wilkes laboratory. No acceptance rate information for this conference is available.*

PUBLICATIONS
(continued)

Conference Papers

Kriete, T. E. and **Noelle, D. C.** (2008). Modeling the development of overselectivity in autism. In *Proceedings of the Seventh International Conference on Development and Learning (ICDL)* (pp. 79–84). Monterey, California: IEEE Press.

> *This paper presents a computational model of conditioning involving multidimensional stimuli, and the model is used to show that perseverative attention, driven by poor modulation of the prefrontal cortex by the dopamine system, can account for core learning deficits observed in autism. This work was conducted with Ph.D. student Kriete, under my supervision. Approximately 33% of submissions were accepted for presentation.*

Noelle, D. C. (2008). Function follows form: Biologically guided functional decomposition of memory systems. In *Biologically Inspired Cognitive Architectures — Papers from the 2008 AAAI Fall Symposium* (pp. 135–139). Washington, D. C.: AAAI Press.

> *This paper argues for a bottom-up approach to the use of biological observations in guiding the design of artificial cognitive systems. Computational cognitive neuroscience models of human memory mechanisms are used to illustrate the kinds of insights that arise from this approach. No acceptance rate information for this symposium is available.*

Kriete, T. and **Noelle, D. C.** (2009). Implicit learning deficits in autism: A neurocomputational account. In N. Taatgen & H. van Rijn (Eds.), *Proceedings of the 31st Annual Conference of the Cognitive Science Society* (pp. 309-314). Amsterdam, Netherlands: Cognitive Science Society.

> *This paper presents the results of computational simulations of human implicit learning performance on a serial reaction time task. These simulations show that impairments in context updating, as would result from deficits in prefrontal cortex gating by the dopamine system, result in patterns of performance matching those observed in people with autism. This work was conducted by UCM Ph.D. student, Kriete, under my guidance. About 39% of submissions were accepted for poster presentation.*

Chella, A., Lebiere, C., **Noelle, D. C.**, and Samsonovich, A. V. (2011). On a roadmap to biologically inspired cognitive agents. In A. V. Samsonovich & K. R. Johannsdottir (Eds.), *Biologically Inspired Cognitive Architectures 2011 — Proceedings of the Second Annual Meeting of the BICA Society* (pp. 453–460). Arlington, Virginia: IOS Press.

> *This invited position paper provides a draft manifesto for researchers pursuing the design and implementation of biologically inspired artificial agents.*

St. Clair, W. B. and **Noelle, D. C.** (2013). Implications of polychronous neuronal groups for the nature of mental representations. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (pp. 1372-1377). Berlin, Germany: Cognitive Science Society.

> *This philosophical paper argues that viewing mental representations as being grounded in spike-timing patterns, as those described as polychronous neuronal groups, introduces a variety of challenges for traditional theories of concepts and conceptual change. Specifically, the spike-timing approach is contrasted with dynamical systems characterizations of continuous conceptual spaces. The reported work was conducted by Ph.D. student St. Clair, under my direction. About 28% of submissions were accepted for oral presentation.*

PUBLICATIONS
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Conference Papers

Kyrilov, A. and **Noelle, D. C.** (2014). Using case-based reasoning to improve the quality of feedback provided by automated grading systems. In M. B. Nunes & M. McPherson (Eds.), *Proceedings of the 8th International Conference on e-Learning* (pp. 384–388). Lisbon, Portugal: IADIS.

This paper describes initial work on an innovative automated system for providing rich rapid formative feedback to students working on computer programming exercises. The system employs a machine learning method called "case-based reasoning" in order to leverage the pedagogical expertise of instructors in the design of feedback given to students while using automatic pattern matching to determine when a given student might benefit from that feedback. The system promises to improve the quality of guidance given to students while reducing teaching labor demands. The described system was developed by Ph.D. student Kyrilov, under my direction. The paper was accepted based on the reviews of five experts.

Kyrilov, A. and **Noelle, D. C.** (2015). Using automated theorem provers to teach knowledge representation in first-order logic. In A. Huertas, J. Marcos, M. Manzano, S. Pinchinat, & F. Schwarzentruber (Eds.), *Fourth International Conference on Tools for Teaching Logic* (pp. 85–92). Rennes, France: Université de Rennes 1.

This paper presents a software tool for providing automated formative feedback on exercises in which students are asked to provide a sentence in first-order logic. The tool uses a theorem prover to recognize answers that are logically equivalent to the correct answer. The described system was developed by Ph.D. student Kyrilov, under my direction. The paper was accepted based on the reviews of three experts.

Kyrilov, A. and **Noelle, D. C.** (2015). Binary instant feedback on programming exercises can reduce student engagement and promote cheating. In *Proceedings of the 15th Koli Calling Conference on Computing Education Research*. Koli, Finland. doi:10.1145/2828959.2828968

This paper presents data collected from students enrolled in an introductory computer programming class, comparing students who received instant binary (correct vs. incorrect) formative feedback with those who received only summative feedback. Instant binary feedback was found to promote plagiarism and a tendency to abandon attempts at subsequent execises. This work was performed by Ph.D. student Kyrilov, under my direction.

Shea, T. M., Warlaumont, A. S., Kello, C. T., and **Noelle, D. C.** (2015). Neuronal dynamics and spatial foraging. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.) *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*. Pasadena, CA: Cognitive Science Society.

This paper uses simulations of spiking neuronal networks contolling a foraging agent in order to assess the degree to which the observed formally complex dynamics of animal foraging patterns may directly arise from the complex dynamics of neural systems. This work was conducted by Ph.D. student Shea, under the direction of myself and the other authors. This paper was accepted for poster presentation, along with about 43% of submissions.

Conference Papers

Rafati, J. and **Noelle, D. C.** (2015). Lateral inhibition overcomes limits of temporal difference learning. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.) *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*. Pasadena, CA: Cognitive Science Society.

> *This paper demonstrates that a ubiquitous feature of biological neural systems, lateral inhibition, can produce sparse codes of sensory states that improves the performance of temporal difference (TD) learning on control problems involving continuous state spaces. This computational simulation work was conducted by Ph.D. student Rafati, under my direction. About 43% of submissions were accepted for poster presentation.*

Kyrilov, A. and **Noelle, D. C.** (2016). Do students need detailed feedback on programming exercises and can automated assessment systems provide it? In C. Lee (Ed.) *Program of the 9th Consortium for Computing Sciences in Colleges Southwest Region Conference*. Stanford, CA.

> *This paper presents data on student engagement in the computer science classroom, as well as an analysis of the range of errors made by students on computer programming exercises. These results are used to argue for the plausibility of a case-based reasoning approach to providing automated feedback to students working on such exercises. This work was conducted by Ph.D. student Kyrilov, under my supervision. An associated poster presentation earned the conference's* Best Student Poster *award.*

Tahaei, N. and **Noelle, D. C.** (2018). Automated plagiarism detection for computer programming exercises based on patterns of resubmission. In L. Malmi et al. (Eds.) *Proceedings of the 2018 ACM Conference on International Computing Education Research (ICER '18)* (pp. 178–186). Espoo, Finland.

> *This aricle describes a novel approach to detecting plagiarism in student computer programming exercise submissions. The proposed method is applied to data gathered during a computer science class, and the detection performance is compared to the judgments of expert instructors, demonstrating the utility of the proposed technique. This work was conducted by Ph.D. student Tahaei, under my supervision. This paper was accepted for oral presentation, with 28% of submissions accepted, overall.*

Shea, T. and **Noelle, D. C.** (2018). A conceptual ladder from spikes to behavior: Toward the neural basis of dynamic choices at multiple scales. In C. Kalish, M. Rau, J. Zhu, & T. T. Rogers (Eds.) *Proceedings of the 40th Annual Meeting of the Cognitive Science Society*. Madison, WI: Cognitive Science Society.

> *This paper demonstrates how computational neuroscience analyses at multiple scales can link computation using spike timing, spiking synchronization, oscillatory activity, functional connectivity across brain areas, and temporally extended choice behavior. The reported modeling work makes the counterintuitive suggestion that coupled activity across brain regions might not arise during the efficient transmission of a signal but during the transmission of noise. This research was conducted by Ph.D. student Shea, under my supervision. About 30% of submissions were accepted for poster presentation.*

Rafati, J. and **Noelle, D. C.** (2019). Unsupervised methods for subgoal discovery during intrinsic motivation in model-free hierarchical reinforcement learning. In M. Guzdial, J. Osborn, & S. Snodgrass (Eds.) *Proceedings of the 2nd Workshop on Knowledge Extraction from Games* (pp. 17–25). Honolulu, HI.

> *This paper describes a novel approach to subgoal discovery in hierarchical reinforcement learning using unsupervised machine learning methods. The approach is demonstrated on a variety of tasks, including the ATARI 2600 game Montezuma's Revenge. This work was selected for oral presentation at the KEG 2019 Workshop, co-located with 33rd AAAI Conference on Artificial Intelligence. The research was conducted by Ph.D. student Rafati, under my supervision.*

PUBLICATIONS
(continued)

Conference Papers

Ebrahimpour, M. K., Li, J., Yu, Y., Reesee, J., Moghtaderi, A., Yang, M-H., and **Noelle, D. C.** (2019). Ventral-dorsal neural networks: Object detection via selective attention. In *Proceedings of the 2019 IEEE Winter Conference on Applications of Computer Vision (WACV)* (pp. 986–994). Waikoloa Village, HI.

> *This paper introduces an original approach to object detection in images. The approach involves coupling a previously trained object recognition deep neural network with a previously trained slow-but-accurate object detection system. For a given image, a sensitivity analysis is performed on the object recognition network to identify regions of interest, and only these regions are presented to the object detection system, speeding processing without sacrificing accuracy. This research was conducted by Ph.D. student Ebrahimpour, both under my supervision and during a Summer internship at Ancestry, Inc..*

Ebrahimpour, M. K. and **Noelle, D. C.** (2019). Fast object localization via sensitivity analysis. In *Proceedings of the 14th International Symposium on Visual Computing (ISVC 2019)*. Lake Tahoe, NV: Springer Lecture Notes in Computer Science.

> *This paper presents a method for rapidly finding the location of an object in an image by analyzing activity in a previously trained deep convolutional neural network that is able to recognize that the object is present somewhere in the image. Simulation results suggest that this fast and simple technique can produce localization accuracy values comparable to much more slow and complex methods. This research, selected for oral presentation, was conducted by Ph.D. student Ebrahimpour, under my direction.*

Ebrahimpour, M. K., Falandays, J., Spevack, S., and **Noelle, D. C.** (2019). Do humans look where deep convolutional neural networks "attend"? In *Proceedings of the 14th International Symposium on Visual Computing (ISVC 2019)*. Lake Tahoe, NV: Springer Lecture Notes in Computer Science.

> *This article explores the possibility that human spatial attention may inform the design of better attention mechanisms for leading computer vision systems that use deep convolutional neural networks. The guidance produced by successful neural network attention mechanisms was compared to the visual fixation patterns exhibited by human viewers when detecting objects in the same images. The results suggest that the attentional needs of the explored artificial systems are not well met by the strategies used by humans to direct their gaze. The computer vision work reported in this paper and the corresponding oral presentation were produced by Ph.D. student Ebrahimpour, and the reported human eye tracking study was conducted by Ph.D. students Falandays and Spevack, all under my supervision.*

PUBLICATIONS
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Conference Abstracts

Noelle, D. C. and Cottrell, G. W. (1994). Integrating induction & instruction: Connectionist advice taking. In *Proceedings of the 12th National Conference On Artificial Intelligence* (p. 1481). Seattle: AAAI Press.

> *This poster abstract introduced a connectionist approach to the classic artificial intelligence problem of advice taking.*

Noelle, D. C. (1996). A connectionist model of instructed learning. In *Proceedings of the 13th National Conference On Artificial Intelligence* (p. 1368). Portland: AAAI Press.

> *This poster abstract provided an overview of my intended dissertation research, as presented to the first SIGART/AAAI Doctoral Consortium.*

Noelle, D. C., Cottrell, G. W., and Wilms, F. R. (1997). Extreme attraction: On the discrete representation preference of attractor networks. In M. G. Shafto & P. Langley (Eds.), *Proceedings of the 19th Annual Conference Of The Cognitive Science Society* (p. 1000). Stanford: Lawrence Erlbaum.

> *This poster abstract reported on a series of carefully designed computer simulations demonstrating a discrete representation preference for memory traces in standard connectionist attractor networks. Cottrell was my Ph.D. thesis adviser, and Wilms was at the University of California, Santa Barbara.*

Noelle, D. C., Cottrell, G. W., and McKenzie, C. R. M. (1999). Interference effects and individual differences in instructed category learning. In *Abstracts of the Psychonomic Society: 40th Annual Meeting* (p. 8). Los Angeles.

> *This poster abstract reported the results of human learning studies that I had conducted, examining exemplar-based interference in instructed category learning. My co-authors are researchers at the University of California, San Diego, and the bulk of the work reported here involved work that I conducted there.*

Noelle, D. C. (2000). Modeling interference between prefrontal cortex and posterior systems during instructed category learning. In *Cognitive Neuroscience Society Annual Meeting Program* (p. 112). San Francisco.

> *This poster abstract argued for a particular mapping between the components of my connectionist model of instructed category learning and specific brain systems.*

Noelle, D. C. (2000). Modeling dynamic modulation of control during instructed category learning. In *Abstracts of the Psychonomic Society: 41st Annual Meeting* (p. 69). New Orleans.

> *This poster abstract described computational modeling work involving the incorporation of a model of the anterior cingulate cortex into my model of instructed category learning, improving its fit to human performance data. This marked the first incorporation of a special function for anterior cingulate in a computational category learning model.*

PUBLICATIONS
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Conference Abstracts

Noelle, D. C. (2001). On the normativity of failing to recall valid advice. In E. M. Altmann, A. Cleeremans, C. D. Schunn, & W. D. Gray (Eds.), *Proceedings of the 2001 Fourth International Conference on Cognitive Modeling* (pp. 259–260). Fairfax, Virginia: Lawrence Erlbaum.

> *This poster abstract described a Bayesian memory model in which memory traces for task-relevant advice are, under some conditions, neglected in favor of the retrieval of problem instance memories.*

Noelle, D. C. (2001). On the normativity of ignoring categorization instructions. In *Abstracts of the Psychonomic Society: 42nd Annual Meeting* (p. 16). Orlando.

> *This poster abstract explored two distinct Bayesian accounts of exemplar-based interference in instructed category learning.*

Racine, C. A., Barch, D. M., Donaldson, D. I., Braver, T. S., and **Noelle, D. C.** (2001). Dissociation of tonic and transient prefrontal activation during strategic processing: an fMRI study. In *Society for Neuroscience Abstracts*, 27, Program Number 456.2.

> *This poster abstract reported the results of a neuroimaging study of prefrontal cortex under instructed category learning conditions which provoke exemplar-based interference. The study was conducted using a behavioral experimental paradigm of my design. My co-authors were all at Washington University in St. Louis.*

Racine, C. A., Barch, D. M., Donaldson, D. I., Braver, T. S., and **Noelle, D. C.** (2002). Effects of aging on tonic and transient prefrontal activity during strategic processing. In *Cognitive Neuroscience Society Annual Meeting Program* (p. 103). San Francisco.

> *This poster abstract reported the results of a study of age differences in exemplar-based interference in instructed category learning. The study was conducted using a behavioral experimental paradigm of my design. My co-authors were all at Washington University in St. Louis.*

Noelle, D. and Fakhouri, T. (2002). Using a virtual environment to assess the ecological validity of a model of prefrontal cortex. In *32nd Annual Meeting of the Society for Computers in Psychology Program* (p. 6). Kansas City.

> *This talk abstract reviewed efforts to test the scalability of a previously reported model of prefrontal cortex in the context of the challenging task domain provided by a complex virtual environment. Fakhouri was a Vanderbilt undergraduate student who conducted this work under my supervision.*

Noelle, D. C. (2002). Learning abstract sequence structure with a connectionist model of the prefrontal cortex. In *Abstracts of the Psychonomic Society: 43rd Annual Meeting* (p. 38). Kansas City.

> *This poster abstract described initial efforts to apply an existing model of prefrontal cortex to the task of inducing abstract structure in simple temporal sequences, addressing a debate in the literature concerning the ability of connectionist models to capture human induction capabilities.*

Conference Abstracts

McKenzie, C. R. M., Wixted, J. T., and **Noelle, D. C.** (2002). Modeling participant skepticism as a means of explaining purportedly irrational behavior. In *Abstracts of the Psychonomic Society: 43rd Annual Meeting* (p. 81). Kansas City.

> *This talk abstract presents a Bayesian model that I derived which explains the apparently non-normative relationship between human yes-no and forced-choice task confidence judgments in terms of a parameter which encodes a graded level of trust in task instructions. This model is fit to human performance data collected by Craig McKenzie. This work was the result of a long-distance collaboration with researchers at the University of California, San Diego.*

Kriete, T., House, M., Bodenheimer, B., and **Noelle, D. C.** (2004). NAV: A tool for producing presentation-quality animations of graphical cognitive model dynamics. In *34th Annual Meeting of the Society for Computers in Psychology Program* (p. 28). Minneapolis.

> *This talk abstract introduced the Node Activity Visualizer (NAV) software system for the easy generation of portable pedagogical animations of cognitive model dynamics. This system was developed by Vanderbilt graduate students Kriete and House, under my supervision, with Vanderbilt's Bodenheimer providing guidance concerning user-interface evaluation.*

Gupta, A. and **Noelle, D. C.** (2005). Savings in conditioning via asymmetric synaptic plasticity. In *Program of the First Computational Cognitive Neuroscience Conference*. Washington, D.C..

> *This poster abstract reveals that, while several existing computational models of conditioning account for the speeded re-acquisition of associations, none of these account for the speeded re-extinction of associations — a phenomenon observed in animals. Two novel approaches to modeling this phenomenon are proposed and tested using computer simulations. This work was conducted by Vanderbilt student Gupta, under my supervision.*

High, J. and **Noelle, D. C.** (2005). Early performance predicts strategy shifts in instructed category learning. In *Program of the First Computational Cognitive Neuroscience Conference*. Washington, D.C..

> *This talk abstract reports the results of human category learning experiments showing a relationship between initial instruction-following accuracy and the effects of feedback-based training on rule use. A neurocomputational model of this phenomenon is proposed, and simulation results are reported. This work was conducted by Vanderbilt Ph.D. student High, under my supervision. The acceptance rate for oral presentation was less than 10% at this conference.*

Kriete, T. and **Noelle, D. C.** (2005). The role of dopamine in the development of executive dysfunction in autism. In *Program of the First Computational Cognitive Neuroscience Conference*. Washington, D.C..

> *This poster abstract reports on an extention of the authors' computational model of executive dysfunction in autism, exploring the effect of dopamine deficits on the formation of representations in prefrontal cortex over the course of development. This work was conducted by Ph.D. student Kriete, under my supervision.*

Conference Abstracts

Phillips, J. L. and **Noelle, D. C.** (2005). Learning dimensional attention via reinforcement during category learning. In *Program of the First Computational Cognitive Neuroscience Conference*. Washington, D.C..

This poster abstract discusses a radical modification to the ALCOVE model of human category learning, in which the focusing of dimensional attention is controlled by a reinforcement learning mechanism based on the brain's dopamine system, rather than by a gradient method. This work was conducted by Vanderbilt computer science Ph.D. student Phillips, under my supervision.

Gupta, A. and **Noelle, D. C.** (2006). A dual-pathway neural network model of motor skill automaticity. In *Program of the Second Annual Computational Cognitive Neuroscience Conference*. Houston, Texas.

This poster abstract introduces a novel approach to modeling motor skill automaticity, based on previous models of prefrontal cortex. This work was conducted by Vanderbilt computer science Ph.D. student Gupta, under my supervision.

Kriete, T. and **Noelle, D. C.** (2007). Impaired cognitive flexibility & stimulus overselectivity in autism. In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th Annual Conference of the Cognitive Science Society* (p. 1795). Nashville, Tennessee: Lawrence Erlbaum.

This poster abstract presents a computational account of stimulus overselectivity deficits in autism, demonstrating that impaired interactions between the prefrontal cortrex and the dopamine system can explain these learning difficulties. This work was conducted by Ph.D. student Kriete, under my supervision.

Kriete, T. and **Noelle, D. C.** (2008). Computational models of dopamine dysfunction in autism spectrum disorders. In *Program of the 7th Annual International Meeting For Autism Research (IMFAR)* (No. 46 155.14). London, UK: INSAR.

This poster abstract suggests that impairments in interactions between the prefrontal cortex and the dopamine system can account for much of the cognitive profile seen in autism spectrum disorders, including phenomena captured by weak central coherence accounts. Computational evidence in support of this position is presented. This work was conducted by Ph.D. student Kriete, under my supervision.

Kriete, T. and **Noelle, D. C.** (2009). Impaired updating of the prefrontal cortex explains diverse aspects of autism. In *Program of the Fourth Computational Cognitive Neuroscience Conference*. Boston, Massachusetts.

This poster abstract describes a general hypothesis concerning the neuroscientific cause of a broad range of cognitive deficits seen in people with autism spectrum disorders, demonstrating through the use of computational cognitive neuroscience models that impaired interactions between the dopamine system and the prefrontal cortex can result in a diverse collection of observed behavioral changes. This work was conducted by Ph.D. student Kriete, under my supervision.

PUBLICATIONS
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Conference Abstracts

Kriete, T. and **Noelle, D. C.** (2010). Differential effects of dopamine dysfunction on context usage in people with autism and schizophrenia: A computational exploration. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society* (p. 674). Portland, Oregon: Cognitive Science Society.

> *This poster abstract describes computational simulations of word-sense disambiguation using sentential context, demonstrating that different kinds of dopamine dysfunction acting on the working memory circuits of the frontal lobe can account for the various disambiguation deficits seen in patients with autism and in patients with schizophrenia. This work was conducted by Ph.D. student Kriete, under my supervision.*

St. Clair, W. B. and **Noelle, D. C.** (2010). A biologically plausible account of the computational utility of consciousness. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society* (p. 678). Portland, Oregon: Cognitive Science Society.

> *This poster abstract reports on a computational reimplementation of a previous connectionist model of visual awareness, using a more biologically plausible modeling framework than used previously, demonstrating that the proposed account of visual awareness is consistent with the dynamics of biological neural circuits. This work was conducted by Ph.D. student St. Clair, under my supervision.*

St. Clair, W. B. and **Noelle, D. C.** (2011). Asymmetric intercortical projections support the learning of temporal associations. In L. Carlson, C. Hoelscher, & T. F. Shipley (Eds.), *Proceedings of the 33rd Annual Conference of the Cognitive Science Society* (p. 1157). Boston, Massachusetts: Cognitive Science Society.

> *This poster abstract presents simulation results involving a simple hierarchical circuit of cortical areas which receives a noisy patterned sequence as input. Using standard forms of synaptic plasticity, temporal contingencies are learned, with broad backward projections between cortical areas facilitating learning. This work was conducted by Ph.D. student St. Clair, under my supervision.*

Noelle, D. C. (2011). Interacting complementary learning systems in brains and machines. In A. V. Samsonovich & K. R. Johannsdottir (Eds.), *Biologically Inspired Cognitive Architectures 2011 — Proceedings of the Second Annual Meeting of the BICA Society* (pp. 262). Arlington, Virginia: IOS Press.

> *This invited talk abstract discusses how interactions between complementary learning systems in the brain can give rise to learning capabilities that are desirable for artificial agents. Issues of explicit instruction and the acquisition of automaticity are used as examples.*

Noelle, D. C. (2012). Mind wandering can support automaticity. In *Program of the 13th Neural Computation and Psychology Workshop (NCPW 13)* (p. 81). San Sebastian, Spain.

> *This poster abstract proposes that common difficulties with maintaining concentration on the current task, producing* mind wandering, *may be critical for the reliquishment of cognitive control during skill learning. Model simulations, involving both motor skill learning and instructed category learning, demonstrate this point.*

PUBLICATIONS
(continued)

Conference Abstracts

Rodny, J. and **Noelle, D. C.** (2012). Modeling the actor-critic architecture by combining recent work in reservoir computing and temporal difference learning in complex environments. In *Program of the 13th Neural Computation and Psychology Workshop (NCPW 13)* (p. 74). San Sebastian, Spain.

> *This poster abstract discusses preliminary work involving the use of a liquid state machine as an adaptive critic for complex reinforcement learning problems, focusing on overcoming convergence problems found in other non-linear value function approximation methods. This work was conducted by Ph.D. student Rodny, under my supervision.*

Kyrilov, A. and **Noelle, D. C.** (2013). Automatic formative assessment of exercises on knowledge representation in first-order logic. In *Proceedings of the 18th ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE '13)* (p. 343). Canterbury, United Kingdom: ACM Press.

> *This poster abstract describes a web-based system for presenting exercises designed to teach knowledge representation skills using first-order logic. The system uses an automatic theorem prover to evaluate student solutions, allowing for immediate feedback on exercises. The discussed system was constructed by Ph.D. student Kyrilov, under my supervision.*

St. Clair, W. B. and **Noelle, D. C.** (2013). Implications of polychronous neuronal groups for the continuity of mind. In *Program of the 3rd Meeting of the Society for Complex Systems in Cognitive Science (SCSCS)* (p. 7). Berlin, Germany.

> *This talk abstract introduces philosophical problems with the continuous dynamical systems approach to conceptual representation that arise if mental content is seen as being encoded in spike-timing sequences, called polychronous neuronal groups (PNGs). This presentation focuses specifically on how PNGs support discrete transitions between concepts, without the activation of intermediate or blended mental representations. The reported analysis was performed by Ph.D. student St. Clair, with my assistance.*

Rodny, J. and **Noelle, D. C.** (2013). Approximating the value function in the actor critic architecture using the temporal dynamics of spiking neural networks. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (p. 4087). Berlin, Germany: Cognitive Science Society.

> *This poster abstract describes efforts to solve difficult reinforcement learning problems by recoding the sensory inputs of the agent using a randomly connected spiking neural network called a liquid state machine. Preliminary results are reported involving the use of a full actor-critic learning architecture on a grid-world problem that includes obstacles. The reported simulations were conducted by Ph.D. student Rodny, under my guidance.*

Noelle, D. C. and Ray, J. (2014). Robotic learning of the delayed saccade task using a neurally inspired adaptive working memory system. In P. Bello, M. Guarini, M. McShane, & B. Scassellati (Eds.), *Proceedings of the 36th Annual Meeting of the Cognitive Science Society* (p. 3341). Québec City, Canada: Cognitive Science Society.

> *This poster abstract describes a controller for a robotic camera which allows the device to learn to perform the "delayed saccade task". This is a task that is commonly used to assess the working memory function of prefrontal cortex in humans and non-human primates. The controller makes use of the Working Memory Toolkit (WMtk), which was previously developed in my laboratory. Thus, this project demonstrates the ability of WMtk to support the learning of a standard neuropsychological task by a physical robot. This work was conducted with extensive help from UCM undergraduate student, Ray.*

PUBLICATIONS
(continued)

Conference Abstracts

Noelle, D. (2014). Indirection and symbol-like processing in the prefrontal cortex and basal ganglia. In Y. Haxhimusa, I. van Rooij, S. Varma, & T. Wareham (Eds.) *Resource-bounded Problem Solving (Dagstuhl Seminar 14341)* (p. 64). Dagstuhl, Germany: Schloss Dagstuhl – Leibniz-Zentrum fuer Informatik.

> *This poster abstract reviews recent work on computational cognitive neuroscience modeling of the emergence of generative representational schemes in the prefrontal cortex and relates that work to issues surrounding formal computational analyses of resource-bounded problem solving in humans and computer systems.*

Kyrilov, A. and **Noelle, D. C.** (2015). A case-based reasoning approach to providing high-quality feedback on computer programming exercises. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.) *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*. Pasadena, CA: Cognitive Science Society.

> *This poster abstract describes a novel approach to providing formative feedback to students working on introductory computer programming exercises. The approach involves a machine learning method called case-based reasoning. This approach leverages the expertise of human instructors to produce pedagogically appropriate feedback while supporting timely automated delivery of that feedback. This work was conducted by Ph.D. student Kyrilov, under my supervision.*

Rodny, J. and **Noelle, D. C.** (2015). Modeling the role of hippocampus in extinction and spontaneous recovery. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.) *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*. Pasadena, CA: Cognitive Science Society.

> *This poster abstract presents an analysis of the spiking neural network model of reinforcement learning previously published by Chorley & Seth (2011). This analysis shows that this model fails to capture important aspects of animal learning, including extinction and spontaneous recovery. Incorporating a spiking neural network model of the hippocampus is proposed as a means to capture these effects. This work was conducted by Ph.D. student Rodny, under my direction.*

St. Clair, W. B. and **Noelle, D. C.** (2015). Topological dependence of rate code stability. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.) *Proceedings of the 37th Annual Meeting of the Cognitive Science Society*. Pasadena, CA: Cognitive Science Society.

> *This poster abstract presents preliminary results from a large parametric computer simulation study examining the effects of neuronal network topology, including variation in axononal delays, on the stability of representations based on neural firing rate. This work was conducted by Ph.D. student St. Clair, under my supervision.*

Shea, T. M., Kello, C. T., **Noelle, D. C.**, Pretzer, G. M., Walle, E. A., and Warlaumont, A. S. (2016). Deep autoencoding of naturalistic infant and parent vocalizations. In J. McClelland, S. Frank, & D. Mirman (Eds.) *Program of the 15th Neural Computation and Psychology Workshop*. Philadelphia, PA.

> *This poster abstract reports the results of using deep autoencoder artificial neural networks to identify patterns in both infant and adult speech. The acoustic structure of speech was found to be more complex in adults, but common features were found in the structures for adults and infants.*

PUBLICATIONS
(continued)

Conference Abstracts

Noelle, D. C. (2016). Toward a Simulation Platform for Comparing Computational Cognitive Neuroscience Models. In A. Papafragou, D. Grodner, D. Mirman, & J. Trueswell (Eds.) *Proceedings of the 38th Annual Meeting of the Cognitive Science Society*. Philadelphia, PA: Cognitive Science Society.

> *This poster abstract presents a design for a modular software framework supporting the direct comparison of computational cognitive neuroscience models of specific brain systems.*

Rodny, J. and **Noelle, D. C.** (2016). The computational role of dopamine, basal ganglia, and hippocampus in extinction and spontaneous recovery. In *Program of the Annual Meeting of the Society for Neuroscience*. San Diego, CA. 850.12/NNN40.

> *This poster abstract presents preliminary simulation results of a spiking neural network model of interactions between the basal ganglia and the hippocampus when reward is withheld after the learning of an association. Specifically, the important role of the hippocampus in the extinction of a behavior and the spontaneous recovery of responding is explicated. This work was conducted by Ph.D. student Rodny, under my supervision.*

Tahaei, N., Kyrilov, A., and **Noelle, D. C.** (2017). Analyzing submission history to detect plagiarism in programming exercises. In L. Porter et al. (Eds.) *Program of the 10th Consortium for Computing Sciences in Colleges Southwest Region Conference*. San Diego, CA.

> *This poster abstract describes a novel method for detecting plagiarism in computer programming exercise submissions. The proposed technique does not rely on comparing code files, allowing it to work even when the source of plagiarism is unknown. Instead, detection is based on the sequence of resubmissions made by individual students as they request feedback from an automated assessment system. This work was conducted by Ph.D. students Tahaei and Kyrilov, under my supervision. The associated poster presentation earned the conference's* Best Student Poster *award.*

Noelle, D. C. (2017). Indirection explains flexible tuning of neurons in prefrontal cortex. In G. Gunzelmann, A. Howes, T. Tenbrink, & E. J. Davelaar (Eds.) *Proceedings of the 39th Annual Meeting of the Cognitive Science Society* (p. 3799). London, UK: Cognitive Science Society.

> *This poster abstract presents an argument that the previously published indirection model of prefrontal cortex organization explains experimental results concerning task-specific tuning of prefrontal neuron response properties.*

Rafati, J. and **Noelle, D. C.** (2017). Sparse coding of learned state representations in reinforcement learning. *Cognitive Computational Neuroscience 2017.* Archived at `http://ccneuro.org/abstracts/abstract_3000324.pdf`.

> *This poster abstract provides further evidence that a ubiquitous feature of biological neural systems, lateral inhibition, can produce sparse codes of sensory states that improve the performance of temporal difference (TD) learning on control problems involving continuous state spaces. Results on two problematic control tasks are reported. This computational simulation work was conducted by Ph.D. student Rafati, under my direction.*

Conference Abstracts

Shea, T. M., Rodny, J. J., Warlaumont, A. S. and **Noelle, D. C.** (2017). Oscillations emerge from conflict in simulated subthalamic nucleus. In *Program of the Annual Meeting of the Society for Neuroscience*. Washington, DC.

> *This poster abstract presents spiking neuronal network simulation results involving thalamo-cortical loops and the generation of coherent oscillations. The simulations show how oscillations may arise from the natural dynamics of spiking networks in the presence of conflict or noise. This work was conducted by Ph.D. students Shea and Rodny, under my supervision.*

Ebrahimpour, M. K. and **Noelle, D. C.** (2018). Weakly supervised object localization via sensitivity analysis. In *Program of Deep Vision 2019* workshop at *Computer Vision and Pattern Recognition (CVPR 2019)*. Salt Lake City, UT.

> *This poster abstract introduces an approach to object localization in images involving sensitivity analyses performed on previously trained object recognition deep networks. This work was conducted by Ph.D. student Ebrahimpour, under my supervision.*

Rafati, J. and **Noelle, D. C.** (2019). Learning representations in model-free hierarchical reinforcement learning. In *Proceedings of the Thirty-third AAAI Conference on Artificial Ingelligence* (pp. 10009–10010). Honolulu, HI.

> *This poster abstract describes an integrated system for model-free hierarchical reinforcement learning, incorporating sparse coding of agent states, unsupervised learning of subgoals, and intrinsic motivation reinforcement learning for subgoal selection. This research was conducted by Ph.D. student Rafati, under my supervision.*

Ebrahimpour, M. K., Falandays, J., Spevack, S., and **Noelle, D. C.** (2019). Do humans look where deep convolutional neural networks "attend"? In A. Goel, C. Seifert, & C. Freksa (Eds.) *Proceedings of the 41st Annual Meeting of the Cognitive Science Society* (p. 3448). Montreal, Canada: Cognitive Science Society

> *This poster abstract presents evidence that spatial attention mechanisms that have been used to improve object detection performance in deep convolutional neural networks are fundamentally different than the processes of human visual attention, as measured by eye fixations.*

PUBLICATIONS
(continued)

Books

Noelle, D. C. (1997). *A Connectionist Model of Instructed Learning.* PhD thesis, University of California, San Diego, Department of Computer Science and Engineering, Department of Cognitive Science.

Noelle, D. C., Dale, R., Warlaumont, A., Yoshimi, J. K., Matlock, T., Jennings, C. D., and Magio, P. (2015). *Proceedings of the 37th Annual Meeting of the Cognitive Science Society.* Pasadena: Cognitive Science Society.

Book Chapters

Noelle, D. C. and Cottrell, G. W. (1994). Towards instructable connectionist systems. In R. Sun & L. A. Bookman (Eds.), *Computational Architectures Integrating Neural And Symbolic Processes* (pp. 187–221). Boston: Kluwer Academic Publishers.

Palmeri, T. J. and **Noelle, D. C.** (2002). Concept learning. In M. A. Arbib (Ed.), *The Handbook of Brain Theory and Neural Networks, Second Edition* (pp. 252–255). Cambridge: MIT Press.

Noelle, D. C. (2003). Learning from advice. In L. Nadel (Ed.), *Encyclopedia of Cognitive Science*, Volume 2 (pp. 819–822). London: Nature Publishing Group.

Commentary

Noelle, D. C. (1998). Is the dynamical hypothesis falsifiable? On unification in theories of cognition. [Commentary on Van Gelder, T., The dynamical hypothesis in cognitive science]. *Behavioral and Brain Sciences*, 21(5), 647–648.

Noelle, D. C. (1999). Explicit to whom? Accessibility, representational homogeneity, and dissociable learning mechanisms. [Commentary on Dienes, Z. and Perner, J., A theory of implicit and explicit knowledge]. *Behavioral and Brain Sciences*, 22(5), 777–778.

Becker, S. and **Noelle, D. C.** (2010). Preface to the special issue on computational cognitive neuroscience. *Brain Research*, 1365, 1–2.

Other Publications

Noelle, D. C. (1995). The neurophilosophy of Patricia Smith Churchland. [interview] *Free Inquiry*, 15(4), 22–25.

Noelle, D. C., Cottrell, G. W., and Wilms, F. R. (1997). Extreme attraction: The benefits of corner attractors. Technical Report CS97-536, Department of Computer Science & Engineering, University of California, San Diego.

Noelle, D. C. (1998). Searching for god in the machine. *Free Inquiry*, 18(3), 54–56.

Noelle, D. C. (2001). Exorcizing the homunculus. *Free Inquiry*, 21(2), 32–35.

Noelle, D. C. (2007). Cognitive science and unbelief. In Flynn, T. (Ed.), *The New Encyclopedia of Unbelief* (pp. 199–202). Prometheus Books: Amherst, New York.

PRESENTATIONS

"Connectionist-symbolic integration," plenary panel member (1995). *Workshop On Connectionist-Symbolic Integration: From Unified To Hybrid Approaches* at *The 1995 International Joint Conference on Artificial Intelligence*, Montréal, Canada.

"In search of articulated attractors," with Cottrell, G. W. (1995). Invited talk to the *Workshop On Symbolic Dynamics In Neural Processing* at *Neural Information Processing Systems 1995*, Vail, Colorado.

"A connectionist model of instructed learning" (1996). Invited talk to the *SIGART/AAAI Doctoral Consortium* at *The 13th National Conference on Artificial Intelligence*, Portland, Oregon.

"Modeling an interference effect in instructed category learning" (1998). Invited talk to the *Center for Cognitive Science Spring Colloquium* at the *State University of New York at Buffalo*, Buffalo, New York.

"Modeling an interference effect in instructed category learning" (1998). Invited talk to the *Center for Automated Learning and Discovery* at *Carnegie Mellon University*, Pittsburgh, Pennsylvania.

"Hybrid strategies for learning: A connectionist perspective" (1999). Invited talk at *Hybrid Strategies for Learning: The Symbolic/Connectionist Gap*, a CMU *Science of Learning Research Seminar*, Pittsburgh, Pennsylvania.

"Do as I say! Artificial neural networks that follow instructions" (2002). Invited talk for the *ACM of Middle Tennessee State University*, Murfreesboro, Tennessee.

"Exorcising the homunculus: Using computational models to explore the neural basis of cognitive control" (2003). Invited talk for the *IEEE Central Tennessee Section*, Nashville, Tennessee.

"Overview of some major issues in the modeling of prefrontal cortex" (2003). Oral presentation at the *CNS*2003 Workshop on Computational Models of Active Maintenance in Prefrontal Cortex*, Alicante, Spain.

"The role of prefrontal cortex in category learning: Computational conjectures" (2004). Invited talk for the *Slovenian Neuroscience Association (SiNAPSA) Symposium on Memory*, Ljubljana, Slovenia.

"Computational cognitive neuroscience using LEABRA" (2006). Invited keynote talk for the *Thirteenth Annual ACT-R Workshop and Summer School*, Pittsburgh, Pennsylvania.

"Adaptive working memory: From computational neuroscience model to robot control module" (2006). Invited talk for the *International Workshop on Cognitive Robotics, Intelligence and Control*, Windsor, UK.

"How does the brain represent explicit rules?" (2006). Invited talk for *The George Washington University Psychology Department*, Washington, DC.

"How does the brain represent explicit rules?" (2007). Invited talk for the *Stanford University Psychology Department*, Stanford, California.

"Prefrontal cortex, dopamine, & autism: Computational connections" (2009). Invited talk for the *University of California, Riverside Department of Psychology*, Riverside, California. Invited talk for the *University of California, San Diego Department of Psychology*, San Diego, California.

"Prefrontal cortex, dopamine, & autism: Computational connections" (2011). Invited talk for the *University of California, Davis MIND Institute*, Sacramento, California. Invited talk for the *University of California, Berkeley Institute of Cognitive and Brain Sciences*, Berkeley, California. Invited talk for the *Stanford Center for Mind, Brain and Computation*, Stanford, California. Invited talk for the *University of California, Irvine Department of Cognitive Sciences*, Irvine, California.

"Cognitive neuroscience: Foundations and insights for problem solving" (2014). Keynote presentation for the *Resource-Bounded Problem Solving Seminar* at *Schloss Dagstuhl*, Germany.

SPONSORED RESEARCH

Title: ITR: A Biologically Inspired Adaptive Working Memory System for Efficient Robot Control and Learning
Sponsoring Agency: National Science Foundation
Date Submitted: February, 2003
Start Date: December, 2003
Duration: 4 Years (Merced subaward extended to November, 2009)
Amount Awarded: \$1,596,360 (\$485,991 as subaward to the University of Missouri at Columbia)
Graduate Students: 6 (2 at UM-Columbia; 1 initially under my direct supervision, 2 by year three)
Offset: None
PI and Co-PIs: M. Wilkes (PI, Vanderbilt), D. Noelle (Vanderbilt), M. Skubic (UM-Columbia),
J. Keller (UM-Columbia), & K. Kawamura (Vanderbilt)

Description: This project involved the distillation of computational neuroscience models of human working memory into software modules that could be incorporated into robot control systems. Robotic working memory systems were be designed, implemented, and evaluated in comparison to control systems not based on computational neuroscience approaches. Supporting work on robotic perception and motor control was also completed. (Note that the Vanderbilt contingent of graduate students includes 2, 3, 4, and 4 students for the four years of the project, respectively.)

Role In Preparation: I penned approximately half of the body of this proposal, by page count, and I was active in the editing and collating of the proposal as a whole.

Role In Execution: I was responsible for modifying contemporary computational models of the working memory circuits of human prefrontal cortex for use on multiple robotic platforms expected to efficiently complete a variety of spatial tasks. The resulting *Working Memory Toolkit* formed the focal component of the systems developed by the other investigators. I also took a leadership role in the organization and management of this project.

Status: Completed

Title: ITR: A Biologically Inspired Adaptive Working Memory System for Efficient Robot Control and Learning (Research Experiences for Undergraduates Supplement)
Sponsoring Agency: National Science Foundation
Date Submitted: April, 2004
Duration: 2 Years
Amount Awarded: \$12,000
Graduate Students: None (2 undergraduates)
Offset: None
PI and Co-PIs: M. Wilkes (PI, Vanderbilt), D. Noelle (Vanderbilt), M. Skubic (UM-Columbia),
J. Keller (UM-Columbia), & K. Kawamura (Vanderbilt)

Description: This grant funded undergraduate involvement in the parent ITR project on robotic working memory.

Role In Preparation: I prepared this proposal essentially by myself.

Role In Execution: I was responsible for supervising undergraduate research involving the generation and testing of software implementing a robotic working memory system inspired by the human prefrontal cortex.

Status: Completed

SPONSORED RESEARCH
(continued)

Title: The Neural Basis of Rule Representations in Category Learning: Using fMRI to Test a Computational Neuroscience Model
Sponsoring Agency: Vanderbilt University Discovery Grant Program
Date Submitted: November, 2004
Duration: 2 Years
Graduate Students: 1
Offset: None
Amount Awarded: $48,902
PI and Co-PIs: D. Noelle (PI, Vanderbilt)

Description: This project involved investigating shifts in concept representation over the course of learning, comparing representational changes under conditions of direct instruction versus conditions of learning from examples. The work involved the fabrication of a computational model of representational change in category learning, and the execution of both behavioral and neuroimaging studies in order to test the model.

Role In Preparation: I penned the entirety of this proposal, and the proposed work is completely of my design.

Role In Execution: I was responsible for developing computational neuroscience models of the role of prefrontal cortex in instructed category and testing those models using behavioral and neuroimaging techniques.

Status: Completed

Title: DHB: Understanding Conceptual and Cultural Change: The Role of Expertise and Flexibility in Folk Medicine
Sponsoring Agency: National Science Foundation
Date Submitted: February, 2005
Start Date: October, 2005
Duration: 2 Years (Extended to December, 2009)
Graduate Students: 2 (and 1 postdoc; 1 student under my direct supervision)
Offset: None
Amount Awarded: $618,967
PI and Co-PIs: N. Ross (PI, Vanderbilt, Anthropology), D. C. Noelle (Vanderbilt), & T. J. Palmeri (Vanderbilt, Psychology)

Description: This project focused on how concept learning and concept change in individuals is related to conceptual change and cultural change in communities. This proposal was a revised resubmission of a previously denied, but highly ranked, proposal involving the same team of collaborators.

Role In Preparation: I was involved in the design of all aspects of this proposal, including laboratory and field experiments. I penned between a quarter and a third of the proposal, and I was active in the editing of the whole.

Role In Execution: I was responsible for developing and testing computational models of conceptual acquisition and change using the methods of graphical causal modeling, artificial neural networks, and agent-based modeling.

Status: Completed

SPONSORED RESEARCH
(continued)

Title: Biologically-Inspired Cognitive Architecture
Sponsoring Agency: DARPA
Date Submitted: April, 2005
Duration: 1 Year
Graduate Students: None
Offset: None (consulting)
Amount Awarded: $342,003
PI and Co-PIs: R. C. O'Reilly (PI, University of Colorado – Boulder), T. Hazy (University of Colorado – Boulder), D. C. Noelle (Vanderbilt), T. Braver (Washington University in St. Louis), & J. Cohen (Princeton University)

Description: This project involved the design of a software cognitive architecture grounded in our understanding of human psychological and neuroscientific processes.

Role In Preparation: I was involved in the design of all aspects of this proposal, and I was active in the editing of the whole.

Role In Execution: I was responsible for ensuring that our design for a cognitive architecture was both consistent with modern computational neuroscience accounts and appropriately constrained by the need to interface with modern artificial intelligence formalisms. I was also responsible for architecture components involved in learning from instruction.

Status: Completed

Title: MRI: Acquisition of Robotic Hardware for Humanoid Research in Cognitive Science and Engineering
Sponsoring Agency: National Science Foundation
Date Submitted: February, 2008
Start Date: September, 2008
Duration: 3 Years
Graduate Students: None (equipment grant)
Offset: None
Amount Awarded: $492,500
PI and Co-PIs: S. Carpin (PI), M. Kallmann, D. Noelle, T. Matlock, & S. Newsam (all UCM)

Description: This grant was intended to fund the establishment of humanoid robot facility, including two robots and motion tracking equipment, designed to support both basic robotics research and research in cognitive science. Planned cognitive science projects included work on using computational neuroscience models for robot control and investigations into human-robot interaction using gestures.

Role In Preparation: This proposal was initially focused solely on engineering issues, and my input shifted the focus to include cognitive science concerns. In addition to describing cognitive modeling work to be conducted with the robots, I penned the final version of the openning overview of this proposal, firmly establishing the cognitive science foundation of the proposal.

Role In Execution: Once basic capabilities were available on the robots, I was responsible for developing and testing computational models of human working memory and attention on these platforms.

Status: Completed

SPONSORED RESEARCH
(continued)

Title: The Role of Dopamine in Autism: A Neurocomputational Account
Sponsoring Agency: UCM Graduate & Research Council
Date Submitted: February, 2009
Start Date: May, 2009
Duration: 1 Year
Graduate Students: None (travel grant)
Offset: None
Amount Awarded: $2,500
PI and Co-PIs: D. C. Noelle (UC Merced)

Description: This travel grant was designed to provide funds to partially defray the costs of disseminating research results at the 2009 *Annual Meeting of the Cognitive Science Society*, with funds allocated to travel for both myself and my graduate student, Trent Kriete.

Role In Preparation: I was the sole author of this proposal.

Role In Execution: Both my graduate student and I presented our work on the role of interactions between the prefrontal cortex and the dopamine system in explaining behavioral differences in autism spectrum disorders, using the tools of computational cognitive neuroscience.

Status: Completed

Title: Improving Computing Education for Students from Underrepresented Groups
Sponsoring Agency: UCM Center for Research on Teaching Excellence (CRTE)
Date Submitted: March, 2014
Start Date: May, 2014
Duration: 1 Year
Graduate Students: 1
Offset: None
Amount Awarded: $10,000
PI and Co-PIs: D. C. Noelle (PI) & I. Beattie (co-PI)
Description: This project included a technological component and a sociology of education component. The granted funds helped to support a graduate student who was developing an artificial intelligence system for automatically providing formative feedback on computer programming exercises. Once prepared, this system was tested in UCM computer science classrooms. Special attention was paid to differential effects on women and other underrepresented student populations.

Role In Preparation: Dr. Beattie and I contributed equally to the preparation of this proposal.

Role In Execution: I was responsible for supervising one of my graduate students in the development of the proposed educational system, as well as providing insights based on my experience as a computer science instructor.

Status: Completed

SPONSORED RESEARCH
(continued)

Title: Improving Computing Education for Students from Underrepresented Groups
Sponsoring Agency: UCM Committee on Research
Date Submitted: March, 2015
Start Date: May, 2015
Duration: 1 Year
Graduate Students: 1
Offset: None
Amount Awarded: $10,000
PI and Co-PIs: I. Beattie (PI) & D. C. Noelle (co-PI)
Description: This project included a technological component and a sociology of education component. The granted funds helped to support a graduate student who designed measures to be used to assess the effects of our artificial intelligence system for automatically providing formative feedback on computer programming exercises. These instruments were piloted in a UCM computer science classrooms. Special attention was paid to differential effects on women and other underrepresented student populations.

Role In Preparation: Dr. Beattie and I contributed equally to the preparation of this proposal.

Role In Execution: I was responsible for supervising one of my graduate students in the development and support of our automated educational system, as well as providing insights based on my experience as a computer science instructor.

Status: Completed

RESEARCH SOFTWARE

Working Memory Toolkit (WMtk) — with Joshua L. Phillips

Based on computational neuroscience models of prefrontal cortex, this open source C++ library provides tools to support the inclusion of *adaptive working memory* mechanisms into robot control systems.

Undergraduate Research Database Recommendations System (URDRS) — with Donald A. Barclay

This web-based tool provides research guidance to undergraduate library patrons using class-specific information, leveraging advanced machine learning methods to adapt to the search term usage distributions of domain novices.

RESEARCH TRAINING & SUPERVISION

Primary Research Guidance —

Mohammadkazem Ebrahimpour	Ph.D.	Electrical Engineering & Computer Science *Visual Attention Mechanisms for Object Detection*	(expected 2021)
Ashish Gupta	M.S.	Computer Science *Computational Neuroscience Models of Conditioning*	(completed 2005)
Julia High	M.S.	Psychology *Instructed Category Learning*	(completed 2006)
Matthew House	M.S.	Computer Science *Visualizing Cognitive Model Dynamics*	(completed 2005)
Trenton Kriete	Ph.D.	Cognitive Science *Computational Explorations of Dopamine Dysfunction in Autism*	(completed 2010)
Angelo Kyrilov	Ph.D.	Electrical Engineering & Computer Science *Case-Based Reasoning for Rich Rapid Formative Feedback*	(completed 2017)
Joshua L. Phillips	M.S.	Computer Science *Reinforcement Learning of Dimensional Attention*	(completed 2004)
Jacob Rafati Heravi	Ph.D.	Electrical Engineering & Computer Science *Representations in Hierarchical Reinforcement Learning*	(completed 2019)
Jeffrey Rodny	Ph.D.	Cognitive & Information Sciences *Reinforcement Learning with Spiking Neurons*	(completed 2017)
Timothy Shea	Ph.D.	Cognitive & Information Sciences *Motor Learning in Networks of Spiking Neurons*	(completed 2019)
William B. St. Clair	Ph.D.	Cognitive & Information Sciences *Generalization Using Spiking Neuron Dynamics*	(completed 2016)
Narjes Tahaei	M.S.	Electrical Engineering & Computer Science *Automated Computer Program Plagiarism Detection*	(completed 2018)

Secondary Research Guidance (Thesis Committee Member) —

Benjamin Balaguer	Ph.D.	Electrical Engineering & Computer Science *Cooperative Manipulation of Deformable Objects*	(completed 2012)
Edward Brown	Ph.D.	Electrical Engineering *Surface EMG Control of a Humanoid Robot Arm*	(completed 2004)
Eva Cadez	Ph.D.	Cognitive & Information Sciences *Differential Equations Modeling in Episodic Processing*	(completed 2013)
Eric Chiu	Ph.D.	Cognitive & Information Sciences *Multisensory Integration & Crossmodal Interactions*	(completed 2014)
Feng-Xuan Choo	Ph.D.	Computer Science *Spaun 2.0*	(completed 2018)
Gorkem Erinc	Ph.D.	Electrical Engineering & Computer Science *Planning for Multi-Robot Coordination*	(completed 2013)
Duygun Erol	M.S.	Electrical Engineering *Development of a Long-Term Memory for Humanoid Behavior and Task Learning*	(completed 2003)
Mohsen Farhadloo	Ph.D.	Electrical Engineering & Computer Science *Statistical Models for Aspect Level Sentiment Analysis*	(completed 2015)
Marci Flannery	Ph.D.	Psychology *Functional Imaging During Category Learning*	(completed 2005)
Lewis Frey	Ph.D.	Computer Science *Bayesian Accounts of Human Categorization*	(completed 2003)
Nathan Graves	M.S.	Computer Science *Image-Based Meteorologic Visibility Estimation*	(completed 2011)

RESEARCH TRAINING & SUPERVISION
(continued)

Secondary Research Guidance (Thesis Committee Member) —

Kimberly Hambuchen	Ph.D.	Electrical Engineering *Multi-Modal Attention and Event Binding in Humanoid Robots Using a Sensory Ego-Sphere*	(completed 2004)
Daniel Holman	Ph.D.	Cognitive & Information Sciences *Problem Finding and its Impact on Problem Solving*	(completed 2018)
Ankur Kamthe	Ph.D.	Electrical Engineering & Computer Science *Data-Driven Modeling of Phenomena in Wireless Sensor Networks*	(completed 2012)
Thomas Katzlberger	Ph.D.	Computer Science *Exploring the Effectiveness of Learning by Teaching through Teachable Agents*	(completed 2004)
Bryan Kerster	Ph.D.	Cognitive & Information Sciences *The Role of Spatial Structure and Memory in Human Foraging*	(completed 2016)
Bugra Koku	Ph.D.	Electrical Engineering *Egocentric Navigation And Its Applications*	(completed 2003)
Umesh Krishnamurthy	Ph.D.	Cognitive & Information Sciences *The Nature of Autonomy*	(expected 2020)
Krittaya Leelawong	Ph.D.	Computer Science *A Learning-By-Teaching Environment for Learning Complex Scientific Domains*	(completed 2005)
Tao Liu	Ph.D.	Electrical Engineering & Computer Science *Tracking Occupancy with Wireless Sensor Networks*	(completed 2013)
Katherine Livins	Ph.D.	Cognitive & Information Sciences *Shaping Relations*	(completed 2015)
Christian Luhmann	Ph.D.	Psychology *BUCKLE: A Model of Causal Learning*	(completed 2006)
Mentar Mahmudi	Ph.D.	Electrical Engineering & Computer Science *Multi-Skill Planning Based On Motion Capture*	(completed 2013)
Surya Pathak	Ph.D.	Management of Technology *Simulation of Supply Chain Networks Using Complex Adaptive Systems Theory*	(completed 2005)
Jian Peng	Ph.D.	Electrical Engineering *Extraction of Salient Features From Sensory-Motor Sequences*	(completed 2004)
Alain Juarez Perez	Ph.D.	Electrical Engineering & Computer Science *Data-Based Motion Planning for Full-Body Virtual Human Interaction with the Environment*	(completed 2018)
Chao Qin	Ph.D.	Computer Science *Data-Driven Approaches to Articulatory Speech Processing*	(completed 2011)
Palis Ratanaswasd	Ph.D.	Electrical Engineering *Cognitive Control in Humanoid Robots*	(completed 2007)
José Luis Susa Rincón	Ph.D.	Electrical Engineering & Computer Science *Semantic Constrained Markov Decision Process*	(expected 2019)
Tamara Rogers	Ph.D.	Electrical Engineering *A Cognitive Agent for Human-Robot Interaction*	(completed 2003)
Michael Romano	Ph.D.	Cognitive & Information Sciences *Supramodal Theory: Unifying Visual Similarity & Categorization*	(completed 2011)
Jason Samonds	Ph.D.	Electrical Engineering *Spatiotemporal Analysis of Synchronization of Neural Ensembles*	(completed 2004)
Corinne Townsend	Ph.D.	Cognitive & Information Sciences *When Do Students Use Metacognitive Judgments?*	(completed 2011)
Sashank Varma	Ph.D.	Psychology & Human Development *A Computational Model of Problem Solving on the Tower of Hanoi Task*	(completed 2006)

RESEARCH TRAINING & SUPERVISION
(continued)

Secondary Research Guidance (Thesis Committee Member) —

Lovekesh Vig	Ph.D.	Computer Science	(completed 2006)
	Issues in Multiple Robot Coalition Formation		
Xiaochun Wang	Ph.D.	Electrical Engineering	(completed 2007)
	Learning Rewarding Visual Features		
Maggie Xiong	Ph.D.	Psychology	(completed 2005)
	Intentionality and the Intentional History of Words		

Undergraduate Research Supervision —

Noor Al-Anne Afzal	B.S.	Cognitive Science	(completed 2015)
	Trained Interference in Instructed Category Learning		
Warren Ani	B.S.	Cognitive Science	(completed 2015)
	Trained Interference in Instructed Category Learning		
Devin Anzelmo	B.S.	Cognitive Science	(completed 2014)
	Modeling Dopamine Manipulations in Conditioning		
Adrian Barr	B.S.	Cognitive Science	(completed 2013)
	Lateral Inhibition in Neural Reinforcement Learning		
Gail Brooks	B.S.	Biology	(completed 2014)
	Modeling Executive Dysfunction in Bipolar Disorder		
Sean Duncavage	B.S.	Computer Science	(completed 2004)
	Modeling the Role of Prefrontal Cortex in Rapid Sequence Learning		
David Eighmey	B.S.	Computer Science & Engineering	(completed 2014)
	Interface & Data Management in e-Learning Systems		
Tamer Fakhouri	B.S.	Computer Science	(completed 2003)
	Assessing a Model of Prefrontal Cortex Using a Virtual Environment		
Jamie Faria	B.S.	Cognitive Science	(completed 2014)
	Modeling Stimulus Overselectivity in Autism Spectrum Disorders		
Charlesice Hawkins	B.S.	Cognitive Science & Human Biology	(completed 2015)
	Auditory Interference in Executive Control		
Sabah Jivani	B.S.	Cognitive Science	(completed 2010)
	Time Perception Illusions		
Markus Kantarci	B.S.	Computer Science & Engineering	(completed 2013)
	Interface & Data Management in e-Learning Systems		
Walter Lee	B.S.	Neuroscience	(completed 2007)
	Assessing a Biologically Inspired Working Memory System for Robots		
Alan Loprete	B.S.	Computer Science	(completed 2003)
	Scientific Visualization of Artificial Neural Network Activation Dynamics		
Vanessa Rafanan	B.S.	Cognitive Science	(completed 2015)
	Mouse-Tracking & Embodied Decision Making		
Justin Ray	B.S.	Computer Science & Engineering	(completed 2012)
	Robotic Implementation of the Delayed Saccade Task		
Rene Tellez Rodriguez	B.S.	Computer Science & Engineering	(completed 2010)
	Robotic Spatial Working Memory		
Roshini Thiagarajan	B.S.	Computer Science & Engineering	(completed 2015)
	Human-Computer Interaction in e-Learning Systems		
Emmanuel Villanueva	B.A.	Psychology	(completed 2015)
	Trained Interference in Instructed Category Learning		
Natasha Zahid	B.S.	Cognitive Science	(completed 2014)
	Trained Interference in Instructed Category Learning		

HONORS

NIMH National Research Service Award (1998–2000)
NSF Fellowship Honorable Mention (1990 & 1991)
Teaching Assistant Excellence Award (1992)
Tau Beta Pi Engineering Honor Society
Phi Eta Sigma National Honor Society
Golden Key National Honor Society
UCLA Dean's Honor List (1984 & 1985)
University of California Regents Scholar
UCLA Alumni Scholar
Bank of America Computer Studies Award (1983)

PROFESSIONAL SOCIETIES

Association for the Advancement of Artificial Intelligence (AAAI)
American Association for the Advancement of Science (AAAS)
Association for Computing Machinery (ACM)
Computer Professionals for Social Responsibility (CPSR)
Institute of Electrical and Electronics Engineers (IEEE)
ACM Special Interest Group for Artificial Intelligence (SIGART)
Biologically Inspired Cognitive Architectures Society (BICA)
Society for Computers in Psychology (SCiP)
Sigma Xi
Cognitive Science Society
Electronic Frontier Foundation (EFF)
American Psychological Association (APA)
Cognitive Neuroscience Society
IEEE Computer Society
IEEE Computational Intelligence Society
Psychonomic Society
Society for Neuroscience

UNIVERSITY SERVICE

Student Advising —
- Academic Adviser, Vanderbilt Computer Science Program, Class of 2006

University of California Governance —
- University Committee on Research Policy (UCORP) (2006–2007, 2007–2008, 2014–2015, 2016–2017)

University of California, Merced Governance —
- Divisional Council (DivCo) (2010–2011, 2014–2015, 2016–2017)
- Graduate Research Council (GRC) (2006–2007, 2007–2008, 2012–2013)
- Committee on Research (COR) (2013–2014, Chair for 2014–2015, 2016-2017, & 2017–2018)
- Social Sciences & Management (SSM) Building Faculty Advisory Committee (FAC) (2006–2008)
- CIO Search Committee (2012–2013)
- CITRIS Core Faculty Member (2006–)
- NRT Intelligent Adaptive Systems Faculty Member (2016–)
- Gallo School Planning Committee (2018–)

UCM School of Engineering Governance —
- Curriculum Committee (2006–2007)
- Vice-Chair of Engineering Senate Faculty (2007–2008, 2008–2009)
- Resources Committee (2009–2010, 2010–2011)

UCM School of Social Sciences, Humanities, and Arts Governance —
- Co-Chair of Cognitive Science Planning Committee (2006–2007, 2007–2008, 2008–2009)
- Chair of Cognitive and Information Sciences Department (2014–2015, 2016–)
- Distinguished Cognitive Scientist Award Committee (2012–2013, 2013–2014)
- Cognitive Science Media Laboratory Manager (2012–)

Faculty Search Committees —
- Senior Computer Science Position (2006–2007)
- Junior Computer Science Position (Systems) (2006–2007)
- Junior Computer Science Position (Data Analysis) (2006–2007)
- Junior Computer Science Position (General) (2006–2007)
- Senior Cognitive Science Position (2007–2008)
- Chair, Junior Cognitive Engineering Position (2007–2008)
- Junior Cognitive Science Position (Linguistics) (2013–2014)
- Open Rank Digital Heritage Position (2013–2014)
- Open Rank Computer Science Position (High Performance Computing) (2013–2014)
- Junior Computer Science Position (Cyber-Human Systems) (2016–2017)

COMMUNITY SERVICE

Invited Faculty —
International Brain Research Organization Summer School on Working Memory (2004)
International Summer School in Cognitive Science (2009)
Telluride Neuromorphic Cognition Engineering Workshop (2011)
Emory-Tibet Science Initiative – Neuroscience (2015 & 2017)

Workshop Chair —
Computational Models of Active Maintenance in Prefrontal Cortex (2003)

Tutorial Instructor —
International Conference on Cognitive Modeling (2007)
Annual Conference of the Cognitive Science Society (2007)

Organizing Committee Member —
Computational Cognitive Neuroscience Conference (2005–)
Biologically Inspired Cognitive Architectures (BICA) Conference (2008–)
The Future Of Cognitive Science Conference (2009)

Program Chair —
Annual Conference of the Cognitive Science Society (2015)

Program Committee Member —
Annual Conference of the Cognitive Science Society (2006, 2011–2014)
National Conference on Artificial Intelligence (2006)

Program Committee Staff —
Annual Conference of the Cognitive Science Society (1996)

Volunteer Staff —
National Conference on Artificial Intelligence (1993, 1994, & 1996)
International Joint Conference on Artificial Intelligence (1995)
Neural Information Processing Systems (1995)

Grant & Funding Program Panel Member —
DARPA "Human-Like Learning" Program (2004)
NSF Perception, Action, & Cognition Panel (2005–2007)

Grant & Funding Program Reviewer —
NSF Perception, Action, & Cognition Panel (2009, 2011, 2014, 2015)

Editor —
Encyclopedia of Cognitive Science (Associate Section Editor)
Brain Research special issue on Computational Cognitive Neuroscience (with S. Becker) (2010)

Editorial Board —
Biologically Inspired Cognitive Architectures (BICA) Journal (2012–)
Cognitive Science Journal (2016–)

COMMUNITY SERVICE
(continued)

Reviewer —

International Joint Conference on Artificial Intelligence
National Conference on Artificial Intelligence
European Conference on Artificial Intelligence
Annual Conference of the Cognitive Science Society
International Conference on Cognitive Modeling
Neural Information Processing Systems
IEEE Transactions on Neural Networks
IEEE Transactions on Knowledge and Data Engineering
Journal of Abnormal Psychology
Journal of Autism and Developmental Disorders
International Journal of Humanoid Robotics
Journal of Experimental Psychology: General
Journal of Experimental Psychology: Learning, Memory, & Cognition
Biologically Inspired Cognitive Architectures (BICA) Conference
IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)
Journal of Theoretical & Philosophical Psychology
Adaptive Behavior
Applied Intelligence
Brain Research
Cognitive Science
Connection Science
Memory & Cognition
Neural Computation
Neural Networks
Behavioral and Brain Sciences
Developmental Science
ACM Crossroads
Psychonomic Bulletin & Review
Journal of Integrative Neuroscience
BICA Journal
Psychological Review

REFERENCES

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More available upon request.