Raluca Budiu

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Research Interests

Computational modeling, information scent and information scent estimates, sensemaking, cognitive models of information search, social bookmarking, natural language understanding, word similarity

Education

2001 **Ph.D. in Computer Science.** Carnegie Mellon University, Pittsburgh, PA.
Supervisor: Prof. John R. Anderson.
Ph.D. Thesis: *The Role of Background Knowledge in Sentence Processing*.

> This dissertation describes a computational model of sentence processing at the semantic level — essentially, an on-line randomized algorithm for language processing that has O(1) time complexity per word and finds an interpretation of a sentence in a background knowledge repository. The algorithm implements a mechanism for comprehending both literal and non-literal language. It can build its own propositional knowledge base from text. It matches behavioral data from psycholinguistics experiments (semantic illusion, metaphor comprehension, semantic memory.

1999 **M.S. in Computer Science.** Carnegie Mellon University, Pittsburgh, PA.

1995 **B.S. in Computer Science.** University "Politehnica" of Bucharest, Romania.

Skills

User studies (design, data analysis, statistical methods)
Cognitive science methods for semantic natural language processing
Cognitive architectures (ACT-R)
Programming (Lisp, Perl, R, Java, Python, C, C++, Pascal)
Communication (written, oral)

Research Experience

2005–Present **Palo Alto Research Center, Palo Alto, CA.**
Visiting researcher in the User Interface Group (Intelligent Systems Lab), working with Peter Pirolli and Stuart Card.

> Developed computational models for how people search for information in visualizations of large knowledge hierarchies. Researched and developed corpus-based statistical measures of information scent. Worked on analyzing social tagging services such as del.icio.us.

2001–2003 **Carnegie Mellon University, Pittsburgh, PA.**
Postdoctoral research associate for Prof. John R. Anderson.

> Developed INP, a computational model of language processing that integrated syntactic and semantic processing. Evaluated INP on text comprehension tests. Performed experiments with human participants.

1996–2001 **Carnegie Mellon University, Pittsburgh, PA.**
Graduate research assistant for Prof. John R. Anderson.

> Developed computational models for learning metaphors and artificial words in context, knowledge transfer in artificial language acquisition, semantic distortions, metaphor comprehension, sentence memory, semantic language processing. Designed, conducted, and analyzed experiments with human subjects.

1996 **Technical University of Tampere, Finland.**
Full-time M.S. thesis research under the supervision of Prof. Moncef Gabbouj.

> Generalized, formalized, and implemented a scalable learning assistant for imperfect domains.

1995 **University "Politehnica" of Bucharest, Romania.**
Full-time B.S. thesis research under the supervision of Prof. Adina Florea.

> Created and formalized APPRENTICE, a system that learns conceptual models for imperfect domain theories.

1993 **Technical University of Eindhoven, Netherlands.**
Full-time research.

> Designed and implemented a divider for numbers of variable width.

Journal Publications

Raluca Budiu, John R. Anderson (2004). *Interpretation-based processing: A unified theory of semantic sentence comprehension.* Cognitive Science, 28, pp. 1-44.

> Descibes INP, a computational model of language processing, and evaluates it on a set of data from psycholinguistic experiments.

Raluca Budiu, John R. Anderson (2002). *Comprehending anaphoric metaphors.* Memory & Cognition, 30, pp. 158-165.

> Describes experiments with human participants that involve the comprehension of anaphoric noun and verb metaphors.

John R. Anderson, Raluca Budiu, Lynne M. Reder (2001). *A theory of sentence memory as part of a general theory of memory.* Journal of Memory and Language, 45, pp. 337-367.

> Presents a computational model of language and memory; it shows how the process of comprehension of a text influences what is remembered at a later stage from that text.

Conferences

Raluca Budiu, Christiaan Royer, Peter Pirolli (2007). *Modeling Information Scent: A Comparison of LSA, PMI and GLSA Similarity Measures on Common Tests and Corpora.* Proceedings of RIAO'07 – Large-Scale Semantic Access to Content (Text, Image, Video and Sound), Pittsburgh, PA.

> Performs a comparison between three co-occurrence based similarity metrics on the same corpora and tests. Provides guidelines for when and on what corpora each metric may be appropriate.

Raluca Budiu, Peter Pirolli, Michael Fleetwood, Julie Heiser (2006). *Navigation in degree-of-interest trees.* Proceedings of the Advanced Visual Interfaces Conference (AVI'06), Venice, Italy.

> Proposes a new cognitive model of how people search for information in large information structures. Distinguishes between two kinds of information scent: category-based and similarity-based.

Raluca Budiu, John R. Anderson (2005). *Negation in nonliteral sentences.* Proceedings of the 27th Annual Meeting of the Cognitive Science Society, Stresa, Italy.

> Describes three experiments concerning how people process negation embedded in metaphoric and semantically distorted sentences. Proposes a new model of negation — negation-as-distortion, based on the INP model of sentence processing.

Raluca Budiu, John R. Anderson (2003). *Verification of sentences containing anaphoric metaphors.* Proceedings of the 5th International Conference on Cognitive Modeling, Bamberg, Germany.

> Describes an application of INP to the task of comprehension and verification of sentences that contain anaphoric metaphors.

Raluca Budiu, John R. Anderson (2000). *Integration of background knowledge in sentence processing: A unified theory of metaphor understanding, semantic illusions and text memory.* Proceedings of the 3rd International Conference on Cognitive Modeling, Groningen, Netherlands.

> Presents a computational model that performs semantic comprehension and that processes metaphoric and distorted language.

Book Chapter

Raluca Budiu, John R. Anderson (2006). *Word learning in context: Metaphors and neologisms.* In Michel Vishnevsky (ed.). *Focus on Cognitive Psychology Research*, Nova Science Publishers, NY: Hauppage.
> Describes two experiments that study how peoplemake sense of and acquire new meanings for new words and words used metaphorically. Proposes an ACT-R computational model for these processes.

Workshops and Other Conferences

Raluca Budiu, Peter Pirolli (2005). *Navigation in degree of interest trees.* Twelfth Annual ACT-R Workshop, Pittsburgh, PA 2005.

Christiaan Royer, Ayman Farahat, Peter Pirolli, Raluca Budiu (2005). *The GLSA Server @ PARC.* Twelfth Annual ACT-R Workshop, Pittsburgh, PA 2005.

Raluca Budiu (2003). *Reading instructions: When word order matters.* Ninth Annual ACT-R Workshop, Pittsburgh, PA 2003.

Raluca Budiu, John R. Anderson (2002). *Interpretation-based processing: A theory of sentence processing.* Forty-third Annual Meeting of the Psychonomic Society, Kansas City, Missouri, November 2002.

Raluca Budiu (2002). *Can ACT-R process language in real time? Putting together syntactic and semantic processing.* Eight Annual ACT-R Workshop, Pittsburgh, PA 2002.

Raluca Budiu (2000). *An ACT-R model for judging metaphoric sentences and learning metaphors.* Seventh Annual ACT-R Workshop, Pittsburgh, PA 2000.

Raluca Budiu (1999). *Imperfect meaning processing: Moses illusion and metaphor comprehension.* Sixth Annual ACT-R Workshop, Fairfax, VA, 1999.

Raluca Budiu (1998). *Learning words in context: A computational theory.* Fifth Annual ACT-R Workshop, Pittsburgh, PA 1998.

Raluca Budiu (1997). *An ACT-R model for learning anaphoric metaphors.* Fourth Annual ACT-R Workshop, Pittsburgh, PA 1997.

Technical Reports and Other Publications

Raluca Budiu, Christiaan Royer, Peter Pirolli (2006). *Modeling information scent: a comparison between LSA, PMI-IR, and GLSA similarity measures on common tests and corpora.* PARC Technical Report 200685.)

Raluca Budiu (2001). *The role of background knowledge in sentence processing.* Doctoral dissertation. School of Computer Science, Carnegie Mellon University. (Available as Technical Report CMU-CS-01-148.)

Raluca Budiu, John R. Anderson (2001). *Word learning in context: Metaphors and neologisms.* Technical Report CMU-CS-01-147, School of Computer Science, Carnegie Mellon University.

Mihai Budiu, Raluca Budiu (1998). *A user-level file service based on watchdogs.* In G. Gibson (ed.) *Selected Reports: Fall 1997 Software Systems Course,* Technical Report CMU-CS-98-103, Carnegie Mellon University.

Raluca Vasilescu (1996). *Scalable apprenticeship learning for imperfect domain theories.* Master Thesis, University "Politehnica" of Bucharest.

Raluca Vasilescu (1995). *APPRENTICE — A learning assistant for imperfect domain theories.* Graduation Thesis, University "Politehnica" of Bucharest.

Invited Talks

Department of Psychology, Carnegie Mellon University, April 2002.
Information Sciences and Technologies Laboratory, PARC, November 2003.
Department of Linguistics, University of Pittsburgh, February 2004.
Department of Computer Science, Northwestern University, March, 2004.
Department of Cognitive Science, Rensselaer Polytechnic Institute, April 2004.
Teachers College, Columbia University, May 2004.
Accenture Technology Labs, August 2004.

Awards

1996	**Technical University of Tampere, Finland.** European Union TEMPUS scholarship for studying abroad.
1993	**Technical University of Eindhoven, Netherlands.** European Union TEMPUS scholarship for studying abroad.
1991–1996	**University "Politehnica" of Bucharest, Romania.** Romanian Government fellowship for high grade point average.

Teaching Experience

1999–2003   **Summer school instructor.** Sixth through Ninth Annual ACT-R Summer Schools.

2002   **Instructor.** Psychology, Carnegie Mellon University, Pittsburgh, PA.
85-412/85-712 Cognitive Modeling (together with Prof. John R. Anderson).
Responsibilities included lectures, grading, and office hours.

1998   **Carnegie Mellon University, Pittsburgh, PA.**
Teaching assistant for 15-451 Algorithms (instructors: Prof. Gary Miller and Prof. Daniel Sleator).
Responsibilities included preparing homeworks, grading and holding office hours.

1998   **Carnegie Mellon University, Pittsburgh, PA.**
Teaching assistant for 15-211 Fundamentals of Data Structures and Algorithms (instructors: Prof. A. Fisher and K. Sutner).
Responsibilities included weekly recitations, grading and holding office hours.

1995–1996   **Part-time high school teacher.** "Tudor Vianu" High School, Bucharest, Romania.
Computer Science teacher.

Professional Activity

Reviwer for *CHI, Cognitive Science Conference, ICCM Conference, Memory and Cognition, Psychonomic Bulletin and Review, Trends in Cognitive Science, IBM Systems Journal*

Member: Cognitive Science Society, ACM.

Program Committee: First International Workshop on Knowledge-Based User Interface, KUI 2007.

Other Work Experience

1994   **Val InfoNet, Bucharest, Romania.**
Part-time programmer working on database applications for accounting.