Psychology 811

Analogy and Relational Reasoning: Data and Models

Course Syllabus, Winter 2010

Course:	PSYCH 811
Official title:	Seminar in Experimental Psychology
Call number:	20491
Credits:	2
Dates:	January 4–March 8, 2010
Times:	Mondays 03:00–5:18 p.m.
Room:	Psychology Building, Room 219
Prerequisites:	Graduate standing in psychology, computer science, linguistics, engineering, neuroscience, philosophy, or any other discipline related to cognitive science. In addition to psychologists, students in computer science and linguistics are particularly welcome, given the emphasis on models and metaphor.
Website:	https://carmen.osu.edu
Textbook:	Gentner, D., Holyoak, K. J., & Kokinov, B. N. (2001). *The Analogical Mind: Perspectives from Cognitive Science.* Cambridge, MA: MIT Press.
Instructor:	Dr. Alexander Petrov (614) 247-2734 apetrov@orion.psy.ohio-state.edu 200B Lazenby Hall Office hours: By appointment

Course Overview

The ability to represent and manipulate complex relational structures is at the core of human cognition. Analogy is arguably the purest manifestation of this ability and the ideal testbed for studying it. This graduate seminar surveys the thriving interdisciplinary field of analogy research. The emphasis is on psychological experiments and computational models but linguistic, neurological, and philosophical contributions have their rightful place as well. Throughout the course, we will relate the specifics of analogy making to foundational issues in cognitive science such as the nature of representation, the organization of memory, the debate between symbolic and connectionist paradigms, the role of metaphor in language and thought, embodiment, the specific adaptations of the prefrontal cortex, and whether the minds of human adults, human infants, and chimpanzees differ in degree or in kind.

Textbook

There is no required textbook for this course. The primary readings are journal articles from the research literature. Nevertheless, the following book is a good collection and contains many chapters that will be presented by students in class. You are well advised to buy a copy of your own: Gentner, D., Holyoak, K. J., & Kokinov, B. N. (2001). *The Analogical Mind: Perspectives from Cognitive Science.* Cambridge, MA: MIT Press. ISBN 0-262-57139-0. http://cognet.mit.edu/library/books/view?isbn=0262571390 Additional readings are listed in the lecture plan below.

Prerequisites

There are no formal prerequisites for this course, other than graduate standing. In exceptional circumstances, advanced undergraduate students can take the course with permission from the instructor.

Teaching Method

The class meets once a week from 3:00 to 5:18 on Mondays. The course will require preparation prior to each class. Each meeting begins with a student-led discussion of the research literature followed by a brief lecture that sets up the topic for the subsequent week.

Accommodations for Students with Special Needs

The policy of The Ohio State University is to provide every reasonable, appropriate, and necessary accommodation to qualified disabled students. The University's colleges and academic centers evaluate and judge applications on an individual basis and no categories of disabled individuals are automatically barred from admission. The privacy rights of each disabled person are honored to the fullest extent possible. The University's interest in a students disabilities are only for the purpose of accommodating his/her specific disability, thereby providing an academically qualified disabled student access to programs and activities accorded all other qualified students. Whenever generally accessible facilities do not adequately accommodate a specific disability, the University makes every reasonable accommodation and program or facility adjustment to assure individual access. These policies are fully supported and practiced in this class.

If you have a disability documented with the Office of Disability Services (http://www.ods.ohio-state.edu, 150 Pomerene Hall, 614-292-3307), please contact Dr. Petrov privately (petrov.11@osu.edu, 200B Lazenby Hall, 614-247-2734) by the end of the second week of classes (1/14/2010) so that accommodations can be made.

Evaluation

Your grade will depend on three components in the following proportions:

Paper presentations	45% (3 x 15%)
Class participation and attendance	15%
Final paper	40%

Grades are based on absolute cutoffs: A=90-100%, B=80-89%, C=70-79%, D=60-69%.

Paper presentations: Each student must present three papers in class. The typical presentation is 15 minutes long and must contain at least 5 substantive PowerPoint slides. The PowerPoint file must be uploaded to the "Presentation" dropbox on Carmen by 11:59 pm on the following Wednesday. Part of your grade is based on the quality of these PowerPoint slides and their delivery in class. (By "quality" I mean substance, not flashy backgrounds and pretty fonts. In fact, you are encouraged to use the plain style with black letters on white background. Other file formats such as PDF are acceptable too.) Some particularly long and complicated papers count as 1.5 (or even 2) presentations, as indicated below. Each student must present on at least two separate days.

Class participation: Productive participation in class discussion is essential. You are expected to familiarize yourself with the readings in advance and come to class prepared to discuss the issues and answer questions even if you do not present on that day. Attendance is required.

Final paper: 40 percent of your grade are based on a final paper. It must be uploaded to the "Final Paper" dropbox on the Carmen website by 11:59 pm on Monday, March 15. It must be 8-12 pages long (double-spaced, 12-pt font, excluding figures) and be submitted in one of the acceptable file formats (.doc, .docx, .pdf, .rtf, .html). Late penalty 5% per day. The final paper should review and integrate at least two scientific articles, or one article and a topic of your own choosing. At least one of these articles must not be an article that you have presented in class. Your review paper should contain a concise introduction to the psychological issue or phenomenon and outline the principle(s) instantiated by the model(s). It should contain methods, results, and a concluding discussion of the significance of the results, how the models can be improved, etc.

By Sunday, February 21, you should upload on Carmen a one-page proposal for your final paper. This proposal should specify which papers you plan to review and a summary of your question of interest. This one-page proposal is worth 5% toward the 40% allocation for the final paper. Your proposal must be approved by the instructor as a prerequisite for the final paper. Unapproved papers will not be graded and do not bring any points.

Academic Ethics

All students enrolled in OSU courses are bound by the Code of Student Conduct (http://studentaffairs.osu.edu/resource_csc.asp). Suspected violations of the Code will be dealt with according to the procedures detailed in the Code. Specifically, any alleged cases of misconduct will be referred to the Committee on Academic Misconduct.

Course Calendar

1. January 04: Introduction and overview.

Getting started. Examples of analogy. Types of analogy. Basic components of analogy-making. Overview of the rest of the course.

Readings:

- Holyoak, K. J. (2005). Analogy. In K. J. Holyoak & R. G. Morrison (Eds.) *The Cambridge Handbook of Thinking and Reasoning* (pp. 117-142). Cambridge, UK: Cambridge University Press.
- Holyoak, K. J. & Thagard, P. (1997). The analogical mind. *American Psychologist, 52* (1), 35-44.

Additional readings: French (2002); Holyoak & Thagard (1995)

2. January 11: Analogical mapping

Structure mapping theory (Gentner, 1983). Multi-constraint theory (Holyoak & Thagard, 1989). Behavioral evidence supporting these theories.

Papers for student presentation:

- Gentner, D. (1983). Structure-Mapping: A theoretical framework for analogy. *Cognitive Science, 7*, 155-170.
- Gentner, D. (1989). The mechanisms of analogical learning. In S. Vosniadou & A. Ortony (Eds.), *Similarity and analogical reasoning* (pp. 199-241). Cambridge, UK: Cambridge University Press.
- Holyoak, K. J. and Thagard, P. (1989). Analogical mapping by constraint satisfaction. *Cognitive Science, 13*, 295-355. **[Weight=1.5]**

Additional readings: Falkenhainer, Forbus, & Gentner (1989); Forbus (2001); Gentner & Markman (1997); Gentner & Toupin (1986); Keane, Ledgeway, & Duff (1994); Krawczyk, Holyoak, & Hummel (2005); Tversky (1977)

January 18: Martin Luther King's Day – no classes

3. January 25: Analog retrieval

Retrieval of a source analog from long-term memory. Psychological data (Holyoak & Koh, 1987; Ross, 1989). Two classic models: ARCS (Thagard et al., 1990) and MAC/FAC (Forbus et al., 1995).

Papers for student presentation:

- Holyoak, K. J. & Koh, K. (1987). Surface and structural similarity in analogical transfer. *Memory & Cognition, 15* (4), 332-340. **[Weight=0.5]**
- Ross, B. H. (1989). Distinguishing types of superficial similarities: Different effects on the access and use of earlier problems. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15* (3), 456-468. **[Weight=0.5]**
- Thagard, P., Holyoak, K. J., Nelson, G., & Gochfeld, D. (1990). Analog retrieval by constraint satisfaction. *Artificial Intelligence, 46*, 259-310.

- Forbus, K. D., Gentner, D., & Law, K. (1994). MAC/FAC: A model of similarity-based retrieval. *Cognitive Science, 19*, 141-205.

Additional readings: Gick & Holyoak (1980); Ratcliff & McKoon (1989); Ross (1987); Seifert et al. (1986); Wharton, Holyoak, & Lange (1996)

4. February 01: Integration of retrieval and mapping. Schema induction.

Priming and context effects. Decentralized representation of episodes. AMBR model (Kokinov & Petrov, 2001). Episode blending (Kokinov & Zareva-Toncheva, 2001; Zareva-Toncheva & Kokinov, 2003). Schema induction (Gick & Holyoak, 1983).

Papers for student presentation:

- Kokinov, B. N. & Petrov, A. A. (2001). Integrating memory and reasoning in analogy-making: The AMBR model. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 59-124). Cambridge, MA: MIT Press. **[Weight=1.5]**
- Kokinov, B. N. & Zareva-Toncheva, N. (2001). Episode blending as a result of analogical problem solving. In *Proceedings of the 23rd Annual Conference of the Cognitive Science Society* (pp. 510-515). London: Erlbaum. **[Weight=0.5]**
- Zareva-Toncheva, N. & Kokinov, B. N. (2003). Blending of non-similar episode as a result of analogical mapping with a third one. In *Proceedings of the 25th Annual Conference of the Cognitive Science Society*. Hillsdale, NJ: Erlbaum. **[Weight=0.5]**
- Gick, M. L. & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology, 15*, 1-38.

Additional readings: Blanchette & Dunbar (2002); Gick & Holyoak (1983); Kokinov (1994); Kokinov, Feldman, & Petkov (2009); Petrov (1998); Schunn & Dunbar (1996); Spencer & Weisberg (1986)

5. February 08: Analogy-making as perception

Philosophical arguments for and against modularity (Chalmers et al, 1992; Forbus et al, 1998). Copycat (Hofstadter & Mitchell, 1995). Metacat (Marshall, 2006).

Papers for student presentation:

- The following two articles together count as **1.5 presentations**:
  - Chalmers, D. J., French, R. M., & Hofstadter, D. R. (1992). High-level perception, representation and analogy: A critique of artificial intelligence methodology. *Journal of Experimental & Theoretical Artificial Intelligence, 4*, 185-211.
  - Forbus, K. D., Gentner, D., Markman, A. B., & Ferguson, R. W. (1998). Analogy just looks like high level perception: Why a domain-general approach to analogical mapping is right. *Journal of Experimental & Theoretical Artificial Intelligence, 10*, 231-257.
- Hofstadter, D. R. & Mitchell, M. (1995). The Copycat project: A model of mental fluidity and analogy-making. In D. R. Hofstadter & FARG, *Fluid*

Concepts and Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought (pp. 205-267). **[Weight=1.5]**

- Marshall, J. B. (2006). A self-watching model of analogy-making and perception. *Journal of Experimental & Theoretical Artificial Intelligence, 18* (3), 267-307.

Additional readings: Green & Hummel (2004); French (1995); French & Hofstadter (1991); Hofstadter (1995); Lovett et al. (2009); Mitchell (1993)

6. February 15: Structured representations in a connectionist network

Dynamic binding. LISA model of relational inference and generalization (Hummel & Holyoak, 2003). Development of relational concepts. DORA (Doumas et al, 2008).

Papers for student presentation:

- Hummel, J. E. & Holyoak, K. J. (2003). A symbolic-connectionist theory of relational inference and generalization. *Psychological Review, 110* (2), 220-264. **[Weight=2.0]**
- Doumas, L. A. A., Hummel, J. E. & Sandhofer, C. M. (2008). A theory of the discovery and predication of relational concepts. *Psychological Review, 115*, 1-43. **[Weight=1.5]**

Additional readings: Doumas & Hummel (2005); Eliasmith & Thagard (2001); Green & Hummel (2004); Jani & Levine (2000); O'Reilly, Busby, & Soto (2003); Ramscar & Yarlett (2003)

7. February 22: Analogy and relational reasoning in the brain

Role of prefrontal cortex. Patients with brain damage: double dissociations (Waltz et al., 1999) and computational modeling (Morrison et al., 2004). Neuroimaging of adults (Christoff et al., 2001) and children (Wright et al., 2008). Transcranial magnetic stimulation (Boroojerdi et al., 2001).

Papers for student presentation:

- Waltz, J. A., Knowlton, B. J., Holyoak, K. J., Boone, K. B., Mishkin, F. S., de Menezes Santos, M., Thomas, C. R., & Miller, B. L. (1999). A system for relational reasoning in human prefrontal cortex. *Psychological Science, 10* (2), 119-125.
- Morrison, R. G., Krawczyk, D. C., Holyoak, K. J., Hummel, John E., Chow, Tiffany W., Miller, Bruce L., & Knowlton, Barbara J. (2004). A neurocomputational model of analogical reasoning and its breakdown in frontotemporal lobar degeneration. *Journal of Cognitive Neuroscience, 16* (2), 260-271.
- Christoff, K., Prabhakaran, V., Dorfman, J., Zhao, Z., Kroger, J. K., Holyoak, K. J., & Gabrieli, J. D. E. (2001). Rostrolateral prefrontal cortex involvement in relational integration during reasoning. *NeuroImage, 14*, 1136-1149.

- Wright, S. B., Matlen, B. J., Baym, C. L., Ferrer, E., & Bunge, S. A. (2008). Neural correlates of fluid reasoning in children and adults. *Frontiers in Human Neuroscience, 1* (8), 1-8. **[Weight=0.5]**
- Boroojerdi, B., Phipps, M., Kopylev, L., Wharton, Charles M., Cohen, L. G. & Grafman, J. (2001). Enhancing analogic reasoning with rTMS over the left prefrontal cortex. *Neurology, 56*, 526-528. **[Weight=0.5]**

Additional readings: Bunge et al. (2005); Crone et al (2009); Krawczyk et al. (2008); Wharton et al. (2000)

One-page proposal for final paper, **due 2/21**, 11:59 pm.

8. March 01: Analogy and relational reasoning in children and primates

Children (Goswami, 2001). Primates (Oden et al., 2001). Is the difference between human and nonhuman kinds one of degree or of kind? (Penn et al, 2008).

Papers for student presentation:

- Goswami, U. (2001). Analogical reasoning in children. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 437-470). Cambridge, MA: MIT Press.
- Oden, D. L., Thompson, R. K. R., & Premack, D. (2001). Can an ape reason analogically? Comprehension and production of analogical problems by Sarah, a Chipmanzee (*Pan troglodytes*). In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 471-497). Cambridge, MA: MIT Press.
- Penn, D. C., Holyoak, K. J., & Povinelli, D. J. (2008). Darwin's mistake: Explaining the discontinuity between human and nonhuman minds. *Behavioral and Brain Sciences, 31*, 109-178. **[Weight=1.5]**

Additional readings: Gentner & Toupin (1986); Halford, Wilson, & Phillips (1998); Leech, Mareschal, & Cooper (2008); Richland, Morrison, & Holyoak (2006); Tunteler & Resing (2002, 2007)

9. March 08: Metaphors we live by

Analogy in naturalistic settings. Metaphors we live by (Lakoff & Johnson, 2003). Conceptual blending (Fauconnier, 2001). Analogy in science (Dunbar, 2001). Epilogue: Analogy as the core of cognition (Hofstadter, 2001).

Papers for student presentation:

- Lakoff, G. & Johnson, M. (2003). *Metaphors We Live By* (2nd Ed.). Chicago: The University of Chicago Press. [You don't need to read, much less present, the whole book, of course. Concentrate on pages 3-34, 46-60, 267-274.]
- Fauconnier, G. (2001). Conceptual blending and analogy. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 255-285). Cambridge, MA: MIT Press.

- Dunbar, K. (2001). The analogical paradox: Why analogy is so easy in naturalistic settings yet so difficult in the psychological laboratory. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 313-334). Cambridge, MA: MIT Press.
- Hofstadter, D. (2001). Epilogue: Analogy as the core of cognition. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 499-538). Cambridge, MA: MIT Press.

Additional readings: Clement (1988); Dunbar & Blanchette (2001)

F. March 15: Final Paper Due 11:59 pm

The above calendar is subject to change at the discretion of the instructor, depending on the rate of progress through the material, student interest in alternative topics, and/or scheduling constraints.

Bibliography

Detailed references to the required papers are provided above. The following are additional readings that can be presented by students in case of special interest and/or if there are not enough required papers for everybody. The papers whose first author is printed in **boldface** are good papers that were omitted from the main list due to time constraints.

- Blanchette, I. & Dunbar, K. (2002). Representational change and analogy: How analogical inferences alter target representations. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28* (4), 672-685.
- Bunge, S. A., Wendelken, C., Badre, D, & Wagner, A. D. R. (2005). Analogical reasoning and prefrontal cortex: evidence for separable retrieval and integration mechanisms. *Cerebral Cortex, 15* (3), 239-249.
- **Clement, J.** (1988) Observed Methods for Generating Analogies in Scientific Problem Solving. *Cognitive Science, 12* (4), 563-586.
- Crone, Eveline A., Wendelken, Carter, van Leijenhorst, Linda, Honomichl, Ryan D., Christoff, Kalina, & Bunge, Silvia A. (2009). Neurocognitive development of relational reasoning. *Developmental Science, 12* (1), 55-66.
- **Doumas, L. A. A.** & Hummel, J. E. (2005). Approaches to Modeling Human Mental Representations: What Works, What Doesn't, and Why. In K. Holyoak & R. Morrison (Eds.), *The Cambridge Handbook of Thinking and Reasoning* (pp. 73-91). Cambridge, UK: Cambridge University Press.
- **Dunbar, K.** & Blanchette, I. (2001). The *in vivo/in vitro* approach to cognition: The case of analogy. *Trends in Cognitive Sciences, 5* (8), 334-339.

- Eliasmith, C. & Thagard, P. (2001). Integrating structure and meaning: A distributed model of analogical mapping. *Cognitive Science, 25* (2), 245-286. [Holographic reduced representations, Plate, 1994]
- Falkenhainer, B., Forbus, K. D. & Gentner, D. (1989). The Structure-Mapping Engine: Algorithm and Examples. *Artificial Intelligence, 41*, 1-63. [Various 6-page conference papers are also available – see Chapter 2 in Petrov, 1998, for references.]
- **Forbus, K.** (2001). Exploring analogy in the large. In D. Gentner, K. J. Holyoak, & B. N. Kokinov (Eds.) *The Analogical Mind: Perspectives from Cognitive Science* (pp. 23-58). Cambridge, MA: MIT Press.
- French, R. (1995). *The subtlety of sameness: A theory and computer model of analogy-making*. Cambridge, MA: MIT Press.
- French, R. (2002). The computational modeling of analogy-making. *Trends in Cognitive Sciences, 6* (5), 200-205. [For reference only; cannot be presented for course credit.]
- **French, R.** & Hofstadter, D. (1991) Tabletop: An Emergent, Stochastic Model of Analogy-Making. In: Proceedings of the 13th Annual Cognitive Science Conference. [Reprinted in: Kokinov (ed.) Perspectives on Cognitive Science, vol. 1, NBU Press. http://www.nbu.bg/cogs/personal/kokinov/COG501/tabletop.pdf]
- **Gentner, D.** & Markman, A. (1997). Structure Mapping in Analogy and Similarity. *American Psychologist, 52* (1), 45-56.
- Gentner, D. & Toupin, C. (1986). Systematicity and surface similarity in the development of analogy. *Cognitive Science, 10* (3), 277-300.
- Gick, M. L. & Holyoak, K. J. (1980). Analogical Problem Solving. *Cognitive Psychology, 12*, 306-355.
- Green, C. & Hummel, J. E. (2004). Relational perception and cognition: Implications for cognitive architecture and the perceptual-cognitive interface. In B. Ross (Ed.), *The Psychology of Learning and Motivation, Vol. 44* (pp. 201-226). San Diego, CA: Academic Press.
- **Halford, G. S.**, Wilson, W. H. & Phillips, S. (1998). Processing capacity defined by relational complexity: Implications for comparative, developmental, and cognitive psychology. *Behavioral and Brain Sciences, 21* (6), 803-865. **[Weight=1.5]**
- Hofstadter, D. & the Fluid Analogies Research Group (1995). *Fluid concepts and creative analogies: Computer models of the fundamental mechanisms of thought*. New York: Basic Books.
- Holyoak, K. & Thagard, P. (1995). *Mental leaps: Analogy in creative thought*. Cambridge, MA: MIT Press. [For reference only; cannot be presented for credit.]
- Jani, N. G. & Levine, D. S. (2000). A neural network theory of proportional analogy-making. *Neural Networks, 13* (2), 149-183. [Grossberg's Adaptive Resonance Theory]

- Keane, Mark T., Ledgeway, Tim, Duff, Stuart (1994). Constraints on analogical mapping: A comparison of three models. *Cognitive Science, 18* (3), 387-438.
- Kokinov, B. (1994). A hybrid model of reasoning by analogy. In K. Holyoak & J. Barnden (Eds.), *Advances in connectionist and neural computation theory, vol. 2: Analogical connections* (pp. 247-318). Norwood, NJ: Ablex.
- Kokinov, B., Feldman, V., & Petkov, G. (2009). Analogy-making automatically produces false memories for both mapped situations. In B. Kokinov, K. Holyoak, & D. Gentner (Eds.), *New Frontiers in Analogy Research*. Sofia, Bulgaria: NBU Press. http://nbu.bg/cogs/analogy09/proceedings/ **[Weight=0.5]**
- Krawczyk, D. C., Holyoak, K. J., & Hummel, J. E. (2005). The one-to-one constraint in analogical mapping and inference. *Cognitive Science, 29* (5), 797-806.
- Krawczyk, D. C., Morrison, Robert G., Viskontas, Indre, Holyoak, Keith J., Chow, Tiffany W., Mendez, Mario F., Miller, Bruce L., & Knowlton, Barbara J. (2008). Distraction during Relational Reasoning: The Role of Prefrontal Cortex in Interference Control. *Neuropsychologia, 29* (5), 797-806.
- Leech, R., Mareschal, D. & Cooper, R. P. (2008). Analogy as Relational Priming: A Developmental and Computational Perspective on the Origins of a Complex Cognitive Skill. *Behavioral and Brain Sciences, 31*, 357-414.
- Lovett, A., Sagi, E., Gentner, D., & Forbus, K. (2009). Modeling perceptual similarity as analogy resolves the paradox of difference detection. In B. Kokinov, K. Holyoak, & D. Gentner (Eds.), *New Frontiers in Analogy Research*. Sofia, Bulgaria: NBU Press. http://nbu.bg/cogs/analogy09/proceedings/ **[Weight=0.5]**
- Mitchell, M. (1993). *Analogy-making as perception: A computer model*. Cambridge, MA: MIT Press.
- **O'Reilly, R. C.,** Busby, R. S. & Soto, R. (2003). Three Forms of Binding and their Neural Substrates: Alternatives to Temporal Synchrony. In A. Cleeremans (Ed), *The Unity of Consciousness: Binding, Integration, and Dissociation* (pp. 168-192). Oxford: Oxford University Press.
- Petrov, A. A. (1998). *A dynamic emergent computational model of analogy-making based on decentralized representations*. Unpublished doctoral dissertation, New Bulgarian University, Sofia, Bulgaria. [Available at http://alexpetrov.com/pub/phd/]
- Ramscar, M. & Yarlett, D. (2003). Semantic grounding in models of analogy: An environmental approach. *Cognitive Science, 27* (1), 41-47. [Latent Semantic Analysis, LSA, Landauer & Dumais, 1997]
- **Ratcliff, R.** & McKoon, G. (1989). Similarity Information versus Relational Information: Differences in the Time Course of Retrieval. *Cognitive Psychology, 21*, 139-155.
- Richland, L. E., Morrison, R. G., & Holyoak, K. J. (2006). Children's development of analogical reasoning: Insights from scene analogy problems. *Journal of Experimental Child Psychology, 94* (3), 249-273.

- **Ross, Brian H.** (1987). This Is Like That: The Use of Earlier Problems and the Separation of Similarity Effects. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13* (4), 629-639.
- Schunn, C. D. & Dunbar, K. (1996). Priming, Analogy, and Awareness in Complex Reasoning. *Memory & Cognition, 24* (3), 271-284.
- Seifert, Colleen M. and McKoon, Gail and Abelson, Robert P. and Ratcliff, Roger (1986). Memory Connections Between Thematically Similar Episodes. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 12* (2), 220-231.
- Spencer, R. M. & Weisberg, R. W. (1986). Context-Dependent Effects on Analogical Transfer. *Memory & Cognition, 14* (5), 442-449.
- Tunteler, E. & Resing, W. C. M. (2002). Spontaneous analogical transfer in 4-year-olds: A microgenetic study. *Journal of Experimental Child Psychology, 83* (3), 149-166.
- **Tunteler, E.** & Resing, W. C. M. (2007). Change in spontaneous analogical transfer in young children: A microgenetic study. *Infant and Child Development, 16* (1), 71-94.
- Tversky, A. (1977). Features of similarity. *Psychological Review, 84*, 327-352
- Wharton, Charles M. and Grafman, Jordan and Flitman, Stephen S. and Hansen, Eric K. and Brauner, Jason and Marks, Allison and Honda, Manabu (2000). Toward Neuroanatomical Models of Analogy: A Positron Emission Tomography Study of Analogical Mapping. *Cognitive Psychology, 40* (3), 173-197.
- Wharton, C. M., Holyoak, K. J., & Lange, T. E. (1996). Remote Analogical Reminding. *Memory & Cognition, 24* (5), 629-643.

Finally, welcome to the course. I hope that you will enjoy the class and learn a lot. I look forward to seeing you on January 4.

Alex Petrov