**Predicting Human Decision Making: Tools of the Trade**

(AAAI-17 Tutorial by Ariel Rosenfeld and Sarit Kraus).

Tutorial web-page:

<https://sites.google.com/view/predicting-human-dm>

Below is a (partial) list of papers we referred to in our tutorial. If you think other papers should be added to the list (in order to help others in the future) - please let us know.

Ariel arielros1@gmail.com

**What drives people's DM?**

Abraham, C., & Sheeran, P. (2003). Acting on intentions: The role of anticipated regret. British *Journal of Social Psychology, 42*, 495-511.

Acevedo, M., & Krueger, JI. (2004). Two egocentric sources of the decision to vote: The voter’s illusion and the belief in personal relevance. *Political Psychology, 25*(1), 115-134. DOI: 10.1111/j.1467-9221.2004.00359.x.

Botti, S., & Iyengar, S.S. (2004). The psychological pleasure and pain of choosing: When people prefer choosing at the cost of subsequent outcome satisfaction. *Journal of Personality and Social Psychology, 87*(3), 312-326. DOI: 10.1037/0022-3514.87.3.312.

de Bruin, W.B., Parker, A.M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology, 92*(5), 938-956. DOI: 10.1037/0022-3514.92.5.938.

Epley, N., & Gilovich, T. (2006). The anchoring-and-adjustment heuristic. *Psychological Science, 17*(4), 311-318. DOI: 10.1111/j.1467-9280.2006.01704.x.

Evans, J.ST., Barston, J.L., & Pollard, P. (1983). On the [conflict](http://www.inquiriesjournal.com/keyword/conflict) between logic and belief in syllogistic reasoning. *Memory & Cognition, 11*(3), 295-306.

Finucane, M.L., Mertz, C.K., Slovic, P. & Schmidt, E.S. (2005). Task complexity and older adults’ decision-making competence. *Psychology and Aging, 20*(1), 71-84. DOI: 10.1037/0882-7974.20.1.71.

Gilbert, D.T., & Ebert, J.E.J. (2002). Decisions and revisions: The affective forecasting of changeable outcomes. *Journal of Personality and Social Psychology, 82*(4), 503-514. DOI: 10.1037/0022-3514.82.4.503.

Goldstein, D.G., & Gigerenzer, G. (2002). Models of ecological rationality: The recognition heuristic. *Psychological Review, 109*(1), 75-90. DOI: 10.1037/0033-295X.109.1.75.

Hilbig, B.E., & Pohl, R.F. (2008). Recognition users of the recognition heuristic. *Experimental Psychology, 55*(6), 394-401. DOI: 10.1027/1618-3169.55.6.394.

Jullisson, E.A., Karlsson, N., Garling, T. (2005). Weighing the past and the future in decision making. *European Journal of Cognitive Psychology, 17*(4), 561-575. DOI: 10.1080/09541440440000159.

Kim, S., Healy, K., Goldstein, D., Hasher, L., & Wiprzycka, U.J. (2008). Age differences in choice satisfaction: A positivity effect in decision making. *Psychology and Aging, 23*(1), 33-38. DOI: 10.1037/0882-7974.23.1.33.

Krantz, D.H., & Kunreuther, H.C. (2007). Goals and plans in decision making. *Judgment and Decision Making, 2*(3), 137-168.

Marsh, D.M., & Hanlon, T.J. (2007). Seeing what we want to see: Confirmation biases in animal behavior research. *Ethology, 113*(11), 1089-1098. DOI: 10.1111/j.1439-0310.2007.01406.x.

McKelvie, S.J. (2000). Quantifying the availability heuristic with famous names. *North American Journal of Psychology, 2*(2), 347-357.

Nestler, S. & von Collani, G. (2008). Hindsight bias, conjunctive explanations and causal attribution. *Social Cognition, 26*(4), 482-493.

Nokes, J.D., Dole, J.A., & Hacker, D.J. (2007). Teaching high school students to use heuristics while reading historical texts. *Journal of Educational Psychology, 99*(3), 492-504. DOI: 10.1037/0022-0663.99.3.492.

Pachur, T, & Hertwig, R. (2006). On the psychology of the recognition heuristic: Retrieval primacy as a key determinant of its use. *Journal of Experimental Psychology, Learning, Memory, and Cognition, 32*(5), 983-1002. DOI: 10.1037/0278-7393.32.5.983.

Redelmeier, D.A. (2005). The cognitive psychology of missed diagnosis. *Annals of Internal Medicine, 142*(2), 115-120.

Reed, A.E., Mikels, J.A., & Simon, K.I. (2008). Older adults prefer less choice than young adults. Psychology and Aging, 23(3), 671-675. DOI: 10.1037/a0012772.

Sagi, A., & Friedland, N. (2007). The cost of richness: The effect of the size and diversity of decision sets on post-decision regret. *Journal of Personality and Social Psychology, 93*(4), 515-524. DOI: 10.1037/0022-3514.93.4.515.

Shah, A.K., & Oppenheimer, D.M. (2008). Heuristics made easy: An effort-reduction framework. *Psychological Bulletin, 134*(2), 207-222. DOI: 1.1037/0033-2909.134.2.207.

Stanovich, K.E., & West, R.F. (2008). On the relative independence of thinking biases and cognitive ability. *Journal of Personality and Social Psychology, 94*(4), 672-695. DOI: 10.1037/0022-3514.94.4.672.

West, R.F., Toplak, M.E., & Stanovich, K.E. (2008). Heuristics and biases as measures of critical thinking: Associations with cognitive ability and thinking dispositions. *Journal of Educational Psychology*, *100*(4), 930-941. DOI: 10.1037/a0012842.

Wester, S.R., Christianson, H.F., Fouad, N.A., Santiago-Rivera, A.L. (2008). Information processing as problem solving: A collaborative approach to dealing with students exhibiting insufficient competence. *Training and* [*Education*](http://www.inquiriesjournal.com/keyword/education) *in Professional Psychology, 2*(4), 193-201. DOI: 10.1037/1931-3918.2.4.193.

Wood, S.L. (2001). Remote purchase environments: The influence of return policy leniency on two-stage decision process. *Journal of* [*Marketing*](http://www.inquiriesjournal.com/keyword/marketing) *Research, 38*(2), 157-169.

Santos, L. R., & Rosati, A. G. (2015). The evolutionary roots of human decision making. *Annual review of psychology*, *66*, 321.‏

**General Examples**

·  [Anticipating Human Activities using Object Affordances for Reactive Robotic Response, Hema S Koppula, Ashutosh Saxena. Robotics: Science and Systems (RSS), 2013. (Open access)](http://pr.cs.cornell.edu/anticipation/)

·  [Learning Spatio-Temporal Structure from RGB-D Videos for Human Activity Detection and Anticipation, Hema S Koppula, Ashutosh Saxena. International Conference on Machine Learning (ICML), 2013. (Open access)](http://pr.cs.cornell.edu/anticipation/anticipation_ICML_2013.pdf)

<http://www.techrepublic.com/article/ai-just-beat-the-worlds-4-best-poker-players-what-it-means/>

Shani, Guy, David Heckerman, and Ronen I. Brafman. "An MDP-based recommender system." *Journal of Machine Learning Research* 6.Sep (2005): 1265-1295.‏

**Revell, Timothy. "AI takes on top poker players." (2017):**

Cook, Diane J. "How smart is your home?." *Science* 335.6076 (2012): 1579-1581.‏

**Game Theory**

**Game Theory** by Michael Maschler, Eilon Solan, and Shmuel Zamir. Cambridge UP, 2013.

**A Course in Game Theory** by Martin J. Osborne and Ariel Rubinstein. MIT Press, 1994.

Available free (legally!) from: http://tinyurl.com/gtbook

**Game Theory – A Very Short Introduction** by Ken Binmore. Oxford UP, 2007.

(A useful companion for bedtime reading. Full of razor sharp opinions and insight from a master of the art.)

**Decision Theory and Rationality**

Gilboa, I., Theory of Decision under Uncertainty. Cambridge University Press, 2009.

Gilboa, I., Rational Choice. MIT Press, 2010.

<https://web.stanford.edu/~jdlevin/Econ%20202/Choice%20Theory.pdf>

<https://hbr.org/2009/07/the-end-of-rational-economics>

**Normative Approch: Use-cases**

Pita, James, et al. "Deployed ARMOR protection: the application of a game theoretic model for security at the Los Angeles International Airport.“, 2008.‏

Nguyen et al. Analyzing the Effectiveness of Adversary Modeling in Security Games, 2013

Kar, Debarun, et al. A game of thrones: when human behavior models compete in repeated Stackelberg security games., 2015.‏

A. Rosenfeld, I. Zuckerman, E. Segal-Halevi, O. Drein and S. Kraus. NegoChat-A: a chat-based negotiation agent with bounded rationality, Journal of Autonomous Agents and Multi-Agent Systems, 30(1), 60-8, 2016

G. Haim, Y. Gal, S. Kraus and B. An. Human-Computer Negotiation in Three-Player Market Settings. ECAI 2014

Galit Haim, Yakov Gal, Sarit Kraus, M. Gelfand, A Cultural Sensitive Agent for Human-Computer Negotiation. Proc. of AAMAS 2012.

Ya'akov Gal, Sarit Kraus, Michele Gelfand, Hilal Khashan and Elizabeth Salmon. Negotiating with People across Cultures using an Adaptive Agent, ACM Transactions on Intelligent Systems and Technology, 3(1), 2011

S. Kraus, P. Hoz-Weiss, J. Wilkenfeld, David R. Andersen and Amy Pate. Resolving crises through automated bilateral negotiations, Artificial Intelligence journal, 172(1):1-18, 2008.

Moshe Bitan, Galit Nahari, Zvi Nisin, Ariel Roth, Sarit Kraus. Psychologically based Virtual-Suspect For interogative Interview Training, AAAI 2017

Hajaj et al. Enhancing comparison shopping agents through ordering and gradual information disclosure, JAAMAS 2017.

Sarne et al. Improving Comparison Shopping Agents’ Competence through

Selective Price Disclosure, Electronic Commerce Research and Applications 2015.

Tal et al. A Study of Human Behavior in Online Voting, AAMAS 2015

**Descriptive Prediction**

Modeling and Understanding Human Routine Behavior, Banovic et al. (2016)

Ajzen, Icek. *Attitudes, personality, and behavior*. McGraw-Hill Education (UK), 2005.‏

Jason Hartford, James R. Wright, and Kevin Leyton-Brown. Deep Learning for Human Strategic Modeling, NIPS 2016

Glorot, Xavier, and Yoshua Bengio. "Understanding the difficulty of training deep feedforward neural networks." *Aistats*. Vol. 9. 2010.‏

Bengio, Yoshua. "Practical recommendations for gradient-based training of deep architectures." *Neural networks: Tricks of the trade*. Springer Berlin Heidelberg, 2012. 437-478.‏

Ariel Rosenfeld and Sarit Kraus, Strategical Argumentative Agent for Human Persuasion, ECAI 2016.

Rosenfeld and Kraus- Providing Arguments in Discussions Based on the Prediction of Human (AAAI-15)

Xia, Peng, et al. "Reciprocal recommendation system for online dating." *Advances in Social Networks Analysis and Mining 2015*. ACM, 2015.‏

Brown, Rebecca, and Curry Guinn. "Developing game-playing agents that adapt to user strategies: A case study." *IEEE Symposium on Intelligent Agents (IA), 2014*.‏

Phua, Clifton, et al. "A comprehensive survey of data mining-based fraud detection research." *arXiv preprint arXiv:1009.6119* (2010).‏

Fawcett, Tom, and Foster Provost. "Adaptive fraud detection." *Data mining and knowledge discovery* 1.3 (1997): 291-316.‏

Kandias, Miltiadis, et al. "An insider threat prediction model." *International Conference on Trust, Privacy and Security in Digital Business*. Springer Berlin Heidelberg, 2010.‏

Ziv Epstein, Alex Peysakhovich and Dave Rand. The Good, the Bad, and the Unflinchingly Selfish: Cooperative Decision-Making can be Predicted with high Accuracy when using only Three Behavioral Types, 2016

Noti, Gali, et al. "Behavior-Based Machine-Learning: A Hybrid Approach for Predicting Human Decision Making." *arXiv preprint arXiv:1611.10228* (2016).‏

Rosenfeld, Avi, et al. "Combining psychological models with machine learning to better predict people’s decisions." *Synthese* 189.1 (2012): 81-93.‏

Erev et al. From anomalies to forecasts: Toward a descriptive model of decisions under risk, under ambiguity, and from experience, Psychological Review, 2017

Ori Plonsky, Ido Erev, Tamir Hazan and Moshe Tennenholtz. Psychological Forest: Predicting Human Behavior, AAAI 2017.

Rosenfeld et al. Adaptive Advice in Automobile Climate Control Systems, AAMAS 2015

Ariel Rosenfeld and Sarit Kraus, Strategical Argumentative Agent for Human Persuasion ECAI 2016.

Rosenfeld et al. Intelligent Agent Supporting Human-Multi-Robot Team Collaboration, IJCAI 2015

Rosenfeld et al. Online Prediction of Exponential Decay Time Series with Human-Agent Application, ECAI 2016

Tanvi Verma, Pradeep Varakantham, Sarit Kraus and Hoong Chuin Lau In Proceedings of the International Conference on Automated Planning and Scheduling, ICAPS-17.

Albrecht, Utilising Policy Types for Effective Ad Hoc Coordination in Multiagent Systems, 2015.

Domingos et al., Reactive Versus Anticipative Decision Making in a Novel Gift-Giving Game, AAAI 2017.

Behavior-Based Machine-Learning: A Hybrid Approach for Predicting Human Decision Making **2016**