**Abstract for an Industry Talk - 1st Israeli RL Day**

**Title:** The Business Value of Reinforcement Learning and Causal Inference

**Abstract:** Machine-learning prediction methods have been extremely productive in various applications, yet there are major gaps between making a prediction and making a decision (Athey, 2017). Data scientists seem to be solely focused on using classification, regression, and clustering methods to answer the question “what is/will be going on.” (Griffin, 2020) thus neglecting answering prescriptive questions like “**what is the effect of my action”** or “**how to take optimal actions** to improve metrics”. (Bertsimas & Kallus, 2020). However, these questions are well studied in the related frameworks of **Causal Inference.** (Guo et al., 2020; Yao et al., 2020) and **Reinforcement Learning** (Dulac-Arnold et al., 2019). In this talk I will cover the potential, opportunities and limitation of application of these frameworks to optimize business outcomes. I will question whether offline RL (Agarwal et al., 2019; Levine et al., 2020) could revolutionize the way operational research, marketing and sales are being done.

**Speaker:** Dr. Hanan Shteingart has a graduated from ELSC/HUJI computation neuroscience program with background in Physics and Electrical Engineering. His PhD thesis focus was on using RL to explain human, and animal behavior as well as neural encoding (Mongillo et al., 2014; Murakami et al., 2017; Shteingart et al., 2013; Shteingart & Loewenstein, 2014, 2015, 2016). He is a lecturer in Yandex Data Science School on Supervised and Reinforcement Learning. He has built the data science teams in several startup companies like Gong.io, Biocatch, Playtika as well as in enterprises like Microsoft. Today he works in VIANAI where he is building a platform to democratize the ability to optimize and evaluate business policies.

**VIANAI** Systems, Inc. was founded in early 2019 to address the emerging market opportunity in Enterprise AI. The company was publicly launched in September 2019 with $50M initial venture investment. Since its founding, VIANAI has worked with some of the largest and most respected businesses across multiple industry segments to deliver AI/ML and Data Science solutions covering a variety of strategic use cases and technology capabilities.

Agarwal, R., Schuurmans, D., & Norouzi, M. (2019). *An Optimistic Perspective on Offline Reinforcement Learning*. http://arxiv.org/abs/1907.04543

Athey, S. (2017). Beyond prediction: Using big data for policy problems. *Science*, *485*(February), 483–485.

Bertsimas, D., & Kallus, N. (2020). From predictive to prescriptive analytics. *Management Science*, *66*(3), 1025–1044. https://doi.org/10.1287/mnsc.2018.3253

Dulac-Arnold, G., Mankowitz, D., & Hester, T. (2019). *Challenges of Real-World Reinforcement Learning*. http://arxiv.org/abs/1904.12901

Griffin, D. K. (2020). The Big Three: A Methodology to Increase Data Science ROI by Answering the Questions Companies Care About. *CoRR*, *abs/2002.0*. http://arxiv.org/abs/2002.07069

Guo, R., Cheng, L. U., Hahn, P. R., Liu, H., Cheng, L., & Li, J. (2020). *A Survey of Learning Causality with Data: Problems and Methods*. https://doi.org/10.1145/3397269

Levine, S., Kumar, A., Tucker, G., & Fu, J. (2020). *Offline Reinforcement Learning: Tutorial, Review, and Perspectives on Open Problems*. http://arxiv.org/abs/2005.01643

Mongillo, G., Shteingart, H., & Loewenstein, Y. (2014). The misbehavior of reinforcement learning. *Proceedings of the IEEE*, *102*(4), 528–541.

Murakami, M., Shteingart, H., Loewenstein, Y., & Mainen, Z. F. (2017). Distinct sources of deterministic and stochastic components of action timing decisions in rodent frontal cortex. *Neuron*, *94*(4), 908–919.

Shteingart, H., & Loewenstein, Y. (2014). Reinforcement learning and human behavior. *Current Opinion in Neurobiology*, *25*, 93–98.

Shteingart, H., & Loewenstein, Y. (2015). The effect of sample size and cognitive strategy on probability estimation bias. *Decision*, *2*(2), 107.

Shteingart, H., & Loewenstein, Y. (2016). Heterogeneous suppression of sequential effects in random sequence generation, but not in operant learning. *PloS One*, *11*(8), e0157643.

Shteingart, H., Neiman, T., & Loewenstein, Y. (2013). The role of first impression in operant learning. *Journal of Experimental Psychology: General*, *142*(2), 476.

Yao, L., Chu, Z., Li, S., Li, Y., Gao, J., & Zhang, A. (2020). *A Survey on Causal Inference*. http://arxiv.org/abs/2002.02770