Time: The next frontier in machine learning

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In this talk, I aim to illuminate the underemphasized yet critical dimension in machine learning: time. I contend that time harbors the potential to revolutionize machine learning methodologies, particularly within healthcare. This presentation underscores the opportunities and challenges that emerge from integrating temporal dynamics into machine learning models, enriching prediction accuracy, inference robustness, and conceptual understanding.

In this talk, I will aim to answer questions such as:

- Could the recognition of time as a variable in machine learning models have saved lives or expedited treatments during the recent global health crisis?

- How might the increased precision and accuracy in early disease detection, afforded by integrating temporal dynamics into machine learning models, reduce healthcare costs and improve the quality of life for patients?

- Why do traditional methods often overlook the crucial dimension of time?

- What are the common misconceptions that impede its incorporation in machine learning models?

- How can we effectively balance the robustness of Bayesian methods with the necessary frequentist guarantees when predicting and managing uncertainties over time?

- Can we successfully bridge seemingly opposing machine learning and statistical philosophies in the context of healthcare?

- How can learning from informative sampling over time help us counteract biases inherent in non-random data collection methods? Could this method be the key to unraveling the subtle, yet critical temporal patterns in health data?

- How might our approach to causal deep learning need to change as we incorporate temporal data?

- What new challenges are we encountering as we try to uncover dynamical systems over time and can we overcome them?