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Markov Simulation through Neural Networks

In his 1998 interview session, Rumelhart dives deep into his background and the many events that led to his contributions to analyzing human cognition, mathematical psychology, and symbolic artificial intelligence. A major theme throughout the session was the discussion of Markovian theory and its comparison to the growing development of neural networks at the time. Many years later in 2018, Maren Awiszus and Bodo Rosenhahn of the Leibniz University in Hanover, Germany presented their research on the ability of modern neural networks to simulate and match the benefits and applications of Markov models through new training methodologies.

Previous issues in developing simulated models of this nature stemmed from the fact that many experiments relied on the use of a defined transition matrix (a common notion in Markovian Theory) to train their neural networks. The issue with this was that "a neural net behaves in a deterministic way" (Awiszus 2295). This essentially alludes to the fact that for any given transition matrix or generator function, the resulting output of the model is almost always the exact same. In their paper, Awuszus and Rosenhahn break into a new form of training in which a "random decision" is introduced in order to "transfer the predefined statistical behavior." (Rosenhan 2296). The benefit of such a model is the ability to match the benefits of optimal policy generation in Markov Chains through the speed of Neural Networks. Most notably, the researchers describe "walker" and "tic tac toe" problems which they were able to solve much faster through this new form of training.

As the world continues to build on Rumelhart's notions of neural networks, it is interesting to imagine the possibilities of future development. There is boundless scope for older techniques such as Markovian Theory to be renovated and optimized through such networks.

Literary References

Awiszus, Maren, and Bodo Rosenhahn. “Markov Chain Neural Networks.” *Http://Www.tnt.uni-Hannover.de/*, Institut Fur Informationsverarbeitung - Leibniz Universitat Hannover, 2018.