Program: Deep Learning Explained: The Future of Smart Networks
Speaker: Melanie Swan, MBA, MA, Technology Theorist, Department of Philosophy, Purdue University
Introduced by: Alan Schmidt
Attendance: 132
Guests: Susan Bradford, Dan Bradford, Mary DeVoe, Steve DeVoe, Paul Giesting, Chris Hoyt, Bill Schmitt
Scribe: John Peer
Editor: Carl Warner

Today's presenter was Melanie Swan from the Philosophy Department of Purdue University, West Lafayette, IN and on the faculty of Singularity University. She also presented to Scientech Club on January 8, 2018 on "The Future of Artificial Intelligence: Deep Learning & Blockchain Crypto-Ledgers".

Today's presentation built on the previous one in describing the nature and possibilities of AI Deep Learning Neural Networks.

Scribe's note: This will be a very high-level overview of a complex subject. The full 100-slide presentation is currently available at: http://slideshare.net/LaBlogga.

To start, Ms. Swan proposed this "Deep Learning Smart Network Thesis":

- Deep learning (machine learning) is an important emerging Artificial Intelligence technology.
- The bigger context is that humanity is embarked on a **digital transformation journey**, evolving into a **computation-harnessing society** with **smart network technologies**.

Technology used to make existing work more efficient; now it is transforming the work itself. The traditional economy had physical infrastructure (highway networks), but the digital economy uses digital networks and is evolving quickly to intelligent networks.

AI has progressed from Deep Blue winning at chess to Watson winning on Jeopardy to AlphaGo winning at the Chinese game of Go which has three times the moves of chess.

What is deep learning?

- Conceptual Definition: Deep learning is a computer program that can identify what something is (physical or digital).
- Technical Definition: Deep learning is a class of machine learning algorithms in the form of neural networks that uses a cascade of layers of processing units to extract features from data sets in order to make predictive guesses about new data.

How do AI and deep learning work? The explosion of data overwhelms existing learning algorithms. Deep learning takes a different approach using huge computing power on huge data sets by processing data with simple trial and error binary choices. It then looks at the success of the choices and adjusts the weights and biases of the algorithms to enhance the successes. Add this to many layers of processing and the machine "learns" to make cognitive decisions such as correctly recognizing images. "Deep" is at least 3 layers of processing, but Google Net has 22 layers. The current state of the art on "cognitive computing" uses 160 billion parameters and "trains" on three multi-core computers overnight.

Many sophisticated techniques are used in the algorithms to improve their accuracy and efficiency including linear and logarithmic regression, back propagation, gradient descent, and Laplace's loss function.

Currently deep learning is being applied as a diagnostic tool in tumor and melanoma recognition. It is also being applied in genomics and could be an imaging tool via smart phones to bring sophisticated diagnosis to the poor around the world. Adding deep learning to medical tools like pacemakers could give real-time monitoring and corrective action.

Autonomous driving is another opportunity for deep learning, but the real-time response and safety concerns are of utmost importance. Another focus could be deep learning robots for space exploration/development.

To further extend the potential of deep learning, the next level is being named Quantum Machine Learning.

Melanie Swan