

# CENTER FOR DEEP LEARNING IN ELECTRONICS MANUFACTURING

A PARTNERSHIP OF **NUFLARE** **MYCRONIC** **DES**

## OUR MISSION

The Center for Deep Learning in Electronics Manufacturing (CDLe) is an alliance of industry leaders who recognize deep learning's problem-solving potential for electronics manufacturing. We have come together to pool talent and resources to advance the state-of-the-art in deep learning for our unique problem space and to accelerate the adoption of deep learning in each of our company's products to improve our respective offerings for our customers.

The CDLe is focused on deep learning, which is a subset of artificial intelligence (AI) and machine learning employing sophisticated deep neural networks to re-frame the traditional programming paradigm. Instead of executing programs that transform a set of inputs to a set of outputs, deep learning takes a set of inputs and outputs and automatically produces a program that transforms like inputs to like outputs through a massive network of pattern matching. For computing problems that involve complex physical phenomena, this approach has proven to be more accurate than traditional programming and computing.



We have come together to form the CDLe in order to accelerate our efforts in what we perceive to be a critical area for the success of our companies' customers.

GPU-accelerated computing power has fueled the recent growth and wide application of deep learning, enabling new types of software applications that were science fiction as recently as five years ago. No other software techniques had been able to beat the best human chess players or be better than humans at visual analysis; deep learning applications have now done both. The recent acceleration of autonomous driving technologies is a result of deep learning as well. We believe that the same types of breakthroughs are possible in the electronics manufacturing industry.

We work in an environment where the data volume is huge and the demand for accuracy is very high. For example, a multi-beam mask writer processes, computes, transmits, and writes extremely large amounts of data for each mask. Masks, whether written by eBeam or laser mask writers, process hundreds of terabytes of data for each mask every 10-20 hours. This is many times more than the entire Imagenet dataset often cited for deep learning work in just one mask! In addition, electronics manufacturing requires tremendous precision. Seven- to eight-sigma accuracy is required, because a single incorrectly processed feature can cause the failure of an entire device. Being better than the best human is not sufficient to achieve this level of accuracy, so deep learning must be applied differently to electronics manufacturing.

We have come together to form the CDLe in order to accelerate our efforts in what we perceive to be a critical area for the success of our companies' customers. We focus both on deep learning technologies and on applications of deep learning to speed the time-to-market of deep learning for electronics manufacturing.



**Ajay Baranwal**  
DIRECTOR

Ajay Baranwal is the Center Director of CDLe. He is a hands-on manager who loves to teach. Ajay has a strong history of Software Engineering and Management in EDA where he got hooked on to Deep Learning as a specialist in Machine Learning. He moved to Natural Language Processing and Understanding to pursue Deep Learning further at Abzooba ([www.abzooba.com](http://www.abzooba.com)) as Sr. Director of Advanced Analytics and AI. Prior to Abzooba, after a distinguished career in Software Engineering at Interra Systems and Magma Design Automation in India, Ajay was asked to move to Silicon Valley for Magma. Afterwards, he moved to Apache Design, which became a part of Ansys ([www.ansys.com](http://www.ansys.com)). He was promoted from Senior Manager, Data Science, to Technical Fellow, Data Science during his tenure there. After starting research with Machine Learning applications, he introduced a number of TensorFlow-based applications including a Prediction and Diagnostic system, Smart Commands, a Natural Language Interface for EDA applications, and Smart Q&A, an automated Help system.