**Deep Learning for Malaria Detection**

With regular manual diagnosis of blood smears, it is an intensive manual process requiring proper expertise in classifying and counting the parasitized and uninfected cells. Typically this may not scale well and might cause problems if we do not have the right expertise in specific regions around the world. Some advancements have been made in leveraging state-of-the-art (SOTA) image processing and analysis techniques to extract hand-engineered features and build machine learning based classification models. However these models are not scalable with more data being available for training and given the fact that hand-engineered features take a lot of time.

Deep Learning models, or to be more specific, Convolutional Neural Networks (CNNs) have proven to be really effective in a wide variety of computer vision tasks. While we assume that you have some knowledge on CNNs, in case you don’t, feel free to dive deeper into them by checking out [this article here](http://cs231n.github.io/convolutional-networks/). Briefly, The key layers in a CNN model include convolution and pooling layers as depicted in the following figure.

Convolution layers learn spatial hierarchical patterns from the data, which are also translation invariant. Thus they are able to learn different aspects of images. For example, the first convolution layer will learn small and local patterns such as edges and corners, a second convolution layer will learn larger patterns based on the features from the first layers, and so on. This allows CNNs to automate feature engineering and learn effective features which generalize well on new data points. Pooling layers help with downsampling and dimension reduction.

Thus, CNNs help us with automated and scalable feature engineering. Also, plugging in dense layers at the end of our model enables us to perform tasks like image classification. Automated malaria detection using deep learning models like CNNs could be very effective, cheap and scalable especially with the advent of transfer learning and pre-trained models which work quite well even with constraints like less data.