# Seismic facies prediction using Convolutional Neural Networks (CNN)

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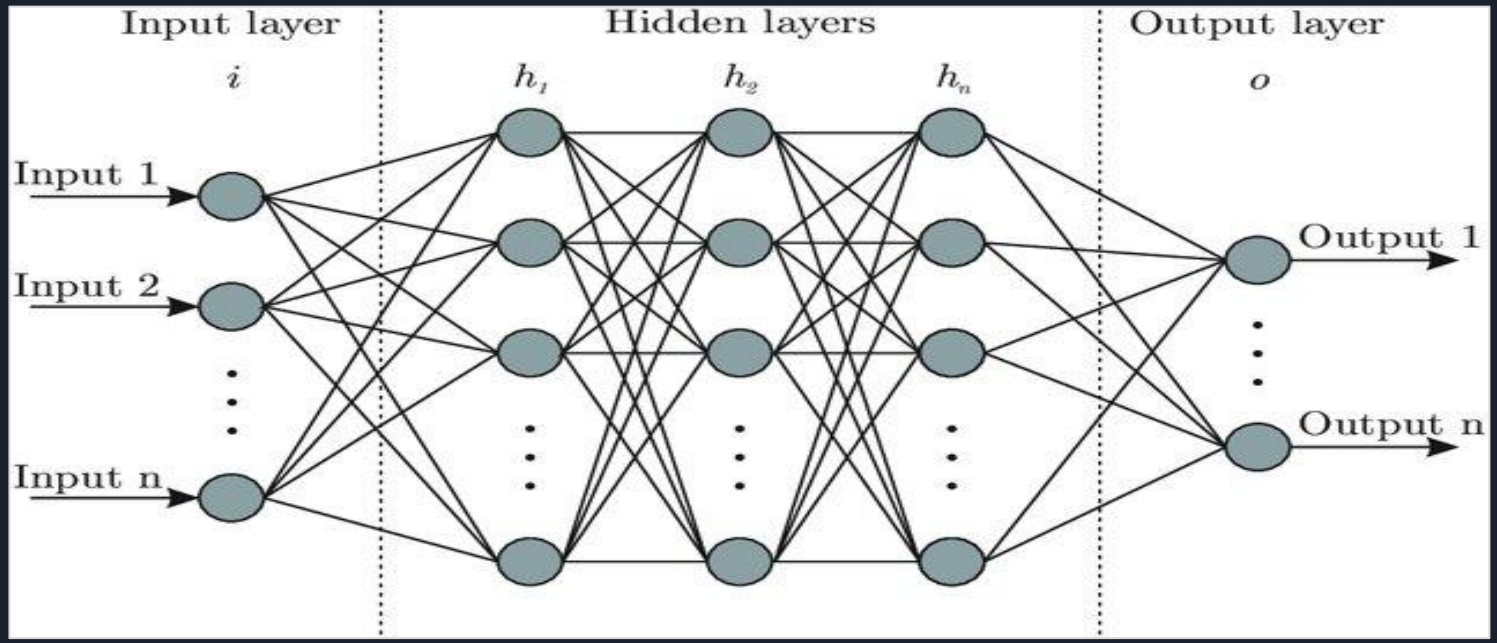
# Outline

- Neural Networks
- Convolutional Neural Networks
- Image Segmentation
- Seismic Facies
- UNet Model  Architecture

# Neural Networks

- Neural networks are a type of machine learning algorithms for finding and detecting patterns in data.
- They try to model the human brain.
- They consist of “neurons” (processing nodes) and “neural links” that connects neurons for sharing information.
- Types of neural networks include;
  - Artificial Neural Networks (ANNs)
  - Convolutional Neural Networks (CNNs)
  - Recurrent Neural Networks (RNNs)
  - Long Short Term Memory (LSTM) etc

# Neural Networks (Cont'd)



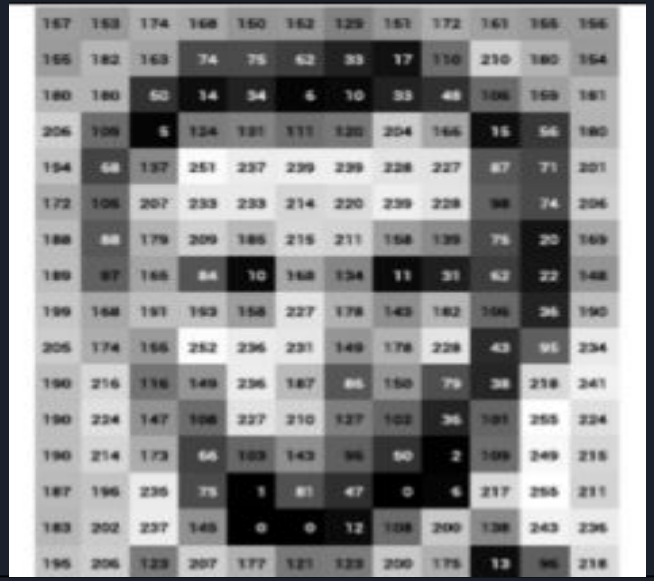

A fully connected artificial neural network (source: Facundo Bre)

# Convolutional Neural Networks (CNNs)

- CNNs are a type of CNNs specifically designed for image recognition problems. They generally consist of;
  - An input layer
  - Convolutional layers
  - Pooling layers
  - Fully connected layers

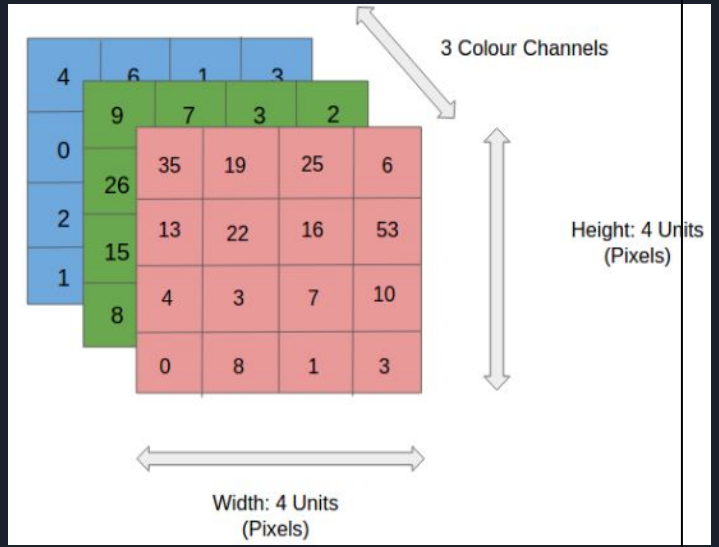
# CNNs (Images)

- Grayscale



Grayscale matrix rep of an image. Image credits — Eryk Lewinson (Towards Data Science)

- Coloured




RGB color channels of an image. Image credits — Saha, S. (2018)

# CNNs Filters

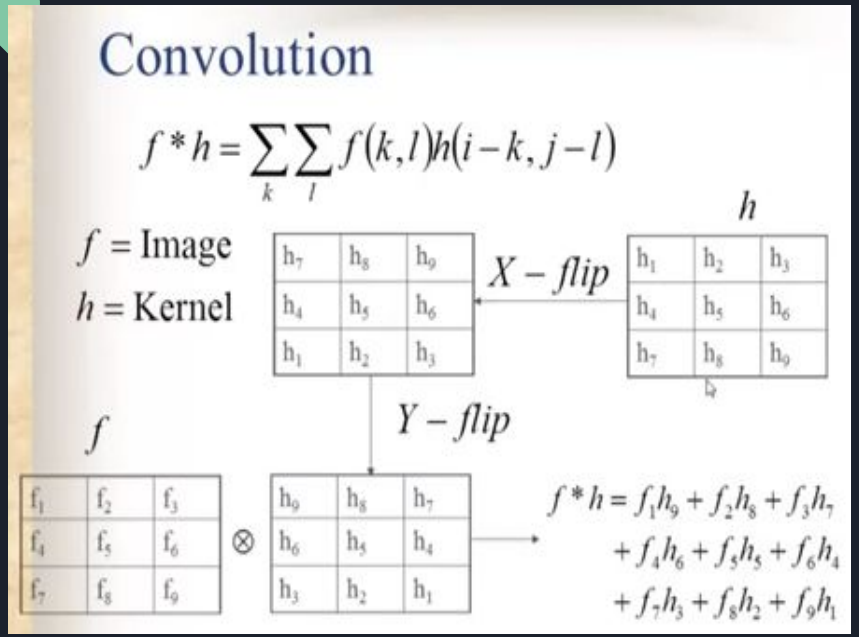



Image from Chris McCornick, WordPress.

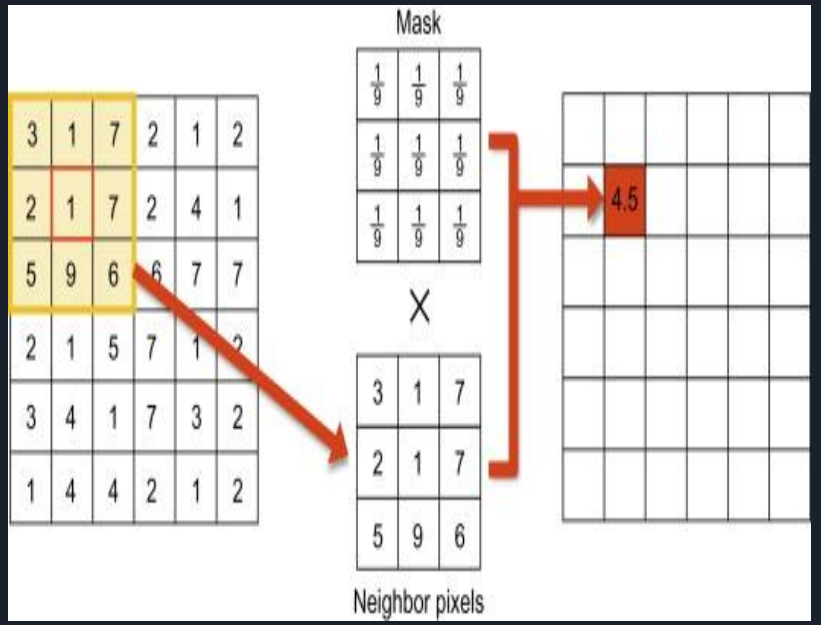
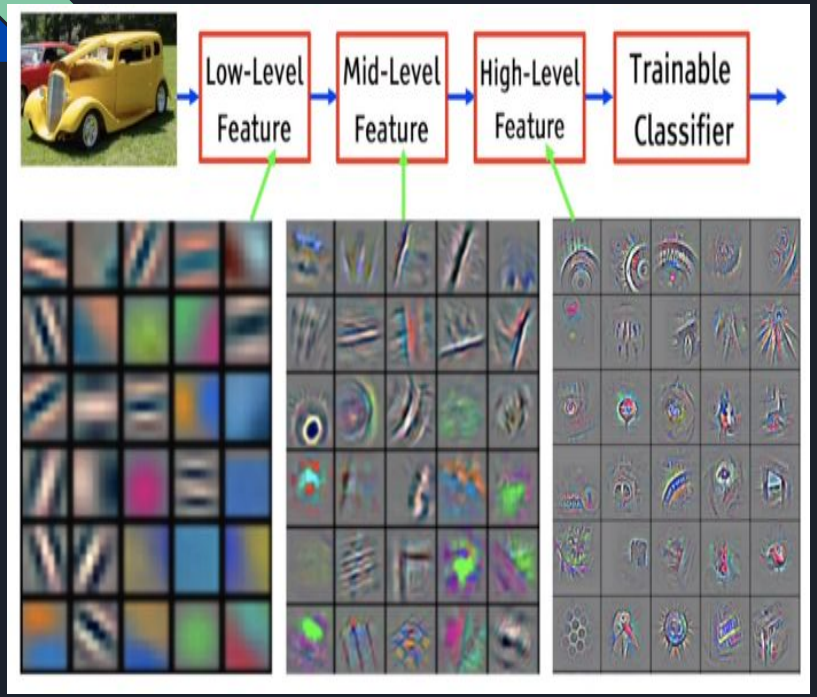
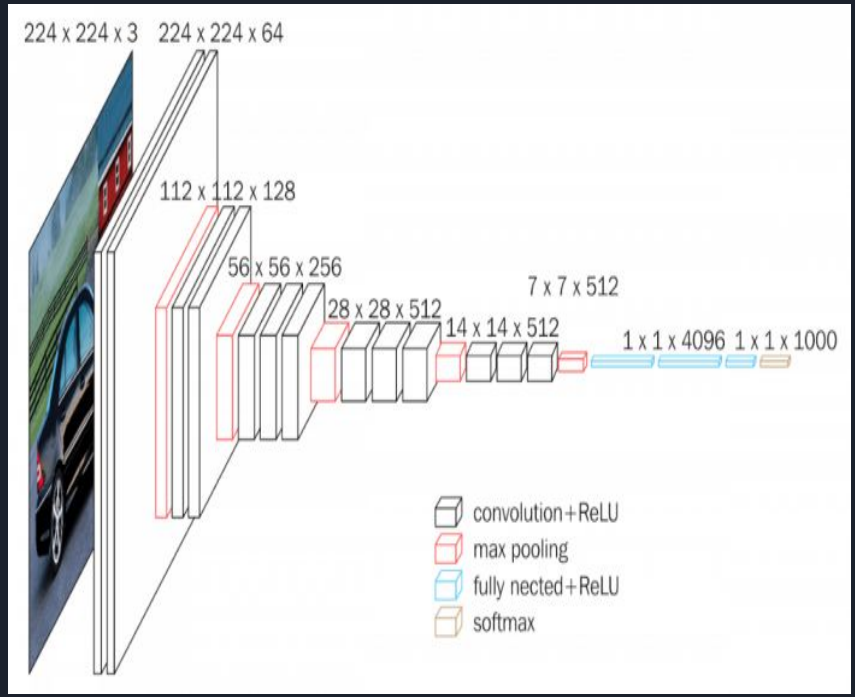



Image from sciencedirect.com

# CNNs Feature Maps

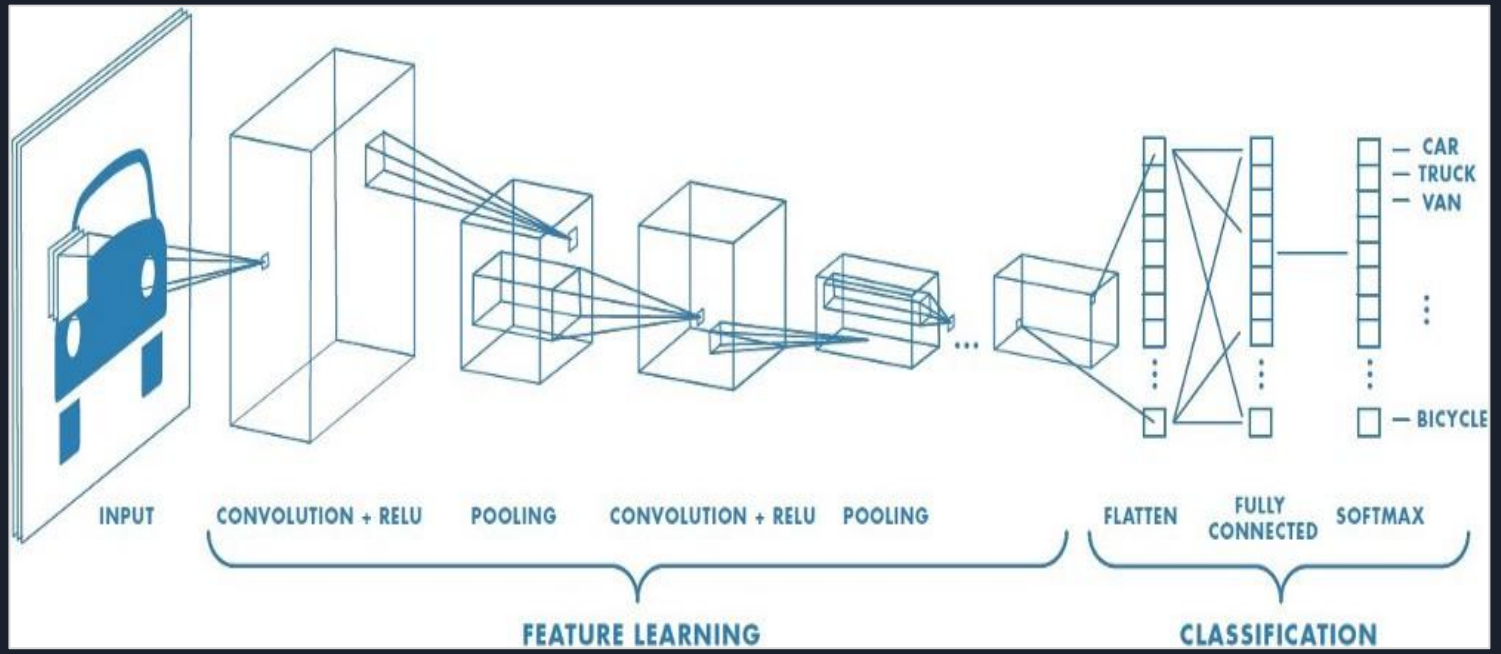



Feature maps extraction (source: Shiv Vignesh)




A CNN model (source: Shiv Vignesh)

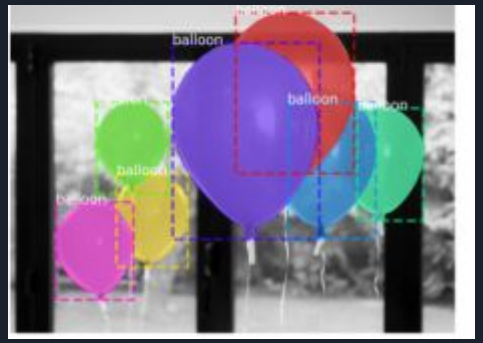
# CNNs (Cont'd)




A typical CNN model (source: Sumit Saha)

# Image Segmentation

- This is the process of classifying each pixel in an image There are two types;
  - Semantic Segmentation
  - Instance Segmentation

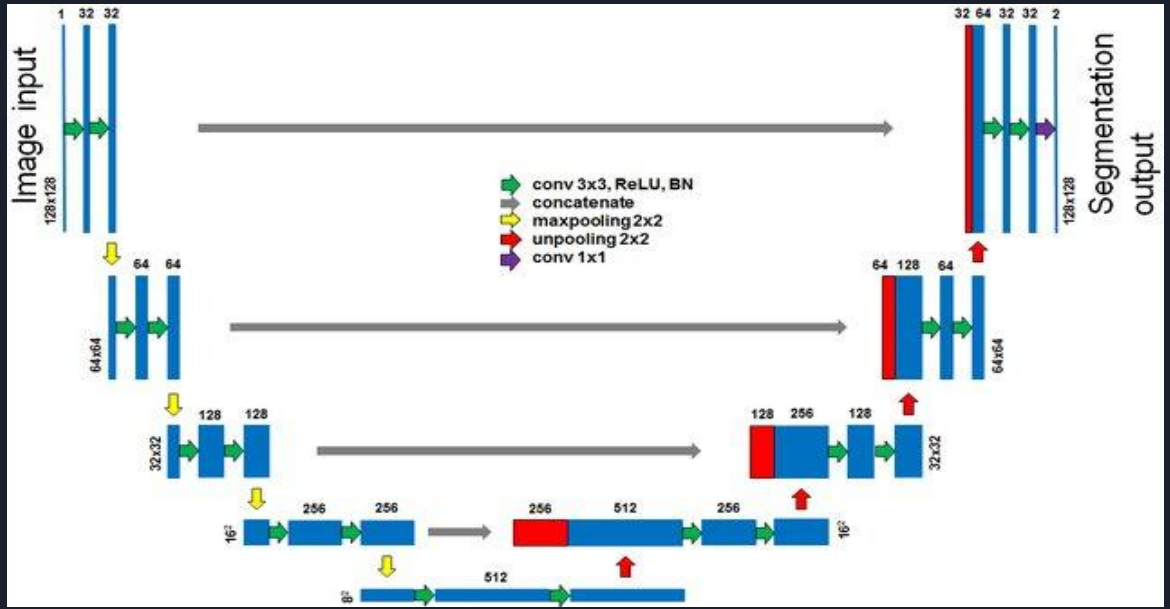



Semantic and instance segmentation left and right respectively (source: Matterport)

# Seismic Facies

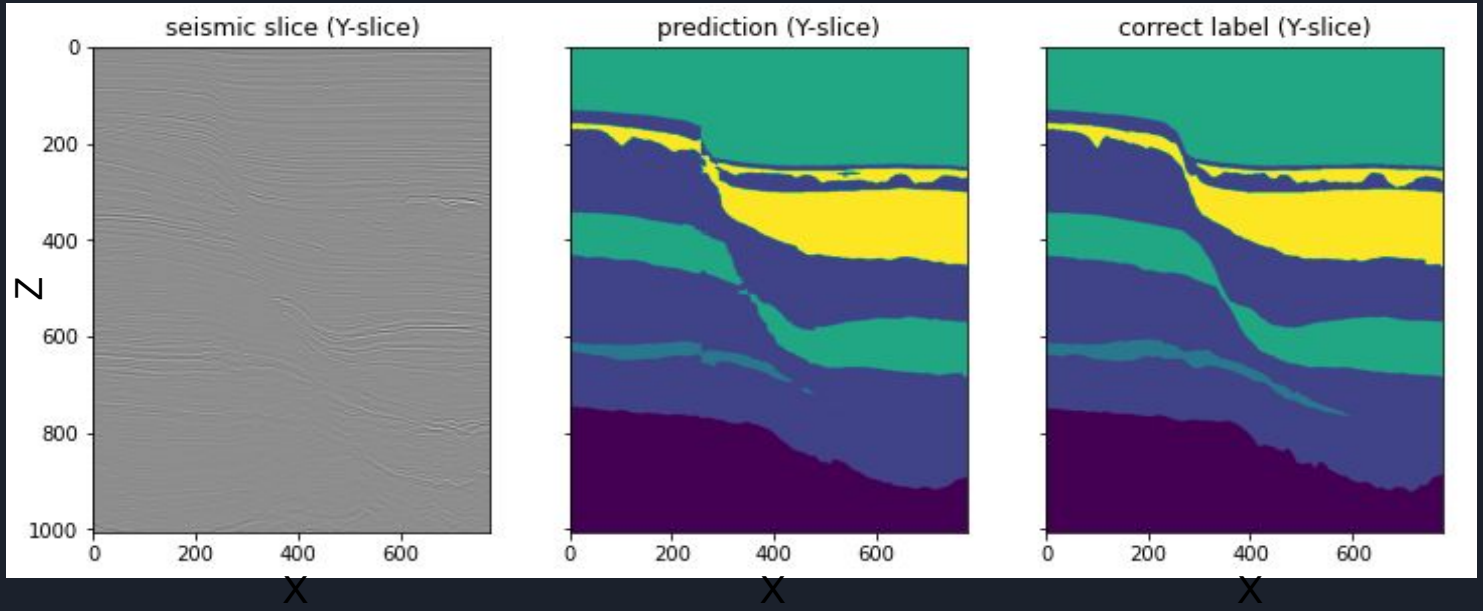
- Seismic facies could either refer to geological or depositional structures in a seismic survey (2D or 3D). They could include; faults, salt domes, channels, bright spots, flat spots, sand waves, and  transparent, chaotic, linear, shingles facies from seismic survey, etc.

# U-Net Model Architecture




A typical UNet architecture (source: Thanh Nguyen)

# SEAM AI Hackathon (cont'd)



# Let’s get started!