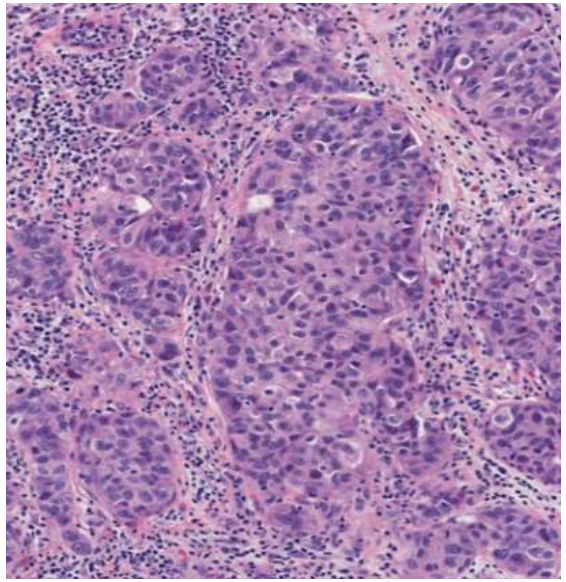
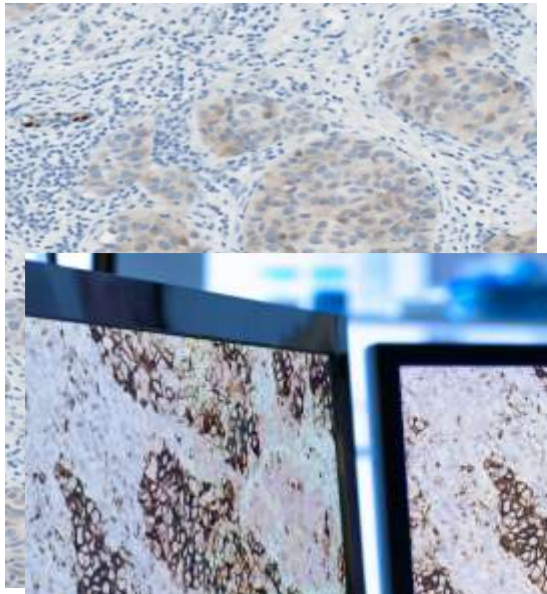
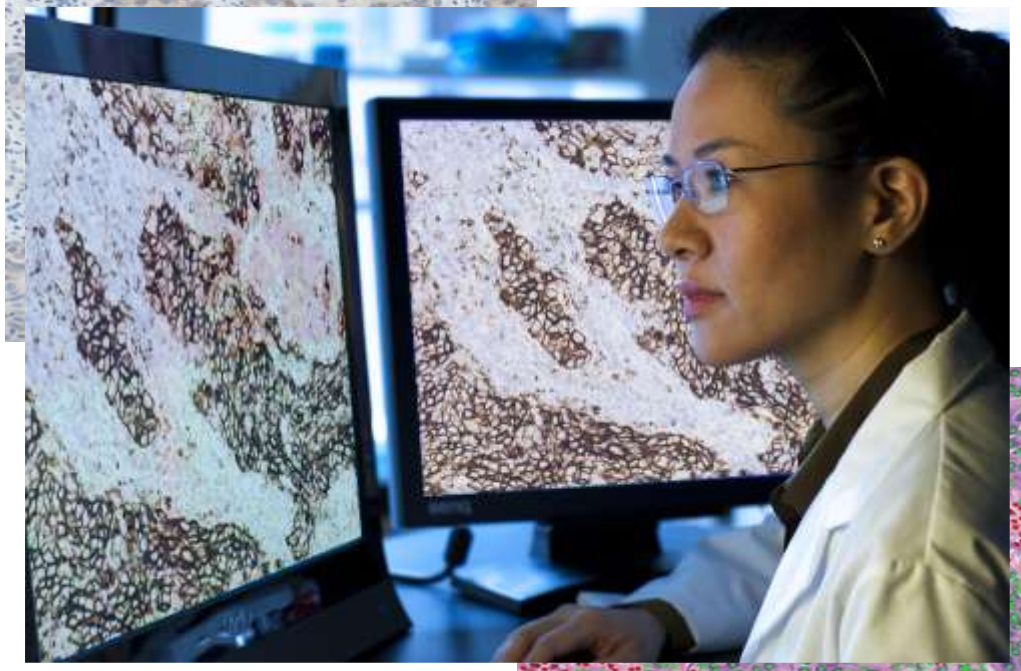
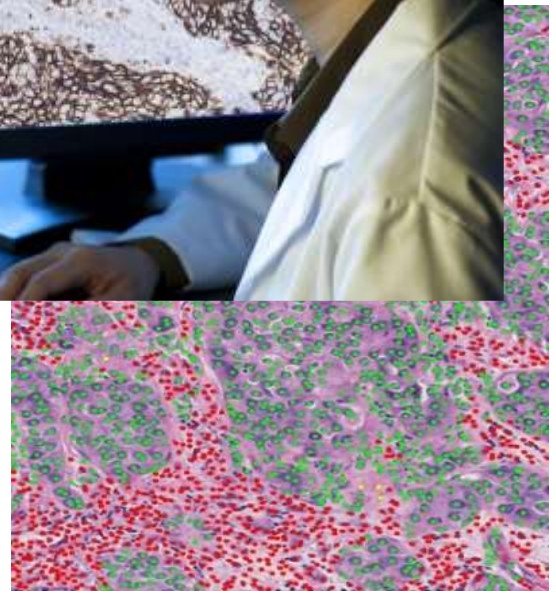
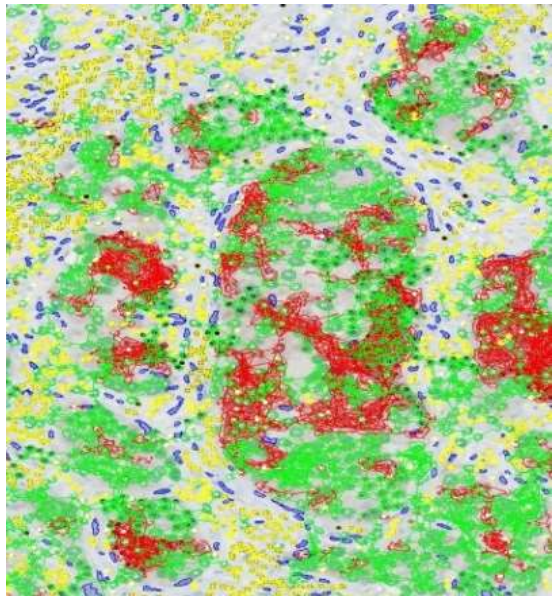
AI and Image Analysis







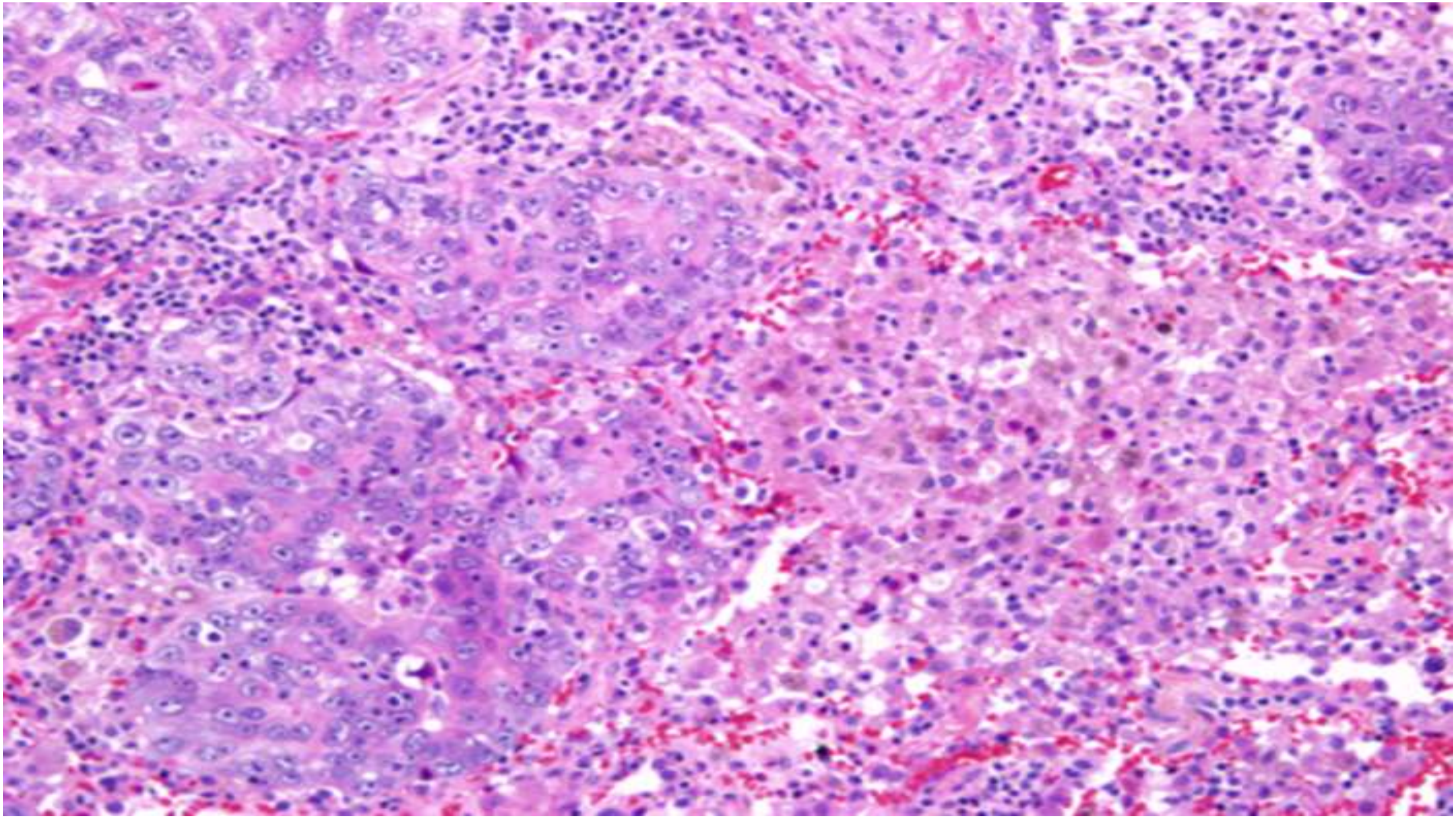




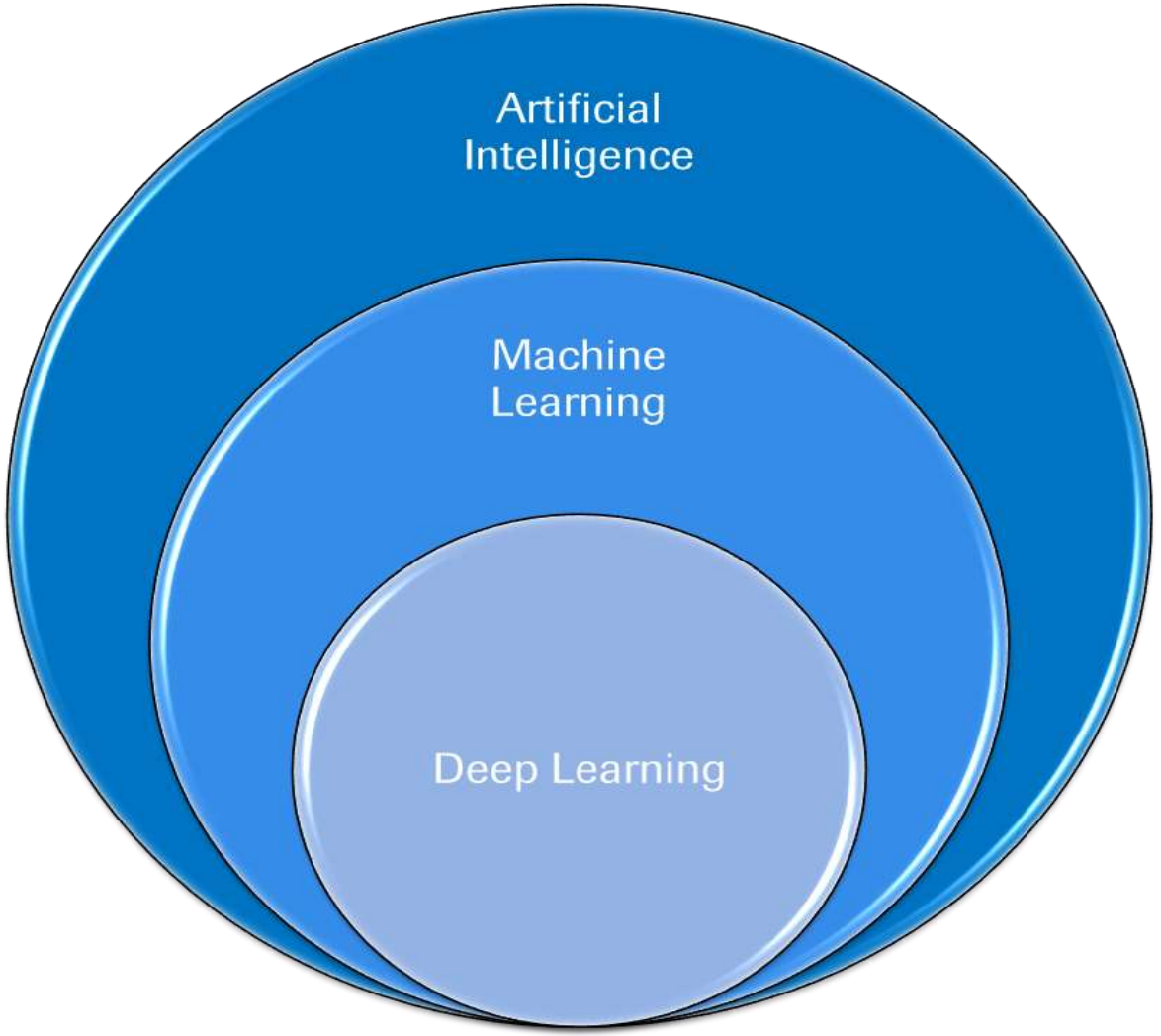
Rule Based Programing vs AI

Algorithm

- 4 Sides
- Closed
- Perpendicular
- Equal Sides



AI, Machine Learning and Deep learning



Definitions

Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind

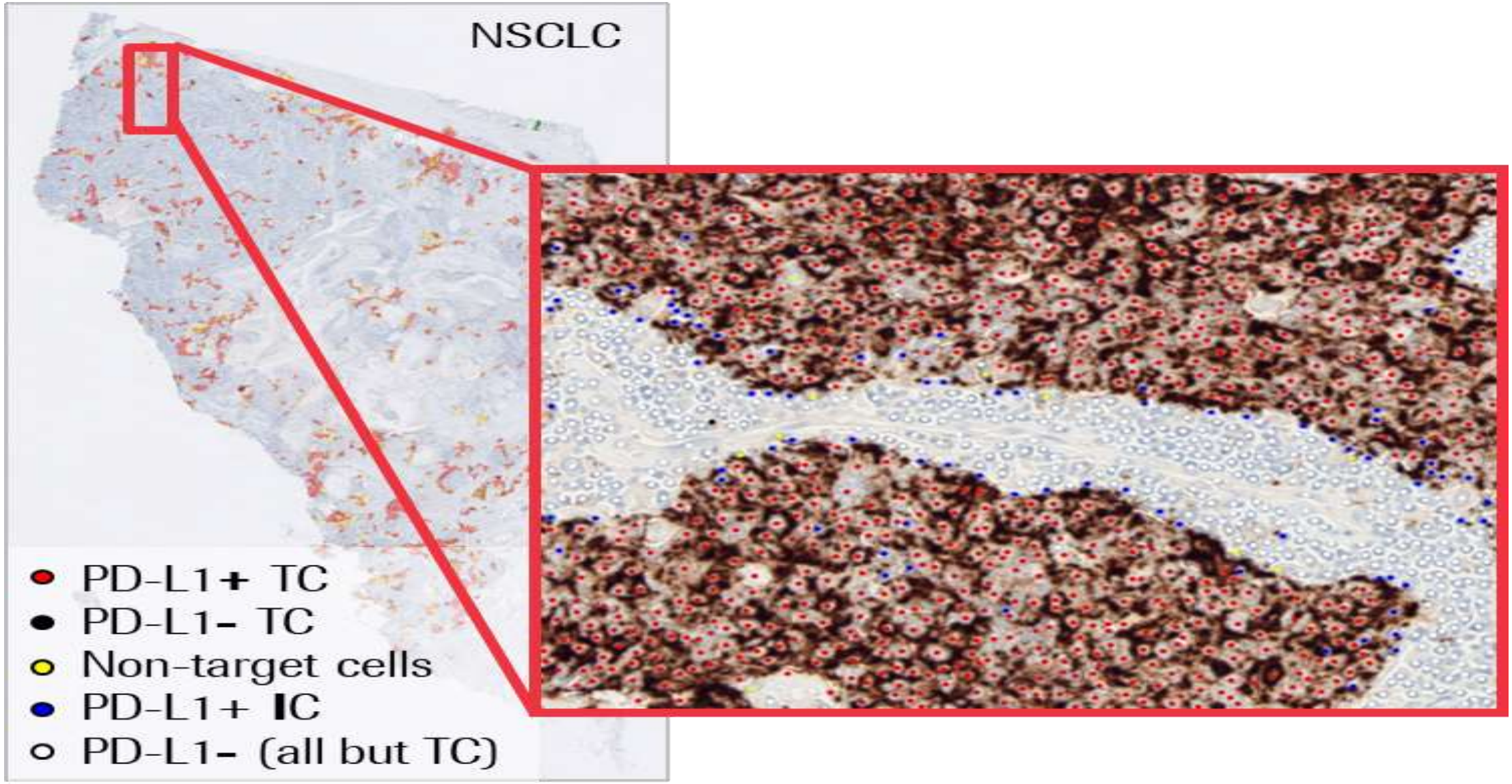
Machine Learning : Algorithms that provide solutions to scenarios that it has not seen in advance, but can predict after seeing data in the form of paired inputs and outputs.

Deep Learning concerned with algorithms inspired by the structure and function of the brain called **artificial neural networks**. While traditional machine learning algorithms are linear, deep learning algorithms are stacked in a hierarchy of increasing complexity (layers) where each layer uses output from the previous layer as input.

Different Learning Strategies

- **Supervised machine learning algorithms** Training using labeled examples to predict future events and comparing it to intended output to modify the model up to the desired accuracy.
- **Unsupervised**
- **Semi-supervised**

Generating Ground Truth : Training, Validating and Testing Data



Machine Learning challenges

- Massive amounts of training data
- Subjectivity of data labeling and ground trothing
- Hidden layers data
- Training data bias
- May not be scalable : A solution may not be applicable for multiple intended uses

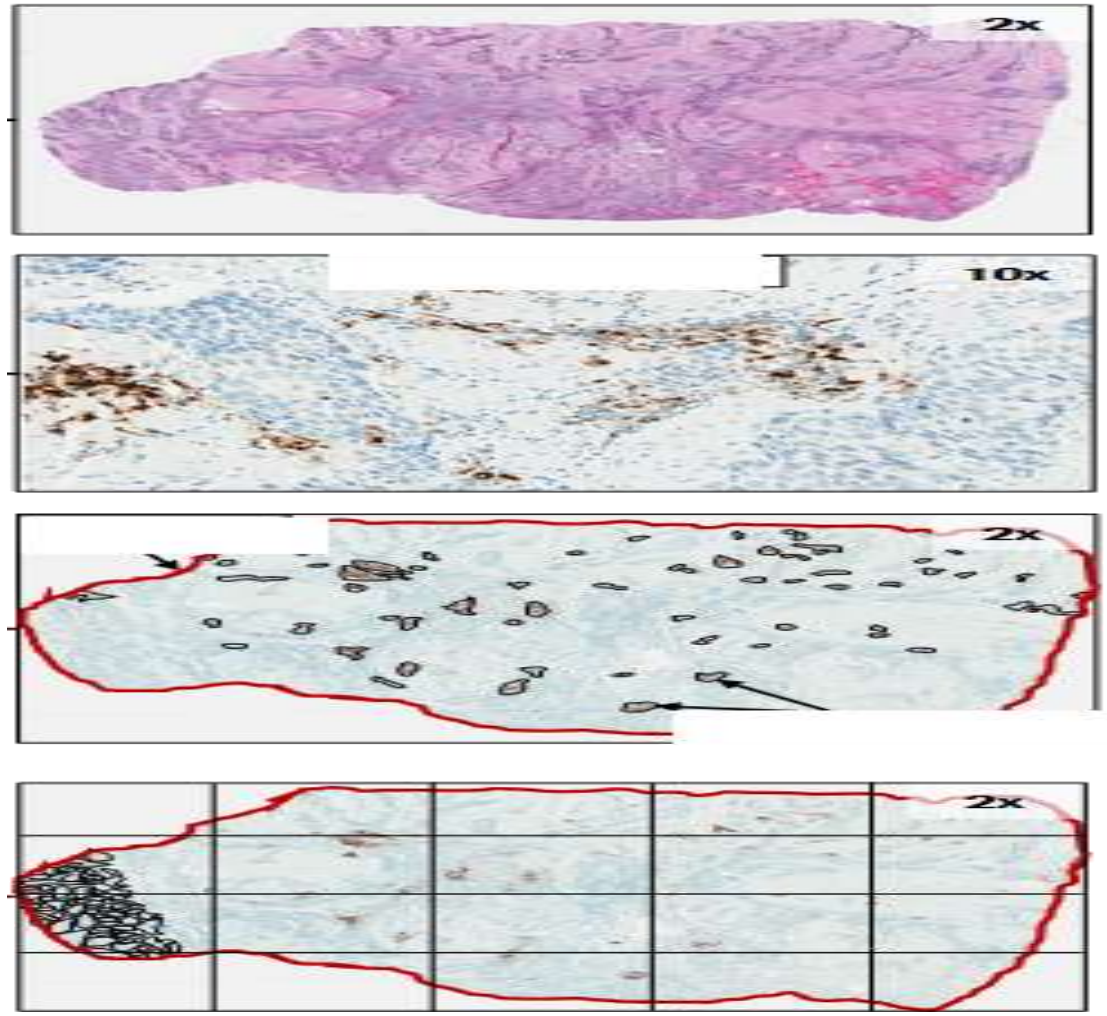
Sources of variability of AI development in pathology

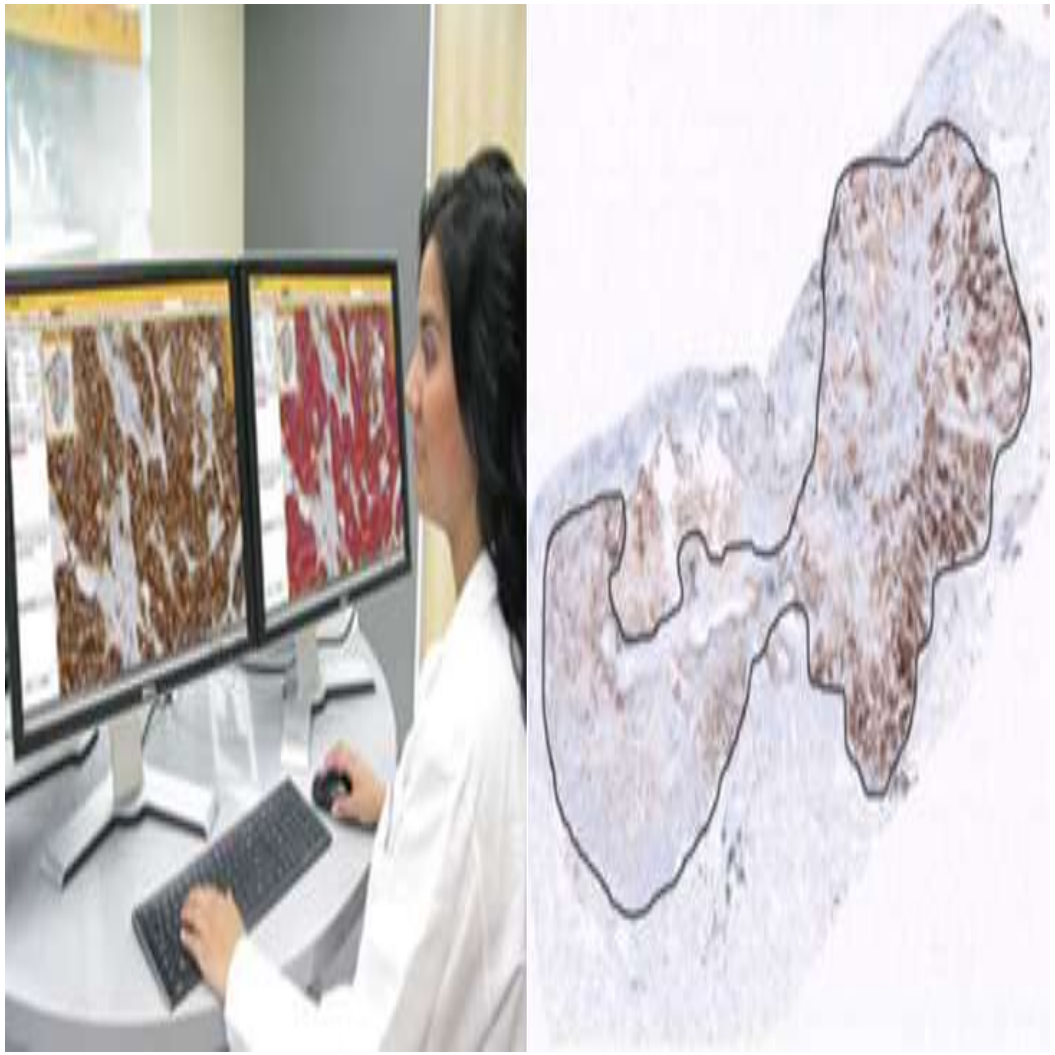
- Preanalytical sample handling/prep
- reagents, staining protocol
- scanner choice
- result interpretation

AI Applications for the pathologist

- Small tumor deposits in lymph nodes
- Cancer Grading
- Quantification (e.g Mitosis)
- Primary diagnosis and Secondary consult e.g. Tumor sign out
- Image analysis applications (PDL1, Her2 ish etc.)
- Text feature extraction
- Text Interpretation of reports
- Coding Error prevention

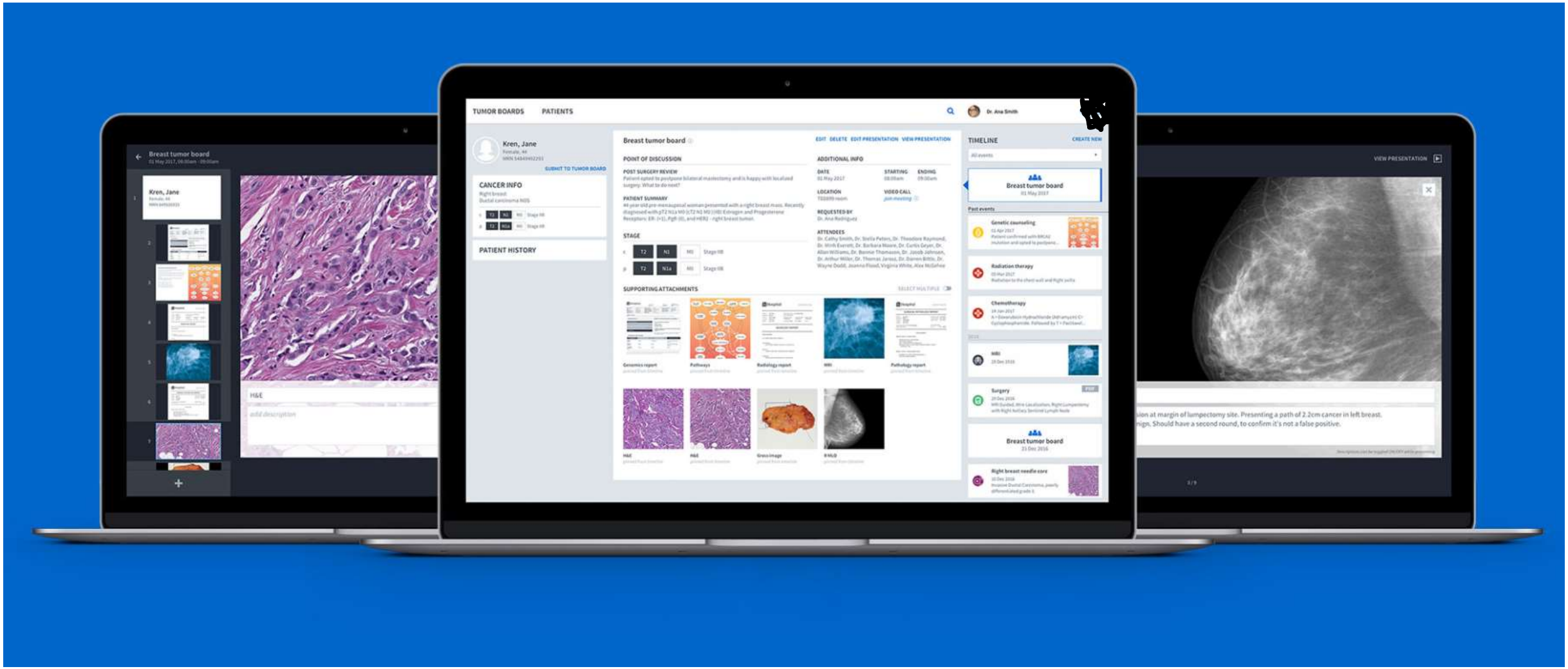
Manual Vs AI Scoring



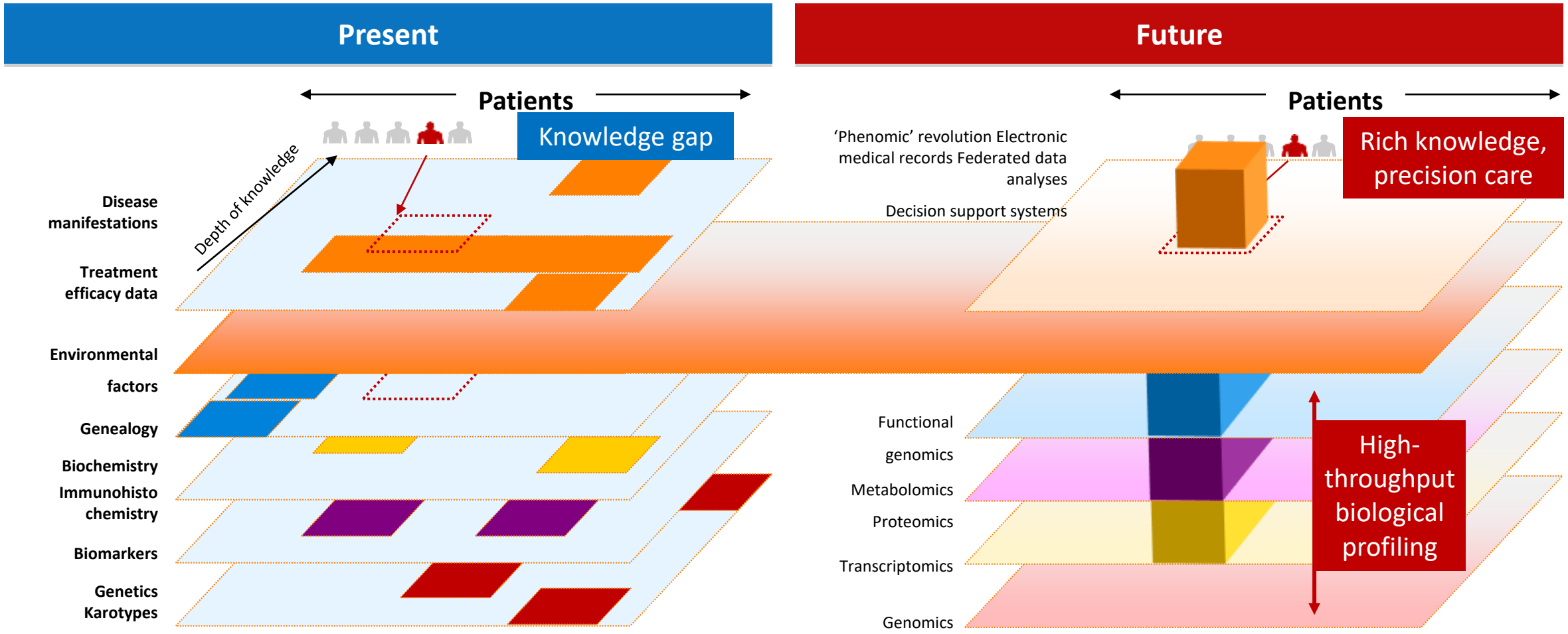


Clinical Decision Support Platforms

Software Tools to Organize Diagnostic Data and Present It



Data-rich precision care of the future



Source: Epstein RJ et al. AFP 2017; 46: 189-93