Welcome

Enhancing the Clinical Development Process with Machine Learning

---

Ian Fleming

Director, Life Sciences, dWise

What is Machine Learning?

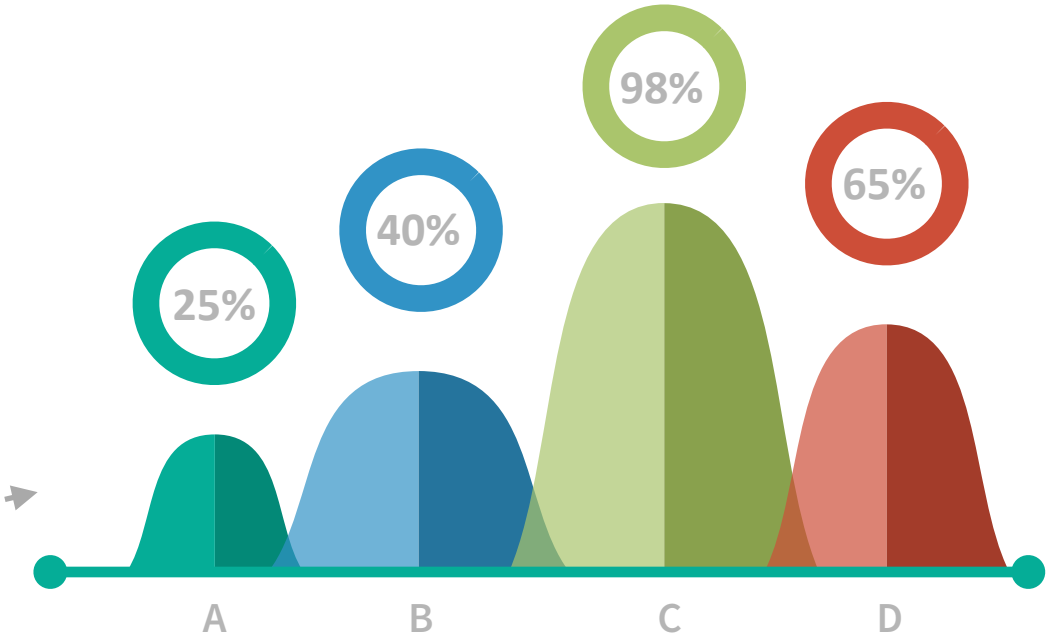
Predictions based on Prior Observation

Machine learning explores the construction and study of algorithms that can learn from and make predictions on data (wikipedia)

Probabilistic based computer algorithms that make predictions about observed data based on previous experience

Probabilistic Modeling

Prediction based on "features"



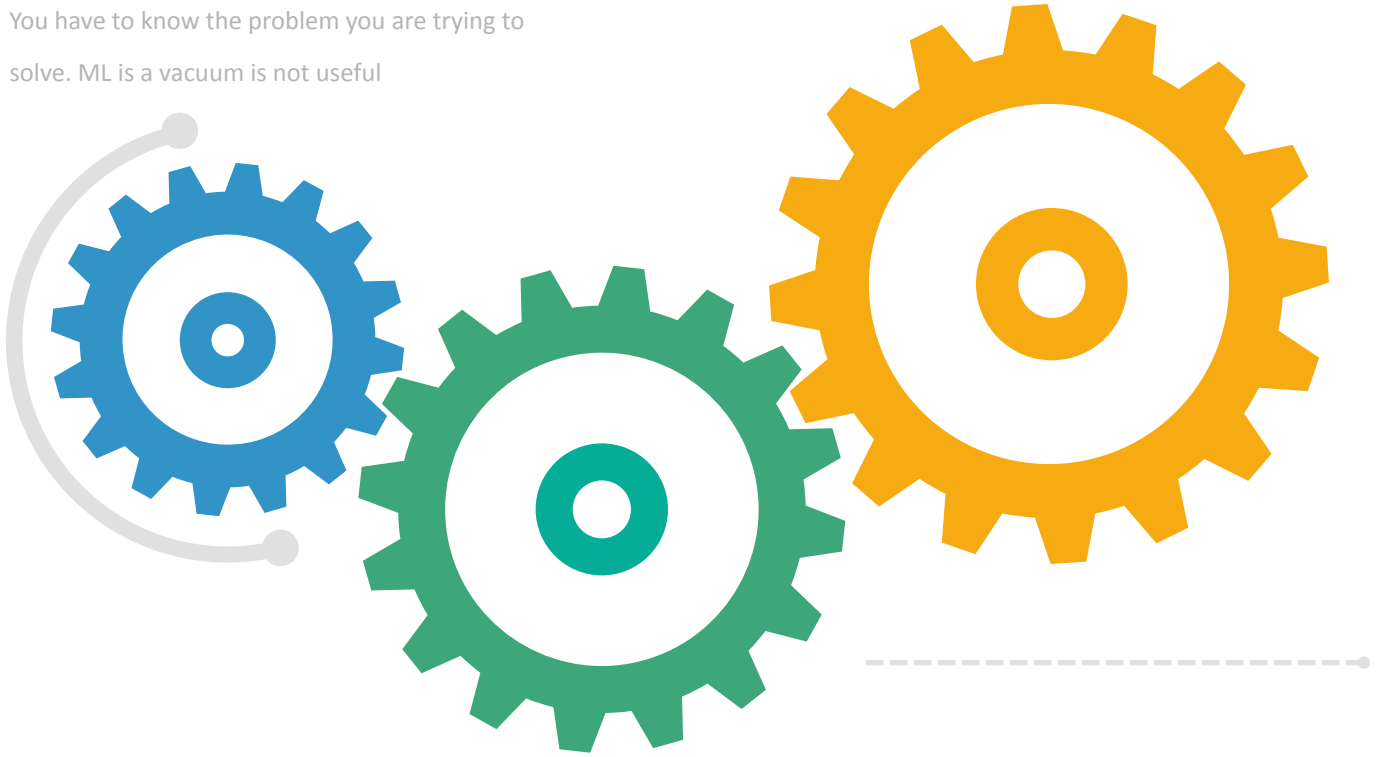
ML determines likely outcomes based on training with already classified data

ML is Multi-disciplinary

Data Science

Real world problems

You have to know the problem you are trying to solve. ML is a vacuum is not useful



Statistics

ML has underpinnings in statistical theory

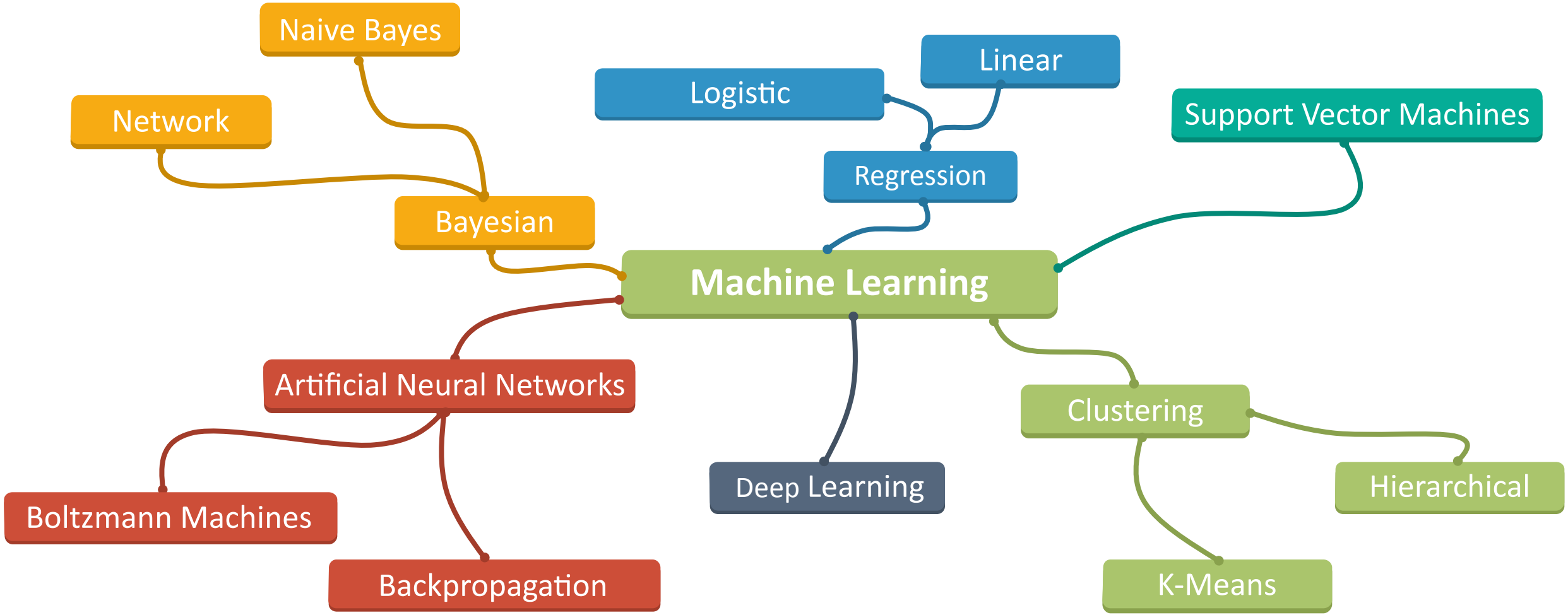
There are some specific ML extensions and terminology, but anyone with statistical training should be able to recognize much of the theory of ML

Computer Science

ML algorithms are implemented primarily in object oriented languages like Python, Scala, and R

Different kinds of Machine Learning

There are many options

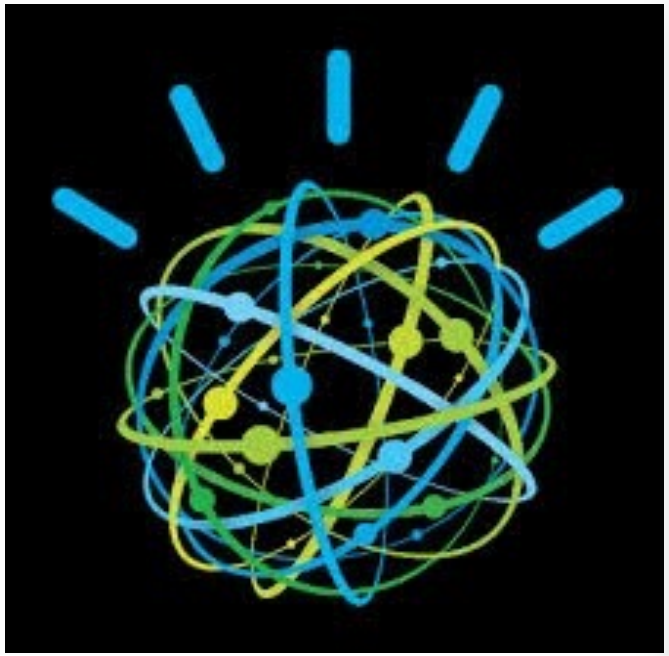


Common ML Applications

You may be familiar with some of these

NATURAL LANGUAGE PROCESSING

SPEECH AND TEXT



IBM WATSON

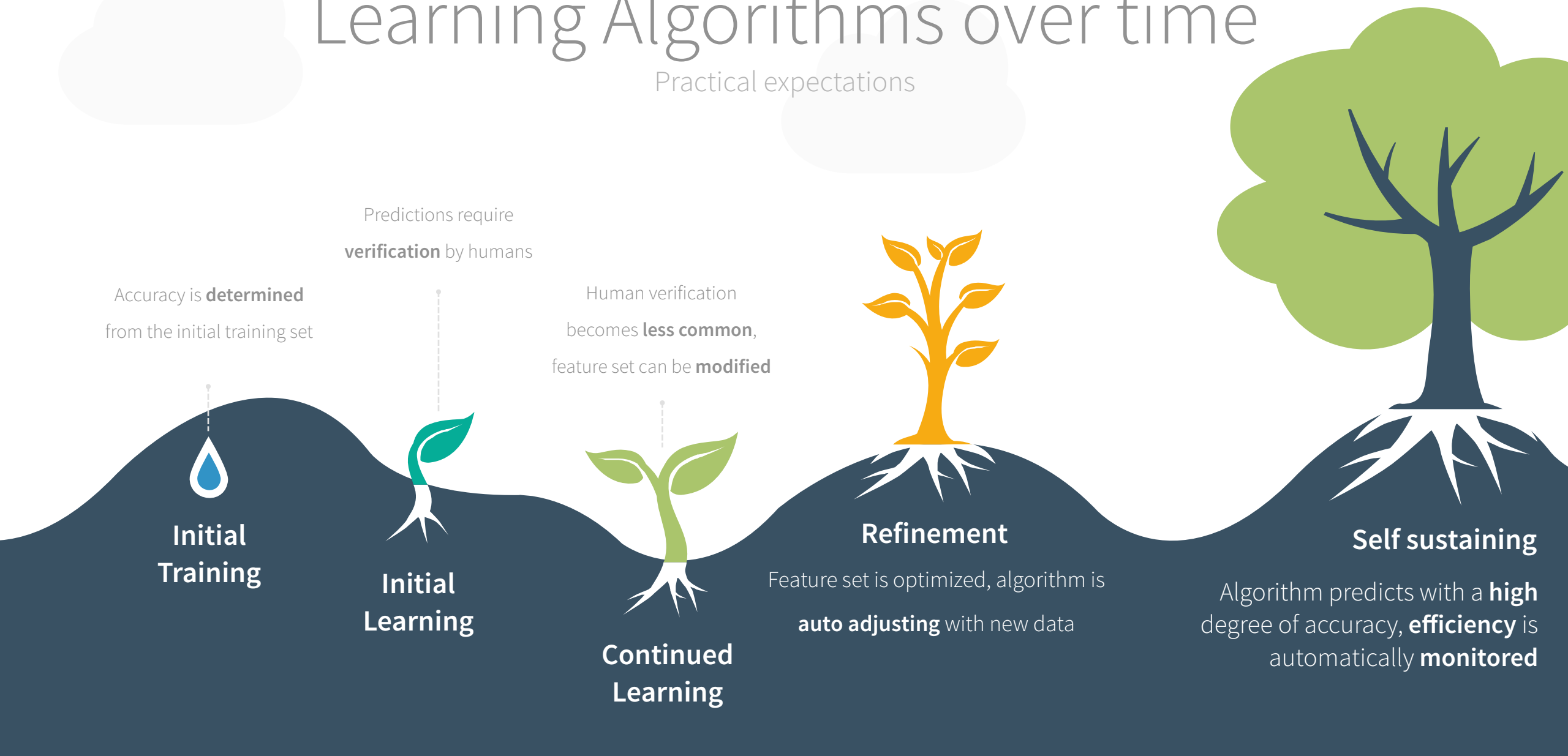
ARTIFICIAL INTELLIGENCE

IMAGE RECOGNITION

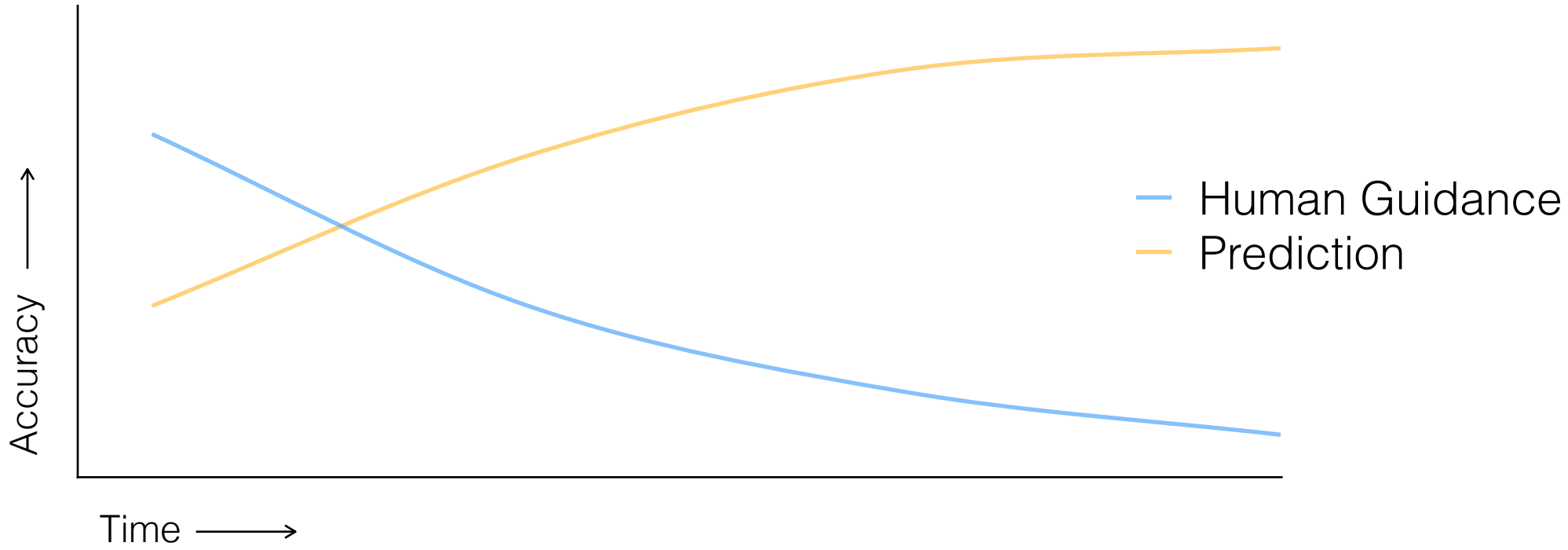
COMPUTER VISION

Learning Algorithms over time

Practical expectations



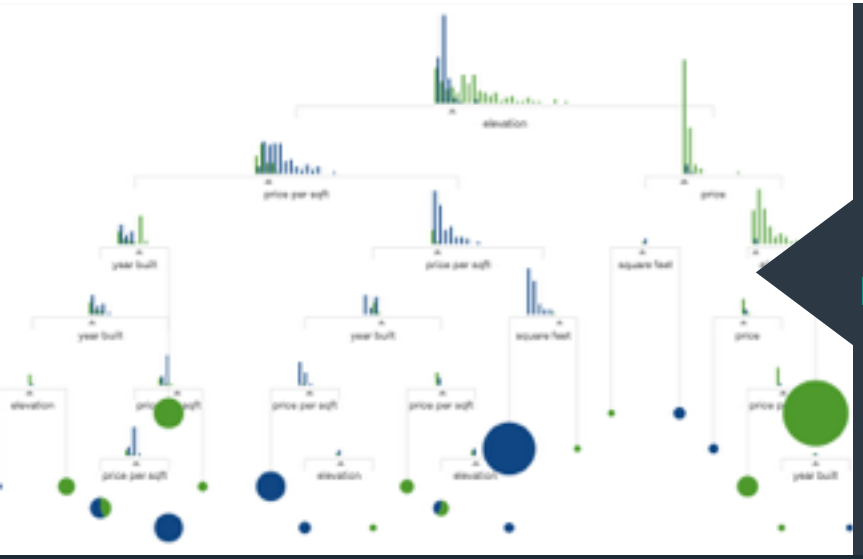
Learning Algorithms over time



Human interaction with the learning system transitions from intervention on mis-categorized predictions to maintenance of the feature set

Great ML Resource

r2d3.us



R2
D3

Machine Learning through d3.js visualizations

d3.js is a javascript library used to build interactive data visualizations

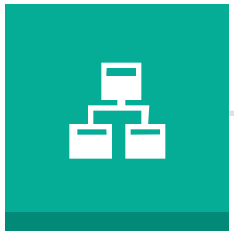
Machine Learning can be leveraged at numerous points in the clinical development process, facilitating better science

The Clinical Development Process

Better future science through learning from past experience

Program Planning

ML can guide program planning in determining phases, studies, and strategies based on similar programs



Study Design

Study designs can be recommended and confirmed/modified based on prior studies with similar attributes

Protocol Development

Schedule of events , structured protocol information, authoring assistance

Data Collection

Sponsor study start up, clinical site data entry workflow

Risk Based Monitoring

Data irregularities, guided source data verification

Statistical Analysis

SAP content and authoring, specific analysis recommendations

Regulatory Review

Being able to identify submission aspects that may require more thorough review

Clinical Ontologies

Development of clinical ontologies is time consuming and theoretical, ML can guide that process

Data Integration

ML would greatly improve the identification of data into known categories

Data Mining

ML can aid in the discovery of information in data that is difficult to find through human based analysis

From Theory to Reality

There are significant hurdles

Data

ML algorithms require a lot of data for training

Computer Science

Skill sets in the industry need to be adjusted to more broadly understand CS concepts

Risk

ML is prone to error by nature, so our processes need to account for this

Ian Fleming

Director, Life Sciences

d-Wise
Moving Beyond the Data

dWise: Morrisville, NC
Me: Brooklyn, NY

ian.fleming@d-wise.com