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# Learn regression algorithms using Python and scikit-learn

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# Let's get started

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<https://ibm.biz/RegressionWebinar>
- Follow along for the hands-on  
<https://ibm.biz/RegressionCodelab>



# Agenda

## What is Machine Learning?

Data Analysis Types

Machine Learning Types

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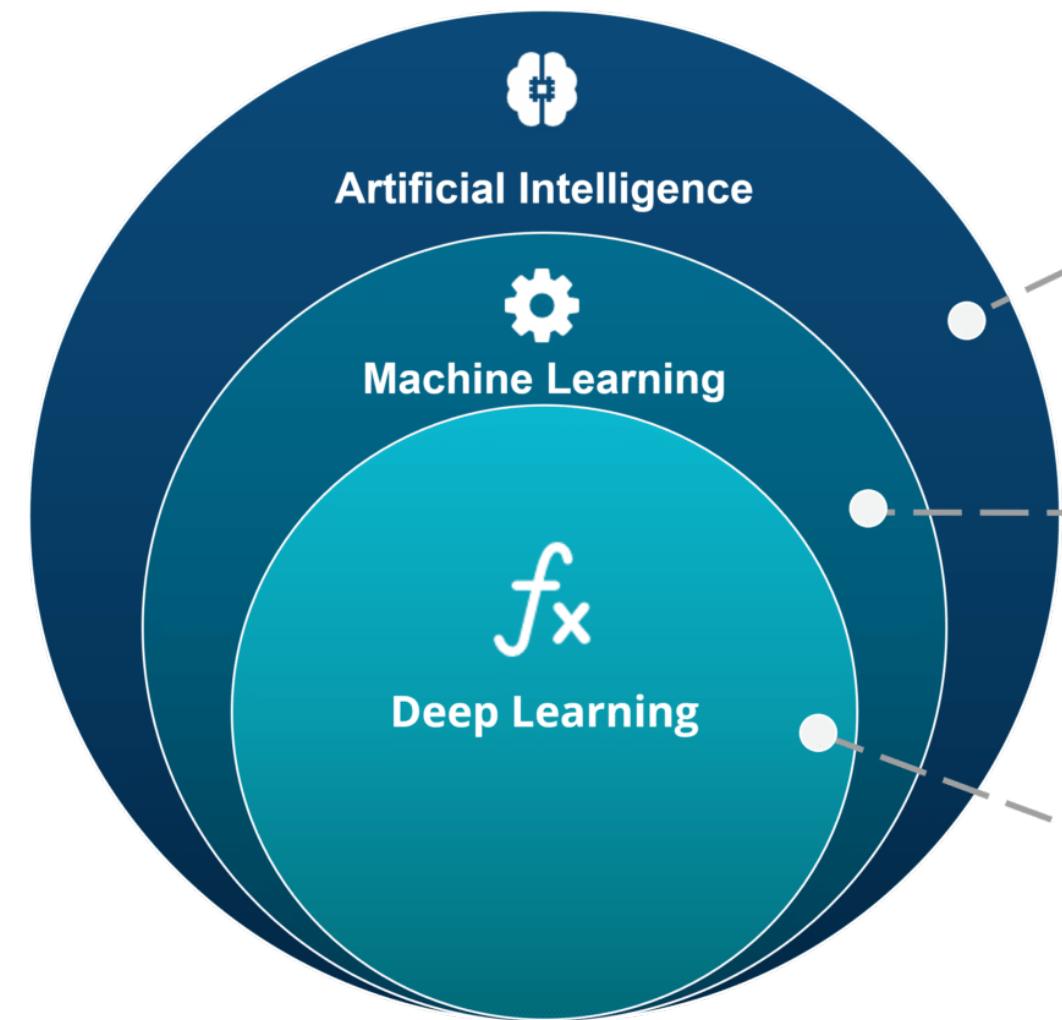
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# What is Machine Learning?



## ARTIFICIAL INTELLIGENCE

A technique which enables machines to mimic human behaviour

## MACHINE LEARNING

Subset of AI technique which use statistical methods to enable machines to improve with experience

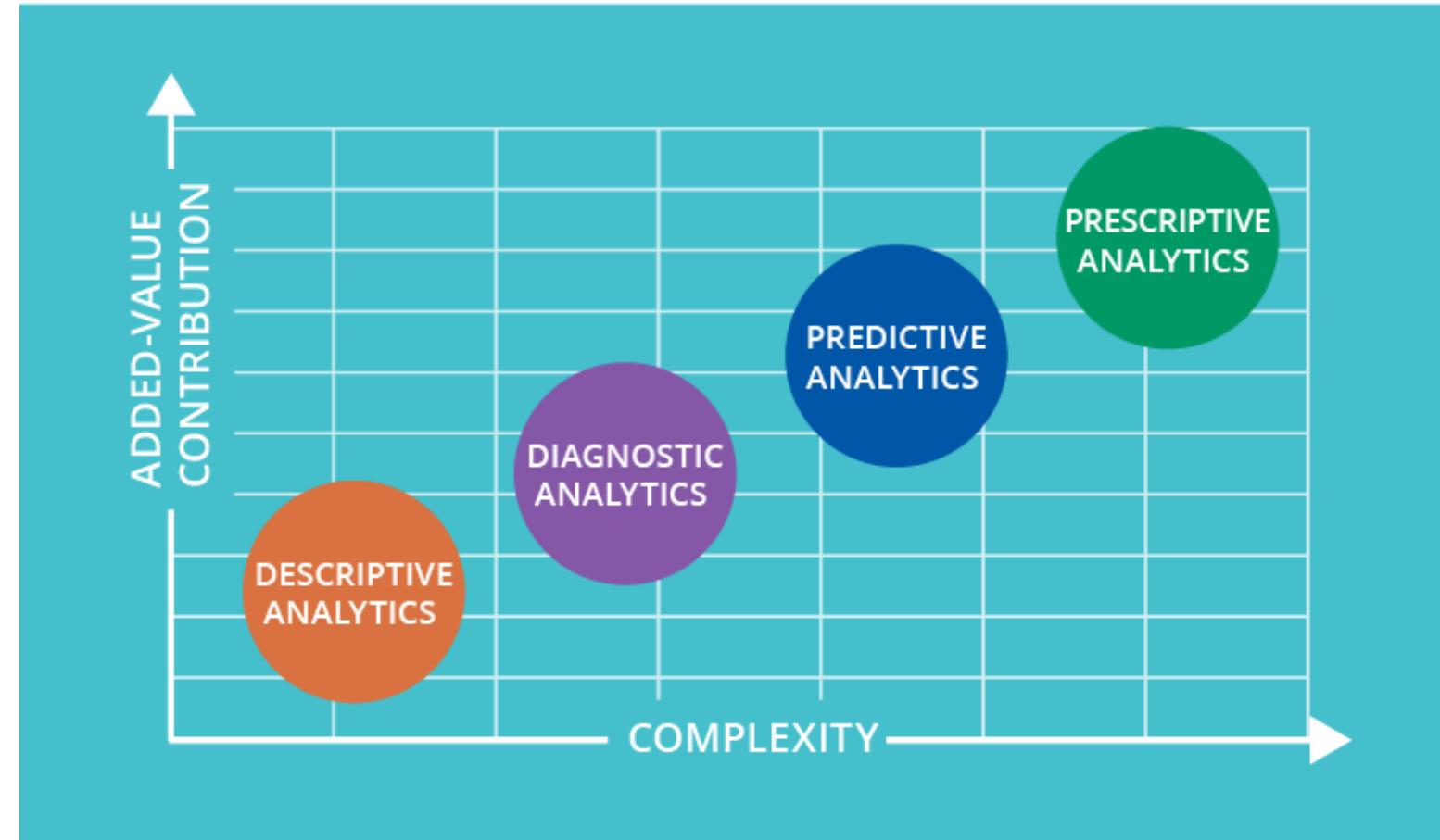
## DEEP LEARNING

Subset of ML which make the computation of multi-layer neural network feasible

# Data Analysis Types

- What happened?
- Why it happened?
- What will happen?
- What to do?

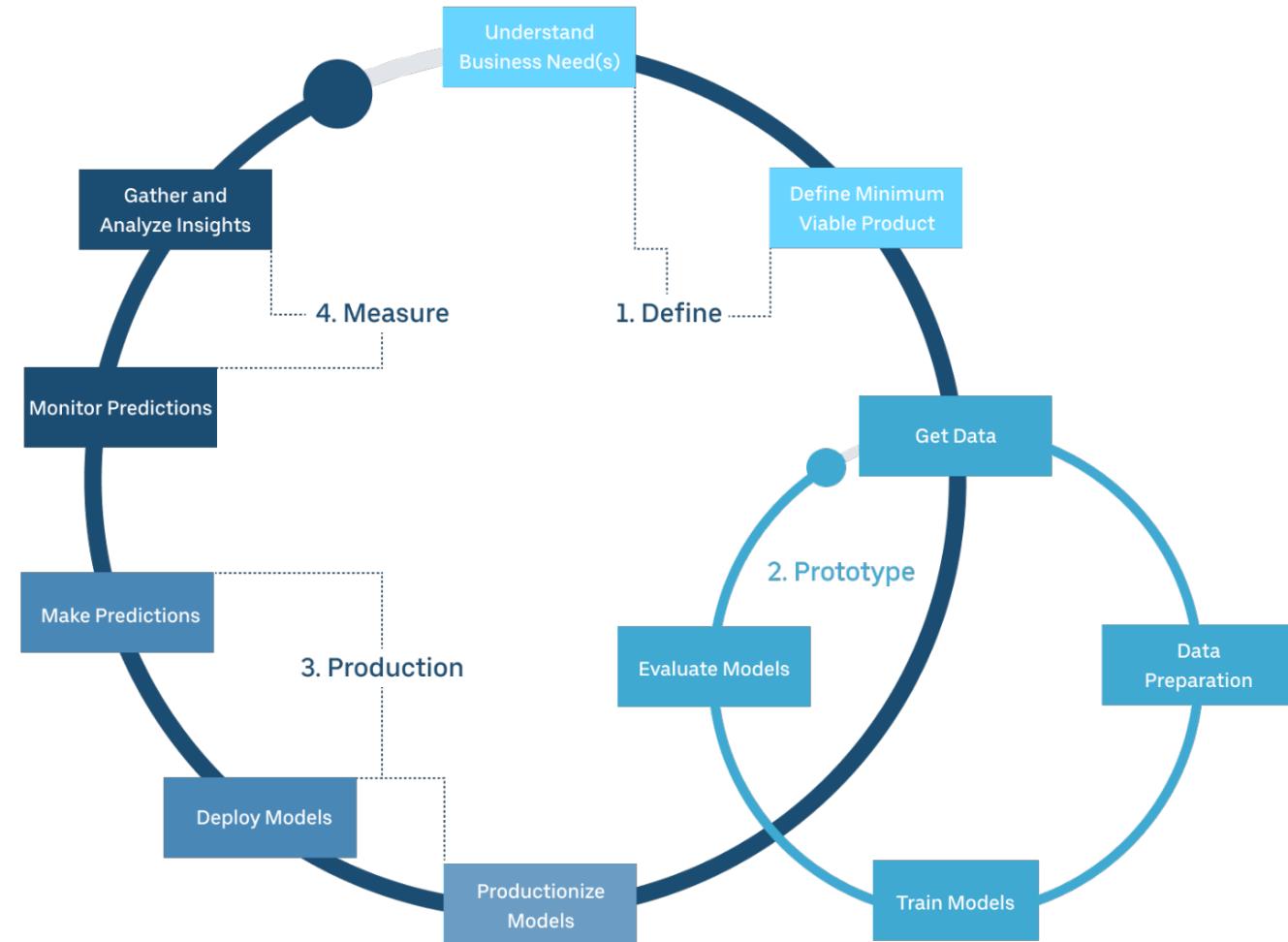
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# ML Process

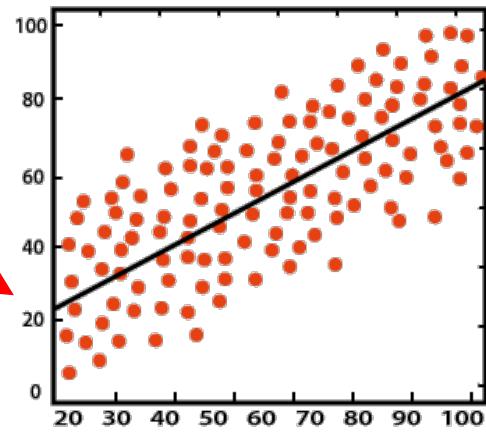
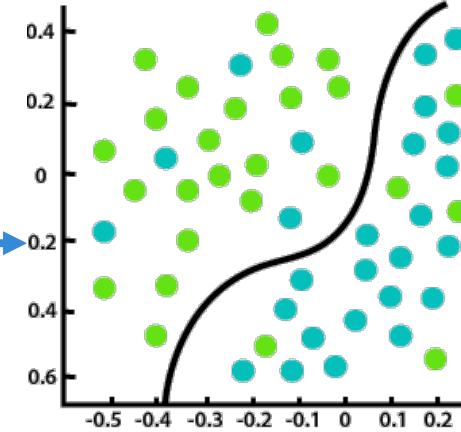
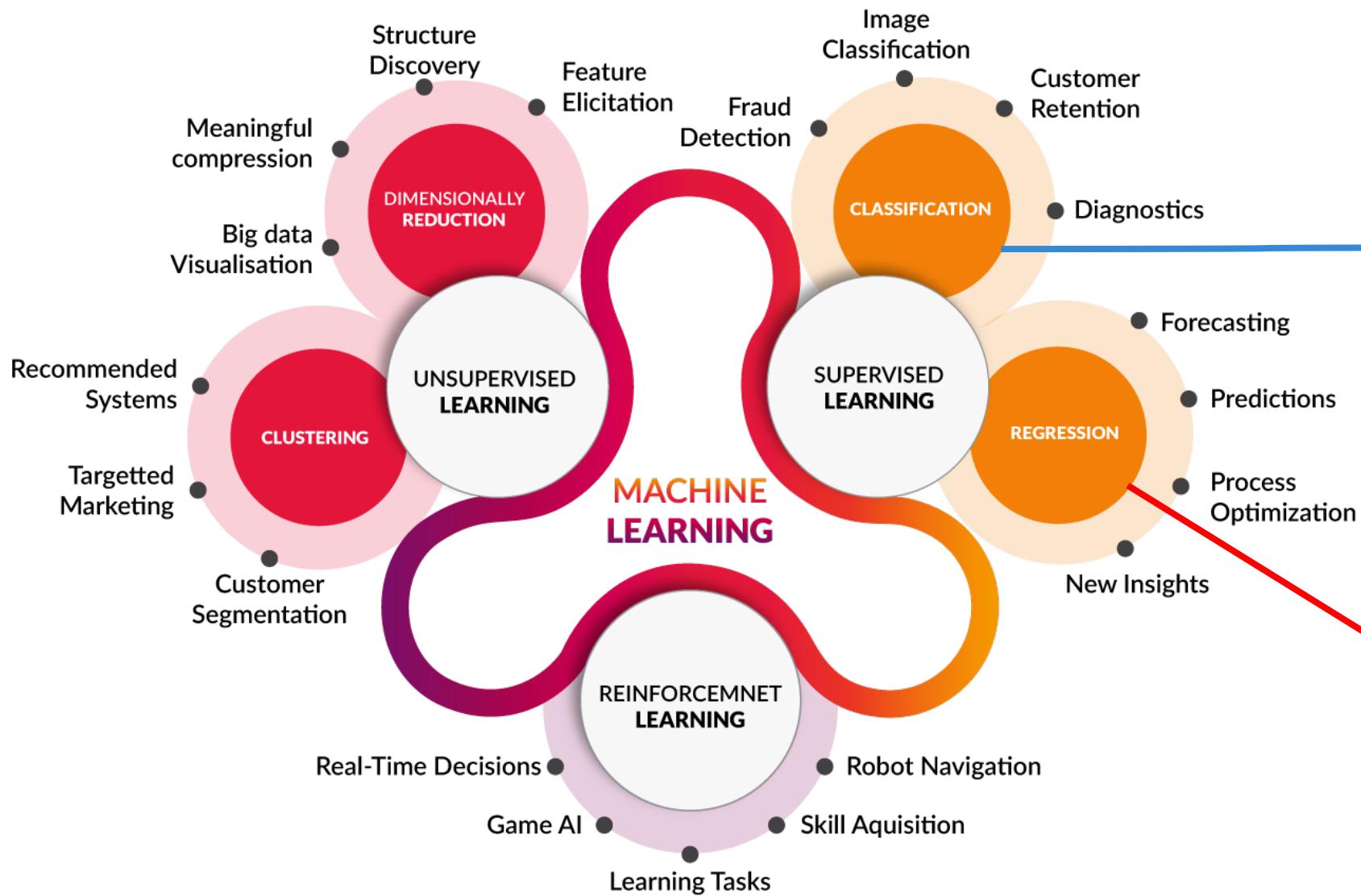
- Define the problem and solution
- Develop and prototype the model
- Produce the model
- Measure the model

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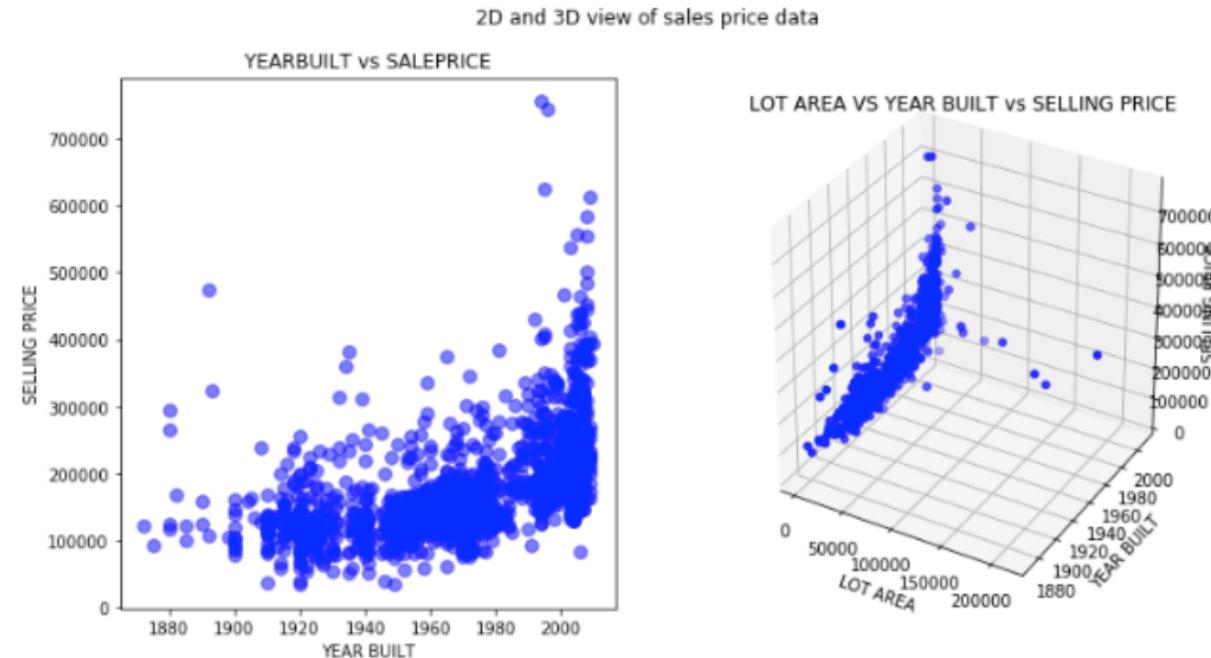
# Machine Learning Types

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# What is Regression?

- Supervised learning algorithm
- Feature to predict contains continuous values
- Analyzing relationship between other independent variables
- Based on a hypothesis
- Use Cases: Insights, optimizations, forecasting, predictions



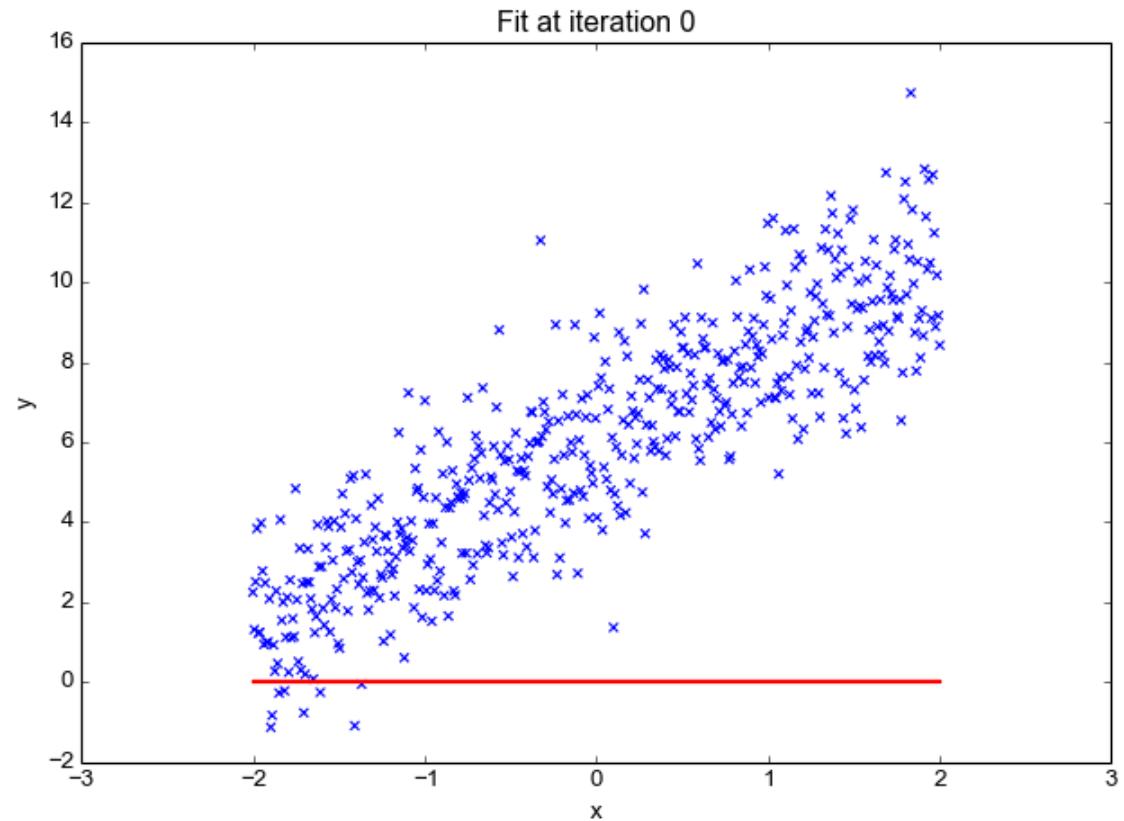
# Linear Regression

Predicts a continuous target when there is a linear relationship between the target and one or more predictors. There are 3 types of linear regressions:

1. Simple Linear Regression
2. Multiple Linear Regression
3. Polynomial Linear Regression

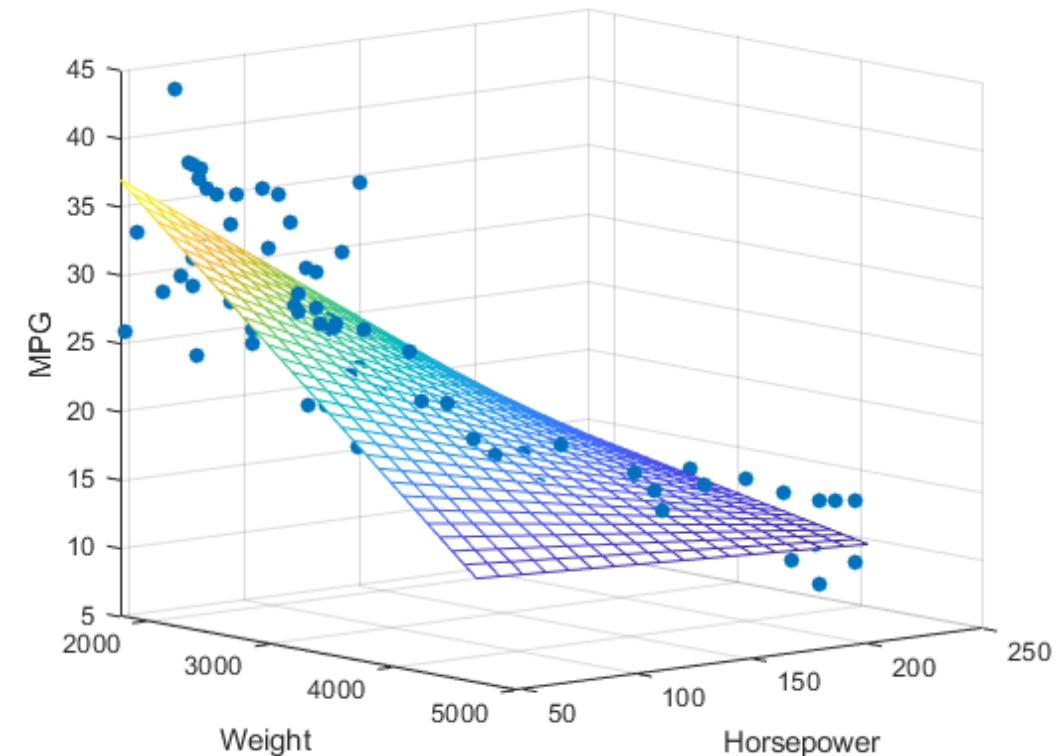
# Simple Linear Regression

- Most basic form of linear regression
- Target to predict depends on only one other variable
- Uses the same formula to calculate the slope of a line:  $y = w_0 + w_1 * x_1$



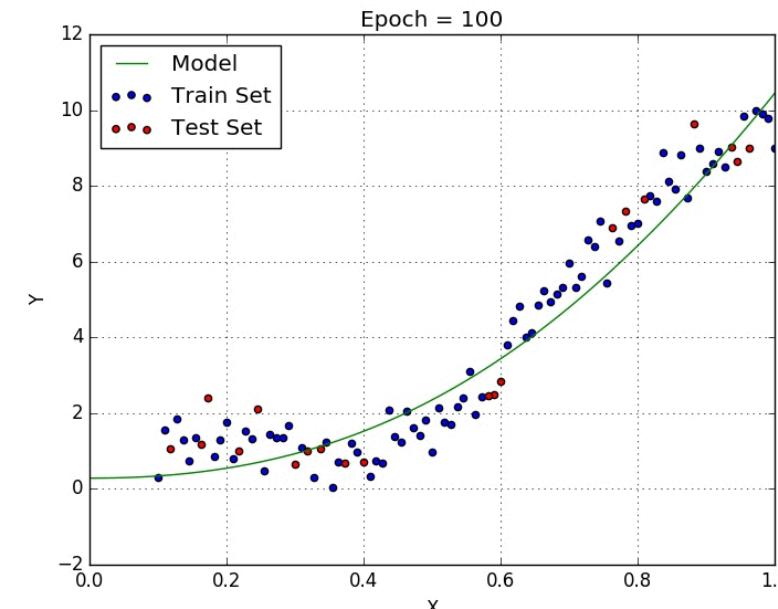
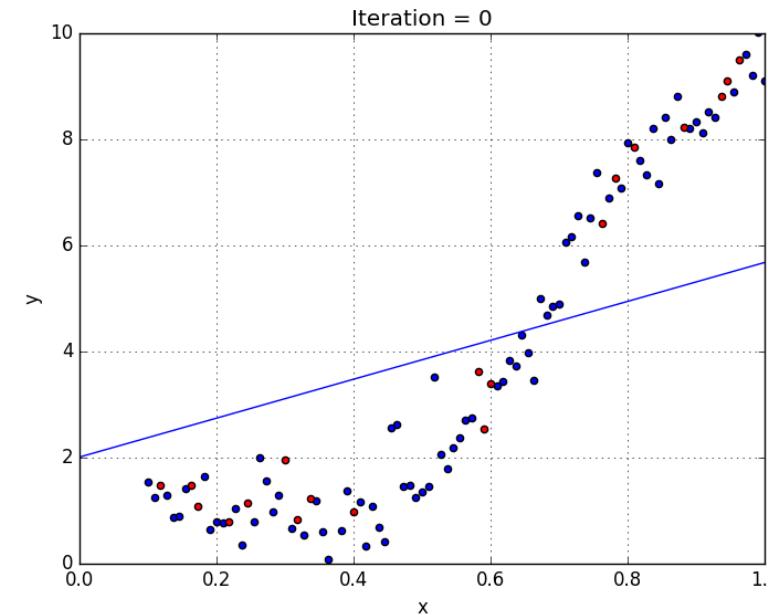
# Multiple Linear Regression

- Extension to simple linear regression
- Target to predict depends on more than one variable
- Number of variables depends on the use case
- Uses the formula :  
$$y = w_0 + w_1 x_1 + w_2 x_2 + \dots + w_n * x_n$$



# Polynomial Linear Regression

- Used when simple or multiple linear regressions don't fit the data accurately
- Provides the best approximation of the relationship between the target and independent variable.
- Uses the formula :  
$$y = w_0 + w_1 x_1 + w_2 x_2^2 + \dots + w_n * x_n^n$$

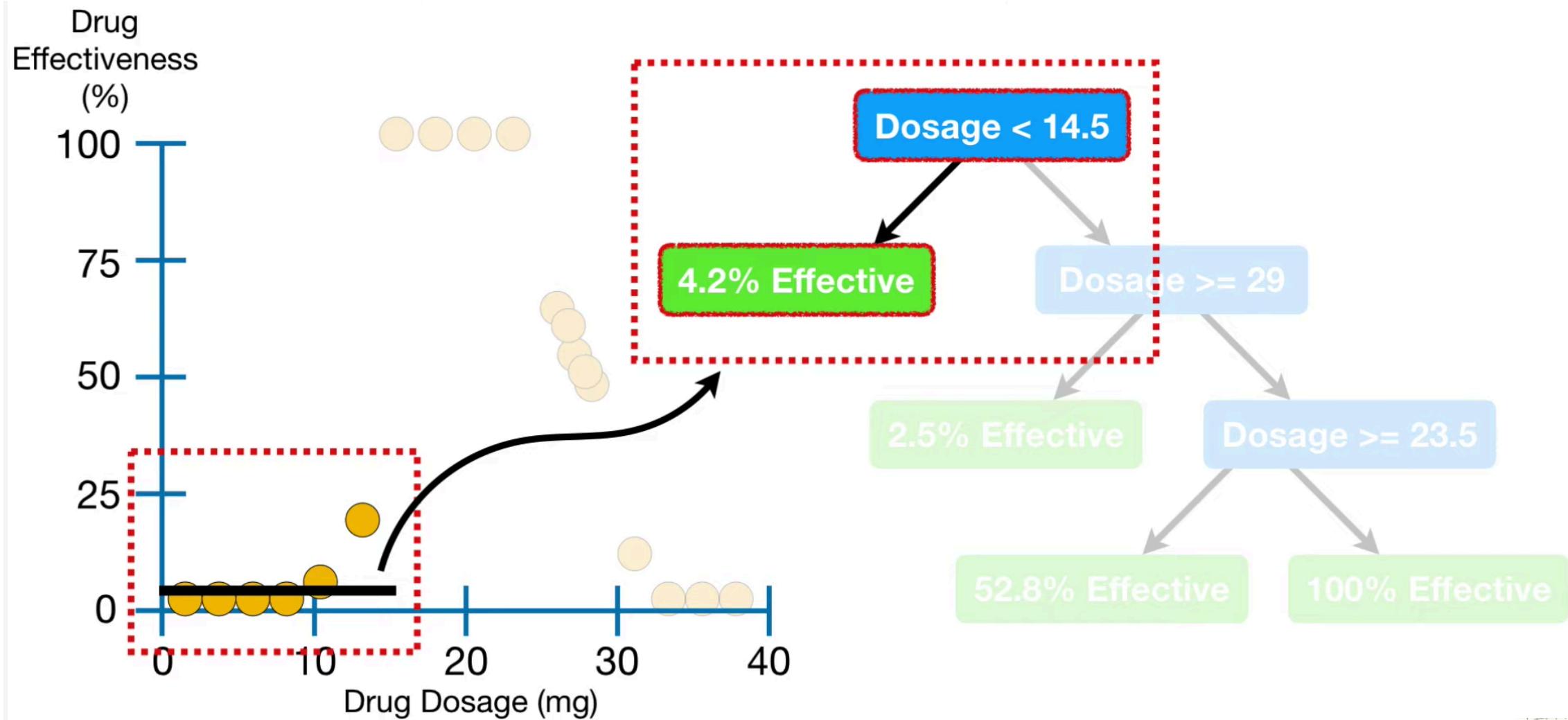


# Decision Trees

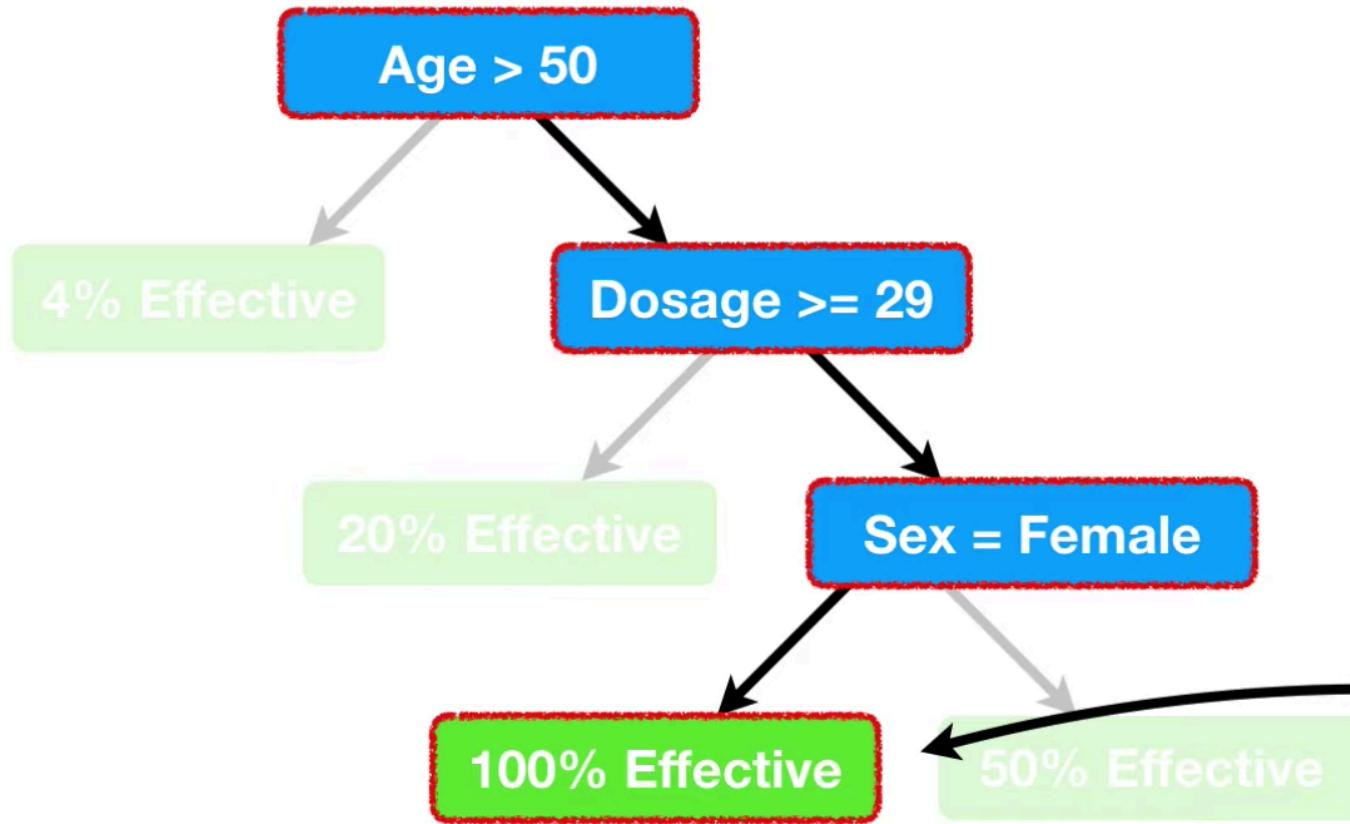
- Builds a set of rules from the training data to be able to predict the outcome.
- Branches represent the rules and the leaves represent the outcome.
- A leaf contains multiple values.
- In regression, final prediction is the average of all values of the leaf.

# Decision Tree Example

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# The Big Deal of Decision Trees



Dosage	Age	Sex	Etc.	Drug Effect.
10	25	Female	...	98
20	73	Male	...	0
35	54	Female	...	100
5	12	Male	...	44

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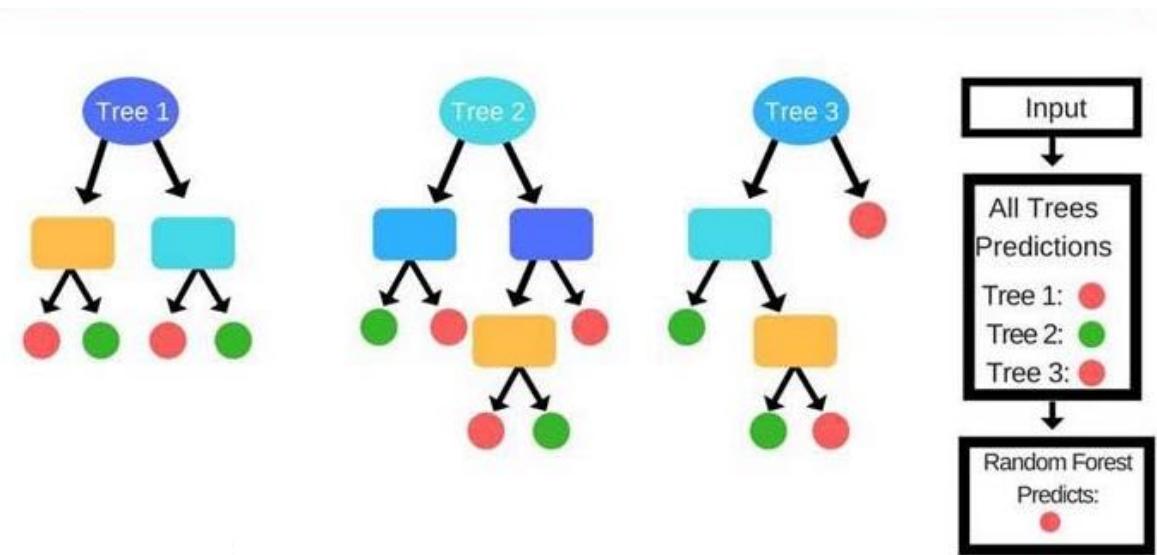
# Ensemble Learning

- More than one algorithm is combined to produce a better model
- Homogenous ensemble and Heterogenous ensemble
- Examples: Random Forest and Gradient Boosted Tree



# Random Forest

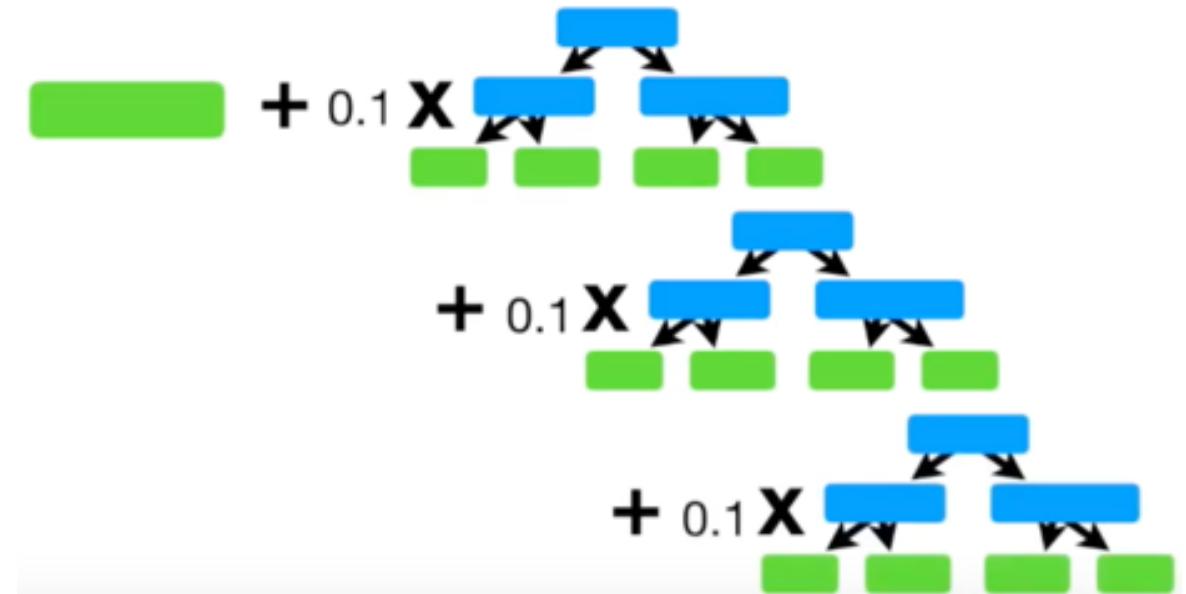
- Homogenous ensemble
- Multiple decision trees are combined into a single model to improve accuracy
- Number of decision trees is arbitrary
- Each decision represents a subset of the training data
- Final predicted value is the average of the values acquired from each individual tree



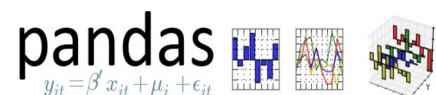
# Gradient Boosted Trees

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- Built sequentially
- Built by additively learning the performance of the previous model
- Calculate the error from previous model (residuals)
- Resulting model is the sum of previous model and the model trained on residuals
- Computationally expensive because model is built sequentially



# Tools & Frameworks for Machine Learning

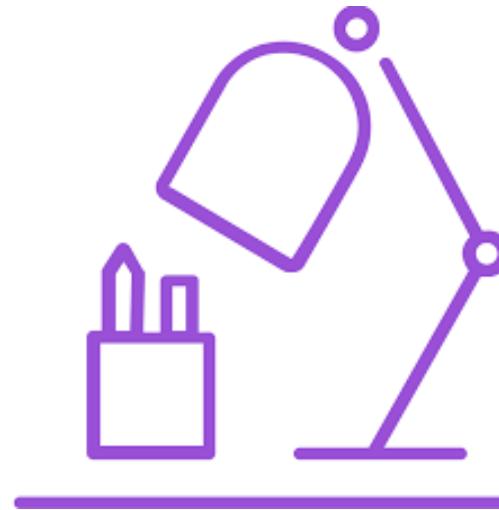


# Competition Time

Go to [www.menti.com](https://www.menti.com) and use the code **35 41 56**

# Hands On

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# *Build solutions that fight back.*

- Build & deploy solutions to **help seize & reduce** the impact of **COVID-19**
- Build & deploy solutions to help **halt & reverse** the impact of **Climate Change**



In 2020, Call for Code is aligned to the UN 75<sup>th</sup> anniversary global conversation theme of **climate change**, with a focus on:

- **water sustainability**
- **energy sustainability**
- **disaster resiliency**

The 2020 Call for Code Global Challenge is being expanded to address the **COVID-19 pandemic**, with a focus on:

- **crisis communication**
- **remote education**
- **community cooperation**

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- **8,000+** applications built

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- Implementation support through **Code and Response™**



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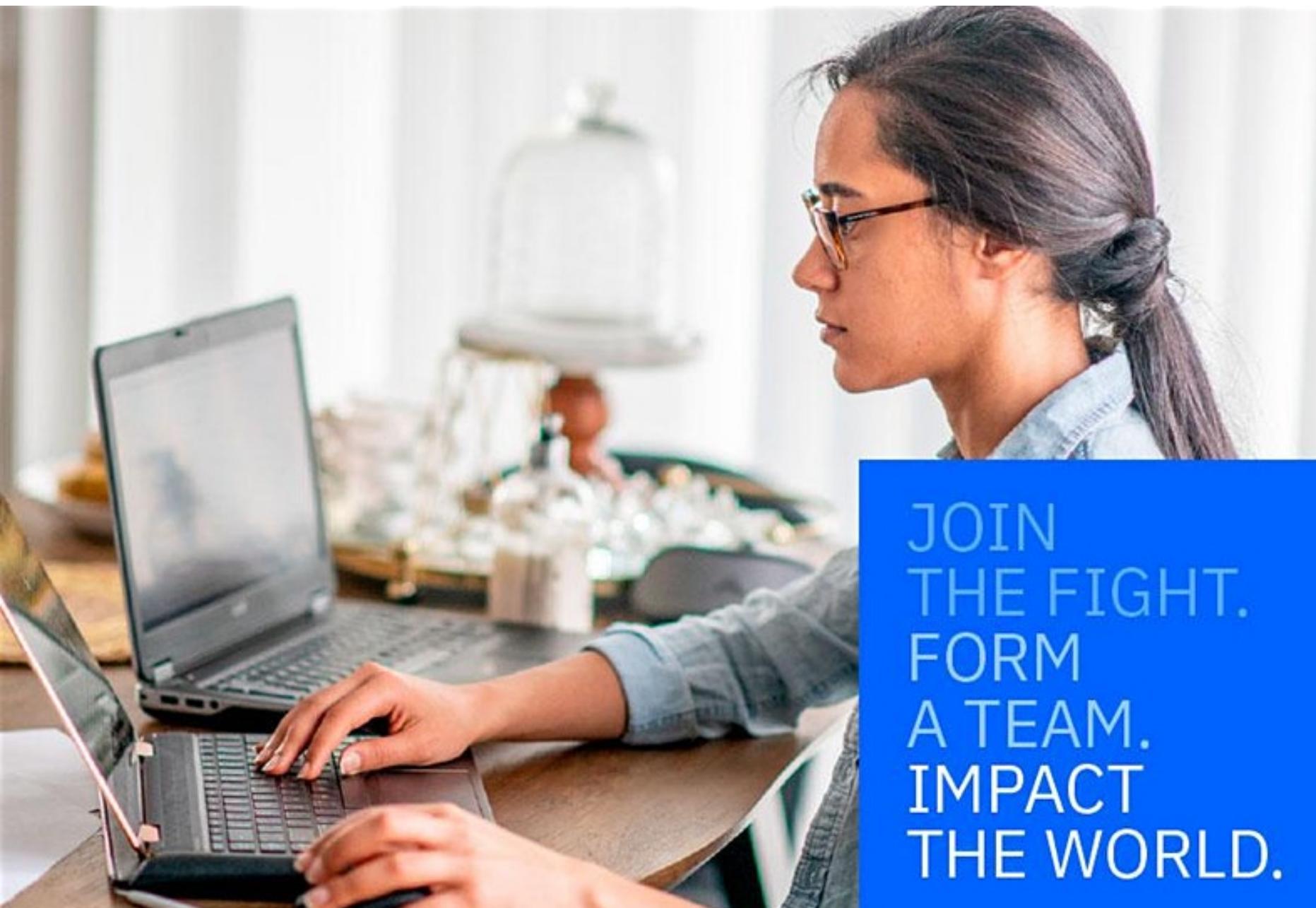
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**TAKE ON  
COVID-19**

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# Code @ Think

## May 5-6

Build Smart. Build Secure.

- Engage with a community of developers and open source leaders to tap into our collective power to innovate and fight back in this time of the COVID-19 pandemic.
- Discuss the ways technology can be used to address pressing global challenges and bring new innovations into your organization, including AI, IoT and quantum.

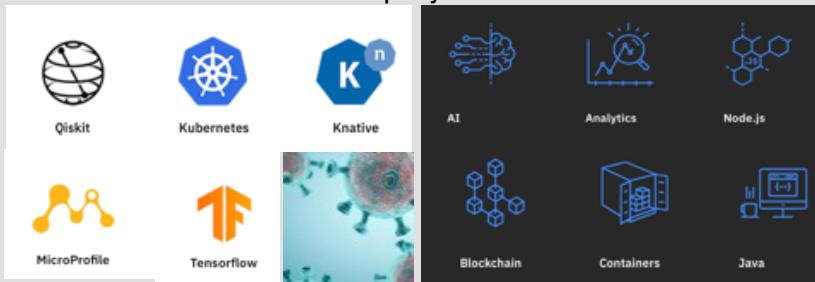
### Trends & Directions: Taking on the World's Toughest Challenges. Build Smart. Build Secure.

- The future will not be defined by technology, but by those who rise to the occasion and build.
- See rapid innovation with Open Source and emerging technologies. Hear from Call for Code 2019 winning team Prometeo.



### On-demand sessions: 23 Code Talks

- Hear the latest from Open Source experts on industry direction and deployment approaches for Knative, Qiskit, and COVID-19 Solutions
- Get a crash course in app modernization leveraging Java and containers deployment



### 16 Master Classes & 15 Labs

- Hands on coding labs and tutorials with technical experts from IBM
- Topics include Deep Learning, Kubernetes, Quantum, and Java



### Build Smart on Kubernetes Challenge

- Four challenges, testing developer skills in app development in a Kubernetes environment
- Compete for prizes based on completion, timing, and accuracy of responses

1	Red Hat OpenShift basics
2	Develop Cloud Functions
3	AI Int: MAX Model Deploy
4	Event Data Streaming w/ Kafka



[Click here to learn more about Code @ Think](#)

# Useful Links

**IBM Developer:** <https://developer.ibm.com/>

**Meetup:** <https://www.meetup.com/IBM-Cloud-MEA/>

**Learning:**

<https://cognitiveclass.ai/>

<https://learn.ibm.com/>

**IBM Watson Studio:**

<https://www.ibm.com/cloud/watson-studio>

**Call for Code 2020:** <https://callforcode.org>

**Code@THINK:** <https://developer.ibm.com/blogs/code-think-2020-agenda-details/>



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# Thank you

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