Online Series on Artificial Intelligence (AI) for Teachers, Phase 3, from 19-23 January 2026

Organized by CENTRAL INSTITUTE OF EDUCATIONAL TECHNOLOGY
(A constituent unit of National Council of Educational Research and Training)

Machine Learning for Real World Applications - A Glimpse

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20/01/2026
12.30pm- 1.15pm

Machine Learning for Real World Applications - A Glimpse

Online Series on Artificial Intelligence (AI) for Teachers, Phase 3, from 19-23 January 2026
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Empowering educators to teach about Machine Learning for Real World Applications

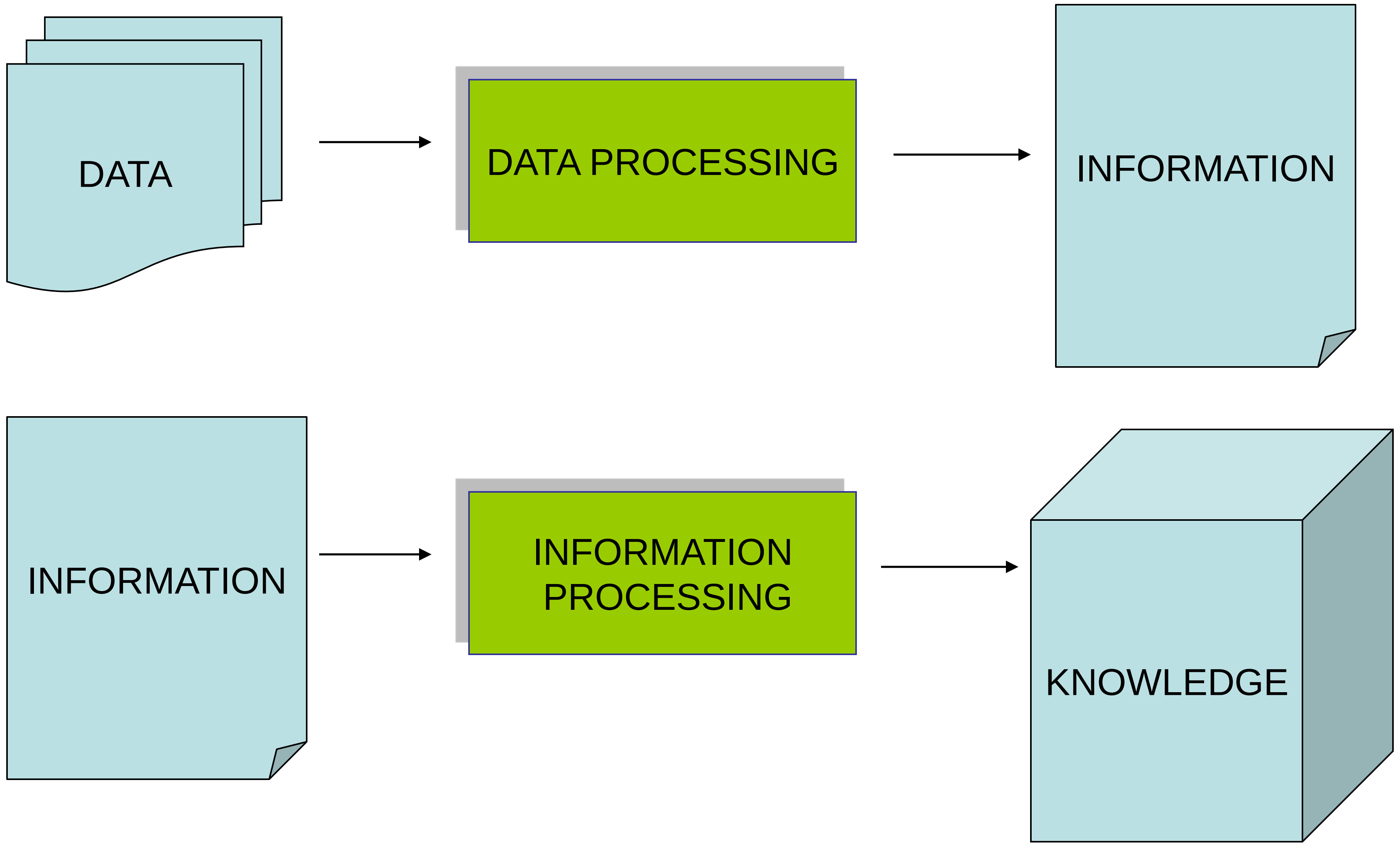
Rajesh R., Central University of Kerala

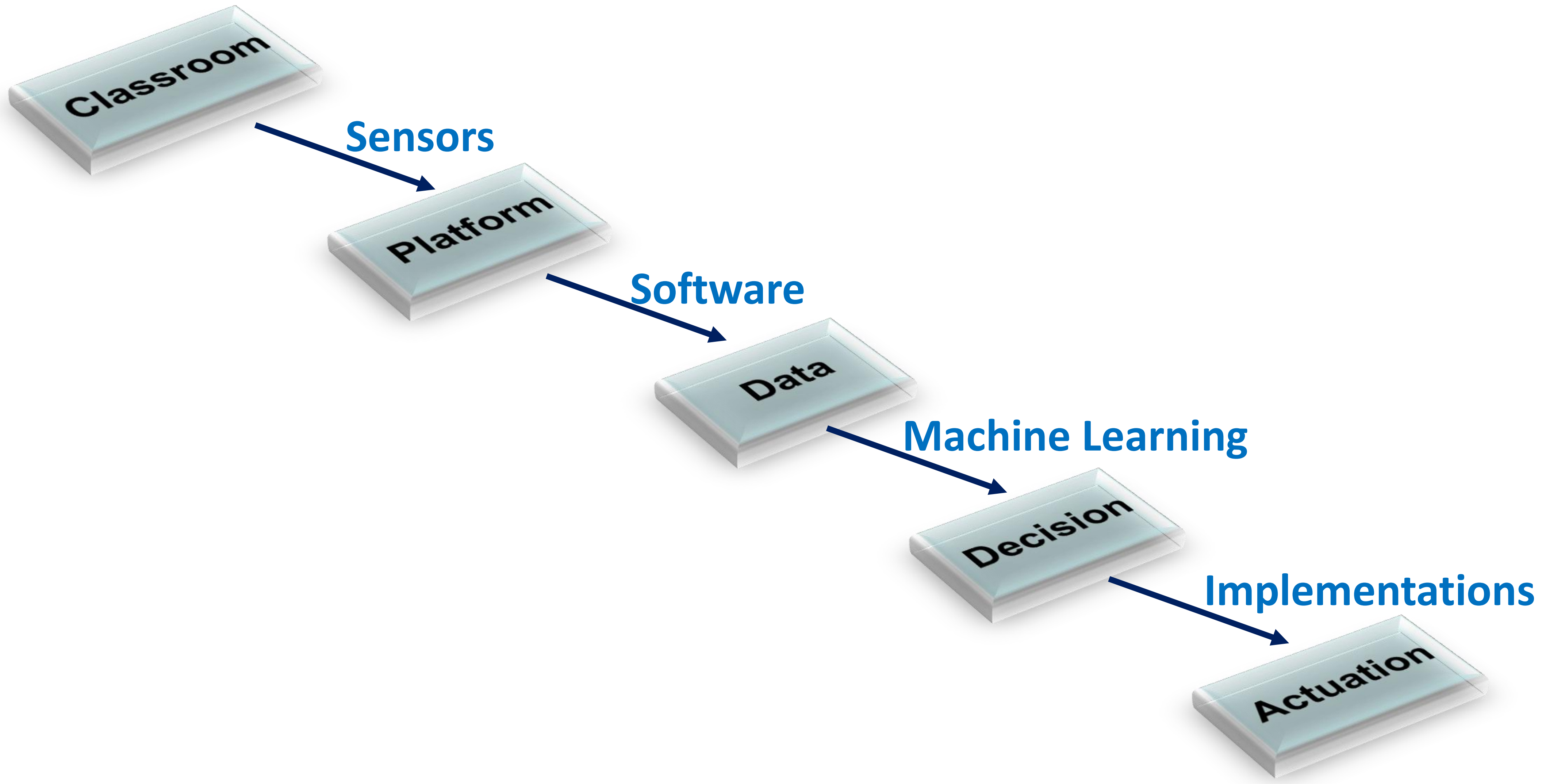

GERMAN OPEN

ML has applications in almost all area of Science and Social Science for the benefit of the society

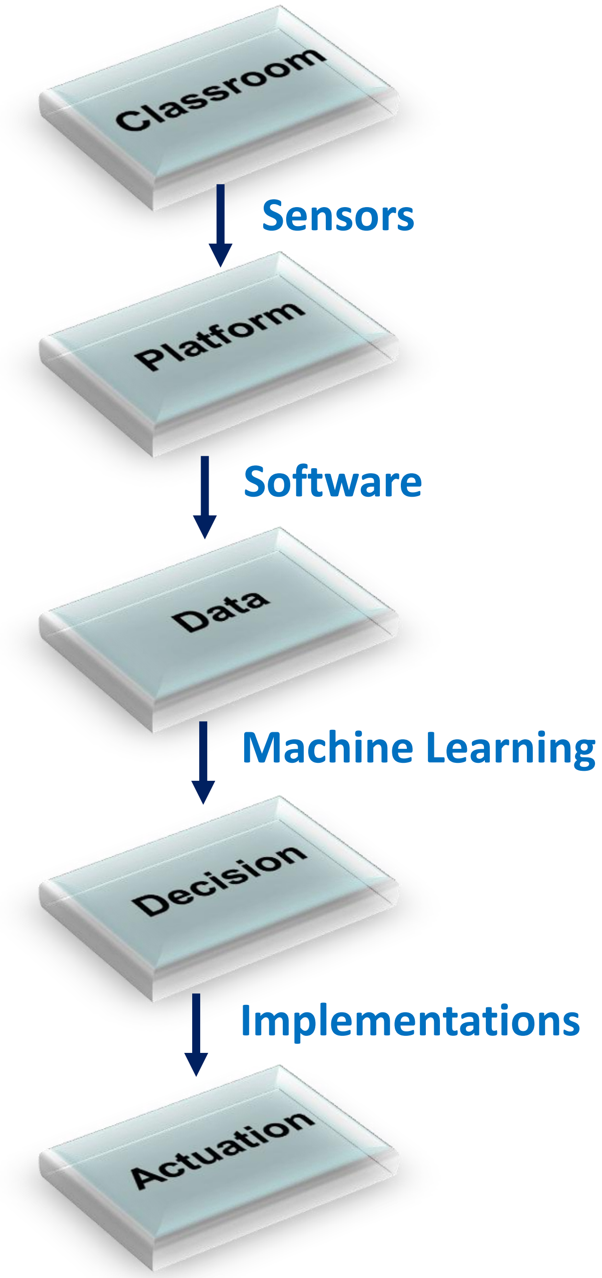
1. Medical Applications
2. Office automation
3. Banking applications
4. Agricultural applications
5. Weather forecasting
6. …

Where the requirement of ML starts?

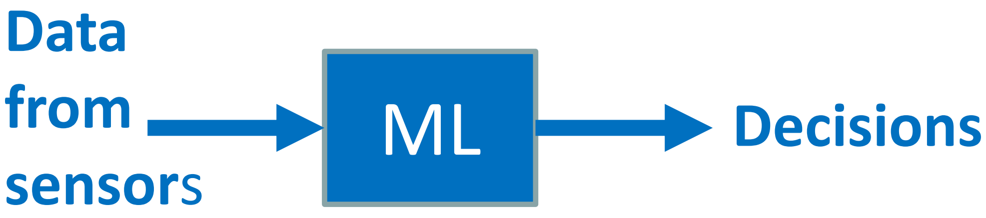




Classroom
Sensors
Platform
Software
Data
Machine Learning
Decision
Implementations
Actuation



Machine Learning (ML) is a range of techniques whereby computers are trained to improve their performance by processing vast amounts of data.



Step 1: To have known labeled data set

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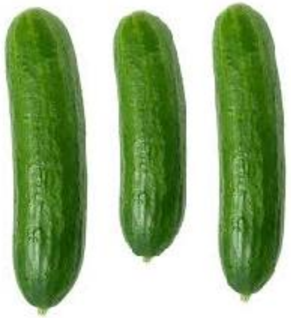


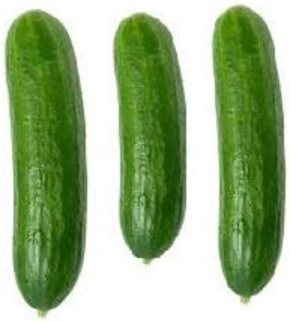
Cucumber

Banana

Talking

Laughing

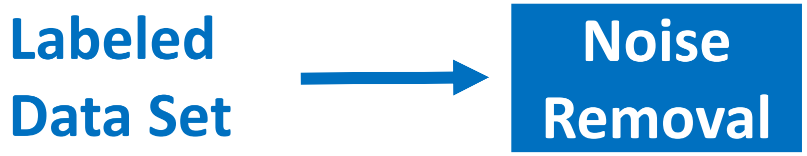
Step 1: To have known labeled data set



Cucumber Banana

Our duty is to train a ML to predict Cucumber/Banana

Step 2: Noise Removal



Step 3: To Extract Features from each of the images captured by the sensor called camera

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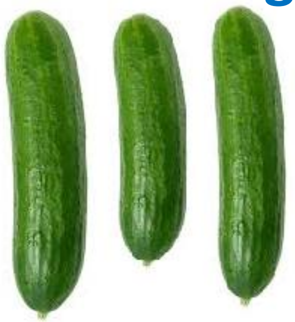
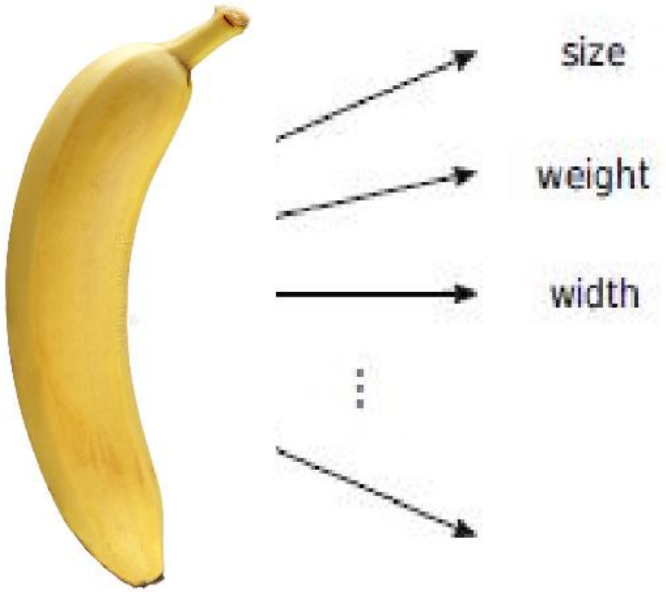
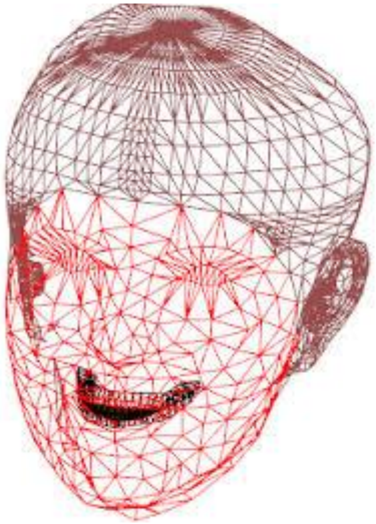


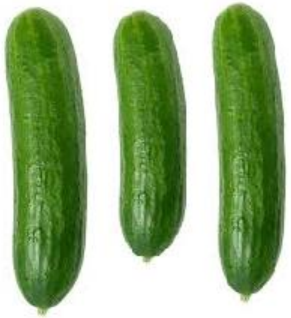
Cucumber

Banana



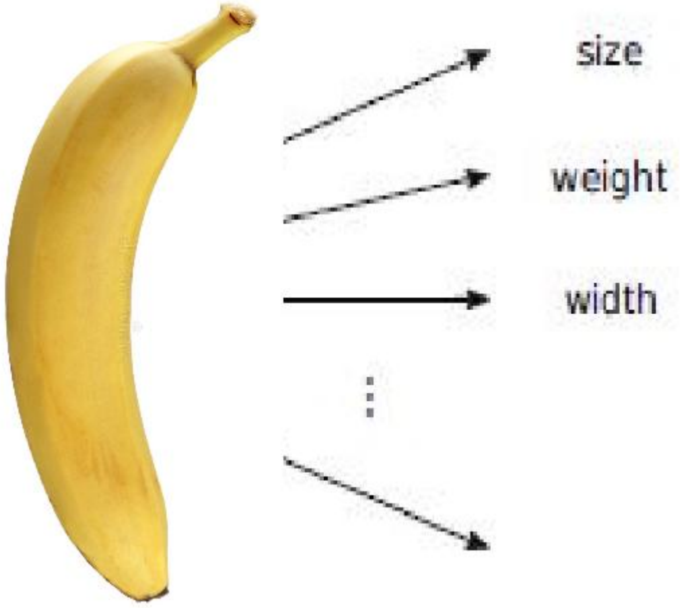


Step 3: To Extract Features from each of the images captured by the sensor called camera



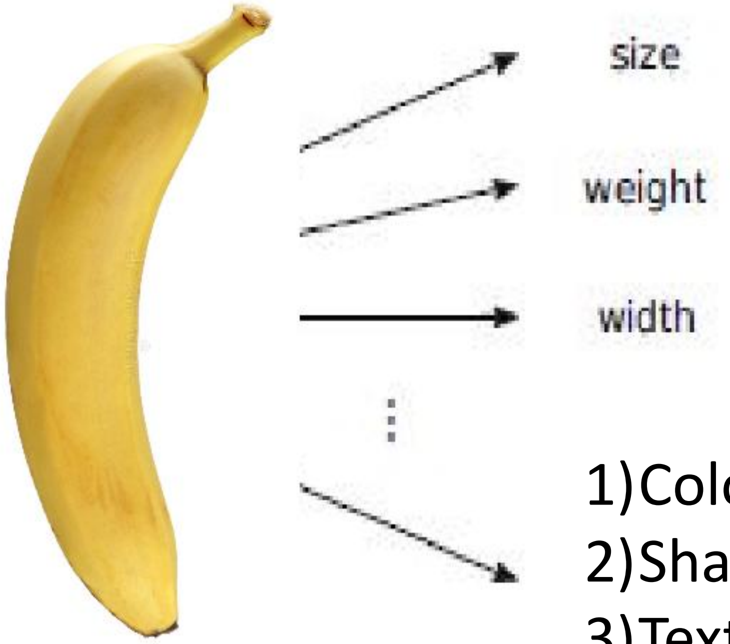
Cucumber

Banana

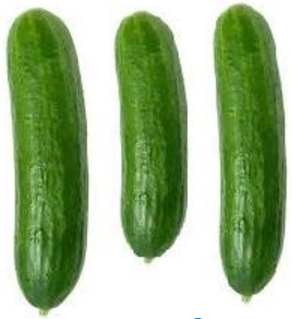


1)Color
2)Shape
3)Texture
…

Step 3: To Extract Features from each of the images captured by the sensor called camera



1)Color
2)Shape
3)Texture
…



Cucumber

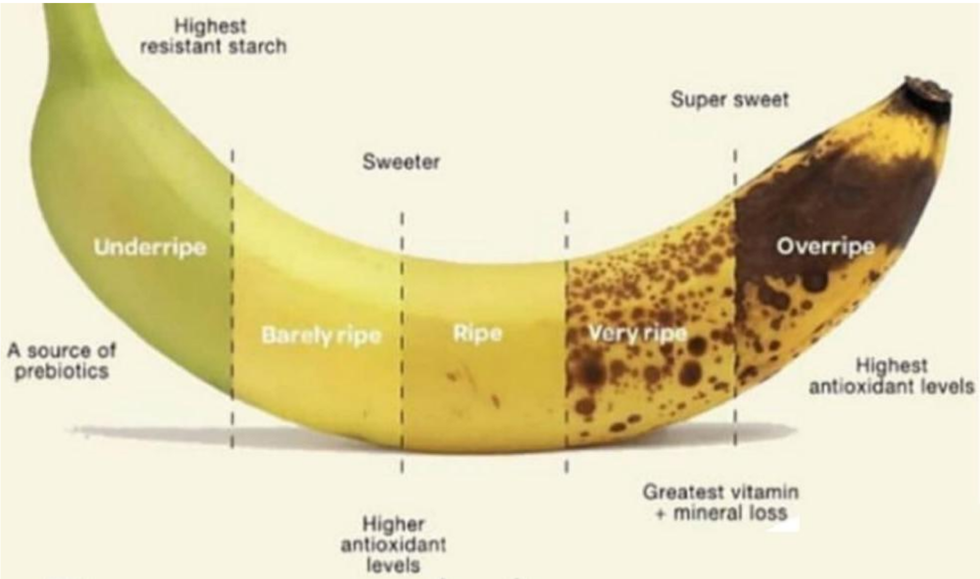
Banana

Transformed Domain Features

1)Frequency Domain
2)Wavelet Domain
3)Curvelet Domain
4)…

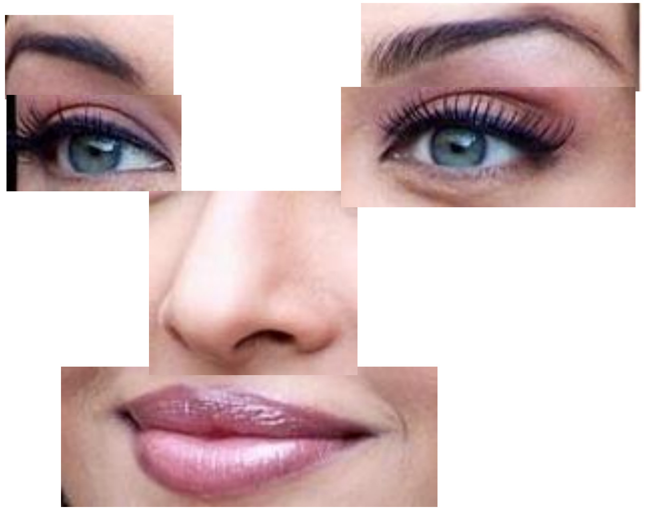
Step 3: To get data from other sensors

F-960 Ripen It! Gas Analyzer
Rapid, precise measurement of ethylene, CO_2 and O_2



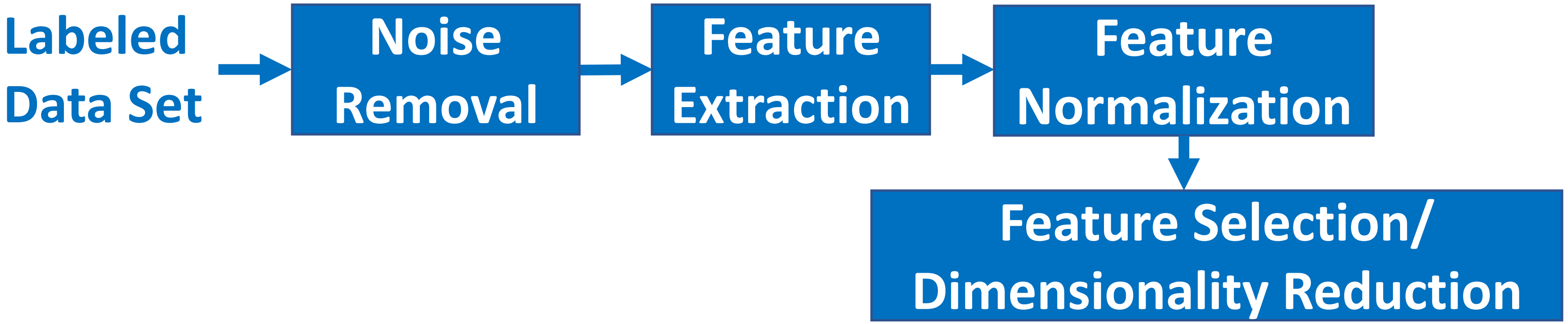
Source: http://www.msv-training.com/ripe-banana-vs-unripe/

Gas Analyzer like this is based on NIR spectroscopy and can measure
(1)total soluble solids (TSS),
(2)dry matter,
(3)titrable acidity, and
(4)external and internal color

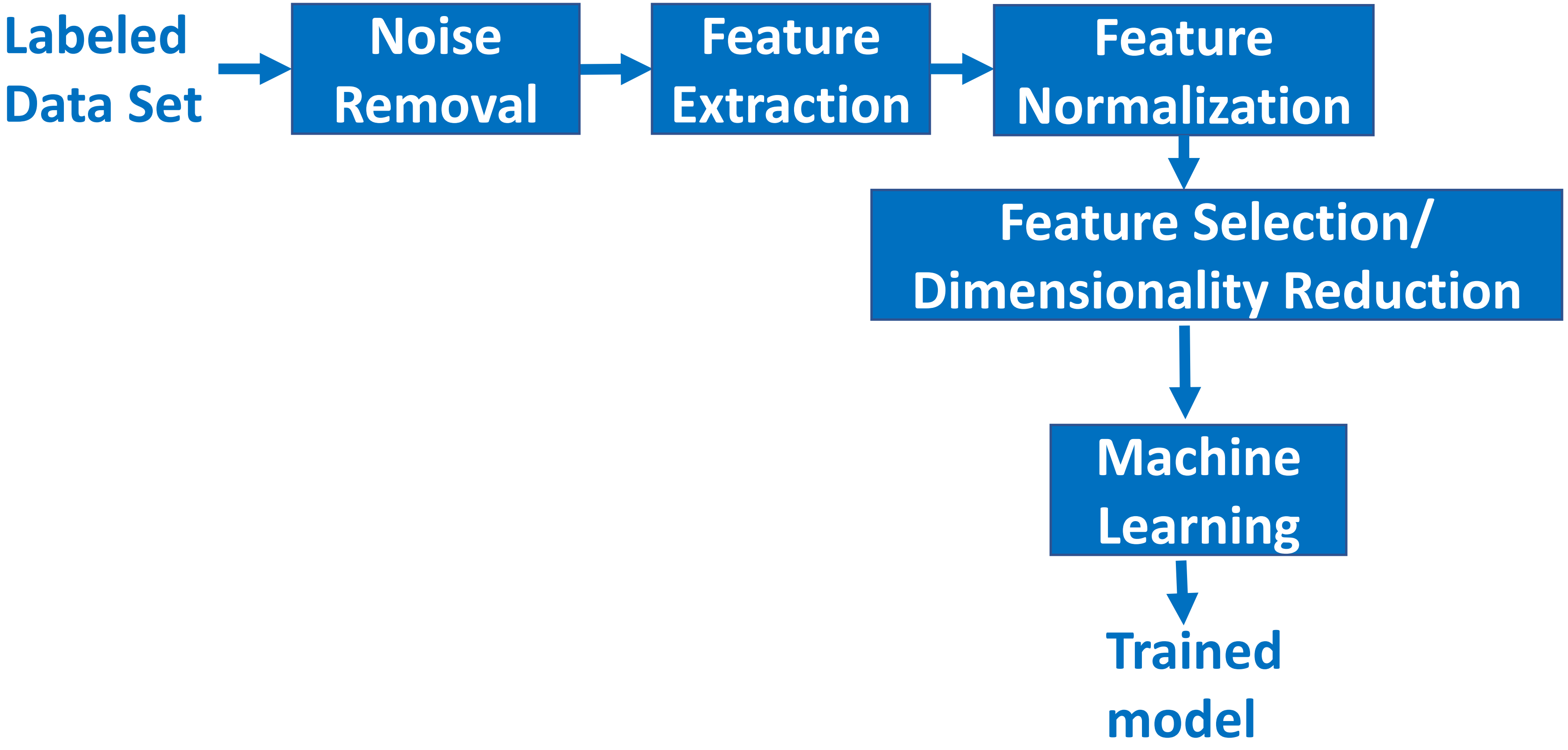


Step 4: Feature Normalization

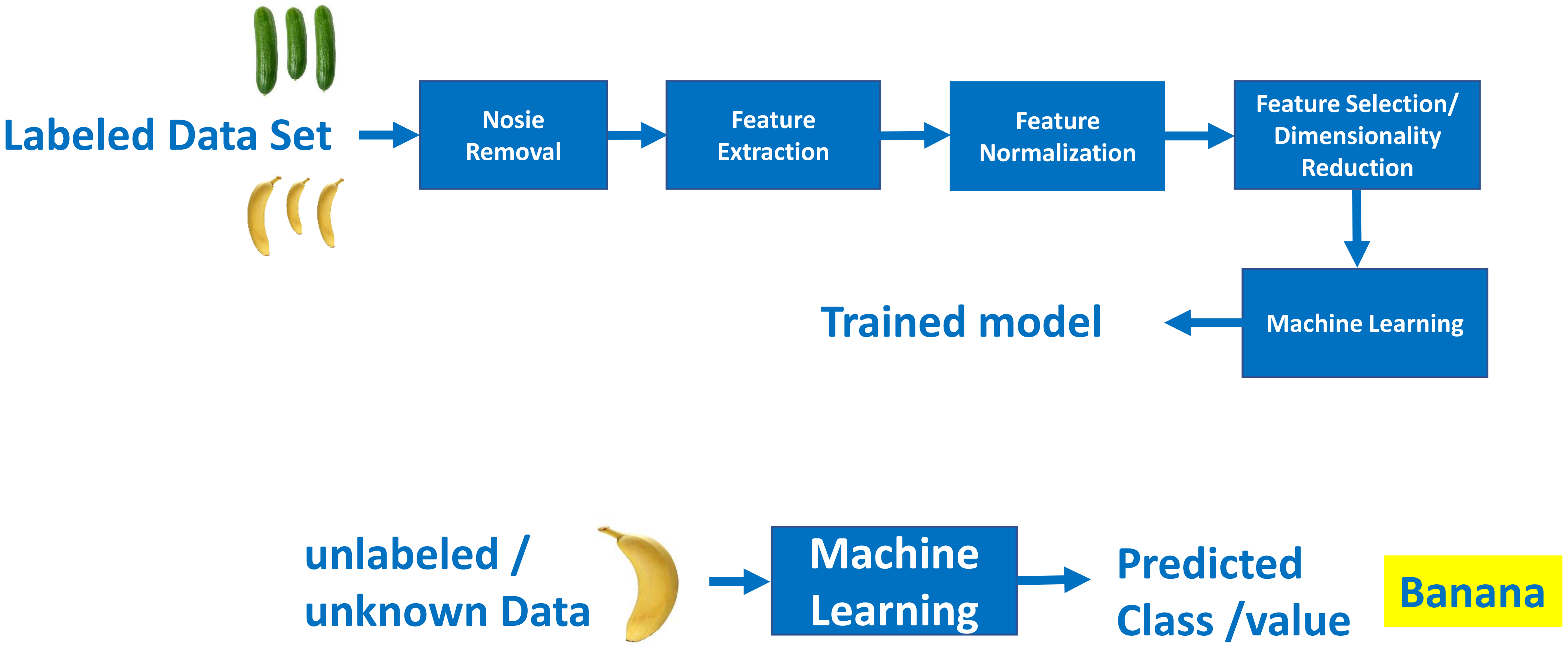
Step 5: Feature Selection/Dimensionality Reduction



Step 6: Training/Learning using Machine Learning

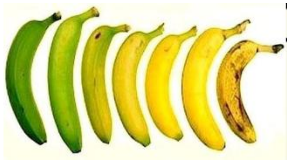


Step 7: Prediction/Classification



Step 7: Prediction/Classification

Labeled Data Set → Nosie Removal → Feature Extraction → Feature Normalization → Feature Selection/ Dimensionality Reduction → Machine Learning → Trained model



unlabeled / unknown Data set

→ Machine Learning → Ripped

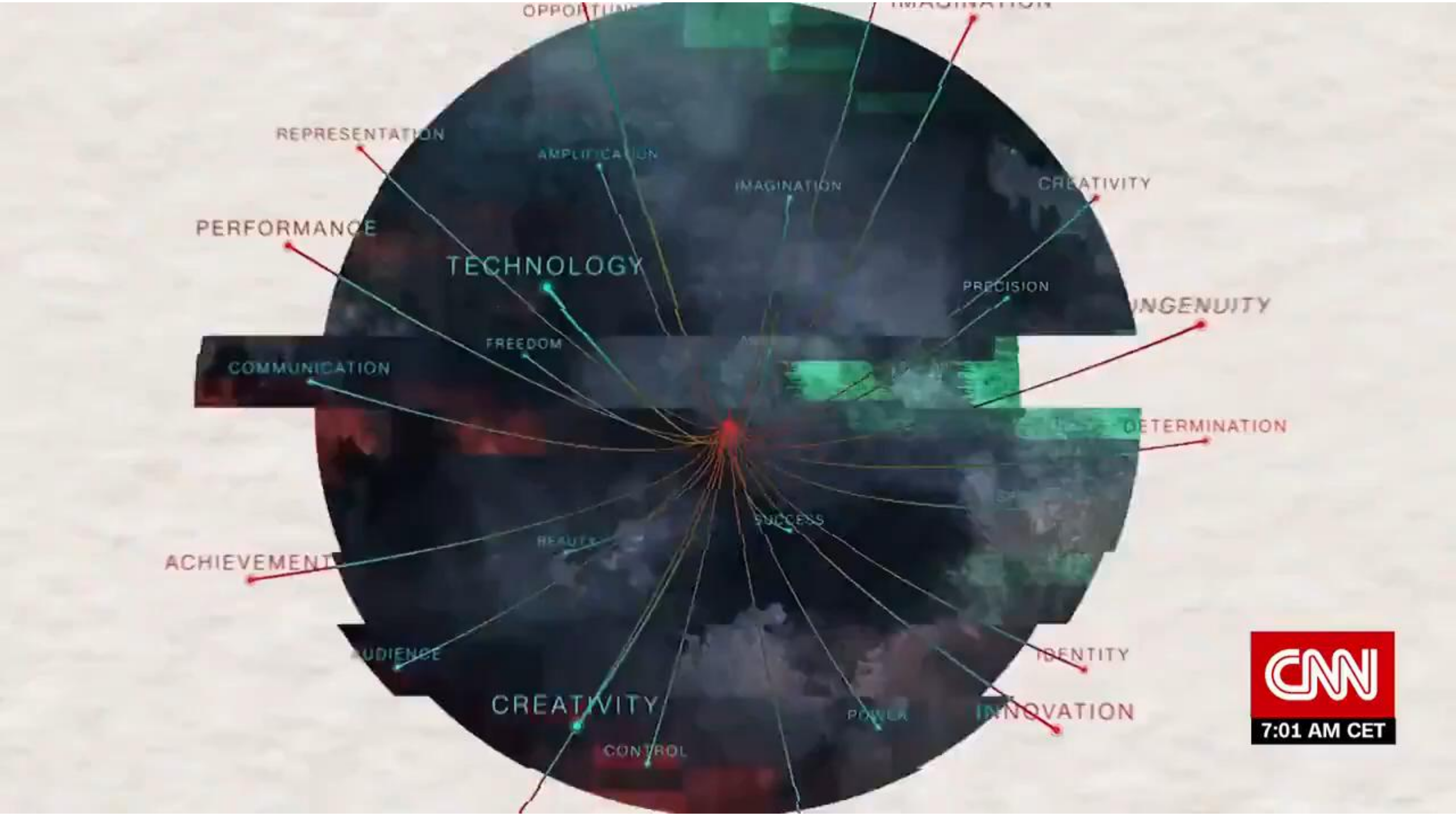
Predicted Class /value

Talking

Applications of Machine Learning

Courtesy: ANUC Corporation (Fanakku Kabushikigaisha) of Japan, Fanuc America Corporation of Rochester Hills, Michigan, USA, and FANUC Europe Corporation S.A. of Luxembourg

Applications of Machine Learning



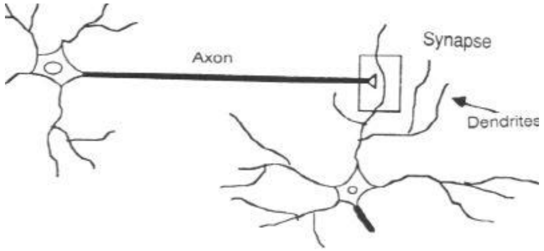
Courtesy: The biggest, most high-tech greenhouse in the U.S. is **AppHarvest's facility in [Kentucky]**

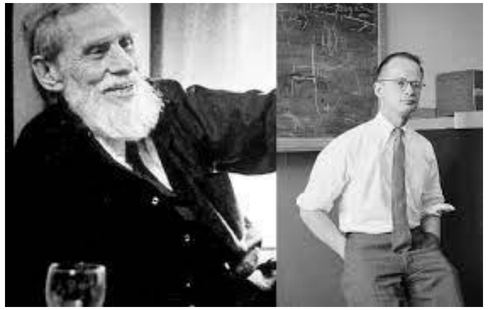
Machine Learning Applications

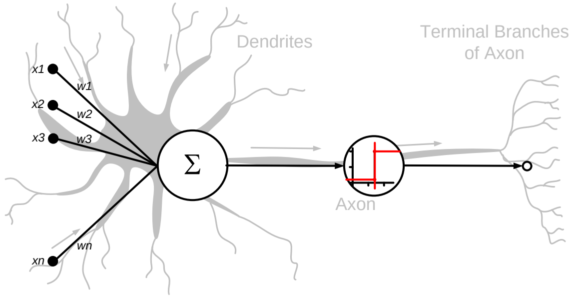
1. Ship identification
2. Oil spill detection
3. Tsunami prediction
4. Weather Prediction
5. Kidney stone detection
6. Brain Tumor detection
7. …

Some of the popular machine learning algorithms

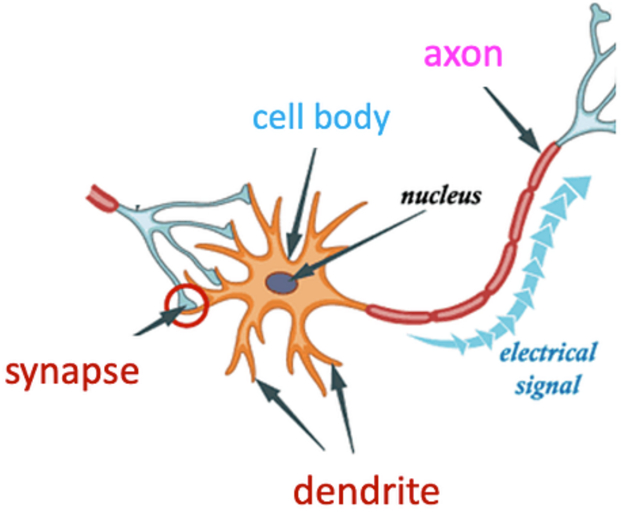
1. KNN
2. SVM
3. Decision Trees
4. Neural Networks
5. …





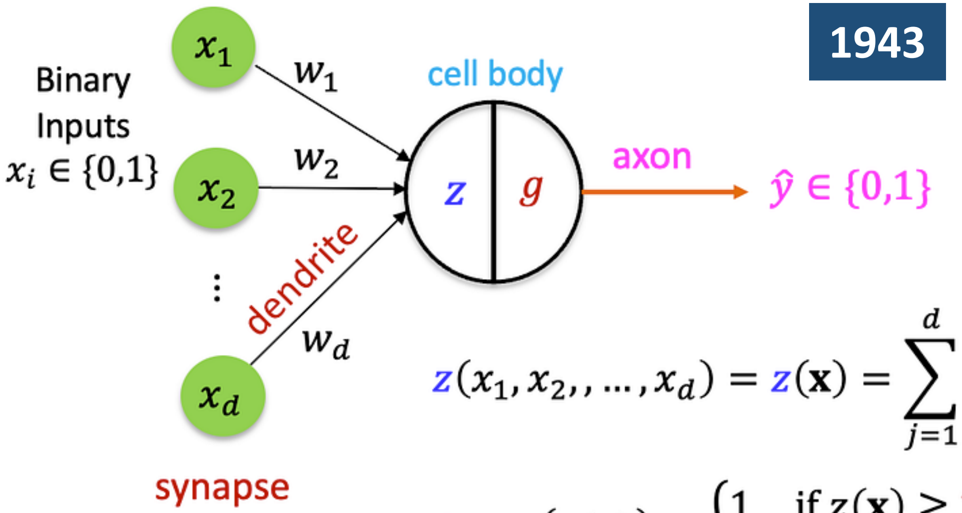


A Biologic Neuron



A McCulloch-Pitts Neuron

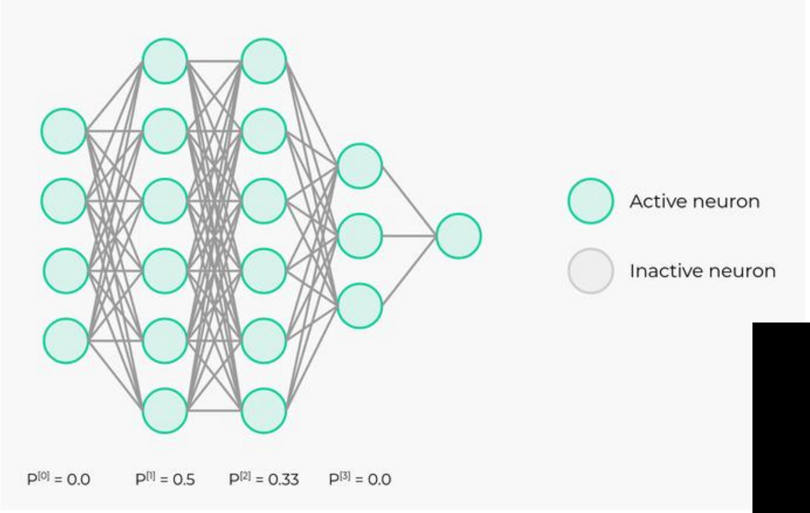
1943

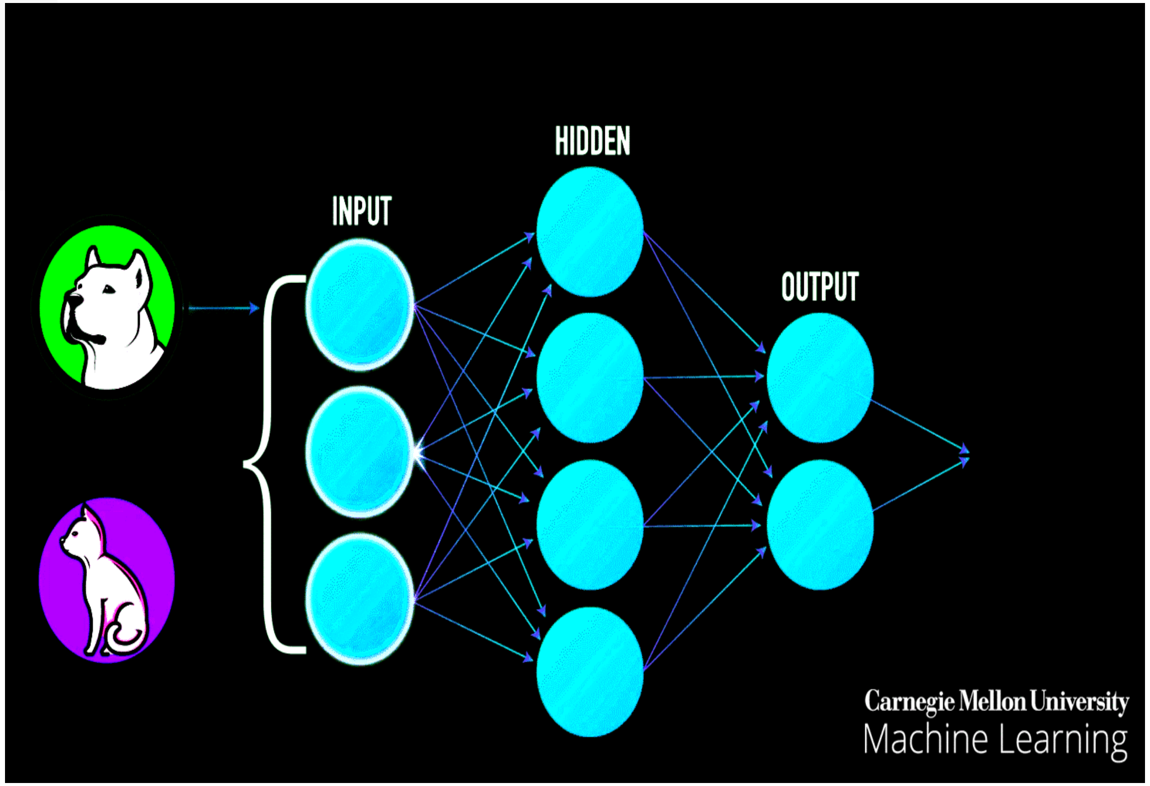


$$z(x_1, x_2, , \dots, x_d) = z(\mathbf{x}) = \sum_{j=1}^{d} w_j \cdot x_j$$

$$\hat{y} = g(z(\mathbf{x})) = \begin{cases} 1 & \text{if } z(\mathbf{x}) \geq T \\ 0 & \text{if } z(\mathbf{x}) < T \end{cases}$$

Neural Networks





Learning representations by back-propagating errors

David E. Rumelhart*, Geoffrey E. Hinton† & Ronald J. Williams*

* Institute for Cognitive Science, C-015, University of California, San Diego, La Jolla, California 92093, USA
† Department of Computer Science, Carnegie-Mellon University, Pittsburgh, Philadelphia 15213, USA

We describe a new learning procedure, back-propagation, for networks of neurone-like units. The procedure repeatedly adjusts the weights of the connections in the network so as to minimize a measure of the difference between the actual output vector of the net and the desired output vector. As a result of the weight adjustments, internal 'hidden' units which are not part of the input or output come to represent important features of the task domain, and the regularities in the task are captured by the interactions of these units. The ability to create useful new features distinguishes back-propagation from earlier, simpler methods such as the perceptron-convergence procedure[1].

There have been many attempts to design self-organizing neural networks. The aim is to find a powerful synaptic modification rule that will allow an arbitrarily connected neural network to develop an internal structure that is appropriate for a particular task domain. The task is specified by giving the desired state vector of the output units for each state vector of the input units. If the input units are directly connected to the output units it is relatively easy to find learning rules that iteratively adjust the relative strengths of the connections so as to progressively reduce the difference between the actual and desired output vectors[2]. Learning becomes more interesting but more difficult when we introduce hidden units whose actual or desired states are not specified by the task. (In perceptrons, there are 'feature analysers' between the input and output that are not true hidden units because their input connections are fixed by hand, so their states are completely determined by the input vector: they do not learn representations.) The learning procedure must decide under what circumstances the hidden units should be active in order to help achieve the desired input-output behaviour. This amounts to deciding what these units should represent. We demonstrate that a general purpose and relatively simple procedure is powerful enough to construct appropriate internal representations.

The simplest form of the learning procedure is for layered networks which have a layer of input units at the bottom; any number of intermediate layers; and a layer of output units at the top. Connections within a layer or from higher to lower layers are forbidden, but connections can skip intermediate layers. An input vector is presented to the network by setting the states of the input units. Then the states of the units in each layer are determined by applying equations (1) and (2) to the connections coming from lower layers. All units within a layer have their states set in parallel, but different layers have their states set sequentially, starting at the bottom and working upwards until the states of the output units are determined.

The total input, x_j, to unit j is a linear function of the outputs, y_i, of the units that are connected to j and of the weights, w_{ji}, on these connections

$$x_j = \sum_i y_i w_{ji} \qquad (1)$$

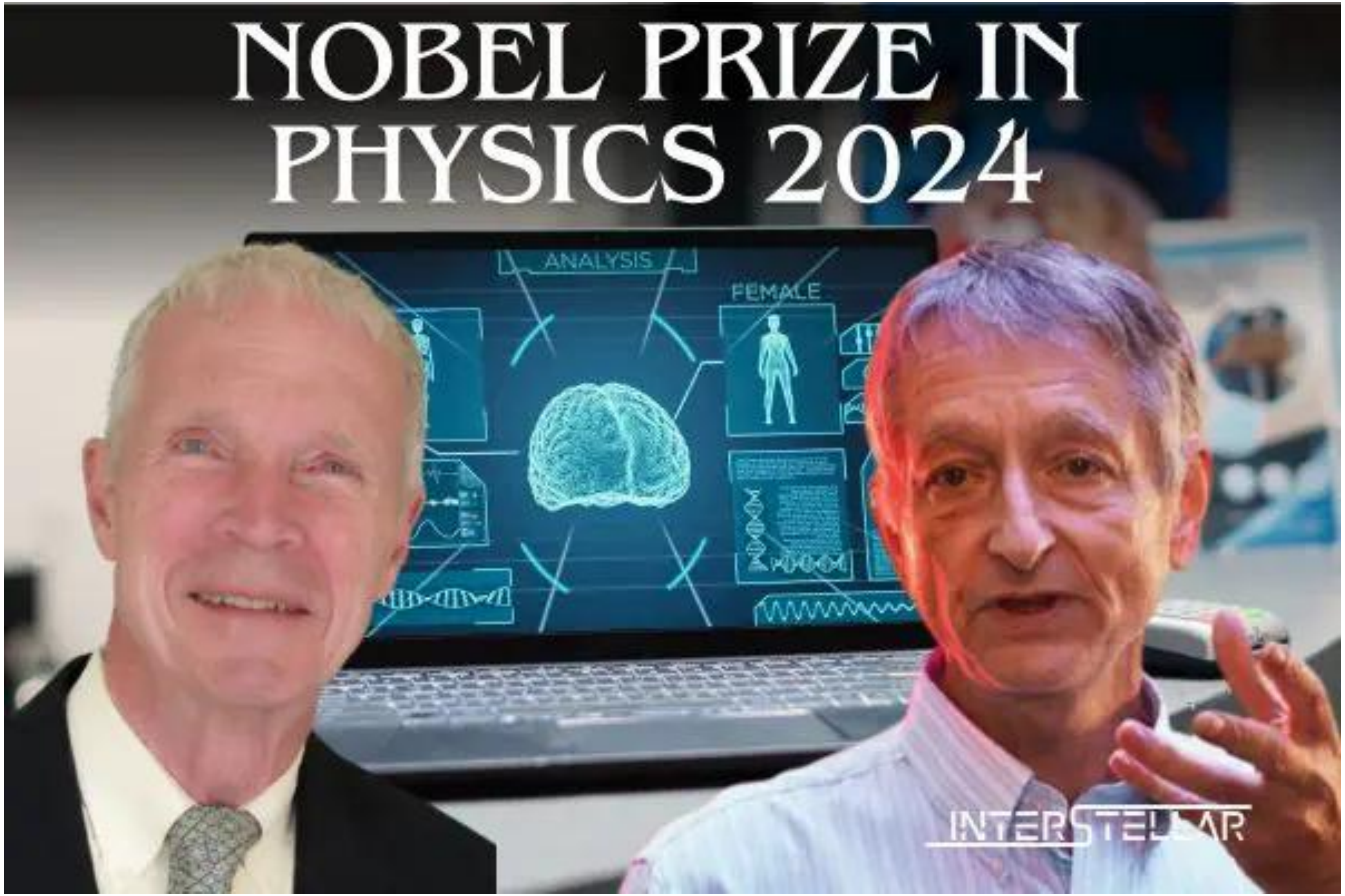
Units can be given biases by introducing an extra input to each unit which always has a value of 1. The weight on this extra input is called the bias and is equivalent to a threshold of the opposite sign. It can be treated just like the other weights.

A unit has a real-valued output, y_j, which is a non-linear function of its total input

$$y_j = \frac{1}{1+e^{-x_j}} \qquad (2)$$

† To whom correspondence should be addressed.

The backpropagation algorithm was first presented in 1986 by David Rumelhart, Geoffrey Hinton and Ronald Williams. For this, and other accomplishments, Geoffrey Hinton was awarded the Turning award in 2018 (along with Yoshua Bengio and Yann LeCun).



John J. Hopfield Geoffrey E. Hinton

Deep Learning (DL)

is an ML technique that utilizes neural networks and algorithms inspired by how human brains learn and process information.

1) Deep Learning (DL)
2) Convolutional Neural Networks
3) Self-attention Networks
4) Etc.

Large Language Models (LLMs), a product of DL techniques, are models specialized for tasks like natural language processing, text generation, and translation.

Generative AI (Gen AI) is a powerful category of AI that includes LLMs and other models that generate text, images, videos, or music.

The internal workings of Gen AI models can lack transparency and explainability, making it challenging to build trust and ensure accountability.

Additional issues specific to Gen AI in education include bias, misinformation, and overreliance on AI tools.

SAMPLING

Rol	Ans
18	Process of selecting small representative group from large population to analyse & study about whole population.
23	Selecting subsets of data or parts of the network for efficient training in tenqune.
15	Sampling is the process of selecting a smaller subset of data from a larger group to study or analysis.
01	Picking a small part of a population and operating over it.
30	Selecting a group that we will actually collect data in our research
36	Processes that convert continous analog to digital
32.	Part of population taken for ~~researchers~~. process.
29	mathematical process of converting continous image to digital form
02	mathematical process of converting real-continous image into discrete digital image.
33	larger population

Roll No.	Student Answer (Summary)	Evaluation	Marks /10
18	Selecting representative group from population	Statistical sampling, **not image sampling**	**2/10**
23	Selecting subsets of data for efficient training	ML/data sampling, not image sampling	**3/10**
15	Selecting smaller subset of data from larger group	General sampling, lacks image context	**3/10**
01	Picking small part of population and operating on it	Too generic, no image reference	**2/10**
30	Selecting group for data collection in research	Research sampling, not image sampling	**2/10**
36	Converts continuous analog to digital	**Correct direction**, but incomplete (no spatial/pixel mention)	**6/10**
32	Part of population taken for research	Statistical definition only	**2/10**
29	Mathematical process converting continuous image to digital form	**Good and relevant**, slightly vague	**8/10**
02	Mathematical process converting real continuous image into discrete digital image	**Very good, correct definition**	**9/10**
33	"Larger population"	Incomplete, meaningless	**1/10**

1. Question preparation
2. Teaching slides
3. Assignment evaluation
4. Text consolidation
5. Review of literature
6. Fact finding from the existing documents in the world
7. Exam preparation
8. Doubt clearance
9. Image analysis
10. Image creation
11. Story/poem writing
12. Thesis writing
13. Paper writing
14. Coding and debugging

Smart Classroom

Smart board

Smart Classroom

no. of students present
late comers
attendance

smart board

saving what you write in the board

smart board

saving what you write in the board

sharing the ppt and writings to the students

smart board

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

smart board.

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

Is there any thing technically wrong in your writing.

smart board

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

Is there any thing technically wrong in your writing.

conceptually wrong writing

smart board

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

Is there any thing technically wrong in your writing.

conceptually wrong writing

spelling, grammatical errors

smart board

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

Is there any thing technically wrong in your writing.

conceptually wrong writing

spelling, grammatical errors

Is there any thing technically wrong in your speech

smart board

saving what you write in the board

sharing the ppt and writings to the students

Portions: todays portion covered. Anything not covered.

Is there any thing technically wrong in your writing.

conceptually wrong writing

spelling, grammatical errors

Is there any thing technically wrong in your speech

teaching speed.

headache
sleeping
stress
understanding difficulty
concentrating

केरल केंद्रीय विश्वविद्यालय

CENTRAL UNIVERSITY OF KERALA

CUK

अमृतं तु विद्या

Amritam Tu Vidya

Knowledge is Eternal