

ChatGPT και Εφαρμογές AI για Ιατρούς

6th session – Χρήση του ChatGPT για την Αξιολόγηση Εικόνων και άλλων Ιατρικών Σημάτων

UNIVERSITY OF THE
AEGEAN



SCHOOL OF ENGINEERING
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Ακτινογραφίες (X-rays)

ChatGPT 4o

Κοινή χρήση



Δοθείσας αυτής της ακτινογραφίας ποια είναι τα ακτινολογικά ευρήματα?

Στην ακτινογραφία θώρακα που επισυνάπτετε, τα πιθανά ακτινολογικά ευρήματα που παρατηρώ είναι:

1. **Καρδιομεγαλία:** Δεν φαίνεται να υπάρχει σημαντική διάταση της

Αποστολή μηνύματος σε ChatGPT

Prompts to ChatGPT

Χρήστης: Δοθείσας αυτής της ακτινογραφίας ποια είναι τα ακτινολογικά ευρήματα?

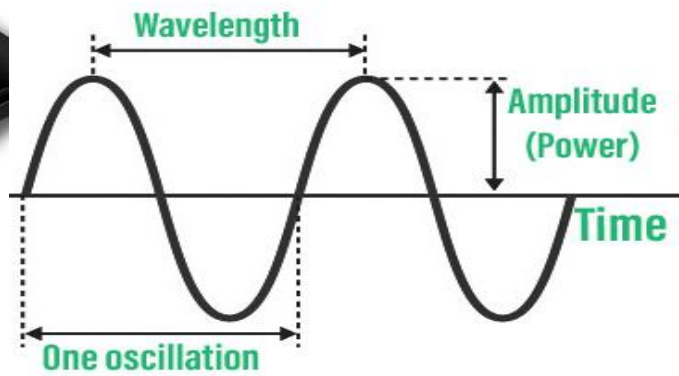
🗨 Κοινή χρ



AI: Στην ακτινογραφία θώρακα που επισυνάπτετε, τα πιθανά ακτινολογικά ευρήματα που παρατηρώ είναι:

1. Καρδιομεγαλία: Δεν φαίνεται σημαντική διάταση της καρδιακής σκιάς.
2. Διαφραγματική ανύψωση: Το δεξί ημιδιάφραγμα φαίνεται ελαφρώς ανυψωμένο.
3. Υποπλάσμος του πνευμονικού παρεγχύματος: Στο κάτω δεξιό πεδίο του πνεύμονα φαίνεται χαμηλή αερότητα.
4. Κανονική ανατομία του θωρακικού τοιχώματος: Δεν φαίνεται παραμόρφωση ή σπασμένα πλευρά.

Heart Failure Prediction (<https://iotsim.web.app/>)



Parameter	Normal Range
ECG QRS width/amplitude	60-110msec/ $\leq 1\text{mV}$
ECG P-wave width/amplitude	80-110ms/ $\leq 0.1\text{mV}$
ECG T-wave width/amplitude	160-200ms/ $\leq 0.25\text{mV}$

Label QRS Telemetry Key ecg-qrs

Label P-wave Telemetry Key ecg-pwave

Label T-wave Telemetry Key ecg-twave

Min 70

Max 120

Interval 5

Function Random

Min 80

Max 120

Interval 5

Function Gaussian

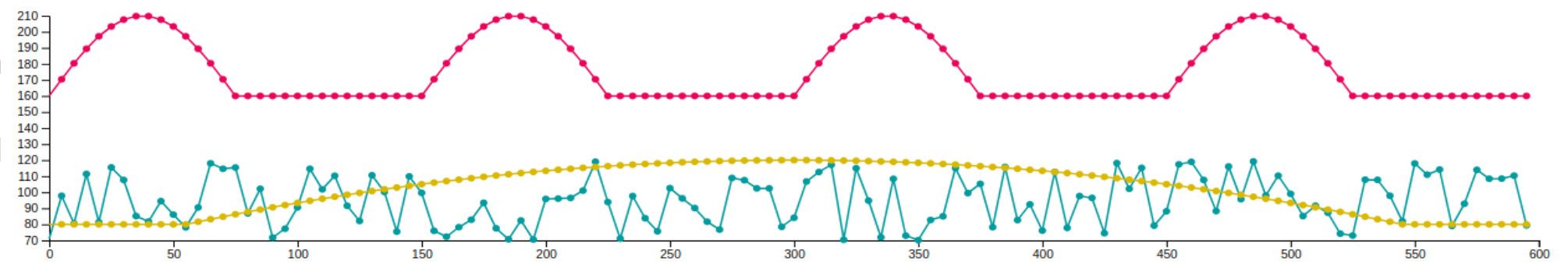
Min 160

Max 210

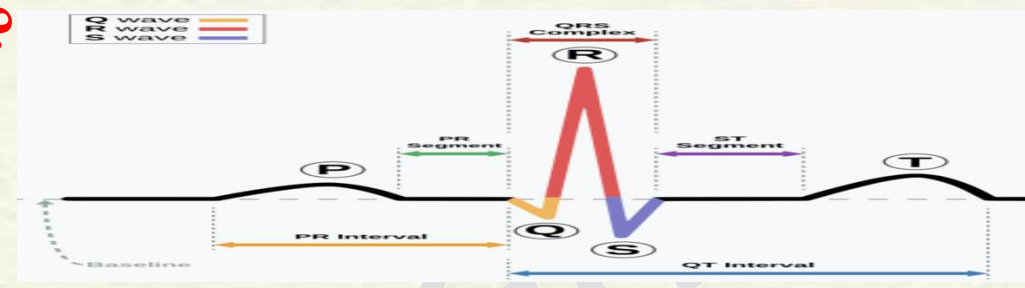
Interval 5

Function Sine

A doctor observes a graph that shows the electrical activity (in volts) of the heart of a patient over a period of time (in seconds). Each local maximum of 0.004 volts corresponds to one heartbeat.

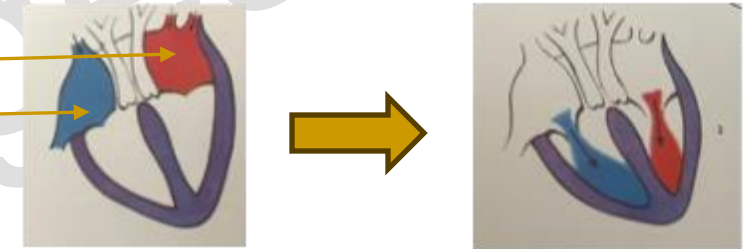


What are the main signals of ECG (Electrocardiogram)?

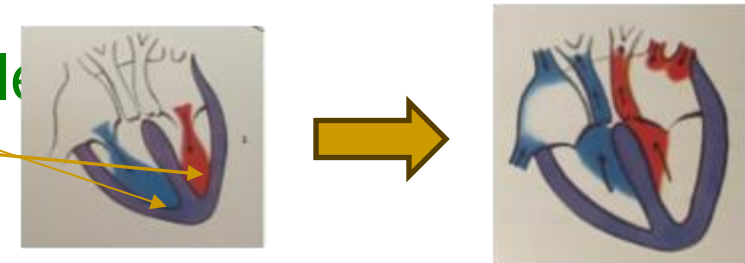


❖ There are three main components to an ECG:

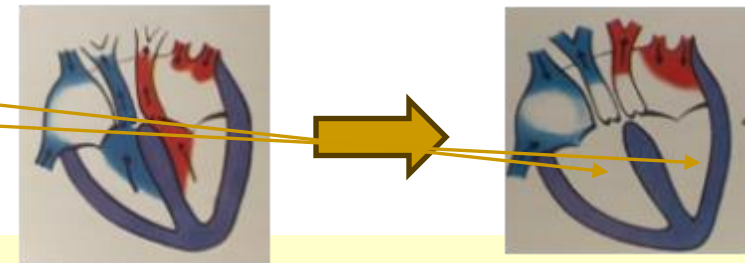
1. The **P wave** represents depolarization of the atria.
(in greek *κολπική αποπόλωση*)



2. The **Q R S complex** represents depolarization of the ventricle.
(in greek *κοιλιακή αποπόλωση*)



3. The **T wave** represents repolarization of the ventricles.
(in greek *κοιλιακή επαναπόλωση*)



Heart movements

Detection Example of Ischemic Heart Failure

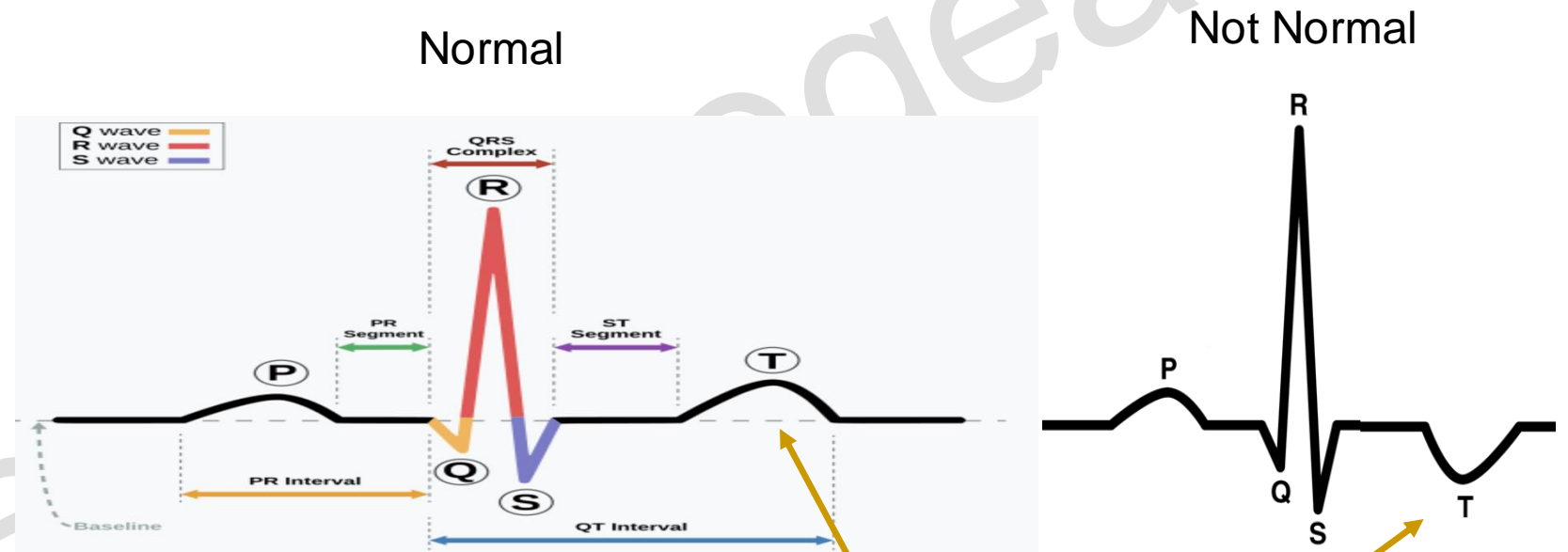
Heart failure:

Ischemia, heart attack and angina pectoris.

Cardiac arrhythmias: –

Tachycardia, bradycardia, ventricular fibrillation, atrial fibrillation, atrial flutter.

Cardiac arrest
arrest



Ischemia happens when we have a narrowing of a large coronary artery. It causes a decrease in blood flow.

Can be found by changes in T wave. T is negative and symmetrical in the leads that are normally positive.

ECG 0/4

E0103

	0.455	
1	0.46	
2	0.45	
3	0.425	
4	0.435	
5	0.455	
6	0.49	

can you analyze this ecg

It appears that the uploaded file contains a single column of ECG voltage data, but there is no sampling rate or units provided. Please use a 500 Hz rate. What would 1000 Hz look like?

The rate is 250 Hz

ECG 2/4

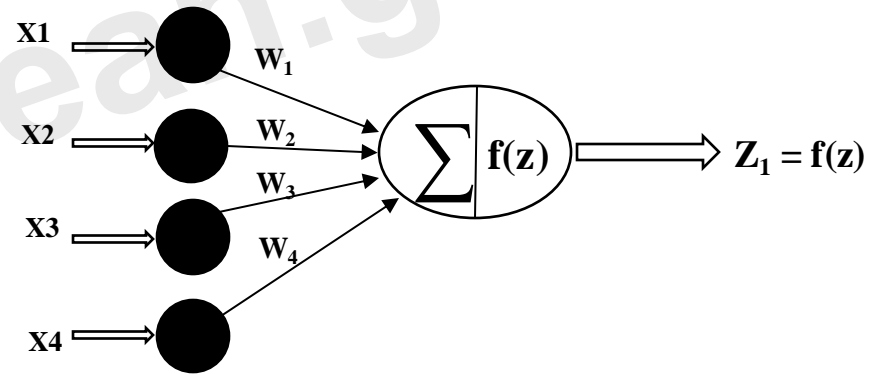
The screenshot shows a web browser window with the ChatGPT interface. The browser's address bar shows the URL `chatgpt.com/c/6702e8e8-b608-8004-a6b7-0d9d6ffcf89`. The page title is "ChatGPT 4o". On the left sidebar, there are navigation options: "ChatGPT", "Voice to Text", "Logo Creator", and "Εξερεύνηση GPT". Under the "Σήμερα" (Today) section, there is a list of recent prompts: "ECG Analysis Request", "Διάγνωση αξονικής τομογραφίας", "Ακτινογραφία και ευρήματα", "Πόλεις με πληθυσμό Ελλάδας", "Μεγαλύτερες πόλεις Ελλάδας", "Serialize DataTable with Json.NET", and "Greek Characters in SSMS". The main chat area shows a user prompt: "Can you calculate the heart rate? Can you detect any ECG abnormalities?". Below the prompt is a plot titled "ECG Signal" showing ECG Voltage (mV) on the y-axis (ranging from 0.5 to 2.5) and Time (seconds) on the x-axis (ranging from 0 to 120). The plot displays a regular ECG signal with a heart rate of approximately 75 bpm. Below the plot, there is a response from ChatGPT: "Here is a plot of the ECG signal based on the data you provided, sampled at 250". At the bottom of the chat area, there is a text input field with the placeholder "Αποστολή μηνύματος σε ChatGPT" and a send button.

Neural Nets in Artificial Systems

Artificial neural networks simulate the human brain by using **neurons (or nodes)**, which are connected to each other through connections (or links) called **synapses**.

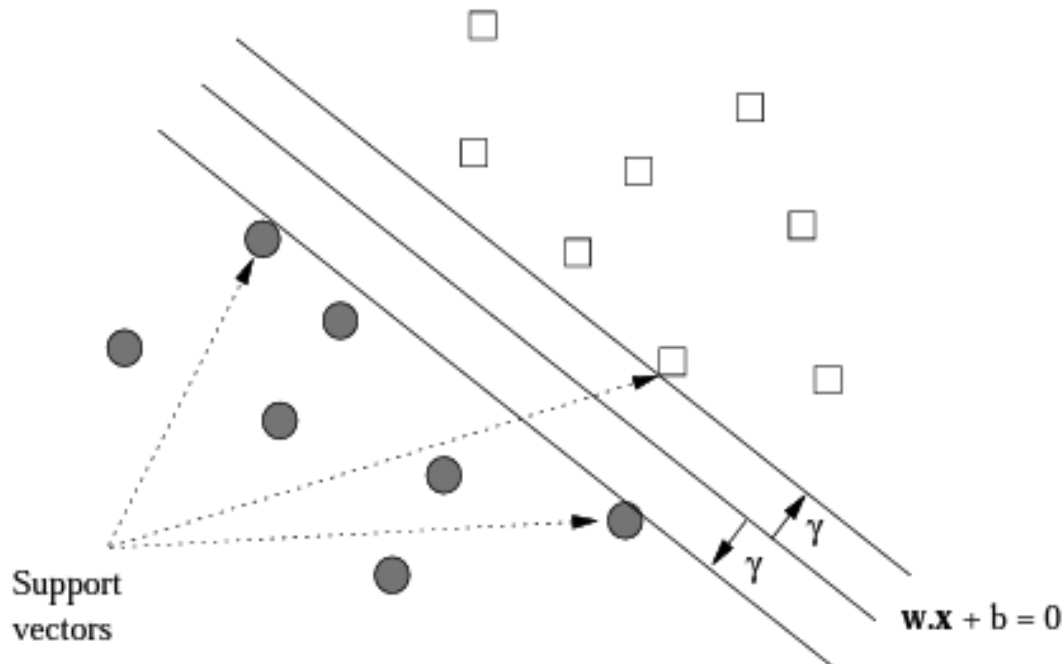
The most basic computational structure in artificial neural networks is the **perceptron**, which contains a set of input nodes and an output node

Single-Layer Perceptron architecture



Support Vector Machines

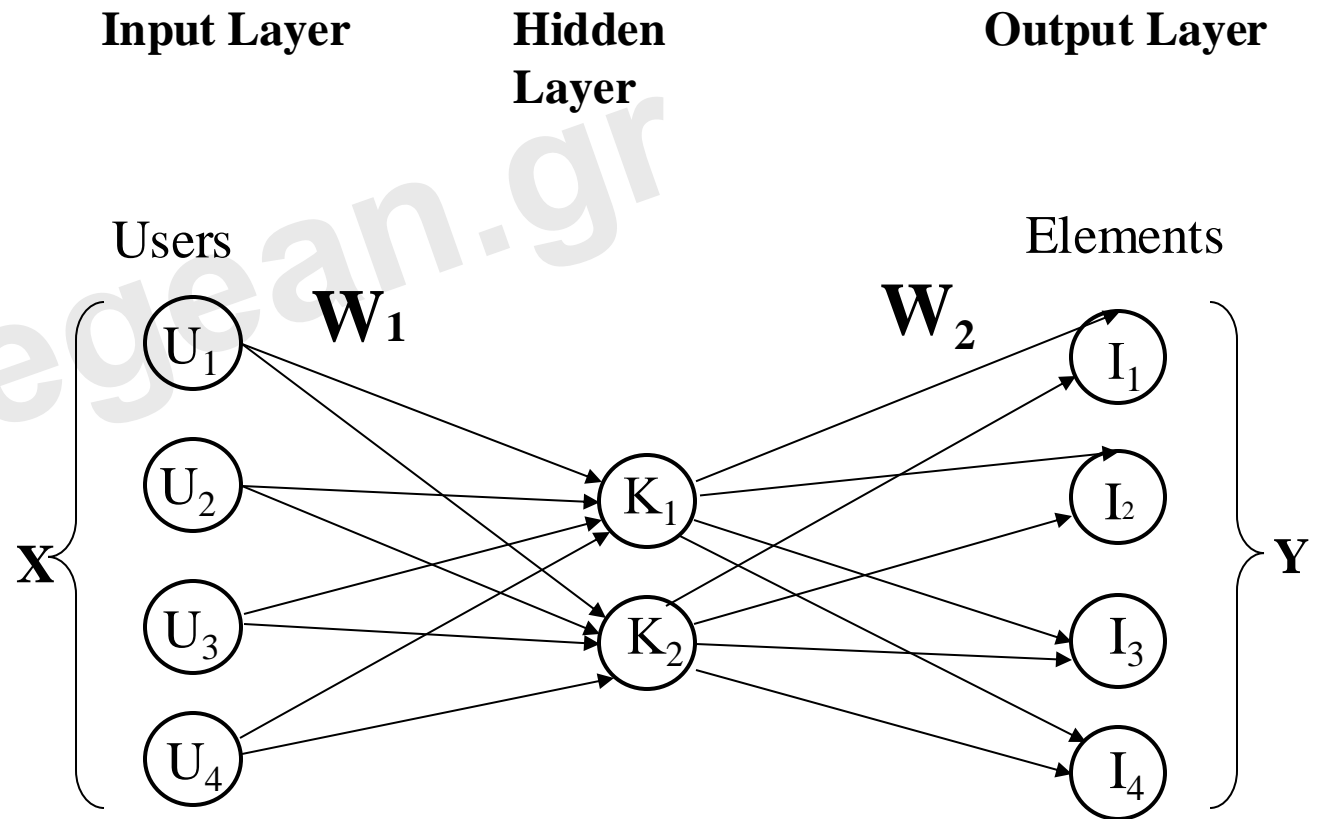
- The goal of a Support Vector Machine (SVM) is to select a hyperplane $w \cdot x + b = 0$ that maximizes the distance γ between the hyperplane and any point of the training set.



With a large margin, we are more certain to correctly classify points that are in the full data set and not only the training set

Multi – Layer Perceptrons

- Neurons are arranged in layers, of which the input and output layers are separated by another group of additional intermediate layers. These layers are called hidden.
- This particular architecture MLP is referred as feed forward neural network.

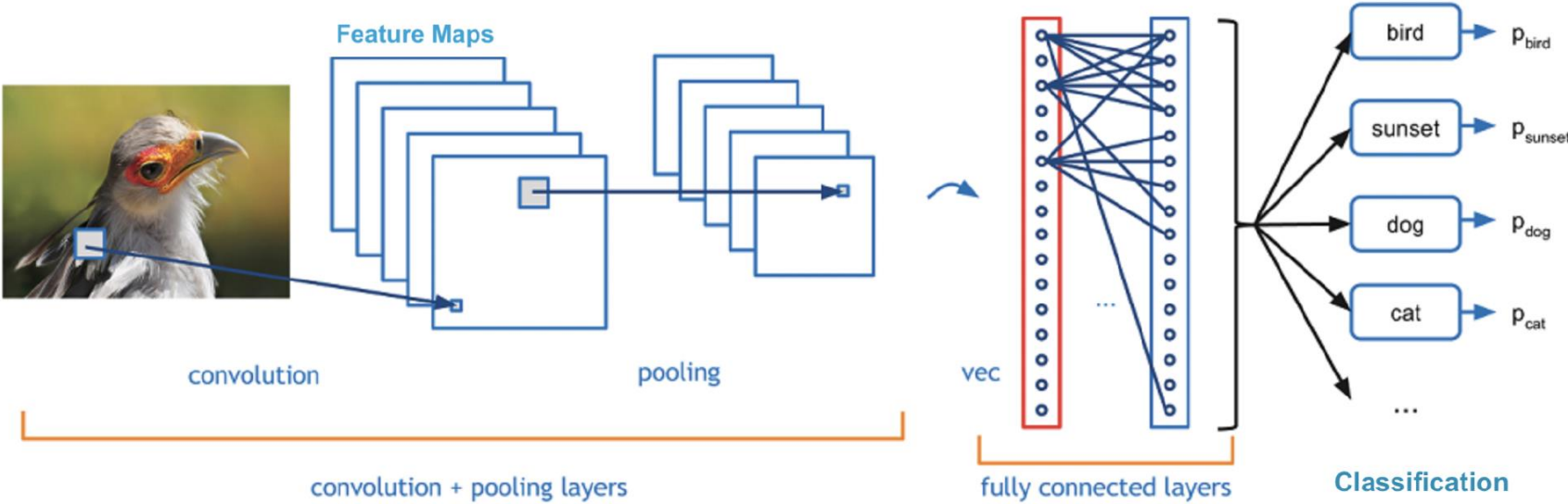


W : weights synapse between layers

Convolution Neural Networks (CNNs)

- **A Convolutional Neural Network (CNN) is essentially a multi-layer Perceptron.**
- **Connectivity mode between CNN neurons similar to the visual cortex of organisms**
 - **Area of cells sensitive to specific areas of the visual field.**
- **A predefined region of the previous layer of neurons is merged and then promoted to the next layer.**
 - **Extract local image features.**
 - **Maintaining the approximate position of a feature relative to other features.**

Example of a Convolutional Neural Network



psyr

Demo of AI software to apply image processing over CT scans and classify patients into COVID and non-COVID disease.