NeuroML

(Machine Learning in Neuroscience)

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NeuroML- Machine Learning in Neuroscience

Machine Learning

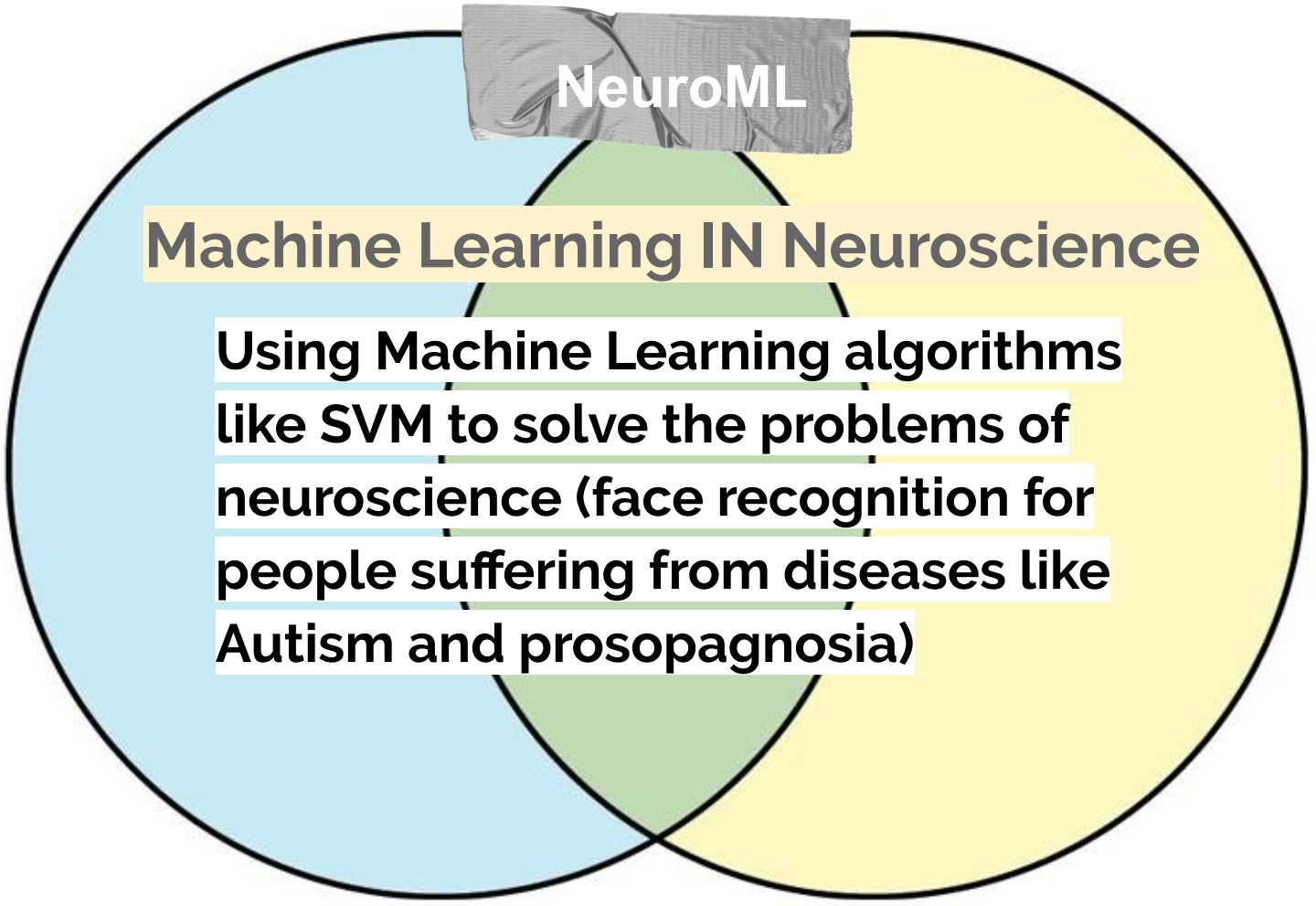
When a machine learns

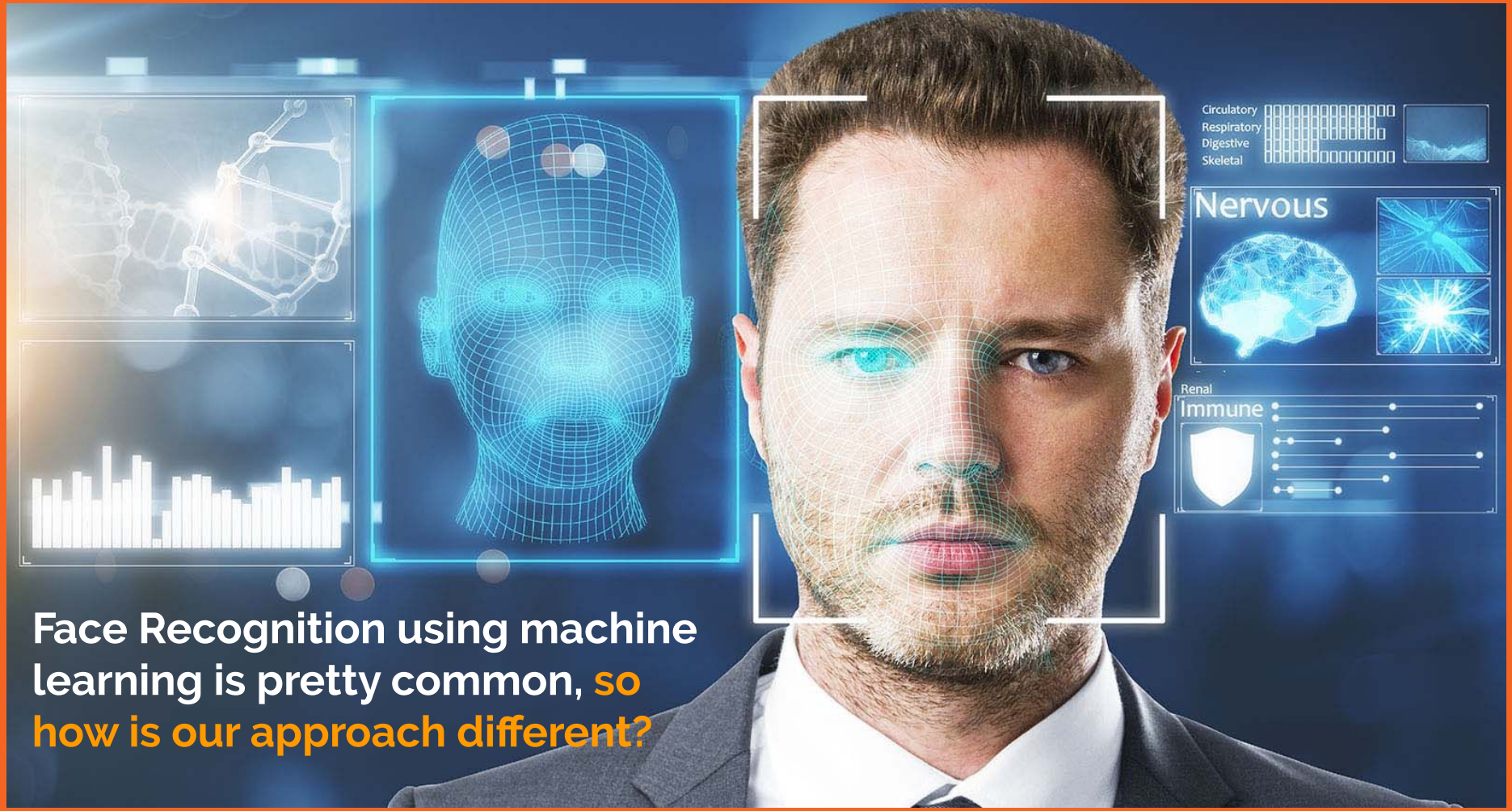
- **LEARNING** from past experiences
- **ADAPTING** in the present scenario
- **IMPROVING** for future predictions

Neuroscience

Science of neurology

- **Neurology**: Branch of medicine that deals with disorders related to nervous system and brain.
- “Scientific study of the nervous system”


NeuroML
Machine Learning IN Neuroscience
Using Machine Learning algorithms like SVM to solve the problems of neuroscience (face recognition for people suffering from diseases like Autism and prosopagnosia)



Face Recognition using machine learning is pretty common, so how is our approach different?

Stimuli (if any)

- auditory
- visual
- somatosensory
- olfactory
- ...

Task

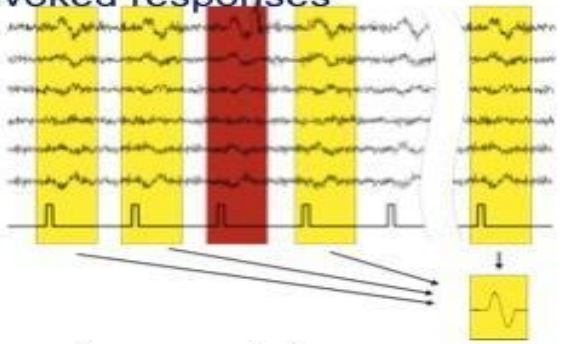
- attend/ignore
- detect + react
- detect + count
- imagine
- observe/imitate
- ...

Behavioral responses

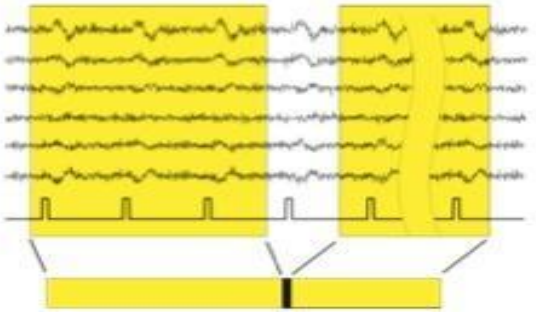
- limb/finger movement
- speech
- ...

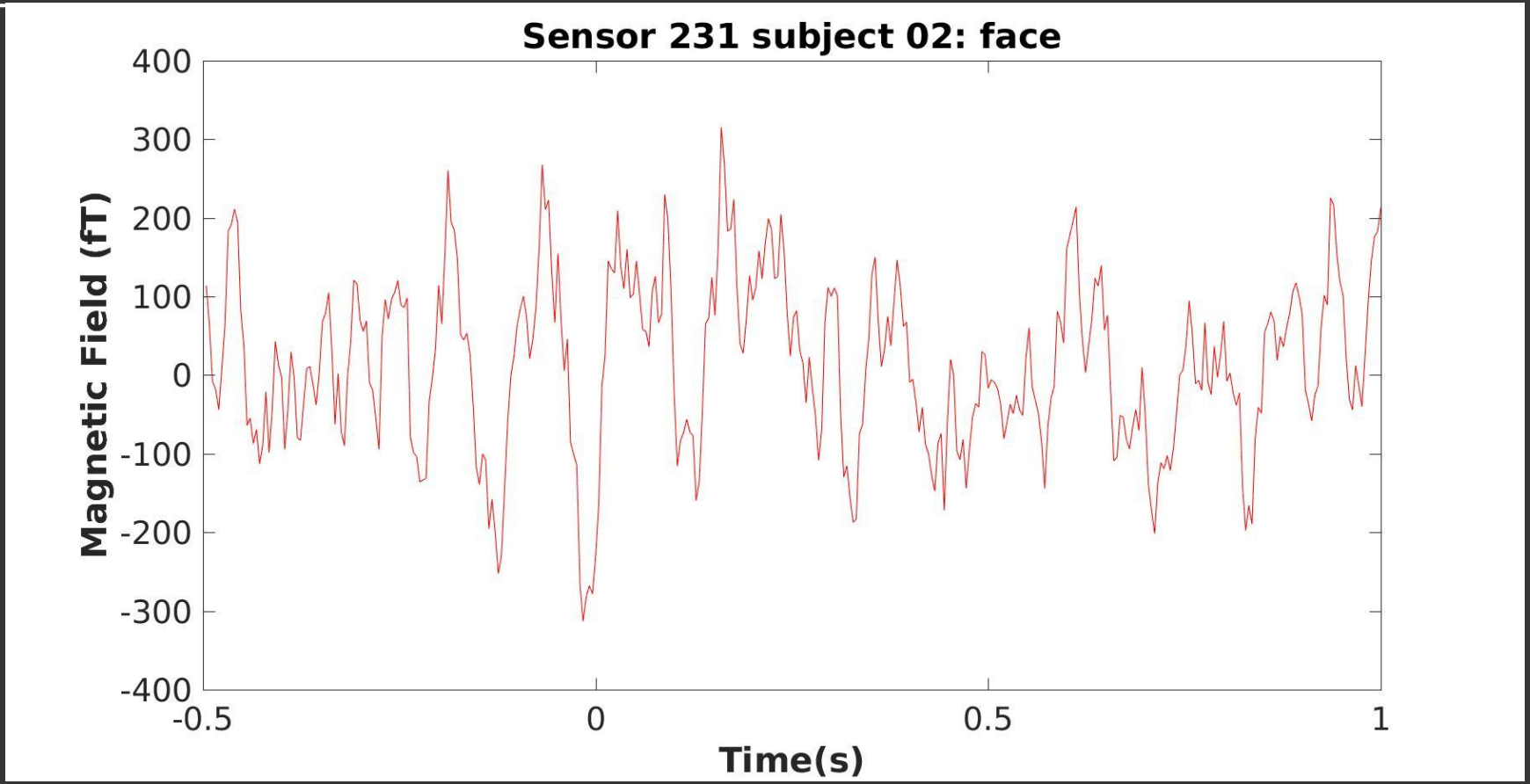
MEG/EEG

- evoked responses

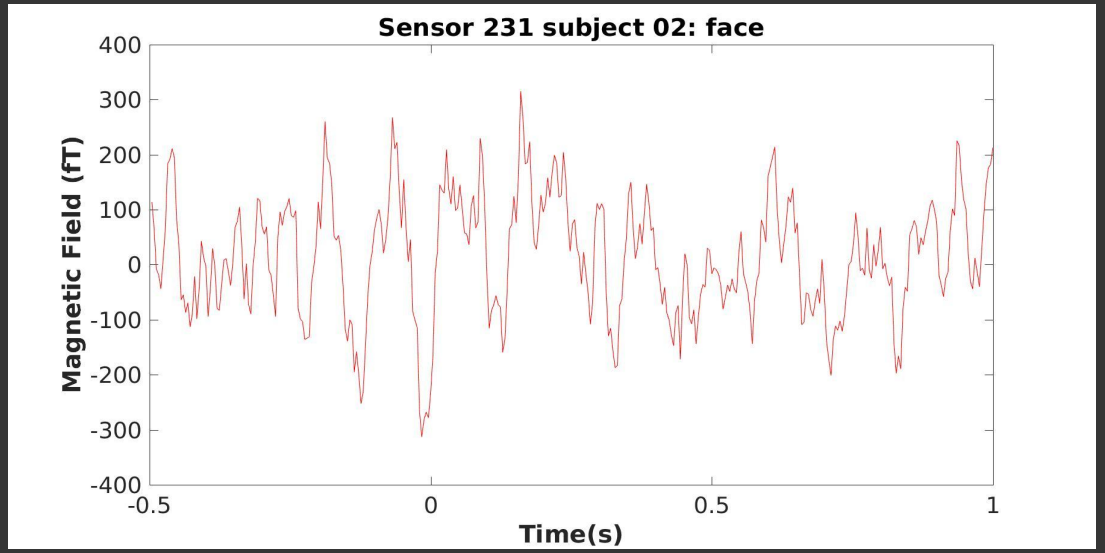


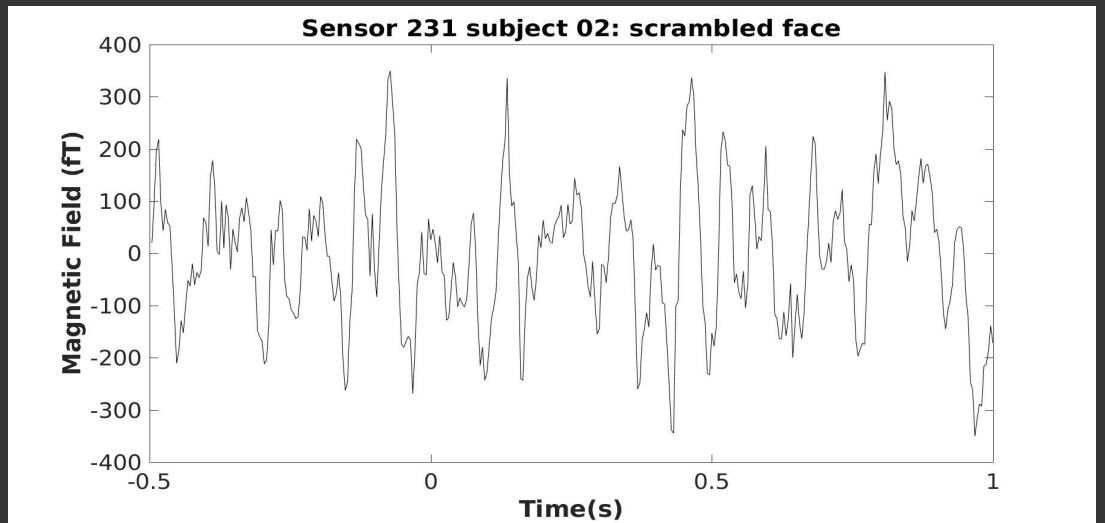
- spontaneous data




Sensor 231 subject 02: face
Magnetic Field (fT)
400
300
200
100
0
-100
-200
-300
-400
-0.5
0
0.5
1
Time(s)

Problem 1: Not all signals are “correct”


Sensor 231 subject 02: face
Magnetic Field (fT)
400
300
200
100
0
-100
-200
-300
-400
-0.5
0
0.5
1
Time(s)


Sensor 231 subject 02: scrambled face
Magnetic Field (fT)
400
300
200
100
0
-100
-200
-300
-400
-0.5
0
0.5
1
Time(s)

Problem 2: **No clear demarcation between the signals.**

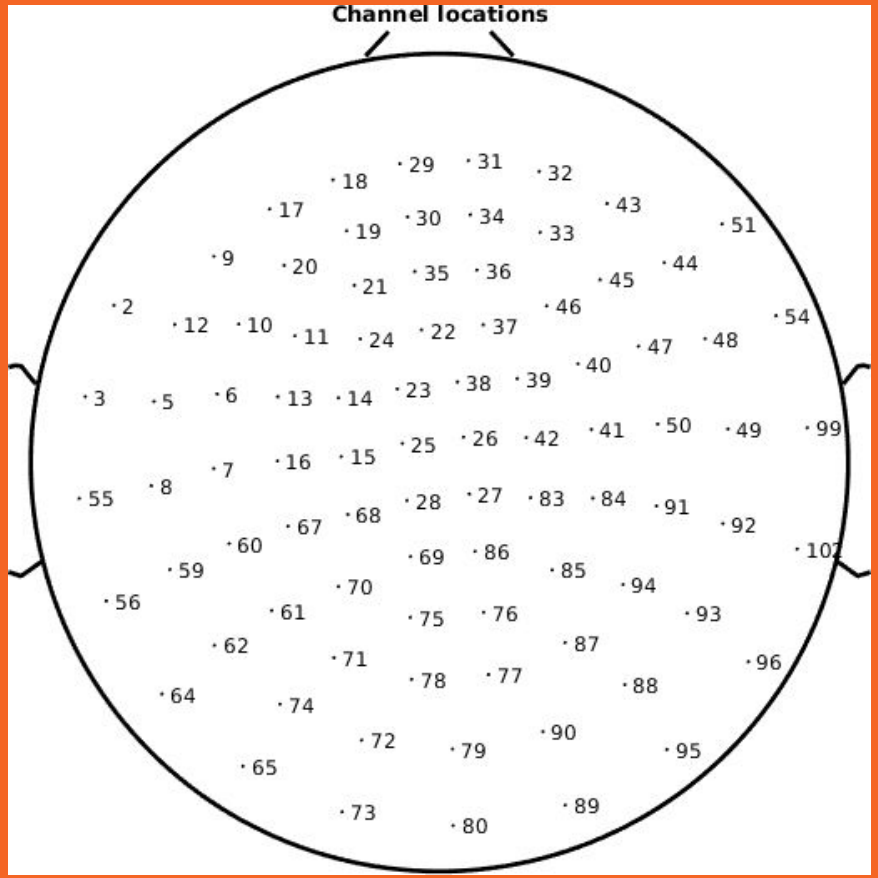
Machine Learning did what humans could not: find the patterns between signals classified as face and scrambled face.

ENTERS MACHINE LEARNING

Central purpose

- Identify neurons in brain responsible for visual identification.
- Detect timestamps during which classification occured.

How I went about it


Channel locations
18
29
31
32
17
30
34
43
51
19
33
9
20
35
36
44
21
45
2
46
54
12
10
11
24
22
37
47
48
40
3
5
6
13
14
23
38
39
99
25
26
42
41
50
49
16
15
7
55
8
28
27
83
84
91
92
67
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94
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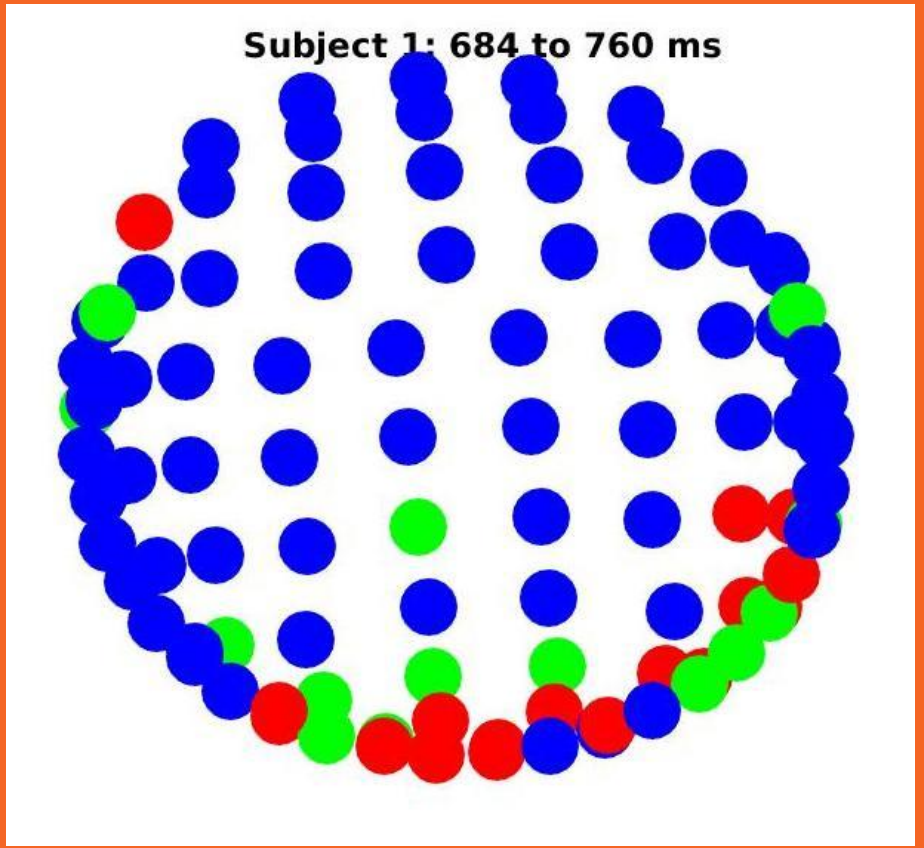
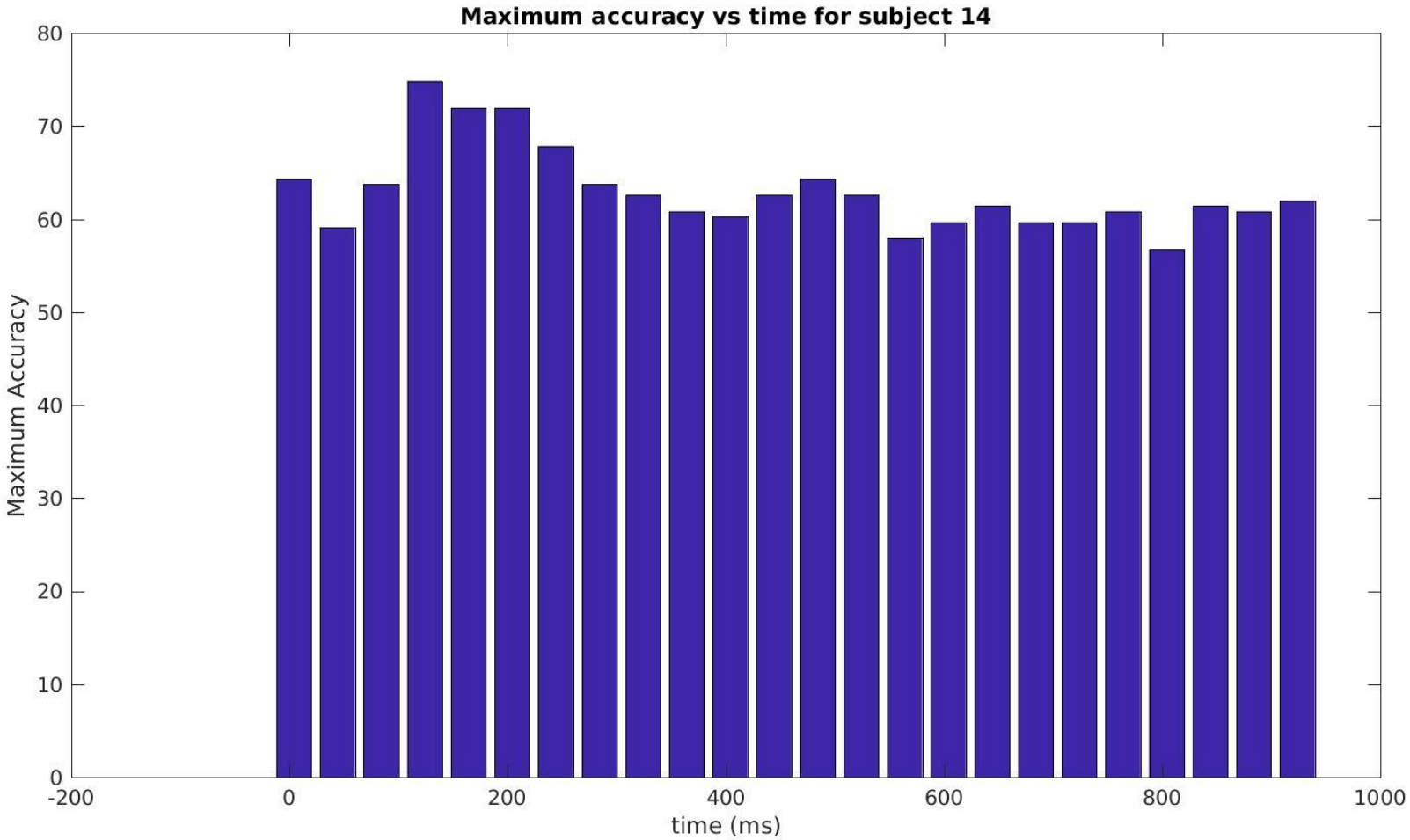
65
73
89
80


Subject 1: 684 to 760 ms


Maximum accuracy vs time for subject 14
Maximum Accuracy
time (ms)
0
10
20
30
40
50
60
70
80
-200
0
200
400
600
800
1000

Future Extension

Use eye tracking to identify the features captured by the sensors during the timestamps found.

Additional Section

How to take up a new field and “learn” it

Step 1: Don’t take an online course.

Step 2: Take up a project. (self-undertaken or under a professor who is generous enough, preferably with a friend if you are a beginner)

Step 3: Search “how to do xyz”.

Thank me later.

Tip

- **Be patient,** it will not happen overnight**.**
- It needs **persistence and devoted time** to your desk and laptop, and maybe some isolation.
- Remember, **Google is your best friend**.
- Follow **Tunnel Approach**

SubSteps: How to go about a self-undertaken project

Step 3.1: Find existing code; copy it in your notebook/notepad and run it.

Step 3.2: Understand it and play with it.

Step 3.3: Tweak with it and analyse the results.

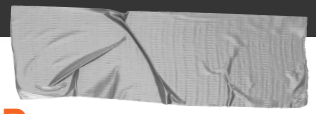
Hello future pro.

Tip

- **Be patient,** it will not happen overnight**.**
- It needs **persistence and devoted time** to your desk and laptop.
- Remember, **Google is your best friend**.
- Follow **Tunnel Approach**
- **Talk to people** about it
- Ask their opinions and different approaches for 3.3

How to develop new ideas?

- Read and observe
- Approach a professor
- Search ‘simple problem statements for machine learning’, ‘kaggle datasets for NLP’.



TIP

- Read articles on Medium, Kaggle
- Follow bloggers like machinelearningmastery, KDnuggets
- Be part of communities like FDG, GDG, WWC, PyDelhi, WiMLDS
- Discuss ideas with people

Good luck!

Machine Learning is not difficult, but needs a careful application and understanding.

I hope you'll use these tips to go out and make great contributions to this field and society!

Reach out to me:

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For more such future events, follow us at

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Delhi Women in Machine Learning and Data Science