Report - Review Meet 2

NeuroClone

Team Inception

Github repository: <https://github.com/SiddhiBG/NeuroClone-Team-Inception>

# Team Details

| Name | Roll number | Contact No. | Email ID |
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# Inspiration for your idea *( under 50 words )*

| The main motivation was to help out paralyzed people by giving them a *sense* of entering into a new body that they can control. The plan is to remotely control a robot via EEG signals. Also, whatever the robot sees and hears will be returned to the paralyzed thereby, giving him the sense of moving in a new body. |
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# Description *( in 80-100 words )*

| Whenever we do an action, we first imagine that we have to do the job. Let’s consider simple hand lifting. So, we think to do that, then we start doing the action. The “imagination part” can be done even by paralyzed people who can’t lift their hands. Now, these imaginations are electric signals in the nerves. They can be detected using a set of electrodes placed on the scalp. The plan is to take these “imagination” signals, interpret them and send them to a robot that can do those actions for you. Whatever the robot sees and hears will be returned to the person on a screen, giving him the feel of a new body. |
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# Workload Distribution

| **Module 1**  Om: Basic studying about the brain and EEG**,** MATLABbasics, EEGLAB basics, ML course on Coursera, Collection of datasets, trying Machine learning with available models, a real experiment to get an actual, live dataset, Training the model.  Akshata: Basic studying about the brain and EEG, Python basics, ML course, PyEEG basics, Trying to train a model on PyEEG, a real experiment to get an actual, live dataset, Training the model.  Siddhi: Basic studying about the brain and EEG, Python basics, ML course, PyEEG basics, Trying to train a model on PyEEG, a real experiment to get an actual, live dataset, data keeping. |
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| **Module 2**  Adit: Basic studying about the brain and EEG, Solidworks Modelling for Robot Design, Simulation on Gazebo using ROS. ROS Beginner level tutorials, Turtlebot installation and simulations. Basic Level Python. Basic Info regarding PID, IMU  Vaishnavi: Basic studying about the brain and EEG, Solidworks Modelling for Robot Design, Simulation on Gazebo using ROS. ROS Beginner level tutorials, Turtlebot installation and simulations. Basic Level Python.Basic Info regarding PID, IMU |

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# Work Done Till Date

| **Module 1**  **Siddhi**:  Python basics learning: (mentioned in the reference below)  Basics of EEG covered.  Link to the workspace: [Siddhi Gaikwad](https://drive.google.com/drive/folders/1jUimX7C2x9JZzY3xtljyuKY21Hoiwaoy?usp=sharing)  Handling Github  **Akshata**:  Python basics covered  ML course started: SS available in the link below  EEG basics covered.  Done with ML course. (SS available)  Done with Deep learning course  Learnt PyTorch basics  Trained a model  [Akshata koshti](https://drive.google.com/drive/folders/1-9s7ab1E4Ax0Fx4Gfjf8Zx6jRKP_U9Qz?usp=sharing)  **Om:**  EEG data collected (final datasets available in the link)  Resource sorting  Learnt MATLAB basics(SS available in link)  Learnt EEGLAB basics  Done with ML course. (SS available)  Done with Deep learning course  Learnt PyTorch basics  Trained a model(SS available)  [Om Mihani](https://drive.google.com/drive/folders/129psiI7WNFewQNTH_4cT27AwmJJW7uC_?usp=sharing) |
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| **Module 2**  **Vaishnavi :**  Brain Study  Learned basics of Solid Modeling, ROS, and Turtlebot.  Solidworks practice  ROS beginner level tutorials completed  Acquired basic knowledge on python  [**Vaishnavi Agnihotri**](https://drive.google.com/drive/folders/18z-O6kQO-dV3mOWoYlSAYZLzoCfeObr-?usp=sharing)  **Adit :**  Brain Study  Learned basics of Solid Modeling, ROS, and TurtleBot3.  Attended workshops of ERC.  Solidworks practice  ROS beginner level tutorials completed  Python course through Coursera  Open Manipulator Basics  [**Adit Agrawal**](https://drive.google.com/drive/folders/1n-bPyiQBJjmkhF0zhTLku1szEWJ0FpNv?usp=sharing) |

# Tools/ Technology used

| **Softwares**  MATLAB with extensions EEGLAB and BIOSIG  Python  Github  PyTorch  Google Colab (with GPU)  Kaggle codes  ROS  Solidworks  Gazebo 11  Virtual BOX 6.1  Turtlebot3 |
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# Difficulties Faced & Solutions Proposed

| * Making us familiar with the topic and searching for usable research papers. Mentors helped us through this and extra efforts were put in. * Searching for relevant, reliable, and reusable EEG Datasets. Took a lot of effort and help from many experts. * It was difficult for our laptops to digest heavy software and for us to learn them in a short span. * Understanding what exactly will be needed to train the system to understand the signal. Valay helped a lot in explaining what ML is. He even suggested relevant courses. * Understanding EEG to a greater extent. Ankit helped a lot in this. * Exact mapping to the electrode to site: ICA, Regularisation * The filters were suggested by many seniors together, especially Shubham and Gagan. * How to give live data? Using a suitable data loader in batches. One small point of dimensions is still pending but will be figured out by 27th June * Frequency for Turtle bot and PyTorch were different: Averaging of the output * There may be a device with lesser channels during presentation: Give constant value inputs to other channels * There may be frequency issues during presentation: Repetition of values |
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# Plan of Action For the 10 days after end sems

| Module 1   * Last stage of module 1. Figuring out how to give live data(dimensions). (Model and weights are ready) * Make a github Repo * Plan for the “offline experiment” with Team, “The Mentalists” * Start collaborating with Module 2 |
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| Module 2   * Preparing turtlebot so that it can perform actions based on EEG data provided by Module1 * Start preparation of actual Bot through Solidworks. * Applying knowledge of ROS to train the bot. |

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# Changes after review meet 1

| Module 1  Not many. Github repo was planned but for post endsems. |
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| Module 2  Working Speed increased. Learned basics of Python, seeing the need to implement robot movement. |

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# Work done after review meet 1

| Module 1   * Deep learning courses done. * PyTorch learnt. * Model trained. |
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| Module 2   * ROS beginner level tutorials completed * Acquired knowledge about python * Gathered info reg PID and IMU * ERC workshops on ROS, Gazebo * Solidworks practice * Open Manipulator |

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# What is to be expected in the Final Presentation

| A simulation that will be able to do a very specific job(mentioned in references) controlled by EEG signals, generated live. |
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# References

| **Siddhi Gaikwad** -  Python Basics: <https://github.com/wncc/learners-space>  <https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3>  Book - AUTOMATE THE BORING STUFF WITH PYTHON.  EEG basics: [Fundamental\_of\_EEG\_Measurement (1)](https://docs.google.com/document/d/1f8kH8XCpuoQHEmxz3xjL203oz7FpN88oyQoozwq-D_8/edit?usp=sharing)  [iMotions\_EEG\_Guide\_\_2019 (2).pdf](https://drive.google.com/file/d/1CLElAoOAo9-8au4OD5Zm5FPBqX_qIGzw/view?usp=sharing)  Github: <https://www.notion.so/shubhlohiya/Version-Control-with-Git-51504dd7484e446aa5f5a50b757a29b4>  **Akshata Koshti** -  Python Basics: <https://github.com/wncc/learners-space>  <https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3>  Book - AUTOMATE THE BORING STUFF WITH PYTHON.  ML course: Coursera  EEG basics: [Fundamental\_of\_EEG\_Measurement (1)](https://docs.google.com/document/d/1f8kH8XCpuoQHEmxz3xjL203oz7FpN88oyQoozwq-D_8/edit?usp=sharing)  [iMotions\_EEG\_Guide\_\_2019 (2).pdf](https://drive.google.com/file/d/1CLElAoOAo9-8au4OD5Zm5FPBqX_qIGzw/view?usp=sharing)  Kaggle:  <https://www.kaggle.com/c/grasp-and-lift-eeg-detection/data>  Pre trained model’s parameters  <https://www.kaggle.com/banggiangle/cnn-eeg-pytorch/notebook>  PyTorch tutorials  [Learn the Basics — PyTorch Tutorials 1.9.0+cu102 documentation](https://pytorch.org/tutorials/beginner/basics/intro.html)  **Om Mihani** -  ML course: Coursera  EEG basics: various research papers: [Resources](https://drive.google.com/drive/folders/1FVvupi4HG7G9Ez3jS53gZzmUlEA4z9HG?usp=sharing)  EEGLAB Tutorial:  [EEGLAB News](https://sccn.ucsd.edu/eeglab/index.php)  Datasets:  [List of datasets](https://docs.google.com/document/d/1LZHiO7OXYTOE35kaswkDvwebgzJTnF3aRyr2hhCLqOc/edit?usp=sharing)  Kaggle:  <https://www.kaggle.com/c/grasp-and-lift-eeg-detection/data>  Pre trained model’s parameters  <https://www.kaggle.com/banggiangle/cnn-eeg-pytorch/notebook>  PyTorch tutorials  [Learn the Basics — PyTorch Tutorials 1.9.0+cu102 documentation](https://pytorch.org/tutorials/beginner/basics/intro.html) |
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| **MODULE 2**  **Vaishnavi Agnihotri**  <http://wiki.ros.org/ROS/Tutorials>  ME119: Lecture 10 - Introduction to Solid Modelling.  Ros beginner tutorials  <http://wiki.ros.org/ROS/Tutorials>  ERC workshops: Solid works and ROS Gazebo  CAD CAM tutorials :  https://www.youtube.com/channel/UCtwaWPOXEBysZLh1rrPzwFw  Tried relaxing stuff like pliers , badminton cock , torsional spring etc. :P .  Python through PYCK  **Adit Agrawal**  <http://wiki.ros.org/ROS/Tutorials>  ME119: Lecture 10 - Introduction to Solid Modelling.  [https://www.youtube.com/channel/UC0NX 5l\_sS-y14xc9XtPzsPw](https://www.youtube.com/channel/UC0NX5l_sS-y14xc9XtPzsPw)  Ros beginner tutorials  <http://wiki.ros.org/ROS/Tutorials>  ERC workshops: Solid works and ROS Gazebo  Python through Coursera  Open Source Manipulator Simulations . |

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