**Cost Efficient Neuroprosthetic Arm**

**THE BUSINESS**

* **The product/service/idea:**
  + **Idea:** To design a low-cost neuro-prosthetic arm which can perform rudimentary motor functions and is compatible with a variety of patients. It basically is an artificial arm that is controlled by processing the tapped brain signals which then provides the ability to do elementary tasks like picking something up, opening doors, etc.
  + **Service:** We are developing a brain-controlled prosthetic arm which will aid the disabled in living their lives less dependent on others and more independent for their rudimentary needs. This arm will be controlled directly by the brain of the amputee like any other part of his/her body. Also, we are trying to minimize the cost as much as possible so that we can reach out to as many people as possible.
  + **The technology behind the product/service:** A prosthetic arm can be developed as an aid for the disabled which can be controlled to perform rudimentary functions with the help of assistive devices. One of the proposed methods to achieve this is by localizing motors and their controllers within the components they control; the arm can be configured to fit multiple different kinds of amputees.
  + There will be **three** major modules:
    - The first module will comprise of Sensing and Signal Acquisition where the brain signals will be tapped noninvasively. Invasive placement of the module may be considered if the non- invasive method is found unsuccessful.
    - The second module will comprise of Signal Processing where the tapped brain signals will be processed and analysed for actuating the further stage of the prosthetic limb.
    - Lastly, the third module will be the designing of the prosthetic limb and actuating it in accordance with the processed signal coming from the second module.
* **Possible innovation at a later stage:** The idea can be further extended to replace or restore useful functions to people disabled by neuromuscular disorders such as amyotrophic lateral sclerosis, cerebral palsy or stroke.
* **Scalability:** This product is intended to reach out to the disabled population who is unable to afford high-end and expensive assisting devices. Jaipur Limbs are being manufactured at a scale of over 60,000 products per year so there is a vast market in this field. This emphasizes the need for technological advancement in this field.
* **The market** (the size of the market and its growth potential)**:** In India, we have 62 amputees per thousand persons i.e. Eighty-Two million (approx.). The size of the market is hence very large. We believe that once constructed our product will touch the lives of many unfortunate people.

**THE TEAM**

* A brief description of each member of the team stating qualification and other details
  + **Ajinkya Bedekar**: Currently pursuing Bachelor of Technology degree in Computer Science and Engineering (Semester VI) from NIIT University, Neemrana, Rajasthan. Good in programming in C, C++, Python, HTML, SQL, Android, Java, SQLite, MySQL, CSS, XML.
  + **Arjun Bakshi**: A first year (Semester II) student pursuing a Bachelor of Technology degree in Electronics and Communications from NIIT University, Neemrana, Rajasthan. Interested in Robotics and represented the university at IIT Guwahati’s Techfest for the same. Proficient in Python, HTML5, and CSS.
  + **Dhruva Agarwal**: A third-year student of BTech-Computer Science engineering interested in a career of Artificial Intelligence. I am well versed with multiple languages which include C, C++, Java, Python, MySQL, HTML, XML, Android, CSS, SQL.
  + **Kawal Nain Singh Batra**: A first year (Semester II) student, pursuing a Bachelor of Technology degree in Electronics and Communication from NIIT University, Neemrana, Rajasthan. I can code efficiently in some languages such as C, C++, Python, HTML.
  + **Cherla Pradyumna Reddy**: A proactive Electronics and Communication Student in the 3rd year of B.Tech. from NIIT University Interested in Signal Processing and System Design, having skills in C, Embedded C, MATLAB, Embedded Systems and core concepts of Signal Processing.
* Name and qualification of mentor: **Dr. Neha Tiwari**, Doctor of Philosophy (Ph.D.) in ECE Barkatullah University, MTech (Digital Communications) Barkatullah University, B.E ECE R.G.P.V Bhopal.
* Whether any preliminary discussion has been done with the mentor: Yes, the product was discussed in detail with our mentor. We were given the required guidance regarding various fields. We also discussed the developments in this field considering other projects and as to why our approach was unique.
* Whether any of the team members participated in a program related to entrepreneurship
  + Ajinkya Bedekar: Participated in E-Summit IIT Roorkee 2019 and took part in different events such as Productathon, Geeks for Geeks Quiz, Split for Success, Logothon, inQUIZitive, Spin and Win, etc in a team with Dhruva Agarwal.
  + Dhruva Agarwal: Participated in E-Summit IIT Roorkee 2019 and took part in different events such as Productathon, Geeks for Geeks Quiz, Split for Success, Logothon, inQUIZitive, Spin and Win, etc in a team with Ajinkya Bedekar.

**THE SUPPORT SYSTEM**

* Is the host institution capable of supporting the student? Yes, our Institution can support us to some extent, but it has its own limitations regarding the funds it can allow for project work.
* Does the host institution have necessary equipment/hardware for product development and subsequent testing? Some of the equipment/hardware for product development and subsequent testing is available in the host institution. The rest equipment required will be acquired from the funds sanctioned by the Dept. of Science and Technology (DST) once the project is approved.

**THE FINANCIAL REQUIREMENT (may not be restricted to DST support)**

* The cost of purchase of raw materials: - ₹ 1.45 Lakhs /-
  + BCI custom Kit - ₹ 55,000 /-
  + Microcontroller - ₹ 3,500 /-
  + Motors (Hybrid-servo and worm-geared including the controller) (x20) - ₹ 75,000 /-
  + Wireless Module (transmitter and receiver) - ₹ 1,500 /-
  + 3-D Printing - ₹ 10,000 /-
* The cost of contingencies: - ₹ 15,000 /-
* Product development cost/ Consultancy cost: - ₹ 20,000 /-
* Any other expenditure(misc.): - ₹ 15,000 /-
* Surplus: - ₹ 55,000 /-

Note: The above-determined prices have been approximated to the best of our knowledge.