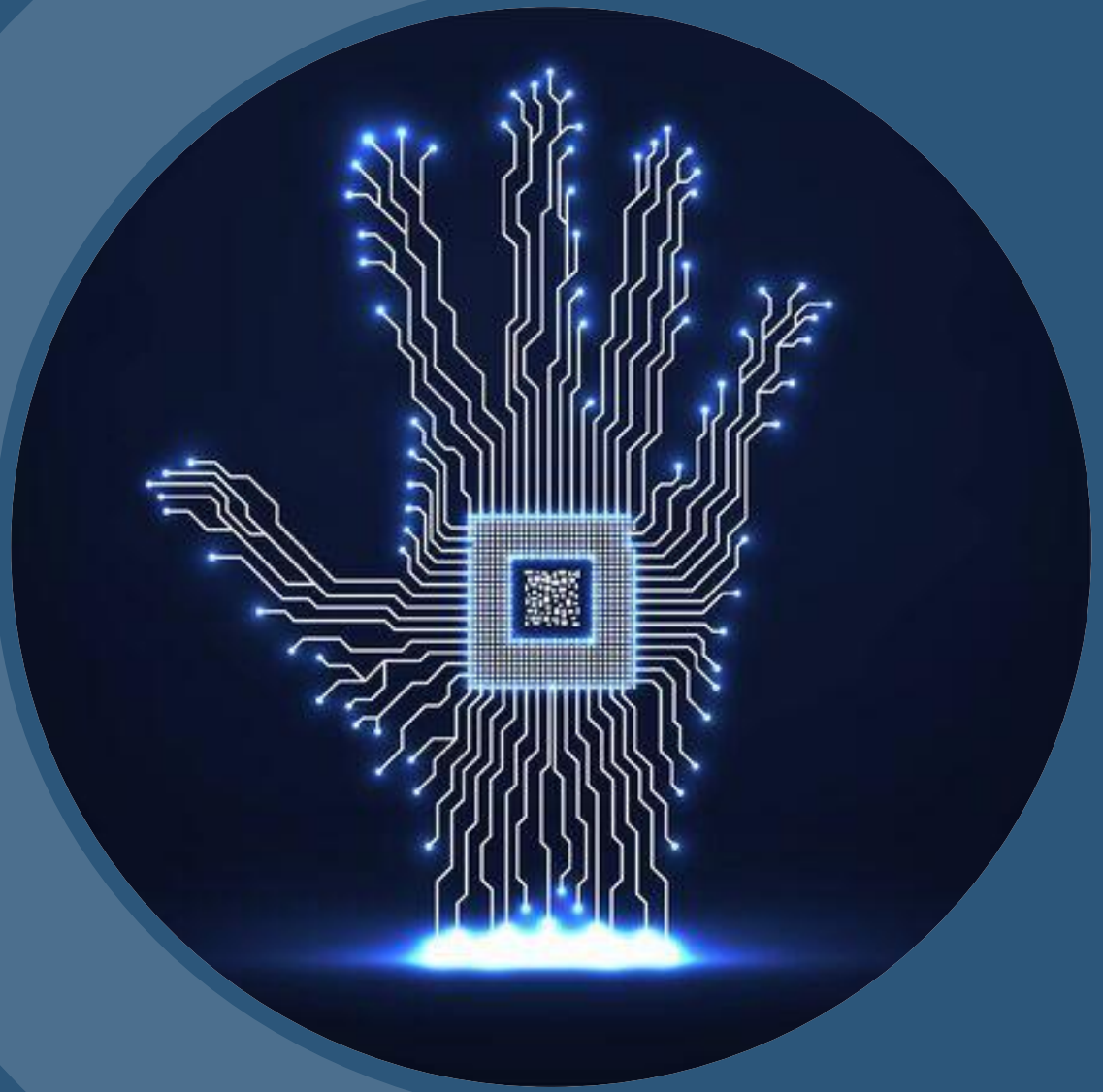

UltraGrasp
GET A GRASP ON YOUR FUTURE

A FULLY AUTONOMOUS, MODULAR, NON-INVASIVE PROSTHETIC HAND

ULTRAGRASP

ANISH SUVARNA & SHAURYA JAIN

THE PROBLEM WITH CURRENT FOREARM PROSTHETICS

- EMG and Patient Complications
  - Forearm prosthetics use invasive and expensive EMG sensors which detect muscle/brain signals.
  - 72.1% of patients reported skin pain/discomfort and difficulty controlling their artificial limb, mainly elderly individuals.
  - Complex grasps are not initiated automatically, requiring button pressing or manual exertion, causing fatigue.
- Stigma and Lack of Emotional Connection
  - Many existing prosthetic devices lack haptic and audio feedback, making it difficult for users to form an emotional connection with their artificial limb.
  - The stigma surrounding prosthetics can lead to discrimination and lower self-esteem in patients, impacting the user's mental well-being.
- High Cost
  - Artificial forearm limbs are costly ($15,000 to $80,000) and require high maintenance.
  - Most amputees are blue-collar workers or aged 65+ who come from 3rd world countries and cannot afford these devices.

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OUR SOLUTION - ULTRAGRASP

A FULLY AUTONOMOUS, MODULAR, NON-INVASIVE PROSTHETIC HAND

The Big 8 Features

Autonomous Grasping

Using a machine learning-based residual neural network, UltraGrasp can autonomously grasp any unseen object in clutter using the depth camera in its palm. This workflow is intuitive and can accurately predict human intention for the desired grasp position.

Dynamic Stability/Control

A PID controller employs dynamic stability, and the inverse kinematics algorithm determines the necessary joint actuations to reach the target object. An IMU ensures continued grasping even if the camera loses sight of the object, improving safety and functionality.

Comfort and Reliability

UltraGrasp uses soft-robotics technology, with a protective and hydrogel-filled outer coating to support the interior electronics. This design also provides comfort for the user in the residual limb area and allows for durability and strength in the long-term.

Cora: Virtual Assistant

Cora is UltraGrasp's onboard-virtual assistant powered by natural language processing algorithms which provide therapy and elderly care from speech-based interactions, also fostering endless two-way conversations and creating a bond with the user.

Haptic & Audio Feedback

UltraGrasp provides haptic feedback through vibration coins, enabling a sense of touch. Audio control with natural language processing allows for voice activation of specific grasp poses and release commands. These features allow patients to feel that UltraGrasp is part of their body.

Multi-Articulation

Each 4-bar finger mechanism replicates human-like motion and is actuated by one powerful servo for efficiency. Our extended range of motion in the wrist allows for three times the torque and three degrees of freedom for advanced heavy weight support.

Affordable Cost

UltraGrasp is made with 3D printing and cost-effective materials which are still of high quality in terms of functionality, durability, and comfort. This aspect allows more amputees to be attracted to our product and be given a quality prosthetic capable of meeting their everyday needs.

Proactive Maintenance

UltraGrasp can detect and diagnose potential issues using machine learning-based monitoring before they become bigger problems, reducing the need for more costly repairs or replacements. Our mobile application notifies users of potential issues.

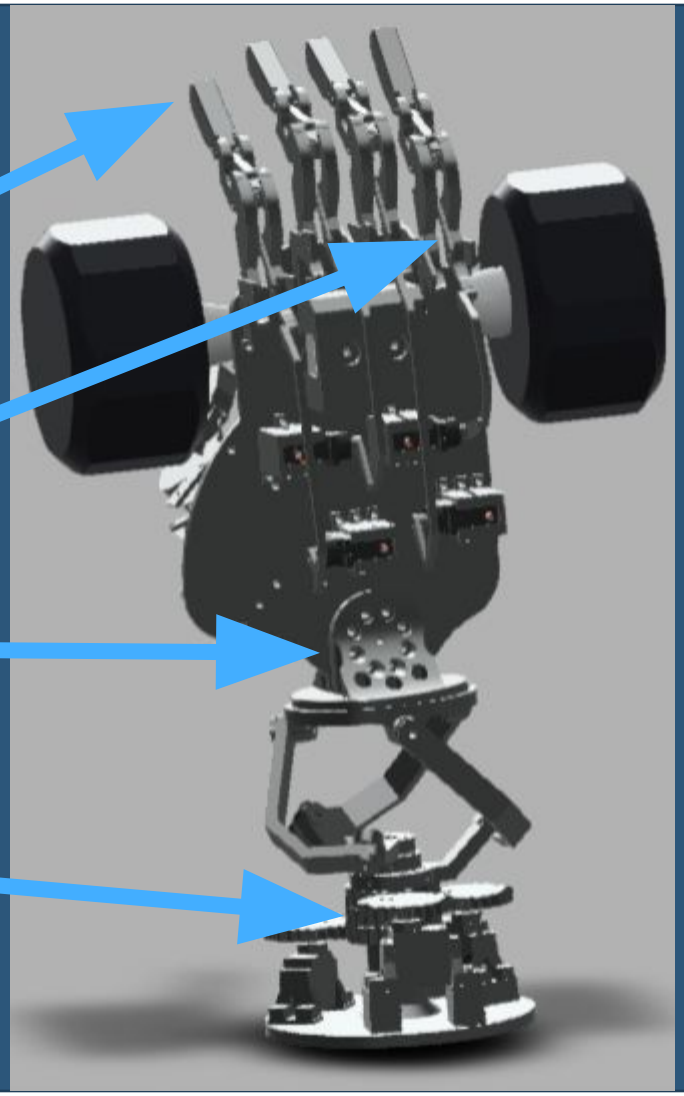
ULTRAGRASP - VISUAL OVERVIEW

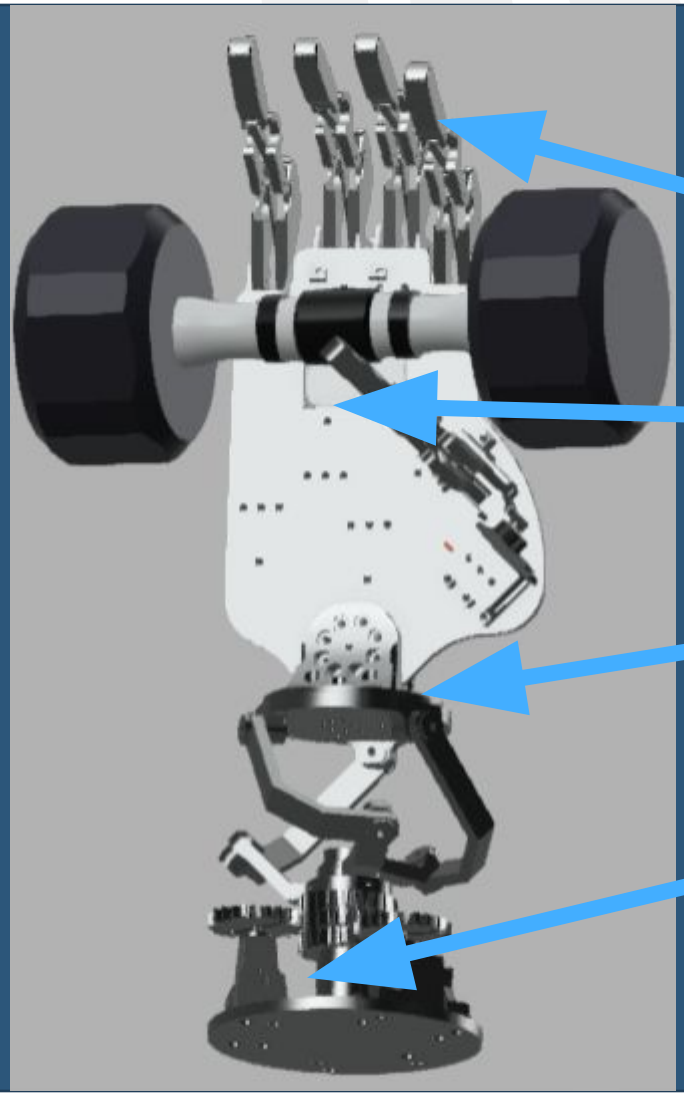
Multi-Articulation Replicating Human Hand

4-Bar-Linkage System for Mechanical Optimization

PID Control-Based Stability Control for Fingers/Wrist

Spherical Parallel Manipulator for Wrist





Inverse Kinematics for Finger Motion Planning

Depth Camera for Autonomous Grasping

Microphone for Onboard, NLP-Based Voice Assistant

Tactile Sensors for Haptic and Audio Feedback

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BUSINESS MODEL

Revenue

Direct Sales

We will sell a complete, base-package unit of UltraGrasp directly to the consumer. Customers can also choose a payment plan.

Base Package	$4999

Includes all hardware and voice activation capabilities, along with proactive maintenance.

Software Subscriptions

On top of the base package, our key features come through subscription-based plans, which users can add and pay for on a monthly basis as needed.

Autonomous Package	+$20
Virtual Assistant	+$10

Licensing & Distributing

We will license our product to manufacturers and distribute our product to clinics and rehabilitation centers, allowing for our product to gain traction and approval in the industry.

+20% royalty on profits per unit sold	
Maintenance and Implementation Fees	+$10000 annually

Profits

We adopt centralized manufacturing, eliminating significant transportation costs and decreasing our reliance on other companies to assemble a component.

Manufacturing costs to create one unit of UltraGrasp using non-specialized components add up to $496.50, which is a drastic decrease from current prosthetic devices. This cost can be further decreased when we create our own components.

From our base-package price, our profit margin is still over 90%, and the retail price is 990% of the manufacturing costs, while also remaining affordable for the amputees.

MARKETING

Digital Marketing

Digital marketing will be primarily through our website and social media, and we will acquire Search Engine Optimization engineers to increase visibility and the ranking of our content in a search engine.

Partnerships

We will partner with medical institutions, clinics, and research centers to promote our prosthetic device and business to their patients, which will work in parallel to our distributing plans.

Product Demos

We will periodically demo our prosthetic device at research conferences and events/workshops, potentially with known influencers, in order to educate potential customers and showcase our product.

UltraGrasp
GET A GRASP ON YOUR FUTURE

VALIDATION AND IMPACT

IMPACT

The impact of UltraGrasp is particularly significant for the 22.3 million amputees worldwide who currently lack access to high-quality upper-limb prosthetics. UltraGrasp's low cost makes it an affordable option for those in third-world countries and lower-income individuals and fosters a prosthetic-patient bond. By providing a comfortable and versatile solution for these populations, UltraGrasp can improve their quality of life and reduce the stigma surrounding amputees.

Furthermore, UltraGrasp's novel technology has the potential to impact the field of research into bionic limbs. Its machine learning-based generative grasping algorithm and use of a residual neural network for accurate replication of human intent/grasps in real-time is groundbreaking. The partnerships we have formed, and positive feedback indicate that UltraGrasp's innovations serve as a foundation for further research into revolutionary autonomous, artificial limbs.

STANFORD UNIVERSITY

N·P·T·L

Neural Prosthetics Translational Laboratory

PARTNERSHIPS/DISTRIBUTING

Currently working on scaling up the product and business for commercialization and partnering with other clinics for distribution.

After a live demo in front of Stanford's Neural Prosthetics Translational Lab, UltraGrasp received positive reviews from Dr. Nishal Shah, and other professors + postdoctoral researchers in the field of bionic limbs.

We secured a partnership with this lab to explore the potential integration of non-invasive human-brain interfaces in our product.

MEDICAL CENTER ORTHOTICS & PROSTHETICS

REVIEWS + VALIDATION

The prototype, incorporating "The Big 8," was successfully demonstrated at the Medical Center Orthotics and Prosthetics, where the lead upper extremity prosthetist, Mr. Jamie Vandersea, provided positive feedback on the product's cost-effectiveness, patient comfort, and ability to replicate human motion.

The prosthetist noted that UltraGrasp was the first device he had seen that was capable of autonomous grasping without the aid of electrode sensors and was impressed with its accuracy in doing so.