**CHAPTER 1**

**INTRODUCTION**

From time to time, man has resorted to many methods in his search for relief of pain. Painless surgery is probably the greatest boon that has been granted to the patients and indirectly to surgeons.

General anesthesia is unconsciousness produced by medications. This allows for surgery and other treatments that would otherwise be too painful or difficult to tolerate. But essentially, *it’s a medically induced*[*coma*](https://www.medicalnewstoday.com/articles/173655.php)*, not sleep*.

General anesthetics are highly lipid soluble and can dissolve in every membrane, penetrate into organelles and interact with numerous cellular constituents. Their actions have long been considered rapid and fully reversible, with the pharmacodynamic time course of anesthesia dictated solely by the pharmacokinetic profiles of anesthetic uptake and elimination. But recent laboratory data call for a cautious reassessment of this assumption.

In the last decade, it has become apparent that anesthetics can affect gene expression, protein synthesis and processing, cause amnesia, and cellular function in poorly understood ways that provide plausible biochemical substrates for durable long-term effects in a number of tissues. While in most patients physiological homeostasis is restored soon following general anesthesia, anesthetics have potentially profound and long-lasting effects that, in animal models, appear particularly consequential in specific developmental periods and path physiological contexts.

Previous investigations involving hospitalized patients suggest that local anesthetic infused via perineural catheters decreases postoperative pain and narcotic requirements after a variety of procedures.

Our solution aims to improve pain management through the use of indwelling catheters that block or mitigate pain at the source before the surgery begins. Pain management catheters reduce dependence on narcotics and speed up patient recovery.

In our solution, we identify and segment a collection of nerves called the Brachial Plexus (BP) in ultrasound images. The brachial plexus is a complex network of nerves, extending from the neck to the axilla, which supplies motor and sensory fibres to the upper extremity. Brachial plexus block offers as optimal operating conditions for upper limb surgeries by producing complete muscular relaxation, maintaining hemodynamic stability and the associated sympathetic block. They also provide extended postoperative analgesia with minimal side effects.

Brachial plexus nerve blocks (BPBs) for upper extremity surgery provide superior analgesia and reduce opioid consumption. Supraclavicular block anesthetizes the brachial plexus where it is in its most compact form, thus providing a complete and reliable block for upper extremity surgery. Ultrasound guided single injection (SI) and triple injection (TI) techniques were found to provide the same degree of surgical anesthesia at 30 minutes while the TI technique needed more time to perform.

Brachial plexus block remains the only practical alternative to general anaesthesia for significant surgery on the upper limb. It provides a superior quality of analgesia and avoids the common side-effects associated with general anaesthesia such as postoperative nausea and vomiting. It can be extremely useful in patients with significant co-morbidities such as severe respiratory and cardiovascular disease, morbid obesity and in those with potential airway difficulties.

In addition, it simplifies the management of other disease conditions such as diabetes mellitus, where perioperative fasting can be minimized, diet more easily reintroduced and conscious level continuously monitored. These blocks are therefore particularly useful in the ambulatory surgical setting for a wide variety of patients and procedures. For more complex major procedures, continuous catheter techniques allow prolongation of analgesic block with earlier mobilization, improved rehabilitation, and the potential to reduce hospital stay and improve functional outcome.

# OBJECTIVES

The basic and specific objectives of this project are:

* To understand and realize the real world project, understand the problems associated in developing it and explore the appropriate solution to it.
* To think in a way so as to make the life simpler and easier with the available technology and resources.
* To become familiar with basic principles of AI towards problem solving, inference, perception, knowledge representation, and learning.
* To demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
* To improve pain management through the use of indwelling catheters that block or mitigate pain at the source before the surgery begins.
* To identify and segment a collection of nerves called the Brachial Plexus (BP) through ultrasound images.
* To build a model that can identify nerve structures in a dataset of ultrasound images of the neck that would improve catheter placement and contribute to a painless surgery.

# PROBLEM STATEMENT

* To develop a computerized AI application using Intelligent Ultrasound that eliminates narcotics and its side effects and improves pain management.
* The system should be able to identify nerve structures in a dataset of ultrasound images of the neck that would improve catheter placement and contribute to a painless surgery.
* The system should be able to check the validity of input data and give a feedback to the user in case of errors or inconsistency using exception handling.
* The system should be user friendly and convenient to use.

**CHAPTER 2**

**LITERATURE SURVEY**

# HEALTHCARE WEBSITES

* **Healthline.com**

<https://www.healthline.com/health/side-effects-of-general-anesthesia>

It’s a website which publishes various articles on health tips and general body awareness. It has an article on the side effects of using anesthesia. The article is written by Tim Newman who bachelor's degree in neuroscience at the U.K.’s University of Manchester and is currently a neurology adviser. He showed various long term and short term ill effects of using general anesthesia.

* **MedicalNews.com**

It’s a website which publishes daily news on healthy lifestyles and human body. The article referred is written by Adithya Cattamanchi. Dr. Adithya Cattamanchi specializes in pulmonary and critical care medicine. He graduated from University of California, San Francisco. He works at Zuckerberg San Francisco General Hospital and Trauma Center and is an associate professor of medicine at University of California, San Francisco.

It tells about how using anesthesia can lead to amnesia which can lead to temporary loss of memory and ability to recollect things of past and relating it which present. Amnesia is one of the biggest side effects of using general anesthesia.

# BOOKS

* **Clinical Anesthesia**

Author: Bruce Cullen, Paul Barash, and Robert K. Stoelting

The chapters of this book brought us to the conclusion that General anesthesia is almost safe for most of the people. But this is not the case with old people or the surgeries which takes more time and is more sophisticated. In these cases we have to upgrade our temporary paralysis techniques by using regional anesthesia.

# VIDEOS

* <https://en.wikipedia.org/wiki/Brachial_plexus_block>

This is a video of a brachial plexus block; a portable ultrasound scanning device is used to track the Brachial Plexus nerves on neck and then the regional anesthesia in induced through the catheter.

* <https://www.youtube.com/watch?v=qsjUz4IDSs>

This videos tell what Brachial plexus nerves are and where they are located. It tells information about how these nerves can be used for paralysing an organ of human body. It gives information about various types of methods in which BP nerves can be blocked and how it is currently practiced by various doctors across the globe.