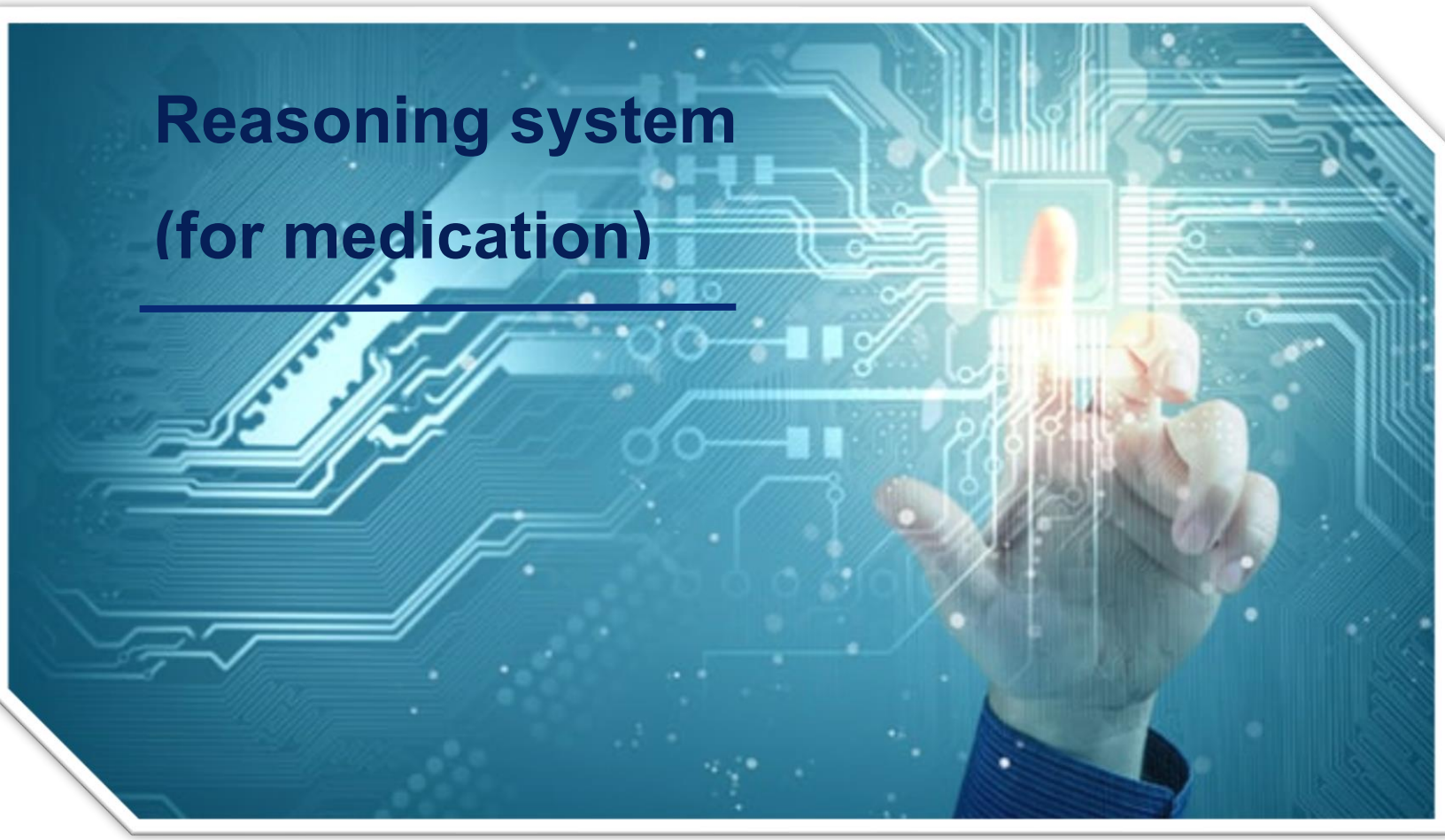
Reasoning system (for medication)



APRIL 7

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Abstract

The project presents a model-based approach to diagnostic reasoning in medicine. A process model is defined on the levels of static elements, dynamic elements and reasoning control. Static elements, facts, hypotheses and different types of disease knowledge, are identified and variations relevant for hypotheses generation are described. Dynamic elements correspond to actions, which in turn modify static elements, but are also controlled and started by the expressions of the static elements. Hypothesis generation starts with the assessment of a given set of facts. According to their priorities, facts are used for the construction of a diagnostic differential: new hypotheses are considered, existing hypothesis refined or excluded. The purpose of hypotheses generation is to establish a complete diagnostic differential with disjunctive explanations which explain a given set of facts.

Introduction

From the very earliest moments in the modern history of the computer, scientists have dreamed of creating an 'electronic brain'. Of all the modern technological quests, this search to create artificially intelligent (AI) computer systems has been one of the most ambitious and, not surprisingly, controversial.

It also seems that our doctors and scientists were captivated by the potential of such a technology might have in medicine industry. With intelligent computers are able to process vast stores of knowledge, the hope was that they would become perfect ‘doctor in a box’, assisting or surpassing clinicians with tasks like diagnosis. With this motivation, scientists created a research program for a new discipline called Artificial Intelligence in medicine.

Reasoning system distinguishes from traditional technologies in health care it gives us an ability to gain information and process it and give a well-defined output to the end user. AI does this through machine learning algorithm. These algorithms can recognize patterns in behavior and create their own logic. In order to reduce the margin of error, AI algorithms need to be tested repeatedly. Reasoning system algorithms behave differently from humans by two ways: one is that algorithms are literal, they can’t adjust itself and only understand. And second algorithms are black boxes, it can predict extremely precise.

The primary aim of health-related reasoning system application is to analyze relationships between prevention or treatment techniques and patient outcomes. AI programs have been developed and applied practices such as diagnosis processes and treatment protocol and patient monitoring.

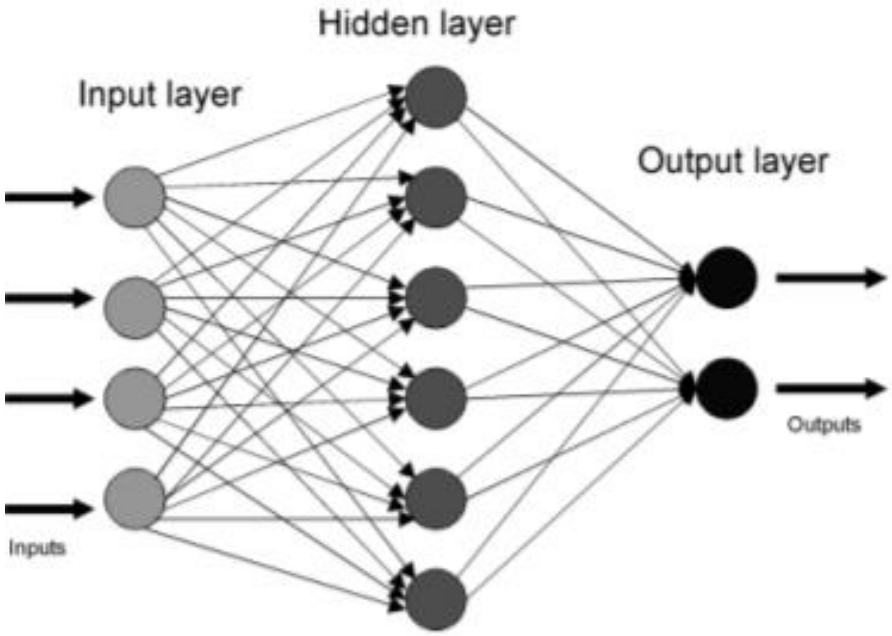
Knowledge based or reasoning systems are the commonest type of AIM system in routine clinical use which is our main motive of our project to achieve. They contain medical knowledge, usually about a very specifically defined task, and able to reason with data from individua patients to come up with reasoned conclusions.

A reasoning system is used for many clinical tasks to which an expert system can be applied:

- Generating alerts and remainders for monitoring of a patients that can warn about the conditions of patients under guidance. It can send the patients report to the doctor through email system.
- Diagnostic assistances for patients with complex case and when the diagnosis is simply inexperienced, a reasoning system can help with coming up with likely diagnosis based upon patient's data or condition.
- Or many other ways.

Artificial neural network is most popular reasoning system (AI) technique in medicine. Artificial neural networks are computational analytics tools which are inspired by the biological nervous system. they consist of networks of highly interconnected computer processors called 'neurons' that are capable of preforming parallel computations for data processing and knowledge representation. Their ability to learn from historical examples, analysis nonlinear data, handle imprecise information and generalize enabling application of the model to independent data has made them a very attractive analytical tool in the field of medicine.

Reasoning system can be used to apply just about any kind of sophisticated decision support system. most common use of the term reasoning system implies the computation representation of logic. Various implementation demonstrates significant variations in terms of system of logic and formality. Most reasoning systems implement variations of propositional and symbolic (predicate) logic. These variations may be mathematically precise representation of formal logic systems or extended and hybrid versions of those systems. Reasoning systems may explicitly implement additional logic systems. These systems typically support a variety of procedural and semi declarative techniques in order to model different reasoning strategies. Many reasoning systems provide capabilities for reasoning under uncertainty. This is important when building situated reasoning agents which deals with uncertain representations of the world.



Fuzzy logic is the science of reasoning, thinking and inference that recognizes and uses the real-world phenomenon-that everything is a matter of degree. Instead of assuming everything is black and white, fuzzy logic recognizes that is reality most things would fall somewhere in between, that its varying shades of grey. It uses continuous set membership from 0 to 1 in contrast to Boolean or conventional logic which uses sharp distinction i.e. 0 for false and 1 for true.

The expert system can be used as a stand-alone system for the specific knowledge domain. It also can provide division support for high level human expert. The main purpose, the rises of the expert system are as a delivery system for extension information, to provide management education for decision makers and for discrimination of up to date scientific information in a readily accessible and easily understood form, to medical researchers, scientists and doctors. By help of expert system the doctors can diagnosis the patients easily by the decrease in the rate of error.

Literature review

- Basic knowledge of medicines.
- Which symptoms lead to which disease.
- It can act as a safety net to prevent unintended harm to patients if detected.
- However, medication system errors during the process can be documented and thought to be preventable.
- In pediatric medicine, doses are usually based on the patient's weight.
- Children are a large, vulnerable group, who undergo rapid growth and development. They face many challenges in this process of development that may require health care professionals' advice and a hospital stay.
- the objectives and rationale of medication review could be expected to apply to chronic diseases in children.
- Issues such as polypharmacy, wastage, repeat prescriptions and medication problems could be similar.
- The benefits seen in adults may also occur in children, and medication review may possibly have a role in the management of medicines in children.
- There is an obvious role for pharmacists in ensuring the safety of over-the-counter medications and provision of information and education to parents and adolescents.
- . Evaluation and provision of necessary education and training to community pharmacists is needed, even in the most basic pediatric issues such as sugar-free medications.
- Children and adolescents need appropriate parental and professional support in taking control of their medication and treatment. The management of medicines in school would appear to be far from ideal. Further research into school-based medicines education and outreach clinics would also be beneficial.

Medicines are chemicals or compounds used to cure, halt, or prevent disease; ease symptoms; or help in the diagnosis of illnesses. Advances in medicines have enabled doctors to cure many diseases and save lives. These days, medicines come from a variety of sources. Many were developed from substances found in nature, and even today many are extracted from plants. Some medicines are made in labs by mixing several chemicals. Others, like penicillin, are by products of organisms such as fungus. And a few are even biologically engineered by inserting genes into bacteria that make them produce the desired substance. When we think about taking medicines, we often think of pills. But medicines can be delivered in many ways, such as:

- liquids that are swallowed
- drops that are put into ears or eyes
- creams, gels, or ointments that are rubbed onto the skin
- inhalers (like nasal sprays or asthma inhalers)
- patches that are stuck to skin (called transdermal patches)
- tablets that are placed under the tongue (called sublingual medicines; the medicine is absorbed into blood vessels and enters the bloodstream)
- injections (shots) or intravenous (inserted into a vein) medicines

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Medicines act in a variety of ways. Some can cure an illness by killing or halting the spread of invading germs, such as bacteria and viruses. Others are used to treat cancer by killing cells as they divide or preventing them from multiplying. Some drugs replace missing substances or correct low levels of natural body chemicals such as some hormones or vitamins. Medicines can even affect parts of the nervous system that control a body process.

Nearly everyone has taken an antibiotic. This type of medicine fights bacterial infections. Your doctor may prescribe an antibiotic for things like strep throat or an ear infection. Antibiotics work either by killing bacteria or halting their multiplication so that the body's immune system can fight off the infection. Sometimes a part of the body can't make enough of a chemical. That can also make you sick. Someone with insulin-dependent diabetes, for instance, has a pancreas that can't produce enough insulin (a hormone that regulates glucose in the body). Some people have a low production of thyroid hormone, which helps control how the body uses energy. In each case, doctors can prescribe medicines to replace the missing hormone.

Some medicines treat symptoms but can't cure the illness that causes the symptoms. (A symptom is anything you feel while you're sick, such as a cough or nausea.) So, taking a lozenge may soothe a sore throat, but it won't kill that nasty strep bacteria.

Some medicines relieve pain. If you pull a muscle, your doctor might tell you to take ibuprofen or acetaminophen. These pain relievers, or analgesics, don't get rid of the source of the pain — your muscle will still be pulled. What they do is block the pathways that transmit pain signals from the injured or irritated body part to the brain (in other words, they affect the way the brain reads the pain signal) so that you don't hurt as much while your body recovers.
As people get older, they sometimes develop chronic or long-term conditions. Medicines can help control things like high blood pressure (hypertension) or high cholesterol. These drugs don't cure the underlying problem, but they can help prevent some of its body-damaging effects over time.

Among the most important medicines are immunizations (or vaccines). These keep people from getting sick in the first place by immunizing, or protecting, the body against some infectious diseases. Vaccines usually contain a small amount of an agent that resembles a specific germ or germs that have been modified or killed. When someone is vaccinated, it primes the body's immune system to "remember" the germ so it will be able to fight off infection by that germ in the future.

Most immunizations that prevent you from catching diseases like measles, whooping cough, and chickenpox are given by injection. No one thinks shots are fun. But the diseases they prevent can be very serious and cause symptoms that last much longer than the temporary discomfort of the shot. To make life easier, now you can get immunizations at many pharmacies.

Although some medicines require a prescription, some are available in stores. You can buy many medicines for pain, fever, cough, or allergies without a prescription. But just because a medicine is available over the counter (OTC), that doesn't mean it's free of side effects. Take OTC medicines with the same caution as those prescribed by a doctor.

Taking Medicines:

No matter what type of medicine your doctor prescribes, it's always important to be safe and follow some basic rules:

- If you feel worse after taking a medicine, tell your doctor right away.
- Double-check that you have the right medicine. If you get the same prescription filled more than once, check that it's the same shape, size, and color as the last time. If not, be sure to ask the pharmacist about it.
- Read the label and follow directions. Ask if you have questions.
- Take medicines exactly as prescribed. If the instructions say take one tablet four times a day, don't take two tablets twice a day. It's not the same.
- Ask if the medicine is likely to affect everyday tasks such as driving or concentrating in school.

- Don't take more medicine than is recommended. It won't make you heal faster or feel better quicker. In fact, an overdose of medicine can make you sick.

- Always follow your doctor's or pharmacist's instructions. For instance, he or she may tell you to take a medicine with food to help lessen the stomach upset it can cause or instead to take the medicine on an empty stomach so as not to interfere with the medicine's absorption into your body.

- Never share prescription medicine with anyone else, even if that person has the same thing as you do. Today's medicines are very complex, and the dosages tend to be precisely prescribed for each person's needs. Either under-dosing or overdosing can be harmful. Additionally, someone else's body may react differently to the same medicine (for example, if the person has an allergy to one of the components of the medicine).

- If you're already taking a medicine but also want to take something you can buy over the counter, ask the pharmacist. There could be a bad interaction between the medicines.

- Always tell your doctor and pharmacist if you're taking any other medicines or any herbal supplements so that he or she can check for any interactions between the medicines.

- Be sure to tell your doctor if you are pregnant or might be pregnant. Some medicines can be harmful to the baby. Also, let your doctor or pharmacist know if you are breastfeeding, as some medications can cause problems with nursing.

- Remember that drinking alcohol can dramatically worsen the side effects of many medicines.

- Even if you get sick with what you think is the same old thing, don't decide on your own that you know what's wrong and take some leftover medicine. Taking that medicine for a different disease might not work — and it can even be harmful. Talk to your doctor first.

- Take antibiotics for the full length of the time prescribed, even if you start feeling better, so that all the germs are killed, and the infection doesn't bounce back.

- Keep medicines in their original labeled containers, if possible.

- Don't use medicine that has expired, especially prescription medicine.
- Medicines should not be stored in your bathroom because heat and humidity can affect the potency of the drug. Most medicines should be kept at room temperature and away from sunlight. Some must be refrigerated. Check with your pharmacist or doctor if you aren't sure.

- Make sure all medicines are stored safely and out of the reach of younger brothers or sisters and pets.

- If you have any allergies, tell your doctor and pharmacist before they start you on a new medicine.

- If you get a rash, start itching, vomiting, or have trouble breathing after starting a medicine, tell your parents immediately. Breathing difficulty, breaking out in hives, or suddenly developing swelling of the tongue, lips, face, or other body parts may be signs of a severe allergic reaction — get emergency medical care right away.

Conclusion

There are many different AI techniques available which are capable of solving a variety of clinical problems. However, in spite of earlier optimism, medical AI technology has not been embraced with enthusiasm. One reason for this is the attitude of the clinicians towards technology being used in the decision-making process. Paradoxically, there is no qualm in accepting the biochemical results generated from an auto-analyzer or images produced by magnetic resonance imaging. However, it is the obligation of researchers active in this field to produce evidence that these techniques work on a practical level. The need to undertake more randomized controlled studies to prove the efficacy of AI systems in medicine is, therefore, vital. There is compelling evidence that medical AI can play a vital role in assisting the clinician to deliver health care efficiently in the 21st century. There is little doubt that these techniques will serve to enhance and complement the ‘medical intelligence’ of the future clinician.

Proposed Methodology

Reasoning System in medicine

Reasoning System in medication correspond to the most common type of AI system in routine clinical use. They are defined as systems with the ability to capture expert knowledge, facts and reasoning techniques to help care providers in routine work. Reasoning System attempt to mimic clinician's expertise by applying inference methods to help in decision support or problem solving. Medication Reasoning System can manage data to come up with reasoned conclusions. Uses of Reasoning System in medication include image interpretation, diagnosis support and alarms generation, among other utilities.

Took common diseases like headache, stomach-ache, cold, cough and fever and user would be entering the symptoms which will lead him to the conclusion of the disease he is suffering from.

Medicine dosage will be automatically told to patient.

The data of the patient will be stored in one file which is done by the usage of file handling.

Result and Discussion

```
print("MEDICATION SYSTEM FOR:\n
FEVER  COLD  STOMACH PAIN  HEADACHE\n")
a=input("WHAT ARE YOU SUFFERING FROM?\n")
x=open("a.txt","wt")
x.write(a)
x.close()

if a=="fever":
   d=input("When it  was started ?\n")
   y=open("b.txt","wt")
   y.write(d)
   y.close()


   e=input("Are you suffering from vomiting too? \n")
   y=open("b.txt","a")
   y.write(e)
   y.close()

   if e=="yes":
      y=open("feverVomating.txt","r")
      print("
==================================Report==========================
========\n",y.read())
   else:
      y=open("fever.txt","r")

print("==================================Report=====================
============\n",y.read())

elif a=="cold":
```

```
    d=input("When it was started ?\n")
    y=open("b.txt","wt")
    y.write(d)
    y.close()


    y=open("cold.txt","r")

print("====================================Report=====================
============\n",y.read())
    #e=input("is there any vomiting happens \n")
    #y=open("b.txt","a")
    #y.write(d)
    #y.close()

elif a=="stomach pain":
    d=input("When it was started ?\n")
    y=open("b.txt","wt")
    y.write(d)
    y.close()

    e=input("Are you suffering from vomiting too? \n")
    y=open("b.txt","a")
    y.write(e)
    y.close()
    f=input("Rank your pain:\n LOW   MEDIUM   HIGH  \n\n\n")

    #for stomach pain level
    if f=="low":
        z=open("lowStomachpain.txt","r")
        print("
====================================Report=========================
========\n",z.read())
```

```
    elif f=="medium":
        z=open("mediumStomachpain.txt","r")
        print("
====================================Report==========================
========\n",z.read())

    elif f=="heigh":
        z=open("heighStomachpain.txt","r")
        print("
====================================Report==========================
========\n ",z.read())
    else:
        print("nothing")

elif a=="headache":
    d=input("when was started \n")
    y=open("b.txt","wt")
    y.write(d)
    y.close()
    g=input("rank your pain\n LOW   MEDIUM   HIGH  \n")


    # for headch pain level
    if g=="low":
        z=open("lowHeadch.txt","r")
        print("
====================================Report==========================
========\n",z.read())
    elif g=="medium":
        z=open("mediumHeadch.txt","r")
        print("
====================================Report==========================
========\n ",z.read())
```

```
    else:
        z=open("heighHeadch.txt","r")
        print("
====================================Report=========================
========\n",z.read())
else:
    print("thank you")

b=input("Any other issue?\n yes or no\n")
if b=="yes":
    c=input("Tell the issue \n")
    x=open("a.txt","a")
    x.write(c)
    x.close()
    if c=="fever":
        y=open("fever.txt","r")

print("====================================Report=====================
============\n",y.read())
    elif c=="cold":
        y=open("cold.txt","r")

print("====================================Report=====================
============\n",y.read())

    elif c=="headache":
        z=open("lowHeadch.txt","r")

print("====================================Report=====================
============\n",z.read())

    elif c=="stomach pain":
```

```
        z=open("heighStomachpain.txt","r")

print("====================================Report==========================
=============\n",z.read())



else:
    print("thank you for showing your interest")
#x=open("a.txt","r")
#print("problem == ",x.read())
#y=open("b.txt","r")
#print("started , womating== ",y.read())
```

Output

```
MEDICATION SYSTEM FOR:
            FEVER  COLD  STOMACH PAIN  HEADACHE

WHAT ARE YOU SUFFERING FROM?
fever
When it  was started ?
yesterday
Are you suffering from vomiting too?
yes
 ===================================Report=====================================


      problem : fever

                              medicine:  loperamide hydrochloride (Imodium) or
                                         bismuth subsalicylate (Pepto-Bismol).
                              use     : two times a day



about::
Imodium A-D and Pepto-Bismol are both available over the counter without a prescription. They treat diarrhea
Any other issue?
 yes or no
```

Program clearly depicts that medicine are alloted to patient according to disease.

```
Shell
      problem : fever

                              medicine:  loperamide hydrochloride (Imodium) or
                                         bismuth subsalicylate (Pepto-Bismol).
                              use     : two times a day



about::
Imodium A-D and Pepto-Bismol are both available over the counter without a prescription. They treat diarrhea
Any other issue?
 yes or no
yes
Tell the issue
cold
===================================Report=====================================
 problem : cold

                              medicine: guaifenesin,dextromethorphan
                              use     : two times a day


about::
Cough suppressants , like dextromethorphan, can provide relief for a short time.
They work on the part of your brain that controls the process.
Expectorants, like guaifenesin, can break up congestion in your chest by thinning the mucus in your airways.
```

On asking any other issue it will genereate new reort for the same.

Work Distribution

Suraj Mishra (11809470): Program
Rajat Garg (11807535): Program and explanation on LOOM
Ritika Garg (11807538): Report
Prajjwal Singh (11807544): Report