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HEALTIFYE_BASE

A Project Report

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Introduction

Proteins are the building blocks of life. It is a macronutrient. To put it simply, protein is one of the main nutrients that every person needs to maintain a healthy body. It helps to repair any internal or external damage, supports the immune system, and contributes to an overall feeling of wellbeing. At a cellular level, proteins are used for just about everything, from transporting messages, carrying out the instructions of DNA, and defending, preserving, and repairing essential life functions.

You need protein in your diet to help your body repair cells and make new ones. Protein is also important for growth and development in children, teens, and pregnant women.

Protein is especially important to consume after a workout, as during exercise you are effectively breaking your muscles down. That is why it's common to see people at the gym eating protein bars or drinking whey shakes when they have finished their routine. It helps to increase the impact of their exercise. It's also important to mix this protein with carbohydrates as they help your body to absorb the protein and turn it into more muscle mass.

Protein is important for everyone who is hitting the gym, playing sports, going for runs, or doing any other form of exercise, not just the pros.

It doesn't matter which way you look at it, protein is essential for exercise. Anyone undertaking any kind of exercise routine is going to need more protein than someone who doesn't. This is because when you exercise, you are effectively tearing and breaking muscle fibers apart, which then need to be repaired by the body, which requires protein.

From a dietary point of view, you can get enough day-to-day protein from eating food such as beans, soy protein products, nuts, and other

such foods. If you are exercising, it is beneficial to supplement this normal intake of protein with additional food items such as protein bars, powders, or shakes.

On the other hand, Bulking requires consuming more **calories** than your body needs.

You can estimate your daily calorie needs by using a calorie counter, which considers your weight, sex, age, height, and physical activity level to estimate daily calorie needs.

Experts recommend consuming 10–20% above your daily weight maintenance calorie needs during the bulking phase for an average weight gain of 0.25–0.5% of your body weight per week

once you establish the number of calories you need for bulking, you can determine your macronutrient ratios.

Macronutrients — carbs, fats, and proteins — are the nutrients that are needed in larger quantities in your diet. Carbs and protein each contain 4 calories per gram, while fat packs 9.

While you can make adjustments based on your dietary needs, the proportion of calories from protein should remain at 30–35% to support optimal muscle growth

But eating too many calories — and not burning enough of them off through activity — can lead to weight gain, many health problems

So, our problem statement is

❖ Problem statement

So we can conclude that we need both calories and protein for bodybuilding or proper workout. i.e, muscle building.

Now, how to keep a check on the number of calories consumed while taking the required amount of protein for our diet?

We need to **maximize our protein intake**, which we will calculate via Lifestyle and the BMI of a person through the data punched in the program.

Then, we need to create a **list of items** from the list already present in the program. The list of items prepared will be the best-balanced diet plan as per our problem statement.

❖ Approach

We need to make sure that a person is intaking meals per day and is well balanced in calorie to protein intake.

We find out **the best-balanced diet** for a customer, concerning our problem statement.

The customer chooses, what type of **lifestyle** he/she is following i.e, Active or Sedentary.

Then we make them punch in their height and weight to calculate their **BMI**.

We compare the BMI with the data to check if he/she is overweight, under-weight, or optimal weight.

Then we ask them how to move on with their diet, i.e, muscle gain, fat loss, etc.

Depending on the above choice and his lifestyle we define his/her PPG(Protein Per Kilogram)

Like this using ppg and weight, we calculate **protein intake per day**.

We already have fixed his calorie intake which is 2000 cal(which can be set accordingly), and find out the best food item list he/she should consume in a day to maintain his protein and calorie intake for bodybuilding, bulking, cutting, etc.

So, we need to maximize the person's protein intake keeping calorie intake constant or less.

Hence maximization problem comes under the optimization problem

Here we make use of **Dynamic Programming**.

More specifically Knapsack 1\0 Dynamic Programming, where we maximize protein(**profit**) while keeping calorie(**knapsack capacity**) less or equal.

We already have the list of food items with their calorie and protein content %. (**Items of knapsack**)

We adopt the **Bottom-up** approach or **tabulation** method for the same as it is less complex and easy to implement.

We store the food ITEMS characteristics

- Name → string Array **items[]**
- Calorie→ integer array **calorie[]**
- Protein → integer array **Protein_content[]**

We make use of the function **make_list()** to find out the **calorie, and protein intake along with the food items** he/she would consume in a day accordingly to maintain protein and calorie intake per day.

❖ Data Structures and Algorithms Used

1. Data Structure

- We store the food ITEMS characteristics :
 - Name → **string Array** items[]
 - Calorie→ **integer array** calorie[]
 - Protein → **integer array** Protein_content[]
- DP Table to find max protein content and list of food items→**2D integer array** K[].
- Retrieval of the food item list→ **integer array** sols[]

2. Algorithm

- Knapsack 0/1 Dynamic Programming.
- DP Bottom-Up or tabulation method.

Q. Why are we implementing Dynamic Programming here?

Sol. Our Problem is a maximization problem i.e, an optimization problem, and we know Dynamic Programming is used to solve optimization problems as it always gives a solution, if it exists.

And our problem satisfies two conditions that are needed for a problem to be able to solve via DP

- Optimal substructure
- Overlapping subproblem

ITEMS LIST USED IN THE PROGRAM

	Item	Quantity (g)	Calories (cal)	Protein (g)
1)	Bread	100	256	9
2)	Butter	100	717	1
3)	Fish	100	206	22
4)	Salami	100	336	22
5)	Oats	100	389	17
6)	Noodles	100	138	4.5
7)	Pasta	100	131	5
8)	Cheese	100	402	25
9)	Pumpkin	100	26	1
10)	Lentils	100	116	9
11)	Potato	100	77	4.3
12)	Sunflower Seed	100	584	21
13)	Apple	100	95	1
14)	Sprouts	100	31	3
15)	Banana	100	110	1
16)	Egg	100	147	12.58
17)	Rice	100	130	2.9
18)	Milk	100	61	3.2
19)	Meat	100	260	35
20)	Peanut Butter	100	588	22.5

OUTPUT

```

                                Welcome to HEALTIFYE_BASE

PRESS
1-> Sedentary Lifestyle
2-> Active Lifestyle
=1

Enter your weight in kgs -> 80
Enter your height in inches -> 78

BMI is -> 20.3814

You have Optimal Weight
Suggested action would be Maintainance or Muscle gain
PRESS
1 -> Maintainance
2 -> Muscle gain
3 -> Fat loss
=1

The optimal protein intake per day, for you would be>=104g
Press any key to continue . . .
```

```

                                Welcome to HEALTIFYE_BASE

Finding the best diet for you.....
Yoru're meal plan for the day is----->
1 chapati
2 sprouts
3 cornflakes
4 egg
5 rice
6 meat
7 milk
8 peanut_butter
9 bread
10 fish
11 salami

Total calories in this diet :1960cal
Total protein in this diet :118g

                                Thank You for using HEALTIFYE_BASE

-----Have a Healthy Day!-----

-----
Process exited after 45.35 seconds with return value 0
Press any key to continue . . .
```

Summary

HEALTHIFYE_BASE is basically a program that helps the user to calculate his daily protein need while keeping hi/her calorie intake nearly constant by taking in user input:

- User Height in inches, which is later converted to meter
- User weight in Kg
- User Lifestyle

And, then depending on the BMI calculated it tells about the user's Body mass i.e,

- Overweight
- Underweight
- Optimal weight

then, it automatically suggests a diet plan according to the user's need which is

- Fat loss
- Weight Gain
- Maintenance

Then it generates the best list of food items that users can consume per day with the diet total calorie and total protein intake value.
