Maharshi Karve Stree Shikshan Samstha's
Cummins College of Engineering for Women, Pune
(An Autonomous Institute affiliated to Savitribai Phule Pune University)

TY COMP C1
23PCCE501L Artificial Intelligence and Machine Learning Laboratory

CALORISCORE: AI-BASED FOOD CALORIE ESTIMATION

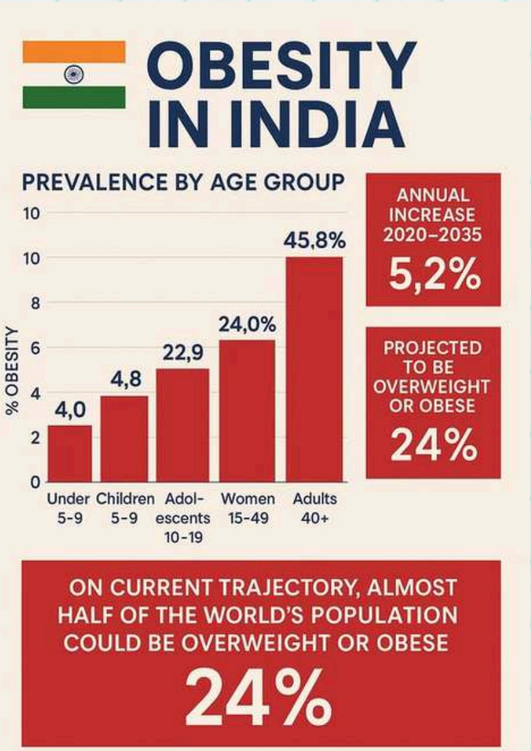
FACULTY: DR. SUPRIYA KELKAR

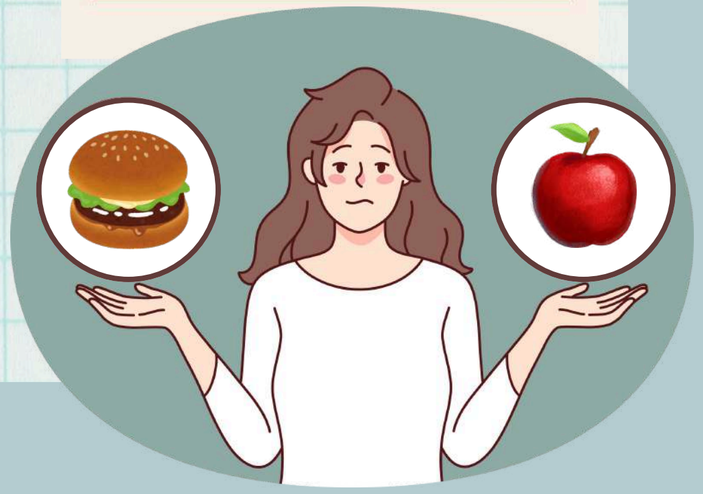
GROUP MEMBERS

UCE2023617: Diksha Khobragade
UCE2023640: Gayatri Mahalle
UCE2023641: Vaibhavi Malche

PROBLEM STATEMENT

- Increasing lifestyle diseases
  - Diabetes (India = Diabetes Capital of the World)
  - High blood pressure
  - Heart disease
  - PCOS
  - Joint problems
- Manual food logging is slow, boring, and rarely consistent.
- People struggle to track calorie intake accurately.
- Manual calorie counting apps are slow & inconsistent.
- In a fast lifestyle, people want quick, reliable calorie estimation without effort.





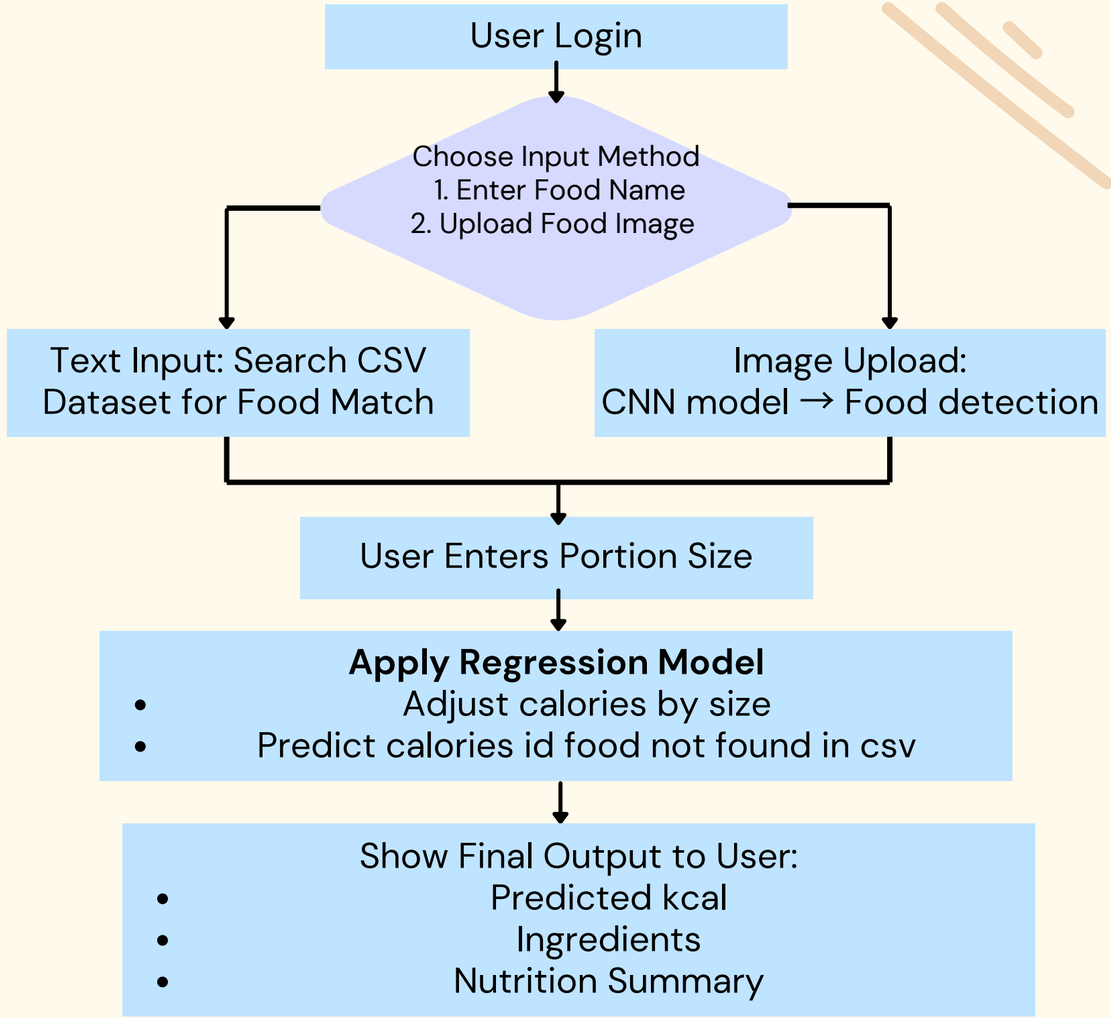
PROPOSED SOLUTION

Our solution allows users to upload a food image or type the food name, after which a CNN identifies the dish and a **regression model** estimates calories using our curated CSV dataset.

The user enters portion size, and the app instantly displays accurate **calorie** and **nutrition** details.

The app also provides a **personalized daily meal plan** for Breakfast, Lunch, and Dinner based on the user's estimated calorie requirement.

SYSTEM ARCHITECTURE



DATASET

Kaggle Indian Images Dataset: Link

- Total images: 11,364
- Total classes: 20
- Preprocessing: Resizing, normalization, augmentation

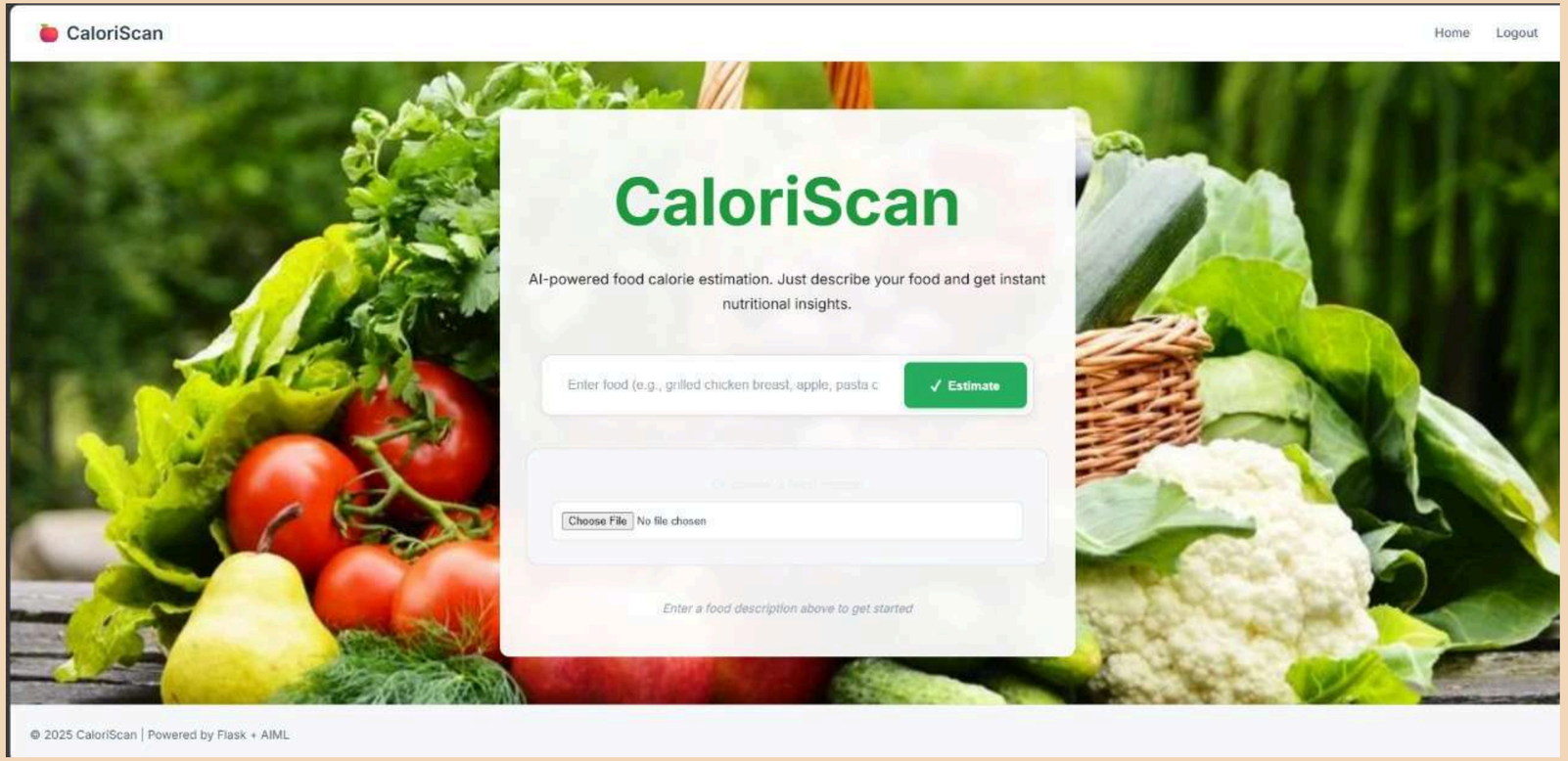
CSV file: Link

- Total items: 1000+
- Attributes: Food item,
- 9 nutrient values-carbohydrates, fats, protein etc

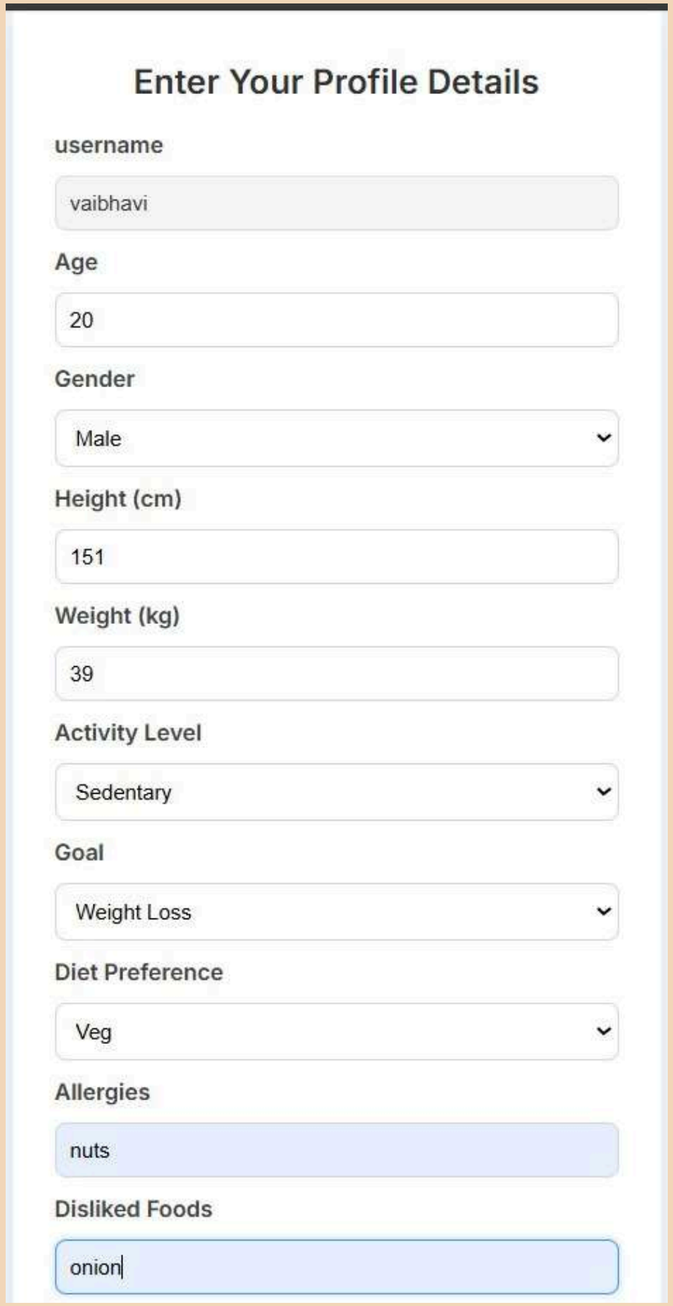
TECH STACK

- **Frontend**
  - HTML
  - CSS
  - JavaScript
- **Backend**
  - Python
  - Flask (REST API)
- **Machine Learning Models**
  - Linear Regression
  - Random Forest

- **Model Training Libraries**
  - TensorFlow
  - Keras
  - scikit-learn
  - pandas
  - numpy
- **Tools & Development**
  - GitHub (Version control)
  - VS Code (IDE)
- **Database**
  - MySQL




```
mysql> use food_estimator;
Database changed
mysql> select*from user_profile;
+----+----------+------+--------+--------+--------+----------------+-------------+-----------------+-----------+----------------+---------+-----------------
---+
| id | username | age  | gender | height | weight | activity_level | goal        | diet_preference | allergies | disliked_foods | bmi     | daily_calorie_ne
ed |
+----+----------+------+--------+--------+--------+----------------+-------------+-----------------+-----------+----------------+---------+-----------------
---+
|  7 | vaibhavi |   29 | Female |    161 |     39 | Sedentary      | Weight Loss | Veg             | nuts      | onion          | 15.0457 |               9
17 |
|  9 | vaibzz   |   45 | Male   |    163 |     49 | Lightly Active | Weight Gain | Non-Veg         | nuts      | onion          | 18.4425 |              20
14 |
| 11 | NULL     |   20 | Female |    151 |     39 | Sedentary      | Weight Loss | Veg             | nuts      | onion          | 17.1045 |              11
49 |
+----+----------+------+--------+--------+--------+----------------+-------------+-----------------+-----------+----------------+---------+-----------------
---+
3 rows in set (0.00 sec)
```



```
mysql> select*from users;
+----+-----------+-----------------------------------+----------+
| id | username  | email                             | password |
+----+-----------+-----------------------------------+----------+
|  1 | vaibhavi  | vaibhavimalche@gmail.com          | 1234     |
|  2 | vaibzz    | vaibhavi.malche@cumminscollege.in | 1122     |
|  3 | vsm       | mvaibahvvi286@gmail.com           | 3344     |
|  4 | Malche123 | malche@gmail.com                  | 9090     |
+----+-----------+-----------------------------------+----------+
4 rows in set (0.10 sec)
```

User Login Details
Profiles saved in database.

Database: food_estimator
Table: Users, user_profiles

```
mysql> use food_estimator;
Database changed
mysql> select*from user_profile;
+----+----------+------+--------+--------+--------+----------------+------------+-----------------+----------+----------------+---------+-----------------
---+
| id | username | age  | gender | height | weight | activity_level | goal       | diet_preference | allergies | disliked_foods | bmi     | daily_calorie_ne
ed |
+----+----------+------+--------+--------+--------+----------------+------------+-----------------+----------+----------------+---------+-----------------
---+
|  7 | vaibhavi |   29 | Female |    161 |     39 | Sedentary      | Weight Loss | Veg             | nuts      | onion          | 15.0457 |                9
17 |
|  9 | vaibzz   |   45 | Male   |    163 |     49 | Lightly Active | Weight Gain | Non-Veg         | nuts      | onion          | 18.4425 |               20
14 |
| 11 | NULL     |   20 | Female |    151 |     39 | Sedentary      | Weight Loss | Veg             | nuts      | onion          | 17.1045 |               11
49 |
+----+----------+------+--------+--------+--------+----------------+------------+-----------------+----------+----------------+---------+-----------------
---+
3 rows in set (0.00 sec)
```

```
mysql> UPDATE user_profile
    -> SET bmi = weight / POWER(height / 100, 2)
    -> WHERE weight IS NOT NULL AND height IS NOT NULL;
Query OK, 3 rows affected (0.01 sec)
Rows matched: 3  Changed: 3  Warnings: 0

mysql> UPDATE user_profile
    -> SET daily_calorie =
    ->     (
    ->         -- Base BMR depending on gender
    ->         CASE
    ->             WHEN gender = 'Female'
    ->                 THEN (655 + (9.6 * weight) + (1.8 * height) - (4.7 * age))
    ->             WHEN gender = 'Male'
    ->                 THEN (66 + (13.7 * weight) + (5 * height) - (6.8 * age))
    ->         END
    ->     ) *
    ->     (
    ->         -- Activity multiplier
    ->         CASE activity_level
    ->             WHEN 'Sedentary' THEN 1.2
    ->             WHEN 'Lightly Active' THEN 1.375
    ->             WHEN 'Moderately Active' THEN 1.55
    ->             WHEN 'Very Active' THEN 1.725
    ->             ELSE 1.2
    ->         END
    ->     )
    ->     +
    ->     (
    ->         -- Goal adjustment
    ->         CASE goal
    ->             WHEN 'Weight Loss' THEN -300
    ->             WHEN 'Maintain' THEN 0
    ->             WHEN 'Weight Gain' THEN 300
    ->             ELSE 0
    ->         END
    ->     );
Query OK, 3 rows affected (0.01 sec)
Rows matched: 3  Changed: 3  Warnings: 0

mysql> SELECT username, bmi, daily_calorie FROM user_profile;
+----------+---------+----------------+
| username | bmi     | daily_calorie |
+----------+---------+----------------+
| vaibhavi | 17.1045 |          1149 |
```

CaloriScan

Home Logout

Welcome, vaibhavi 👋

Upload an image of your food or directly enter the food name to estimate calories.

🍽️ Image Analysis

Choose File No file chosen

Analyze Image

📊 Predict Calories (Enter Food Item)

Enter food name (e.g., apple, pizza, rice)

100

Predict Calories

Meal Planner

Analyze Image

📊 Predict Calories (Enter Food Item)

Enter food name (e.g., apple, pizza, rice)

100

Predict Calories

🍽️ **Food:** Dhokla

Calories: 160

Ingredients: Gram flour;Curd;Eno;Oil;Spices

Meal Planner

Daily Meal Plan (Non-veg)

Breakfast (520 cal)

- Egg Sandwich – 290 cal
- Cornflakes – 110 cal
- Veg Salad – 120 cal

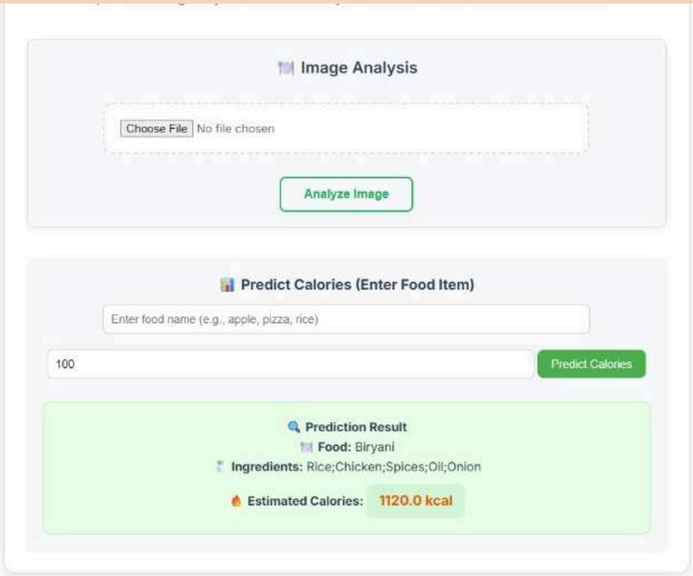
Lunch (530 cal)

- Biryani Chicken – 450 cal
- Roti – 80 cal

Dinner (600 cal)

- Biryani Mutton – 600 cal

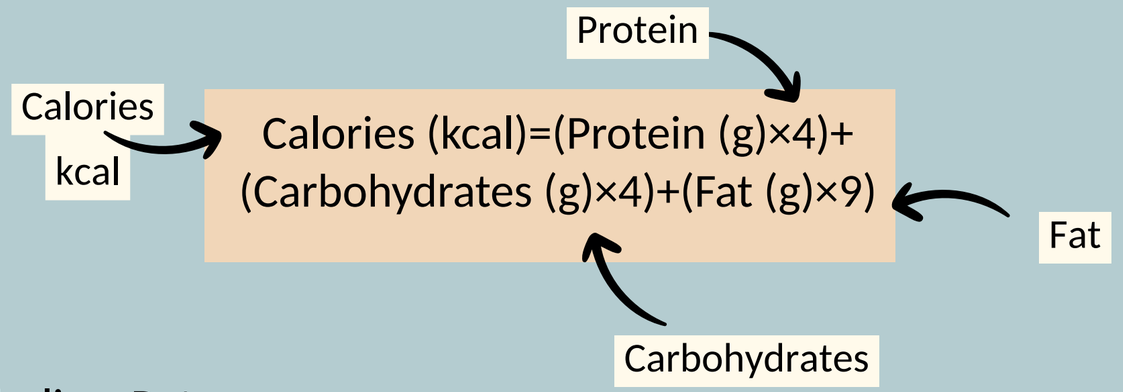
Total: 1650 / 1800 cal



Meal Planner

AI-ML TECHNIQUE USED

- **CNN** Detects food from uploaded image
- Layers Used:
    a. Conv2D
    b. MaxPooling
    c. Dropout
    d. Dense
- **Linear Regression**
- **Random Forest** (for comparison)



Basal Metabolism Rate

Men: BMR = 88.362 +
(13.397 x weight in kg) + (4.799 x height in cm)
– (5.677 x age in years)

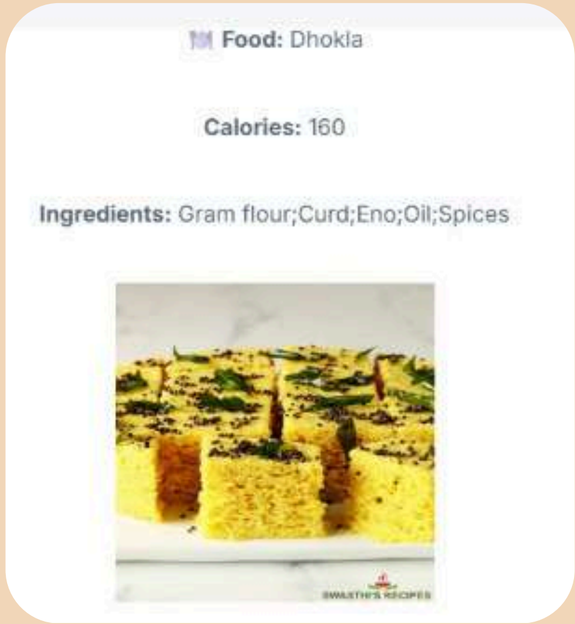
Women: BMR = 447.593 +
(9.247 x weight in kg) + (3.098 x height in cm)
– (4.330 x age in years)

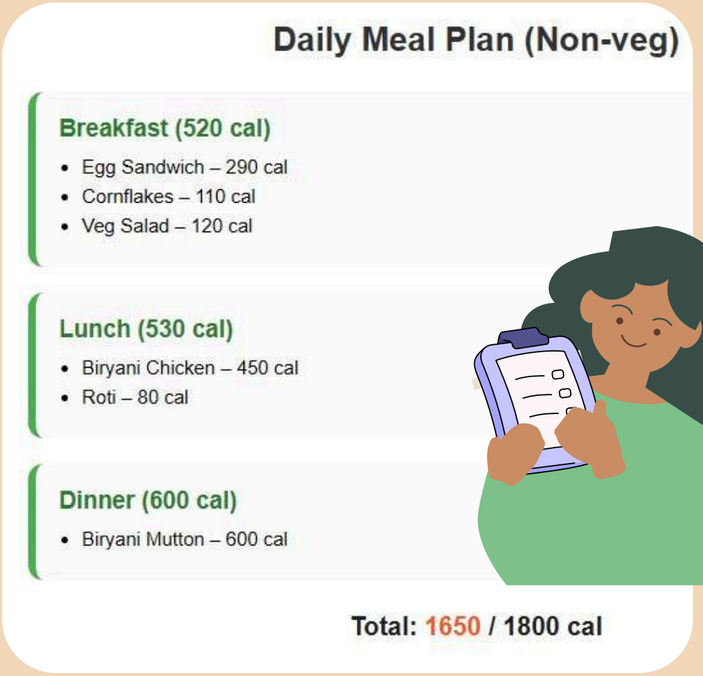
$$BMI = \frac{\text{Weight in kilogram}}{\left(\text{Height in meter}\right)^2}$$

RESULTS & ACCURACY

- Performance metrics

Linear Regression metrics: R2: 1.00	MAE: 0.0 (1e-13)	MSE: 0.0 (1e-26)	RMSE: 0.0 (1e-13)
Random Forest metrics: R2: 0.998	MAE: 4.15	MSE: 57.08	RMSE: 7.56





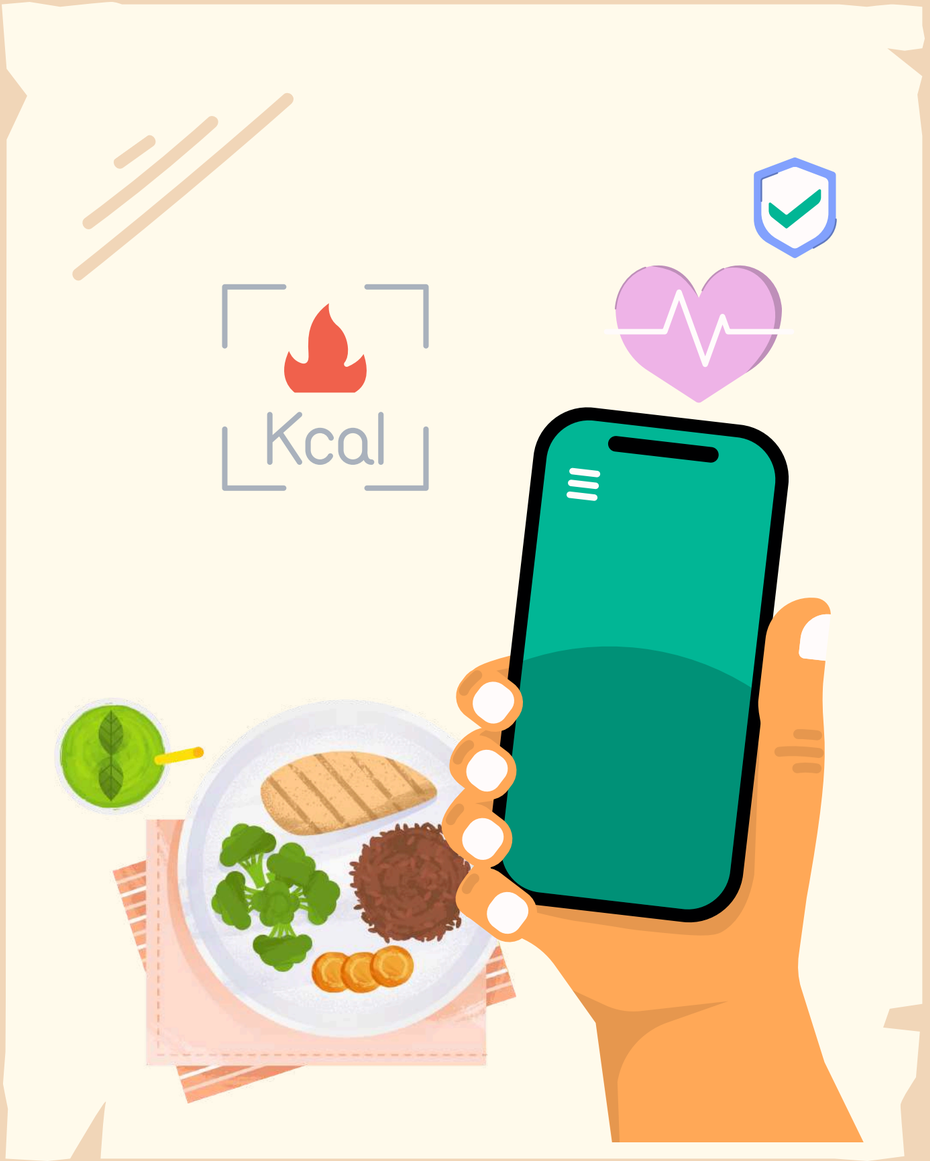
Key Takeaways

- **Linear Regression is ideal** here because the relationship between nutrients and calories is exactly linear.
- **Random Forest** is more flexible for messy or **non-linear** datasets, but here it's unnecessary and slightly less accurate.

- Performance metrics show the scale of error:
- LR error ≈ 0
- RF error ≈ 7.5 calories on average

FUTURE ENHANCEMENTS

- Portion size estimation
- Multi-food detection
- Real-time calorie estimation
- Mobile app version
- Voice-based food logging



CONCLUSION

- In this project, we developed CaloriScan, a smart system for estimating food calories and suggesting personalized meals. The system combines machine learning, image recognition, and nutritional databases to provide accurate and user-friendly insights.
- We applied two machine learning techniques for calorie estimation:
- Linear Regression – serves as a baseline, capturing linear relationships between macronutrients and calories.
- Random Forest Regression – handles non-linear interactions between nutrients, improving prediction robustness.
- The models were trained on a curated dataset . The model achieved 80% accuracy, MSE, MAE, R^2, RMSE scores, demonstrating reliable calorie prediction.
- **Applications:**
- Automatic calorie estimation from food images or text input.
- Personalized daily calorie recommendations based on user profile (age, weight, gender, activity).
- Meal planning for dietary goals (weight loss, maintenance, or gain).
- Educational tool for promoting healthy eating habits.
- Overall, CaloriScan showcases the potential of combining AI, nutrition science, and user profiling to make dietary management accessible and accurate.

THANKYOU

"Let food be thy medicine and medicine be thy food."
– Hippocrates

REFERENCES

1. WHO, "Obesity and overweight," World Health Organization, 2023.
2. J. Chen et al., "Challenges in manual dietary logging," Nutrition Journal, 2021.
3. M. Pouladzadeh, "Food image analysis for calorie measurement," IEEE Access, 2019.
4. Y. Kawano & K. Yanai, "Food image recognition using deep CNNs," ICME, 2015.
5. A. Myers et al., "Im2Calories," ICCV, 2015.
6. S. Kim et al., "Understanding menus using NLP," EMNLP, 2019.
7. J. Devlin et al., "BERT: Pre-training of Deep Bidirectional Transformers," NAACL, 2019.
8. S. Abbar et al., "You tweet what you eat," CHI, 2015.
9. A. Fadhil, "Intelligent nutrition assistant," ACM Digital Health, 2018.
10. R. Gonzalez & R. Woods, "Digital Image Processing," 4th ed., Pearson, 2018.