

Introduction

Carbohydrate estimation remains one of the most error-prone skills for people living with diabetes. Despite years of patient education and clinical experience, even trained dietitians can struggle to estimate the grams of carbohydrates in complex or mixed meals. With the rise of mobile nutrition tools, artificial intelligence offers a scalable, consistent alternative for carb counting. This study analyzes thousands of food entries from the Carbsnap app to uncover who is most accurate at estimating carbohydrates—non-dietitians, dietitians, or AI.

Methods

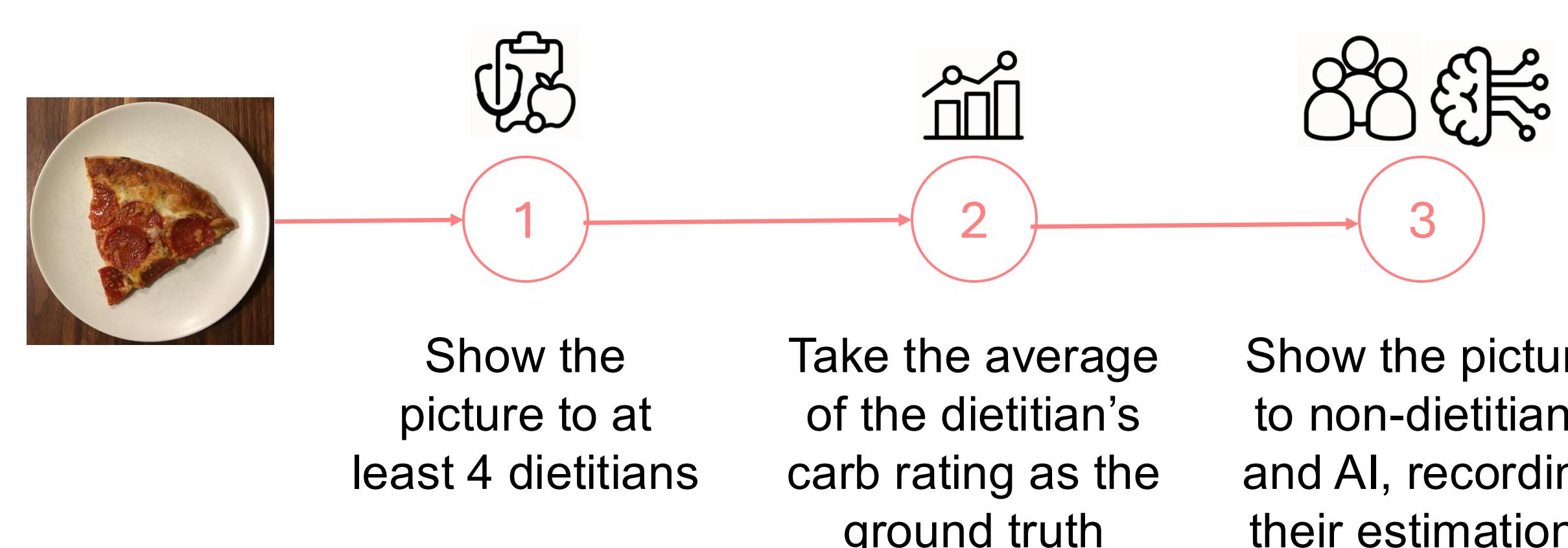
We analyzed thousands of food entries submitted through the Carbsnap web app. Each entry included:

- A photo of a meal
- A carbohydrate estimate by the user (non-dietitian or dietitian)

We grouped users into:

- Non-dietitians: general app users without formal training
- Dietitians: verified registered clinicians

Since there was no data set with pictures of meals labeled with their grams of carbs when we built Carbsnap, we implemented the following process:



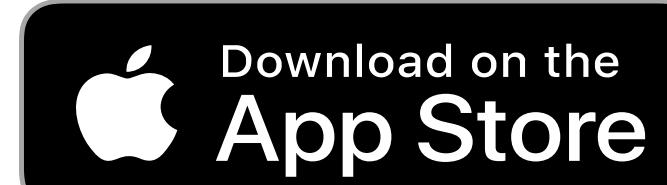
With this method, it is conceivable that the ground truth is skewed towards dietitian observations, as opposed to the actual carb count.

We used the OpenAI 4o model to obtain a carb count for all the pictures. Accuracy was defined by the deviation (in grams) from the reference value.

Think you can beat AI?

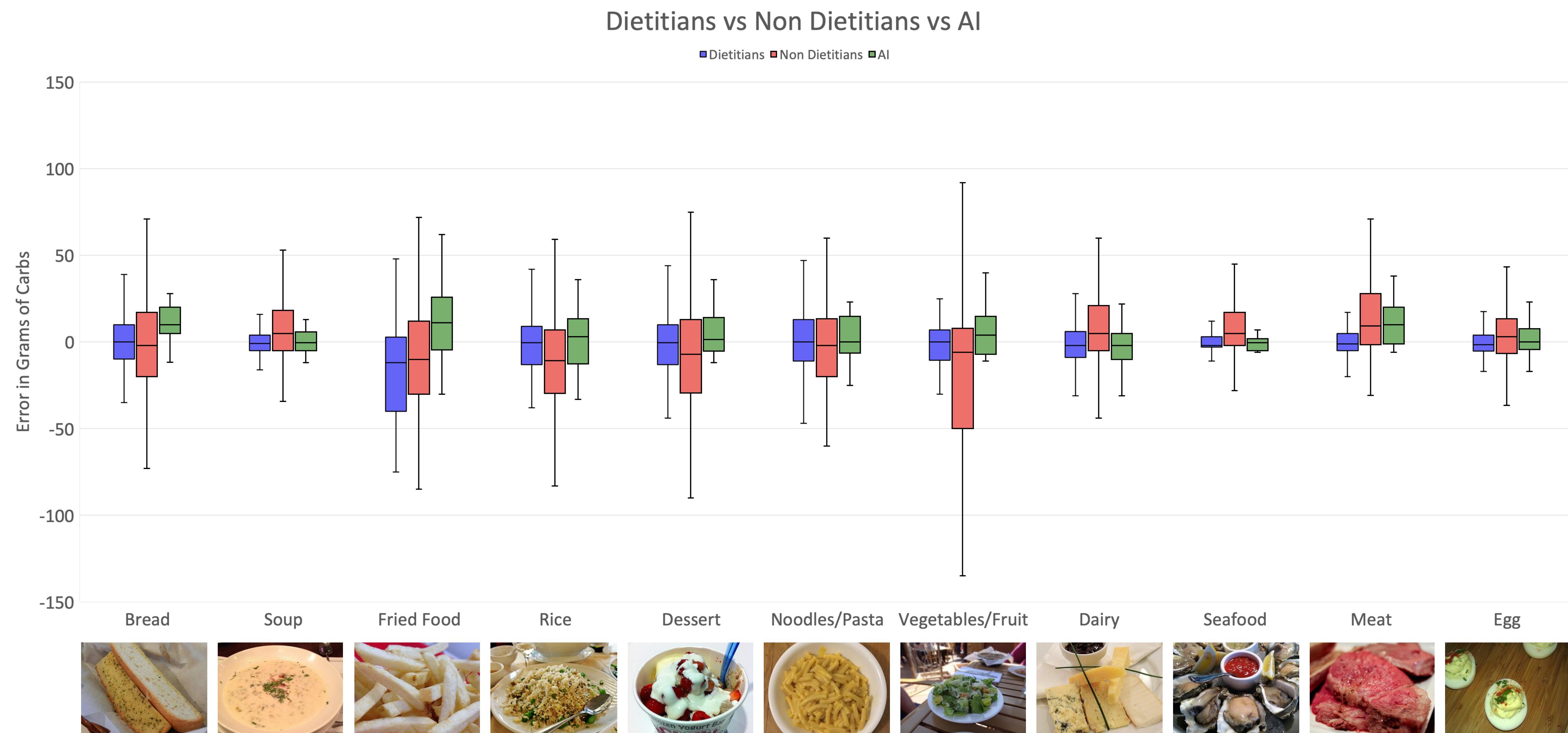
Put your skills to the test with Carbsnap

Snap a photo of your next meal and compare your estimate with AI's



Results

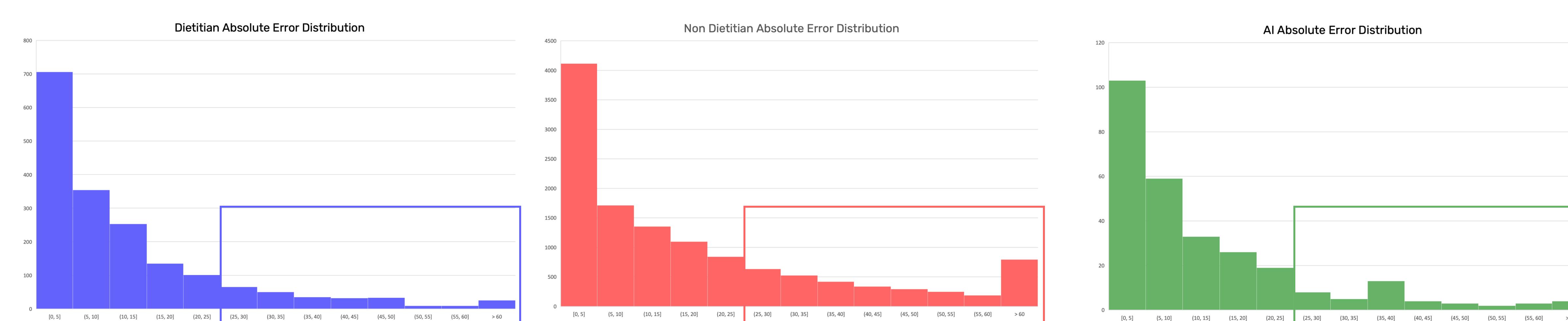
Error Distribution by Food Category



Based on the 12K+ Carbsnap data points, we found the following trends in carbohydrate estimation accuracy across 12 food categories:

- **AI estimates were the most consistent and tightly distributed**, especially for foods like dairy, eggs, and desserts
- **Non-dietitians (red)** showed the highest variability and most extreme over/underestimations, particularly for vegetables, desserts, and bread
- **Dietitians (blue)** performed better than non-dietitians overall, but still exhibited wider error ranges than AI in most food types
- **The AI model (green)** maintained the narrowest error range across categories, with minimal systematic over- or underestimation, while it underperformed dietitians in breads, rice and vegetables/ruits

The largest errors occurred in vegetables/fruits and fried foods, where all groups struggled, but AI still showed smaller spread and lower bias.



In the histograms above, it is clear that the non-dietitians have a much higher rate (almost 40%) of estimations with error higher than 25g than dietitians and AI, which would impact insulin dosage significantly.

Key Takeaways

- AI outperforms non-dietitians 70% of the time, with a mean error 9g lower
- AI beats dietitians 54% of the time, but dietitians outperform AI in terms of median absolute error
- Non-dietitians have a statistically significant high rate of large errors (>25g deviation), which can negatively impact insulin dosing

Carbsnap provides real-world evidence that AI can support more accurate, consistent carb counting—enhancing education, safety, and self-management.

Real World Implications

Carbsnap provides a near-dietitian-level estimation of carbs in food

The AI model performs similarly to dietitians and significantly better than non-dietitians.

Focus education for Vegetables, Fruit, and Desserts

Non-dietitians have a hard time with these food categories, so more education on carb counting for them would be productive.

Non-dietitians are at high risk of dosing miscalculations

Nearly 40% of estimates from non-dietitians were off by more than 25g, underscoring the need for better support tools.

AI can enhance, not replace, human expertise

By providing consistent estimates and reducing outlier errors, AI-powered tools like Carbsnap can complement dietitian-led education and reinforce safe self-management.

Training + Technology = Better Outcomes

Combining human judgment with AI assistance may help reduce carb counting burden, increase confidence, and improve glycemic outcomes.

Let's connect

Interested in collaboration or learning more?

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