

Applying Deep Learning to Recognize Food

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Problems in Food Consumption



We produce an excessive amount of food waste. It's estimated that around **40% of food produced is wasted** in the United States.

We also don't eat healthy enough. Almost **40% of Americans are obese**. Furthermore, we **consume 2-3 times more sugar than recommended** on average.

This screenshot shows a mobile application interface with a red header bar. The header contains a back arrow, the text "Lunch", the title "Manual Calories", and a "Done" button. Below the header is a form with several input fields. The first field is labeled "Name" with a "Required" note. Below this is a section titled "SERVING INFORMATION". The next field is "Serving Size" with a value of "1 Serving". This is followed by "Calories" with a value of "500". The final three fields are "Fat", "Carbs", and "Protein", each with a "Grams per serving" note. The bottom of the screen is a large, empty light gray rectangular area.

AT&T 9:50 PM 49%

< Lunch Manual Calories Done

Name Required

SERVING INFORMATION

Serving Size 1 Serving

Calories 500

Fat Grams per serving

Carbs Grams per serving

Protein Grams per serving

This screenshot shows a mobile application interface with a blue header bar. The header contains a back arrow, the title "Create Food", and a forward arrow. Below the header is a form with four input fields. The first field is "Brand Name" with a note "Optional" and an example "ex. Campbell's". The second field is "Description" with a note "Required" and an example "ex. Chicken Soup". The third field is "Serving Size" with a note "Required" and an example "ex. 1 cup". The fourth field is "Servings per container" with a note "Required" and a value of "1". The bottom of the screen is a large, empty light gray rectangular area.

AT&T 10:38 PM 46%

< Create Food >

Brand Name Optional ex. Campbell's

Description Required ex. Chicken Soup

Serving Size Required ex. 1 cup

Servings per container Required 1

There have been phone applications to help with healthy eating, but they **require users to enter data manually.**

There's a **disconnect between the food and our phones**, making it difficult for technology to play a direct role in food consumption.



Image
recognition



Providing a more **convenient interface** between food and technology can help **encourage more people to make positive lifestyle changes.**

We can apply **deep learning** to create a model that can **recognize food in images**, helping bridge the disconnect between food and software.

Collecting Data

eggs: 900x523



cheddar_cheese: 700x700



bay_leaf: 1280x1280



cabbage: 3456x2592



asparagus: 264x250



bell_pepper: 612x404



tilapia: 640x640



chickpeas: 355x355



Data Augmentation

original



add hue



adjust saturation



adjust brightness



salt and pepper noise



gaussian noise



rotate



translate



crop and resize



shear



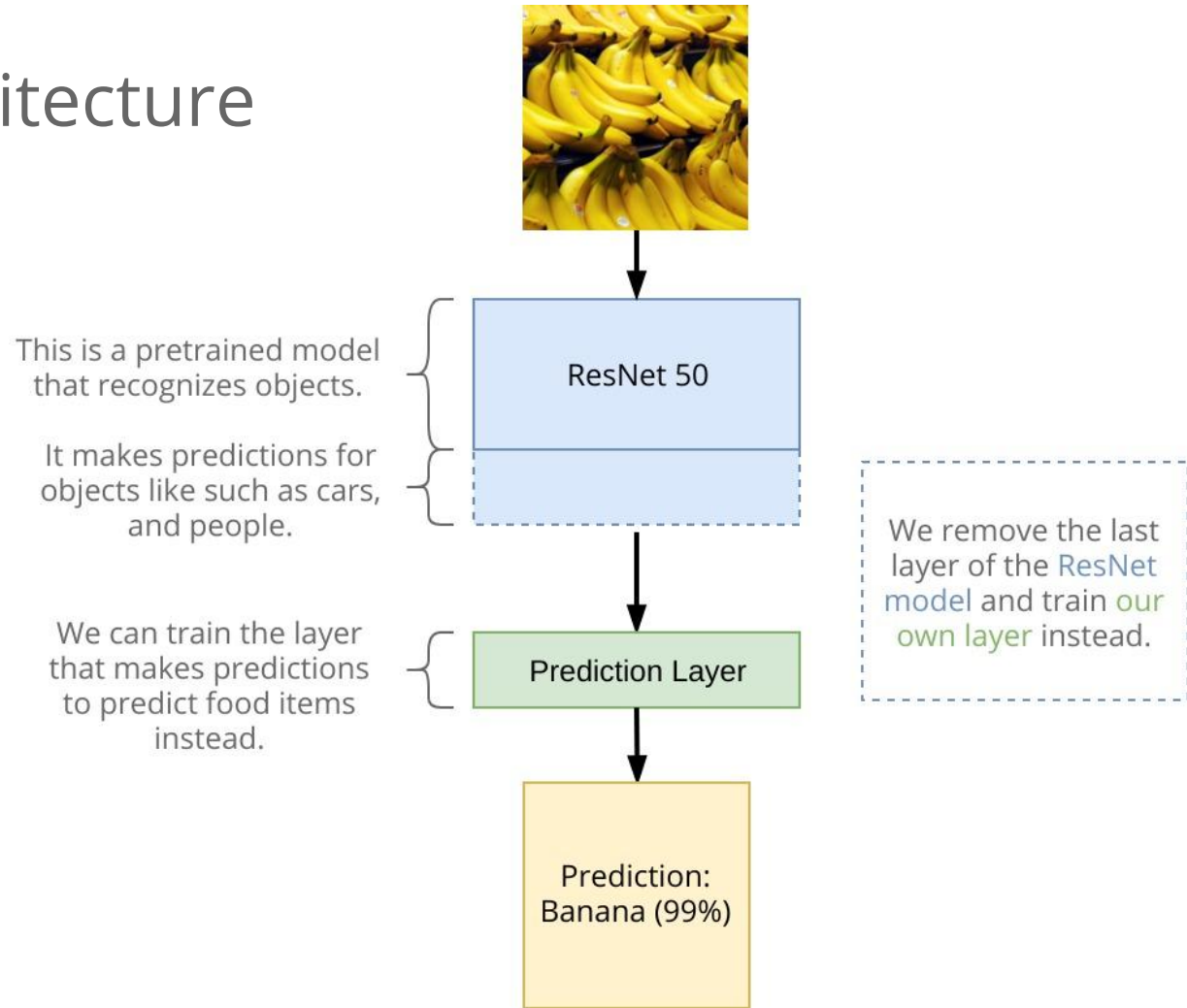
color jitter



random affine



Model Architecture



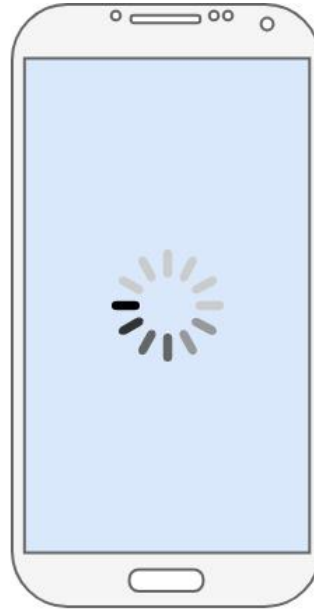
We trained the model on
52 food items
with around 20 images for
each class.

The model scored
92.56%
accuracy on test images.

Application: Recipe Suggestion



Take an image of some ingredients.



Application identifies items in image.



Application returns recipes that use the ingredients in the image.

Multiple Objects



We've trained a model that recognizes food items.

To use it in our application, we need it to detect **multiple objects in a single image**.

Sliding Window



Implementation as a Web Application


Quick Recipe

RECOMMENDATIONS

MY RECIPES

SETTINGS

LOG OUT




Detected: mushroom, garlic, spinach, cheddar cheese, eggs

SAVE RECIPE

Cheesy Mushroom and Spinach Bread Pudding


Uses your mushroom, garlic, spinach, cheddar cheese, eggs



SAVE RECIPE

Bacon Spinach Strata

Uses your mushroom, garlic, spinach, cheddar cheese, eggs



This recipe suggester has potential commercial value, but can help us **reduce food waste at home.**

Instead of letting good produce spoil, we have an easy way to find recipes to put it to use.