

# Applying Deep Learning to Food Images

Jonathan Shuai

# 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. The status bar at the top shows "AT&T", signal strength, Wi-Fi, time "9:50 PM", and battery level "49%". The main content area is white and contains a form with the following fields: "Name" (Required), "SERVING INFORMATION", "Serving Size" (1 Serving), "Calories" (500), "Fat" (Grams per serving), "Carbs" (Grams per serving), and "Protein" (Grams per serving). Each field has a light gray input area.

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. The status bar at the top shows "AT&T", signal strength, Wi-Fi, time "10:38 PM", and battery level "46%". The main content area is white and contains a form with the following fields: "Brand Name" (Optional, ex. Campbell's), "Description" (Required, ex. Chicken Soup), "Serving Size" (Required, ex. 1 cup), and "Servings per container" (Required, 1). Each field has a light gray input area.

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

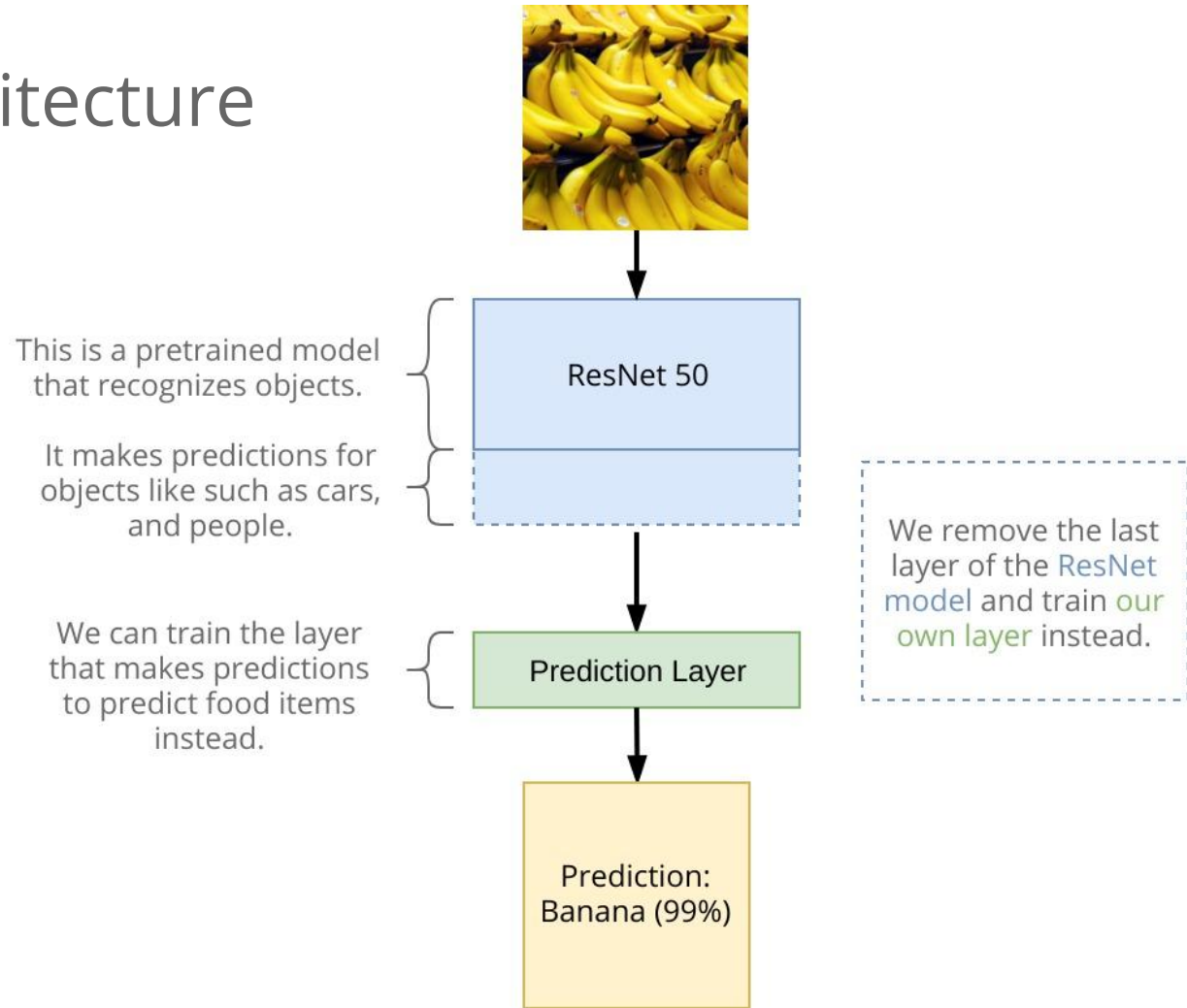


random affine





# Model Architecture



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

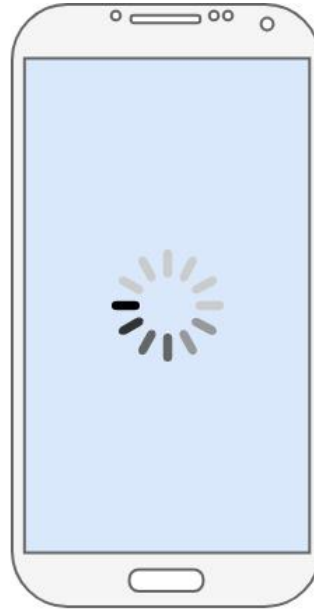
The model scored  
**92.56%**  
accuracy on test images.



# 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.