

# RNN *Chef*

Recipes Generated by a Recurrent Neural Network

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# The problem

## Who you are

Food connoisseur

Love taking photos of  
Food

## Context

You see a new dish

Take a photo

## Problem statement

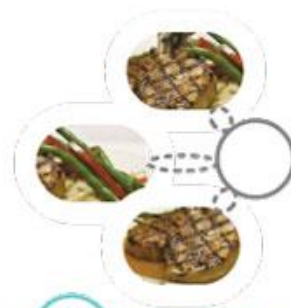
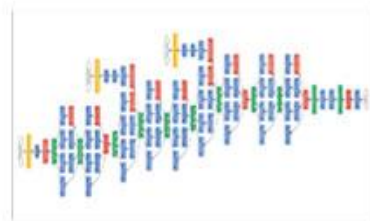
Upload the photo

Get an approximate  
recipe

# The Data [allrecipes](#)



# Recipe Generation



In a large skillet over medium-high heat, cook the pork chops until no longer pink in the center, 5 to 7 minutes per side. An instant-read thermometer inserted into the center should read 145 degrees F (63 degrees C).



Input food image

Feature extraction  
with Inception 3

LSTM  
with attention

Recipe generation

# LSTM With Attention

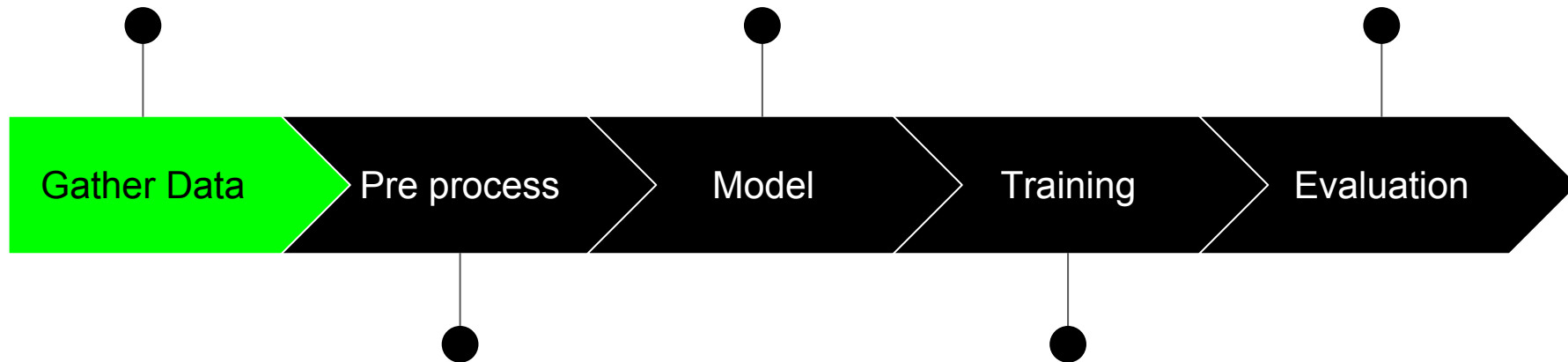
- April 2016
- State-of-the-art performance for Image Captioning
- Focuses on parts of image when generating relevant descriptions
- Image captioning model trained over 1,000 epochs

Xu, Kelvin, et al. "Show, attend and tell: Neural image caption generation with visual attention." *arXiv preprint arXiv:1502.03044* (2015).

Python Scraper using  
Pattern web library

Simple LSTM that  
burnt our laptops

Website and  
Evaluation



Data cleaning and  
preprocessing.

Training using  
Amazon EC2 g2.  
2xlarge and c4.4xlarge

Home > Recipes > Desserts > Mousse

## Easy Passion Fruit Mousse



18 made it | 14 reviews

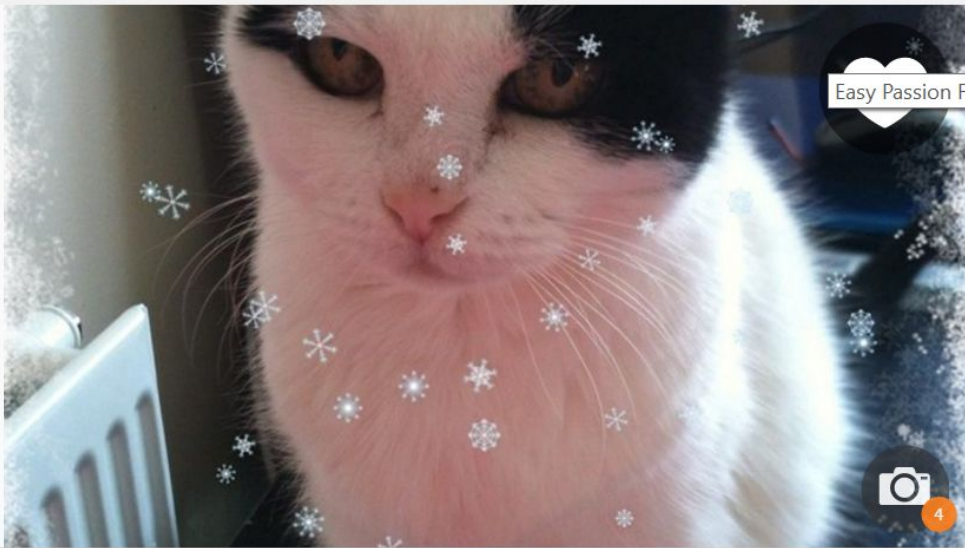


Recipe by: Rena Lynn



0

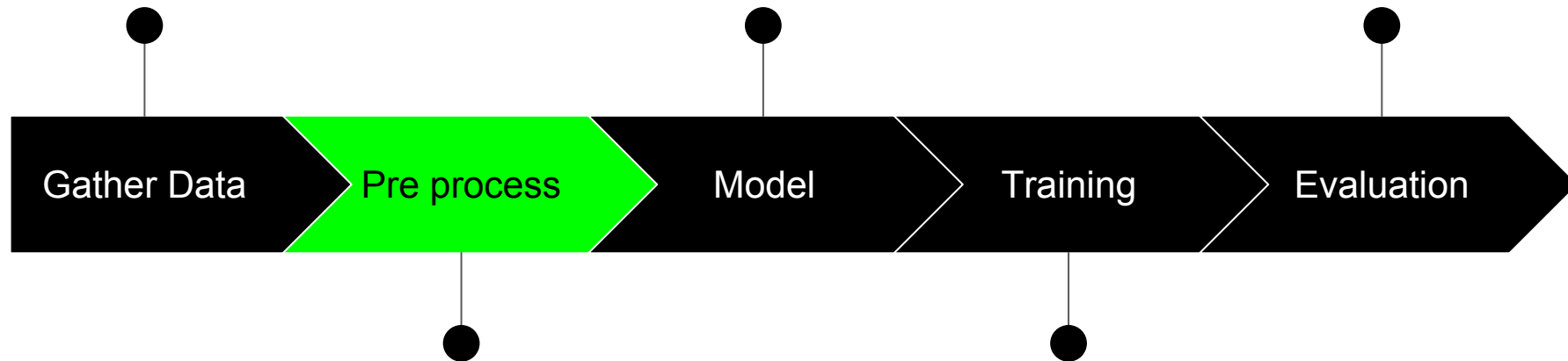
"This is the easiest way ever to produce a creamy and deliciously out-of-this-world mousse! Lemon or concentrated orange juice may also be used in place of the passion fruit."



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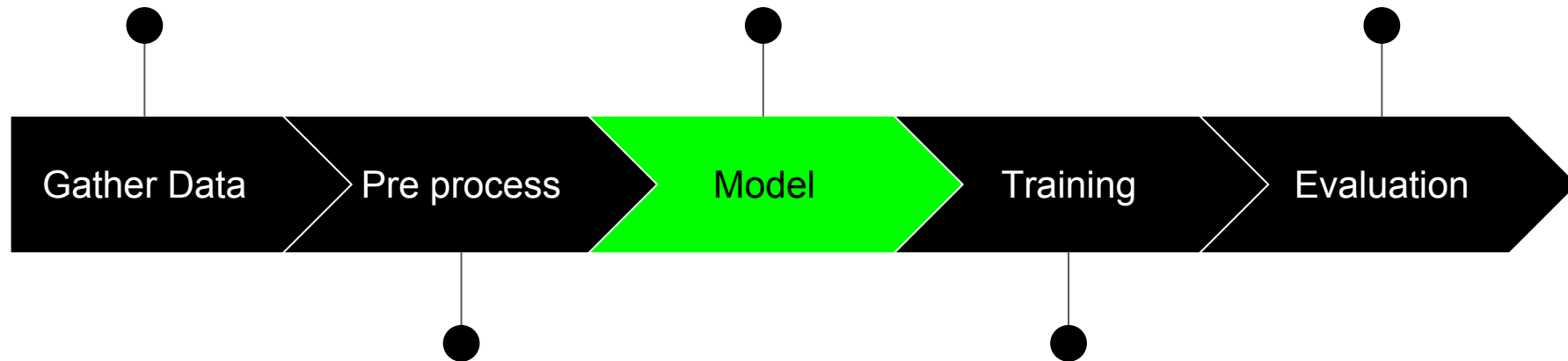
# Gather Data and Preprocessing

- Image size decision
- Running Inception v3
- PCA 2048 -> 512

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# Model

Two Models trained

Model 1 - Vocab of 70,000.

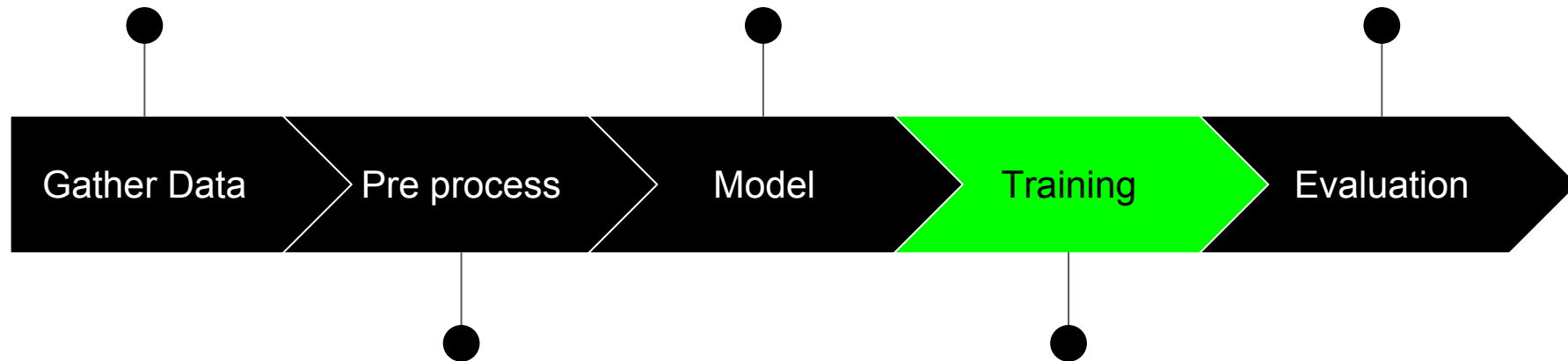
Model 2- Cleaner version, reduced to 10,000

35000 Training Image Features - size = 512

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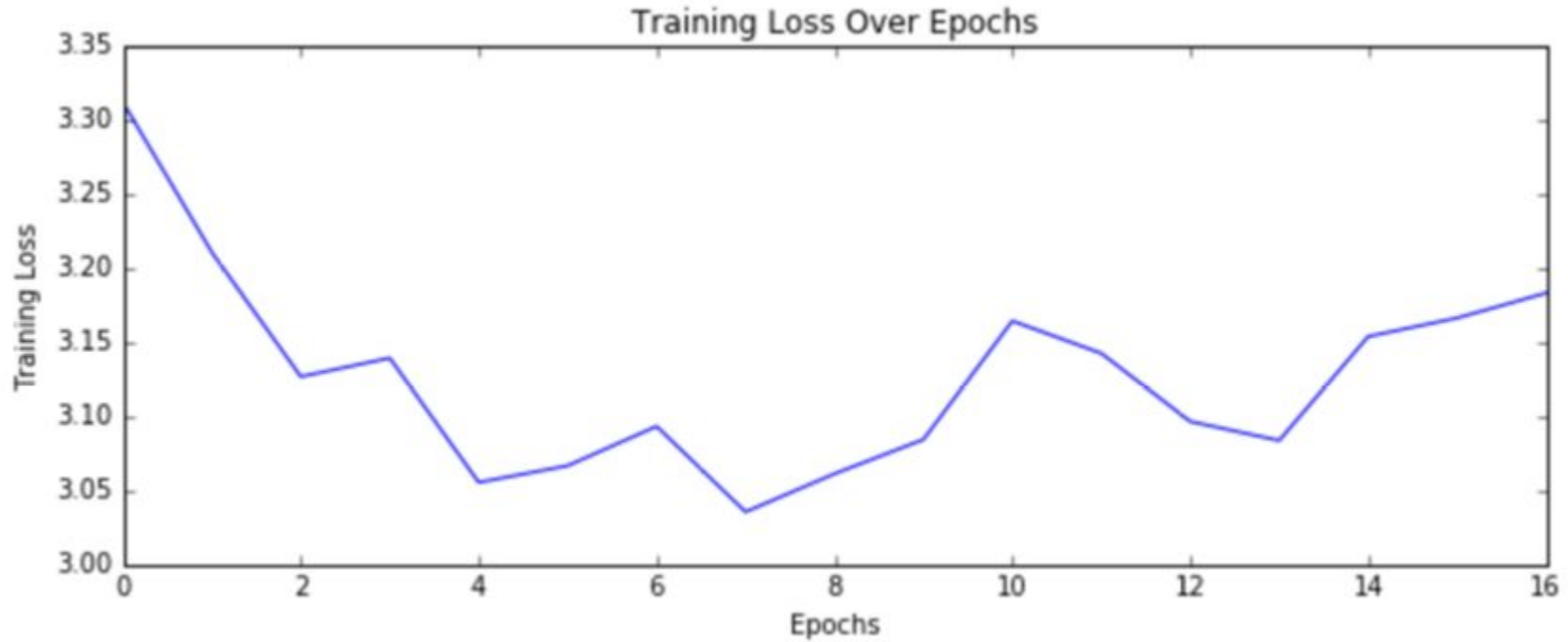
Data cleaning and  
preprocessing.

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# Training - Hyperparameters

- Maximum length of sentence = 150/200 (actual was 900)
- Learning rate : 0.01
- Training data size = 35000 images
- Hidden Units = 256, 512, 1024, 2048
- Epochs = 5, 10, 15, 20, 25, 30

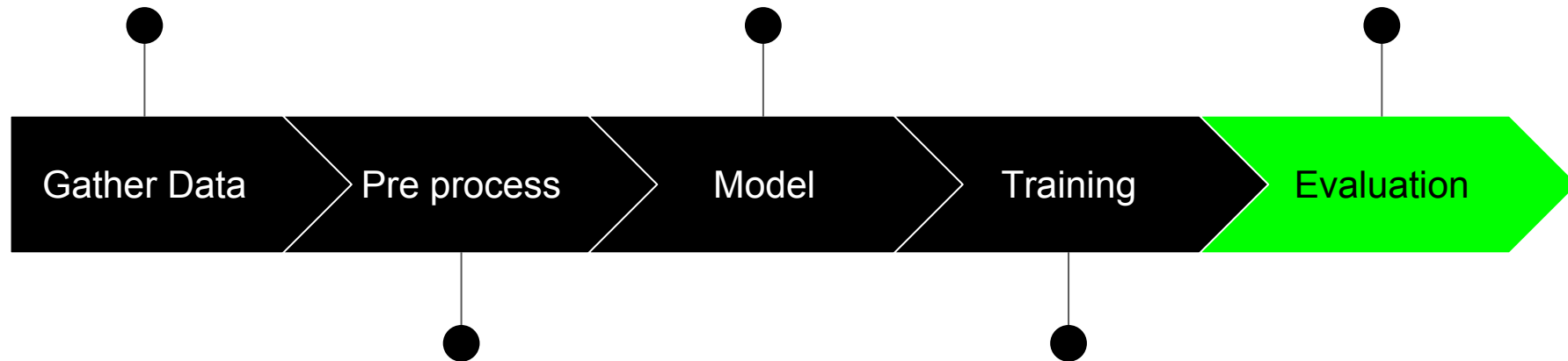
# Training Loss



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Gather Data

Pre process

Model

Training

Evaluation

Data cleaning and  
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# BLEU Score

One of the most popular metrics used to evaluate machine translation

Captures similarity between two samples of text

Similar evaluation to human judgement

Between 0 and 1 (1 being a perfect match)

Our models had BLEU scores in the range of **0.6 to 0.8** up to 20 epochs.



[alazareva.github.io](https://alazareva.github.io)



# Most Frequent Tokens Model 1 (Chicken: 18,340)

and	185,829
the	161,201
to	136,078
a	103,174
in	96,702
cup	82,817
until	71,237
with	57,390
into	46,147
teaspoon	45,951

# Most Frequent Tokens Model 2

\n	490,616
,	332,119
.	295,200
1	251,734
and	186,950
the	161,377
to	137,624
2	134,296
/	117,552
in	108,770

# Model-1-Example1- Use Large Skillet

## Cranberry Nut Bars



9 inch baking sheet with a large skillet over medium-high heat. **cook and stir until the mixture and salt in a large skillet over medium-high heat.**

# Model-1 Example-2- Chicken is tender

## Crostini with Mozzarella and Tomato



2 tablespoons chopped fresh and the chicken is tender, about 10 minutes. **add the chicken and the chicken is tender, about 10 minutes.**

# Model-1 Example3 Stir in Chicken & Salt

## Corn and Chicken Soup



1 cup chopped fresh and the chicken and salt together in a large skillet over medium-high heat.  
cook and stir in the chicken and salt together in a large skillet over medium-high heat.

# Model 1 Example 4 Quantity

## Easy and Delicious Blender Quiche



1 tablespoon chopped fresh and the and the chicken is tender, about 10 minutes. **add the chicken is tender, about 10 minutes.**

# Model 1 Example 5 Newline

## Grilled Chicken with Herbs



1                      1/2                      cups                      white                      sugar  
1/2 cup chopped fresh and the chicken



# Model 1 Recipe Evolution

## One Skillet Corned Beef Hash



- 2 tablespoons vegetable oil
- 2 onions, chopped
- 4 potatoes, peeled and chopped
- 2 (12 ounce) cans corned beef
- 1 tablespoon **ground black pepper**
- 5 tablespoons cider vinegar

Heat oil in a large skillet over medium high heat. Saute onions and potatoes until slightly browned, then stir in corned beef. Season with pepper and add vinegar 1 tablespoon at a time, cooking for 3 to 5 minutes in between each addition. Partially cover skillet, reduce heat to medium-low and cook, stirring occasionally, for about 20 minutes or until potatoes are tender

# Epoch 6

2 cups white sugar

1 cup chopped fresh **and the chicken**

# Epoch 10

1 tablespoon chopped fresh and the chicken and cook until the chicken

# Epoch 15

1 teaspoon ground black pepper to a boil. cook and stir in the preheated oven until the center **and cook until the center**

# Epoch 20

2 cups white sugar

1/2 teaspoon **ground black pepper** to a boil. cook and stir in the chicken and the chicken is tender, about 10 minutes. add the chicken and the chicken is tender, about 10 minutes. **add the chicken and the chicken is tender, about 10 minutes.**

# Model 2 Recipe Evolution

## Herbed Cream Cheese-Stuffed Lamb Burgers



4 ounces PHILADELPHIA Cream Cheese, softened

1 tablespoon chopped fresh chives

1 tablespoon **chopped fresh parsley**

1 1/2 pounds ground lamb

1 tablespoon Worcestershire sauce

1 teaspoon salt

1/2 teaspoon **pepper**

1 tablespoon olive oil

4 onion sandwich rolls, split, toasted

1 bunch watercress, thick stems removed, separated into equal portions

Mix cream cheese and herbs until well blended. Roll into 4 balls; flatten each into disk on sheet of waxed paper. Refrigerate 15 min. or until firm.

Combine meat, Worcestershire sauce, salt and pepper. Shape into 8 thin patties. Place cream cheese disks on 4 patties; cover with remaining patties. Press edges together to seal.

Heat oil in large skillet on medium heat. Add patties; cook about 5-6 min. on each side or until done (160 degrees F). Serve in rolls topped with watercress.

# Epoch 15

1 / 2 cup butter

# Epoch 25

1 / 2 cup butter



# Epoch 30

the and **chopped fresh parsley**

1 / 2 teaspoon ground black **pepper**

# CONCLUSION

Chicken is tender

Also heat it to medium-high

Always stir in large skillet

Butter is smooth, salted or as is needed

# REAL CONCLUSION

Analysed how long can an LSTM really remember.

PCA does help fit data into memory.

GPU memory can be a bottleneck

Perhaps longer sentences require more info from images.

# APPENDIX

# Model2 Example 1

Epoch 15 -  
Id: 246316

the and salt .

#END# the chicken broth , and cook until the chicken is tender .

#END# the chicken broth , and cook until the chicken is tender .

#END# the chicken broth , and cook until the chicken is tender .

# Model 2 Example 2

EPOCH-5

Id = 218365

1 / 2 cup butter , or as needed

1 / 2 cup butter , or as needed

1 / 2 cup butter , or as needed

1 / 2 cup butter , or as needed

1 / 2 cup butter , or as needed

# Model 2 Example 3

EPOCH -5  
Id: 123379

1 / 2 cup of the chicken , and the mixture into the mixture .  
#END#

# Model 2 Example 4

EPOCH = 5

Id: 230922

/ 2 cups chopped fresh parsley

1 / 2 cup butter , softened

1 / 2 cup butter , softened

1 / 2 cup butter , softened

1 / 2 cup butter , softened