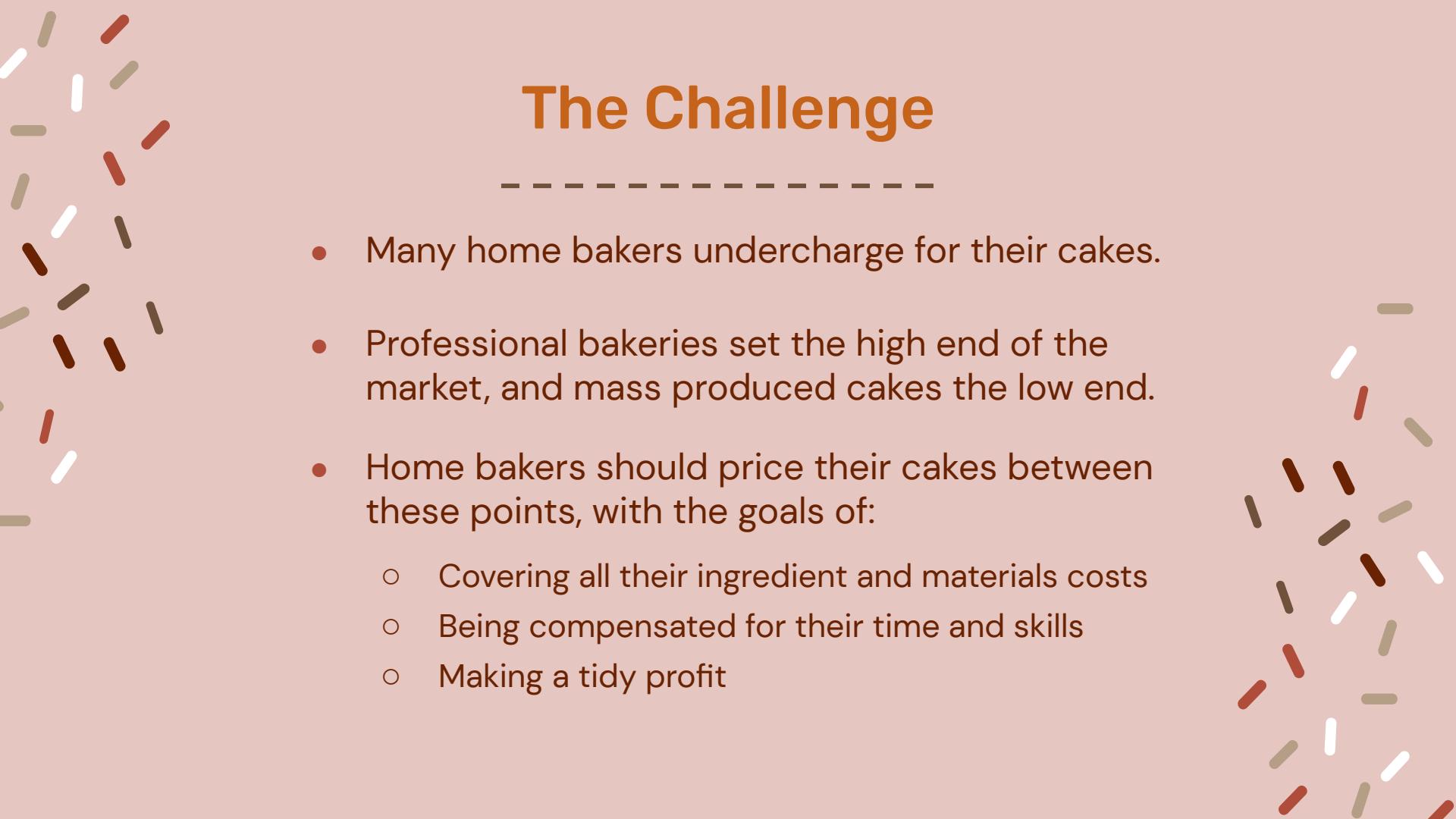


# Cake Pricing Tool

## Using Image Recognition

By Heather Johansen





# The Challenge

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- Many home bakers undercharge for their cakes.
- Professional bakeries set the high end of the market, and mass produced cakes the low end.
- Home bakers should price their cakes between these points, with the goals of:
  - Covering all their ingredient and materials costs
  - Being compensated for their time and skills
  - Making a tidy profit



1



2



3



4



hours of time, effort, artistry and craftsmanship...

# Just Say No To Grocery Store Cakes



Image Credit: [www.CakeWrecks.com](http://www.CakeWrecks.com) (the world's funniest cake blog)



# The Solution

Cake  
Pricing  
App



Upload  
Cake  
Photo



Image  
Classification  
Model



Suggested  
Price  
Range



# The Process



## Collect Images

My own cake photos,  
those from fellow home  
bakers, and the internet

## Build Models

Predict shape/number of tiers, and  
level of complexity of cake design.  
*Note: not predicting price*



## Prepare Images

Classify, Resize, Augment,  
Train-Test-Split, Batch

## Develop App

Streamlit functionality,  
User Input, Model  
Prediction, Price Lookup

# Image Collection

400 Images



# Image Preparation

CLASSIFY



- 1 Tier Complex
- 1 Tier Simple
- 2 Tier Complex
- 2 Tier Simple
- 3+ Tier Complex
- 3+ Tier Simple
- Sculpted Complex**
- Sculpted Simple

AUGMENT

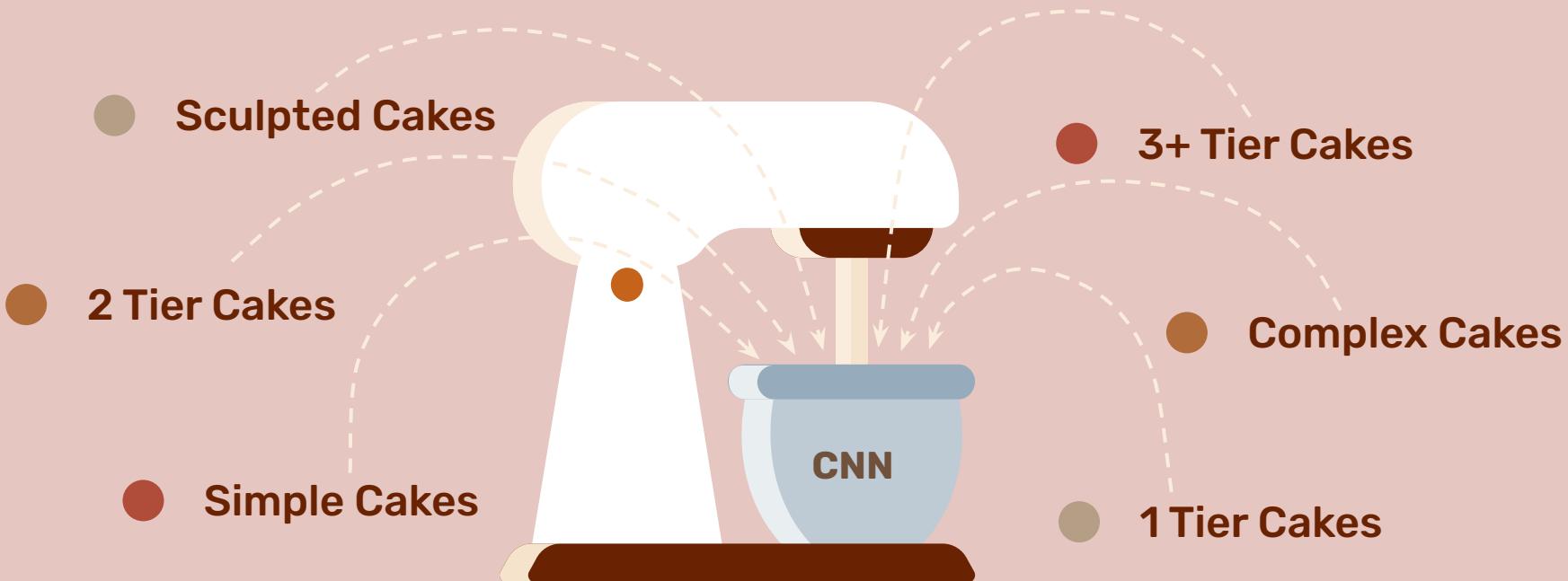


RESIZE



# Model Development

Plan A: Throw in all the ingredients and see how it goes.



*Blend wet ingredients together, sift together dry ingredients,  
then combine it all.*

# Model Development

Plan B: Separate the “ingredients” for our models

Classify by Shape/Tier

Train

75%

Test

25%

4 Class  
Convolutional  
Neural Network

All Photos

Classify by Complexity

Train

75%

Test

25%

Binary  
Convolutional  
Neural Network

# Model Development

## Plan B: Separate the “ingredients” for our models

1

Detect Shape & Number of Tiers



2

Detect Complexity of Design

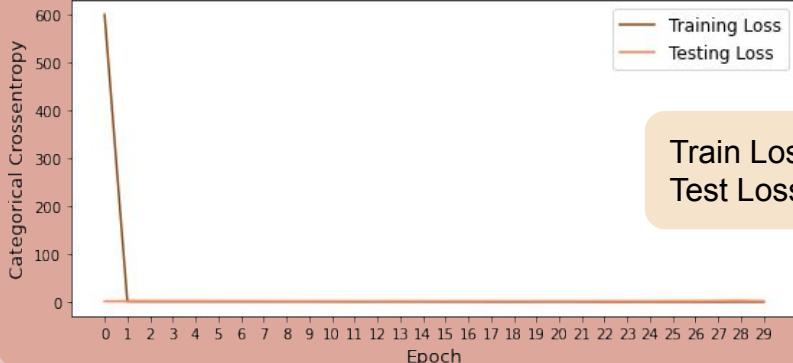


Layer type	Output Shape	Param #
Conv2D (32 filters)	(None, 400, 400, 32)	896
MaxPooling2D (2)	(None, 200, 200, 32)	0
Conv2D (64 filters)	(None, 200, 200, 64)	18496
MaxPooling2D (2)	(None, 100, 100, 64)	0
Flatten	(None, 640000)	0
Dense (64 node)	(None, 64)	40960064
Dropout (50%)	(None, 64)	0
Dense (32 node)	(None, 32)	2080
Dropout (50%)	(None, 32)	0
Dense (4 classes)	(None, 4)	132

Layer type	Output Shape	Param #
Conv2D (32 filters)	(None, 400, 400, 32)	896
MaxPooling2D (2)	(None, 200, 200, 32)	0
Conv2D (64 filters)	(None, 200, 200, 64)	18496
MaxPooling2D (2)	(None, 100, 100, 64)	0
Flatten	(None, 640000)	0
Dense (64 node)	(None, 64)	40960064
Dropout (50%)	(None, 64)	0
Dense (2 classes)	(None, 2)	130

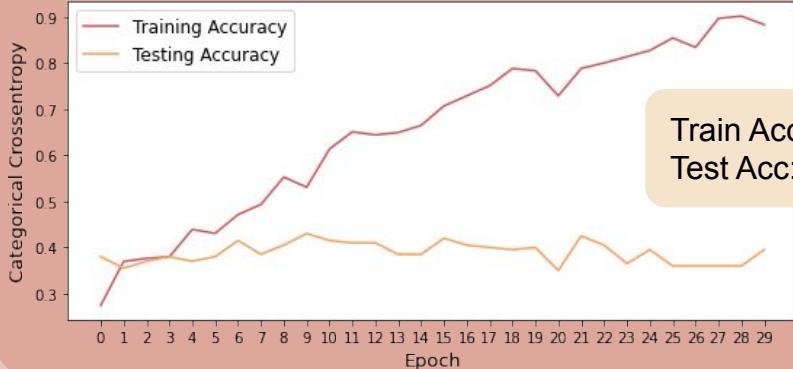
# Model Performance: Tiers/Shape

Training and Testing Loss by Epoch



Train Loss: .40  
Test Loss: 1.84

Training and Testing Accuracy by Epoch



Train Acc: 88%  
Test Acc: 40%

## Too Few Images

With only 800 total images, the model had a hard time training well.

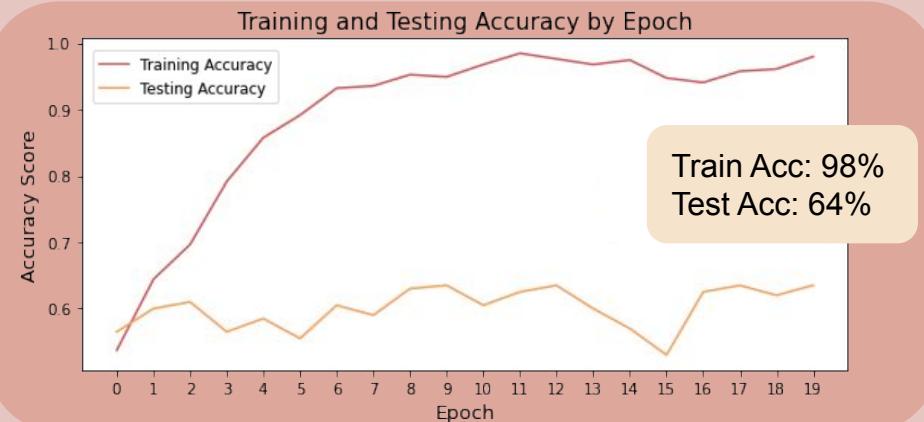
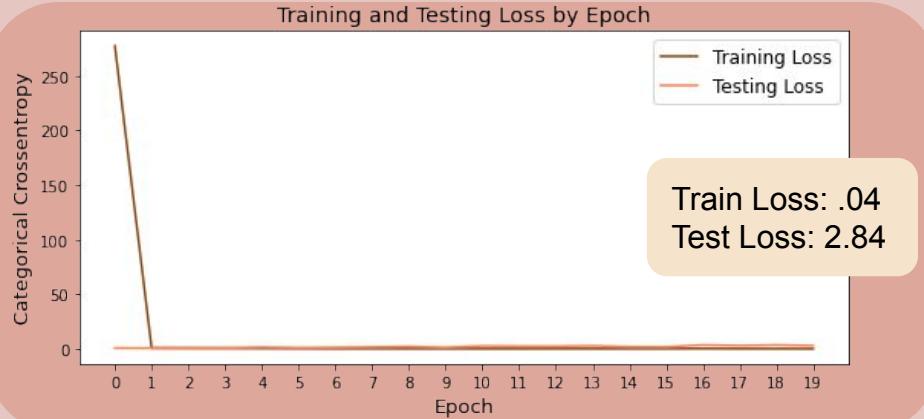
## Unbalanced Classes

36% of the images were 1 Tier.  
Only 17% were 3+ Tier.

## Binary Classification

The model gravitated toward the majority class and the class most distinct from it: Sculpted.

# Model Performance: Complexity



## Subjective

Assigning cakes to these classes was a highly subjective process based on my own experience and knowledge.

## Visually Difficult to Judge

Some types of complexity are difficult to quantify visually. Expertise in cake decorating techniques is needed.

## Bias Toward Majority

The model gravitated toward the majority class – Complex – given the small number of images to classify.

# App Development

Streamlit code is added to your regular python script, and the app is developed inline with your data processing and model code.

## Import Models

Save in TensorFlow's H5 format and import, much like a pickled model.



## Preprocessing

Modify preprocessing steps necessary for new images to be classified.

## App Script

Using simple, pythonic script, build out app using Streamlit's easy-to-learn process.



To the App!

# Next Steps

1

Collect and classify additional images

- Balance classes
- Build out by features

3

Launch app and get feedback from fellow home bakers!

- Price accuracy
- Improve speed

2

Test additional image preparation methods and ways of classifying cakes.

- VGG16 image prep and modeling
- Image detection for cake features like flowers, fondant characters, etc.



A circular inset photograph shows two young girls in a kitchen. The girl on the left, wearing a pink dress and a white chef's hat, has her right arm raised, holding a large metal spoon. The girl on the right, wearing a white dress and a white chef's hat, is smiling and holding the girl on the left's hand. They are standing in front of a dark wooden cabinet.

# Questions?

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# Thanks!

For sharing cake photos and pricing models:

Kira Helm  
Jennie Mendez, Moonlight Cakes  
Josey Fountain, JoseyCakes  
Jenn Romero, Sweet Justice Cakes

Charlie Rice, John Hazard, Hov Gasparian and Prasoon Karmacharya for being guidance and untangling along the way.



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