

Luxury Handbag Price Prediction

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EE 500 : Neural Learning and Computational Intelligence

MOTIVATION



Most women love shopping, especially handbags

MOTIVATION



Need for luxury handbag price prediction

VARIATION IN BAG PRICES

Complimentary Two Day Shipping and Gift Wrapping

RE(BELLE) medium top handle bag

\$ 2,600

Style 516459 OPLOT 6438

AVAILABLE
Your selection is available for immediate purchase online.

[ADD TO SHOPPING BAG](#)

TRY IN STORE



A red leather top handle bag with a rounded dome shape, two top handles, and a small gold-toned double G logo plaque on the front. It has a shoulder strap with a chain-link buckle.

\$2,600 – calfskin
Gucci

Complimentary Two Day Shipping and Gift Wrapping

Sylvie medium crocodile top handle bag

\$ 34,000

Style 431665 EV4CG 6473

Personalize

AVAILABLE
Your selection is available for immediate purchase online.

[ADD TO SHOPPING BAG](#)

May We Help?



A red crocodile-skin top handle bag with a structured rectangular shape, a flap closure, and a gold-toned chain-link belt across the front. It features a dark blue leather panel with a gold buckle and a small gold-toned double G logo plaque.

\$34,000 – Crocodile skin
Gucci

Skin Type is the most important feature

TALKING TO THE EXPERTS



With the **Celine** expert at Neiman Marcus
9700 Wilshire Blvd, Beverly Hills



With the **Tom Ford** expert at
Beverly Hills Rodeo Drive



With the **Louis Vuitton** experts at
Beverly Hills Rodeo Drive

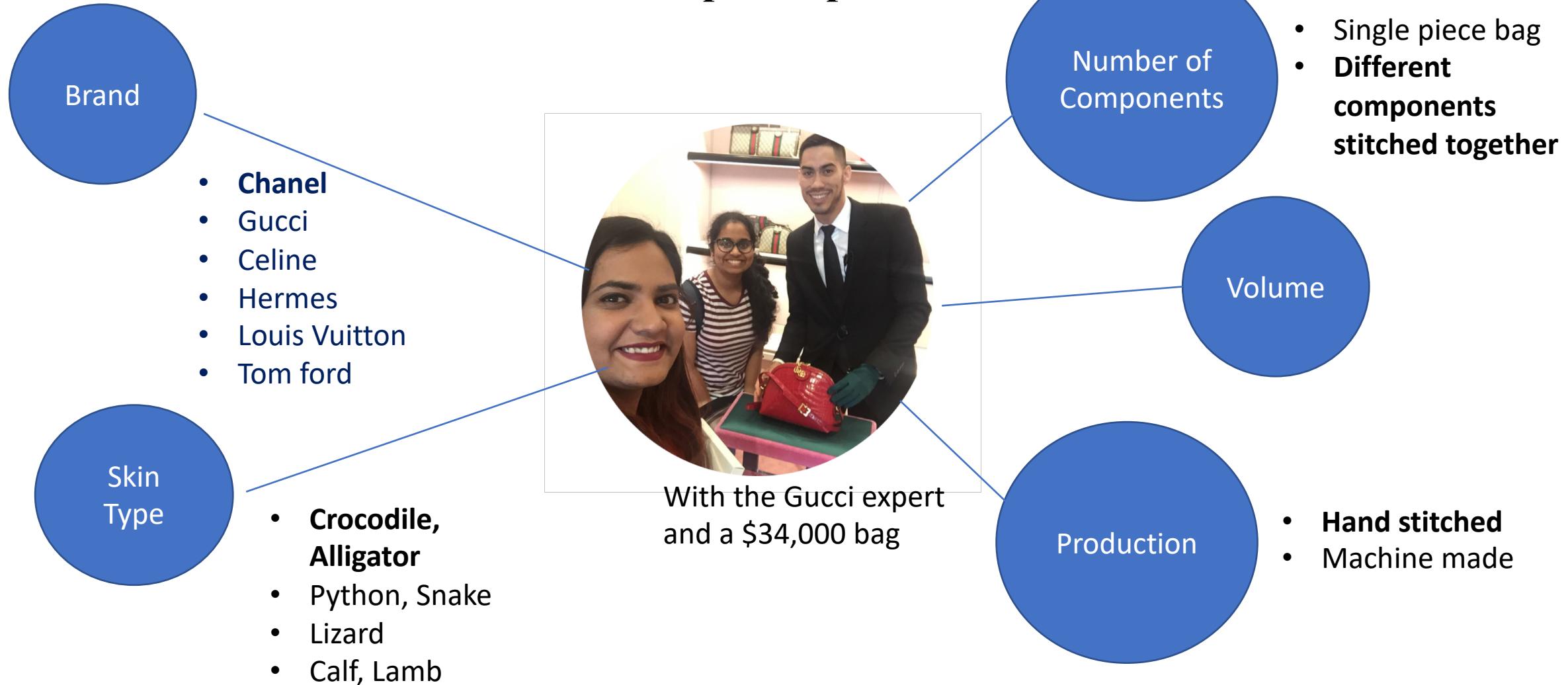
DATA COLLECTION

Brand	Hardware – Metal Type	Number of Components	Usage Type
Bag Name	Hardware – Number of zips	Major Color	Number of Functionality
Accessories	Hardware - Strap type	Number of Colors	Launch Season
Bag Style	Hardware – strap length	Height, Width, Breadth	Launch Year
Skin Type	Number of Compartments	Volume	Production Type
Inner Material	Place of Manufacture	Demand	Number of Hours
Skin Source	PRICE		Number of People

Total of 27 Features were determined

IMPORTANT FEATURE IDENTIFICATION

Based on Experts opinions



These five features are important for hand bag pricing

PRE-PROCESSING

Continuous features

- Number of zips
- Strap length
- Number of compartments
- Number of components
- Number of colors
- Volume
- Number of functionalities

Ordered Categorical features

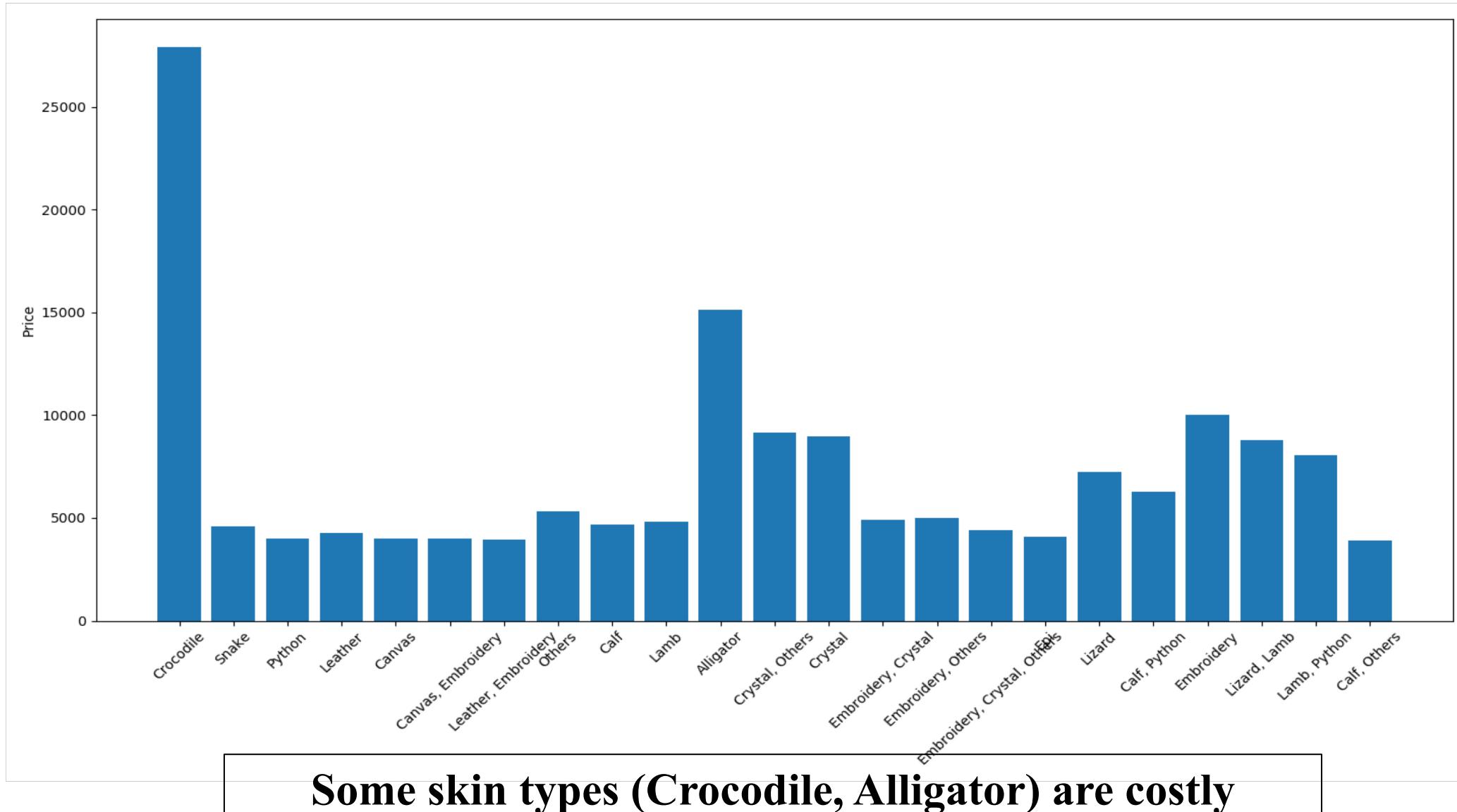
- Metal type
- Strap type
- Inner material

Unordered Categorical features

- Brand
- Accessories
- Bag style
- Major color
- Skin Type

Total data points collected = 142
Train-Test Split (80/20) = 113/29

SKIN TYPE

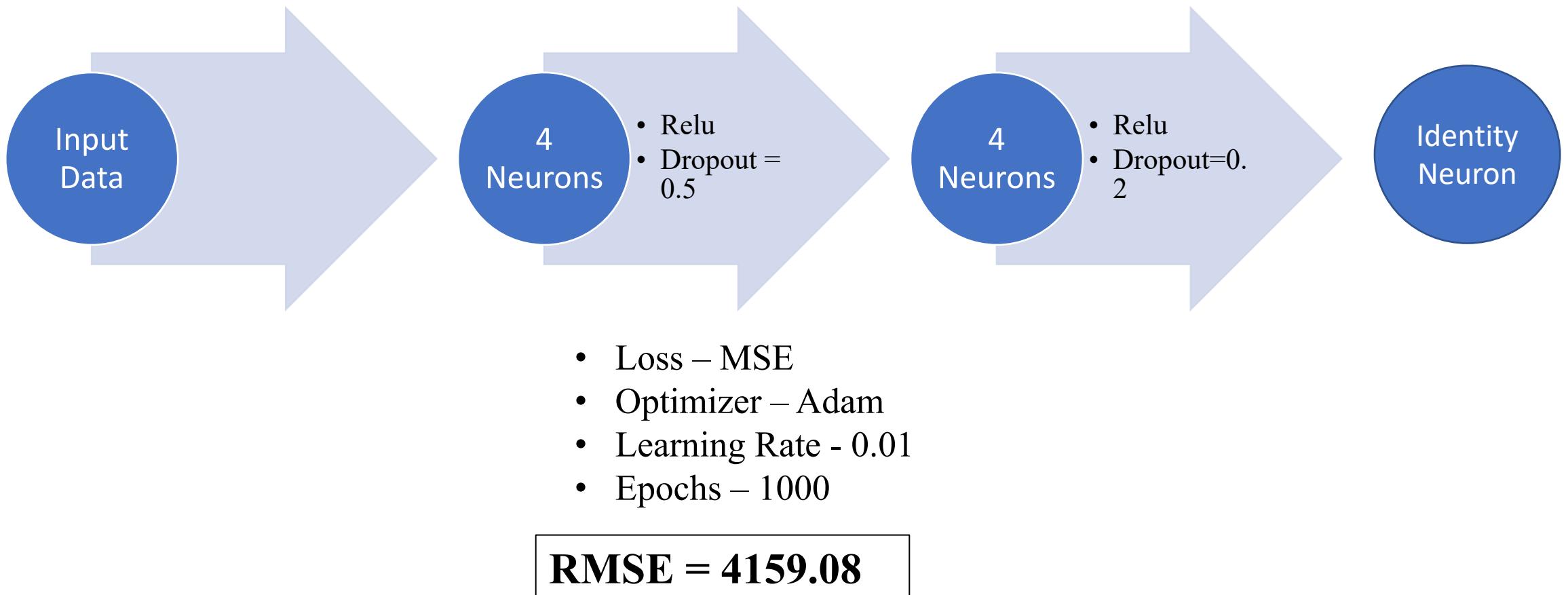


INTIAL MODEL - ALL FEATURES

MODEL	Test RMSE	TEST R^2 SCORE
Linear	4248.90	-0.367
Ridge(Alpha = 3)	2231.86	0.477
Lasso(Alpha = 3)	2578.71	0.316
SVR(kernel = Poly)	3359.31	-0.323

Overfitting!

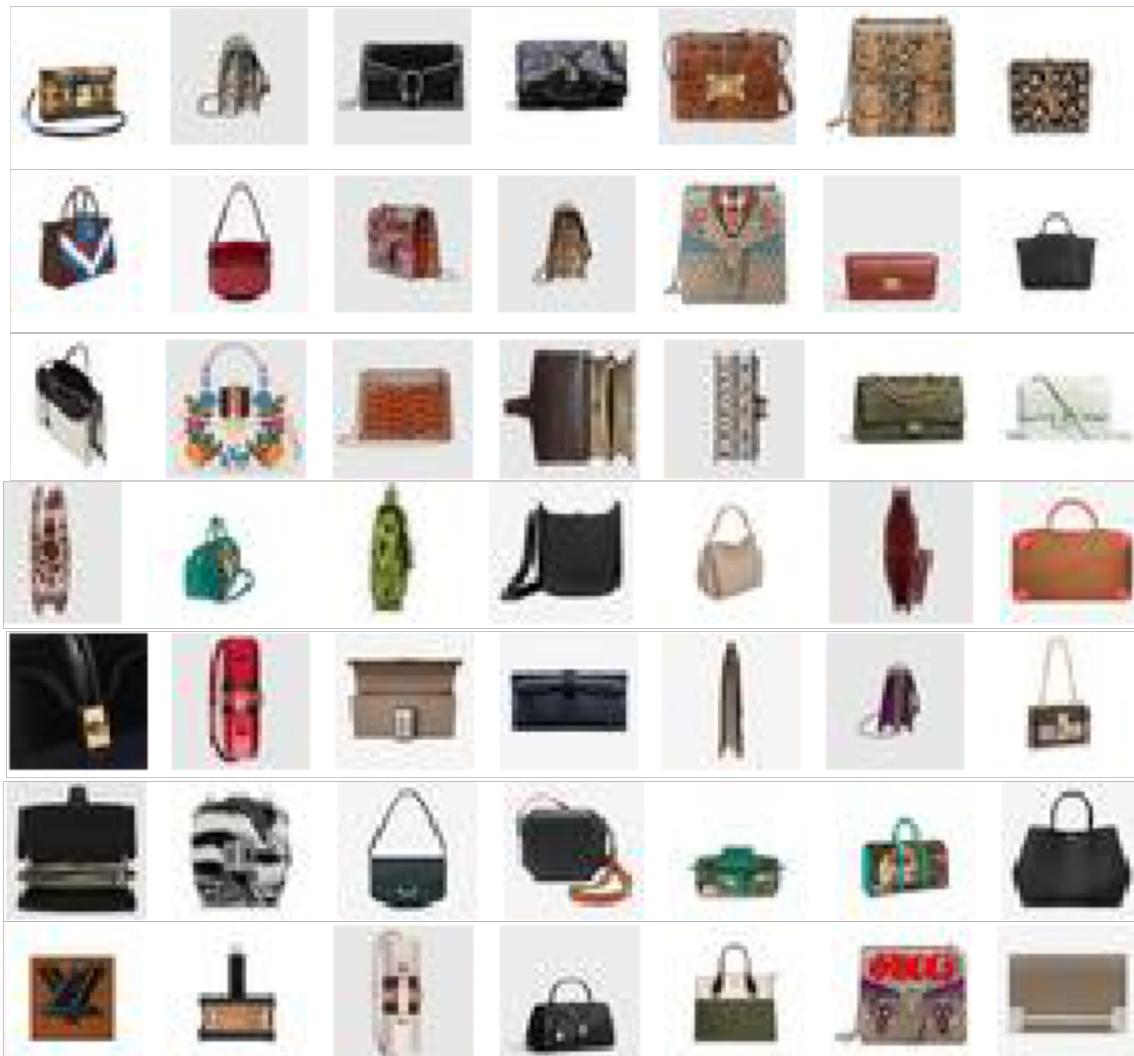
MULTI LAYER PERCEPTRONS



MLP converges slowly and is unstable

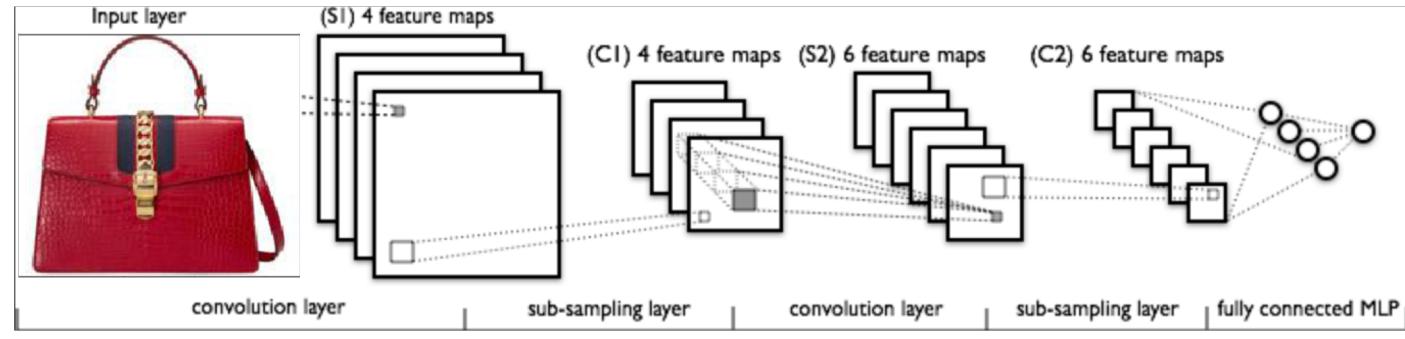
Convolutional Neural Network

- Data Collection:
 - Web scrapper
 - Multiple views for the same price
 - 628 images – Train/Test :80/20
 - Resized images to 32 x 32
- Pre Processing
 - Normalization
- Data Augmentation
 - Horizontal flipping
 - Random zoom and crop

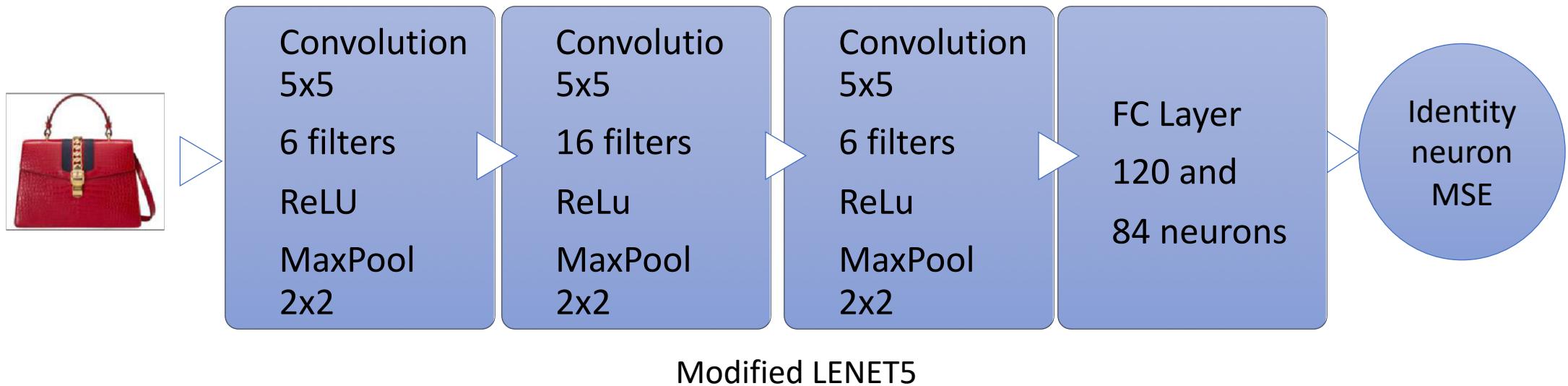


Model setup

ARCHITECTURE OF CNN



LENET5



Modified LeNet with an extra convolution layer has lower RMSE

CNN - SUMMARY

Model Architecture	R^2 Score	RMSE Loss
Lenet, batch size = 64, #epochs = 1000	0.322	5052.8499
Modified architecture, batch size = 32, #epochs = 1000	0.357	4789.56
Modified architecture, batch size = 32, #epochs = 5000	0.511	3963.98
Lenet with data augmentation, batch size = 64, steps per epoch = 16, #epochs = 1000,	0.14	5903.003
Modified architecture with data augmentation, batch size = 64, steps per epoch = 16, #epochs = 1000	0.1578	5892.3

Data Augmentation doesn't help due to large variance in collected data

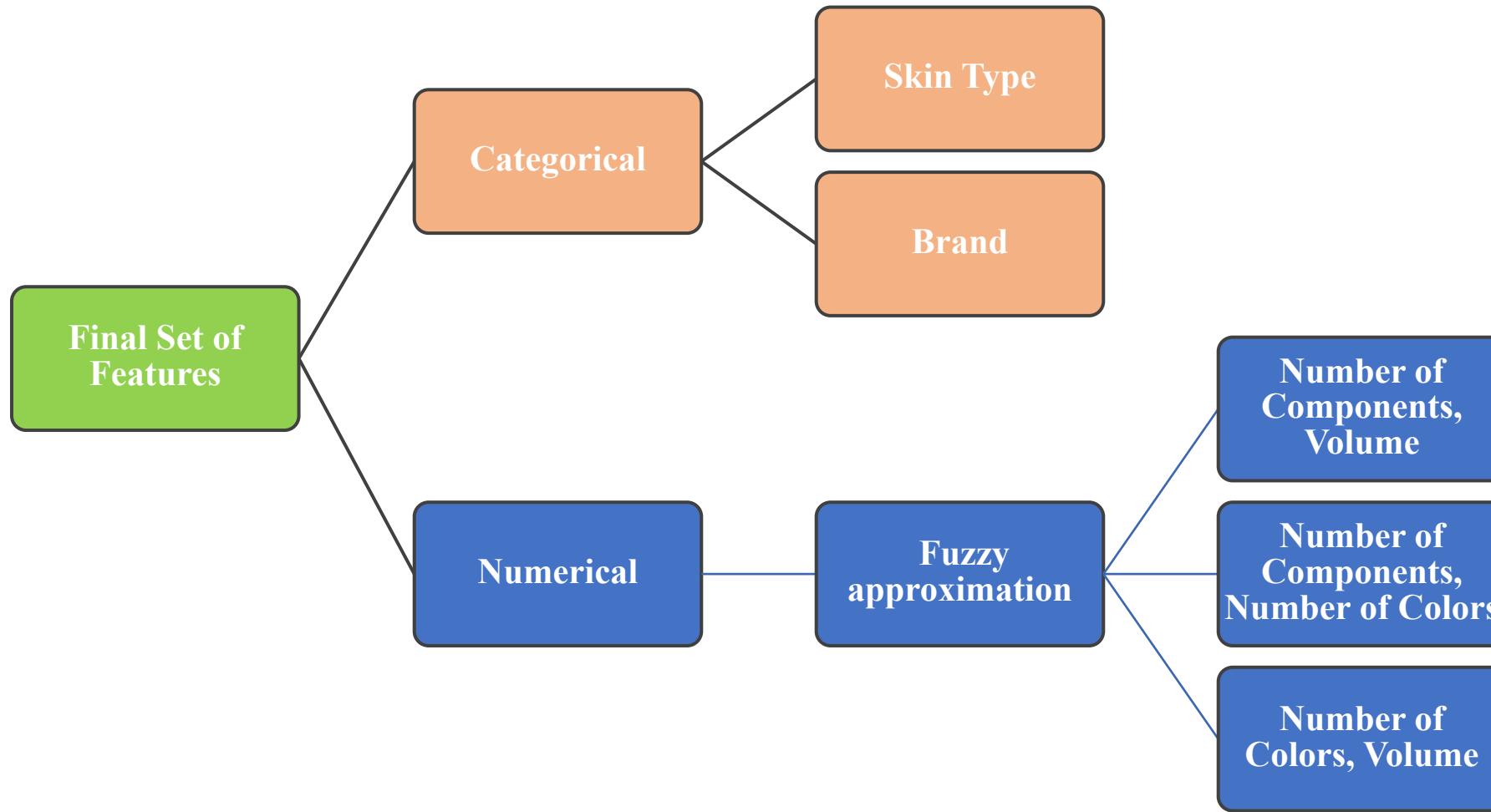
FUZZY APPROXIMATION

- Numerical features = 7
- 21 sets of 2 features
- Number of rules = 17

Best Combinations	RMSE
Number of Components, Volume	3100.421
Number of Components, Number of Colors	3119.442
Number of Colors, Volume	3062.386

Best combinations gave low RMSE

FEATURE SELECTION



Combining categorical features and fuzzy approximations of numerical features

FUZZY MODEL COMBINATION

MODEL	TEST RMSE
Linear	2591.49
Ridge (alpha = 3)	1698.69
Lasso (alpha = 3)	2573.76
SVR (kernel = poly)	2197.56

Improved accuracy and best result!

BRAND SPECIFIC MODEL



CÉLINE
297.66

TOM FORD
1262.27

GUCCI
673.63

CHANEL

1479.66

LOUIS VUITTON
795.00

Brand specific models work for some brands(Celine)

CHALLENGES

- 1) Less number of data
- 2) Variation in data across different brands
- 3) Some features were not available
 - Production type
 - Number of hours to manufacture
 - Source of skin
 - Launch year and season



THANK YOU