



咖啡競賽

COE

競標價格預測

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研究動機



研究動機

咖啡價格的預測對於咖啡產業具有重要性。透過預測競標價格，可以幫助農民、出口商和相關利益者更好地規劃生產和貿易策略。

Cup of Excellence(COE)咖啡競賽是全球享譽的咖啡競賽，競標價格往往反映出咖啡品質和價值。透過準確預測競標價格，台灣咖啡農可以參考咖啡豆哪些特性對於競標特別有價值，幫助做出更明智的種植和收穫決策，提高農產品的品質和價值，並增加農民的收入。另外對於競標者來說，我們的模型或許可以提供價格落點參考。



資料集建構



資料來源



The Cup of Excellence(COE), Historical COE Result

各國家各年度COE Auction的結果



Google Place Api, Google Evaluation Api

補齊海拔、得標者所屬區域資料

資料爬取 - COE Auction Result

利用 request 與 beautifulsoup 爬取每個國家每年的 Auction Results 表格，並爬下每家農場的網頁連結，接著至各網頁爬取該農場相關資訊與該年參賽豆子的處理方法與評語

Guatemala 2022

COE Competition Results							COE Auction Results							NW Competition Results							NW Auction Results									
International Jury			National Jury				Organizing Country Commissions				Sponsors				Farm Name			Farmer				La Reforma Y Anexos			La Reforma Y Asociados, S. A.					
Rank	Farm	Score	Weight (lbs)	High Bid	Total Value	Company Name	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank		
1a	El Morito	91.75	224.1	\$138.20	\$30,970.62	The Espresso Lab	88.95	7																						
1b	El Morito	91.75	224.1	\$138.20	\$30,970.62	Fisher coffee 啡舍 / 青岛李想珈 / 东方国际商业（集团）有限公司 / CoffeeBuff / SHANGHAI CARMO TRADING CO., LTD (珈露梦咖啡)																								
2a	El Injerto I	91.33	213	\$111.10	\$23,664.30	Fisher coffee 啡舍 / 青岛李想珈 / 东方国际商业（集团）有限公司 / CoffeeBuff / SHANGHAI CARMO TRADING CO., LTD (珈露梦咖啡) / S.O.E COFFEE 八平方咖啡 / MARUS COFFEE 马路咖啡. M1 咖啡奇幻工场 M1 Coffee Dream Factory	2022																							
2b	El Injerto I	91.33	213	\$111.20	\$23,685.60	MUSEO Co., Ltd. // TXT Coffee (.txt) // No Doubt // liike coffee	Washed																							
3a	Rosma	90.13	296.6	\$77.10	\$22,867.86	Haru International Corporation	Gesha																							

 Farm Information

Farm Name: La Reforma Y Anexos

 Farmer

Farmer: La Reforma Y Asociados, S. A.

 Score

Score: 88.95

 Rank

Rank: 7

 Lot Information

Year: 2022

Processing System: Washed

Variety: Gesha

Overall:

Caramel, Floral, Honey, Tangerine, Orange, Vanilla, Apple, Bright, Tangerine, Orange, Firm, Creamy, Caramel, Chocolate, Grapefruit, Jasmine, Roses, White wine, Transparent, Well balanced, Harmonious, Melon, Almond, Black tea, Berries, Kiwi, Sweet Almond, Hazelnut

資料爬取 - COE Auction Result

挑戰一：每個國家每年的表格格式與 HTML 屬性皆不相同

Costa Rica 2017

Cup of Excellence: The winning lots are coffees scoring 86 points and above in each cupping by both the National Jury and the Cup of Excellence International Jury. These coffees have each been cupped a minimum of five different times during the cupping process. The lot size indicates the number of 15kg vacuum-packed bags.

National Winners: The winning lots are coffees scoring 84 points and above in each cupping by both the National Jury and the Cup of Excellence International Jury. These coffees have each been cupped a minimum of five different times during the cupping process.

[Winning Farms](#) [National Winners](#) [International Jury](#) [COE Auction Results](#)

LOT #	WINNING FARM / CWS	LOT SIZE	HIGH BID	TOTAL VALUE	HIGH BIDDER(S)
1a	Finca Don Antonio 2017	9	\$80.60/lb	\$47,977.15	Maruyama Coffee, Adachi Coffee, Sarutahiko Coffee, Difference Coffee (UK), Good Boy Bob Coffee (U.S.A.), Saza Coffee
1b	Finca Don Antonio 2017	9	\$80.30/lb	\$47,798.58	Time's Club, Inc., Coffee Libre, Hisashi Yamamoto Coffee(Unir), Proud Mary
2a	VOLCAN AZUL 2017	8	\$38.71/lb	\$20,481.46	SUPREMO
2b	VOLCAN AZUL 2017	8	\$38.70/lb	\$20,476.17	Black Gold Coffee Co., Ltd.
3a	Don Cayito 2017	8	\$37.10/lb	\$19,629.61	Taniguchi Coffee, NOZY COFFEE Co.,Ltd, COFFEE FACTORY, Magnolia Coffee Roasters, SHRUB COFFEE, NAGAHAMA COFFEE Inc.
3b	Don Cayito 2017	8	\$36.91/lb	\$19,529.08	Beijing HMC Foods Co.,Ltd

Guatemala 2020

Cup of Excellence competition: Due to COVID-19 the Cup of Excellence Guatemala competition was completed in the following way: Coffees were blindly cupped through the following process:

- Preselection stage: April 27th – May 1st with the 10 National Judges in Guatemala City, Guatemala with Eduardo Ambrocio as head judge.
- National stage: May 18 – 22nd with the 8 National Judges in Guatemala City, Guatemala with Eduardo Ambrocio as head judge.
- International stage: Completed on different dates with the judges Kentaro Maruyama, Miyoko Watanabe, Shinji Sekine, Keita Matsumoto, Kim, Will Young, Adam Matheson, Thomas Pulpan, Synove Neseon, Erin Wang, Alex Pond, Eduardo Ambrocio, Diego del Aguila and Jonathan from respective labs around the globe.

Cup of Excellence: The winning lots are the top 30 coffees that scored above an 87 by the Cup of Excellence International Jury. These coffees have each been cupped a minimum of five different times during the cupping process. The coffee is packaged in a 30kg box containing two 15kg vacuum-packed bags.

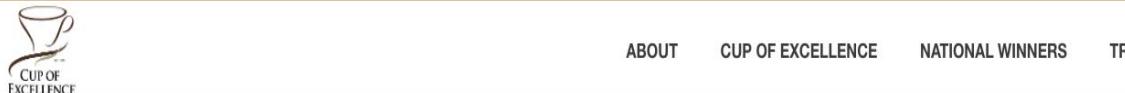
National Winners: The National Winner lots are coffees scoring 85+ points during the International Week by the Cup of Excellence International Jury. These coffees have each been cupped a minimum of five different times during the cupping process. The coffee is packaged in a 30kg box containing two 15kg vacuum-packed bags.

COE Auction: July 28th
National Winner Auction: July 20th – August 7th

[See COE Competition Results & Farm Stories](#)

[COE Auction Results](#) [NW Auction Results](#) [Organizing Country Commissions](#)

Rank	Farm	Score	Weight (lbs)	High Bid	Total Value	Company Name
1a	El Socorro	91.06	233.22	\$180.20	\$42,026.24	Maruyama Coffee, Goodboybob Coffee, Cometeete, Bird Rock Coffee Roasters, PT's Coffee
1b	El Socorro	91.06	233.22	\$175.30	\$40,883.47	JOOYEON Selection
2	Mama Cata	89.69	609.84	\$37.90	\$23,112.94	Pebble Coffee (Taiwan), Kakalove (Taiwan), Simple Kaffa (Taiwan), The Hub Coffee (Malaysia), Urban Coffee Roaster (HK), Stellar on Coffee (South Korea)
3	La Esperanza	89.04	542.33	\$37.40	\$20,283.14	Kyokuto Fadie Corporation & Onyx Coffee



ABOUT CUP OF EXCELLENCE NATIONAL WINNERS TRAINING & EDUCATION

cupped a minimum of five different times during the cupping process. The coffee is packaged in a 30kg box containing two 15kg vacuum-packed bags.

National Winners: The National Winner lots are coffees scoring 85+ points during the International Week by the Cup of Excellence International Jury. These coffees have each been cupped a minimum of five different times during the cupping process. The coffee is packaged in a 30kg box containing two 15kg vacuum-packed bags.

COE Auction: July 28th

National Winner Auction: July 20th – August 7th

[Become an ACE Member to Participate in Auction](#)

Winning Farms* National Winners* National Jury International Jury Sponsors

RANK	WEIGHT (kg)	FARM	FARMER	REGION	SCORE	VARIETY	PROCESS
1a	105.79	El Socorro	Cercol, S. A.	Guatemala	91.06	Gesha	Washed
1b	105.79	El Socorro	Cercol, S. A.	Guatemala	91.06	Gesha	Washed
2	276.62	Mama Cata	Max Fernando Perez Rios	Chimaltenango	89.69	Gesha	Natural
3	246	La Esperanza	Pedro Villatoro Castillo	Huehuetenango	89.04	Bourbon, Caturra, Typica	Washed
4	229.22	Los Aguacatones	Rosa Maria De La Peña Illescas	Huehuetenango	88.94	Gesha, Villa Sarchi, Typica	Washed
5	133.83	Miramundo	Naturavista, S. A.	Santa Rosa	88.92	Gesha	Washed
6	136.95	La Reforma Y Anexos	La Reforma Y Asociados, S. A.	Huehuetenango	88.77	Gesha	Washed
7	161.82	Ponderosa	Perez Perez Wilfrido Hernan	Huehuetenango	88.65	Gesha	Natural
8	64.95	Antigua El Semillero	Entre Caminos, S. A.	Sacatepequez	88.56	Typica	Washed
9	287.16	La Hermosa	Max Fernando Perez Rios	Chimaltenango	88.5	Gesha (Organic)	Natural

Description		Details
Rank		8
Farm Name		Sítio Portella
Farmer/Rep.		Edir José de Carvalho
Altitude		1250 m.a.s.l.
Country		Brazil
Year		2019
Size (30kg boxes)		12
City		Caldas, MG
Region		Sul de Minas
Program		Brazil 2019
Coffee		chocolate, creamy, vanilla, floral, honey, sweet lemon, green apple, melon
2 Pegasing Takengon Utara - Indonesia 2022		
lively, malic, citric and refined		
ear, creamt, well balanced, improved on cool, sugar sweet		
Natural		
3.6 ha		
3 ha		
793.68		
360		
Description		De
PT. Biji Kopi Internusa or abbreviated as BIKOIN, was established in 2022, with the goal to introduce Indonesia's Specialty Coffees to the world. Indeed BIKOIN has not been established for a long time, however the team that has joined this company are those who have been in the coffee industry for more than 10 years, both in upstream and downstream activities. With this experience, BIKOIN is eager to support and help coffee farmers to increase their income by building the coffee processing facility in their neighborhood, as well as providing the training program to improve their knowledge in order to provide high quality coffee bean which is able to meet the international standard requirement.		Bookmark
One of the co-operation with the coffee farmers that has been carried out is to participate in COE- Cup of Excellent event with Pegasing coffee farm. It takes 2 hours to reach this coffee farm from the city of Banda Aceh v conditions, however the BIKOIN team is still eager to collaborate with c produce high quality coffee and successfully take the 2nd place. We w achievement to the farmers who have worked hard and hopefully can p benefits to improve their standard of living in the future.		
ABOUT CUP OF EXCELLENCE NATIONAL WINNERS TRAINING & EDUCATION DONATE		
Description		
Farm Information		
Score		
Lot Information		
Rank		1a
Farm Name		El Socorro
Farmer/Rep.		Cercol, S. A.
Altitude		6100 famsl
Country		Guatemala
Year		2020
City		Palencia
Region		Guatemala
Program		Guatemala 2020
Auction		Cup of Excellence
Score		
Rank		
Aroma/Flavor		Floral, Guava, Lemongrass, Tropical Fruit, Watermelon, Lemonade, White Peach, Sorbet, Jasmine, Black Tea, Strawberries, Tropical Fruit Ice Cream, Mango, Lychee, Lemongrass, Apricot, Basil, Mint, , Peach Floral Mango, Floral, Jasmine, Minty,
Acidity		Citric Acid, Complex, Citric, Intense, Multi-Dimensional Fruit Acidity, Citric, Tartaric Sweet And Complex Citric, Grape, Lively
Other		Well Balanced, Lingering, Sweet, Transparent, Sparkling Aspect Like 7Up, Well Balance, Soft Finish, Tea Like Brown Sugar, Cashew, Syrupy, Long Lasting
Processing system		Washed
Variety		Gesha
Farm Size		280 hectares

資料爬取 - COE Auction Result

挑戰二：部分農場無海拔資料，無法得知買方所屬地區

Farm Information	
Farm Name	Sitio Bonilha
Farmer	Maridalton Silva Santana
Score	
Score	90.59
Rank	2
Lot Information	
Year	2022
Processing System	Pulped Natural
Variety	Catuaí 144

Description	Details
Rank	2
Farm Name	San Ignacio
Farmer/Rep.	Juana Mamani Huanca
Altitude	-1
Country	Bolivia
Year	2007

HIGH BIDDER(S)
Invalsa Coffee, Orsir Coffee, Cafe Valverde
Stumptown Coffee Roasters, Sweet Maria's, Terroir Coffee
Mercanta The Coffee Hunters for Fortnum and Mason London and Cafes El Magnifico Barcelona
Maruyama Coffee for Mikatajuku group, Inoue Coffee
KAFFA as, Oslo
Andronicas World of Coffee in Harrods
Time's Club for C-COOP
Bewleys Ltd



資料爬取 - 海拔與買家所屬地區

由於許多農場的海拔資料缺失與得標公司僅顯示公司名而無所屬地區，利用Google Place API先取得該農場的經緯度以及得標公司的地址，接著利用經緯度至Evaluation API獲得該地海拔，並從地址中擷取所屬國家

國家 + 城市 + 農場名
Rwanda Rulindo Fakco-Rulindo

經度 : 30.02029
緯度 : -1.7555338



Maps Elevation API

海拔 : 1670



Places API (New)

買家公司名稱
Maruyama Coffee

336, Taiwan, Taoyuan City, Fuxing District,
丸山2鄰8之1號

地區 : 亞洲



資料欄位

類別

- **品種(13):**
geisha, pacamara, catuai, caturra, bourbon, typica, sl-28, sl-34, colombia, 74112, 74110, 74158, mixed_variety
- **國家(14):**
Country_Brazil, Country_Burundi, Country_Colombia,
- **地區(257)**
- **農場(100)**
- **處理法(5):**
Process_anaerobic, Process_honey, Process_natural, Process_washed, Process_wet hulled
- **Year(18):**
Year_2005 ~ Year_2023
- **買家(5)**
Asia, North_America, Nordic, Europe, Others

數字

- **競標價格**
- **海拔**
- **排名**
- **風味(19):**
Clean_and_clear, Balance_cup, Transparent_cup, Creamy_body, Big_body, Long_aftertaste, Roasted_flavor, Spices_flavor, NuttyCocoa_flavor, Sweet_flavor, Floral_flavor, Fruity_flavor, GreenVegetative_flavor, Winey_flavor, Malic_acidity, Citric_acidity, Tartaric_acidity, Lactic_acidity, Complex_acidity





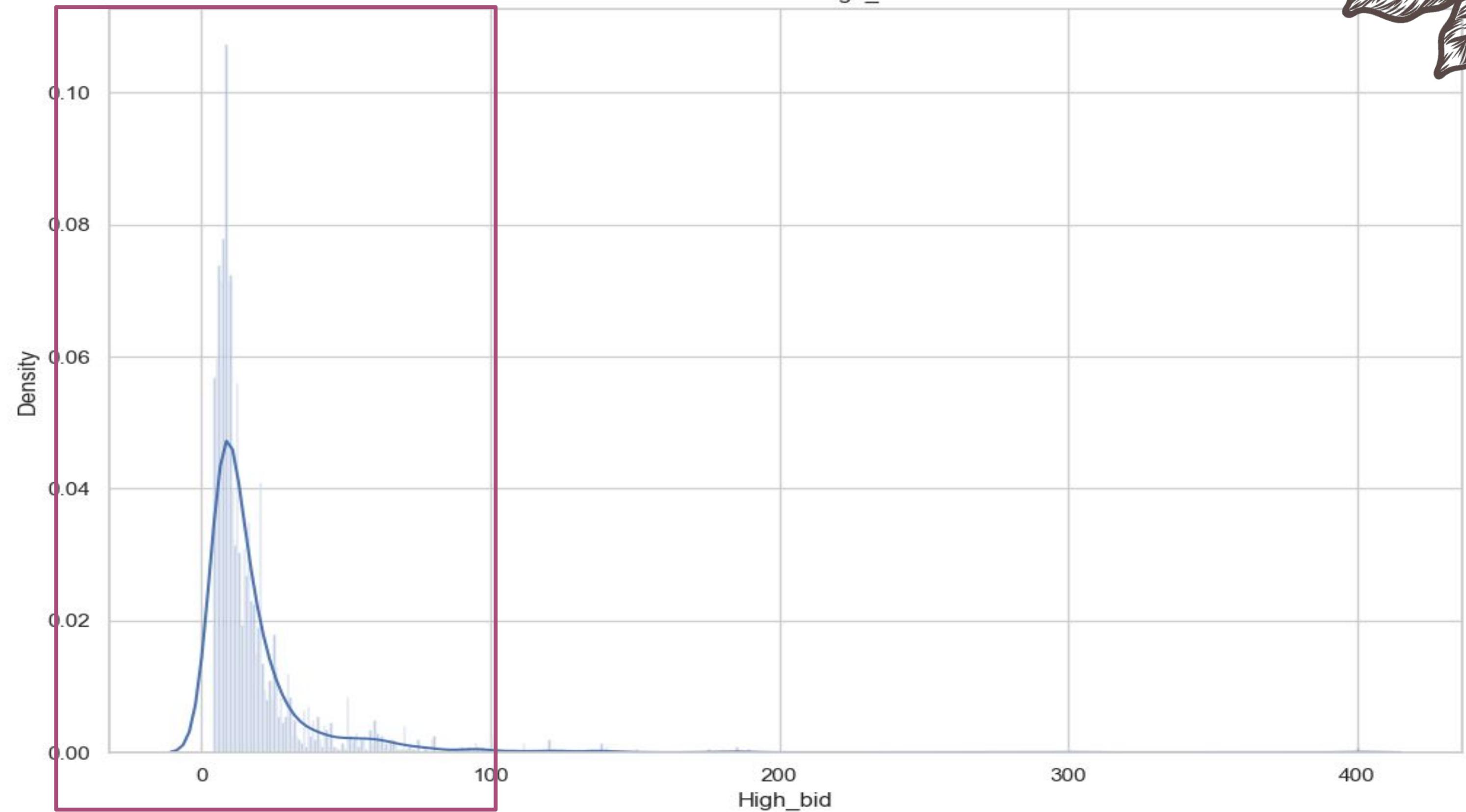
敘述統計



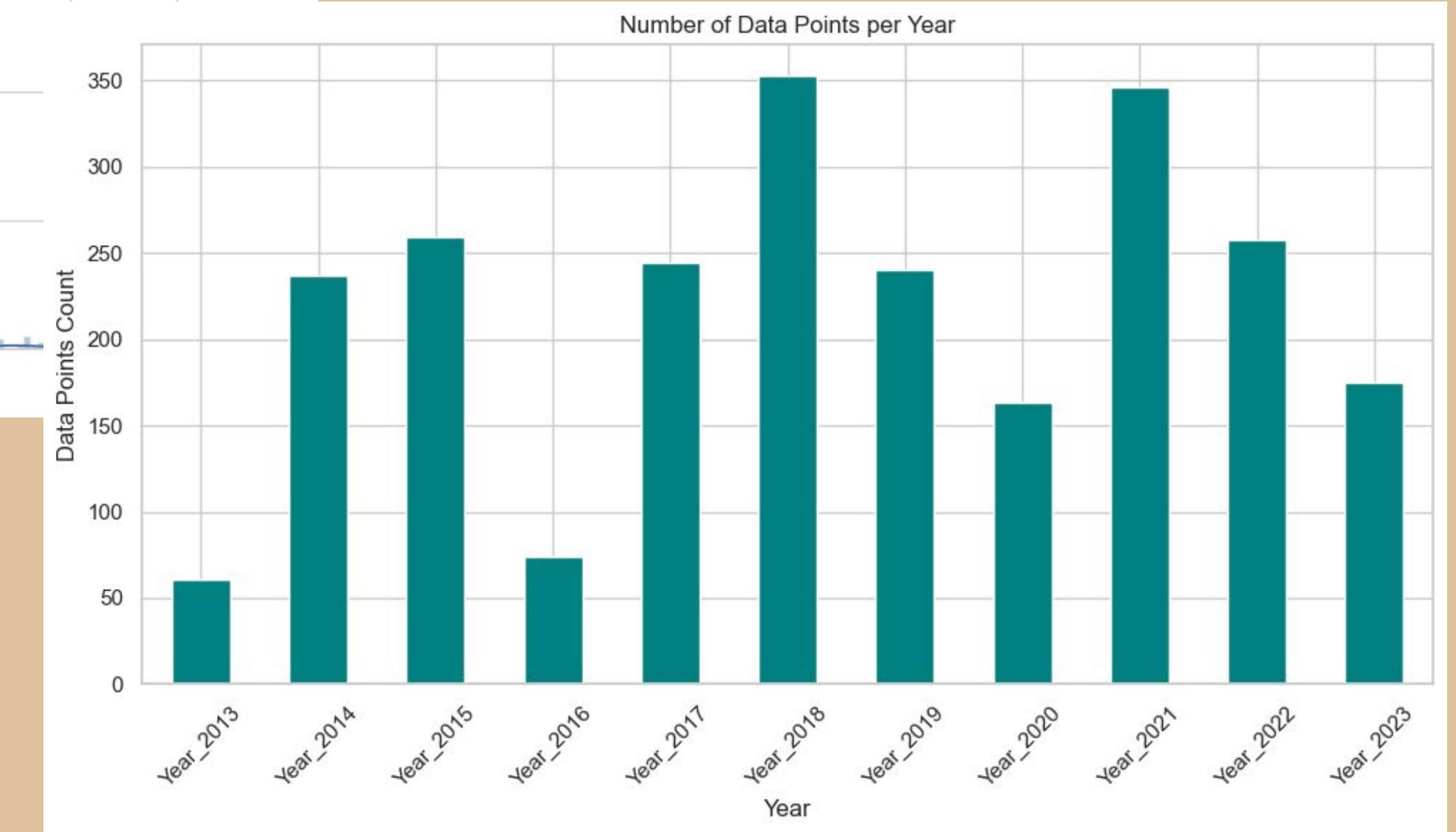
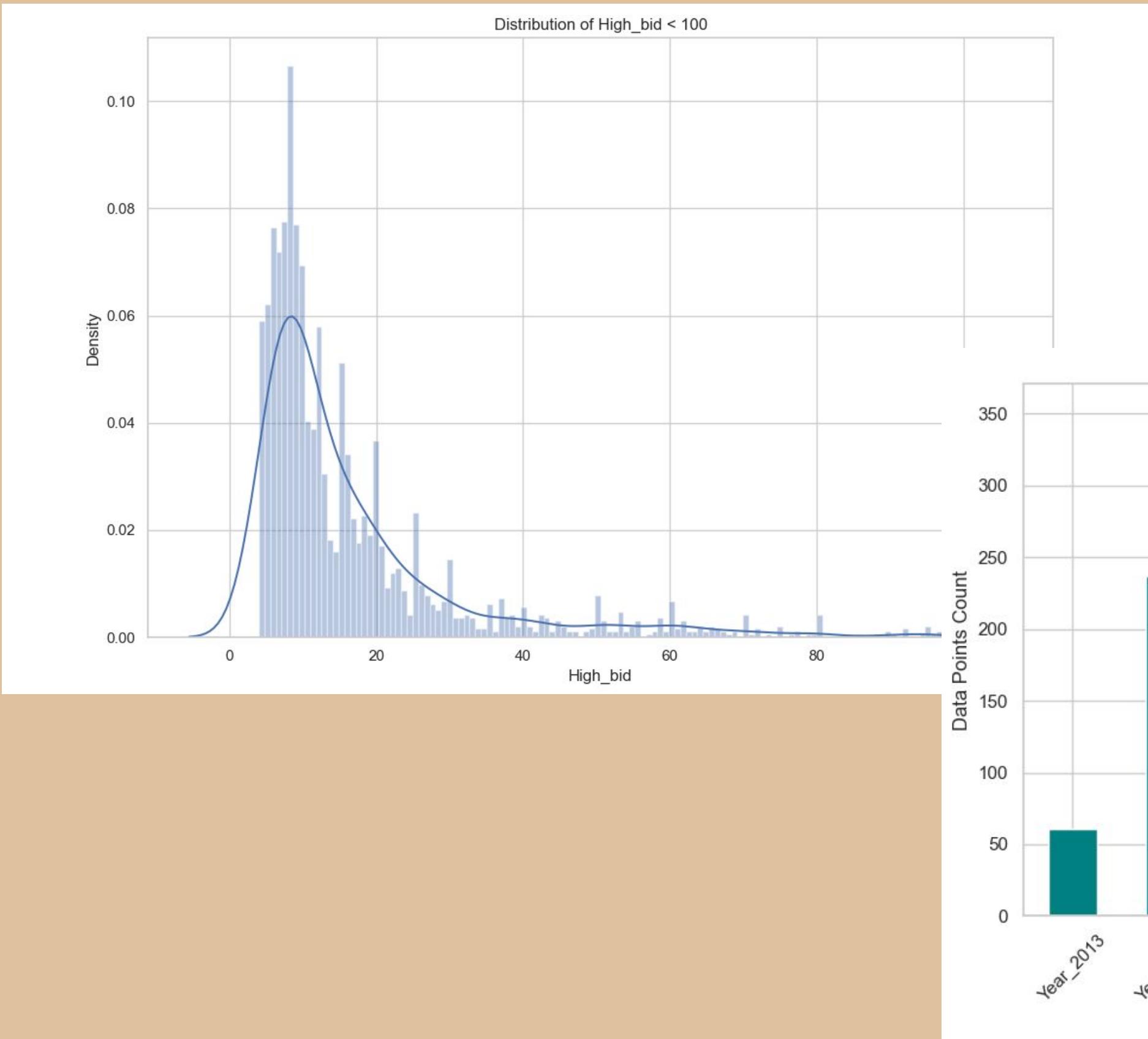
- 目標：
預測咖啡每磅價格
- 資料筆數：
約 2800 筆

敘述統計 - High Bid(成交價格)

Distribution of High_bid



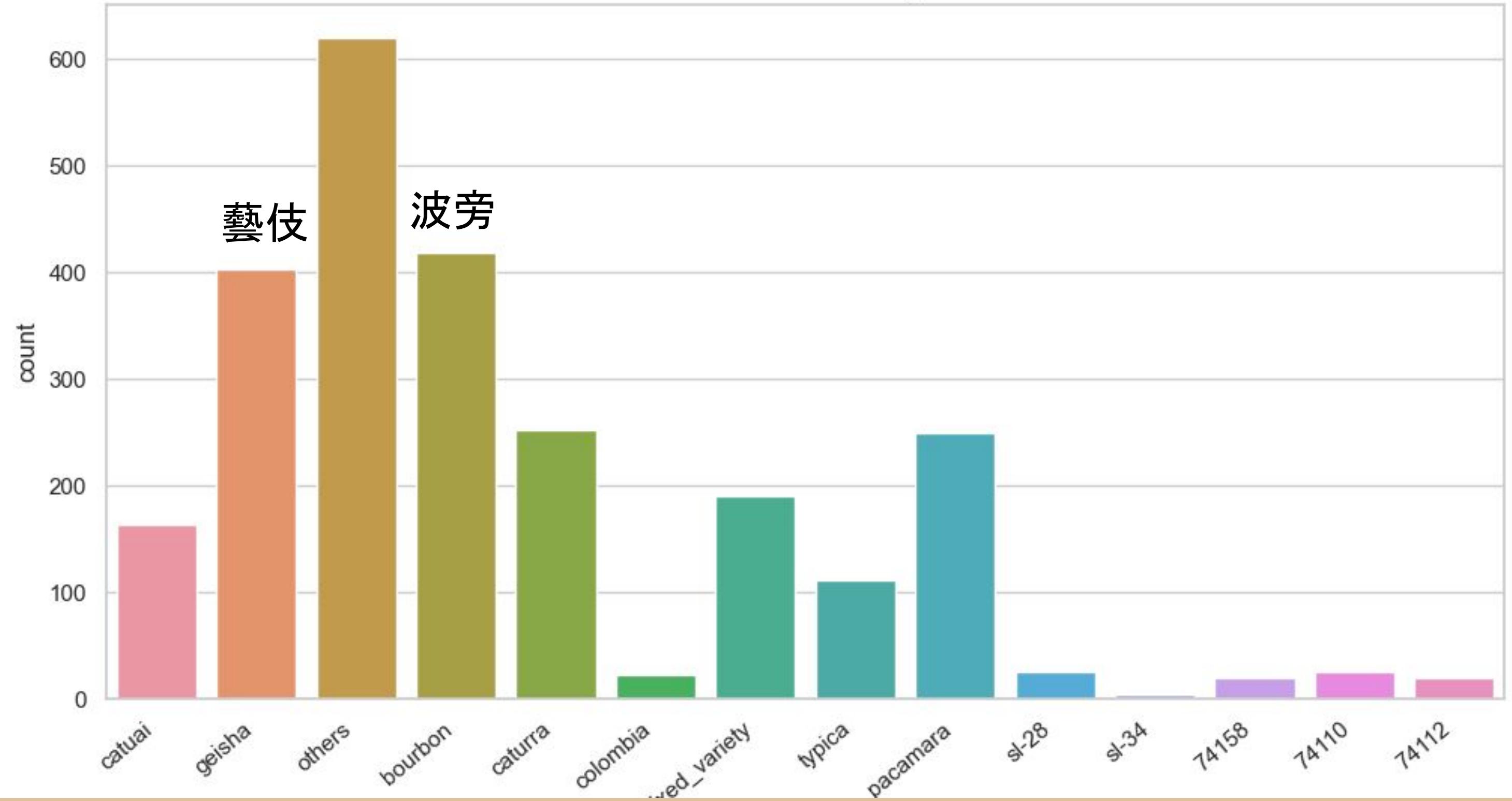
敘述統計 - High Bid(成交價格)、各年資料量



敘述統計 - 各品種分佈



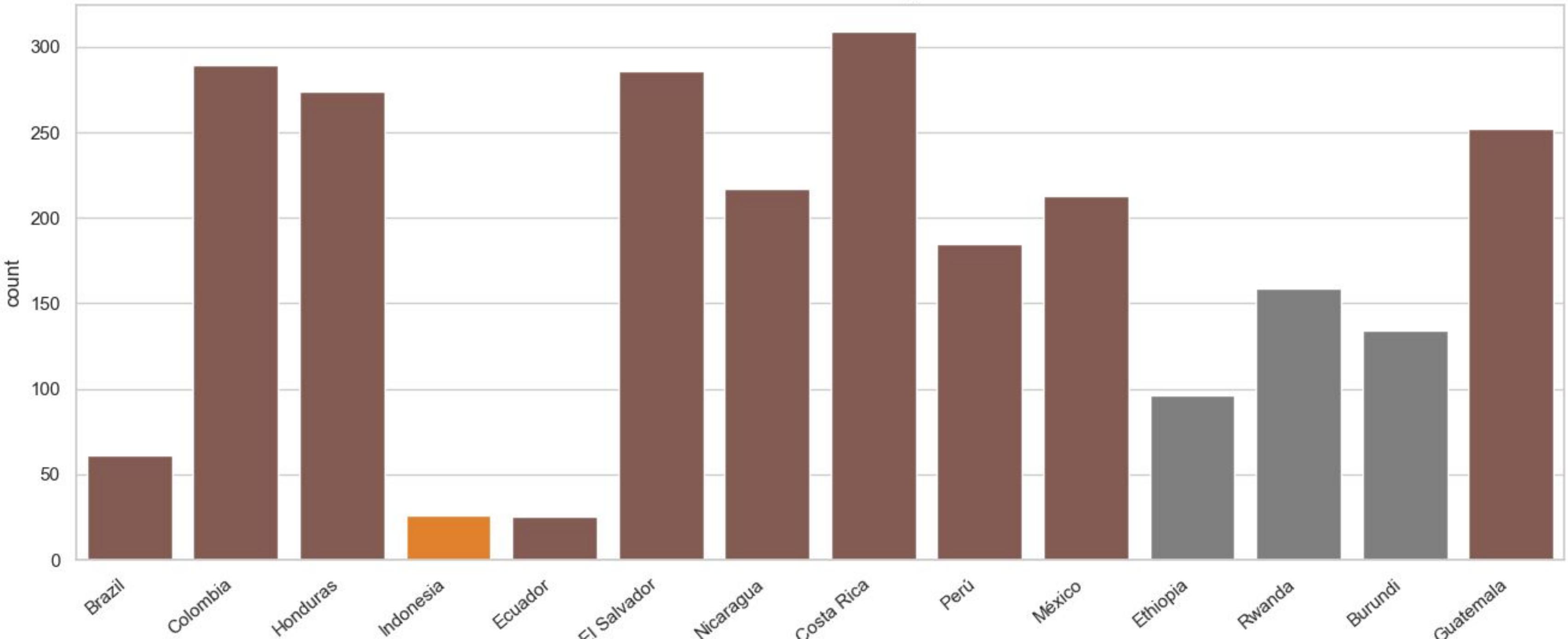
Distribution of variety



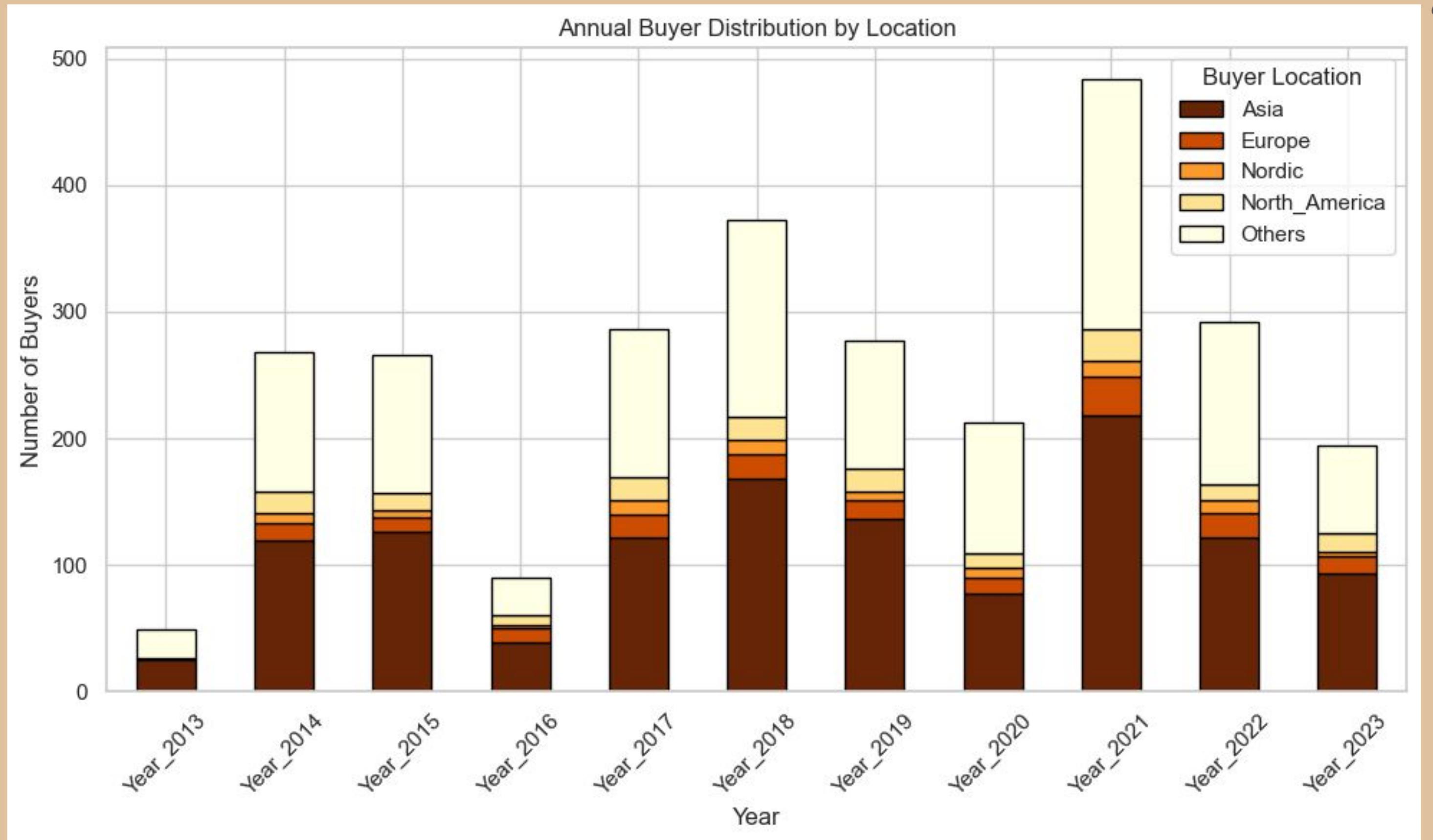
敘述統計 - 各產地分布



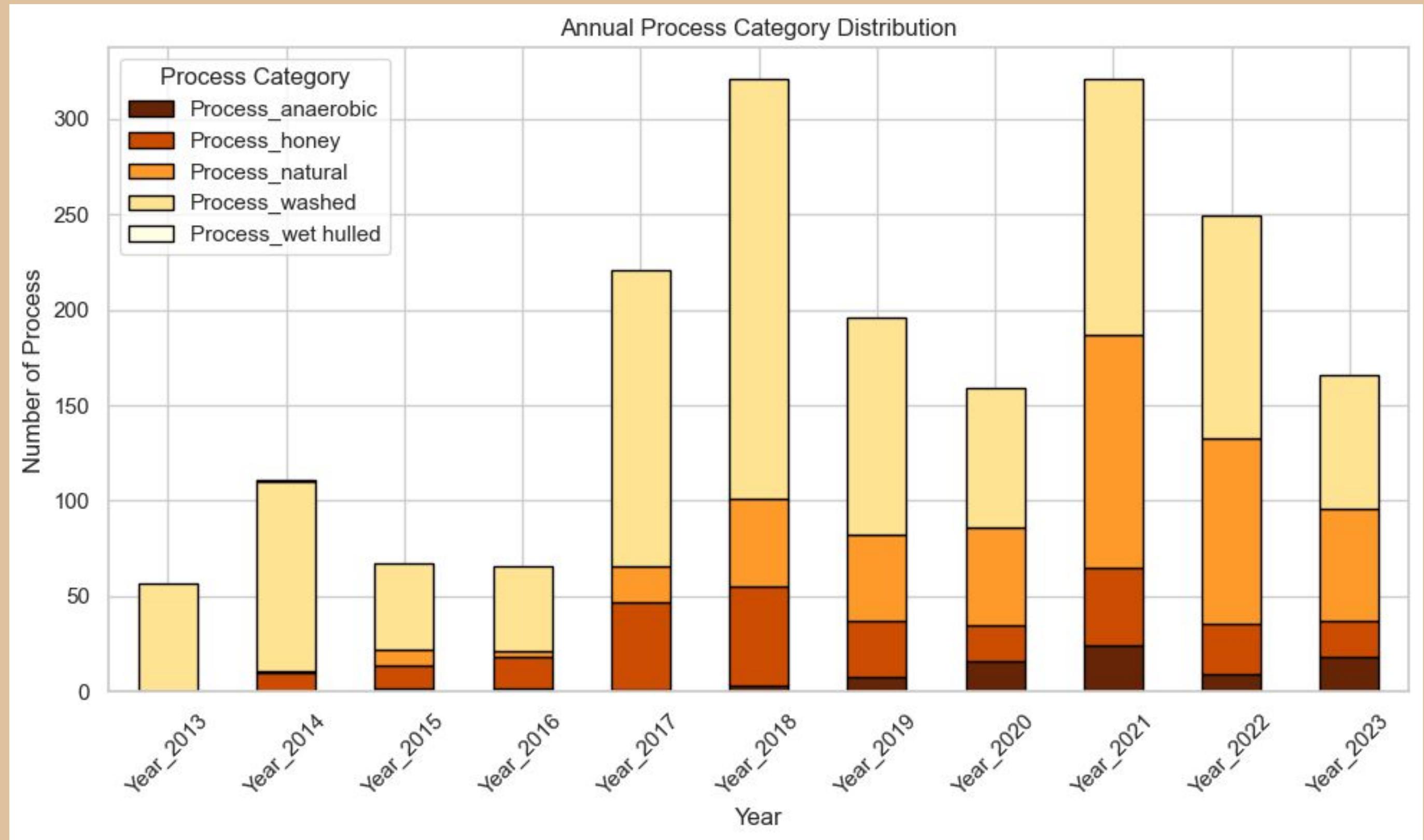
Distribution of Country



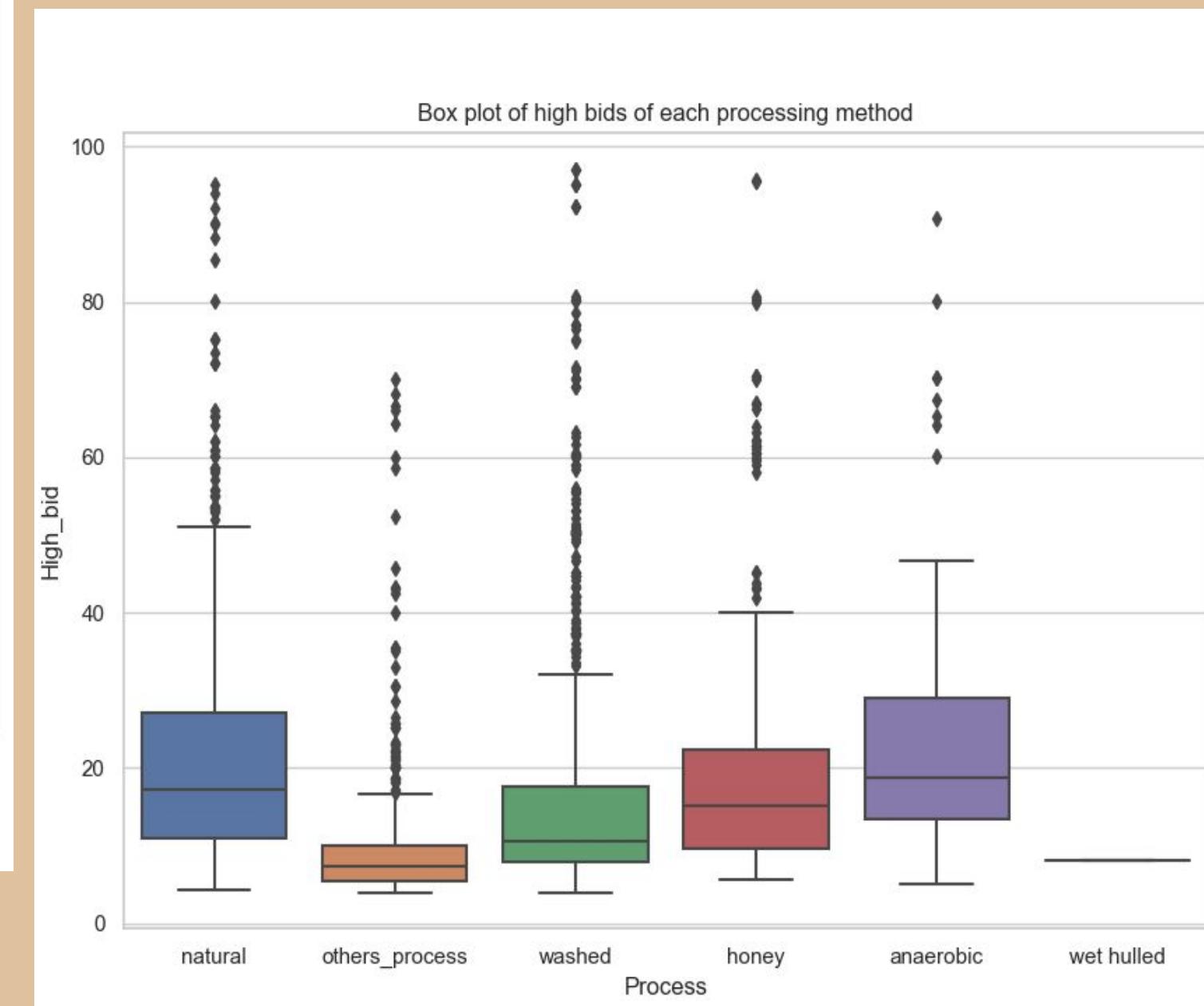
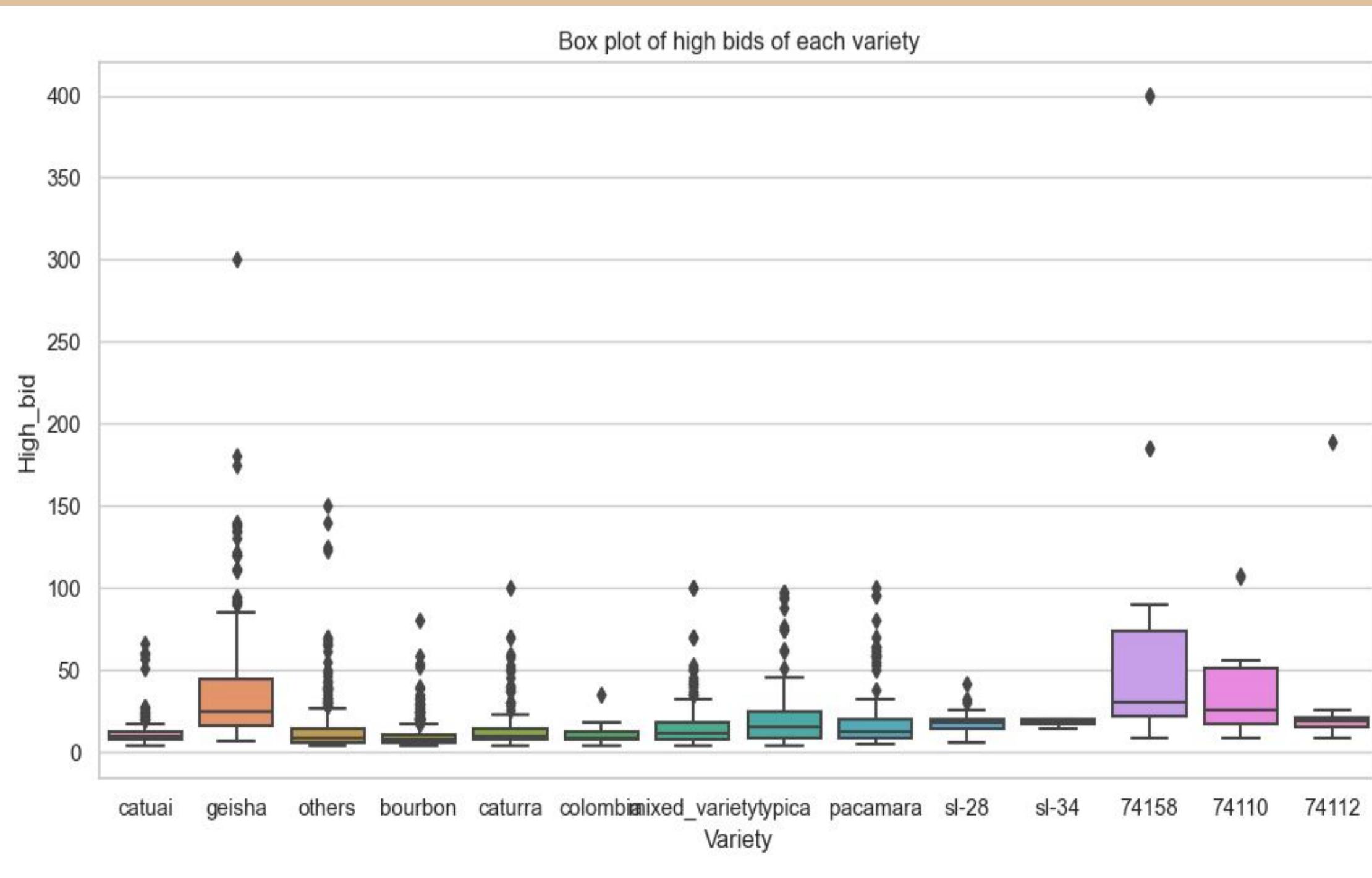
敘述統計 - 各年買家所屬地區分佈



敘述統計 - 各年處理方法分佈



敘述統計 - 特徵的分佈



研究方法



機器學習模型



Linear Regression



Lasso Regression



Ridge Regression



Random Forest

`n_estimators=100, max_depth=10`



XGBoost

`max_depth: 10, learning_rate: 0.3,
n_estimators: 100, max_depth: 6,
objective: reg:squarederror, gamma: 0`



深度學習模型

MLP: Tuning

- Learning Rate:
0.0001, 0.0005,
0.001, 0.005, 0.01,
0.05, 0.1, 0.5, 1



- Hidden Layers Size:
20, 50, 100, 150,
200

Layer (type)	Output Shape	Param #
Linear-1	[-1, 100]	7,800
ReLU-2	[-1, 100]	0
Dropout-3	[-1, 100]	0
Linear-4	[-1, 100]	10,100
ReLU-5	[-1, 100]	0
Dropout-6	[-1, 100]	0
Linear-7	[-1, 100]	10,100
ReLU-8	[-1, 100]	0
Dropout-9	[-1, 100]	0
Linear-10	[-1, 100]	10,100
ReLU-11	[-1, 100]	0
Dropout-12	[-1, 100]	0
Linear-13	[-1, 1]	101

Total params: 38,201

Trainable params: 38,201

Non-trainable params: 0

模型比較



特徵選取



Feature set 1:
Rank, COE_score, Year, 國家, 海拔

Feature set 2:
Rank, COE_score, Year, 國家, 海拔, 處
理法, 買家, 風味, 品種

Feature set 3:
Rank, COE_score, Year, 國家, 海拔, 處
理法, 買家, 風味, 品種, 農場

結果比較

分別針對三個自選的特徵集進行訓練, Feature set 1 + Linear Model 作為 Baseline

feature set	LR	LASSO	Ridge	GradientBoosting	RandomForest	XGBoost
1	12.619	12.9529	12.62	8.6308	8.4595	8.2132
2	12.0866	12.5421	12.0913	8.8121	8.2753	8.4066
3	11.8268	12.5421	11.8296	8.9408	8.1783	8.1304

True and Predicted High_bid of LR using feature set 1

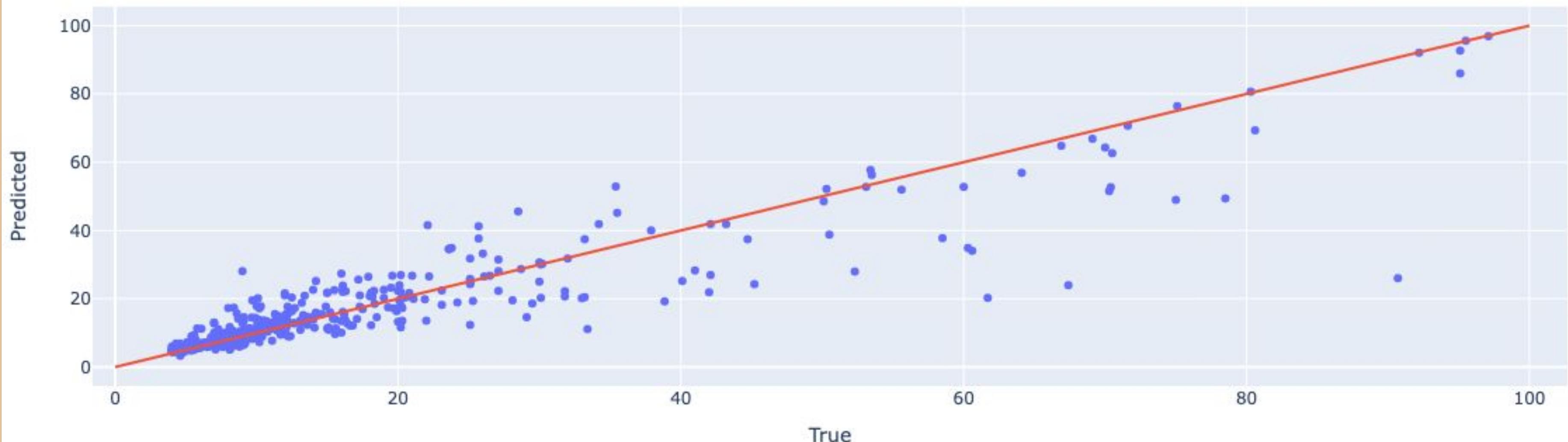


結果比較

Feature set 3 + XGBoost 為三個自選特徵集中表現最佳

feature set	LR	LASSO	Ridge	GradientBoosting	RandomForest	XGBoost
1	12.619	12.9529	12.62	8.6308	8.4595	8.2132
2	12.0866	12.5421	12.0913	8.8121	8.2753	8.4066
3	11.8268	12.5421	11.8296	8.9408	8.1783	8.1304

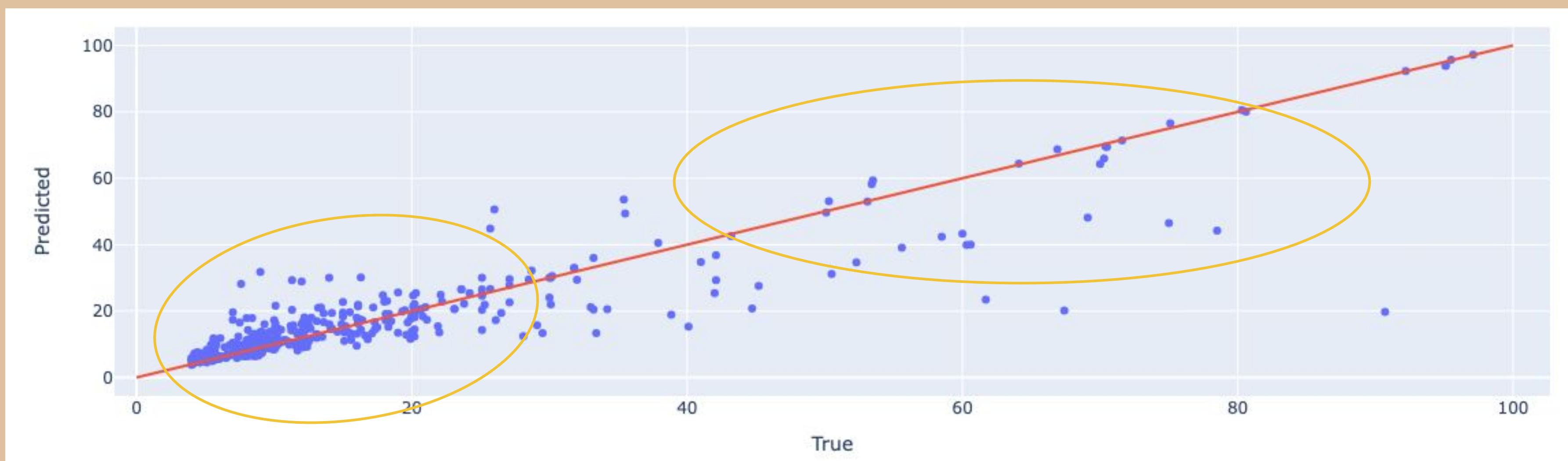
True and Predicted High_bid of XGBoost using feature set 3



結果模型比較

運用 Random Forest 挑出前 25、50、75 與 100 重要的特徵重新進行訓練

feature set	LR	LASSO	Ridge	GradientBoosting	RandomForest	XGBoost
rf25	12.5932	12.8415	12.5941	9.2547	8.3606	8.4654
rf50	12.1416	12.6986	12.1437	9.064	8.2047	7.7946
rf75	12.1402	12.5421	12.1417	9.0117	8.2332	7.8552
rf100	12.0689	12.5421	12.0691	8.9054	8.2269	7.9846



深度學習模型

MLP :

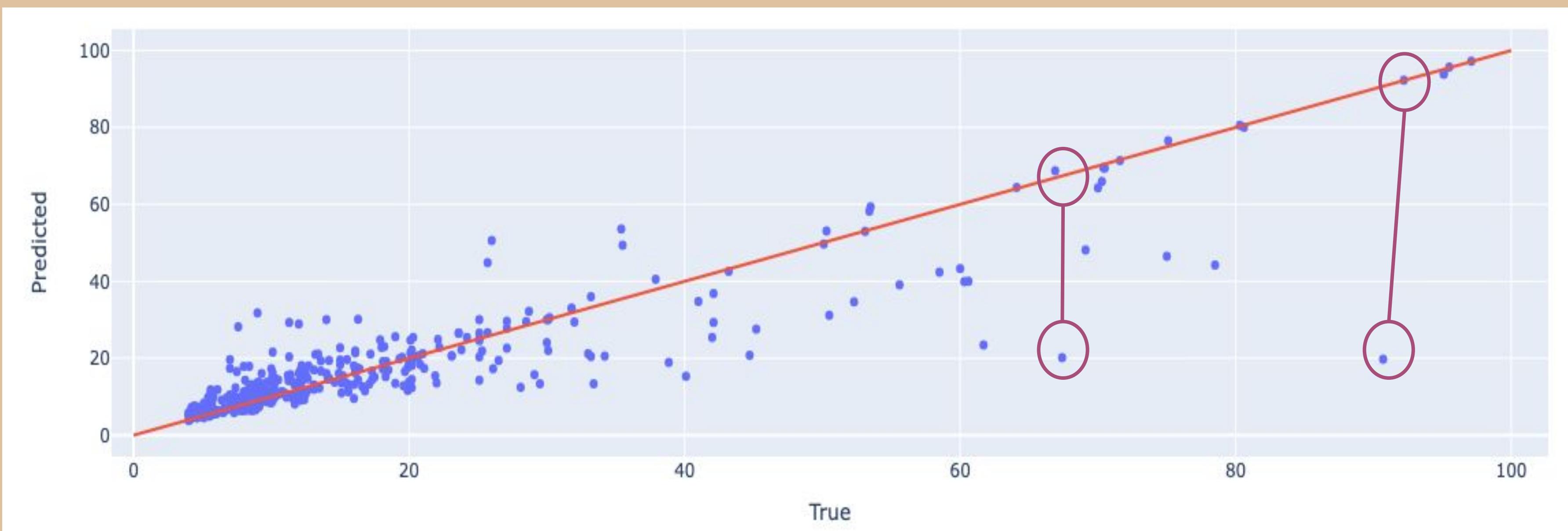


- 4 hidden layers
- Activation Function: ReLu
- weight update: Adam
- learning rate: 0.005
- H: 150

Test RMSE: 9.1422

討論 – 離群值

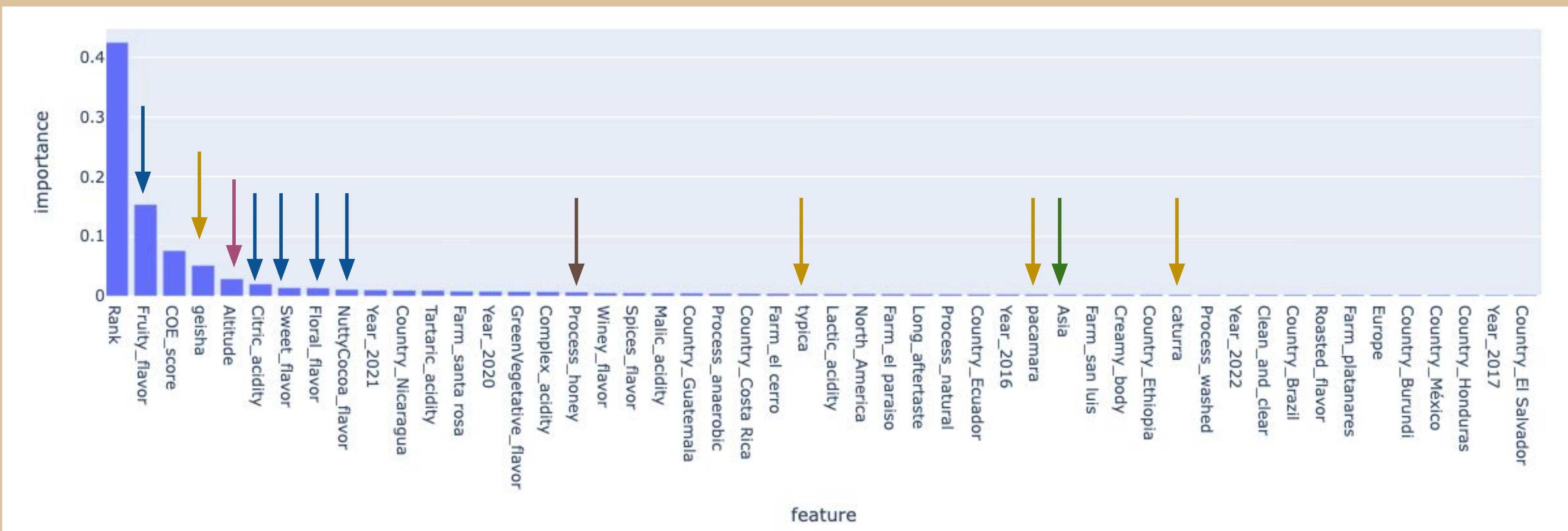
- 離群值導致低估的原因：海拔不夠高、甜感風味描述不夠、酸感風味描述不夠、Spicy_flavor 可能扣分
- 推測模型在海拔、酸甜風味、水果風味權重較大



結果特徵討論

前五十個重要特徵：

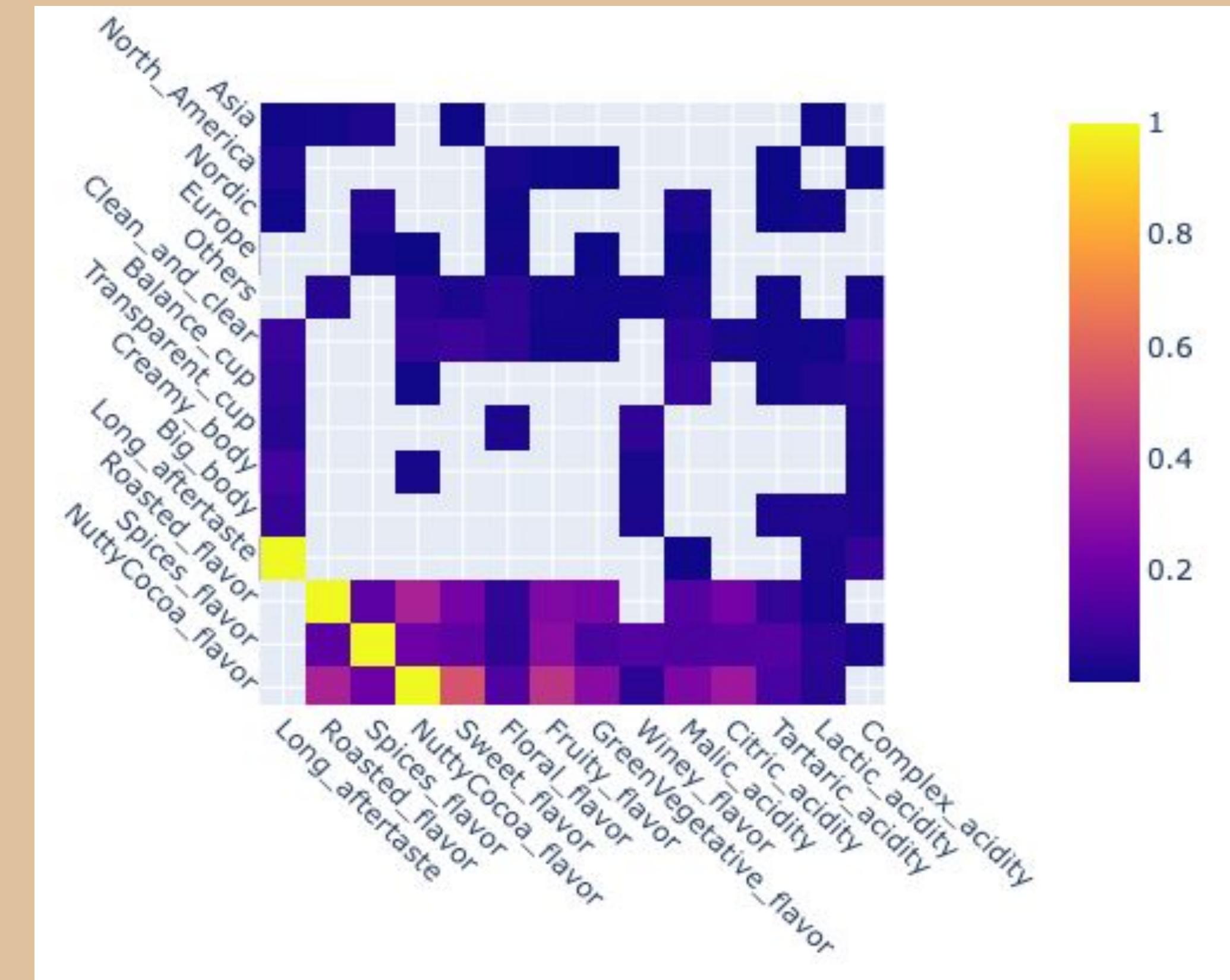
風味與酸度(Fruity, Sweet, Floral, NuttyCocoa, Cltric_Acidity)、品種(Geisha, Typica, Pacamara, Caturra)、處理法(Honey)、市場(Asia)、海拔



討論 - 重要特徵(風味)

發現不同買家對於風味的偏好 有很大的不同

- 亞洲買家：喜歡酸、甜，甚至喜歡烘焙感風味
 - 北美洲買家：喜歡花、水果、草本



結論

- 相對排名對於競標價格的影響大於絕對 COE 分數
- 海拔越高
- 品種 Geisha 會得到很高的競標價格
- 風味敘述獲得「甜」和「水果」風味的咖啡會被競標得更高價



未來發展

- 加入更多可能的特徵。例如公平交易認證、女性工作者友善認證、氣候、濕度、歷年咖啡物價指數等。
- 針對不同品種的豆子各別進行預測。
- 結合更多方面的資料。例如更密切關注新品種培育，因為新品種的出現通常會引發熱潮。另外行銷廣告也可能是重要的因素。
- 考慮地區與口味的交互作用。每個地區偏好的咖啡口味可能不相同，可能影響買家競標特定風味的咖啡，因此可能要考慮每個地區的口味偏好



Thank You!



Reference

**WHAT EXPLAINS SPECIALTY COFFEE QUALITY SCORES
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