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Airbnb New User Booking

Springboard Capstone Project # 1

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SPRINGBOARD

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Background

Airbnb is an American online marketplace company based in San Francisco, California, United States.

Airbnb offer arrangement for lodging, primarily homestays, or tourism experiences

Instead of waking to overlooked "Do not disturb" signs, Airbnb travelers find themselves rising with the birds in a whimsical treehouse, having their morning coffee on the deck of a houseboat, or cooking a shared regional breakfast with their hosts

New users on Airbnb can book a place to stay in 34,000+ cities across 190+ countries.

Problem Statement

In which country will a new guest book their first travel experience?

Objective

The objective is to help Airbnb understand the following:

1. Better forecast demand
2. Share customized content with client
3. Decrease the average time to first booking

Kaggle Data

In this challenge, Kaggle has given a list of users along with their demographics, web session records, and some summary statistics.

All the users in this dataset are from the USA

There are 12 possible outcomes of the destination country: 'US', 'FR', 'CA', 'GB', 'ES', 'IT', 'PT', 'NL','DE', 'AU', 'NDF' (no destination found), and 'other'.

'NDF' is different from 'other' because 'other' means there was a booking, but it is to a country not included in the list, while 'NDF' means there wasn't a booking.

The training and test sets are split by dates. In the test set, we need predict all the new users with first activities after 7/1/2014

The sessions dataset, the data only dates back to 1/1/2014, while the 'users' dataset dates back to 2010.

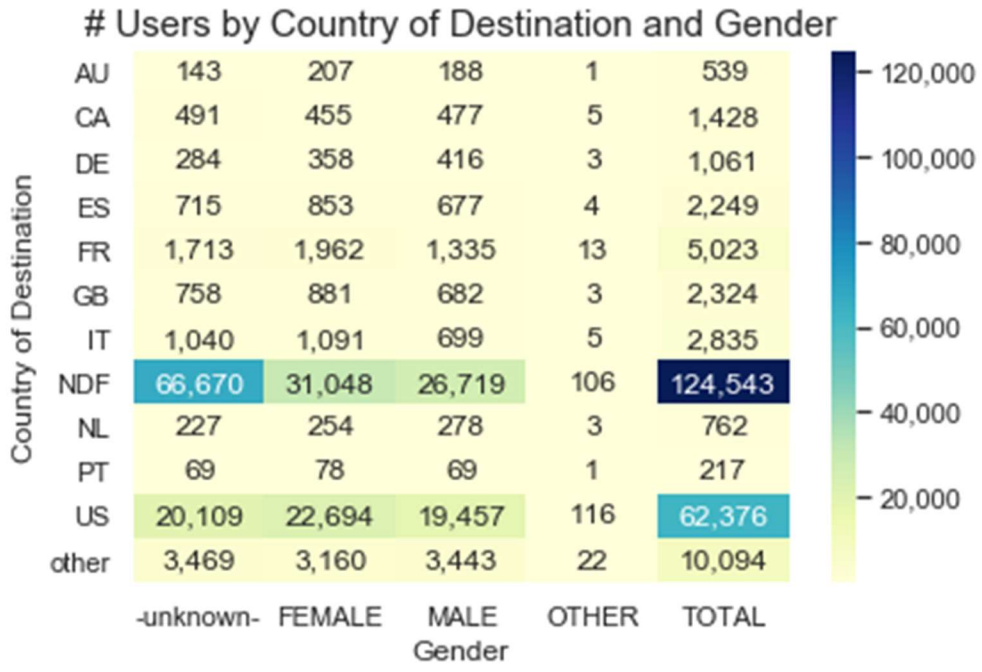
Data Wrangling

1. Concatenate train and test data so that data cleaning performed together.
2. Drop ‘date_first_booking’ column which is entirely missing in test data.
3. Replace unknown values in ‘gender’ and ‘f'irst_browser’ columns to NaN.
4. ‘Age’ column will only have values between 18-100 years, therefore, other values will be set to NaN.
5. Date time data of 'time_first_active' and 'timestamp_first_active' to be split into day, month and year columns.
6. Drop ‘date_account_created’ and ‘timestamp_first_active’ columns after completing step 5.
7. Remove leading and trailing spaces from ‘language’ column.

Exploratory Data Analysis

1. Destination Country and Gender

a. Each country has similar distribution of users in Male/Female categories
b. Using Chi-Square test, there’s a statistically significant association between country of destination and gender



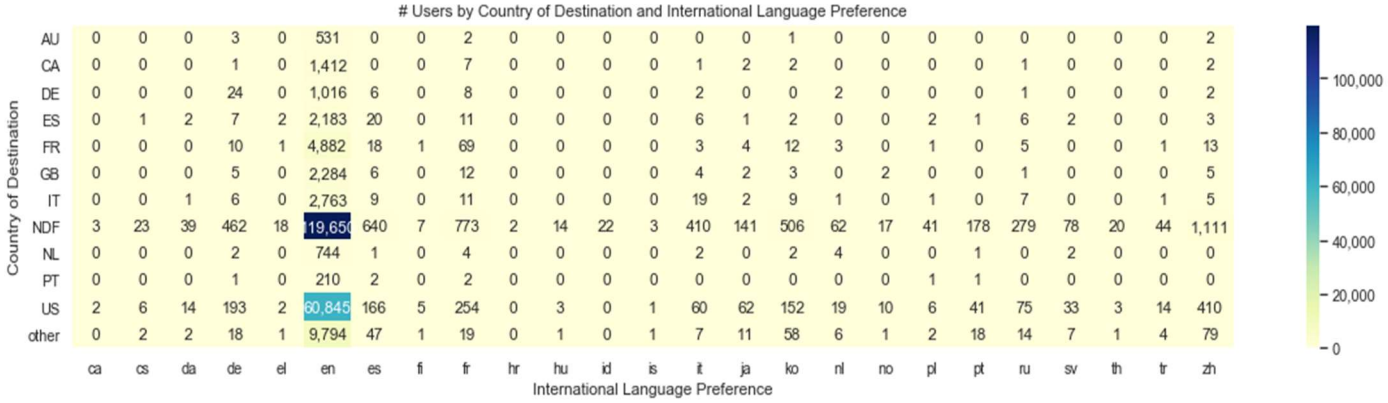
2. Destination Country and Signup Method/Language

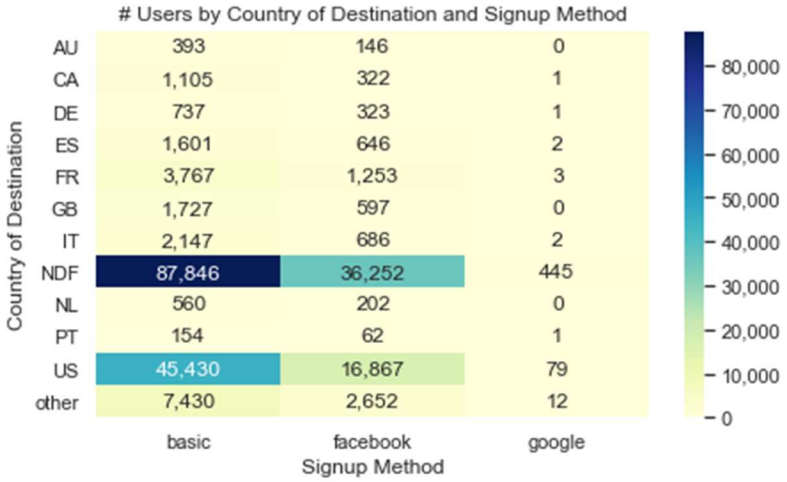
‘English’ is the international language of preference for almost all users

Most users signup either through their own website or Facebook

- Using Chi-Square test, there is a statistically significant association between:

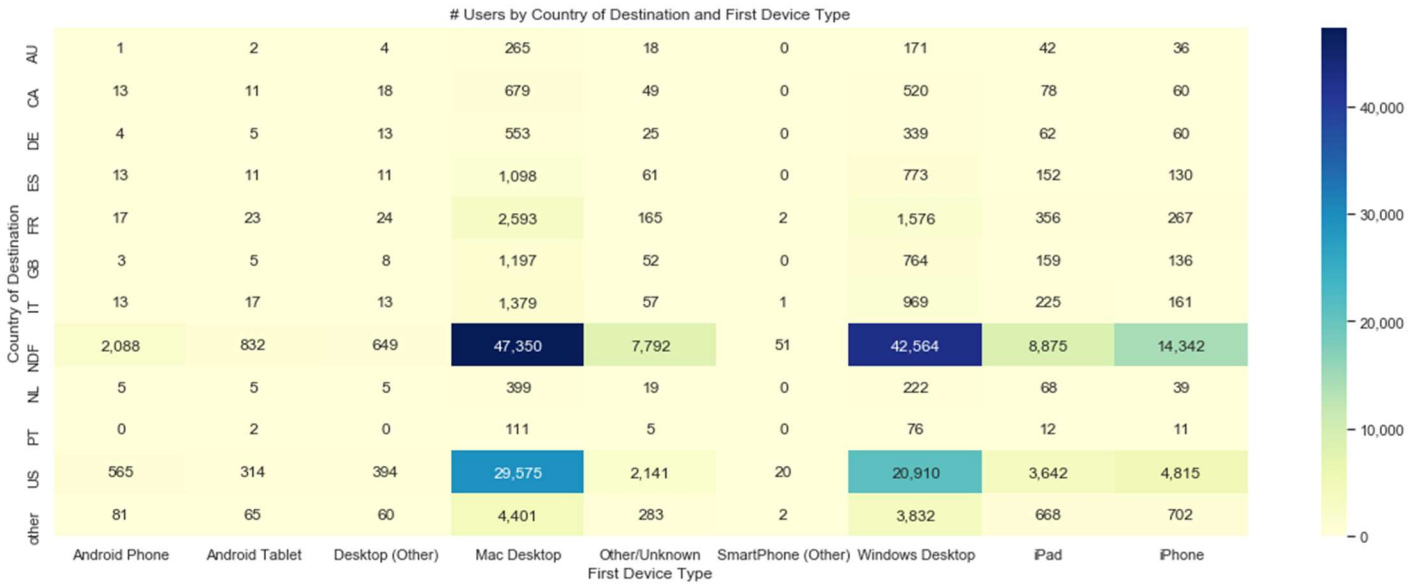
- Country of destination and international language preference
- Country of destination and signup method





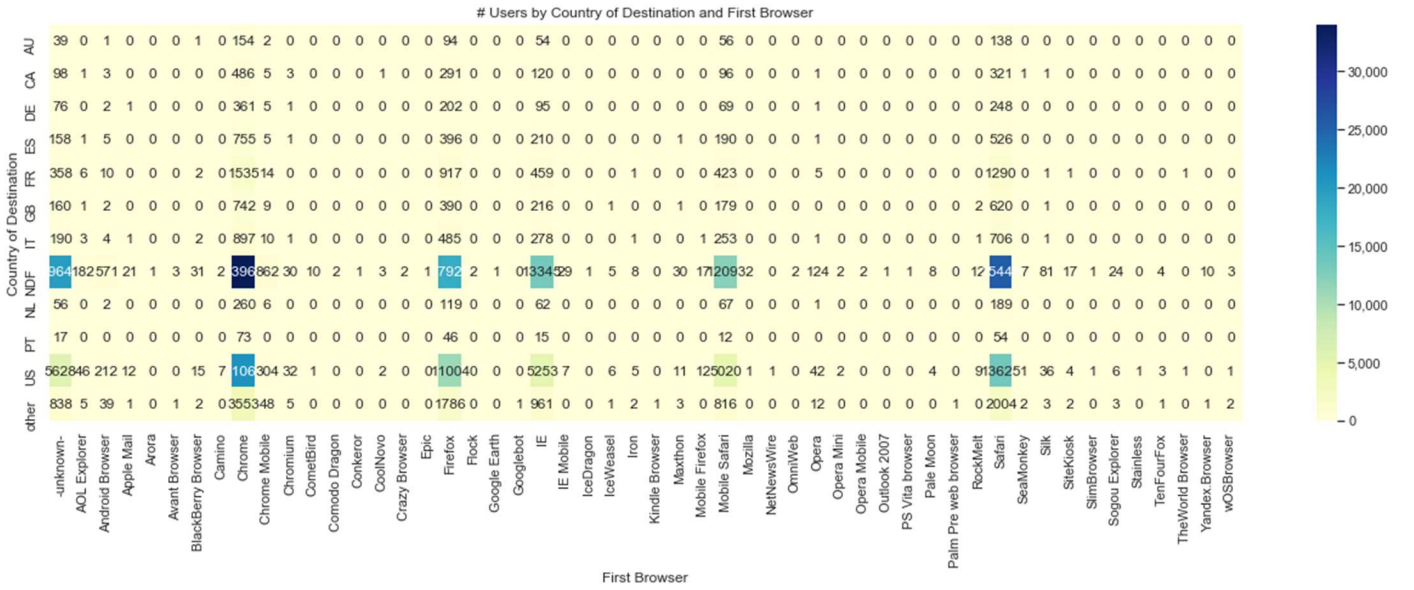
3. Destination Country and First Device Type

- Most users are either Mac Desktop users or Windows Desktop users
- Using Chi-Square test, there's a statistically significant association between country of destination and first device type



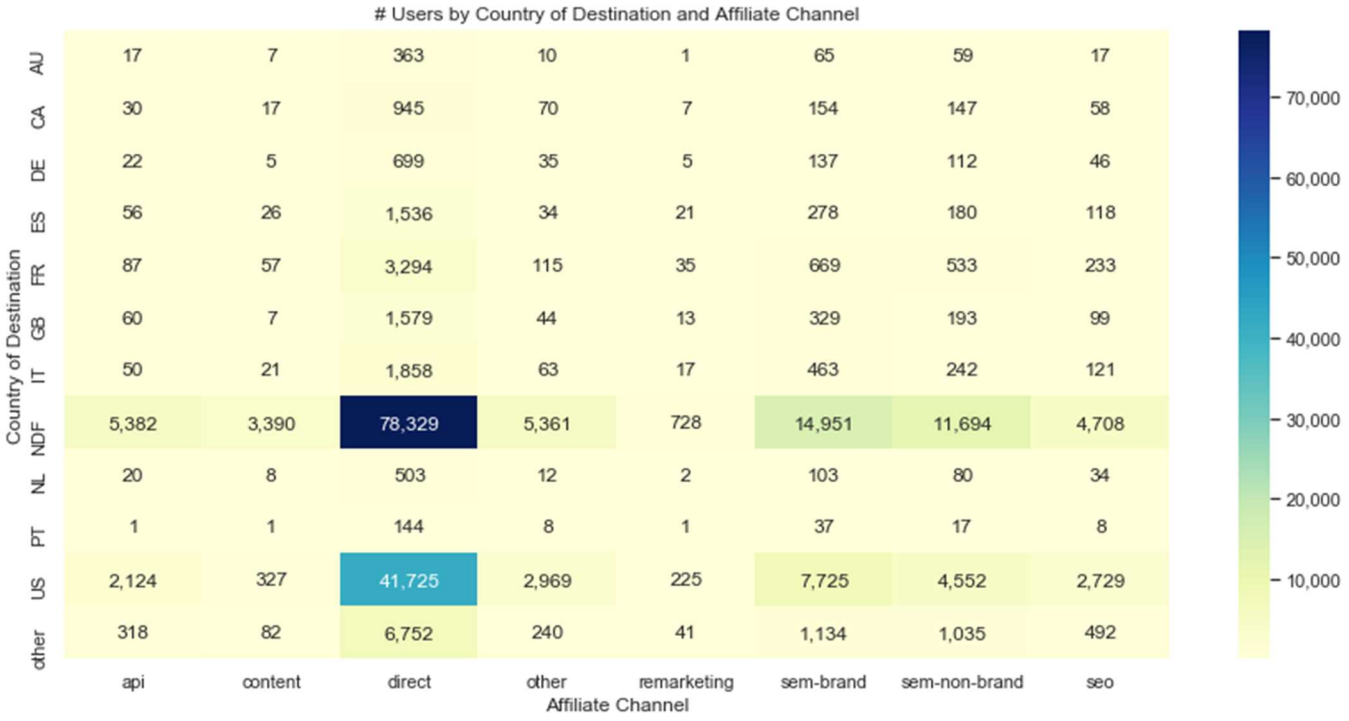
4. Destination Country and First Browser

- Chrome, Firefox, IE, Safari and most popular first browsers used by user



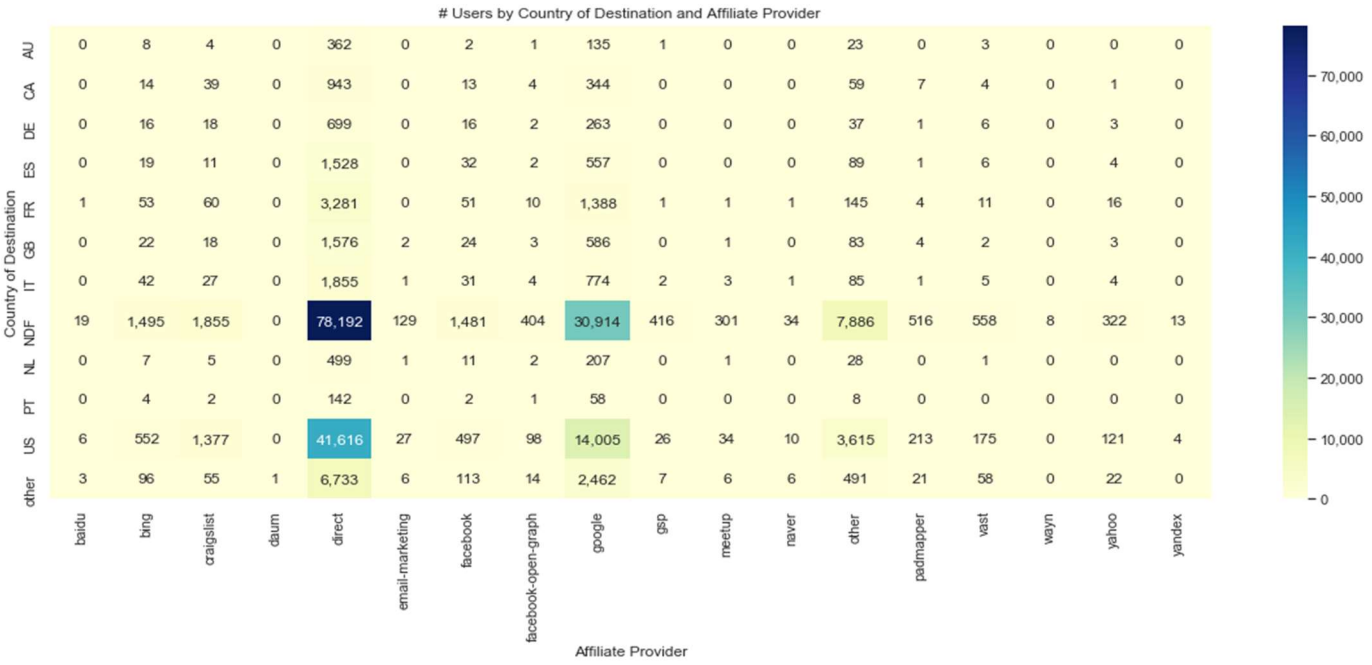
5. Destination country and Affiliate Channel

- The most popular paid marketing channels are direct, sem-brand and sem-non-brand



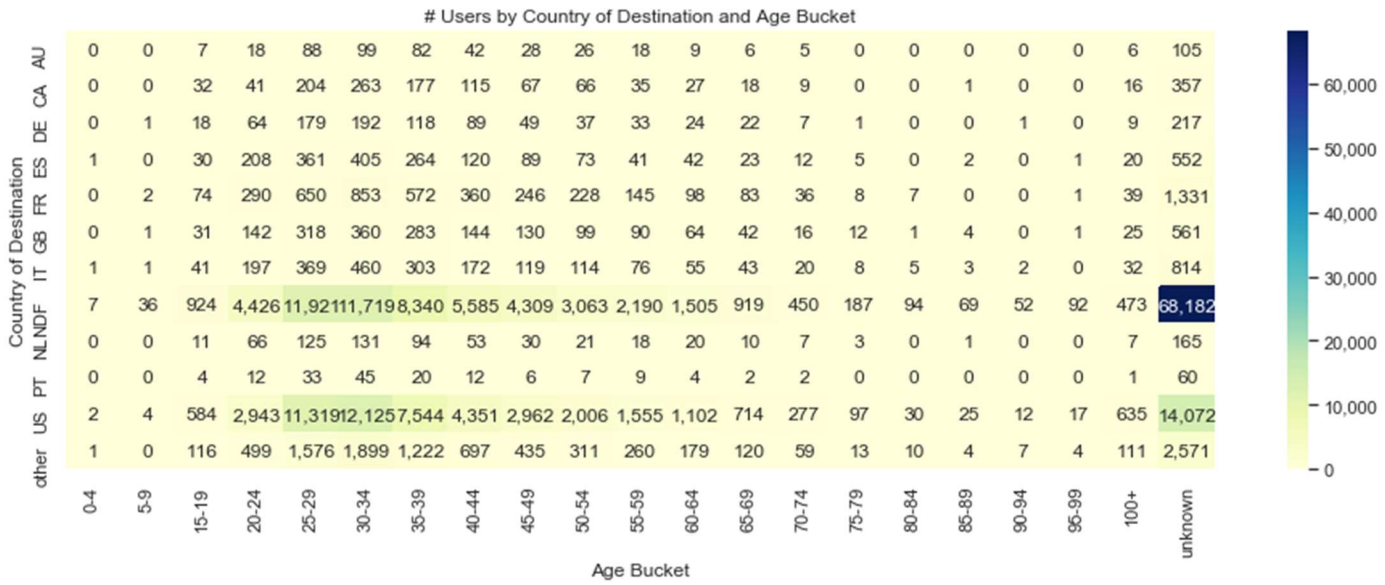
6. Destination Country and Affiliate Provider

- The most popular affiliate providers are direct and google



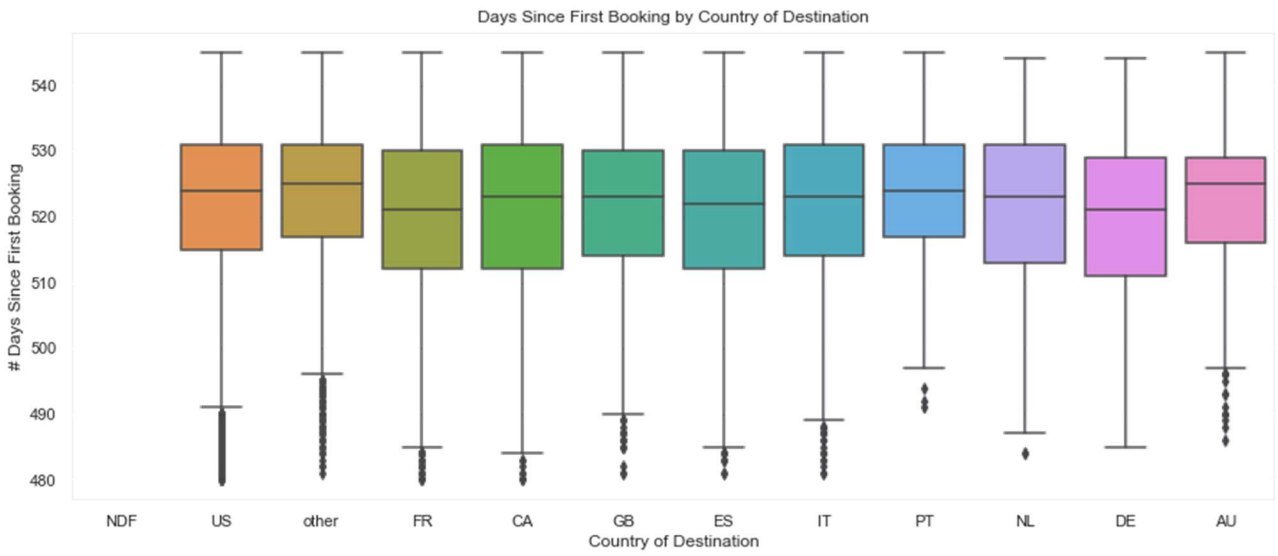
7. Destination Country and Age

- Most users with destination country as US, are between ages 25-39 years

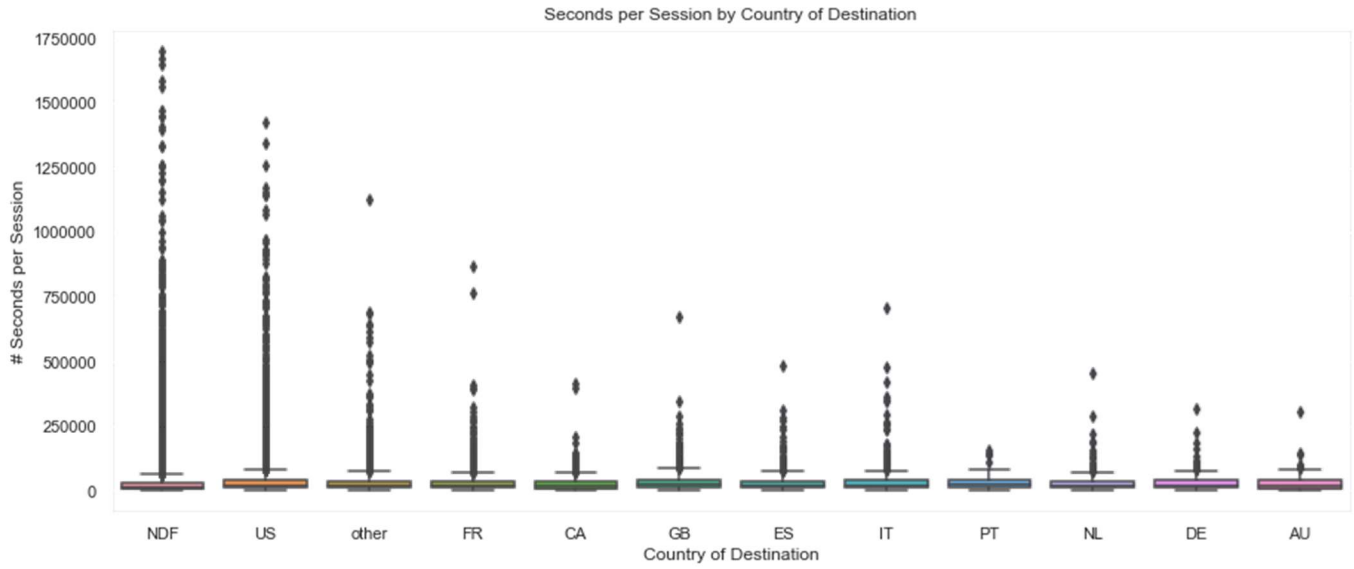


8. Destination Country and Days Since First Booking

As per the ANOVA test, The F-statistic= 38.9 and the p-value < 0.05 which indicates that there is a statistically significant association between country of destination and days since first booking but this test may not be very reliable because it may violate some of the assumptions of ANOVA



9. Destination Country and Seconds per Session



Independent Variables

#	Variable name	Description	Type
1	gender	Gender of the user	categorical
2	age	Age (in years) of the user	numeric
3	signup_method	Signup method used by user e.g. basic, facebook or google	categorical
4	Signup_flow	the page a user came to signup up from	categorical
5	language	international language preference	categorical
6	affiliate_channel	type of paid marketing	categorical
7	affiliate_provider	where the marketing is e.g. google, craigslist, other	categorical
8	first_affiliate_tracked	whats the first marketing the user interacted with before the signing up	categorical
9	Signup_app	app through which the user signed up	categorical

10	first_device_type	the first device type used by user e.g. phone, tablet, desktop	categorical
11	first_browser	the first browser used by user	categorical
12	dac_year, dac_month, dac_day	year, month and date when the account was created by user	numeric
13	tfa_year, tfa_month, tfa_day	year, month and date when the user was first active	numeric
14	cnt_action	# of actions by user	numeric
15	cnt_uniq_action_type	# of unique action types by user	numeric
16	cnt_uniq_dev_type	# of device types by user	numeric
17	secs_per_session	average # of seconds elapsed per session by user	numeric

Comparison Between Prediction Models

	XGBoost Classification	Multi-Class Logistic Regression	Random Forest Classification
Dependent variable	Predicts destination country out of 12 countries	Predicts destination country out of 12 countries	Predicts destination country out of 12 countries
Hyperparameter Tuning Method	Gridsearch	Not applicable	Gridsearch
Optimal Hyperparameters	max_depth = 6 learning_rate = 0.1 n_estimators = 70 objective = 'multi:softprob'	penalty = 'l2' multi_class = 'multinomial' solver = 'lbfgs' C = 0.1	criterion = 'entropy' max_depth = 15 max_features = 'sqrt' n_estimators = 150
Accuracy (Train set)	65.4%	58.4%	68.5%

Accuracy (Test set)	64.2%	58.1%	49.1%
Accuracy (Hold out set on Kaggle)	85.7%	Not calculated	Not calculated

Variable Importance

Variable name	Importance	Description
gender	14.7%	gender of the user
first_browser	12.5%	the first browser used by user
signup_method	12.1%	signup method used by user e.g. basic, facebook or google
age	10.5%	age (in years) of the user
first_affiliate_tracked	8.1%	whats the first marketing the user interacted with before the signing up
affiliate_channel	8.0%	type of paid marketing
affiliate_provider	7.1%	where the marketing is e.g. google, craigslist, other
tfa_year	6.3%	year, month and date when the user was first active
first_device_type	5.3%	the first device type used by user e.g. phone, tablet, desktop
cnt_uniq_action_type	5.1%	# of unique action types by user
signup_app	3.9%	app through which the user signed up
signup_flow	1.6%	the page a user came to signup up from
dac_year	1.2%	year when the account was created by user
tfa_month	0.7%	month when the user was first active
secs_per_session	0.6%	average # of seconds elapsed per session by user
cnt_uniq_dev_type	0.6%	# of device types by user
cnt_action	0.6%	# of actions by user
dac_month	0.5%	month when the account was created by user

tfa_day	0.4%	day of the month when the user was first active
dac_day	0.4%	day of the month when the account was created by user

Insights

1. Out of the three classification models used, XGBoost, Multi-class Logistic Regression, Random Forest, XGBoost classification model gives the best accuracy at 85.7% on the Kaggle test set or hold out set
2. XGboost hyperparameters were determined using Gridsearch and the best hyperparameters are:
    a. max_depth = 6
    b. learning_rate = 0.1
    c. n_estimators = 70
    d. objective = 'multi:softprob'
3. The top 5 variables as per the XGBoost variable importance are:
    a. Gender
    b. First_Browser
    c. Signup_Method
    d. Age
    e. First_Affiliate_Tracked