

EUR/USD

Harvey Bastidas, Andrés Caicedo, Alexander Alvarado

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Chapter 1

Justificación de elección del Dataset

Integrantes:

Harvey Bastidas, Alexander Alvarado y Andrés Caicedo

Materia:

Análisis de series de tiempo

Profesora:

Isabel Cristina García

1.1 Información del Dataset

El dataset seleccionado para este análisis es el siguiente: EUR/USD Forex Trading Data (2003-2021), el cual fue extraído de Forex Trading Charts, propiedad de Barchart Solutions, una empresa especializada en servicios financieros en los Estados Unidos. Barchart Solutions cuenta con reconocidos clientes como el Banco Goldman Sachs y el Bank of Canada, lo que nos lleva a concluir que los datos ofrecidos son confiables y precisos para realizar análisis financieros.

La empresa matriz, **Barchart Solutions**, tiene su sede en:

**222 S. Riverside Plaza, Suite 810,
Chicago, IL 60606, Estados Unidos**

El dataset presenta las tasas de cambio del par de divisas EUR/USD desde el **5 de mayo de 2003** hasta el **16 de octubre de 2021**, con una periodicidad de **4 horas**. Este conjunto de datos incluye las siguientes 6 columnas:

- **Open:** Precio de apertura para el periodo.
- **High:** Precio máximo durante el periodo.
- **Low:** Precio mínimo durante el periodo.
- **Close:** Precio de cierre para el periodo.
- **Volume:** Volumen de transacciones reportado.

Es importante resaltar que los datos no contienen valores nulos ni perdidos para los días de semana, aunque no se registran valores durante los fines de semana, lo que es normal en los mercados de Forex.

El análisis se centrará en la columna **Close**, que representa el precio de cierre, dado que es la variable más relevante para el pronóstico de tendencias.

1.2 Justificación de la Elección del Dataset

La elección de este dataset se fundamenta en la importancia de analizar la tasa de cambio EUR/USD, uno de los pares de divisas más negociados en el mercado Forex. La predicción de la tendencia de la tasa de cambio es crucial para varias estrategias financieras, como el balanceo de portafolios de inversión. En este contexto, se pueden usar tanto la **Teoría Moderna de Portafolios (MPT)** como la **Teoría de Portafolios Post-Moderna (PMPT)**, que son ampliamente utilizadas en la optimización de la distribución de activos. Ambas teorías se benefician de predicciones precisas de la tendencia de los activos subyacentes, como es el caso de las divisas.

Además, este dataset ofrece una excelente relación señal-ruido, lo que mejora la predictibilidad de los modelos basados en series de tiempo. Utilizamos el **coeficiente de variación (CV)** como criterio para seleccionar este dataset, debido a que es una métrica robusta para medir la variabilidad en relación con la media. Un CV bajo indica que la variabilidad en los datos es relativamente baja, lo que es favorable para la predicción de tendencias.

El **coeficiente de variación** calculado para la columna “Close” de este dataset es de aproximadamente **9.5%**, lo que lo convierte en el más bajo entre los datasets que evaluamos. Esto lo hace ideal para el pronóstico, ya que un CV bajo sugiere que la señal en los datos es fuerte en comparación con el ruido.

1.2.1 Relación con el Signal-to-Noise Ratio (SNR)

El **coeficiente de variación (CV)** está inversamente relacionado con el **Signal-to-Noise Ratio (SNR)**, una métrica comúnmente utilizada en el procesamiento de señales. El SNR mide la proporción de la potencia de la señal con respecto a la del ruido, lo que ayuda a evaluar la calidad de los datos.

El SNR para este dataset se calcula como el cuadrado del inverso del CV. Para el EUR/USD, con un CV de **0.09**, el SNR es aproximadamente:

$$SNR = \left(\frac{1}{0.09} \right)^2 \approx 123$$

Este valor indica que la señal es mucho más fuerte que el ruido en este dataset. En contraste, otro dataset que probamos, con un CV de **20%**, tenía un SNR mucho menor, alrededor de **25**. La diferencia muestra que el dataset de EUR/USD tiene una mayor preponderancia de señal sobre el ruido, lo que permite una mejor predictibilidad en los modelos de pronóstico.

Dado que sabemos que el **SNR** es aprox **123**, esto significa que el ruido es aprox $1/123 = 0.008$ que nos da una idea del máximo error absoluto (**MAE**) en los datos Normalizados en el pronóstico del siguiente periodo que podemos obtener, ya que errores por debajo de este valor probablemente incluirían la predicción del ruido y podrían ser indicador de overfitting en el modelo predictivo usado.

1.3 Importancia de Analizar este Dataset

La capacidad de predecir con precisión la tasa de cambio EUR/USD tiene múltiples aplicaciones en el sector financiero. En primer lugar, es fundamental para el **trading de divisas (Forex)**, donde una mejor predicción de las tendencias puede resultar en decisiones de inversión más acertadas. Además, es esencial para la gestión de portafolios financieros, ya que permite el uso de herramientas como la **Teoría Moderna de Portafolios (MPT)**, donde la diversificación se realiza teniendo en cuenta tanto la tendencia como la variabilidad de los activos.

Por lo tanto, este dataset fue seleccionado debido a su alta calidad y baja variabilidad, lo que lo hace ideal para el análisis predictivo en el mercado de Forex, así como en la gestión de portafolios. El alto **SNR** nos da confianza en que las predicciones basadas en este dataset serán precisas y útiles en un entorno real, al mismo tiempo que nos alerta sobre los límites predictivos en función del ruido presente en los datos.

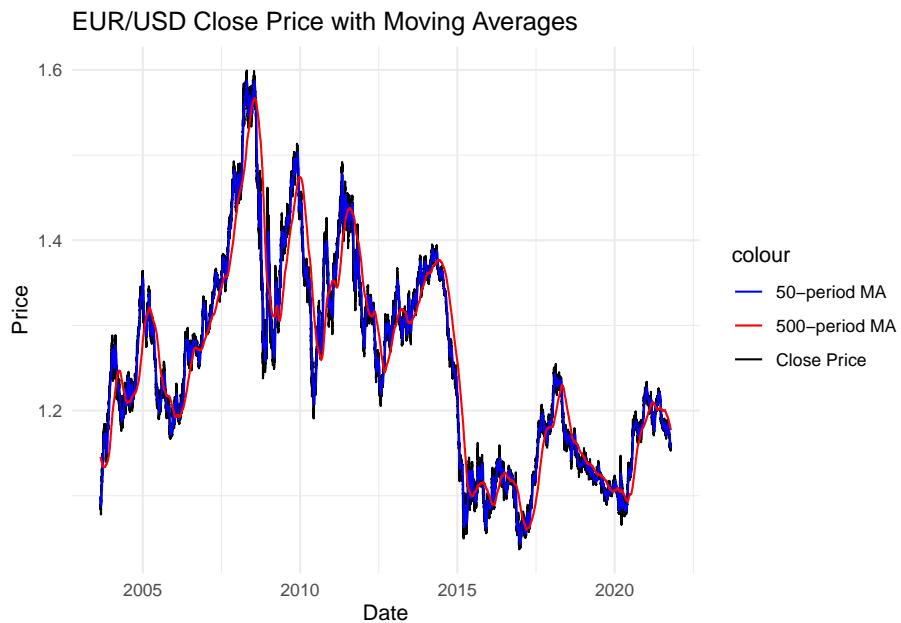
Chapter 2

Estructura de los datos

Con el propósito de observar las tendencias y cambios estructurales en la serie, se realizan pruebas estadísticas para conocer la estructura subyacente de la serie.

2.1 Cálculo de Medias Móviles Simples:

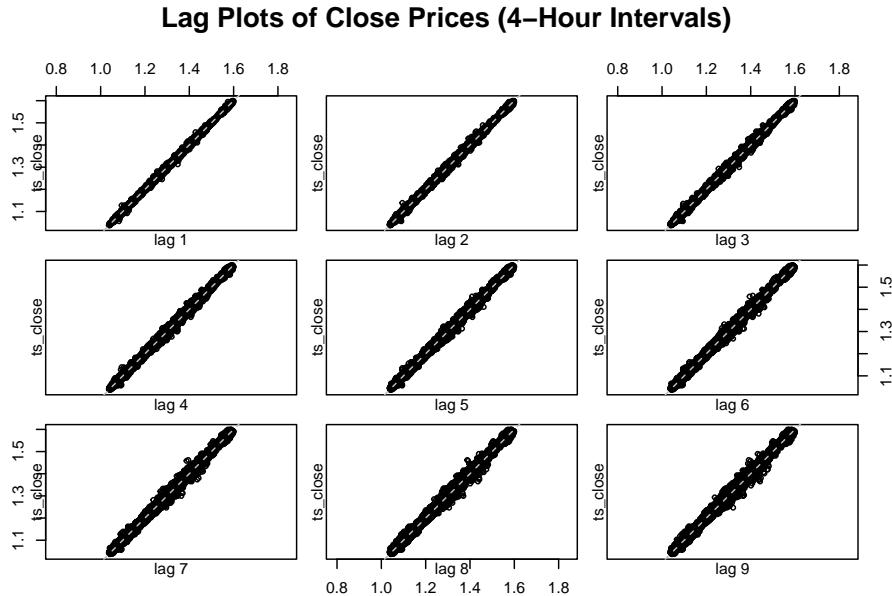
El cálculo de medias móviles es una técnica común en el análisis de series de tiempo utilizada para suavizar las fluctuaciones a corto plazo y destacar las tendencias subyacentes en los datos. En este análisis, se implementan medias móviles de corto y largo plazo para identificar patrones de comportamiento y ayudar en la toma de decisiones basadas en tendencias más claras.



- **Media móvil de 50 períodos (MA corta):**
 - Sigue de cerca las fluctuaciones del precio de cierre, respondiendo rápidamente a los cambios de tendencia.
 - Captura las tendencias a **corto plazo**, pero también refleja mucha volatilidad.
- **Media móvil de 500 períodos (MA larga):**
 - Se mueve de forma más suave, reaccionando más lentamente a los cambios de precios.
 - Indica la **tendencia a largo plazo**, proporcionando una visión más estable del comportamiento del mercado.

2.2 Análisis de Rezagos

Cómo se comporta la serie de tiempo con respecto a sus valores pasados, introduciendo rezagos.



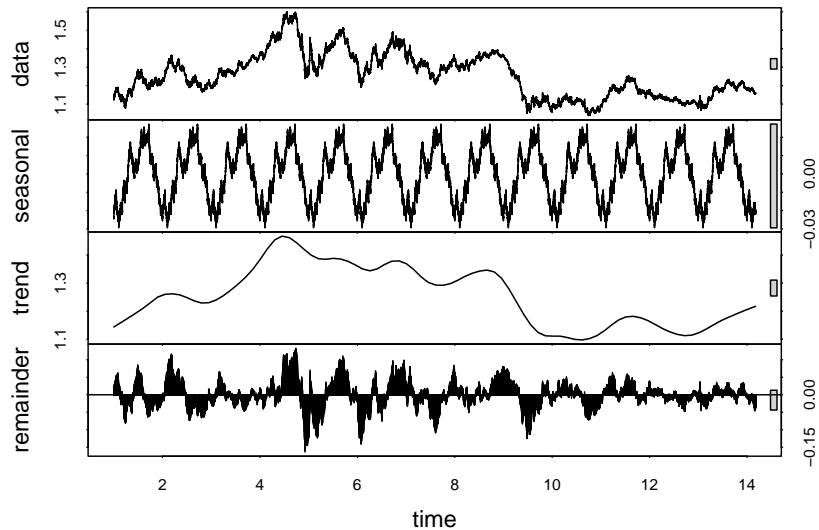
En cada uno de los gráficos, los puntos siguen una línea casi perfectamente recta, sugiriendo una **alta autocorrelación** entre los valores de la serie con sus rezagos cercanos.

La pendiente positiva indica que cuando el valor anterior era alto, el valor actual también tiende a ser alto, y lo mismo sucede para valores bajos. Esto sugiere que **la serie es muy persistente**, es decir, los precios tienden a seguir una dirección similar en el corto plazo.

Dado que no hay patrones dispersos o sin forma definida, se puede inferir que la serie no tiene cambios abruptos o comportamiento caótico entre los puntos cercanos. Esto podría indicar que **no hay mucha volatilidad** en los intervalos de 4 horas.

2.3 Análisis de Estacionalidad

Para detectar si existe estacionalidad (patrones repetitivos), utilizaremos **decomposición o test de estacionalidad**.



En la gráfica de **descomposición de series de tiempo** se visualizan los **componentes de la serie**: datos originales, estacionalidad, tendencia y residuales (remainder):

1. **Datos Originales (data):** En la primera gráfica (data), se observan los valores de cierre a lo largo del tiempo. Vemos fluctuaciones en los precios con algunas subidas y bajadas claras, lo que indica la volatilidad normal del mercado Forex.
2. **Componente Estacional (seasonal):** El segundo gráfico muestra un **patrón repetitivo y periódico**. Este patrón sugiere que hay **ciclos regulares** en la serie. La estacionalidad se mantiene constante a lo largo del tiempo, lo que indica que ciertos movimientos en el mercado se repiten con una periodicidad fija (en este caso, podría ser diaria o semanal). Es probable que este componente estacional refleje la actividad cíclica en horarios específicos o días determinados, como mayor volatilidad durante sesiones overlap (como entre Londres y Nueva York).
3. **Componente de Tendencia (trend):** El tercer gráfico muestra una **tendencia suavizada** que sigue la dirección general del mercado. Observamos fases de **alzas y caídas**: primero hay una subida clara, luego una caída, y finalmente otra leve tendencia hacia la estabilidad.
4. **Componente de Residuos o Resto (remainder):** El último gráfico (remainder) muestra los **residuos** o la parte de los datos que no es explicada por la tendencia ni la estacionalidad. Estos residuos parecen ser **ruido blanco**, con fluctuaciones alrededor de cero, lo que indica que no hay patrones significativos

adicionales no capturados por los otros componentes.

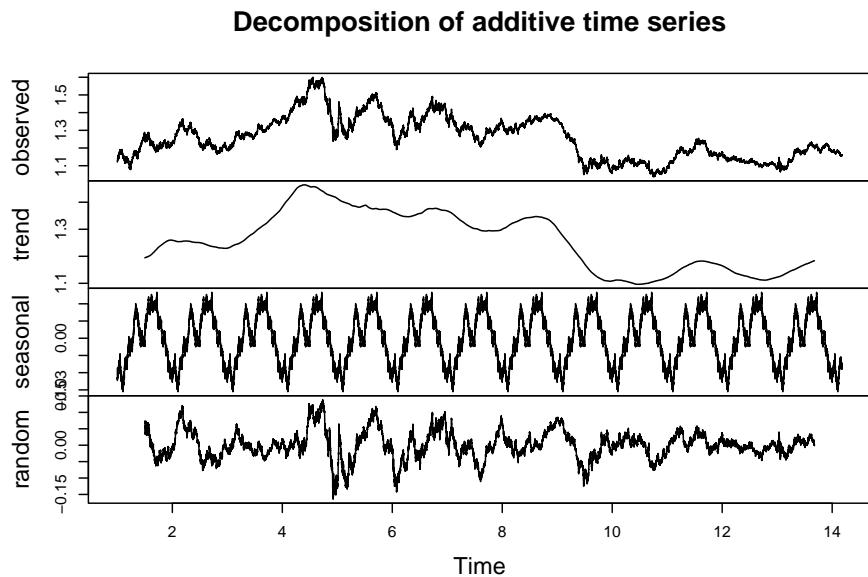
Chapter 3

Preprocesamiento y Visualización

En este análisis, trabajaremos con el dataset de tipo de cambio EUR/USD de Forex proporcionado, el cual incluye datos históricos de 2003 a 2021. El objetivo es estudiar las tendencias, estacionalidad y comportamiento estructural de la serie de tiempo. Además, evaluaremos si es necesario realizar transformaciones en la serie para estabilizar la varianza y facilitar la predicción.

3.1 Descomposición de la Serie de Tiempo

En esta etapa se busca realizar la descomposición de la serie de tiempo para identificar los componentes de **tendencia, estacionalidad y residuos**.



En la gráfica de **descomposición de series de tiempo** se visualizan los **componentes de la serie**: datos originales, estacionalidad, tendencia y residuales (remainder):

- 1. Datos Originales (data):** En la primera gráfica (data), se observan los valores de cierre a lo largo del tiempo. Vemos fluctuaciones en los precios con algunas subidas y bajadas claras, lo que indica la volatilidad normal del mercado Forex.
- 2. Componente Estacional (seasonal):** El segundo gráfico muestra un **patrón repetitivo y periódico**. Este patrón sugiere que hay **ciclos regulares** en la serie. La estacionalidad se mantiene constante a lo largo del tiempo, lo que indica que ciertos movimientos en el mercado se repiten con una periodicidad fija (en este caso, podría ser diaria o semanal). Es probable que este componente estacional refleje la actividad cíclica en horarios específicos o días determinados, como mayor volatilidad durante sesiones overlap (como entre Londres y Nueva York).
- 3. Componente de Tendencia (trend):** El tercer gráfico muestra una **tendencia suavizada** que sigue la dirección general del mercado. Observamos fases de **alzas y caídas**: primero hay una subida clara, luego una caída, y finalmente otra leve tendencia hacia la estabilidad.
- 4. Componente de Residuos o Resto (remainder):** El último gráfico (remainder) muestra los **residuos** o la parte de los datos que no es explicada por la tendencia ni la estacionalidad. Estos residuos parecen ser **ruido blanco**, con fluctuaciones alrededor de cero, lo que indica que no hay patrones significativos

adicionales no capturados por los otros componentes.

3.2 Prueba de Estacionariedad

La estacionariedad es importante en el análisis de series de tiempo porque indica si las propiedades estadísticas de la serie (como la media y la varianza) se mantienen constantes a lo largo del tiempo. Una serie estacionaria es generalmente más fácil de modelar y predecir.

```
## Augmented Dickey-Fuller Test
## alternative: stationary
##
## Type 1: no drift no trend
##      lag      ADF p.value
## [1,] 0 -0.135  0.606
## [2,] 1 -0.133  0.606
## [3,] 2 -0.135  0.606
## [4,] 3 -0.131  0.607
## [5,] 4 -0.143  0.603
## [6,] 5 -0.146  0.603
## [7,] 6 -0.149  0.602
## [8,] 7 -0.147  0.602
## [9,] 8 -0.155  0.600
## [10,] 9 -0.156  0.600
## [11,] 10 -0.158 0.599
## [12,] 11 -0.174 0.594
## [13,] 12 -0.172 0.595
## [14,] 13 -0.169 0.596
## [15,] 14 -0.166 0.597
## Type 2: with drift no trend
##      lag      ADF p.value
## [1,] 0 -2.20  0.248
## [2,] 1 -2.21  0.244
## [3,] 2 -2.23  0.238
## [4,] 3 -2.19  0.253
## [5,] 4 -2.20  0.250
## [6,] 5 -2.20  0.248
## [7,] 6 -2.21  0.244
## [8,] 7 -2.20  0.248
## [9,] 8 -2.19  0.254
## [10,] 9 -2.18 0.257
## [11,] 10 -2.18 0.255
## [12,] 11 -2.18 0.257
## [13,] 12 -2.18 0.257
```

```

## [14,] 13 -2.16 0.263
## [15,] 14 -2.17 0.258
## Type 3: with drift and trend
##      lag      ADF p.value
## [1,] 0 -2.91 0.192
## [2,] 1 -2.93 0.186
## [3,] 2 -2.94 0.180
## [4,] 3 -2.90 0.196
## [5,] 4 -2.90 0.197
## [6,] 5 -2.90 0.196
## [7,] 6 -2.91 0.193
## [8,] 7 -2.90 0.197
## [9,] 8 -2.88 0.207
## [10,] 9 -2.87 0.210
## [11,] 10 -2.87 0.209
## [12,] 11 -2.85 0.219
## [13,] 12 -2.85 0.218
## [14,] 13 -2.84 0.223
## [15,] 14 -2.85 0.216
## -----
## Note: in fact, p.value = 0.01 means p.value <= 0.01

## $type1
##      lag      ADF p.value
## [1,] 0 -0.1349353 0.6056581
## [2,] 1 -0.1332845 0.6061322
## [3,] 2 -0.1350012 0.6056392
## [4,] 3 -0.1311022 0.6067589
## [5,] 4 -0.1432485 0.6032707
## [6,] 5 -0.1455745 0.6026027
## [7,] 6 -0.1491280 0.6015823
## [8,] 7 -0.1466525 0.6022932
## [9,] 8 -0.1553530 0.5997946
## [10,] 9 -0.1558747 0.5996447
## [11,] 10 -0.1575228 0.5991714
## [12,] 11 -0.1743717 0.5943327
## [13,] 12 -0.1723248 0.5949206
## [14,] 13 -0.1686293 0.5959819
## [15,] 14 -0.1662663 0.5966605
##
## $type2
##      lag      ADF p.value
## [1,] 0 -2.199690 0.2481241
## [2,] 1 -2.210308 0.2438767
## [3,] 2 -2.225752 0.2376991
## [4,] 3 -2.186315 0.2534741

```

```

## [5,]   4 -2.196090 0.2495641
## [6,]   5 -2.199991 0.2480038
## [7,]   6 -2.210932 0.2436273
## [8,]   7 -2.199519 0.2481923
## [9,]   8 -2.185380 0.2538481
## [10,]  9 -2.178336 0.2566657
## [11,] 10 -2.183564 0.2545744
## [12,] 11 -2.178602 0.2565592
## [13,] 12 -2.178490 0.2566041
## [14,] 13 -2.163515 0.2625942
## [15,] 14 -2.174827 0.2580694
##
## $type3
##      lag      ADF  p.value
## [1,]  0 -2.911720 0.1919072
## [2,]  1 -2.925278 0.1861988
## [3,]  2 -2.940306 0.1798712
## [4,]  3 -2.902268 0.1958871
## [5,]  4 -2.899542 0.1970351
## [6,]  5 -2.901407 0.1962497
## [7,]  6 -2.909540 0.1928254
## [8,]  7 -2.900196 0.1967594
## [9,]  8 -2.875536 0.2071427
## [10,] 9 -2.867569 0.2104971
## [11,] 10 -2.871608 0.2087965
## [12,] 11 -2.848029 0.2187245
## [13,] 12 -2.850350 0.2177475
## [14,] 13 -2.838511 0.2227323
## [15,] 14 -2.853430 0.2164506

```

La interpretación es la siguiente:

- **Hipótesis nula (H0):** La serie no es estacionaria (tiene una raíz unitaria).
- **Hipótesis alternativa (H1):** La serie es estacionaria.

En todas las configuraciones (sin tendencia ni drift, con drift, y con drift y tendencia), los p-valores son mayores a 0.05. Esto implica que, bajo ninguna de estas configuraciones, la serie es estacionaria en su forma actual.

3.3 Diferenciación para Estacionariedad

Como la serie no es estacionaria, el siguiente paso es aplicar una diferenciación para intentar volverla estacionaria. La diferenciación ayuda a eliminar tenden-

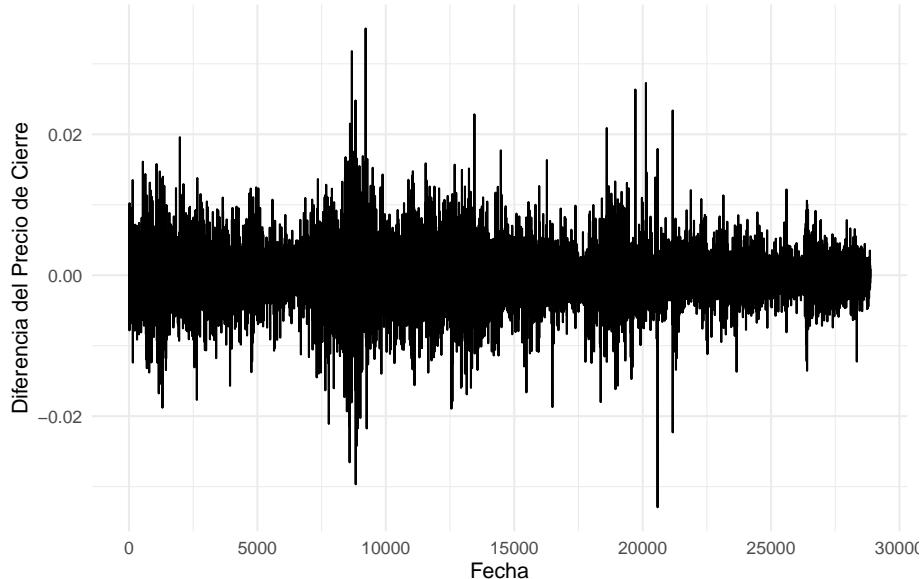
cias y hacer que las propiedades estadísticas de la serie se mantengan constantes a lo largo del tiempo.

Aplicaremos una diferenciación de primer orden y realizaremos nuevamente la prueba ADF para verificar si la serie se ha vuelto estacionaria.

Para este análisis, utilizaremos la columna de cierre (`Close`) del dataset como nuestra serie de tiempo principal. Convertiremos los datos a formato de serie temporal.

Aplicaremos una primera diferenciación.

Serie Temporal Diferenciada del Precio de Cierre EUR/USD



Después de la primera diferenciación, se puede obtener que por cada tick quedó el valor del return ($x-x_{\text{ant}}$) que es el resultado de la aplicación de la diferenciaión de primer orden. Como se aprecia, la serie ya no tiene una tendencia sino que presenta un comportamiento estacionario, sin embargo, esta serie de tiempo parece ser menos predecible que la serie de tiempo antes de la diferenciación, ya que evidentemente tiene mayor desviación estándar y por tanto un mayor Coeficiente de Variación y un menor SNR.

3.4 Verificación de Estacionariedad en la Serie Diferenciada

Aplicamos nuevamente la prueba Dickey-Fuller a la serie diferenciada para verificar si ahora es estacionaria.

3.4. VERIFICACIÓN DE ESTACIONARIEDAD EN LA SERIE DIFERENCIADA21

```
## Augmented Dickey-Fuller Test
## alternative: stationary
##
## Type 1: no drift no trend
##          lag      ADF p.value
## [1,]    0 -169.3   0.01
## [2,]    1 -119.0   0.01
## [3,]    2 -99.3    0.01
## [4,]    3 -84.8    0.01
## [5,]    4 -75.7    0.01
## [6,]    5 -68.7    0.01
## [7,]    6 -64.1    0.01
## [8,]    7 -60.1    0.01
## [9,]    8 -56.8    0.01
## [10,]   9 -53.7    0.01
## [11,]  10 -50.9    0.01
## [12,]  11 -48.8    0.01
## [13,]  12 -47.3    0.01
## [14,]  13 -45.4    0.01
## [15,]  14 -43.7    0.01
## Type 2: with drift no trend
##          lag      ADF p.value
## [1,]    0 -169.3   0.01
## [2,]    1 -119.0   0.01
## [3,]    2 -99.3    0.01
## [4,]    3 -84.8    0.01
## [5,]    4 -75.7    0.01
## [6,]    5 -68.7    0.01
## [7,]    6 -64.1    0.01
## [8,]    7 -60.1    0.01
## [9,]    8 -56.8    0.01
## [10,]   9 -53.7    0.01
## [11,]  10 -50.9    0.01
## [12,]  11 -48.8    0.01
## [13,]  12 -47.3    0.01
## [14,]  13 -45.4    0.01
## [15,]  14 -43.7    0.01
## Type 3: with drift and trend
##          lag      ADF p.value
## [1,]    0 -169.3   0.01
## [2,]    1 -119.0   0.01
## [3,]    2 -99.3    0.01
## [4,]    3 -84.9    0.01
## [5,]    4 -75.7    0.01
## [6,]    5 -68.7    0.01
## [7,]    6 -64.1    0.01
```

```
## [8,]    7  -60.1   0.01
## [9,]    8  -56.8   0.01
## [10,]   9  -53.7   0.01
## [11,]  10  -50.9   0.01
## [12,]  11  -48.8   0.01
## [13,]  12  -47.3   0.01
## [14,]  13  -45.4   0.01
## [15,]  14  -43.7   0.01
## ----
## Note: in fact, p.value = 0.01 means p.value <= 0.01

## $type1
##      lag      ADF p.value
## [1,]  0 -169.27722   0.01
## [2,]  1 -119.03874   0.01
## [3,]  2  -99.30334   0.01
## [4,]  3  -84.84969   0.01
## [5,]  4  -75.69590   0.01
## [6,]  5  -68.70703   0.01
## [7,]  6  -64.07591   0.01
## [8,]  7  -60.05652   0.01
## [9,]  8  -56.77621   0.01
## [10,] 9  -53.68723   0.01
## [11,] 10 -50.91061   0.01
## [12,] 11 -48.81278   0.01
## [13,] 12 -47.29027   0.01
## [14,] 13 -45.38630   0.01
## [15,] 14 -43.68676   0.01
##
## $type2
##      lag      ADF p.value
## [1,]  0 -169.27433   0.01
## [2,]  1 -119.03671   0.01
## [3,]  2  -99.30166   0.01
## [4,]  3  -84.84825   0.01
## [5,]  4  -75.69462   0.01
## [6,]  5  -68.70587   0.01
## [7,]  6  -64.07484   0.01
## [8,]  7  -60.05550   0.01
## [9,]  8  -56.77525   0.01
## [10,] 9  -53.68632   0.01
## [11,] 10 -50.90973   0.01
## [12,] 11 -48.81194   0.01
## [13,] 12 -47.28946   0.01
## [14,] 13 -45.38553   0.01
## [15,] 14 -43.68601   0.01
```

```

## $type3
##      lag      ADF p.value
## [1,] 0 -169.27489 0.01
## [2,] 1 -119.03832 0.01
## [3,] 2 -99.30402 0.01
## [4,] 3 -84.85094 0.01
## [5,] 4 -75.69772 0.01
## [6,] 5 -68.70929 0.01
## [7,] 6 -64.07866 0.01
## [8,] 7 -60.05942 0.01
## [9,] 8 -56.77944 0.01
## [10,] 9 -53.69075 0.01
## [11,] 10 -50.91391 0.01
## [12,] 11 -48.81642 0.01
## [13,] 12 -47.29426 0.01
## [14,] 13 -45.39063 0.01
## [15,] 14 -43.69120 0.01

```

3.5 Justificación de la Transformación

Dado que la serie original no era estacionaria, fue necesario aplicar una diferenciación de primer orden para hacerla estacionaria. Esta transformación es importante para poder aplicar modelos de series de tiempo que asumen estacionariedad y para obtener mejores resultados en el análisis de patrones y predicciones.

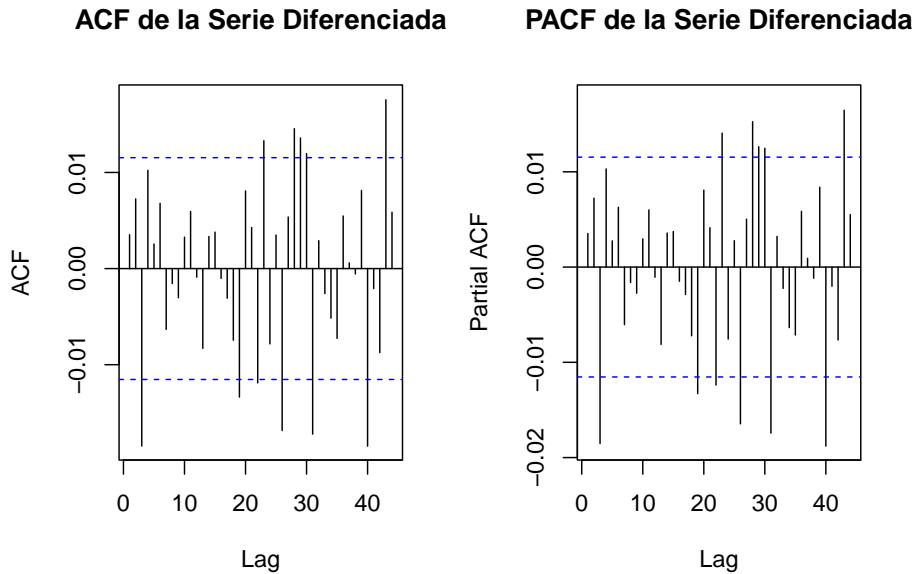
3.6 Análisis de Autocorrelación

Graficaremos las funciones de autocorrelación (ACF) y autocorrelación parcial (PACF) para observar la dependencia temporal en los datos diferenciados.

```

# Graficar ACF y PACF de la serie diferenciada
par(mfrow = c(1, 2))
Acf(forex_diff, main = "ACF de la Serie Diferenciada")
Pacf(forex_diff, main = "PACF de la Serie Diferenciada")

```



```
par(mfrow = c(1,1))
```

La ACF a la izquierda muestra cómo los valores actuales de la serie diferenciada están correlacionados con sus valores en diferentes rezagos (lags). Algunos puntos de la ACF están fuera de las líneas de significancia (líneas punteadas azules), lo cual sugiere que hay correlaciones significativas en esos rezagos específicos. Este patrón puede ser indicativo de que aún existen estructuras autoregresivas o de medias móviles en la serie, incluso después de la diferenciación.

La PACF a la derecha muestra la autocorrelación de la serie diferenciada en cada rezago eliminando el efecto de los rezagos intermedios. Similar a la ACF, algunos valores están fuera de las líneas de significancia, lo que indica correlación significativa en esos rezagos específicos. Este patrón puede sugerir la presencia de efectos autoregresivos en los rezagos correspondientes.

Los picos significativos en la ACF y PACF sugieren que la serie diferenciada podría beneficiarse de un modelo ARIMA para capturar la estructura subyacente. Dependiendo de la cantidad de rezagos significativos en cada gráfico, podría ser apropiado un modelo ARIMA específico (por ejemplo, con ciertos órdenes autoregresivos y de medias móviles).

3.7 Modelo ARIMA

Utilizaremos `auto.arima` para identificar el mejor modelo ARIMA para los datos.

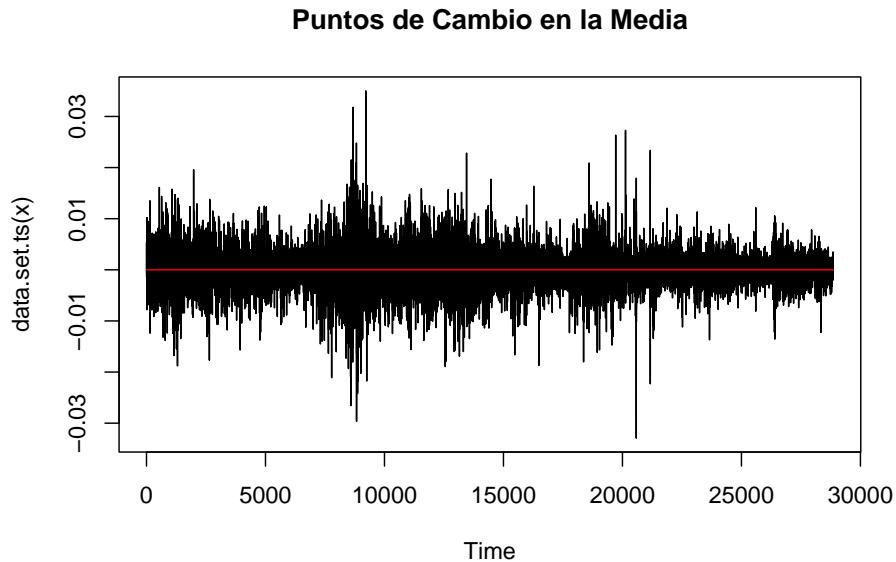
```
# Ajuste del modelo ARIMA
forex_arima <- auto.arima(forex_diff)
summary(forex_arima)

## Series: forex_diff
## ARIMA(0,0,0) with zero mean
##
## sigma^2 = 8.978e-06: log likelihood = 126732.8
## AIC=-253463.6   AICc=-253463.6   BIC=-253455.4
##
## Training set error measures:
##               ME        RMSE       MAE      MPE      MAPE      MASE      ACF1
## Training set 1.304966e-06 0.002996269 0.001979825 100    100 0.675058 0.003518741
```

El modelo ajustado para la serie `forex_diff` es un ARIMA(0,0,0) con media cero, lo que sugiere que la serie no presenta patrones autoregresivos ni de medias móviles significativos, siendo esencialmente ruido blanco. El valor de $\sigma^2 = 8.978 \times 10^{-6}$ representa la varianza del error, con una alta verosimilitud (log likelihood) de 126732.8. Los criterios de información, AIC y BIC, son de -253463.6 y -253455.4, respectivamente, indicando un buen ajuste para este modelo sencillo. Las medidas de error en el conjunto de entrenamiento muestran un error medio (ME) cercano a cero (1.30e-06) y un RMSE de 0.002996, lo cual refleja una precisión razonable. La autocorrelación en el primer rezago (ACF1) es baja (0.0035), sugiriendo independencia en los residuos.

3.8 Detección de Puntos de Cambio

Usaremos la función `cpt.mean` para detectar cambios significativos en la media de la serie.



No se detectaron puntos de cambio, debido a que después de la diferenciación, se convierte básicamente en ruido blanco.

3.9 Media Cero de los Residuos

Comprobamos si la media de los residuos es cero.

```
# Prueba t en los residuos
residuals_arima <- residuals(forex_arima)
t_test_residuals <- t.test(residuals_arima)
print(t_test_residuals)

##
## One Sample t-test
##
## data: residuals_arima
## t = 0.073986, df = 28858, p-value = 0.941
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## -3.326619e-05 3.587612e-05
## sample estimates:
##   mean of x
## 1.304966e-06
```

La prueba t de una muestra realizada sobre los residuos (residuals_arima) arroja un valor de =0.073986 con 28,858 grados de libertad y un valor p de 0.941. Dado que el valor p es significativamente mayor a 0.05, no rechazamos la hipótesis nula de que la media de los residuos es igual a cero. Esto sugiere que los residuos no presentan un sesgo significativo. El intervalo de confianza del 95% para la media de los residuos y la media estimada muy cercana a cero es consistente con un modelo bien ajustado sin tendencia sistemática en los errores.

3.10 Independencia de los Residuos

Evaluamos la independencia de los residuos usando la prueba de Ljung-Box.

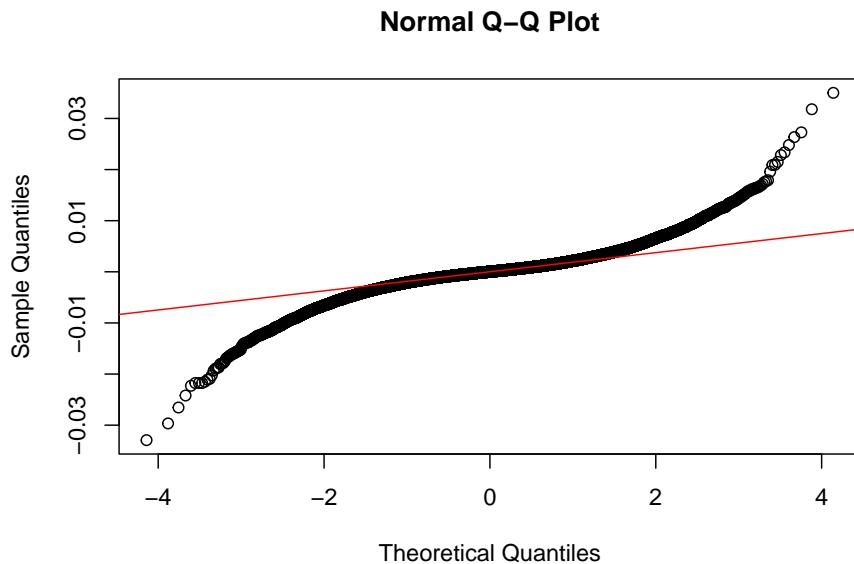
```
# Prueba de independencia
Box.test(residuals_arima, lag = 20, type = "Ljung-Box")

##
## Box-Ljung test
##
## data: residuals_arima
## X-squared = 30.772, df = 20, p-value = 0.05827
```

Los datos cargados contienen 28,860 filas y 6 columnas de información sobre el tipo de cambio EUR/USD. La prueba de Dickey-Fuller Aumentada (ADF) realizada en tres configuraciones (sin constante ni tendencia, con constante sin tendencia, y con constante y tendencia) muestra valores ADF altamente negativos y p-valores menores o iguales a 0.01, lo que indica que la serie diferenciada es estacionaria. Además, la prueba de Box-Ljung aplicada a los residuos del modelo ARIMA arroja un valor de 30.772 con un valor p de 0.05827, lo cual sugiere que los residuos **no tienen autocorrelación significativa**, indicando independencia en los errores del modelo.

3.11 Distribución de los Residuos

Analizaremos la normalidad de los residuos con un gráfico Q-Q.



El gráfico Q-Q muestra que los residuos del modelo se alinean con la normalidad en el centro de la distribución, pero presentan desviaciones significativas en las colas. Esto sugiere que, aunque los residuos se comportan aproximadamente como una distribución normal en el centro, tienen colas más pesadas de lo esperado, lo que indica la presencia de valores extremos.

Chapter 4

Análisis de Series de Tiempo con el Método Holt-Winters

Este documento realiza un análisis de series de tiempo utilizando el método de Holt-Winters aplicado exclusivamente a la columna `close` del dataset `EURUSD_ForexTrading_4hrs.csv`. Se utilizarán solo 6000 datos, normalizando la columna `close`, dividiendo en conjunto de entrenamiento y prueba, y calculando la métricas de error MAE en el conjunto de entrenamiento y en el conjunto de prueba.

4.1 Carga de Bibliotecas y Datos

El dataset `EURUSD_ForexTrading_4hrs.csv` contiene datos de trading del par de divisas EUR/USD con una frecuencia de 4 horas. Solo se ha seleccionado la columna `close` con los primeros 6000 datos para este análisis.

Table 4.1: Primeras filas del dataset EURUSD ForexTrading 4hrs Columna close

close
1.12274
1.12126
1.12113
1.12174
1.12712
1.12804

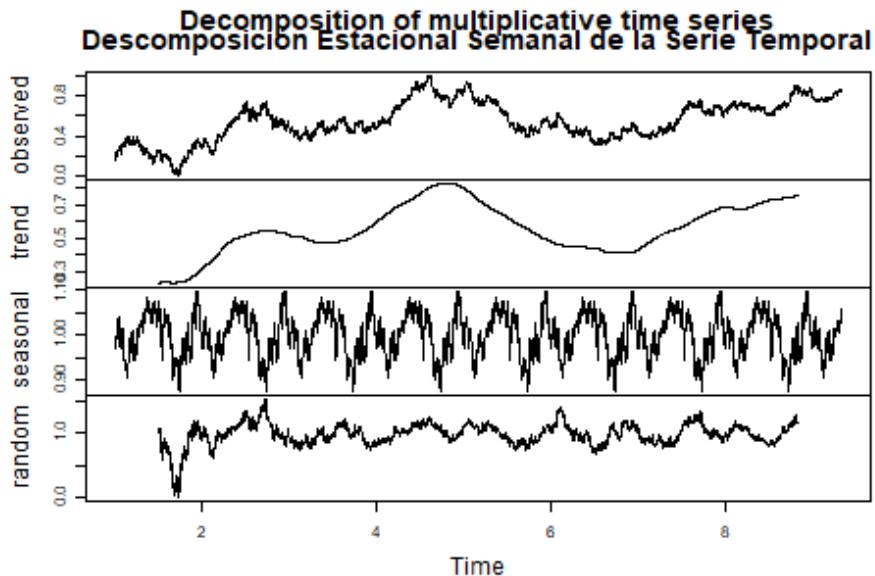
Table 4.2: Columna 'close' Normalizada

x
0.1566893
0.1515141
0.1510595
0.1531925
0.1720050
0.1752220

4.2 Normalización de la Columna 'close'

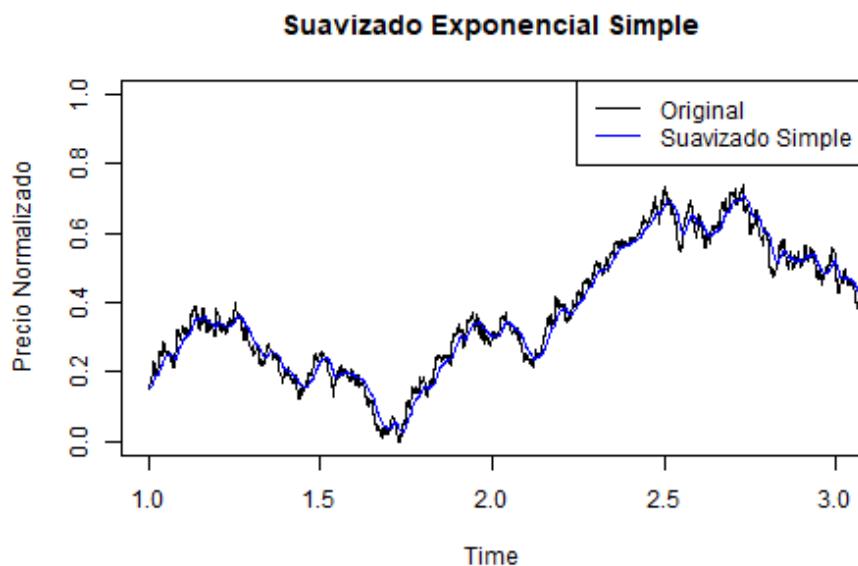
Se ha normalizado la columna `close` utilizando la técnica Min-Max, transformando los valores entre 0 y 1 para mejorar la estabilidad del modelo.

4.3 Descomposición Estacional



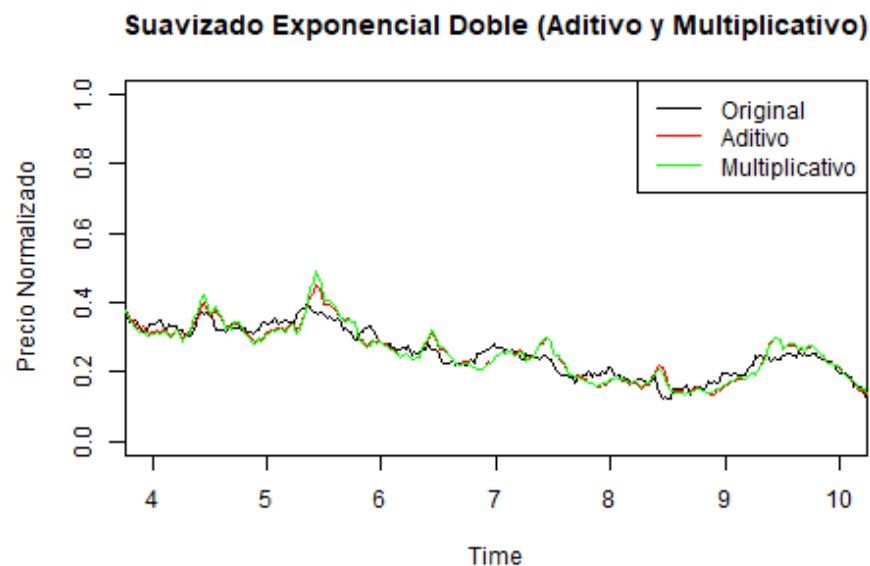
Descomponemos la serie temporal en componentes de tendencia, estacionalidad y ruido para analizar los patrones internos de la serie temporal antes de aplicar el modelo.

4.4 Suavizado Exponencial Simple



Aplicamos el suavizado exponencial simple a la serie `close` para visualizar una versión suavizada de la serie de tiempo. Se pude observar como la señal original contiene mas ruido que la suavizada.

4.5 Suavizado Exponencial Doble (Aditivo y Multiplicativo)



Se puede apreciar que tanto el suavizado aditivo como el multiplicativo producen una estimación cercana a los datos originales, aunque estas señales contienen mas ruido que el suavizado simple e incluso al parecer mas que la señal original.

4.6 Calculo de error

Se calcularon los errores de los modelos multiplicativo y aditivo en el dataset de training. Se usa un ajuste de 0.001 para el modelo multiplicativo, porque este requiere que todos los datos sean positivos y mayores que cero (no admite ceros), y como los datos fueron nomalizados con min-max, obligatoriamente existe al menos un valor de cero.

```
## MAE en entrenamiento (Aditivo): 0.01972768
```

```
## MAE en entrenamiento (Multiplicativo): 0.05277391
```

Finalmente se calcularon los errores de los modelos en el dataset de validación

```
## MAE en validación (Aditivo): 2.350168
```

```
## MAE en validación (Multiplicativo): 4.704901
```

Este gigantesco error es debido a que el modelo trata de predecir todo el dataset de validación de una sola vez (1238 ticks). En otros modelos predictivos en series de tiempo como redes neuronales, se usa un sliding window usando los últimos 128 ticks como entrada del modelo, se predice el siguiente, y esto se repite para cada tick, luego se promedian todos los errores y esa es la medida de desempeño de la red neuronal.

Para poder comparar el desempeño predictivo del modelo Holt-Winter con otros modelos predictivos en una serie de tiempo larga como la nuestra, probablemente se requiera usar sliding window como en las redes neuronales, se requeriría adaptar el modelo Holt-Winter para que se entrene con una ventana y prediga segmentos cortos que se concatenan y que formarían la señal pronosticada, con la cual se calcularían y promediarían los errores por tick, en lugar de tratar de predecir la serie de tiempo completa de una sola vez.

4.7 Conclusiones

El método Holt-Winters aplicado a la columna `close` del conjunto de datos muestra que este modelo es capaz de capturar patrones de tendencia y estacionalidad en los datos de precios de cierre normalizados. Las métricas de evaluación como MAE muestran la precisión del modelo tanto en el conjunto de entrenamiento como en el conjunto de prueba, donde se puede apreciar que la predicción de todo el dataset de validación completo no es una buena forma de evaluar el desempeño de estos modelos, especialmente para compararlos con modelos ampliamente usados como las redes neuronales.

Chapter 5

Modelos Estacionarios

En esta sección, analizamos y predecimos series temporales usando la metodología **Box-Jenkins**. El objetivo es ajustar modelos autoregresivos integrados de media móvil (ARIMA) para encontrar patrones subyacentes en los datos y realizar predicciones futuras.

El dataset analizado contiene precios Forex EUR/USD en intervalos de 4 horas, el cual será procesado y transformado para cumplir con los requisitos de estacionariedad y ajuste de modelos ARIMA.

5.1 Objetivo

Esquematizar los modelos convencionales de series temporales mediante la metodología **Box-Jenkins** y explorar su aplicabilidad en la predicción de futuras observaciones.

5.2 1. Carga y Exploración de los Datos

En esta sección se carga el dataset `EURUSD_ForexTrading_4hrs.csv`, y se realiza una exploración inicial para entender su estructura y características básicas.

```
##               Gmt.time      open      high      low     close    volume
## 1 04.05.2003 21:00:00.000 1.12354 1.12354 1.12166 1.12274 95533.1
## 2 05.05.2003 01:00:00.000 1.12242 1.12276 1.12067 1.12126 93778.6
## 3 05.05.2003 05:00:00.000 1.12139 1.12255 1.12030 1.12113 90924.7
## 4 05.05.2003 09:00:00.000 1.12092 1.12331 1.12049 1.12174 91254.7
## 5 05.05.2003 13:00:00.000 1.12194 1.12900 1.12130 1.12712 308003.4
## 6 05.05.2003 17:00:00.000 1.12718 1.13019 1.12657 1.12804 373668.3
```

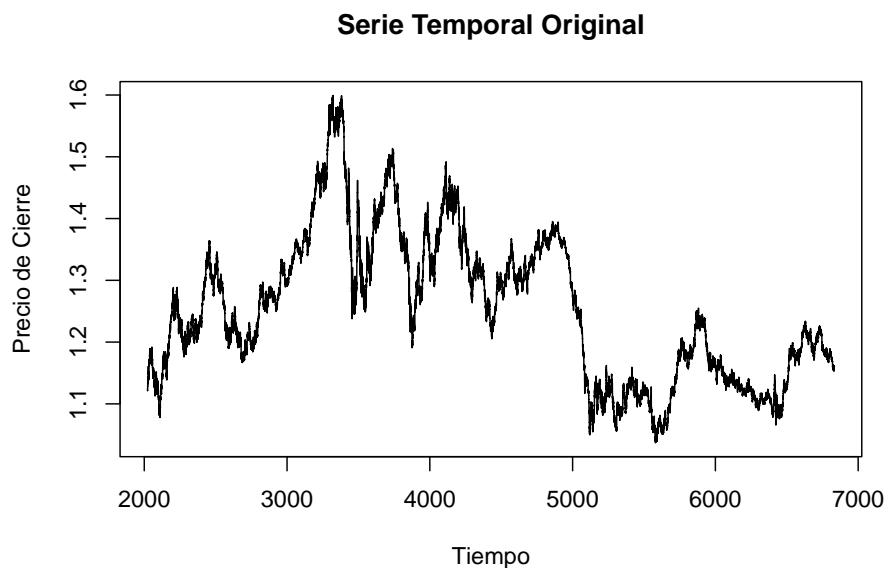
```

##   Gmt.time      open      high      low
## Length:28860    Min. :1.037    Min. :1.039    Min. :1.034
## Class :character 1st Qu.:1.154    1st Qu.:1.156    1st Qu.:1.152
## Mode  :character Median :1.242    Median :1.244    Median :1.240
##                               Mean  :1.254    Mean  :1.256    Mean  :1.252
##                               3rd Qu.:1.339    3rd Qu.:1.341    3rd Qu.:1.337
##                               Max. :1.599    Max. :1.604    Max. :1.597
##   close      volume
##   Min. :1.037    Min. :     0
##   1st Qu.:1.154    1st Qu.: 20322
##   Median :1.242    Median : 47813
##   Mean   :1.254    Mean   : 83079
##   3rd Qu.:1.339    3rd Qu.:102455
##   Max. :1.599    Max. :752269

```

5.3 2. Limpieza y Preprocesamiento de los Datos

Se seleccionan las columnas relevantes (en este caso, `Close`) y se convierten en una serie temporal.



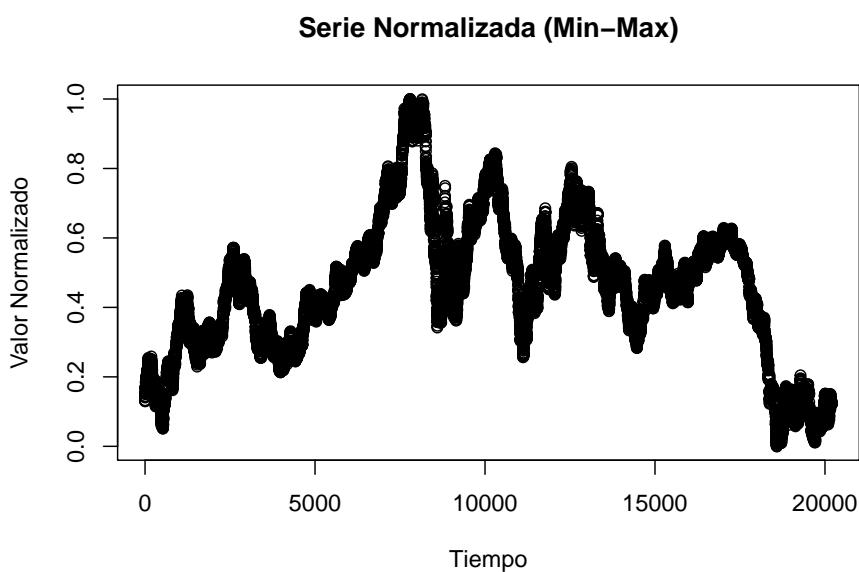
El gráfico representa la serie temporal original del precio de cierre del par Forex EUR/USD, registrado en intervalos de 4 horas. Observamos fluctuaciones significativas que reflejan los cambios en el mercado durante el período analizado. La serie muestra patrones evidentes de tendencias ascendentes y descendentes, lo que sugiere posibles componentes de largo plazo y estacionalidad que deben ser tratados en etapas posteriores del análisis, como la transformación a estacionariedad y la descomposición de los datos.

5.4 3. División del Dataset en Conjuntos de Entrenamiento y Validación

Se divide el dataset en 70% para entrenamiento y 30% para evaluación del modelo.

5.5 4. Normalización de los Datos

La normalización es útil para estabilizar la varianza y hacer que los datos sean más adecuados para el análisis.



Como se observa, el rango de los datos ahora se encuentra entre 0 y 1.

5.6 5. Verificación de Estacionariedad

La serie debe ser estacionaria para que los modelos ARIMA sean válidos. Evaluamos esto usando la prueba Dickey-Fuller Aumentada (ADF).

```
## Augmented Dickey-Fuller Test
## alternative: stationary
##
## Type 1: no drift no trend
##      lag      ADF p.value
## [1,] 0 -0.861  0.372
## [2,] 1 -0.868  0.369
## [3,] 2 -0.874  0.367
## [4,] 3 -0.861  0.372
## [5,] 4 -0.874  0.367
## [6,] 5 -0.876  0.366
## [7,] 6 -0.878  0.365
## [8,] 7 -0.874  0.367
## [9,] 8 -0.875  0.367
## [10,] 9 -0.873  0.367
## [11,] 10 -0.877 0.366
## [12,] 11 -0.886 0.363
## [13,] 12 -0.885 0.363
## [14,] 13 -0.876 0.366
## Type 2: with drift no trend
##      lag      ADF p.value
## [1,] 0 -2.12  0.278
## [2,] 1 -2.15  0.268
## [3,] 2 -2.17  0.261
## [4,] 3 -2.13  0.276
## [5,] 4 -2.14  0.273
## [6,] 5 -2.14  0.272
## [7,] 6 -2.14  0.272
## [8,] 7 -2.13  0.275
## [9,] 8 -2.11  0.285
## [10,] 9 -2.10  0.287
## [11,] 10 -2.11 0.285
## [12,] 11 -2.09 0.292
## [13,] 12 -2.09 0.291
## [14,] 13 -2.08 0.298
## Type 3: with drift and trend
##      lag      ADF p.value
```

```

## [1,] 0 -2.16 0.507
## [2,] 1 -2.19 0.496
## [3,] 2 -2.21 0.489
## [4,] 3 -2.17 0.505
## [5,] 4 -2.18 0.501
## [6,] 5 -2.18 0.501
## [7,] 6 -2.18 0.501
## [8,] 7 -2.17 0.504
## [9,] 8 -2.15 0.514
## [10,] 9 -2.14 0.517
## [11,] 10 -2.15 0.514
## [12,] 11 -2.13 0.523
## [13,] 12 -2.13 0.521
## [14,] 13 -2.11 0.528
## -----
## Note: in fact, p.value = 0.01 means p.value <= 0.01

## $type1
##      lag      ADF  p.value
## [1,] 0 -0.8607895 0.3716268
## [2,] 1 -0.8679287 0.3690726
## [3,] 2 -0.8742777 0.3668010
## [4,] 3 -0.8606220 0.3716867
## [5,] 4 -0.8741001 0.3668646
## [6,] 5 -0.8764373 0.3660284
## [7,] 6 -0.8781312 0.3654224
## [8,] 7 -0.8743629 0.3667706
## [9,] 8 -0.8746145 0.3666806
## [10,] 9 -0.8733773 0.3671232
## [11,] 10 -0.8765659 0.3659824
## [12,] 11 -0.8856760 0.3627230
## [13,] 12 -0.8848509 0.3630182
## [14,] 13 -0.8762256 0.3661041
##
## $type2
##      lag      ADF  p.value
## [1,] 0 -2.124490 0.2782040
## [2,] 1 -2.149853 0.2680589
## [3,] 2 -2.166670 0.2613321
## [4,] 3 -2.129695 0.2761221
## [5,] 4 -2.138047 0.2727812
## [6,] 5 -2.140018 0.2719927
## [7,] 6 -2.139519 0.2721925
## [8,] 7 -2.132869 0.2748525
## [9,] 8 -2.108596 0.2845615
## [10,] 9 -2.102436 0.2870256

```

```

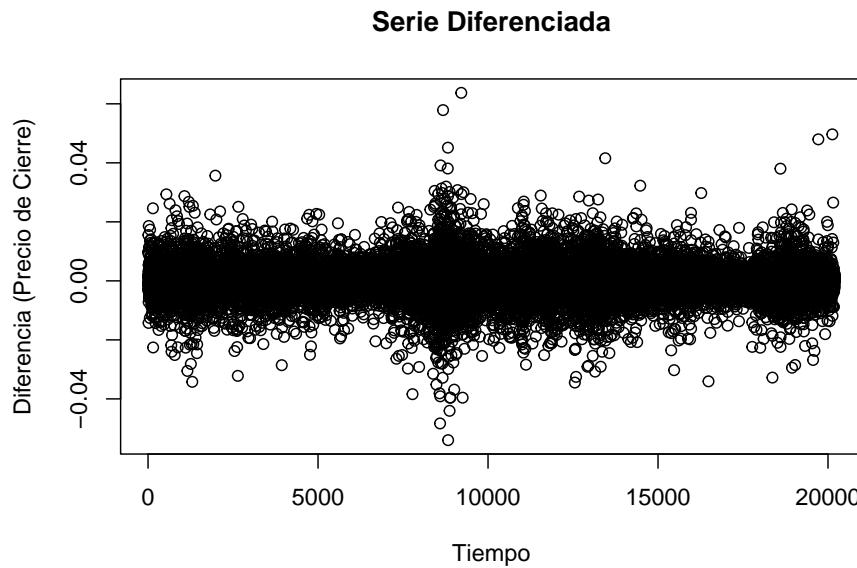
## [11,] 10 -2.108329 0.2846684
## [12,] 11 -2.089681 0.2921277
## [13,] 12 -2.093017 0.2907933
## [14,] 13 -2.075880 0.2976481
##
## $type3
##      lag      ADF  p.value
## [1,] 0 -2.164022 0.5068136
## [2,] 1 -2.189210 0.4961222
## [3,] 2 -2.205776 0.4891471
## [4,] 3 -2.169354 0.5045398
## [5,] 4 -2.176674 0.5014184
## [6,] 5 -2.178475 0.5006505
## [7,] 6 -2.177817 0.5009308
## [8,] 7 -2.171376 0.5036774
## [9,] 8 -2.146670 0.5142130
## [10,] 9 -2.140507 0.5168410
## [11,] 10 -2.146217 0.5144060
## [12,] 11 -2.126486 0.5228201
## [13,] 12 -2.129930 0.5213512
## [14,] 13 -2.113231 0.5284725

```

El resultado de la prueba Dickey-Fuller Aumentada (ADF) muestra un estadístico Dickey-Fuller de -2.0393 con un p-valor de 0.5618, lo que indica que no podemos rechazar la hipótesis nula de que la serie tiene una raíz unitaria. Esto significa que la serie `norm_train_data` no es estacionaria. Dado que la estacionariedad es un requisito fundamental para ajustar modelos ARIMA, será necesario transformar la serie, aplicando una diferenciación para estabilizar su media y eliminar tendencias.

5.7 6. Transformación a Estacionariedad

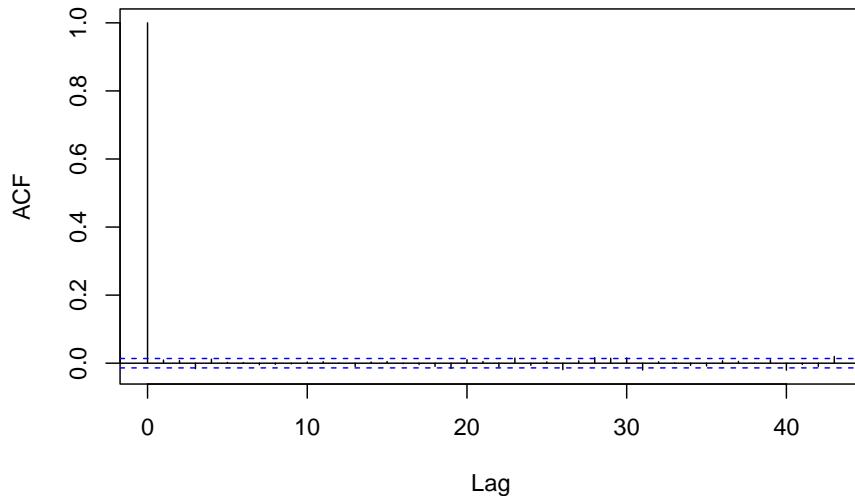
Si la serie no es estacionaria, aplicamos una diferenciación para eliminar tendencias no deseadas.



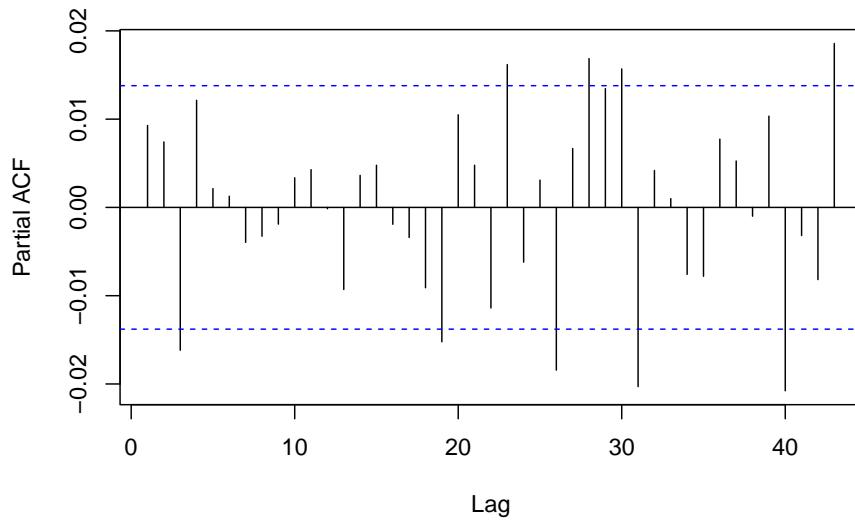
El gráfico muestra la serie diferenciada con valores oscilando alrededor de 0, entre aproximadamente -0.02 y 0.02. Esto indica que la diferenciación logró estabilizar la media y eliminar tendencias, dejando la serie preparada para verificar su estacionariedad y ajustar un modelo ARIMA.

5.8 7. Análisis ACF y PACF

Los gráficos de ACF y PACF ayudan a determinar los valores p y q del modelo ARIMA.

ACF de la Serie Diferenciada

El gráfico de la ACF (Función de Autocorrelación) muestra un primer retardo significativo, con un valor cercano a 1.0, mientras que los retardos restantes están dentro de los intervalos de confianza (± 0.05), indicando que no hay correlación significativa más allá del primer lag.

PACF de la Serie Diferenciada

En el gráfico de la PACF (Función de Autocorrelación Parcial), los primeros retardos presentan valores significativos positivos y negativos, especialmente en los primeros lags, como el 1, 3 y 5. Esto sugiere la posible inclusión de términos autorregresivos (AR) en el modelo ARIMA.

Estos resultados guían la selección de los parámetros para ajustar un modelo ARIMA adecuado.

5.9 8. Ajuste del Modelo ARIMA

Ajustamos un modelo ARIMA utilizando los valores p , d y q obtenidos previamente. Usamos `auto.arima` para seleccionar automáticamente los mejores parámetros.

```
## Series: norm_train_data
## ARIMA(4,1,0)
##
## Coefficients:
##             ar1      ar2      ar3      ar4
##            0.0095  0.0075 -0.0163  0.0121
## s.e.    0.0070  0.0070  0.0070  0.0070
##
## sigma^2 = 3.647e-05: log likelihood = 74553.92
## AIC=-149097.8   AICc=-149097.8   BIC=-149058.3
##
## Training set error measures:
##                  ME        RMSE        MAE       MPE      MAPE       MASE
## Training set -2.667179e-07 0.006038687 0.004067731 -Inf     Inf 1.000317
##                  ACF1
## Training set -2.599614e-05
```

El modelo ajustado sobre la serie normalizada (`norm_train_data`) es un **ARIMA(4,1,0)** con los siguientes coeficientes: - **AR1**: 0.0095 (s.e.: 0.0070), - **AR2**: 0.0075 (s.e.: 0.0070), - **AR3**: -0.0163 (s.e.: 0.0070), - **AR4**: 0.0121 (s.e.: 0.0070).

Indicadores del modelo: - **Log-Likelihood**: 74553.92, - **AIC**: -149097.8, - **BIC**: -149058.3.

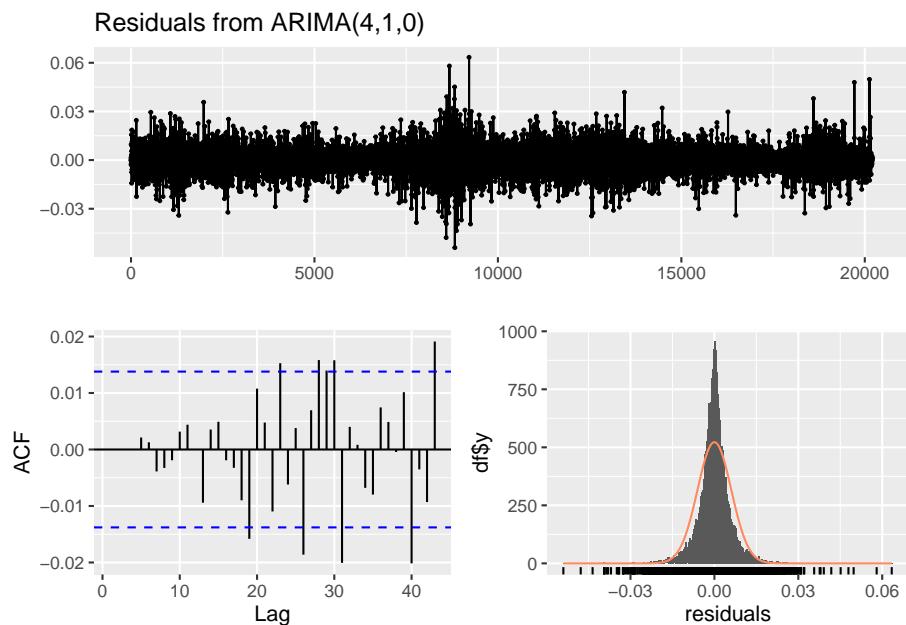
Métricas del conjunto de entrenamiento: - **RMSE**: 0.0060, - **MAE**: 0.0041, - **ACF1**: -0.000026.

Estos resultados indican un ajuste razonable del modelo a los datos normalizados, con residuos independientes y métricas de error bajas en el conjunto de

entrenamiento. Sin embargo, la presencia de valores extremos en las métricas como MAPE y MPE $(-\infty, \infty)$ sugiere posibles problemas en los cálculos debido a la normalización o a valores cercanos a cero.

5.10 9. Validación del Modelo

Se validan los supuestos del modelo mediante el análisis de los residuos.



```
##  
## Ljung-Box test  
##  
## data: Residuals from ARIMA(4,1,0)  
## Q* = 0.91976, df = 6, p-value = 0.9885  
##  
## Model df: 4. Total lags used: 10
```

El análisis de los residuos del modelo **ARIMA(4,1,0)** muestra lo siguiente:

- 1. Gráfico de Residuos:** Los residuos oscilan alrededor de 0, con valores en el rango de aproximadamente -0.02 a 0.02, sin patrones visibles ni tendencias evidentes, lo que sugiere independencia de los residuos.

2. **ACF de Residuos:** Los valores de autocorrelación de los residuos están mayoritariamente dentro de los intervalos de confianza (± 0.02), excepto por algunos picos en retardos altos, indicando que los residuos son casi ruido blanco.
3. **Distribución de Residuos:** El histograma muestra una distribución aproximadamente normal centrada en 0, corroborada por la curva de densidad ajustada, lo que valida la suposición de normalidad en los residuos.

Estos resultados indican que el modelo ajustado cumple los supuestos de independencia y normalidad de los residuos, validando su uso para predicción.

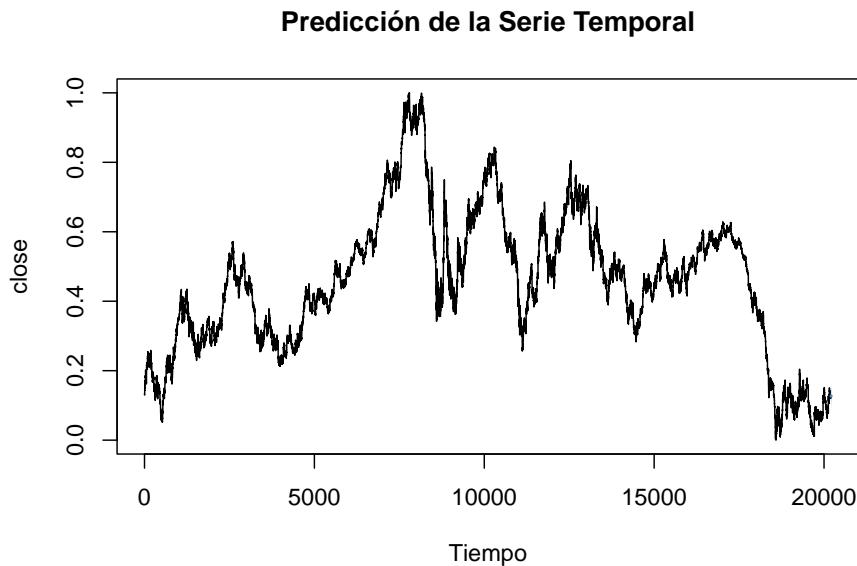
```
##  
## Box-Ljung test  
##  
## data: model$residuals  
## X-squared = 0.91976, df = 10, p-value = 0.9999
```

El resultado de la prueba **Box-Ljung** para los residuos del modelo muestra un estadístico $X^2 = 0.91976$ con $df = 10$ grados de libertad y un p -valor = 0.9999. Dado que el p -valor $\gg 0.05$, no se puede rechazar la hipótesis nula de que los residuos son ruido blanco, confirmando la independencia de los residuos y validando el ajuste del modelo.

Dado que el p -valor > 0.05 , no se puede rechazar la hipótesis nula de que los residuos son ruido blanco. Esto confirma que los residuos del modelo no presentan autocorrelación significativa, validando así el ajuste del modelo ARIMA.

5.11 10. Predicción

Realizamos predicciones para los próximos intervalos usando el modelo ajustado.



El gráfico muestra la serie temporal original superpuesta con la predicción generada por el modelo **ARIMA(4,1,0)**. Aunque las predicciones siguen la tendencia general de la serie, el resultado es muy similar al original debido a que el modelo representa una diferenciación de primer orden, capturando únicamente cambios incrementales sin agregar términos de media móvil (q) y usando 4 para el autorregresivo.

5.12 11. Evaluación de Predicciones

Se evalúan las predicciones contra los datos de prueba usando métricas de error.

```
## MAE en el conjunto de entrenamiento: 0.004067731
## MAE en el conjunto de prueba: 0.07728354
```

El error absoluto medio (MAE) del modelo en el conjunto de entrenamiento es **0.00406**, mientras que en el conjunto de prueba es significativamente mayor, con un valor de **0.0772**. Esto sugiere que el modelo se ajusta bien a los datos de entrenamiento, pero tiene dificultades para generalizar a datos no vistos, indicando un posible sobreajuste o la necesidad de mejorar la capacidad predictiva del modelo.

5.13 12. Conclusiones

Las siguientes son las conclusiones de las actividades realizadas:

- **Ajuste del Modelo ARIMA:**

- Un modelo **ARIMA(4,1,0)**, incorporó términos autorregresivos ($p = 4$) y mostró mejoras sutiles respecto al ARIMA(0,1,0) probado inicialmente en los indicadores como **log-likelihood = 74553.92** y **AIC = -149097.8**, con residuos que cumplen las suposiciones de ruido blanco y normalidad.

- **Validación del Modelo:**

- La prueba **Box-Ljung** confirmó que los residuos del modelo **ARIMA(4,1,0)** son independientes y no presentan autocorrelación significativa (p -valor = 0.9999).
- Los residuos mostraron una distribución aproximadamente normal, validando aún más la calidad del modelo ajustado.

- **Evaluación de Predicciones:**

- El **MAE en el conjunto de entrenamiento** fue de **0.00406**, mientras que en el conjunto de prueba aumentó significativamente a **0.07728354**, lo que indica que el modelo tiene dificultades para generalizar a datos no vistos, posiblemente debido a sobreajuste o características complejas no capturadas.

- **Limitaciones y Mejoras:**

- Aunque el modelo **ARIMA(4,1,0)** ofrece un mejor ajuste que el **ARIMA(0,1,0)**, no logra reducir el error en el conjunto de prueba de forma significativa.
- Sería recomendable explorar modelos más avanzados, como **SARIMA**, para capturar componentes estacionales, o incluir variables exógenas para mejorar las predicciones.

El uso de la metodología **Box-Jenkins** permitió identificar patrones y ajustar modelos que explican las características principales de la serie temporal. Sin embargo, la discrepancia entre el desempeño en los conjuntos de entrenamiento y prueba resalta la necesidad de modelos más robustos para mejorar la capacidad predictiva.

Chapter 6

Modelos Estacionarios en series de tiempo

El Algoritmo prophet permite pronosticar series de tiempo adaptandose a tendencias no lineales, con estacionalidad e involucrando dias festivos o periodos de vacaciones.

Realizaremos la predicción de nuestros serie basados en el Modelo Prophet.

6.1 1. Carga y Exploración de los Datos

Cargamos los paquetes necesarios y el dataset EURUSD_ForexTrading_4hrs.csv que contiene los tipos de cambio Euro Dolar históricos de 2003 a 2021

```
##               Gmt.time      open      high      low    close   volume
## 1 04.05.2003 21:00:00.000 1.12354 1.12354 1.12166 1.12274 95533.1
## 2 05.05.2003 01:00:00.000 1.12242 1.12276 1.12067 1.12126 93778.6
## 3 05.05.2003 05:00:00.000 1.12139 1.12255 1.12030 1.12113 90924.7
## 4 05.05.2003 09:00:00.000 1.12092 1.12331 1.12049 1.12174 91254.7
## 5 05.05.2003 13:00:00.000 1.12194 1.12900 1.12130 1.12712 308003.4
## 6 05.05.2003 17:00:00.000 1.12718 1.13019 1.12657 1.12804 373668.3
```

6.2 2. Limpieza y Preprocesamiento de los Datos

Continuamos trabajando con la seleccionan las columnas relevantes, la columna de precio de cierre de la negociacion “Close” y para el modelo prophet necesitamos la fecha. Posteriormente se convierten en una serie temporal.

Graficamos los datos originales en funcion del precio de cierre (Close)

```
##          Gmt.time    close
## 1      2003-05-04 1.12274
## 2      2003-05-05 1.12126
## 3      2003-05-05 1.12113
## 4      2003-05-05 1.12174
## 5      2003-05-05 1.12712
## 6      2003-05-05 1.12804
## 7      2003-05-05 1.12913
## 8      2003-05-06 1.12855
## 9      2003-05-06 1.13381
## 10     2003-05-06 1.13456
## 11     2003-05-06 1.13515
## 12     2003-05-06 1.14368
## 13     2003-05-06 1.14274
## 14     2003-05-07 1.14191
## 15     2003-05-07 1.13995
## 16     2003-05-07 1.14164
## 17     2003-05-07 1.13381
## 18     2003-05-07 1.13677
## 19     2003-05-07 1.13607
## 20     2003-05-08 1.13210
## 21     2003-05-08 1.13312
## 22     2003-05-08 1.14334
## 23     2003-05-08 1.14540
## 24     2003-05-08 1.15026
## 25     2003-05-08 1.15164
## 26     2003-05-09 1.15215
## 27     2003-05-09 1.15142
## 28     2003-05-09 1.14825
## 29     2003-05-09 1.14952
## 30     2003-05-09 1.14907
## 31     2003-05-11 1.15536
## 32     2003-05-12 1.15733
## 33     2003-05-12 1.16077
## 34     2003-05-12 1.15876
## 35     2003-05-12 1.15553
## 36     2003-05-12 1.15457
## 37     2003-05-12 1.15150
## 38     2003-05-13 1.14968
## 39     2003-05-13 1.14958
## 40     2003-05-13 1.15263
## 41     2003-05-13 1.15002
## 42     2003-05-13 1.15150
## 43     2003-05-13 1.15216
```

```
## 44 2003-05-14 1.15113
## 45 2003-05-14 1.15223
## 46 2003-05-14 1.14919
## 47 2003-05-14 1.14972
## 48 2003-05-14 1.14970
## 49 2003-05-14 1.14713
## 50 2003-05-15 1.14456
## 51 2003-05-15 1.14583
## 52 2003-05-15 1.14749
## 53 2003-05-15 1.14567
## 54 2003-05-15 1.13877
## 55 2003-05-15 1.13881
## 56 2003-05-16 1.14088
## 57 2003-05-16 1.14060
## 58 2003-05-16 1.14810
## 59 2003-05-16 1.15443
## 60 2003-05-16 1.15735
## 61 2003-05-18 1.16688
## 62 2003-05-19 1.16944
## 63 2003-05-19 1.16904
## 64 2003-05-19 1.16657
## 65 2003-05-19 1.16840
## 66 2003-05-19 1.16596
## 67 2003-05-19 1.16309
## 68 2003-05-20 1.16517
## 69 2003-05-20 1.16176
## 70 2003-05-20 1.16434
## 71 2003-05-20 1.16859
## 72 2003-05-20 1.17069
## 73 2003-05-20 1.17225
## 74 2003-05-21 1.17167
## 75 2003-05-21 1.17148
## 76 2003-05-21 1.16859
## 77 2003-05-21 1.17058
## 78 2003-05-21 1.16746
## 79 2003-05-21 1.16541
## 80 2003-05-22 1.16426
## 81 2003-05-22 1.16458
## 82 2003-05-22 1.17167
## 83 2003-05-22 1.16982
## 84 2003-05-22 1.16938
## 85 2003-05-22 1.16802
## 86 2003-05-23 1.16772
## 87 2003-05-23 1.17131
## 88 2003-05-23 1.17905
## 89 2003-05-23 1.17819
```

```
## 90    2003-05-23 1.18266
## 91    2003-05-25 1.18139
## 92    2003-05-26 1.18178
## 93    2003-05-26 1.18073
## 94    2003-05-26 1.18110
## 95    2003-05-26 1.18613
## 96    2003-05-26 1.18690
## 97    2003-05-26 1.18620
## 98    2003-05-27 1.18871
## 99    2003-05-27 1.18807
## 100   2003-05-27 1.18970
## 101   2003-05-27 1.18534
## 102   2003-05-27 1.18288
## 103   2003-05-27 1.18116
## 104   2003-05-28 1.18322
## 105   2003-05-28 1.17695
## 106   2003-05-28 1.17200
## 107   2003-05-28 1.17427
## 108   2003-05-28 1.17649
## 109   2003-05-28 1.17540
## 110   2003-05-29 1.17423
## 111   2003-05-29 1.17036
## 112   2003-05-29 1.17606
## 113   2003-05-29 1.18250
## 114   2003-05-29 1.18833
## 115   2003-05-29 1.18828
## 116   2003-05-30 1.18734
## 117   2003-05-30 1.18536
## 118   2003-05-30 1.18272
## 119   2003-05-30 1.17620
## 120   2003-05-30 1.17691
## 121   2003-05-31 1.17825
## 122   2003-06-01 1.17229
## 123   2003-06-02 1.16748
## 124   2003-06-02 1.16841
## 125   2003-06-02 1.16758
## 126   2003-06-02 1.17402
## 127   2003-06-02 1.17473
## 128   2003-06-02 1.17418
## 129   2003-06-03 1.17552
## 130   2003-06-03 1.17714
## 131   2003-06-03 1.17250
## 132   2003-06-03 1.16998
## 133   2003-06-03 1.17391
## 134   2003-06-03 1.17232
## 135   2003-06-04 1.17247
```

```
## 136 2003-06-04 1.17373
## 137 2003-06-04 1.17039
## 138 2003-06-04 1.17053
## 139 2003-06-04 1.16645
## 140 2003-06-04 1.16468
## 141 2003-06-05 1.16531
## 142 2003-06-05 1.16646
## 143 2003-06-05 1.17341
## 144 2003-06-05 1.18692
## 145 2003-06-05 1.18405
## 146 2003-06-05 1.18342
## 147 2003-06-06 1.18484
## 148 2003-06-06 1.18319
## 149 2003-06-06 1.18172
## 150 2003-06-06 1.16932
## 151 2003-06-06 1.17001
## 152 2003-06-08 1.17032
## 153 2003-06-09 1.17041
## 154 2003-06-09 1.16785
## 155 2003-06-09 1.17224
## 156 2003-06-09 1.17399
## 157 2003-06-09 1.17161
## 158 2003-06-09 1.17111
## 159 2003-06-10 1.17227
## 160 2003-06-10 1.17057
## 161 2003-06-10 1.17109
## 162 2003-06-10 1.16831
## 163 2003-06-10 1.16759
## 164 2003-06-10 1.16708
## 165 2003-06-11 1.16754
## 166 2003-06-11 1.17029
## 167 2003-06-11 1.17530
## 168 2003-06-11 1.17637
## 169 2003-06-11 1.17421
## 170 2003-06-11 1.17542
## 171 2003-06-12 1.17603
## 172 2003-06-12 1.18002
## 173 2003-06-12 1.17460
## 174 2003-06-12 1.17651
## 175 2003-06-12 1.17638
## 176 2003-06-12 1.17716
## 177 2003-06-13 1.17599
## 178 2003-06-13 1.17700
## 179 2003-06-13 1.17518
## 180 2003-06-13 1.18232
## 181 2003-06-13 1.18630
```

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## 188 2003-06-16 1.18263
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## 193 2003-06-17 1.17937
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## 196 2003-06-18 1.17624
## 197 2003-06-18 1.17017
## 198 2003-06-18 1.17068
## 199 2003-06-18 1.16883
## 200 2003-06-18 1.16818
## 201 2003-06-19 1.16146
## 202 2003-06-19 1.16186
## 203 2003-06-19 1.16598
## 204 2003-06-19 1.16805
## 205 2003-06-19 1.17203
## 206 2003-06-19 1.17076
## 207 2003-06-20 1.17232
## 208 2003-06-20 1.16906
## 209 2003-06-20 1.16539
## 210 2003-06-20 1.16138
## 211 2003-06-20 1.16040
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## 215 2003-06-23 1.15424
## 216 2003-06-23 1.15452
## 217 2003-06-23 1.15429
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## 222 2003-06-24 1.14956
## 223 2003-06-24 1.15171
## 224 2003-06-24 1.15028
## 225 2003-06-25 1.15160
## 226 2003-06-25 1.15201
## 227 2003-06-25 1.15371
```

```
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## 229 2003-06-25 1.15398
## 230 2003-06-25 1.15354
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## 232 2003-06-26 1.15101
## 233 2003-06-26 1.14404
## 234 2003-06-26 1.14292
## 235 2003-06-26 1.14181
## 236 2003-06-26 1.14257
## 237 2003-06-27 1.14486
## 238 2003-06-27 1.14144
## 239 2003-06-27 1.14228
## 240 2003-06-27 1.14177
## 241 2003-06-27 1.14254
## 242 2003-06-29 1.14153
## 243 2003-06-30 1.14344
## 244 2003-06-30 1.14553
## 245 2003-06-30 1.14277
## 246 2003-06-30 1.14994
## 247 2003-06-30 1.15116
## 248 2003-06-30 1.15185
## 249 2003-07-01 1.15136
## 250 2003-07-01 1.15370
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## 252 2003-07-01 1.15772
## 253 2003-07-01 1.15608
## 254 2003-07-01 1.15545
## 255 2003-07-02 1.15498
## 256 2003-07-02 1.15338
## 257 2003-07-02 1.15321
## 258 2003-07-02 1.15237
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## 262 2003-07-03 1.14754
## 263 2003-07-03 1.14537
## 264 2003-07-03 1.15029
## 265 2003-07-03 1.14945
## 266 2003-07-03 1.14829
## 267 2003-07-04 1.14684
## 268 2003-07-04 1.14741
## 269 2003-07-04 1.14583
## 270 2003-07-04 1.14894
## 271 2003-07-04 1.14892
## 272 2003-07-06 1.14680
## 273 2003-07-07 1.14566
```

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```
## 274 2003-07-07 1.14119
## 275 2003-07-07 1.13629
## 276 2003-07-07 1.13409
## 277 2003-07-07 1.13252
## 278 2003-07-07 1.13237
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## 280 2003-07-08 1.13152
## 281 2003-07-08 1.13161
## 282 2003-07-08 1.12641
## 283 2003-07-08 1.13151
## 284 2003-07-08 1.13118
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## 292 2003-07-10 1.13573
## 293 2003-07-10 1.13419
## 294 2003-07-10 1.13873
## 295 2003-07-10 1.13891
## 296 2003-07-10 1.13504
## 297 2003-07-11 1.13104
## 298 2003-07-11 1.13331
## 299 2003-07-11 1.13014
## 300 2003-07-11 1.13043
## 301 2003-07-11 1.12990
## 302 2003-07-13 1.12745
## 303 2003-07-14 1.12696
## 304 2003-07-14 1.12641
## 305 2003-07-14 1.12968
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## 307 2003-07-14 1.12779
## 308 2003-07-14 1.12727
## 309 2003-07-15 1.12537
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## 314 2003-07-15 1.11341
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## 316 2003-07-16 1.11294
## 317 2003-07-16 1.11375
## 318 2003-07-16 1.12074
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```

```
## 320 2003-07-16 1.12175
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## 333 2003-07-21 1.12863
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## 336 2003-07-21 1.13377
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## 339 2003-07-22 1.13205
## 340 2003-07-22 1.13491
## 341 2003-07-22 1.13494
## 342 2003-07-22 1.13254
## 343 2003-07-22 1.13315
## 344 2003-07-22 1.13199
## 345 2003-07-23 1.13520
## 346 2003-07-23 1.13869
## 347 2003-07-23 1.14131
## 348 2003-07-23 1.14810
## 349 2003-07-23 1.14754
## 350 2003-07-23 1.14815
## 351 2003-07-24 1.14780
## 352 2003-07-24 1.15054
## 353 2003-07-24 1.14720
## 354 2003-07-24 1.14400
## 355 2003-07-24 1.14695
## 356 2003-07-24 1.14606
## 357 2003-07-25 1.14620
## 358 2003-07-25 1.14916
## 359 2003-07-25 1.14833
## 360 2003-07-25 1.15124
## 361 2003-07-25 1.15079
## 362 2003-07-27 1.14884
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64 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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100 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 13613 2012-01-06 1.27217
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## 13659 2012-01-18 1.27937
```

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## 13705 2012-01-29 1.31857
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## 13710 2012-01-30 1.31439
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## 13713 2012-01-31 1.31957
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## 13717 2012-01-31 1.30683
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## 13728 2012-02-02 1.31443
## 13729 2012-02-02 1.31260
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## 13731 2012-02-03 1.31675
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## 13733 2012-02-03 1.31394
## 13734 2012-02-03 1.31596
## 13735 2012-02-05 1.31072
## 13736 2012-02-06 1.30869
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## 13738 2012-02-06 1.30310
## 13739 2012-02-06 1.31287
## 13740 2012-02-06 1.31304
## 13741 2012-02-06 1.31206
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## 13743 2012-02-07 1.31500
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## 13747 2012-02-07 1.32465
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## 13751 2012-02-08 1.32730
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## 13766 2012-02-13 1.32486
## 13767 2012-02-13 1.32586
## 13768 2012-02-13 1.32366
## 13769 2012-02-13 1.32091
## 13770 2012-02-13 1.31870
## 13771 2012-02-13 1.31604
## 13772 2012-02-14 1.31616
## 13773 2012-02-14 1.31869
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## 13775 2012-02-14 1.31185
## 13776 2012-02-14 1.31312
## 13777 2012-02-14 1.31137
## 13778 2012-02-15 1.31806
## 13779 2012-02-15 1.31694
## 13780 2012-02-15 1.30914
## 13781 2012-02-15 1.30612
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## 13784 2012-02-16 1.30236
## 13785 2012-02-16 1.30060
## 13786 2012-02-16 1.29936
## 13787 2012-02-16 1.31041
## 13788 2012-02-16 1.31309
## 13789 2012-02-16 1.31383
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## 13791 2012-02-17 1.31568
## 13792 2012-02-17 1.31734
## 13793 2012-02-17 1.31530
## 13794 2012-02-17 1.31445
## 13795 2012-02-19 1.32111
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## 13797 2012-02-20 1.32222
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## 13808 2012-02-22 1.32385
## 13809 2012-02-22 1.32300
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## 13812 2012-02-22 1.32507
## 13813 2012-02-22 1.32458
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## 13817 2012-02-23 1.33172
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## 13819 2012-02-23 1.33711
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## 13823 2012-02-24 1.34628
## 13824 2012-02-24 1.34486
## 13825 2012-02-26 1.34570
## 13826 2012-02-27 1.34472
## 13827 2012-02-27 1.34270
## 13828 2012-02-27 1.33886
## 13829 2012-02-27 1.34110
## 13830 2012-02-27 1.33975
## 13831 2012-02-27 1.34131
## 13832 2012-02-28 1.34423
## 13833 2012-02-28 1.34388
## 13834 2012-02-28 1.34382
## 13835 2012-02-28 1.34524
## 13836 2012-02-28 1.34612
## 13837 2012-02-28 1.34745
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## 13839 2012-02-29 1.34621
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## 13843 2012-02-29 1.33388
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## 13849 2012-03-01 1.33215
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## 13858 2012-03-05 1.32274
## 13859 2012-03-05 1.32279
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## 13865 2012-03-06 1.31156
## 13866 2012-03-06 1.31126
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## 13886 2012-03-12 1.30926
## 13887 2012-03-12 1.31142
## 13888 2012-03-12 1.31220
## 13889 2012-03-12 1.31486
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## 13898 2012-03-14 1.30698
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## 13901 2012-03-14 1.30384
## 13902 2012-03-14 1.30334
## 13903 2012-03-14 1.30208
## 13904 2012-03-15 1.30361
## 13905 2012-03-15 1.30509
## 13906 2012-03-15 1.30600
## 13907 2012-03-15 1.30906
## 13908 2012-03-15 1.30815
## 13909 2012-03-15 1.30716
## 13910 2012-03-16 1.30862
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## 13914 2012-03-16 1.31765
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## 13916 2012-03-19 1.31692
## 13917 2012-03-19 1.31461
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## 13924 2012-03-20 1.31892
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## 13927 2012-03-20 1.32650
## 13928 2012-03-21 1.32739
## 13929 2012-03-21 1.32780
## 13930 2012-03-21 1.32231
## 13931 2012-03-21 1.32039
## 13932 2012-03-21 1.32169
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## 13950 2012-03-26 1.33608
## 13951 2012-03-26 1.33606
## 13952 2012-03-27 1.33521
## 13953 2012-03-27 1.33503
## 13954 2012-03-27 1.33462
## 13955 2012-03-27 1.33381
## 13956 2012-03-27 1.33162
## 13957 2012-03-27 1.33317
## 13958 2012-03-28 1.33267
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## 13966 2012-03-29 1.32788
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## 13994 2012-04-04 1.31501
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## 13996 2012-04-05 1.31161
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## 13999 2012-04-05 1.30667
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490 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 21098 2016-10-24 1.08915
## 21099 2016-10-24 1.08906
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## 21101 2016-10-24 1.08825
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## 21103 2016-10-25 1.08797
## 21104 2016-10-25 1.08898
## 21105 2016-10-25 1.08585
## 21106 2016-10-25 1.08910
## 21107 2016-10-25 1.08896
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## 21110 2016-10-26 1.09243
## 21111 2016-10-26 1.09175
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## 21117 2016-10-27 1.09201
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## 21123 2016-10-28 1.09266
## 21124 2016-10-28 1.09400
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## 21129 2016-10-31 1.09445
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## 21131 2016-10-31 1.09814
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## 21149 2016-11-03 1.11057
## 21150 2016-11-03 1.11023
## 21151 2016-11-04 1.10950
## 21152 2016-11-04 1.10993
## 21153 2016-11-04 1.10952
## 21154 2016-11-04 1.11197
## 21155 2016-11-04 1.11425
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## 21157 2016-11-07 1.10736
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510 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 21203 2016-11-16 1.06916
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## 21393 2016-12-30 1.05438
## 21394 2016-12-30 1.05463
## 21395 2016-12-30 1.05219
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516 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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550 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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552 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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554 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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556 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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574 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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600 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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602 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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604 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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610 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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612 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 26265 2020-02-17 1.08373
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## 26269 2020-02-18 1.08024
## 26270 2020-02-18 1.08044
## 26271 2020-02-18 1.07926
## 26272 2020-02-18 1.08023
## 26273 2020-02-19 1.07957
## 26274 2020-02-19 1.08034
## 26275 2020-02-19 1.07936
## 26276 2020-02-19 1.07921
## 26277 2020-02-19 1.08082
## 26278 2020-02-19 1.08004
## 26279 2020-02-20 1.07969
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## 26281 2020-02-20 1.08049
## 26282 2020-02-20 1.07932
## 26283 2020-02-20 1.07856
## 26284 2020-02-20 1.07930
## 26285 2020-02-21 1.07933
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## 26287 2020-02-21 1.08094
## 26288 2020-02-21 1.08577
## 26289 2020-02-21 1.08482
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## 26294 2020-02-24 1.08711
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## 26298 2020-02-25 1.08508
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## 26301 2020-02-25 1.08824
## 26302 2020-02-25 1.08742
## 26303 2020-02-26 1.08763
## 26304 2020-02-26 1.08892
## 26305 2020-02-26 1.08657
## 26306 2020-02-26 1.08789
## 26307 2020-02-26 1.08817
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## 26309 2020-02-27 1.09078
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622 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 26310 2020-02-27 1.09357
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## 26314 2020-02-27 1.09881
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## 26316 2020-02-28 1.10448
## 26317 2020-02-28 1.09871
## 26318 2020-02-28 1.10013
## 26319 2020-02-28 1.10289
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## 26321 2020-03-02 1.10434
## 26322 2020-03-02 1.10798
## 26323 2020-03-02 1.11221
## 26324 2020-03-02 1.11800
## 26325 2020-03-02 1.11342
## 26326 2020-03-02 1.11325
## 26327 2020-03-03 1.11452
## 26328 2020-03-03 1.11274
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## 26334 2020-03-04 1.11570
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## 26343 2020-03-05 1.12411
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## 26345 2020-03-06 1.12285
## 26346 2020-03-06 1.12942
## 26347 2020-03-06 1.13229
## 26348 2020-03-06 1.13057
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## 26351 2020-03-09 1.14018
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## 26354 2020-03-09 1.14710
## 26355 2020-03-09 1.14478
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## 26377 2020-03-13 1.11106
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## 26383 2020-03-16 1.11662
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## 26396 2020-03-18 1.08097
## 26397 2020-03-18 1.09154
## 26398 2020-03-18 1.09014
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## 26401 2020-03-19 1.07992
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```
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## 26413 2020-03-23 1.07795
## 26414 2020-03-23 1.07504
## 26415 2020-03-23 1.07285
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## 26435 2020-03-27 1.10588
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## 26447 2020-03-31 1.10167
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## 26455 2020-04-01 1.09299
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## 26457 2020-04-01 1.09649
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## 26463 2020-04-02 1.08604
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## 26490 2020-04-09 1.08695
## 26491 2020-04-09 1.09043
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## 26493 2020-04-09 1.09299
```

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```
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## 26505 2020-04-13 1.09160
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## 26507 2020-04-14 1.09439
## 26508 2020-04-14 1.09232
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## 26535 2020-04-20 1.08632
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## 26539 2020-04-21 1.08294
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## 26545 2020-04-22 1.08688
## 26546 2020-04-22 1.08158
## 26547 2020-04-22 1.08239
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## 26558 2020-04-24 1.07885
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## 26561 2020-04-27 1.08387
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## 26631 2020-05-12 1.08483
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## 26637 2020-05-13 1.08191
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## 26639 2020-05-14 1.08098
## 26640 2020-05-14 1.08104
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## 26653 2020-05-18 1.08378
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## 26655 2020-05-18 1.09163
## 26656 2020-05-18 1.09194
## 26657 2020-05-19 1.09098
## 26658 2020-05-19 1.09518
## 26659 2020-05-19 1.09509
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```

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```
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## 26690 2020-05-26 1.09766
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## 26714 2020-06-01 1.11299
## 26715 2020-06-01 1.11357
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652 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 28007 2021-03-31 1.17500
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## 28011 2021-04-01 1.17278
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660 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 28149 2021-05-04 1.20035
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## 28216 2021-05-19 1.22080
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666 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

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## 28554 2021-08-05 1.18339
## 28555 2021-08-05 1.18256
## 28556 2021-08-06 1.18257
## 28557 2021-08-06 1.18112
## 28558 2021-08-06 1.17846
## 28559 2021-08-06 1.17563
## 28560 2021-08-06 1.17639
## 28561 2021-08-08 1.17509
## 28562 2021-08-09 1.17635
## 28563 2021-08-09 1.17548
```

```
## 28564 2021-08-09 1.17611
## 28565 2021-08-09 1.17422
## 28566 2021-08-09 1.17370
## 28567 2021-08-09 1.17379
## 28568 2021-08-10 1.17386
## 28569 2021-08-10 1.17323
## 28570 2021-08-10 1.17164
## 28571 2021-08-10 1.17159
## 28572 2021-08-10 1.17227
## 28573 2021-08-10 1.17132
## 28574 2021-08-11 1.17183
## 28575 2021-08-11 1.17127
## 28576 2021-08-11 1.17369
## 28577 2021-08-11 1.17485
## 28578 2021-08-11 1.17399
## 28579 2021-08-11 1.17402
## 28580 2021-08-12 1.17399
## 28581 2021-08-12 1.17470
## 28582 2021-08-12 1.17402
## 28583 2021-08-12 1.17384
## 28584 2021-08-12 1.17305
## 28585 2021-08-12 1.17365
## 28586 2021-08-13 1.17392
## 28587 2021-08-13 1.17424
## 28588 2021-08-13 1.17660
## 28589 2021-08-13 1.18003
## 28590 2021-08-13 1.17966
## 28591 2021-08-15 1.17959
## 28592 2021-08-16 1.17938
## 28593 2021-08-16 1.17874
## 28594 2021-08-16 1.17776
## 28595 2021-08-16 1.17753
## 28596 2021-08-16 1.17777
## 28597 2021-08-16 1.17742
## 28598 2021-08-17 1.17687
## 28599 2021-08-17 1.17775
## 28600 2021-08-17 1.17441
## 28601 2021-08-17 1.17088
## 28602 2021-08-17 1.17094
## 28603 2021-08-17 1.17124
## 28604 2021-08-18 1.17184
## 28605 2021-08-18 1.17203
## 28606 2021-08-18 1.17177
## 28607 2021-08-18 1.16993
## 28608 2021-08-18 1.17134
## 28609 2021-08-18 1.16874
```

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```
## 28610 2021-08-19 1.16772
## 28611 2021-08-19 1.16870
## 28612 2021-08-19 1.16990
## 28613 2021-08-19 1.16885
## 28614 2021-08-19 1.16765
## 28615 2021-08-19 1.16825
## 28616 2021-08-20 1.16862
## 28617 2021-08-20 1.16743
## 28618 2021-08-20 1.16686
## 28619 2021-08-20 1.17034
## 28620 2021-08-20 1.17041
## 28621 2021-08-22 1.16993
## 28622 2021-08-23 1.17190
## 28623 2021-08-23 1.17311
## 28624 2021-08-23 1.17323
## 28625 2021-08-23 1.17395
## 28626 2021-08-23 1.17481
## 28627 2021-08-23 1.17394
## 28628 2021-08-24 1.17414
## 28629 2021-08-24 1.17288
## 28630 2021-08-24 1.17508
## 28631 2021-08-24 1.17476
## 28632 2021-08-24 1.17584
## 28633 2021-08-24 1.17419
## 28634 2021-08-25 1.17408
## 28635 2021-08-25 1.17513
## 28636 2021-08-25 1.17327
## 28637 2021-08-25 1.17604
## 28638 2021-08-25 1.17737
## 28639 2021-08-25 1.17672
## 28640 2021-08-26 1.17644
## 28641 2021-08-26 1.17592
## 28642 2021-08-26 1.17560
## 28643 2021-08-26 1.17527
## 28644 2021-08-26 1.17530
## 28645 2021-08-26 1.17454
## 28646 2021-08-27 1.17635
## 28647 2021-08-27 1.17511
## 28648 2021-08-27 1.17562
## 28649 2021-08-27 1.18007
## 28650 2021-08-27 1.17996
## 28651 2021-08-29 1.18049
## 28652 2021-08-30 1.18039
## 28653 2021-08-30 1.17988
## 28654 2021-08-30 1.17865
## 28655 2021-08-30 1.17975
```

```
## 28656 2021-08-30 1.17974
## 28657 2021-08-30 1.18021
## 28658 2021-08-31 1.18176
## 28659 2021-08-31 1.18204
## 28660 2021-08-31 1.18369
## 28661 2021-08-31 1.18071
## 28662 2021-08-31 1.18102
## 28663 2021-08-31 1.18030
## 28664 2021-09-01 1.17996
## 28665 2021-09-01 1.18142
## 28666 2021-09-01 1.18379
## 28667 2021-09-01 1.18482
## 28668 2021-09-01 1.18402
## 28669 2021-09-01 1.18452
## 28670 2021-09-02 1.18349
## 28671 2021-09-02 1.18457
## 28672 2021-09-02 1.18472
## 28673 2021-09-02 1.18651
## 28674 2021-09-02 1.18758
## 28675 2021-09-02 1.18822
## 28676 2021-09-03 1.18764
## 28677 2021-09-03 1.18748
## 28678 2021-09-03 1.18914
## 28679 2021-09-03 1.18897
## 28680 2021-09-03 1.18811
## 28681 2021-09-05 1.18789
## 28682 2021-09-06 1.18695
## 28683 2021-09-06 1.18642
## 28684 2021-09-06 1.18664
## 28685 2021-09-06 1.18714
## 28686 2021-09-06 1.18716
## 28687 2021-09-06 1.18796
## 28688 2021-09-07 1.18756
## 28689 2021-09-07 1.18764
## 28690 2021-09-07 1.18507
## 28691 2021-09-07 1.18457
## 28692 2021-09-07 1.18419
## 28693 2021-09-07 1.18483
## 28694 2021-09-08 1.18439
## 28695 2021-09-08 1.18216
## 28696 2021-09-08 1.18214
## 28697 2021-09-08 1.18188
## 28698 2021-09-08 1.18175
## 28699 2021-09-08 1.18143
## 28700 2021-09-09 1.18145
## 28701 2021-09-09 1.18341
```

674 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 28702 2021-09-09 1.18234
## 28703 2021-09-09 1.18317
## 28704 2021-09-09 1.18267
## 28705 2021-09-09 1.18243
## 28706 2021-09-10 1.18301
## 28707 2021-09-10 1.18479
## 28708 2021-09-10 1.18270
## 28709 2021-09-10 1.18189
## 28710 2021-09-10 1.18177
## 28711 2021-09-12 1.18054
## 28712 2021-09-13 1.17957
## 28713 2021-09-13 1.17897
## 28714 2021-09-13 1.17827
## 28715 2021-09-13 1.18074
## 28716 2021-09-13 1.18122
## 28717 2021-09-13 1.18087
## 28718 2021-09-14 1.18133
## 28719 2021-09-14 1.18214
## 28720 2021-09-14 1.18416
## 28721 2021-09-14 1.18222
## 28722 2021-09-14 1.18047
## 28723 2021-09-14 1.18057
## 28724 2021-09-15 1.18053
## 28725 2021-09-15 1.18263
## 28726 2021-09-15 1.18117
## 28727 2021-09-15 1.18040
## 28728 2021-09-15 1.18186
## 28729 2021-09-15 1.18192
## 28730 2021-09-16 1.18100
## 28731 2021-09-16 1.17729
## 28732 2021-09-16 1.17552
## 28733 2021-09-16 1.17598
## 28734 2021-09-16 1.17685
## 28735 2021-09-16 1.17600
## 28736 2021-09-17 1.17733
## 28737 2021-09-17 1.17774
## 28738 2021-09-17 1.17738
## 28739 2021-09-17 1.17257
## 28740 2021-09-17 1.17264
## 28741 2021-09-19 1.17238
## 28742 2021-09-20 1.17153
## 28743 2021-09-20 1.17098
## 28744 2021-09-20 1.17147
## 28745 2021-09-20 1.17226
## 28746 2021-09-20 1.17276
## 28747 2021-09-20 1.17258
```

```
## 28748 2021-09-21 1.17320
## 28749 2021-09-21 1.17343
## 28750 2021-09-21 1.17399
## 28751 2021-09-21 1.17287
## 28752 2021-09-21 1.17279
## 28753 2021-09-21 1.17198
## 28754 2021-09-22 1.17220
## 28755 2021-09-22 1.17346
## 28756 2021-09-22 1.17297
## 28757 2021-09-22 1.17353
## 28758 2021-09-22 1.16880
## 28759 2021-09-22 1.16890
## 28760 2021-09-23 1.17098
## 28761 2021-09-23 1.17210
## 28762 2021-09-23 1.17293
## 28763 2021-09-23 1.17443
## 28764 2021-09-23 1.17392
## 28765 2021-09-23 1.17462
## 28766 2021-09-24 1.17373
## 28767 2021-09-24 1.17362
## 28768 2021-09-24 1.17068
## 28769 2021-09-24 1.17164
## 28770 2021-09-24 1.17219
## 28771 2021-09-26 1.17174
## 28772 2021-09-27 1.17226
## 28773 2021-09-27 1.16896
## 28774 2021-09-27 1.17075
## 28775 2021-09-27 1.17022
## 28776 2021-09-27 1.16969
## 28777 2021-09-27 1.16890
## 28778 2021-09-28 1.16990
## 28779 2021-09-28 1.16807
## 28780 2021-09-28 1.16807
## 28781 2021-09-28 1.16821
## 28782 2021-09-28 1.16838
## 28783 2021-09-28 1.16814
## 28784 2021-09-29 1.16868
## 28785 2021-09-29 1.16639
## 28786 2021-09-29 1.16460
## 28787 2021-09-29 1.16016
## 28788 2021-09-29 1.15985
## 28789 2021-09-29 1.16037
## 28790 2021-09-30 1.16082
## 28791 2021-09-30 1.16044
## 28792 2021-09-30 1.15908
## 28793 2021-09-30 1.15708
```

676 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 28794 2021-09-30 1.15799
## 28795 2021-09-30 1.15653
## 28796 2021-10-01 1.15807
## 28797 2021-10-01 1.15788
## 28798 2021-10-01 1.16038
## 28799 2021-10-01 1.15971
## 28800 2021-10-01 1.16011
## 28801 2021-10-03 1.16031
## 28802 2021-10-04 1.15960
## 28803 2021-10-04 1.16127
## 28804 2021-10-04 1.16327
## 28805 2021-10-04 1.16192
## 28806 2021-10-04 1.16212
## 28807 2021-10-04 1.16116
## 28808 2021-10-05 1.15950
## 28809 2021-10-05 1.15990
## 28810 2021-10-05 1.16002
## 28811 2021-10-05 1.16053
## 28812 2021-10-05 1.15990
## 28813 2021-10-05 1.15939
## 28814 2021-10-06 1.15848
## 28815 2021-10-06 1.15523
## 28816 2021-10-06 1.15453
## 28817 2021-10-06 1.15435
## 28818 2021-10-06 1.15584
## 28819 2021-10-06 1.15586
## 28820 2021-10-07 1.15557
## 28821 2021-10-07 1.15603
## 28822 2021-10-07 1.15560
## 28823 2021-10-07 1.15557
## 28824 2021-10-07 1.15532
## 28825 2021-10-07 1.15585
## 28826 2021-10-08 1.15484
## 28827 2021-10-08 1.15537
## 28828 2021-10-08 1.15710
## 28829 2021-10-08 1.15645
## 28830 2021-10-08 1.15770
## 28831 2021-10-10 1.15748
## 28832 2021-10-11 1.15726
## 28833 2021-10-11 1.15700
## 28834 2021-10-11 1.15616
## 28835 2021-10-11 1.15635
## 28836 2021-10-11 1.15535
## 28837 2021-10-11 1.15494
## 28838 2021-10-12 1.15565
## 28839 2021-10-12 1.15622
```

```

## 28840 2021-10-12 1.15418
## 28841 2021-10-12 1.15283
## 28842 2021-10-12 1.15307
## 28843 2021-10-12 1.15414
## 28844 2021-10-13 1.15527
## 28845 2021-10-13 1.15565
## 28846 2021-10-13 1.15430
## 28847 2021-10-13 1.15780
## 28848 2021-10-13 1.15956
## 28849 2021-10-13 1.15992
## 28850 2021-10-14 1.15900
## 28851 2021-10-14 1.16166
## 28852 2021-10-14 1.16065
## 28853 2021-10-14 1.15883
## 28854 2021-10-14 1.15978
## 28855 2021-10-14 1.15940
## 28856 2021-10-15 1.16082
## 28857 2021-10-15 1.16034
## 28858 2021-10-15 1.15923
## 28859 2021-10-15 1.15953
## 28860 2021-10-15 1.16040

```



Se evidencian fluctuaciones significativas que reflejan los cambios en el mercado durante el período analizado. La serie muestra patrones claros de tendencias ascendentes y descendentes, lo que sugiere posibles componentes de largo plazo

y estacionalidad que deben ser tratados en etapas posteriores del análisis.

6.3 3. División del Dataset en Conjuntos de Entrenamiento y Validación

Se divide el dataset en 70% para entrenamiento y 30% para evaluación del modelo.

```
##           Gmt.time   close
## 20203 2016-03-29 1.11906
## 20204 2016-03-29 1.11810
## 20205 2016-03-29 1.12145
## 20206 2016-03-29 1.12648
## 20207 2016-03-29 1.12915
## 20208 2016-03-29 1.12967
## 20209 2016-03-30 1.12967
## 20210 2016-03-30 1.13199
## 20211 2016-03-30 1.13114
## 20212 2016-03-30 1.13190
## 20213 2016-03-30 1.13391
## 20214 2016-03-30 1.13298
## 20215 2016-03-31 1.13181
## 20216 2016-03-31 1.13568
## 20217 2016-03-31 1.13888
## 20218 2016-03-31 1.13816
## 20219 2016-03-31 1.13814
## 20220 2016-03-31 1.13831
## 20221 2016-04-01 1.13742
## 20222 2016-04-01 1.14000
## 20223 2016-04-01 1.13999
## 20224 2016-04-01 1.13922
## 20225 2016-04-01 1.13966
## 20226 2016-04-03 1.14063
## 20227 2016-04-04 1.13834
## 20228 2016-04-04 1.13714
## 20229 2016-04-04 1.13979
## 20230 2016-04-04 1.13952
## 20231 2016-04-04 1.13949
## 20232 2016-04-04 1.14005
## 20233 2016-04-05 1.13903
## 20234 2016-04-05 1.13670
## 20235 2016-04-05 1.13732
## 20236 2016-04-05 1.13962
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN679

```
## 20237 2016-04-05 1.13857
## 20238 2016-04-05 1.13830
## 20239 2016-04-06 1.13724
## 20240 2016-04-06 1.13495
## 20241 2016-04-06 1.13659
## 20242 2016-04-06 1.14148
## 20243 2016-04-06 1.13997
## 20244 2016-04-06 1.14119
## 20245 2016-04-07 1.14063
## 20246 2016-04-07 1.13871
## 20247 2016-04-07 1.13777
## 20248 2016-04-07 1.13759
## 20249 2016-04-07 1.13780
## 20250 2016-04-07 1.13687
## 20251 2016-04-08 1.13647
## 20252 2016-04-08 1.13869
## 20253 2016-04-08 1.13636
## 20254 2016-04-08 1.14072
## 20255 2016-04-08 1.13997
## 20256 2016-04-10 1.13960
## 20257 2016-04-11 1.14105
## 20258 2016-04-11 1.13930
## 20259 2016-04-11 1.14118
## 20260 2016-04-11 1.14139
## 20261 2016-04-11 1.14103
## 20262 2016-04-11 1.14105
## 20263 2016-04-12 1.14086
## 20264 2016-04-12 1.14336
## 20265 2016-04-12 1.13828
## 20266 2016-04-12 1.13757
## 20267 2016-04-12 1.13876
## 20268 2016-04-12 1.13809
## 20269 2016-04-13 1.13675
## 20270 2016-04-13 1.13379
## 20271 2016-04-13 1.13130
## 20272 2016-04-13 1.12873
## 20273 2016-04-13 1.12752
## 20274 2016-04-13 1.12663
## 20275 2016-04-14 1.12619
## 20276 2016-04-14 1.12683
## 20277 2016-04-14 1.12765
## 20278 2016-04-14 1.12622
## 20279 2016-04-14 1.12684
## 20280 2016-04-14 1.12557
## 20281 2016-04-15 1.12626
## 20282 2016-04-15 1.12650
```

```
## 20283 2016-04-15 1.12747
## 20284 2016-04-15 1.12979
## 20285 2016-04-15 1.12855
## 20286 2016-04-17 1.12953
## 20287 2016-04-18 1.12867
## 20288 2016-04-18 1.13020
## 20289 2016-04-18 1.13073
## 20290 2016-04-18 1.13249
## 20291 2016-04-18 1.13154
## 20292 2016-04-18 1.13105
## 20293 2016-04-19 1.13242
## 20294 2016-04-19 1.13335
## 20295 2016-04-19 1.13539
## 20296 2016-04-19 1.13761
## 20297 2016-04-19 1.13580
## 20298 2016-04-19 1.13579
## 20299 2016-04-20 1.13614
## 20300 2016-04-20 1.13659
## 20301 2016-04-20 1.13660
## 20302 2016-04-20 1.13274
## 20303 2016-04-20 1.12974
## 20304 2016-04-20 1.12990
## 20305 2016-04-21 1.12928
## 20306 2016-04-21 1.12929
## 20307 2016-04-21 1.13761
## 20308 2016-04-21 1.12982
## 20309 2016-04-21 1.12876
## 20310 2016-04-21 1.12979
## 20311 2016-04-22 1.12946
## 20312 2016-04-22 1.12735
## 20313 2016-04-22 1.12563
## 20314 2016-04-22 1.12232
## 20315 2016-04-22 1.12266
## 20316 2016-04-24 1.12273
## 20317 2016-04-25 1.12415
## 20318 2016-04-25 1.12561
## 20319 2016-04-25 1.12505
## 20320 2016-04-25 1.12661
## 20321 2016-04-25 1.12695
## 20322 2016-04-25 1.12655
## 20323 2016-04-26 1.12629
## 20324 2016-04-26 1.12928
## 20325 2016-04-26 1.13075
## 20326 2016-04-26 1.12953
## 20327 2016-04-26 1.12984
## 20328 2016-04-26 1.13035
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN681

```
## 20329 2016-04-27 1.12970
## 20330 2016-04-27 1.13221
## 20331 2016-04-27 1.13159
## 20332 2016-04-27 1.13243
## 20333 2016-04-27 1.13227
## 20334 2016-04-27 1.13104
## 20335 2016-04-28 1.13361
## 20336 2016-04-28 1.13589
## 20337 2016-04-28 1.13457
## 20338 2016-04-28 1.13374
## 20339 2016-04-28 1.13536
## 20340 2016-04-28 1.13635
## 20341 2016-04-29 1.13939
## 20342 2016-04-29 1.13797
## 20343 2016-04-29 1.14149
## 20344 2016-04-29 1.14402
## 20345 2016-04-29 1.14516
## 20346 2016-05-01 1.14746
## 20347 2016-05-02 1.14667
## 20348 2016-05-02 1.14791
## 20349 2016-05-02 1.14839
## 20350 2016-05-02 1.15242
## 20351 2016-05-02 1.15352
## 20352 2016-05-02 1.15341
## 20353 2016-05-03 1.15328
## 20354 2016-05-03 1.15930
## 20355 2016-05-03 1.15538
## 20356 2016-05-03 1.15269
## 20357 2016-05-03 1.14971
## 20358 2016-05-03 1.15054
## 20359 2016-05-04 1.14877
## 20360 2016-05-04 1.14894
## 20361 2016-05-04 1.14936
## 20362 2016-05-04 1.14973
## 20363 2016-05-04 1.14887
## 20364 2016-05-04 1.14856
## 20365 2016-05-05 1.14844
## 20366 2016-05-05 1.14386
## 20367 2016-05-05 1.14343
## 20368 2016-05-05 1.14121
## 20369 2016-05-05 1.14060
## 20370 2016-05-05 1.13968
## 20371 2016-05-06 1.14033
## 20372 2016-05-06 1.14226
## 20373 2016-05-06 1.14359
## 20374 2016-05-06 1.14247
```

```
## 20375 2016-05-06 1.14090
## 20376 2016-05-08 1.13838
## 20377 2016-05-09 1.14121
## 20378 2016-05-09 1.13938
## 20379 2016-05-09 1.14026
## 20380 2016-05-09 1.13911
## 20381 2016-05-09 1.13835
## 20382 2016-05-09 1.13848
## 20383 2016-05-10 1.13741
## 20384 2016-05-10 1.13952
## 20385 2016-05-10 1.13744
## 20386 2016-05-10 1.13821
## 20387 2016-05-10 1.13741
## 20388 2016-05-10 1.13732
## 20389 2016-05-11 1.13806
## 20390 2016-05-11 1.13901
## 20391 2016-05-11 1.14061
## 20392 2016-05-11 1.14325
## 20393 2016-05-11 1.14265
## 20394 2016-05-11 1.14285
## 20395 2016-05-12 1.14237
## 20396 2016-05-12 1.14081
## 20397 2016-05-12 1.14050
## 20398 2016-05-12 1.13866
## 20399 2016-05-12 1.13770
## 20400 2016-05-12 1.13739
## 20401 2016-05-13 1.13738
## 20402 2016-05-13 1.13517
## 20403 2016-05-13 1.13172
## 20404 2016-05-13 1.12945
## 20405 2016-05-13 1.13136
## 20406 2016-05-15 1.13038
## 20407 2016-05-16 1.13102
## 20408 2016-05-16 1.13219
## 20409 2016-05-16 1.13364
## 20410 2016-05-16 1.13283
## 20411 2016-05-16 1.13216
## 20412 2016-05-16 1.13181
## 20413 2016-05-17 1.13154
## 20414 2016-05-17 1.13246
## 20415 2016-05-17 1.13110
## 20416 2016-05-17 1.13319
## 20417 2016-05-17 1.13150
## 20418 2016-05-17 1.13085
## 20419 2016-05-18 1.12857
## 20420 2016-05-18 1.12630
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN683

```
## 20421 2016-05-18 1.12746
## 20422 2016-05-18 1.12808
## 20423 2016-05-18 1.12167
## 20424 2016-05-18 1.12261
## 20425 2016-05-19 1.12186
## 20426 2016-05-19 1.12256
## 20427 2016-05-19 1.11813
## 20428 2016-05-19 1.12083
## 20429 2016-05-19 1.12032
## 20430 2016-05-19 1.11990
## 20431 2016-05-20 1.12011
## 20432 2016-05-20 1.12213
## 20433 2016-05-20 1.12226
## 20434 2016-05-20 1.12129
## 20435 2016-05-20 1.12242
## 20436 2016-05-22 1.12247
## 20437 2016-05-23 1.12312
## 20438 2016-05-23 1.12103
## 20439 2016-05-23 1.12003
## 20440 2016-05-23 1.12103
## 20441 2016-05-23 1.12212
## 20442 2016-05-23 1.12126
## 20443 2016-05-24 1.12135
## 20444 2016-05-24 1.11792
## 20445 2016-05-24 1.11609
## 20446 2016-05-24 1.11495
## 20447 2016-05-24 1.11415
## 20448 2016-05-24 1.11388
## 20449 2016-05-25 1.11505
## 20450 2016-05-25 1.11466
## 20451 2016-05-25 1.11471
## 20452 2016-05-25 1.11592
## 20453 2016-05-25 1.11554
## 20454 2016-05-25 1.11706
## 20455 2016-05-26 1.11804
## 20456 2016-05-26 1.11784
## 20457 2016-05-26 1.12004
## 20458 2016-05-26 1.11758
## 20459 2016-05-26 1.11943
## 20460 2016-05-26 1.11919
## 20461 2016-05-27 1.11888
## 20462 2016-05-27 1.11812
## 20463 2016-05-27 1.11566
## 20464 2016-05-27 1.11370
## 20465 2016-05-27 1.11164
## 20466 2016-05-29 1.11033
```

```
## 20467 2016-05-30 1.11053
## 20468 2016-05-30 1.11344
## 20469 2016-05-30 1.11399
## 20470 2016-05-30 1.11344
## 20471 2016-05-30 1.11392
## 20472 2016-05-30 1.11478
## 20473 2016-05-31 1.11335
## 20474 2016-05-31 1.11346
## 20475 2016-05-31 1.11546
## 20476 2016-05-31 1.11388
## 20477 2016-05-31 1.11325
## 20478 2016-05-31 1.11255
## 20479 2016-06-01 1.11243
## 20480 2016-06-01 1.11553
## 20481 2016-06-01 1.11780
## 20482 2016-06-01 1.11738
## 20483 2016-06-01 1.11889
## 20484 2016-06-01 1.11941
## 20485 2016-06-02 1.12055
## 20486 2016-06-02 1.12111
## 20487 2016-06-02 1.11888
## 20488 2016-06-02 1.11563
## 20489 2016-06-02 1.11509
## 20490 2016-06-02 1.11440
## 20491 2016-06-03 1.11576
## 20492 2016-06-03 1.11488
## 20493 2016-06-03 1.12875
## 20494 2016-06-03 1.13264
## 20495 2016-06-03 1.13672
## 20496 2016-06-05 1.13460
## 20497 2016-06-06 1.13420
## 20498 2016-06-06 1.13580
## 20499 2016-06-06 1.13489
## 20500 2016-06-06 1.13782
## 20501 2016-06-06 1.13563
## 20502 2016-06-06 1.13573
## 20503 2016-06-07 1.13576
## 20504 2016-06-07 1.13653
## 20505 2016-06-07 1.13651
## 20506 2016-06-07 1.13488
## 20507 2016-06-07 1.13598
## 20508 2016-06-07 1.13620
## 20509 2016-06-08 1.13746
## 20510 2016-06-08 1.13705
## 20511 2016-06-08 1.13925
## 20512 2016-06-08 1.13995
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN685

```
## 20513 2016-06-08 1.13968
## 20514 2016-06-08 1.13997
## 20515 2016-06-09 1.14050
## 20516 2016-06-09 1.13654
## 20517 2016-06-09 1.13264
## 20518 2016-06-09 1.13195
## 20519 2016-06-09 1.13184
## 20520 2016-06-09 1.12981
## 20521 2016-06-10 1.12945
## 20522 2016-06-10 1.13014
## 20523 2016-06-10 1.13043
## 20524 2016-06-10 1.12786
## 20525 2016-06-10 1.12518
## 20526 2016-06-12 1.12468
## 20527 2016-06-13 1.12510
## 20528 2016-06-13 1.12716
## 20529 2016-06-13 1.12512
## 20530 2016-06-13 1.12842
## 20531 2016-06-13 1.12949
## 20532 2016-06-13 1.12956
## 20533 2016-06-14 1.12882
## 20534 2016-06-14 1.12361
## 20535 2016-06-14 1.12344
## 20536 2016-06-14 1.12127
## 20537 2016-06-14 1.12084
## 20538 2016-06-14 1.12011
## 20539 2016-06-15 1.12092
## 20540 2016-06-15 1.12197
## 20541 2016-06-15 1.12259
## 20542 2016-06-15 1.12376
## 20543 2016-06-15 1.12599
## 20544 2016-06-15 1.12688
## 20545 2016-06-16 1.12771
## 20546 2016-06-16 1.12613
## 20547 2016-06-16 1.11709
## 20548 2016-06-16 1.12068
## 20549 2016-06-16 1.12257
## 20550 2016-06-16 1.12686
## 20551 2016-06-17 1.12478
## 20552 2016-06-17 1.12573
## 20553 2016-06-17 1.12458
## 20554 2016-06-17 1.12670
## 20555 2016-06-17 1.12793
## 20556 2016-06-19 1.13517
## 20557 2016-06-20 1.13783
## 20558 2016-06-20 1.13479
```

```
## 20559 2016-06-20 1.13428
## 20560 2016-06-20 1.13147
## 20561 2016-06-20 1.13168
## 20562 2016-06-20 1.13321
## 20563 2016-06-21 1.13335
## 20564 2016-06-21 1.13359
## 20565 2016-06-21 1.12847
## 20566 2016-06-21 1.12592
## 20567 2016-06-21 1.12427
## 20568 2016-06-21 1.12430
## 20569 2016-06-22 1.12646
## 20570 2016-06-22 1.12729
## 20571 2016-06-22 1.13131
## 20572 2016-06-22 1.13032
## 20573 2016-06-22 1.12973
## 20574 2016-06-22 1.13314
## 20575 2016-06-23 1.13368
## 20576 2016-06-23 1.13538
## 20577 2016-06-23 1.13915
## 20578 2016-06-23 1.13535
## 20579 2016-06-23 1.13880
## 20580 2016-06-23 1.12778
## 20581 2016-06-24 1.09485
## 20582 2016-06-24 1.11277
## 20583 2016-06-24 1.10518
## 20584 2016-06-24 1.11659
## 20585 2016-06-24 1.11141
## 20586 2016-06-26 1.10127
## 20587 2016-06-27 1.10143
## 20588 2016-06-27 1.10513
## 20589 2016-06-27 1.09925
## 20590 2016-06-27 1.10381
## 20591 2016-06-27 1.10260
## 20592 2016-06-27 1.10198
## 20593 2016-06-28 1.10623
## 20594 2016-06-28 1.10536
## 20595 2016-06-28 1.10718
## 20596 2016-06-28 1.10527
## 20597 2016-06-28 1.10670
## 20598 2016-06-28 1.10626
## 20599 2016-06-29 1.10677
## 20600 2016-06-29 1.10620
## 20601 2016-06-29 1.10817
## 20602 2016-06-29 1.10980
## 20603 2016-06-29 1.11259
## 20604 2016-06-29 1.11097
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN687

```
## 20605 2016-06-30 1.11018
## 20606 2016-06-30 1.11214
## 20607 2016-06-30 1.11128
## 20608 2016-06-30 1.10733
## 20609 2016-06-30 1.11066
## 20610 2016-06-30 1.11129
## 20611 2016-07-01 1.11001
## 20612 2016-07-01 1.11062
## 20613 2016-07-01 1.11324
## 20614 2016-07-01 1.11358
## 20615 2016-07-01 1.11418
## 20616 2016-07-03 1.11295
## 20617 2016-07-04 1.11357
## 20618 2016-07-04 1.11094
## 20619 2016-07-04 1.11445
## 20620 2016-07-04 1.11482
## 20621 2016-07-04 1.11563
## 20622 2016-07-04 1.11340
## 20623 2016-07-05 1.11240
## 20624 2016-07-05 1.11366
## 20625 2016-07-05 1.11545
## 20626 2016-07-05 1.10904
## 20627 2016-07-05 1.10773
## 20628 2016-07-05 1.10503
## 20629 2016-07-06 1.10533
## 20630 2016-07-06 1.10559
## 20631 2016-07-06 1.10742
## 20632 2016-07-06 1.10895
## 20633 2016-07-06 1.10997
## 20634 2016-07-06 1.10884
## 20635 2016-07-07 1.11020
## 20636 2016-07-07 1.10817
## 20637 2016-07-07 1.10875
## 20638 2016-07-07 1.10642
## 20639 2016-07-07 1.10629
## 20640 2016-07-07 1.10685
## 20641 2016-07-08 1.10840
## 20642 2016-07-08 1.10749
## 20643 2016-07-08 1.10248
## 20644 2016-07-08 1.10546
## 20645 2016-07-08 1.10523
## 20646 2016-07-10 1.10387
## 20647 2016-07-11 1.10471
## 20648 2016-07-11 1.10263
## 20649 2016-07-11 1.10538
## 20650 2016-07-11 1.10534
```

```
## 20651 2016-07-11 1.10590
## 20652 2016-07-11 1.10597
## 20653 2016-07-12 1.10778
## 20654 2016-07-12 1.11115
## 20655 2016-07-12 1.11020
## 20656 2016-07-12 1.10916
## 20657 2016-07-12 1.10611
## 20658 2016-07-12 1.10622
## 20659 2016-07-13 1.10659
## 20660 2016-07-13 1.10599
## 20661 2016-07-13 1.10879
## 20662 2016-07-13 1.11085
## 20663 2016-07-13 1.10915
## 20664 2016-07-13 1.10966
## 20665 2016-07-14 1.11115
## 20666 2016-07-14 1.11080
## 20667 2016-07-14 1.11152
## 20668 2016-07-14 1.11135
## 20669 2016-07-14 1.11224
## 20670 2016-07-14 1.11169
## 20671 2016-07-15 1.11268
## 20672 2016-07-15 1.11391
## 20673 2016-07-15 1.11167
## 20674 2016-07-15 1.10623
## 20675 2016-07-15 1.10374
## 20676 2016-07-17 1.10576
## 20677 2016-07-18 1.10658
## 20678 2016-07-18 1.10512
## 20679 2016-07-18 1.10513
## 20680 2016-07-18 1.10714
## 20681 2016-07-18 1.10756
## 20682 2016-07-18 1.10681
## 20683 2016-07-19 1.10758
## 20684 2016-07-19 1.10668
## 20685 2016-07-19 1.10247
## 20686 2016-07-19 1.10145
## 20687 2016-07-19 1.10227
## 20688 2016-07-19 1.10146
## 20689 2016-07-20 1.10159
## 20690 2016-07-20 1.10019
## 20691 2016-07-20 1.09954
## 20692 2016-07-20 1.10062
## 20693 2016-07-20 1.10162
## 20694 2016-07-20 1.10101
## 20695 2016-07-21 1.10348
## 20696 2016-07-21 1.10149
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN689

```
## 20697 2016-07-21 1.10436
## 20698 2016-07-21 1.10077
## 20699 2016-07-21 1.10286
## 20700 2016-07-21 1.10285
## 20701 2016-07-22 1.10310
## 20702 2016-07-22 1.10290
## 20703 2016-07-22 1.10141
## 20704 2016-07-22 1.09672
## 20705 2016-07-22 1.09777
## 20706 2016-07-24 1.09599
## 20707 2016-07-25 1.09756
## 20708 2016-07-25 1.09827
## 20709 2016-07-25 1.09741
## 20710 2016-07-25 1.09874
## 20711 2016-07-25 1.09967
## 20712 2016-07-25 1.09848
## 20713 2016-07-26 1.10050
## 20714 2016-07-26 1.10118
## 20715 2016-07-26 1.09951
## 20716 2016-07-26 1.09881
## 20717 2016-07-26 1.09869
## 20718 2016-07-26 1.09904
## 20719 2016-07-27 1.10005
## 20720 2016-07-27 1.09940
## 20721 2016-07-27 1.09994
## 20722 2016-07-27 1.09914
## 20723 2016-07-27 1.10588
## 20724 2016-07-27 1.10679
## 20725 2016-07-28 1.10704
## 20726 2016-07-28 1.11052
## 20727 2016-07-28 1.10997
## 20728 2016-07-28 1.10758
## 20729 2016-07-28 1.10767
## 20730 2016-07-28 1.10820
## 20731 2016-07-29 1.10818
## 20732 2016-07-29 1.10986
## 20733 2016-07-29 1.11501
## 20734 2016-07-29 1.11568
## 20735 2016-07-29 1.11765
## 20736 2016-07-31 1.11756
## 20737 2016-08-01 1.11797
## 20738 2016-08-01 1.11598
## 20739 2016-08-01 1.11651
## 20740 2016-08-01 1.11712
## 20741 2016-08-01 1.11637
## 20742 2016-08-01 1.11725
```

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```
## 20743 2016-08-02 1.11766
## 20744 2016-08-02 1.12024
## 20745 2016-08-02 1.12012
## 20746 2016-08-02 1.12232
## 20747 2016-08-02 1.12259
## 20748 2016-08-02 1.12148
## 20749 2016-08-03 1.12137
## 20750 2016-08-03 1.12000
## 20751 2016-08-03 1.11934
## 20752 2016-08-03 1.11738
## 20753 2016-08-03 1.11499
## 20754 2016-08-03 1.11445
## 20755 2016-08-04 1.11461
## 20756 2016-08-04 1.11345
## 20757 2016-08-04 1.11443
## 20758 2016-08-04 1.11375
## 20759 2016-08-04 1.11307
## 20760 2016-08-04 1.11324
## 20761 2016-08-05 1.11368
## 20762 2016-08-05 1.11502
## 20763 2016-08-05 1.10839
## 20764 2016-08-05 1.10884
## 20765 2016-08-05 1.10897
## 20766 2016-08-07 1.10839
## 20767 2016-08-08 1.11046
## 20768 2016-08-08 1.10864
## 20769 2016-08-08 1.10868
## 20770 2016-08-08 1.10775
## 20771 2016-08-08 1.10889
## 20772 2016-08-08 1.10864
## 20773 2016-08-09 1.10832
## 20774 2016-08-09 1.10944
## 20775 2016-08-09 1.10797
## 20776 2016-08-09 1.11028
## 20777 2016-08-09 1.11172
## 20778 2016-08-09 1.11383
## 20779 2016-08-10 1.11502
## 20780 2016-08-10 1.11469
## 20781 2016-08-10 1.11895
## 20782 2016-08-10 1.11669
## 20783 2016-08-10 1.11775
## 20784 2016-08-10 1.11842
## 20785 2016-08-11 1.11682
## 20786 2016-08-11 1.11435
## 20787 2016-08-11 1.11572
## 20788 2016-08-11 1.11577
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN691

```
## 20789 2016-08-11 1.11376
## 20790 2016-08-11 1.11348
## 20791 2016-08-12 1.11400
## 20792 2016-08-12 1.11550
## 20793 2016-08-12 1.12091
## 20794 2016-08-12 1.11684
## 20795 2016-08-12 1.11666
## 20796 2016-08-14 1.11559
## 20797 2016-08-15 1.11585
## 20798 2016-08-15 1.11685
## 20799 2016-08-15 1.11745
## 20800 2016-08-15 1.11815
## 20801 2016-08-15 1.11838
## 20802 2016-08-15 1.11810
## 20803 2016-08-16 1.11995
## 20804 2016-08-16 1.12584
## 20805 2016-08-16 1.12791
## 20806 2016-08-16 1.12693
## 20807 2016-08-16 1.12788
## 20808 2016-08-16 1.12799
## 20809 2016-08-17 1.12668
## 20810 2016-08-17 1.12570
## 20811 2016-08-17 1.12720
## 20812 2016-08-17 1.12726
## 20813 2016-08-17 1.12903
## 20814 2016-08-17 1.12982
## 20815 2016-08-18 1.13045
## 20816 2016-08-18 1.13263
## 20817 2016-08-18 1.13120
## 20818 2016-08-18 1.13295
## 20819 2016-08-18 1.13546
## 20820 2016-08-18 1.13416
## 20821 2016-08-19 1.13373
## 20822 2016-08-19 1.13172
## 20823 2016-08-19 1.13212
## 20824 2016-08-19 1.13200
## 20825 2016-08-19 1.13256
## 20826 2016-08-21 1.12898
## 20827 2016-08-22 1.12816
## 20828 2016-08-22 1.12977
## 20829 2016-08-22 1.13046
## 20830 2016-08-22 1.13196
## 20831 2016-08-22 1.13205
## 20832 2016-08-22 1.13263
## 20833 2016-08-23 1.13386
## 20834 2016-08-23 1.13319
```

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```
## 20835 2016-08-23 1.13387
## 20836 2016-08-23 1.13181
## 20837 2016-08-23 1.13060
## 20838 2016-08-23 1.12990
## 20839 2016-08-24 1.12956
## 20840 2016-08-24 1.12947
## 20841 2016-08-24 1.12601
## 20842 2016-08-24 1.12687
## 20843 2016-08-24 1.12640
## 20844 2016-08-24 1.12747
## 20845 2016-08-25 1.12700
## 20846 2016-08-25 1.12844
## 20847 2016-08-25 1.12944
## 20848 2016-08-25 1.12780
## 20849 2016-08-25 1.12861
## 20850 2016-08-25 1.12926
## 20851 2016-08-26 1.12886
## 20852 2016-08-26 1.12870
## 20853 2016-08-26 1.12996
## 20854 2016-08-26 1.12349
## 20855 2016-08-26 1.11982
## 20856 2016-08-28 1.11942
## 20857 2016-08-29 1.12026
## 20858 2016-08-29 1.11864
## 20859 2016-08-29 1.11663
## 20860 2016-08-29 1.11758
## 20861 2016-08-29 1.11895
## 20862 2016-08-29 1.11853
## 20863 2016-08-30 1.11716
## 20864 2016-08-30 1.11694
## 20865 2016-08-30 1.11591
## 20866 2016-08-30 1.11510
## 20867 2016-08-30 1.11432
## 20868 2016-08-30 1.11411
## 20869 2016-08-31 1.11570
## 20870 2016-08-31 1.11436
## 20871 2016-08-31 1.11324
## 20872 2016-08-31 1.11580
## 20873 2016-08-31 1.11592
## 20874 2016-08-31 1.11539
## 20875 2016-09-01 1.11535
## 20876 2016-09-01 1.11501
## 20877 2016-09-01 1.11409
## 20878 2016-09-01 1.11978
## 20879 2016-09-01 1.11971
## 20880 2016-09-01 1.12012
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN693

```
## 20881 2016-09-02 1.12010
## 20882 2016-09-02 1.11831
## 20883 2016-09-02 1.12081
## 20884 2016-09-02 1.11629
## 20885 2016-09-02 1.11565
## 20886 2016-09-04 1.11580
## 20887 2016-09-05 1.11748
## 20888 2016-09-05 1.11681
## 20889 2016-09-05 1.11548
## 20890 2016-09-05 1.11531
## 20891 2016-09-05 1.11481
## 20892 2016-09-05 1.11448
## 20893 2016-09-06 1.11467
## 20894 2016-09-06 1.11640
## 20895 2016-09-06 1.11594
## 20896 2016-09-06 1.12407
## 20897 2016-09-06 1.12560
## 20898 2016-09-06 1.12434
## 20899 2016-09-07 1.12522
## 20900 2016-09-07 1.12397
## 20901 2016-09-07 1.12454
## 20902 2016-09-07 1.12323
## 20903 2016-09-07 1.12397
## 20904 2016-09-07 1.12484
## 20905 2016-09-08 1.12489
## 20906 2016-09-08 1.12727
## 20907 2016-09-08 1.13073
## 20908 2016-09-08 1.12452
## 20909 2016-09-08 1.12604
## 20910 2016-09-08 1.12678
## 20911 2016-09-09 1.12774
## 20912 2016-09-09 1.12702
## 20913 2016-09-09 1.12339
## 20914 2016-09-09 1.12150
## 20915 2016-09-09 1.12345
## 20916 2016-09-11 1.12489
## 20917 2016-09-12 1.12416
## 20918 2016-09-12 1.12396
## 20919 2016-09-12 1.12253
## 20920 2016-09-12 1.12358
## 20921 2016-09-12 1.12359
## 20922 2016-09-12 1.12300
## 20923 2016-09-13 1.12337
## 20924 2016-09-13 1.12332
## 20925 2016-09-13 1.12348
## 20926 2016-09-13 1.12350
```

```
## 20927 2016-09-13 1.12214
## 20928 2016-09-13 1.12185
## 20929 2016-09-14 1.12259
## 20930 2016-09-14 1.12245
## 20931 2016-09-14 1.12211
## 20932 2016-09-14 1.12545
## 20933 2016-09-14 1.12520
## 20934 2016-09-14 1.12433
## 20935 2016-09-15 1.12429
## 20936 2016-09-15 1.12341
## 20937 2016-09-15 1.12468
## 20938 2016-09-15 1.12422
## 20939 2016-09-15 1.12443
## 20940 2016-09-15 1.12405
## 20941 2016-09-16 1.12393
## 20942 2016-09-16 1.12329
## 20943 2016-09-16 1.11849
## 20944 2016-09-16 1.11627
## 20945 2016-09-16 1.11592
## 20946 2016-09-18 1.11570
## 20947 2016-09-19 1.11675
## 20948 2016-09-19 1.11643
## 20949 2016-09-19 1.11706
## 20950 2016-09-19 1.11769
## 20951 2016-09-19 1.11760
## 20952 2016-09-19 1.11723
## 20953 2016-09-20 1.11740
## 20954 2016-09-20 1.11884
## 20955 2016-09-20 1.11783
## 20956 2016-09-20 1.11646
## 20957 2016-09-20 1.11510
## 20958 2016-09-20 1.11533
## 20959 2016-09-21 1.11309
## 20960 2016-09-21 1.11489
## 20961 2016-09-21 1.11488
## 20962 2016-09-21 1.11594
## 20963 2016-09-21 1.11905
## 20964 2016-09-21 1.11983
## 20965 2016-09-22 1.12011
## 20966 2016-09-22 1.12366
## 20967 2016-09-22 1.12466
## 20968 2016-09-22 1.12277
## 20969 2016-09-22 1.12081
## 20970 2016-09-22 1.12069
## 20971 2016-09-23 1.11978
## 20972 2016-09-23 1.12032
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN695

```
## 20973 2016-09-23 1.12176
## 20974 2016-09-23 1.12318
## 20975 2016-09-23 1.12285
## 20976 2016-09-25 1.12329
## 20977 2016-09-26 1.12285
## 20978 2016-09-26 1.12403
## 20979 2016-09-26 1.12635
## 20980 2016-09-26 1.12530
## 20981 2016-09-26 1.12551
## 20982 2016-09-26 1.12452
## 20983 2016-09-27 1.12447
## 20984 2016-09-27 1.12408
## 20985 2016-09-27 1.12063
## 20986 2016-09-27 1.12190
## 20987 2016-09-27 1.12158
## 20988 2016-09-27 1.12107
## 20989 2016-09-28 1.12128
## 20990 2016-09-28 1.12151
## 20991 2016-09-28 1.12272
## 20992 2016-09-28 1.12094
## 20993 2016-09-28 1.12177
## 20994 2016-09-28 1.12294
## 20995 2016-09-29 1.12292
## 20996 2016-09-29 1.12145
## 20997 2016-09-29 1.12030
## 20998 2016-09-29 1.12233
## 20999 2016-09-29 1.12229
## 21000 2016-09-29 1.12058
## 21001 2016-09-30 1.12194
## 21002 2016-09-30 1.11838
## 21003 2016-09-30 1.11764
## 21004 2016-09-30 1.12276
## 21005 2016-09-30 1.12434
## 21006 2016-10-02 1.12309
## 21007 2016-10-03 1.12342
## 21008 2016-10-03 1.12336
## 21009 2016-10-03 1.12329
## 21010 2016-10-03 1.12178
## 21011 2016-10-03 1.12126
## 21012 2016-10-03 1.12063
## 21013 2016-10-04 1.11980
## 21014 2016-10-04 1.11721
## 21015 2016-10-04 1.11656
## 21016 2016-10-04 1.11938
## 21017 2016-10-04 1.12054
## 21018 2016-10-04 1.12106
```

```
## 21019 2016-10-05 1.12177
## 21020 2016-10-05 1.12286
## 21021 2016-10-05 1.12100
## 21022 2016-10-05 1.12060
## 21023 2016-10-05 1.12063
## 21024 2016-10-05 1.12027
## 21025 2016-10-06 1.11976
## 21026 2016-10-06 1.11907
## 21027 2016-10-06 1.11798
## 21028 2016-10-06 1.11612
## 21029 2016-10-06 1.11521
## 21030 2016-10-06 1.11320
## 21031 2016-10-07 1.11175
## 21032 2016-10-07 1.11289
## 21033 2016-10-07 1.11714
## 21034 2016-10-07 1.11677
## 21035 2016-10-07 1.12040
## 21036 2016-10-09 1.11998
## 21037 2016-10-10 1.11916
## 21038 2016-10-10 1.11814
## 21039 2016-10-10 1.11522
## 21040 2016-10-10 1.11436
## 21041 2016-10-10 1.11399
## 21042 2016-10-10 1.11319
## 21043 2016-10-11 1.11339
## 21044 2016-10-11 1.11118
## 21045 2016-10-11 1.10889
## 21046 2016-10-11 1.10692
## 21047 2016-10-11 1.10545
## 21048 2016-10-11 1.10445
## 21049 2016-10-12 1.10488
## 21050 2016-10-12 1.10242
## 21051 2016-10-12 1.10217
## 21052 2016-10-12 1.10302
## 21053 2016-10-12 1.10073
## 21054 2016-10-12 1.10032
## 21055 2016-10-13 1.10147
## 21056 2016-10-13 1.09958
## 21057 2016-10-13 1.10313
## 21058 2016-10-13 1.10406
## 21059 2016-10-13 1.10571
## 21060 2016-10-13 1.10467
## 21061 2016-10-14 1.10285
## 21062 2016-10-14 1.10230
## 21063 2016-10-14 1.10102
## 21064 2016-10-14 1.09951
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN697

```
## 21065 2016-10-14 1.09722
## 21066 2016-10-16 1.09673
## 21067 2016-10-17 1.09860
## 21068 2016-10-17 1.09894
## 21069 2016-10-17 1.10047
## 21070 2016-10-17 1.10009
## 21071 2016-10-17 1.10005
## 21072 2016-10-17 1.10164
## 21073 2016-10-18 1.10163
## 21074 2016-10-18 1.10173
## 21075 2016-10-18 1.09814
## 21076 2016-10-18 1.09906
## 21077 2016-10-18 1.09808
## 21078 2016-10-18 1.09917
## 21079 2016-10-19 1.09802
## 21080 2016-10-19 1.09978
## 21081 2016-10-19 1.09681
## 21082 2016-10-19 1.09677
## 21083 2016-10-19 1.09745
## 21084 2016-10-19 1.09696
## 21085 2016-10-20 1.09629
## 21086 2016-10-20 1.09725
## 21087 2016-10-20 1.09778
## 21088 2016-10-20 1.09447
## 21089 2016-10-20 1.09295
## 21090 2016-10-20 1.09202
## 21091 2016-10-21 1.09030
## 21092 2016-10-21 1.08808
## 21093 2016-10-21 1.08727
## 21094 2016-10-21 1.08744
## 21095 2016-10-21 1.08890
## 21096 2016-10-23 1.08751
## 21097 2016-10-24 1.08667
## 21098 2016-10-24 1.08915
## 21099 2016-10-24 1.08906
## 21100 2016-10-24 1.08783
## 21101 2016-10-24 1.08825
## 21102 2016-10-24 1.08719
## 21103 2016-10-25 1.08797
## 21104 2016-10-25 1.08898
## 21105 2016-10-25 1.08585
## 21106 2016-10-25 1.08910
## 21107 2016-10-25 1.08896
## 21108 2016-10-25 1.08785
## 21109 2016-10-26 1.08874
## 21110 2016-10-26 1.09243
```

```
## 21111 2016-10-26 1.09175
## 21112 2016-10-26 1.09114
## 21113 2016-10-26 1.09092
## 21114 2016-10-26 1.09056
## 21115 2016-10-27 1.08985
## 21116 2016-10-27 1.09149
## 21117 2016-10-27 1.09201
## 21118 2016-10-27 1.08920
## 21119 2016-10-27 1.08983
## 21120 2016-10-27 1.09020
## 21121 2016-10-28 1.09046
## 21122 2016-10-28 1.09064
## 21123 2016-10-28 1.09266
## 21124 2016-10-28 1.09400
## 21125 2016-10-28 1.09879
## 21126 2016-10-30 1.09710
## 21127 2016-10-31 1.09689
## 21128 2016-10-31 1.09524
## 21129 2016-10-31 1.09445
## 21130 2016-10-31 1.09662
## 21131 2016-10-31 1.09814
## 21132 2016-10-31 1.09674
## 21133 2016-11-01 1.09636
## 21134 2016-11-01 1.09882
## 21135 2016-11-01 1.10218
## 21136 2016-11-01 1.10568
## 21137 2016-11-01 1.10554
## 21138 2016-11-01 1.10534
## 21139 2016-11-02 1.10697
## 21140 2016-11-02 1.10843
## 21141 2016-11-02 1.10852
## 21142 2016-11-02 1.11172
## 21143 2016-11-02 1.10978
## 21144 2016-11-02 1.11025
## 21145 2016-11-03 1.11152
## 21146 2016-11-03 1.10977
## 21147 2016-11-03 1.10650
## 21148 2016-11-03 1.10960
## 21149 2016-11-03 1.11057
## 21150 2016-11-03 1.11023
## 21151 2016-11-04 1.10950
## 21152 2016-11-04 1.10993
## 21153 2016-11-04 1.10952
## 21154 2016-11-04 1.11197
## 21155 2016-11-04 1.11425
## 21156 2016-11-06 1.10948
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN699

```
## 21157 2016-11-07 1.10736
## 21158 2016-11-07 1.10604
## 21159 2016-11-07 1.10578
## 21160 2016-11-07 1.10430
## 21161 2016-11-07 1.10407
## 21162 2016-11-07 1.10388
## 21163 2016-11-08 1.10427
## 21164 2016-11-08 1.10504
## 21165 2016-11-08 1.10475
## 21166 2016-11-08 1.10234
## 21167 2016-11-08 1.10270
## 21168 2016-11-08 1.10412
## 21169 2016-11-09 1.12749
## 21170 2016-11-09 1.10519
## 21171 2016-11-09 1.10095
## 21172 2016-11-09 1.09389
## 21173 2016-11-09 1.09106
## 21174 2016-11-09 1.09350
## 21175 2016-11-10 1.09424
## 21176 2016-11-10 1.08945
## 21177 2016-11-10 1.08985
## 21178 2016-11-10 1.08905
## 21179 2016-11-10 1.08940
## 21180 2016-11-10 1.08849
## 21181 2016-11-11 1.09126
## 21182 2016-11-11 1.08693
## 21183 2016-11-11 1.09022
## 21184 2016-11-11 1.08599
## 21185 2016-11-11 1.08602
## 21186 2016-11-13 1.07969
## 21187 2016-11-14 1.07923
## 21188 2016-11-14 1.07578
## 21189 2016-11-14 1.07680
## 21190 2016-11-14 1.07485
## 21191 2016-11-14 1.07377
## 21192 2016-11-14 1.07567
## 21193 2016-11-15 1.07489
## 21194 2016-11-15 1.07990
## 21195 2016-11-15 1.07340
## 21196 2016-11-15 1.07317
## 21197 2016-11-15 1.07235
## 21198 2016-11-15 1.07392
## 21199 2016-11-16 1.07470
## 21200 2016-11-16 1.07147
## 21201 2016-11-16 1.07123
## 21202 2016-11-16 1.06957
```

```
## 21203 2016-11-16 1.06916
## 21204 2016-11-16 1.07075
## 21205 2016-11-17 1.06999
## 21206 2016-11-17 1.07242
## 21207 2016-11-17 1.06880
## 21208 2016-11-17 1.06358
## 21209 2016-11-17 1.06272
## 21210 2016-11-17 1.05946
## 21211 2016-11-18 1.05853
## 21212 2016-11-18 1.05988
## 21213 2016-11-18 1.06109
## 21214 2016-11-18 1.05864
## 21215 2016-11-18 1.05914
## 21216 2016-11-20 1.06052
## 21217 2016-11-21 1.06012
## 21218 2016-11-21 1.06321
## 21219 2016-11-21 1.06395
## 21220 2016-11-21 1.06058
## 21221 2016-11-21 1.06326
## 21222 2016-11-21 1.06353
## 21223 2016-11-22 1.06305
## 21224 2016-11-22 1.06475
## 21225 2016-11-22 1.06115
## 21226 2016-11-22 1.06248
## 21227 2016-11-22 1.06295
## 21228 2016-11-22 1.06245
## 21229 2016-11-23 1.06299
## 21230 2016-11-23 1.06125
## 21231 2016-11-23 1.05574
## 21232 2016-11-23 1.05574
## 21233 2016-11-23 1.05556
## 21234 2016-11-23 1.05352
## 21235 2016-11-24 1.05473
## 21236 2016-11-24 1.05675
## 21237 2016-11-24 1.05625
## 21238 2016-11-24 1.05554
## 21239 2016-11-24 1.05570
## 21240 2016-11-24 1.05576
## 21241 2016-11-25 1.05697
## 21242 2016-11-25 1.05957
## 21243 2016-11-25 1.06041
## 21244 2016-11-25 1.05929
## 21245 2016-11-25 1.05991
## 21246 2016-11-27 1.06456
## 21247 2016-11-28 1.06538
## 21248 2016-11-28 1.06425
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN701

```
## 21249 2016-11-28 1.05687
## 21250 2016-11-28 1.05849
## 21251 2016-11-28 1.06151
## 21252 2016-11-28 1.06104
## 21253 2016-11-29 1.06025
## 21254 2016-11-29 1.05964
## 21255 2016-11-29 1.05762
## 21256 2016-11-29 1.06274
## 21257 2016-11-29 1.06497
## 21258 2016-11-29 1.06501
## 21259 2016-11-30 1.06320
## 21260 2016-11-30 1.06374
## 21261 2016-11-30 1.06298
## 21262 2016-11-30 1.05992
## 21263 2016-11-30 1.05892
## 21264 2016-11-30 1.05959
## 21265 2016-12-01 1.06143
## 21266 2016-12-01 1.06300
## 21267 2016-12-01 1.06284
## 21268 2016-12-01 1.06256
## 21269 2016-12-01 1.06612
## 21270 2016-12-01 1.06705
## 21271 2016-12-02 1.06837
## 21272 2016-12-02 1.06469
## 21273 2016-12-02 1.06350
## 21274 2016-12-02 1.06749
## 21275 2016-12-02 1.06698
## 21276 2016-12-04 1.05608
## 21277 2016-12-05 1.05667
## 21278 2016-12-05 1.06336
## 21279 2016-12-05 1.06871
## 21280 2016-12-05 1.07675
## 21281 2016-12-05 1.07645
## 21282 2016-12-05 1.07619
## 21283 2016-12-06 1.07552
## 21284 2016-12-06 1.07670
## 21285 2016-12-06 1.07332
## 21286 2016-12-06 1.07119
## 21287 2016-12-06 1.07195
## 21288 2016-12-06 1.07202
## 21289 2016-12-07 1.07187
## 21290 2016-12-07 1.07197
## 21291 2016-12-07 1.07359
## 21292 2016-12-07 1.07439
## 21293 2016-12-07 1.07537
## 21294 2016-12-07 1.07666
```

```
## 21295 2016-12-08 1.07731
## 21296 2016-12-08 1.08023
## 21297 2016-12-08 1.06680
## 21298 2016-12-08 1.06092
## 21299 2016-12-08 1.06161
## 21300 2016-12-08 1.05907
## 21301 2016-12-09 1.06164
## 21302 2016-12-09 1.06260
## 21303 2016-12-09 1.05754
## 21304 2016-12-09 1.05400
## 21305 2016-12-09 1.05625
## 21306 2016-12-11 1.05550
## 21307 2016-12-12 1.05595
## 21308 2016-12-12 1.05930
## 21309 2016-12-12 1.06084
## 21310 2016-12-12 1.06417
## 21311 2016-12-12 1.06351
## 21312 2016-12-12 1.06336
## 21313 2016-12-13 1.06337
## 21314 2016-12-13 1.06193
## 21315 2016-12-13 1.06273
## 21316 2016-12-13 1.06244
## 21317 2016-12-13 1.06262
## 21318 2016-12-13 1.06339
## 21319 2016-12-14 1.06443
## 21320 2016-12-14 1.06262
## 21321 2016-12-14 1.06402
## 21322 2016-12-14 1.06554
## 21323 2016-12-14 1.05375
## 21324 2016-12-14 1.05145
## 21325 2016-12-15 1.05069
## 21326 2016-12-15 1.05009
## 21327 2016-12-15 1.04370
## 21328 2016-12-15 1.04138
## 21329 2016-12-15 1.04143
## 21330 2016-12-15 1.04195
## 21331 2016-12-16 1.04334
## 21332 2016-12-16 1.04633
## 21333 2016-12-16 1.04458
## 21334 2016-12-16 1.04459
## 21335 2016-12-16 1.04550
## 21336 2016-12-18 1.04606
## 21337 2016-12-19 1.04656
## 21338 2016-12-19 1.04483
## 21339 2016-12-19 1.04292
## 21340 2016-12-19 1.04441
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN703

```
## 21341 2016-12-19 1.04032
## 21342 2016-12-19 1.04107
## 21343 2016-12-20 1.03973
## 21344 2016-12-20 1.03837
## 21345 2016-12-20 1.03697
## 21346 2016-12-20 1.03975
## 21347 2016-12-20 1.03898
## 21348 2016-12-20 1.03966
## 21349 2016-12-21 1.04043
## 21350 2016-12-21 1.03983
## 21351 2016-12-21 1.04413
## 21352 2016-12-21 1.04275
## 21353 2016-12-21 1.04245
## 21354 2016-12-21 1.04430
## 21355 2016-12-22 1.04376
## 21356 2016-12-22 1.04431
## 21357 2016-12-22 1.04390
## 21358 2016-12-22 1.04418
## 21359 2016-12-22 1.04376
## 21360 2016-12-22 1.04449
## 21361 2016-12-23 1.04498
## 21362 2016-12-23 1.04554
## 21363 2016-12-23 1.04345
## 21364 2016-12-23 1.04476
## 21365 2016-12-23 1.04560
## 21366 2016-12-25 1.04516
## 21367 2016-12-26 1.04628
## 21368 2016-12-26 1.04499
## 21369 2016-12-26 1.04577
## 21370 2016-12-26 1.04521
## 21371 2016-12-26 1.04581
## 21372 2016-12-26 1.04345
## 21373 2016-12-27 1.04459
## 21374 2016-12-27 1.04510
## 21375 2016-12-27 1.04435
## 21376 2016-12-27 1.04565
## 21377 2016-12-27 1.04590
## 21378 2016-12-27 1.04696
## 21379 2016-12-28 1.04785
## 21380 2016-12-28 1.04400
## 21381 2016-12-28 1.03935
## 21382 2016-12-28 1.03840
## 21383 2016-12-28 1.04161
## 21384 2016-12-28 1.04344
## 21385 2016-12-29 1.04608
## 21386 2016-12-29 1.04691
```

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```
## 21387 2016-12-29 1.04651
## 21388 2016-12-29 1.04726
## 21389 2016-12-29 1.04910
## 21390 2016-12-29 1.05456
## 21391 2016-12-30 1.05366
## 21392 2016-12-30 1.05895
## 21393 2016-12-30 1.05438
## 21394 2016-12-30 1.05463
## 21395 2016-12-30 1.05219
## 21396 2017-01-01 1.05240
## 21397 2017-01-02 1.05161
## 21398 2017-01-02 1.04877
## 21399 2017-01-02 1.04666
## 21400 2017-01-02 1.04668
## 21401 2017-01-02 1.04552
## 21402 2017-01-02 1.04760
## 21403 2017-01-03 1.04823
## 21404 2017-01-03 1.04018
## 21405 2017-01-03 1.03917
## 21406 2017-01-03 1.04272
## 21407 2017-01-03 1.04063
## 21408 2017-01-03 1.03936
## 21409 2017-01-04 1.04068
## 21410 2017-01-04 1.04386
## 21411 2017-01-04 1.04394
## 21412 2017-01-04 1.04719
## 21413 2017-01-04 1.04911
## 21414 2017-01-04 1.05197
## 21415 2017-01-05 1.05417
## 21416 2017-01-05 1.05052
## 21417 2017-01-05 1.05308
## 21418 2017-01-05 1.05985
## 21419 2017-01-05 1.06074
## 21420 2017-01-05 1.05838
## 21421 2017-01-06 1.05829
## 21422 2017-01-06 1.06012
## 21423 2017-01-06 1.05440
## 21424 2017-01-06 1.05499
## 21425 2017-01-06 1.05346
## 21426 2017-01-08 1.05423
## 21427 2017-01-09 1.05240
## 21428 2017-01-09 1.05246
## 21429 2017-01-09 1.05347
## 21430 2017-01-09 1.05708
## 21431 2017-01-09 1.05750
## 21432 2017-01-09 1.05789
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN705

```
## 21433 2017-01-10 1.06098
## 21434 2017-01-10 1.05965
## 21435 2017-01-10 1.05749
## 21436 2017-01-10 1.05613
## 21437 2017-01-10 1.05546
## 21438 2017-01-10 1.05582
## 21439 2017-01-11 1.05500
## 21440 2017-01-11 1.05354
## 21441 2017-01-11 1.05133
## 21442 2017-01-11 1.05586
## 21443 2017-01-11 1.05831
## 21444 2017-01-11 1.05842
## 21445 2017-01-12 1.06113
## 21446 2017-01-12 1.06411
## 21447 2017-01-12 1.06529
## 21448 2017-01-12 1.06487
## 21449 2017-01-12 1.06132
## 21450 2017-01-12 1.06164
## 21451 2017-01-13 1.06174
## 21452 2017-01-13 1.06444
## 21453 2017-01-13 1.06455
## 21454 2017-01-13 1.06374
## 21455 2017-01-13 1.06481
## 21456 2017-01-15 1.06209
## 21457 2017-01-16 1.06209
## 21458 2017-01-16 1.05904
## 21459 2017-01-16 1.05928
## 21460 2017-01-16 1.06044
## 21461 2017-01-16 1.06060
## 21462 2017-01-16 1.06032
## 21463 2017-01-17 1.06577
## 21464 2017-01-17 1.06793
## 21465 2017-01-17 1.06919
## 21466 2017-01-17 1.06994
## 21467 2017-01-17 1.07139
## 21468 2017-01-17 1.06993
## 21469 2017-01-18 1.06846
## 21470 2017-01-18 1.06959
## 21471 2017-01-18 1.06685
## 21472 2017-01-18 1.06832
## 21473 2017-01-18 1.06302
## 21474 2017-01-18 1.06282
## 21475 2017-01-19 1.06394
## 21476 2017-01-19 1.06610
## 21477 2017-01-19 1.06195
## 21478 2017-01-19 1.06325
```

```
## 21479 2017-01-19 1.06638
## 21480 2017-01-19 1.06817
## 21481 2017-01-20 1.06725
## 21482 2017-01-20 1.06464
## 21483 2017-01-20 1.06568
## 21484 2017-01-20 1.06750
## 21485 2017-01-20 1.07044
## 21486 2017-01-22 1.07445
## 21487 2017-01-23 1.07485
## 21488 2017-01-23 1.07261
## 21489 2017-01-23 1.07304
## 21490 2017-01-23 1.07271
## 21491 2017-01-23 1.07663
## 21492 2017-01-23 1.07549
## 21493 2017-01-24 1.07554
## 21494 2017-01-24 1.07404
## 21495 2017-01-24 1.07476
## 21496 2017-01-24 1.07568
## 21497 2017-01-24 1.07321
## 21498 2017-01-24 1.07295
## 21499 2017-01-25 1.07263
## 21500 2017-01-25 1.07499
## 21501 2017-01-25 1.07450
## 21502 2017-01-25 1.07378
## 21503 2017-01-25 1.07485
## 21504 2017-01-25 1.07590
## 21505 2017-01-26 1.07559
## 21506 2017-01-26 1.07212
## 21507 2017-01-26 1.06972
## 21508 2017-01-26 1.06870
## 21509 2017-01-26 1.06830
## 21510 2017-01-26 1.06829
## 21511 2017-01-27 1.06721
## 21512 2017-01-27 1.06935
## 21513 2017-01-27 1.06983
## 21514 2017-01-27 1.06828
## 21515 2017-01-27 1.07000
## 21516 2017-01-29 1.07371
## 21517 2017-01-30 1.07246
## 21518 2017-01-30 1.06958
## 21519 2017-01-30 1.06448
## 21520 2017-01-30 1.06933
## 21521 2017-01-30 1.06966
## 21522 2017-01-30 1.06933
## 21523 2017-01-31 1.06999
## 21524 2017-01-31 1.07118
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN707

```
## 21525 2017-01-31 1.07556
## 21526 2017-01-31 1.07836
## 21527 2017-01-31 1.07978
## 21528 2017-01-31 1.07933
## 21529 2017-02-01 1.07908
## 21530 2017-02-01 1.07847
## 21531 2017-02-01 1.07606
## 21532 2017-02-01 1.07530
## 21533 2017-02-01 1.07695
## 21534 2017-02-01 1.07832
## 21535 2017-02-02 1.07929
## 21536 2017-02-02 1.08153
## 21537 2017-02-02 1.08147
## 21538 2017-02-02 1.07880
## 21539 2017-02-02 1.07584
## 21540 2017-02-02 1.07695
## 21541 2017-02-03 1.07580
## 21542 2017-02-03 1.07417
## 21543 2017-02-03 1.07562
## 21544 2017-02-03 1.07838
## 21545 2017-02-03 1.07876
## 21546 2017-02-05 1.07799
## 21547 2017-02-06 1.07749
## 21548 2017-02-06 1.07468
## 21549 2017-02-06 1.07133
## 21550 2017-02-06 1.07351
## 21551 2017-02-06 1.07502
## 21552 2017-02-06 1.07305
## 21553 2017-02-07 1.07128
## 21554 2017-02-07 1.06598
## 21555 2017-02-07 1.06759
## 21556 2017-02-07 1.06922
## 21557 2017-02-07 1.06837
## 21558 2017-02-07 1.06853
## 21559 2017-02-08 1.06772
## 21560 2017-02-08 1.06444
## 21561 2017-02-08 1.06703
## 21562 2017-02-08 1.06968
## 21563 2017-02-08 1.06992
## 21564 2017-02-08 1.06852
## 21565 2017-02-09 1.06808
## 21566 2017-02-09 1.07022
## 21567 2017-02-09 1.06819
## 21568 2017-02-09 1.06572
## 21569 2017-02-09 1.06554
## 21570 2017-02-09 1.06611
```

```
## 21571 2017-02-10 1.06531
## 21572 2017-02-10 1.06423
## 21573 2017-02-10 1.06195
## 21574 2017-02-10 1.06343
## 21575 2017-02-10 1.06427
## 21576 2017-02-12 1.06210
## 21577 2017-02-13 1.06284
## 21578 2017-02-13 1.06375
## 21579 2017-02-13 1.06238
## 21580 2017-02-13 1.05959
## 21581 2017-02-13 1.05989
## 21582 2017-02-13 1.05959
## 21583 2017-02-14 1.06196
## 21584 2017-02-14 1.06178
## 21585 2017-02-14 1.06132
## 21586 2017-02-14 1.05651
## 21587 2017-02-14 1.05789
## 21588 2017-02-14 1.05738
## 21589 2017-02-15 1.05792
## 21590 2017-02-15 1.05558
## 21591 2017-02-15 1.05342
## 21592 2017-02-15 1.05839
## 21593 2017-02-15 1.06000
## 21594 2017-02-15 1.06214
## 21595 2017-02-16 1.06211
## 21596 2017-02-16 1.06397
## 21597 2017-02-16 1.06370
## 21598 2017-02-16 1.06528
## 21599 2017-02-16 1.06739
## 21600 2017-02-16 1.06714
## 21601 2017-02-17 1.06716
## 21602 2017-02-17 1.06437
## 21603 2017-02-17 1.06555
## 21604 2017-02-17 1.06144
## 21605 2017-02-17 1.06151
## 21606 2017-02-19 1.06097
## 21607 2017-02-20 1.06145
## 21608 2017-02-20 1.06225
## 21609 2017-02-20 1.06210
## 21610 2017-02-20 1.06099
## 21611 2017-02-20 1.06135
## 21612 2017-02-20 1.05849
## 21613 2017-02-21 1.05851
## 21614 2017-02-21 1.05427
## 21615 2017-02-21 1.05372
## 21616 2017-02-21 1.05440
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN709

```
## 21617 2017-02-21 1.05376
## 21618 2017-02-21 1.05495
## 21619 2017-02-22 1.05446
## 21620 2017-02-22 1.05088
## 21621 2017-02-22 1.05145
## 21622 2017-02-22 1.05466
## 21623 2017-02-22 1.05582
## 21624 2017-02-22 1.05527
## 21625 2017-02-23 1.05659
## 21626 2017-02-23 1.05467
## 21627 2017-02-23 1.05797
## 21628 2017-02-23 1.05665
## 21629 2017-02-23 1.05823
## 21630 2017-02-23 1.05748
## 21631 2017-02-24 1.05808
## 21632 2017-02-24 1.05935
## 21633 2017-02-24 1.06139
## 21634 2017-02-24 1.05687
## 21635 2017-02-24 1.05630
## 21636 2017-02-26 1.05716
## 21637 2017-02-27 1.05679
## 21638 2017-02-27 1.05862
## 21639 2017-02-27 1.05989
## 21640 2017-02-27 1.06045
## 21641 2017-02-27 1.05875
## 21642 2017-02-27 1.05839
## 21643 2017-02-28 1.05947
## 21644 2017-02-28 1.05891
## 21645 2017-02-28 1.05954
## 21646 2017-02-28 1.06076
## 21647 2017-02-28 1.05769
## 21648 2017-02-28 1.05724
## 21649 2017-03-01 1.05558
## 21650 2017-03-01 1.05397
## 21651 2017-03-01 1.05254
## 21652 2017-03-01 1.05637
## 21653 2017-03-01 1.05474
## 21654 2017-03-01 1.05347
## 21655 2017-03-02 1.05311
## 21656 2017-03-02 1.05261
## 21657 2017-03-02 1.05142
## 21658 2017-03-02 1.05065
## 21659 2017-03-02 1.05075
## 21660 2017-03-02 1.05184
## 21661 2017-03-03 1.05181
## 21662 2017-03-03 1.05171
```

```
## 21663 2017-03-03 1.05688
## 21664 2017-03-03 1.05618
## 21665 2017-03-03 1.06250
## 21666 2017-03-05 1.06075
## 21667 2017-03-06 1.06043
## 21668 2017-03-06 1.06021
## 21669 2017-03-06 1.05977
## 21670 2017-03-06 1.05778
## 21671 2017-03-06 1.05831
## 21672 2017-03-06 1.05828
## 21673 2017-03-07 1.05857
## 21674 2017-03-07 1.05638
## 21675 2017-03-07 1.05696
## 21676 2017-03-07 1.05751
## 21677 2017-03-07 1.05666
## 21678 2017-03-07 1.05682
## 21679 2017-03-08 1.05638
## 21680 2017-03-08 1.05561
## 21681 2017-03-08 1.05541
## 21682 2017-03-08 1.05367
## 21683 2017-03-08 1.05411
## 21684 2017-03-08 1.05430
## 21685 2017-03-09 1.05329
## 21686 2017-03-09 1.05589
## 21687 2017-03-09 1.05846
## 21688 2017-03-09 1.05802
## 21689 2017-03-09 1.05777
## 21690 2017-03-09 1.05876
## 21691 2017-03-10 1.05984
## 21692 2017-03-10 1.06139
## 21693 2017-03-10 1.06465
## 21694 2017-03-10 1.06689
## 21695 2017-03-10 1.06763
## 21696 2017-03-12 1.06827
## 21697 2017-03-13 1.06992
## 21698 2017-03-13 1.06744
## 21699 2017-03-13 1.06595
## 21700 2017-03-13 1.06628
## 21701 2017-03-13 1.06537
## 21702 2017-03-13 1.06566
## 21703 2017-03-14 1.06540
## 21704 2017-03-14 1.06476
## 21705 2017-03-14 1.06293
## 21706 2017-03-14 1.06370
## 21707 2017-03-14 1.06044
## 21708 2017-03-14 1.06128
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN711

```
## 21709 2017-03-15 1.06151
## 21710 2017-03-15 1.06325
## 21711 2017-03-15 1.06205
## 21712 2017-03-15 1.06427
## 21713 2017-03-15 1.07349
## 21714 2017-03-15 1.07359
## 21715 2017-03-16 1.07238
## 21716 2017-03-16 1.07096
## 21717 2017-03-16 1.07330
## 21718 2017-03-16 1.07379
## 21719 2017-03-16 1.07663
## 21720 2017-03-16 1.07672
## 21721 2017-03-17 1.07715
## 21722 2017-03-17 1.07700
## 21723 2017-03-17 1.07360
## 21724 2017-03-17 1.07405
## 21725 2017-03-17 1.07390
## 21726 2017-03-19 1.07508
## 21727 2017-03-20 1.07637
## 21728 2017-03-20 1.07643
## 21729 2017-03-20 1.07515
## 21730 2017-03-20 1.07373
## 21731 2017-03-20 1.07396
## 21732 2017-03-20 1.07601
## 21733 2017-03-21 1.07561
## 21734 2017-03-21 1.07952
## 21735 2017-03-21 1.07963
## 21736 2017-03-21 1.08157
## 21737 2017-03-21 1.08117
## 21738 2017-03-21 1.07998
## 21739 2017-03-22 1.08014
## 21740 2017-03-22 1.07874
## 21741 2017-03-22 1.08031
## 21742 2017-03-22 1.08059
## 21743 2017-03-22 1.07978
## 21744 2017-03-22 1.07864
## 21745 2017-03-23 1.07927
## 21746 2017-03-23 1.07747
## 21747 2017-03-23 1.07868
## 21748 2017-03-23 1.07881
## 21749 2017-03-23 1.07843
## 21750 2017-03-23 1.07669
## 21751 2017-03-24 1.07645
## 21752 2017-03-24 1.07994
## 21753 2017-03-24 1.08064
## 21754 2017-03-24 1.08074
```

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```
## 21755 2017-03-24 1.08004
## 21756 2017-03-26 1.08461
## 21757 2017-03-27 1.08442
## 21758 2017-03-27 1.08597
## 21759 2017-03-27 1.08944
## 21760 2017-03-27 1.08639
## 21761 2017-03-27 1.08652
## 21762 2017-03-27 1.08568
## 21763 2017-03-28 1.08662
## 21764 2017-03-28 1.08593
## 21765 2017-03-28 1.08594
## 21766 2017-03-28 1.08336
## 21767 2017-03-28 1.08139
## 21768 2017-03-28 1.08177
## 21769 2017-03-29 1.08153
## 21770 2017-03-29 1.07885
## 21771 2017-03-29 1.07639
## 21772 2017-03-29 1.07517
## 21773 2017-03-29 1.07663
## 21774 2017-03-29 1.07516
## 21775 2017-03-30 1.07537
## 21776 2017-03-30 1.07334
## 21777 2017-03-30 1.07217
## 21778 2017-03-30 1.07041
## 21779 2017-03-30 1.06752
## 21780 2017-03-30 1.06824
## 21781 2017-03-31 1.06756
## 21782 2017-03-31 1.06949
## 21783 2017-03-31 1.06782
## 21784 2017-03-31 1.06975
## 21785 2017-03-31 1.06561
## 21786 2017-04-02 1.06731
## 21787 2017-04-03 1.06798
## 21788 2017-04-03 1.06722
## 21789 2017-04-03 1.06628
## 21790 2017-04-03 1.06612
## 21791 2017-04-03 1.06693
## 21792 2017-04-03 1.06697
## 21793 2017-04-04 1.06712
## 21794 2017-04-04 1.06612
## 21795 2017-04-04 1.06554
## 21796 2017-04-04 1.06607
## 21797 2017-04-04 1.06738
## 21798 2017-04-04 1.06800
## 21799 2017-04-05 1.06742
## 21800 2017-04-05 1.06742
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN713

```
## 21801 2017-04-05 1.06665
## 21802 2017-04-05 1.06471
## 21803 2017-04-05 1.06644
## 21804 2017-04-05 1.06769
## 21805 2017-04-06 1.06749
## 21806 2017-04-06 1.06583
## 21807 2017-04-06 1.06608
## 21808 2017-04-06 1.06499
## 21809 2017-04-06 1.06450
## 21810 2017-04-06 1.06445
## 21811 2017-04-07 1.06480
## 21812 2017-04-07 1.06324
## 21813 2017-04-07 1.06202
## 21814 2017-04-07 1.05988
## 21815 2017-04-07 1.05919
## 21816 2017-04-09 1.05772
## 21817 2017-04-10 1.05859
## 21818 2017-04-10 1.05866
## 21819 2017-04-10 1.05756
## 21820 2017-04-10 1.06004
## 21821 2017-04-10 1.05961
## 21822 2017-04-10 1.05919
## 21823 2017-04-11 1.05886
## 21824 2017-04-11 1.06015
## 21825 2017-04-11 1.06124
## 21826 2017-04-11 1.06101
## 21827 2017-04-11 1.06049
## 21828 2017-04-11 1.06087
## 21829 2017-04-12 1.06043
## 21830 2017-04-12 1.06192
## 21831 2017-04-12 1.06006
## 21832 2017-04-12 1.06027
## 21833 2017-04-12 1.06661
## 21834 2017-04-12 1.06660
## 21835 2017-04-13 1.06735
## 21836 2017-04-13 1.06427
## 21837 2017-04-13 1.06282
## 21838 2017-04-13 1.06220
## 21839 2017-04-13 1.06141
## 21840 2017-04-13 1.06141
## 21841 2017-04-14 1.06162
## 21842 2017-04-14 1.06232
## 21843 2017-04-14 1.06300
## 21844 2017-04-14 1.06184
## 21845 2017-04-14 1.06148
## 21846 2017-04-16 1.06206
```

714 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 21847 2017-04-17 1.06191
## 21848 2017-04-17 1.06259
## 21849 2017-04-17 1.06456
## 21850 2017-04-17 1.06541
## 21851 2017-04-17 1.06450
## 21852 2017-04-17 1.06440
## 21853 2017-04-18 1.06439
## 21854 2017-04-18 1.06507
## 21855 2017-04-18 1.06970
## 21856 2017-04-18 1.07079
## 21857 2017-04-18 1.07312
## 21858 2017-04-18 1.07261
## 21859 2017-04-19 1.07192
## 21860 2017-04-19 1.07159
## 21861 2017-04-19 1.07201
## 21862 2017-04-19 1.07106
## 21863 2017-04-19 1.07121
## 21864 2017-04-19 1.07166
## 21865 2017-04-20 1.07275
## 21866 2017-04-20 1.07702
## 21867 2017-04-20 1.07506
## 21868 2017-04-20 1.07458
## 21869 2017-04-20 1.07176
## 21870 2017-04-20 1.07181
## 21871 2017-04-21 1.07166
## 21872 2017-04-21 1.07188
## 21873 2017-04-21 1.07013
## 21874 2017-04-21 1.06927
## 21875 2017-04-21 1.07298
## 21876 2017-04-23 1.08505
## 21877 2017-04-24 1.08588
## 21878 2017-04-24 1.08586
## 21879 2017-04-24 1.08576
## 21880 2017-04-24 1.08417
## 21881 2017-04-24 1.08674
## 21882 2017-04-24 1.08627
## 21883 2017-04-25 1.08635
## 21884 2017-04-25 1.08928
## 21885 2017-04-25 1.08893
## 21886 2017-04-25 1.09496
## 21887 2017-04-25 1.09267
## 21888 2017-04-25 1.09381
## 21889 2017-04-26 1.09407
## 21890 2017-04-26 1.09029
## 21891 2017-04-26 1.08873
## 21892 2017-04-26 1.08758
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN715

```
## 21893 2017-04-26 1.09039
## 21894 2017-04-26 1.09070
## 21895 2017-04-27 1.09054
## 21896 2017-04-27 1.09079
## 21897 2017-04-27 1.08960
## 21898 2017-04-27 1.08758
## 21899 2017-04-27 1.08735
## 21900 2017-04-27 1.08610
## 21901 2017-04-28 1.08648
## 21902 2017-04-28 1.09025
## 21903 2017-04-28 1.09124
## 21904 2017-04-28 1.09011
## 21905 2017-04-28 1.08964
## 21906 2017-04-30 1.08998
## 21907 2017-05-01 1.08912
## 21908 2017-05-01 1.08989
## 21909 2017-05-01 1.09171
## 21910 2017-05-01 1.09043
## 21911 2017-05-01 1.08992
## 21912 2017-05-01 1.09073
## 21913 2017-05-02 1.09130
## 21914 2017-05-02 1.09152
## 21915 2017-05-02 1.09078
## 21916 2017-05-02 1.09065
## 21917 2017-05-02 1.09305
## 21918 2017-05-02 1.09336
## 21919 2017-05-03 1.09346
## 21920 2017-05-03 1.09126
## 21921 2017-05-03 1.09151
## 21922 2017-05-03 1.09173
## 21923 2017-05-03 1.08862
## 21924 2017-05-03 1.08869
## 21925 2017-05-04 1.08964
## 21926 2017-05-04 1.09189
## 21927 2017-05-04 1.09347
## 21928 2017-05-04 1.09738
## 21929 2017-05-04 1.09846
## 21930 2017-05-04 1.09797
## 21931 2017-05-05 1.09837
## 21932 2017-05-05 1.09586
## 21933 2017-05-05 1.09790
## 21934 2017-05-05 1.09905
## 21935 2017-05-05 1.09990
## 21936 2017-05-07 1.09671
## 21937 2017-05-08 1.09726
## 21938 2017-05-08 1.09564
```

716 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 21939 2017-05-08 1.09472
## 21940 2017-05-08 1.09324
## 21941 2017-05-08 1.09239
## 21942 2017-05-08 1.09254
## 21943 2017-05-09 1.09308
## 21944 2017-05-09 1.09066
## 21945 2017-05-09 1.08844
## 21946 2017-05-09 1.08960
## 21947 2017-05-09 1.08753
## 21948 2017-05-09 1.08950
## 21949 2017-05-10 1.08916
## 21950 2017-05-10 1.08712
## 21951 2017-05-10 1.08802
## 21952 2017-05-10 1.08678
## 21953 2017-05-10 1.08681
## 21954 2017-05-10 1.08742
## 21955 2017-05-11 1.08703
## 21956 2017-05-11 1.08786
## 21957 2017-05-11 1.08521
## 21958 2017-05-11 1.08671
## 21959 2017-05-11 1.08616
## 21960 2017-05-11 1.08652
## 21961 2017-05-12 1.08714
## 21962 2017-05-12 1.08661
## 21963 2017-05-12 1.09063
## 21964 2017-05-12 1.09190
## 21965 2017-05-12 1.09339
## 21966 2017-05-14 1.09245
## 21967 2017-05-15 1.09304
## 21968 2017-05-15 1.09453
## 21969 2017-05-15 1.09786
## 21970 2017-05-15 1.09742
## 21971 2017-05-15 1.09752
## 21972 2017-05-15 1.09835
## 21973 2017-05-16 1.09921
## 21974 2017-05-16 1.10461
## 21975 2017-05-16 1.10779
## 21976 2017-05-16 1.10757
## 21977 2017-05-16 1.10830
## 21978 2017-05-16 1.10958
## 21979 2017-05-17 1.11063
## 21980 2017-05-17 1.10857
## 21981 2017-05-17 1.11234
## 21982 2017-05-17 1.11382
## 21983 2017-05-17 1.11590
## 21984 2017-05-17 1.11647
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN71

```
## 21985 2017-05-18 1.11444
## 21986 2017-05-18 1.11274
## 21987 2017-05-18 1.11088
## 21988 2017-05-18 1.11257
## 21989 2017-05-18 1.11036
## 21990 2017-05-18 1.11092
## 21991 2017-05-19 1.11121
## 21992 2017-05-19 1.11494
## 21993 2017-05-19 1.11796
## 21994 2017-05-19 1.11910
## 21995 2017-05-19 1.12080
## 21996 2017-05-21 1.11868
## 21997 2017-05-22 1.11888
## 21998 2017-05-22 1.11681
## 21999 2017-05-22 1.12455
## 22000 2017-05-22 1.12340
## 22001 2017-05-22 1.12377
## 22002 2017-05-22 1.12397
## 22003 2017-05-23 1.12505
## 22004 2017-05-23 1.12487
## 22005 2017-05-23 1.12340
## 22006 2017-05-23 1.11924
## 22007 2017-05-23 1.11829
## 22008 2017-05-23 1.11871
## 22009 2017-05-24 1.11801
## 22010 2017-05-24 1.11858
## 22011 2017-05-24 1.11980
## 22012 2017-05-24 1.11778
## 22013 2017-05-24 1.12194
## 22014 2017-05-24 1.12233
## 22015 2017-05-25 1.12411
## 22016 2017-05-25 1.12424
## 22017 2017-05-25 1.12029
## 22018 2017-05-25 1.12183
## 22019 2017-05-25 1.12106
## 22020 2017-05-25 1.12062
## 22021 2017-05-26 1.12005
## 22022 2017-05-26 1.12241
## 22023 2017-05-26 1.11804
## 22024 2017-05-26 1.11774
## 22025 2017-05-26 1.11841
## 22026 2017-05-28 1.11726
## 22027 2017-05-29 1.11640
## 22028 2017-05-29 1.11837
## 22029 2017-05-29 1.11851
## 22030 2017-05-29 1.11741
```

```
## 22031 2017-05-29 1.11666
## 22032 2017-05-29 1.11337
## 22033 2017-05-30 1.11278
## 22034 2017-05-30 1.11404
## 22035 2017-05-30 1.11627
## 22036 2017-05-30 1.11747
## 22037 2017-05-30 1.11868
## 22038 2017-05-30 1.11714
## 22039 2017-05-31 1.11730
## 22040 2017-05-31 1.11748
## 22041 2017-05-31 1.12224
## 22042 2017-05-31 1.12370
## 22043 2017-05-31 1.12443
## 22044 2017-05-31 1.12347
## 22045 2017-06-01 1.12468
## 22046 2017-06-01 1.12265
## 22047 2017-06-01 1.12150
## 22048 2017-06-01 1.12097
## 22049 2017-06-01 1.12130
## 22050 2017-06-01 1.12170
## 22051 2017-06-02 1.12197
## 22052 2017-06-02 1.12214
## 22053 2017-06-02 1.12697
## 22054 2017-06-02 1.12700
## 22055 2017-06-02 1.12851
## 22056 2017-06-04 1.12727
## 22057 2017-06-05 1.12667
## 22058 2017-06-05 1.12722
## 22059 2017-06-05 1.12421
## 22060 2017-06-05 1.12531
## 22061 2017-06-05 1.12544
## 22062 2017-06-05 1.12625
## 22063 2017-06-06 1.12683
## 22064 2017-06-06 1.12520
## 22065 2017-06-06 1.12553
## 22066 2017-06-06 1.12702
## 22067 2017-06-06 1.12780
## 22068 2017-06-06 1.12727
## 22069 2017-06-07 1.12649
## 22070 2017-06-07 1.12626
## 22071 2017-06-07 1.12300
## 22072 2017-06-07 1.12650
## 22073 2017-06-07 1.12583
## 22074 2017-06-07 1.12508
## 22075 2017-06-08 1.12576
## 22076 2017-06-08 1.12496
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN719

```
## 22077 2017-06-08 1.12265
## 22078 2017-06-08 1.12117
## 22079 2017-06-08 1.12163
## 22080 2017-06-08 1.11826
## 22081 2017-06-09 1.12047
## 22082 2017-06-09 1.11763
## 22083 2017-06-09 1.11692
## 22084 2017-06-09 1.11978
## 22085 2017-06-09 1.11975
## 22086 2017-06-11 1.12053
## 22087 2017-06-12 1.12068
## 22088 2017-06-12 1.12256
## 22089 2017-06-12 1.12149
## 22090 2017-06-12 1.11982
## 22091 2017-06-12 1.12033
## 22092 2017-06-12 1.11947
## 22093 2017-06-13 1.11931
## 22094 2017-06-13 1.12126
## 22095 2017-06-13 1.12071
## 22096 2017-06-13 1.12018
## 22097 2017-06-13 1.12110
## 22098 2017-06-13 1.12140
## 22099 2017-06-14 1.12153
## 22100 2017-06-14 1.12080
## 22101 2017-06-14 1.12633
## 22102 2017-06-14 1.12732
## 22103 2017-06-14 1.12182
## 22104 2017-06-14 1.12189
## 22105 2017-06-15 1.12217
## 22106 2017-06-15 1.11798
## 22107 2017-06-15 1.11524
## 22108 2017-06-15 1.11484
## 22109 2017-06-15 1.11452
## 22110 2017-06-15 1.11540
## 22111 2017-06-16 1.11444
## 22112 2017-06-16 1.11733
## 22113 2017-06-16 1.11726
## 22114 2017-06-16 1.11888
## 22115 2017-06-16 1.11969
## 22116 2017-06-18 1.11909
## 22117 2017-06-19 1.11937
## 22118 2017-06-19 1.11954
## 22119 2017-06-19 1.11820
## 22120 2017-06-19 1.11591
## 22121 2017-06-19 1.11488
## 22122 2017-06-19 1.11451
```

```
## 22123 2017-06-20 1.11556
## 22124 2017-06-20 1.11584
## 22125 2017-06-20 1.11508
## 22126 2017-06-20 1.11249
## 22127 2017-06-20 1.11337
## 22128 2017-06-20 1.11358
## 22129 2017-06-21 1.11337
## 22130 2017-06-21 1.11429
## 22131 2017-06-21 1.11481
## 22132 2017-06-21 1.11474
## 22133 2017-06-21 1.11686
## 22134 2017-06-21 1.11635
## 22135 2017-06-22 1.11711
## 22136 2017-06-22 1.11683
## 22137 2017-06-22 1.11613
## 22138 2017-06-22 1.11558
## 22139 2017-06-22 1.11521
## 22140 2017-06-22 1.11497
## 22141 2017-06-23 1.11620
## 22142 2017-06-23 1.11718
## 22143 2017-06-23 1.11764
## 22144 2017-06-23 1.11971
## 22145 2017-06-23 1.11954
## 22146 2017-06-25 1.11965
## 22147 2017-06-26 1.11918
## 22148 2017-06-26 1.11861
## 22149 2017-06-26 1.12112
## 22150 2017-06-26 1.11877
## 22151 2017-06-26 1.11820
## 22152 2017-06-26 1.11843
## 22153 2017-06-27 1.11903
## 22154 2017-06-27 1.12490
## 22155 2017-06-27 1.12772
## 22156 2017-06-27 1.13120
## 22157 2017-06-27 1.13409
## 22158 2017-06-27 1.13400
## 22159 2017-06-28 1.13470
## 22160 2017-06-28 1.13606
## 22161 2017-06-28 1.13316
## 22162 2017-06-28 1.13781
## 22163 2017-06-28 1.13776
## 22164 2017-06-28 1.13874
## 22165 2017-06-29 1.14021
## 22166 2017-06-29 1.14257
## 22167 2017-06-29 1.14009
## 22168 2017-06-29 1.14300
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN721

```
## 22169 2017-06-29 1.14408
## 22170 2017-06-29 1.14286
## 22171 2017-06-30 1.14406
## 22172 2017-06-30 1.14034
## 22173 2017-06-30 1.14130
## 22174 2017-06-30 1.14127
## 22175 2017-06-30 1.14272
## 22176 2017-07-02 1.14176
## 22177 2017-07-03 1.14134
## 22178 2017-07-03 1.13792
## 22179 2017-07-03 1.13679
## 22180 2017-07-03 1.13571
## 22181 2017-07-03 1.13648
## 22182 2017-07-03 1.13741
## 22183 2017-07-04 1.13723
## 22184 2017-07-04 1.13539
## 22185 2017-07-04 1.13429
## 22186 2017-07-04 1.13514
## 22187 2017-07-04 1.13480
## 22188 2017-07-04 1.13589
## 22189 2017-07-05 1.13548
## 22190 2017-07-05 1.13420
## 22191 2017-07-05 1.13207
## 22192 2017-07-05 1.13385
## 22193 2017-07-05 1.13520
## 22194 2017-07-05 1.13422
## 22195 2017-07-06 1.13393
## 22196 2017-07-06 1.13492
## 22197 2017-07-06 1.13906
## 22198 2017-07-06 1.14197
## 22199 2017-07-06 1.14235
## 22200 2017-07-06 1.14157
## 22201 2017-07-07 1.14153
## 22202 2017-07-07 1.14219
## 22203 2017-07-07 1.14020
## 22204 2017-07-07 1.14083
## 22205 2017-07-07 1.14031
## 22206 2017-07-09 1.14007
## 22207 2017-07-10 1.14039
## 22208 2017-07-10 1.13959
## 22209 2017-07-10 1.13923
## 22210 2017-07-10 1.13957
## 22211 2017-07-10 1.13997
## 22212 2017-07-10 1.13950
## 22213 2017-07-11 1.13887
## 22214 2017-07-11 1.13962
```

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```
## 22215 2017-07-11 1.14021
## 22216 2017-07-11 1.14397
## 22217 2017-07-11 1.14679
## 22218 2017-07-11 1.14767
## 22219 2017-07-12 1.14859
## 22220 2017-07-12 1.14579
## 22221 2017-07-12 1.14678
## 22222 2017-07-12 1.14205
## 22223 2017-07-12 1.14121
## 22224 2017-07-12 1.14300
## 22225 2017-07-13 1.14378
## 22226 2017-07-13 1.14037
## 22227 2017-07-13 1.14163
## 22228 2017-07-13 1.13908
## 22229 2017-07-13 1.13979
## 22230 2017-07-13 1.14019
## 22231 2017-07-14 1.14010
## 22232 2017-07-14 1.14081
## 22233 2017-07-14 1.14618
## 22234 2017-07-14 1.14597
## 22235 2017-07-14 1.14697
## 22236 2017-07-16 1.14650
## 22237 2017-07-17 1.14616
## 22238 2017-07-17 1.14486
## 22239 2017-07-17 1.14680
## 22240 2017-07-17 1.14724
## 22241 2017-07-17 1.14784
## 22242 2017-07-17 1.14854
## 22243 2017-07-18 1.15278
## 22244 2017-07-18 1.15257
## 22245 2017-07-18 1.15561
## 22246 2017-07-18 1.15631
## 22247 2017-07-18 1.15546
## 22248 2017-07-18 1.15450
## 22249 2017-07-19 1.15379
## 22250 2017-07-19 1.15270
## 22251 2017-07-19 1.15258
## 22252 2017-07-19 1.15210
## 22253 2017-07-19 1.15156
## 22254 2017-07-19 1.15233
## 22255 2017-07-20 1.15122
## 22256 2017-07-20 1.15050
## 22257 2017-07-20 1.15621
## 22258 2017-07-20 1.16347
## 22259 2017-07-20 1.16312
## 22260 2017-07-20 1.16268
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN723

```
## 22261 2017-07-21 1.16288
## 22262 2017-07-21 1.16497
## 22263 2017-07-21 1.16402
## 22264 2017-07-21 1.16663
## 22265 2017-07-21 1.16639
## 22266 2017-07-23 1.16711
## 22267 2017-07-24 1.16709
## 22268 2017-07-24 1.16531
## 22269 2017-07-24 1.16560
## 22270 2017-07-24 1.16381
## 22271 2017-07-24 1.16441
## 22272 2017-07-24 1.16380
## 22273 2017-07-25 1.16622
## 22274 2017-07-25 1.16540
## 22275 2017-07-25 1.16887
## 22276 2017-07-25 1.16535
## 22277 2017-07-25 1.16470
## 22278 2017-07-25 1.16417
## 22279 2017-07-26 1.16387
## 22280 2017-07-26 1.16234
## 22281 2017-07-26 1.16412
## 22282 2017-07-26 1.16268
## 22283 2017-07-26 1.17349
## 22284 2017-07-26 1.17296
## 22285 2017-07-27 1.17492
## 22286 2017-07-27 1.17286
## 22287 2017-07-27 1.16969
## 22288 2017-07-27 1.16646
## 22289 2017-07-27 1.16777
## 22290 2017-07-27 1.16763
## 22291 2017-07-28 1.16853
## 22292 2017-07-28 1.17057
## 22293 2017-07-28 1.17165
## 22294 2017-07-28 1.17407
## 22295 2017-07-28 1.17519
## 22296 2017-07-30 1.17431
## 22297 2017-07-31 1.17366
## 22298 2017-07-31 1.17329
## 22299 2017-07-31 1.17339
## 22300 2017-07-31 1.18108
## 22301 2017-07-31 1.18425
## 22302 2017-07-31 1.18273
## 22303 2017-08-01 1.18310
## 22304 2017-08-01 1.18219
## 22305 2017-08-01 1.18179
## 22306 2017-08-01 1.18049
```

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```
## 22307 2017-08-01 1.18017
## 22308 2017-08-01 1.18134
## 22309 2017-08-02 1.18251
## 22310 2017-08-02 1.18549
## 22311 2017-08-02 1.18249
## 22312 2017-08-02 1.18681
## 22313 2017-08-02 1.18565
## 22314 2017-08-02 1.18361
## 22315 2017-08-03 1.18465
## 22316 2017-08-03 1.18435
## 22317 2017-08-03 1.18597
## 22318 2017-08-03 1.18692
## 22319 2017-08-03 1.18706
## 22320 2017-08-03 1.18768
## 22321 2017-08-04 1.18800
## 22322 2017-08-04 1.18823
## 22323 2017-08-04 1.18303
## 22324 2017-08-04 1.17544
## 22325 2017-08-04 1.17736
## 22326 2017-08-06 1.17862
## 22327 2017-08-07 1.17952
## 22328 2017-08-07 1.17983
## 22329 2017-08-07 1.17869
## 22330 2017-08-07 1.17889
## 22331 2017-08-07 1.17956
## 22332 2017-08-07 1.18026
## 22333 2017-08-08 1.18117
## 22334 2017-08-08 1.18085
## 22335 2017-08-08 1.18149
## 22336 2017-08-08 1.17525
## 22337 2017-08-08 1.17541
## 22338 2017-08-08 1.17436
## 22339 2017-08-09 1.17378
## 22340 2017-08-09 1.17321
## 22341 2017-08-09 1.17451
## 22342 2017-08-09 1.17444
## 22343 2017-08-09 1.17595
## 22344 2017-08-09 1.17573
## 22345 2017-08-10 1.17361
## 22346 2017-08-10 1.17231
## 22347 2017-08-10 1.17416
## 22348 2017-08-10 1.17566
## 22349 2017-08-10 1.17727
## 22350 2017-08-10 1.17723
## 22351 2017-08-11 1.17747
## 22352 2017-08-11 1.17557
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN725

```
## 22353 2017-08-11 1.18164
## 22354 2017-08-11 1.18208
## 22355 2017-08-11 1.18224
## 22356 2017-08-13 1.18192
## 22357 2017-08-14 1.18186
## 22358 2017-08-14 1.18037
## 22359 2017-08-14 1.17957
## 22360 2017-08-14 1.17933
## 22361 2017-08-14 1.17813
## 22362 2017-08-14 1.17815
## 22363 2017-08-15 1.17774
## 22364 2017-08-15 1.17566
## 22365 2017-08-15 1.16921
## 22366 2017-08-15 1.17374
## 22367 2017-08-15 1.17359
## 22368 2017-08-15 1.17382
## 22369 2017-08-16 1.17428
## 22370 2017-08-16 1.17262
## 22371 2017-08-16 1.17034
## 22372 2017-08-16 1.17018
## 22373 2017-08-16 1.17677
## 22374 2017-08-16 1.17680
## 22375 2017-08-17 1.17794
## 22376 2017-08-17 1.17333
## 22377 2017-08-17 1.16937
## 22378 2017-08-17 1.17414
## 22379 2017-08-17 1.17234
## 22380 2017-08-17 1.17283
## 22381 2017-08-18 1.17374
## 22382 2017-08-18 1.17474
## 22383 2017-08-18 1.17487
## 22384 2017-08-18 1.17494
## 22385 2017-08-18 1.17622
## 22386 2017-08-20 1.17517
## 22387 2017-08-21 1.17513
## 22388 2017-08-21 1.17411
## 22389 2017-08-21 1.17803
## 22390 2017-08-21 1.18241
## 22391 2017-08-21 1.18154
## 22392 2017-08-21 1.18145
## 22393 2017-08-22 1.18070
## 22394 2017-08-22 1.17719
## 22395 2017-08-22 1.17617
## 22396 2017-08-22 1.17644
## 22397 2017-08-22 1.17622
## 22398 2017-08-22 1.17497
```

```
## 22399 2017-08-23 1.17582
## 22400 2017-08-23 1.17901
## 22401 2017-08-23 1.17949
## 22402 2017-08-23 1.18012
## 22403 2017-08-23 1.18076
## 22404 2017-08-23 1.18096
## 22405 2017-08-24 1.18026
## 22406 2017-08-24 1.17875
## 22407 2017-08-24 1.17992
## 22408 2017-08-24 1.18045
## 22409 2017-08-24 1.17996
## 22410 2017-08-24 1.17969
## 22411 2017-08-25 1.17982
## 22412 2017-08-25 1.17964
## 22413 2017-08-25 1.18056
## 22414 2017-08-25 1.18872
## 22415 2017-08-25 1.19240
## 22416 2017-08-27 1.19298
## 22417 2017-08-28 1.19207
## 22418 2017-08-28 1.19311
## 22419 2017-08-28 1.19350
## 22420 2017-08-28 1.19767
## 22421 2017-08-28 1.19790
## 22422 2017-08-28 1.19652
## 22423 2017-08-29 1.19747
## 22424 2017-08-29 1.20603
## 22425 2017-08-29 1.20292
## 22426 2017-08-29 1.20161
## 22427 2017-08-29 1.19728
## 22428 2017-08-29 1.19749
## 22429 2017-08-30 1.19737
## 22430 2017-08-30 1.19444
## 22431 2017-08-30 1.19186
## 22432 2017-08-30 1.19046
## 22433 2017-08-30 1.18842
## 22434 2017-08-30 1.18934
## 22435 2017-08-31 1.18790
## 22436 2017-08-31 1.18972
## 22437 2017-08-31 1.18435
## 22438 2017-08-31 1.18808
## 22439 2017-08-31 1.19102
## 22440 2017-08-31 1.19101
## 22441 2017-09-01 1.18977
## 22442 2017-09-01 1.18928
## 22443 2017-09-01 1.19064
## 22444 2017-09-01 1.18579
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN727

```
## 22445 2017-09-01 1.18611
## 22446 2017-09-03 1.18804
## 22447 2017-09-04 1.18821
## 22448 2017-09-04 1.19189
## 22449 2017-09-04 1.18969
## 22450 2017-09-04 1.18894
## 22451 2017-09-04 1.18990
## 22452 2017-09-04 1.18999
## 22453 2017-09-05 1.19058
## 22454 2017-09-05 1.18850
## 22455 2017-09-05 1.19007
## 22456 2017-09-05 1.19033
## 22457 2017-09-05 1.19154
## 22458 2017-09-05 1.19219
## 22459 2017-09-06 1.19143
## 22460 2017-09-06 1.19440
## 22461 2017-09-06 1.19319
## 22462 2017-09-06 1.19269
## 22463 2017-09-06 1.19175
## 22464 2017-09-06 1.19230
## 22465 2017-09-07 1.19243
## 22466 2017-09-07 1.19595
## 22467 2017-09-07 1.20424
## 22468 2017-09-07 1.19895
## 22469 2017-09-07 1.20240
## 22470 2017-09-07 1.20352
## 22471 2017-09-08 1.20695
## 22472 2017-09-08 1.20634
## 22473 2017-09-08 1.20425
## 22474 2017-09-08 1.20264
## 22475 2017-09-08 1.20365
## 22476 2017-09-10 1.20123
## 22477 2017-09-11 1.20079
## 22478 2017-09-11 1.20214
## 22479 2017-09-11 1.19844
## 22480 2017-09-11 1.19699
## 22481 2017-09-11 1.19528
## 22482 2017-09-11 1.19473
## 22483 2017-09-12 1.19559
## 22484 2017-09-12 1.19582
## 22485 2017-09-12 1.19300
## 22486 2017-09-12 1.19630
## 22487 2017-09-12 1.19670
## 22488 2017-09-12 1.19701
## 22489 2017-09-13 1.19837
## 22490 2017-09-13 1.19794
```

```
## 22491 2017-09-13 1.19740
## 22492 2017-09-13 1.18815
## 22493 2017-09-13 1.18860
## 22494 2017-09-13 1.18831
## 22495 2017-09-14 1.18785
## 22496 2017-09-14 1.19048
## 22497 2017-09-14 1.18929
## 22498 2017-09-14 1.18841
## 22499 2017-09-14 1.19195
## 22500 2017-09-14 1.19084
## 22501 2017-09-15 1.19127
## 22502 2017-09-15 1.19295
## 22503 2017-09-15 1.19742
## 22504 2017-09-15 1.19455
## 22505 2017-09-15 1.19478
## 22506 2017-09-17 1.19443
## 22507 2017-09-18 1.19410
## 22508 2017-09-18 1.19392
## 22509 2017-09-18 1.19614
## 22510 2017-09-18 1.19344
## 22511 2017-09-18 1.19549
## 22512 2017-09-18 1.19644
## 22513 2017-09-19 1.19760
## 22514 2017-09-19 1.19846
## 22515 2017-09-19 1.19845
## 22516 2017-09-19 1.19742
## 22517 2017-09-19 1.19947
## 22518 2017-09-19 1.19921
## 22519 2017-09-20 1.20071
## 22520 2017-09-20 1.20071
## 22521 2017-09-20 1.19922
## 22522 2017-09-20 1.20045
## 22523 2017-09-20 1.18926
## 22524 2017-09-20 1.18777
## 22525 2017-09-21 1.18833
## 22526 2017-09-21 1.19137
## 22527 2017-09-21 1.19167
## 22528 2017-09-21 1.19328
## 22529 2017-09-21 1.19416
## 22530 2017-09-21 1.19419
## 22531 2017-09-22 1.19604
## 22532 2017-09-22 1.19904
## 22533 2017-09-22 1.19718
## 22534 2017-09-22 1.19449
## 22535 2017-09-22 1.19476
## 22536 2017-09-24 1.19285
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN729

```
## 22537 2017-09-25 1.19335
## 22538 2017-09-25 1.19054
## 22539 2017-09-25 1.18730
## 22540 2017-09-25 1.18451
## 22541 2017-09-25 1.18486
## 22542 2017-09-25 1.18545
## 22543 2017-09-26 1.18537
## 22544 2017-09-26 1.18174
## 22545 2017-09-26 1.17921
## 22546 2017-09-26 1.17822
## 22547 2017-09-26 1.17940
## 22548 2017-09-26 1.17880
## 22549 2017-09-27 1.17794
## 22550 2017-09-27 1.17363
## 22551 2017-09-27 1.17204
## 22552 2017-09-27 1.17525
## 22553 2017-09-27 1.17452
## 22554 2017-09-27 1.17487
## 22555 2017-09-28 1.17320
## 22556 2017-09-28 1.17668
## 22557 2017-09-28 1.17671
## 22558 2017-09-28 1.17841
## 22559 2017-09-28 1.17866
## 22560 2017-09-28 1.17864
## 22561 2017-09-29 1.17791
## 22562 2017-09-29 1.18000
## 22563 2017-09-29 1.18294
## 22564 2017-09-29 1.18031
## 22565 2017-09-29 1.18165
## 22566 2017-10-01 1.17896
## 22567 2017-10-02 1.17769
## 22568 2017-10-02 1.17456
## 22569 2017-10-02 1.17579
## 22570 2017-10-02 1.17430
## 22571 2017-10-02 1.17336
## 22572 2017-10-02 1.17199
## 22573 2017-10-03 1.17068
## 22574 2017-10-03 1.17334
## 22575 2017-10-03 1.17489
## 22576 2017-10-03 1.17532
## 22577 2017-10-03 1.17443
## 22578 2017-10-03 1.17749
## 22579 2017-10-04 1.17675
## 22580 2017-10-04 1.17570
## 22581 2017-10-04 1.17719
## 22582 2017-10-04 1.17631
```

```
## 22583 2017-10-04 1.17592
## 22584 2017-10-04 1.17548
## 22585 2017-10-05 1.17594
## 22586 2017-10-05 1.17755
## 22587 2017-10-05 1.17308
## 22588 2017-10-05 1.17094
## 22589 2017-10-05 1.17119
## 22590 2017-10-05 1.17117
## 22591 2017-10-06 1.16998
## 22592 2017-10-06 1.16965
## 22593 2017-10-06 1.16909
## 22594 2017-10-06 1.17241
## 22595 2017-10-06 1.17336
## 22596 2017-10-08 1.17370
## 22597 2017-10-09 1.17358
## 22598 2017-10-09 1.17357
## 22599 2017-10-09 1.17389
## 22600 2017-10-09 1.17498
## 22601 2017-10-09 1.17412
## 22602 2017-10-09 1.17489
## 22603 2017-10-10 1.17706
## 22604 2017-10-10 1.17786
## 22605 2017-10-10 1.17872
## 22606 2017-10-10 1.18027
## 22607 2017-10-10 1.18085
## 22608 2017-10-10 1.18196
## 22609 2017-10-11 1.18139
## 22610 2017-10-11 1.18275
## 22611 2017-10-11 1.18443
## 22612 2017-10-11 1.18458
## 22613 2017-10-11 1.18601
## 22614 2017-10-11 1.18644
## 22615 2017-10-12 1.18762
## 22616 2017-10-12 1.18624
## 22617 2017-10-12 1.18475
## 22618 2017-10-12 1.18353
## 22619 2017-10-12 1.18303
## 22620 2017-10-12 1.18445
## 22621 2017-10-13 1.18457
## 22622 2017-10-13 1.18313
## 22623 2017-10-13 1.18569
## 22624 2017-10-13 1.18274
## 22625 2017-10-13 1.18223
## 22626 2017-10-15 1.18128
## 22627 2017-10-16 1.18094
## 22628 2017-10-16 1.17899
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN731

```
## 22629 2017-10-16 1.18071
## 22630 2017-10-16 1.18106
## 22631 2017-10-16 1.17964
## 22632 2017-10-16 1.17864
## 22633 2017-10-17 1.17778
## 22634 2017-10-17 1.17652
## 22635 2017-10-17 1.17515
## 22636 2017-10-17 1.17459
## 22637 2017-10-17 1.17666
## 22638 2017-10-17 1.17730
## 22639 2017-10-18 1.17641
## 22640 2017-10-18 1.17457
## 22641 2017-10-18 1.17650
## 22642 2017-10-18 1.17870
## 22643 2017-10-18 1.17878
## 22644 2017-10-18 1.18113
## 22645 2017-10-19 1.18026
## 22646 2017-10-19 1.18066
## 22647 2017-10-19 1.18304
## 22648 2017-10-19 1.18352
## 22649 2017-10-19 1.18536
## 22650 2017-10-19 1.18500
## 22651 2017-10-20 1.18152
## 22652 2017-10-20 1.18039
## 22653 2017-10-20 1.18013
## 22654 2017-10-20 1.17838
## 22655 2017-10-20 1.17825
## 22656 2017-10-22 1.17605
## 22657 2017-10-23 1.17700
## 22658 2017-10-23 1.17463
## 22659 2017-10-23 1.17358
## 22660 2017-10-23 1.17447
## 22661 2017-10-23 1.17496
## 22662 2017-10-23 1.17600
## 22663 2017-10-24 1.17619
## 22664 2017-10-24 1.17640
## 22665 2017-10-24 1.17611
## 22666 2017-10-24 1.17639
## 22667 2017-10-24 1.17617
## 22668 2017-10-24 1.17586
## 22669 2017-10-25 1.17576
## 22670 2017-10-25 1.17679
## 22671 2017-10-25 1.17768
## 22672 2017-10-25 1.18131
## 22673 2017-10-25 1.18134
## 22674 2017-10-25 1.18179
```

```
## 22675 2017-10-26 1.18262
## 22676 2017-10-26 1.18140
## 22677 2017-10-26 1.17699
## 22678 2017-10-26 1.16823
## 22679 2017-10-26 1.16512
## 22680 2017-10-26 1.16309
## 22681 2017-10-27 1.16354
## 22682 2017-10-27 1.16274
## 22683 2017-10-27 1.15992
## 22684 2017-10-27 1.15901
## 22685 2017-10-27 1.16108
## 22686 2017-10-29 1.16059
## 22687 2017-10-30 1.16175
## 22688 2017-10-30 1.16342
## 22689 2017-10-30 1.16146
## 22690 2017-10-30 1.16394
## 22691 2017-10-30 1.16512
## 22692 2017-10-30 1.16475
## 22693 2017-10-31 1.16259
## 22694 2017-10-31 1.16414
## 22695 2017-10-31 1.16360
## 22696 2017-10-31 1.16586
## 22697 2017-10-31 1.16463
## 22698 2017-10-31 1.16401
## 22699 2017-11-01 1.16311
## 22700 2017-11-01 1.16402
## 22701 2017-11-01 1.16178
## 22702 2017-11-01 1.16257
## 22703 2017-11-01 1.16197
## 22704 2017-11-01 1.16348
## 22705 2017-11-02 1.16579
## 22706 2017-11-02 1.16328
## 22707 2017-11-02 1.16524
## 22708 2017-11-02 1.16631
## 22709 2017-11-02 1.16588
## 22710 2017-11-02 1.16575
## 22711 2017-11-03 1.16623
## 22712 2017-11-03 1.16475
## 22713 2017-11-03 1.16546
## 22714 2017-11-03 1.16046
## 22715 2017-11-03 1.16103
## 22716 2017-11-05 1.16105
## 22717 2017-11-06 1.16124
## 22718 2017-11-06 1.16028
## 22719 2017-11-06 1.15856
## 22720 2017-11-06 1.16118
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN733

```
## 22721 2017-11-06 1.16100
## 22722 2017-11-06 1.16047
## 22723 2017-11-07 1.16058
## 22724 2017-11-07 1.15674
## 22725 2017-11-07 1.15629
## 22726 2017-11-07 1.15827
## 22727 2017-11-07 1.15871
## 22728 2017-11-07 1.15963
## 22729 2017-11-08 1.15962
## 22730 2017-11-08 1.15923
## 22731 2017-11-08 1.15912
## 22732 2017-11-08 1.15937
## 22733 2017-11-08 1.15959
## 22734 2017-11-08 1.15943
## 22735 2017-11-09 1.16034
## 22736 2017-11-09 1.16024
## 22737 2017-11-09 1.16045
## 22738 2017-11-09 1.16404
## 22739 2017-11-09 1.16420
## 22740 2017-11-09 1.16461
## 22741 2017-11-10 1.16461
## 22742 2017-11-10 1.16604
## 22743 2017-11-10 1.16484
## 22744 2017-11-10 1.16594
## 22745 2017-11-10 1.16667
## 22746 2017-11-12 1.16503
## 22747 2017-11-13 1.16584
## 22748 2017-11-13 1.16415
## 22749 2017-11-13 1.16702
## 22750 2017-11-13 1.16628
## 22751 2017-11-13 1.16675
## 22752 2017-11-13 1.16704
## 22753 2017-11-14 1.16742
## 22754 2017-11-14 1.17185
## 22755 2017-11-14 1.17519
## 22756 2017-11-14 1.17818
## 22757 2017-11-14 1.17982
## 22758 2017-11-14 1.17896
## 22759 2017-11-15 1.17868
## 22760 2017-11-15 1.18398
## 22761 2017-11-15 1.18447
## 22762 2017-11-15 1.17977
## 22763 2017-11-15 1.17919
## 22764 2017-11-15 1.17879
## 22765 2017-11-16 1.17794
## 22766 2017-11-16 1.17764
```

```
## 22767 2017-11-16 1.17755
## 22768 2017-11-16 1.17735
## 22769 2017-11-16 1.17705
## 22770 2017-11-16 1.18131
## 22771 2017-11-17 1.18036
## 22772 2017-11-17 1.17939
## 22773 2017-11-17 1.17875
## 22774 2017-11-17 1.18017
## 22775 2017-11-17 1.17926
## 22776 2017-11-19 1.17452
## 22777 2017-11-20 1.17338
## 22778 2017-11-20 1.17946
## 22779 2017-11-20 1.17711
## 22780 2017-11-20 1.17470
## 22781 2017-11-20 1.17333
## 22782 2017-11-20 1.17335
## 22783 2017-11-21 1.17419
## 22784 2017-11-21 1.17290
## 22785 2017-11-21 1.17223
## 22786 2017-11-21 1.17430
## 22787 2017-11-21 1.17384
## 22788 2017-11-21 1.17390
## 22789 2017-11-22 1.17445
## 22790 2017-11-22 1.17568
## 22791 2017-11-22 1.17510
## 22792 2017-11-22 1.17953
## 22793 2017-11-22 1.18225
## 22794 2017-11-22 1.18231
## 22795 2017-11-23 1.18297
## 22796 2017-11-23 1.18429
## 22797 2017-11-23 1.18496
## 22798 2017-11-23 1.18498
## 22799 2017-11-23 1.18515
## 22800 2017-11-23 1.18486
## 22801 2017-11-24 1.18521
## 22802 2017-11-24 1.18686
## 22803 2017-11-24 1.18966
## 22804 2017-11-24 1.19279
## 22805 2017-11-24 1.19346
## 22806 2017-11-26 1.19209
## 22807 2017-11-27 1.19285
## 22808 2017-11-27 1.19306
## 22809 2017-11-27 1.19591
## 22810 2017-11-27 1.19025
## 22811 2017-11-27 1.18988
## 22812 2017-11-27 1.18997
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN735

```
## 22813 2017-11-28 1.19021
## 22814 2017-11-28 1.18920
## 22815 2017-11-28 1.18942
## 22816 2017-11-28 1.18699
## 22817 2017-11-28 1.18422
## 22818 2017-11-28 1.18420
## 22819 2017-11-29 1.18516
## 22820 2017-11-29 1.18668
## 22821 2017-11-29 1.18376
## 22822 2017-11-29 1.18515
## 22823 2017-11-29 1.18478
## 22824 2017-11-29 1.18611
## 22825 2017-11-30 1.18647
## 22826 2017-11-30 1.18326
## 22827 2017-11-30 1.18590
## 22828 2017-11-30 1.18918
## 22829 2017-11-30 1.19048
## 22830 2017-11-30 1.19096
## 22831 2017-12-01 1.19277
## 22832 2017-12-01 1.19028
## 22833 2017-12-01 1.18694
## 22834 2017-12-01 1.19065
## 22835 2017-12-01 1.19005
## 22836 2017-12-03 1.18754
## 22837 2017-12-04 1.18677
## 22838 2017-12-04 1.18546
## 22839 2017-12-04 1.18459
## 22840 2017-12-04 1.18440
## 22841 2017-12-04 1.18661
## 22842 2017-12-04 1.18732
## 22843 2017-12-05 1.18675
## 22844 2017-12-05 1.18534
## 22845 2017-12-05 1.18350
## 22846 2017-12-05 1.18059
## 22847 2017-12-05 1.18264
## 22848 2017-12-05 1.18268
## 22849 2017-12-06 1.18441
## 22850 2017-12-06 1.18237
## 22851 2017-12-06 1.18079
## 22852 2017-12-06 1.17932
## 22853 2017-12-06 1.17961
## 22854 2017-12-06 1.17985
## 22855 2017-12-07 1.17921
## 22856 2017-12-07 1.17895
## 22857 2017-12-07 1.17997
## 22858 2017-12-07 1.17973
```

```
## 22859 2017-12-07 1.17733
## 22860 2017-12-07 1.17634
## 22861 2017-12-08 1.17652
## 22862 2017-12-08 1.17370
## 22863 2017-12-08 1.17629
## 22864 2017-12-08 1.17564
## 22865 2017-12-08 1.17755
## 22866 2017-12-10 1.17772
## 22867 2017-12-11 1.17804
## 22868 2017-12-11 1.17974
## 22869 2017-12-11 1.17784
## 22870 2017-12-11 1.17920
## 22871 2017-12-11 1.17689
## 22872 2017-12-11 1.17696
## 22873 2017-12-12 1.17732
## 22874 2017-12-12 1.17840
## 22875 2017-12-12 1.17508
## 22876 2017-12-12 1.17238
## 22877 2017-12-12 1.17420
## 22878 2017-12-12 1.17433
## 22879 2017-12-13 1.17549
## 22880 2017-12-13 1.17495
## 22881 2017-12-13 1.17578
## 22882 2017-12-13 1.17631
## 22883 2017-12-13 1.18264
## 22884 2017-12-13 1.18425
## 22885 2017-12-14 1.18268
## 22886 2017-12-14 1.18194
## 22887 2017-12-14 1.18209
## 22888 2017-12-14 1.17880
## 22889 2017-12-14 1.17783
## 22890 2017-12-14 1.17849
## 22891 2017-12-15 1.17839
## 22892 2017-12-15 1.17972
## 22893 2017-12-15 1.17997
## 22894 2017-12-15 1.17653
## 22895 2017-12-15 1.17519
## 22896 2017-12-17 1.17567
## 22897 2017-12-18 1.17611
## 22898 2017-12-18 1.17893
## 22899 2017-12-18 1.17937
## 22900 2017-12-18 1.17905
## 22901 2017-12-18 1.17818
## 22902 2017-12-18 1.17825
## 22903 2017-12-19 1.17926
## 22904 2017-12-19 1.18068
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN737

```
## 22905 2017-12-19 1.18270
## 22906 2017-12-19 1.18290
## 22907 2017-12-19 1.18405
## 22908 2017-12-19 1.18422
## 22909 2017-12-20 1.18461
## 22910 2017-12-20 1.18380
## 22911 2017-12-20 1.18441
## 22912 2017-12-20 1.18770
## 22913 2017-12-20 1.18715
## 22914 2017-12-20 1.18710
## 22915 2017-12-21 1.18681
## 22916 2017-12-21 1.18809
## 22917 2017-12-21 1.18588
## 22918 2017-12-21 1.18680
## 22919 2017-12-21 1.18746
## 22920 2017-12-21 1.18447
## 22921 2017-12-22 1.18498
## 22922 2017-12-22 1.18490
## 22923 2017-12-22 1.18550
## 22924 2017-12-22 1.18533
## 22925 2017-12-22 1.18644
## 22926 2017-12-24 1.18499
## 22927 2017-12-25 1.18595
## 22928 2017-12-25 1.18767
## 22929 2017-12-25 1.18656
## 22930 2017-12-26 1.18709
## 22931 2017-12-26 1.18611
## 22932 2017-12-26 1.18554
## 22933 2017-12-26 1.18707
## 22934 2017-12-26 1.18586
## 22935 2017-12-26 1.18605
## 22936 2017-12-27 1.18783
## 22937 2017-12-27 1.18882
## 22938 2017-12-27 1.19012
## 22939 2017-12-27 1.18991
## 22940 2017-12-27 1.18890
## 22941 2017-12-27 1.19059
## 22942 2017-12-28 1.19318
## 22943 2017-12-28 1.19320
## 22944 2017-12-28 1.19475
## 22945 2017-12-28 1.19532
## 22946 2017-12-28 1.19432
## 22947 2017-12-28 1.19424
## 22948 2017-12-29 1.19493
## 22949 2017-12-29 1.19815
## 22950 2017-12-29 1.19871
```

```
## 22951 2017-12-29 1.20218
## 22952 2017-12-29 1.20075
## 22953 2018-01-01 1.20159
## 22954 2018-01-02 1.20247
## 22955 2018-01-02 1.20708
## 22956 2018-01-02 1.20577
## 22957 2018-01-02 1.20449
## 22958 2018-01-02 1.20590
## 22959 2018-01-02 1.20533
## 22960 2018-01-03 1.20584
## 22961 2018-01-03 1.20384
## 22962 2018-01-03 1.20330
## 22963 2018-01-03 1.20273
## 22964 2018-01-03 1.20146
## 22965 2018-01-03 1.20080
## 22966 2018-01-04 1.20194
## 22967 2018-01-04 1.20434
## 22968 2018-01-04 1.20623
## 22969 2018-01-04 1.20747
## 22970 2018-01-04 1.20685
## 22971 2018-01-04 1.20725
## 22972 2018-01-05 1.20719
## 22973 2018-01-05 1.20460
## 22974 2018-01-05 1.20522
## 22975 2018-01-05 1.20473
## 22976 2018-01-05 1.20314
## 22977 2018-01-07 1.20448
## 22978 2018-01-08 1.20200
## 22979 2018-01-08 1.19900
## 22980 2018-01-08 1.19704
## 22981 2018-01-08 1.19775
## 22982 2018-01-08 1.19679
## 22983 2018-01-08 1.19672
## 22984 2018-01-09 1.19654
## 22985 2018-01-09 1.19390
## 22986 2018-01-09 1.19211
## 22987 2018-01-09 1.19211
## 22988 2018-01-09 1.19372
## 22989 2018-01-09 1.19453
## 22990 2018-01-10 1.19283
## 22991 2018-01-10 1.19388
## 22992 2018-01-10 1.19951
## 22993 2018-01-10 1.19604
## 22994 2018-01-10 1.19479
## 22995 2018-01-10 1.19598
## 22996 2018-01-11 1.19527
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN739

```
## 22997 2018-01-11 1.19481
## 22998 2018-01-11 1.20316
## 22999 2018-01-11 1.20379
## 23000 2018-01-11 1.20322
## 23001 2018-01-11 1.20456
## 23002 2018-01-12 1.20443
## 23003 2018-01-12 1.21255
## 23004 2018-01-12 1.21202
## 23005 2018-01-12 1.21346
## 23006 2018-01-12 1.22051
## 23007 2018-01-14 1.21985
## 23008 2018-01-15 1.22232
## 23009 2018-01-15 1.22607
## 23010 2018-01-15 1.22834
## 23011 2018-01-15 1.22718
## 23012 2018-01-15 1.22638
## 23013 2018-01-15 1.22656
## 23014 2018-01-16 1.22629
## 23015 2018-01-16 1.22334
## 23016 2018-01-16 1.22186
## 23017 2018-01-16 1.22438
## 23018 2018-01-16 1.22606
## 23019 2018-01-16 1.22909
## 23020 2018-01-17 1.22446
## 23021 2018-01-17 1.22371
## 23022 2018-01-17 1.22194
## 23023 2018-01-17 1.22520
## 23024 2018-01-17 1.21868
## 23025 2018-01-17 1.21932
## 23026 2018-01-18 1.22071
## 23027 2018-01-18 1.22147
## 23028 2018-01-18 1.22493
## 23029 2018-01-18 1.22288
## 23030 2018-01-18 1.22394
## 23031 2018-01-18 1.22434
## 23032 2018-01-19 1.22610
## 23033 2018-01-19 1.22821
## 23034 2018-01-19 1.22437
## 23035 2018-01-19 1.22326
## 23036 2018-01-19 1.22174
## 23037 2018-01-21 1.22289
## 23038 2018-01-22 1.22314
## 23039 2018-01-22 1.22498
## 23040 2018-01-22 1.22496
## 23041 2018-01-22 1.22437
## 23042 2018-01-22 1.22626
```

```
## 23043 2018-01-22 1.22666
## 23044 2018-01-23 1.22582
## 23045 2018-01-23 1.22383
## 23046 2018-01-23 1.22588
## 23047 2018-01-23 1.22794
## 23048 2018-01-23 1.22989
## 23049 2018-01-23 1.23073
## 23050 2018-01-24 1.23248
## 23051 2018-01-24 1.23373
## 23052 2018-01-24 1.23659
## 23053 2018-01-24 1.23917
## 23054 2018-01-24 1.24087
## 23055 2018-01-24 1.24106
## 23056 2018-01-25 1.24483
## 23057 2018-01-25 1.24321
## 23058 2018-01-25 1.24971
## 23059 2018-01-25 1.24926
## 23060 2018-01-25 1.23978
## 23061 2018-01-25 1.24304
## 23062 2018-01-26 1.24312
## 23063 2018-01-26 1.24559
## 23064 2018-01-26 1.24289
## 23065 2018-01-26 1.24393
## 23066 2018-01-26 1.24315
## 23067 2018-01-28 1.23969
## 23068 2018-01-29 1.24140
## 23069 2018-01-29 1.24122
## 23070 2018-01-29 1.23649
## 23071 2018-01-29 1.23717
## 23072 2018-01-29 1.23826
## 23073 2018-01-29 1.23853
## 23074 2018-01-30 1.23642
## 23075 2018-01-30 1.23984
## 23076 2018-01-30 1.24453
## 23077 2018-01-30 1.24053
## 23078 2018-01-30 1.24030
## 23079 2018-01-30 1.24147
## 23080 2018-01-31 1.24374
## 23081 2018-01-31 1.24517
## 23082 2018-01-31 1.24648
## 23083 2018-01-31 1.24152
## 23084 2018-01-31 1.24139
## 23085 2018-01-31 1.24193
## 23086 2018-02-01 1.24208
## 23087 2018-02-01 1.24465
## 23088 2018-02-01 1.24496
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN741

```
## 23089 2018-02-01 1.24786
## 23090 2018-02-01 1.25101
## 23091 2018-02-01 1.24996
## 23092 2018-02-02 1.24960
## 23093 2018-02-02 1.24870
## 23094 2018-02-02 1.24452
## 23095 2018-02-02 1.24696
## 23096 2018-02-02 1.24608
## 23097 2018-02-04 1.24542
## 23098 2018-02-05 1.24608
## 23099 2018-02-05 1.24611
## 23100 2018-02-05 1.24378
## 23101 2018-02-05 1.24290
## 23102 2018-02-05 1.23672
## 23103 2018-02-05 1.23757
## 23104 2018-02-06 1.23762
## 23105 2018-02-06 1.24030
## 23106 2018-02-06 1.23439
## 23107 2018-02-06 1.23914
## 23108 2018-02-06 1.23774
## 23109 2018-02-06 1.23892
## 23110 2018-02-07 1.23913
## 23111 2018-02-07 1.23509
## 23112 2018-02-07 1.23374
## 23113 2018-02-07 1.22700
## 23114 2018-02-07 1.22648
## 23115 2018-02-07 1.22722
## 23116 2018-02-08 1.22750
## 23117 2018-02-08 1.22309
## 23118 2018-02-08 1.22754
## 23119 2018-02-08 1.22504
## 23120 2018-02-08 1.22474
## 23121 2018-02-08 1.22524
## 23122 2018-02-09 1.22578
## 23123 2018-02-09 1.22650
## 23124 2018-02-09 1.22768
## 23125 2018-02-09 1.22145
## 23126 2018-02-09 1.22535
## 23127 2018-02-11 1.22721
## 23128 2018-02-12 1.22830
## 23129 2018-02-12 1.22639
## 23130 2018-02-12 1.22433
## 23131 2018-02-12 1.22753
## 23132 2018-02-12 1.22920
## 23133 2018-02-12 1.22940
## 23134 2018-02-13 1.23139
```

```
## 23135 2018-02-13 1.23138
## 23136 2018-02-13 1.23436
## 23137 2018-02-13 1.23533
## 23138 2018-02-13 1.23530
## 23139 2018-02-13 1.23549
## 23140 2018-02-14 1.23789
## 23141 2018-02-14 1.23532
## 23142 2018-02-14 1.23047
## 23143 2018-02-14 1.24180
## 23144 2018-02-14 1.24516
## 23145 2018-02-14 1.24612
## 23146 2018-02-15 1.24659
## 23147 2018-02-15 1.24874
## 23148 2018-02-15 1.24740
## 23149 2018-02-15 1.24718
## 23150 2018-02-15 1.25063
## 23151 2018-02-15 1.25138
## 23152 2018-02-16 1.25493
## 23153 2018-02-16 1.25277
## 23154 2018-02-16 1.24528
## 23155 2018-02-16 1.24409
## 23156 2018-02-16 1.24123
## 23157 2018-02-18 1.24345
## 23158 2018-02-19 1.24097
## 23159 2018-02-19 1.24110
## 23160 2018-02-19 1.23732
## 23161 2018-02-19 1.24132
## 23162 2018-02-19 1.24082
## 23163 2018-02-19 1.23946
## 23164 2018-02-20 1.23854
## 23165 2018-02-20 1.23442
## 23166 2018-02-20 1.23258
## 23167 2018-02-20 1.23444
## 23168 2018-02-20 1.23377
## 23169 2018-02-20 1.23374
## 23170 2018-02-21 1.23230
## 23171 2018-02-21 1.23337
## 23172 2018-02-21 1.23207
## 23173 2018-02-21 1.23273
## 23174 2018-02-21 1.22836
## 23175 2018-02-21 1.22793
## 23176 2018-02-22 1.22748
## 23177 2018-02-22 1.22941
## 23178 2018-02-22 1.23134
## 23179 2018-02-22 1.23365
## 23180 2018-02-22 1.23309
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN743

```
## 23181 2018-02-22 1.23253
## 23182 2018-02-23 1.23026
## 23183 2018-02-23 1.23082
## 23184 2018-02-23 1.22981
## 23185 2018-02-23 1.23062
## 23186 2018-02-23 1.22975
## 23187 2018-02-25 1.22979
## 23188 2018-02-26 1.23285
## 23189 2018-02-26 1.23434
## 23190 2018-02-26 1.23046
## 23191 2018-02-26 1.23080
## 23192 2018-02-26 1.23177
## 23193 2018-02-26 1.23361
## 23194 2018-02-27 1.23262
## 23195 2018-02-27 1.23314
## 23196 2018-02-27 1.22879
## 23197 2018-02-27 1.22480
## 23198 2018-02-27 1.22333
## 23199 2018-02-27 1.22299
## 23200 2018-02-28 1.22273
## 23201 2018-02-28 1.22208
## 23202 2018-02-28 1.22184
## 23203 2018-02-28 1.22089
## 23204 2018-02-28 1.21944
## 23205 2018-02-28 1.21919
## 23206 2018-03-01 1.21926
## 23207 2018-03-01 1.21818
## 23208 2018-03-01 1.21875
## 23209 2018-03-01 1.22122
## 23210 2018-03-01 1.22672
## 23211 2018-03-01 1.22746
## 23212 2018-03-02 1.22794
## 23213 2018-03-02 1.22764
## 23214 2018-03-02 1.23092
## 23215 2018-03-02 1.23123
## 23216 2018-03-02 1.23203
## 23217 2018-03-04 1.23302
## 23218 2018-03-05 1.23192
## 23219 2018-03-05 1.23223
## 23220 2018-03-05 1.23085
## 23221 2018-03-05 1.23344
## 23222 2018-03-05 1.23361
## 23223 2018-03-05 1.23561
## 23224 2018-03-06 1.23495
## 23225 2018-03-06 1.23442
## 23226 2018-03-06 1.24073
```

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```
## 23227 2018-03-06 1.23936
## 23228 2018-03-06 1.24044
## 23229 2018-03-06 1.24142
## 23230 2018-03-07 1.24189
## 23231 2018-03-07 1.24238
## 23232 2018-03-07 1.24148
## 23233 2018-03-07 1.24007
## 23234 2018-03-07 1.24117
## 23235 2018-03-07 1.24009
## 23236 2018-03-08 1.24044
## 23237 2018-03-08 1.23829
## 23238 2018-03-08 1.24031
## 23239 2018-03-08 1.23190
## 23240 2018-03-08 1.23126
## 23241 2018-03-08 1.22989
## 23242 2018-03-09 1.23156
## 23243 2018-03-09 1.23021
## 23244 2018-03-09 1.22938
## 23245 2018-03-09 1.23178
## 23246 2018-03-09 1.23061
## 23247 2018-03-11 1.23108
## 23248 2018-03-12 1.23252
## 23249 2018-03-12 1.23344
## 23250 2018-03-12 1.23015
## 23251 2018-03-12 1.23194
## 23252 2018-03-12 1.23347
## 23253 2018-03-12 1.23403
## 23254 2018-03-13 1.23279
## 23255 2018-03-13 1.23342
## 23256 2018-03-13 1.23667
## 23257 2018-03-13 1.24013
## 23258 2018-03-13 1.23898
## 23259 2018-03-13 1.23944
## 23260 2018-03-14 1.24075
## 23261 2018-03-14 1.23752
## 23262 2018-03-14 1.23630
## 23263 2018-03-14 1.23675
## 23264 2018-03-14 1.23679
## 23265 2018-03-14 1.23820
## 23266 2018-03-15 1.23818
## 23267 2018-03-15 1.23651
## 23268 2018-03-15 1.23385
## 23269 2018-03-15 1.23162
## 23270 2018-03-15 1.23048
## 23271 2018-03-15 1.23044
## 23272 2018-03-16 1.23106
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN745

```
## 23273 2018-03-16 1.23184
## 23274 2018-03-16 1.23090
## 23275 2018-03-16 1.22915
## 23276 2018-03-16 1.22904
## 23277 2018-03-18 1.22713
## 23278 2018-03-19 1.22670
## 23279 2018-03-19 1.22803
## 23280 2018-03-19 1.23029
## 23281 2018-03-19 1.23336
## 23282 2018-03-19 1.23357
## 23283 2018-03-19 1.23414
## 23284 2018-03-20 1.23390
## 23285 2018-03-20 1.23463
## 23286 2018-03-20 1.22844
## 23287 2018-03-20 1.22541
## 23288 2018-03-20 1.22417
## 23289 2018-03-20 1.22564
## 23290 2018-03-21 1.22613
## 23291 2018-03-21 1.22800
## 23292 2018-03-21 1.22851
## 23293 2018-03-21 1.22623
## 23294 2018-03-21 1.23382
## 23295 2018-03-21 1.23682
## 23296 2018-03-22 1.23607
## 23297 2018-03-22 1.23572
## 23298 2018-03-22 1.23135
## 23299 2018-03-22 1.23066
## 23300 2018-03-22 1.23024
## 23301 2018-03-22 1.23369
## 23302 2018-03-23 1.23347
## 23303 2018-03-23 1.23365
## 23304 2018-03-23 1.23383
## 23305 2018-03-23 1.23629
## 23306 2018-03-23 1.23548
## 23307 2018-03-25 1.23698
## 23308 2018-03-26 1.23737
## 23309 2018-03-26 1.23923
## 23310 2018-03-26 1.24007
## 23311 2018-03-26 1.24445
## 23312 2018-03-26 1.24443
## 23313 2018-03-26 1.24499
## 23314 2018-03-27 1.24500
## 23315 2018-03-27 1.24303
## 23316 2018-03-27 1.23873
## 23317 2018-03-27 1.24136
## 23318 2018-03-27 1.24031
```

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## 23319 2018-03-27 1.24129
## 23320 2018-03-28 1.24085
## 23321 2018-03-28 1.23979
## 23322 2018-03-28 1.23832
## 23323 2018-03-28 1.23462
## 23324 2018-03-28 1.23095
## 23325 2018-03-28 1.23127
## 23326 2018-03-29 1.23305
## 23327 2018-03-29 1.23071
## 23328 2018-03-29 1.23190
## 23329 2018-03-29 1.22905
## 23330 2018-03-29 1.23009
## 23331 2018-03-29 1.23012
## 23332 2018-03-30 1.23125
## 23333 2018-03-30 1.23284
## 23334 2018-03-30 1.23281
## 23335 2018-03-30 1.23274
## 23336 2018-03-30 1.23261
## 23337 2018-04-01 1.23221
## 23338 2018-04-02 1.23172
## 23339 2018-04-02 1.23294
## 23340 2018-04-02 1.23362
## 23341 2018-04-02 1.22944
## 23342 2018-04-02 1.23027
## 23343 2018-04-02 1.23035
## 23344 2018-04-03 1.23098
## 23345 2018-04-03 1.23168
## 23346 2018-04-03 1.22960
## 23347 2018-04-03 1.22666
## 23348 2018-04-03 1.22713
## 23349 2018-04-03 1.22790
## 23350 2018-04-04 1.22784
## 23351 2018-04-04 1.22921
## 23352 2018-04-04 1.22968
## 23353 2018-04-04 1.22943
## 23354 2018-04-04 1.22780
## 23355 2018-04-04 1.22862
## 23356 2018-04-05 1.22771
## 23357 2018-04-05 1.22653
## 23358 2018-04-05 1.22501
## 23359 2018-04-05 1.22365
## 23360 2018-04-05 1.22407
## 23361 2018-04-05 1.22493
## 23362 2018-04-06 1.22386
## 23363 2018-04-06 1.22352
## 23364 2018-04-06 1.22481
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN747

```
## 23365 2018-04-06 1.22757
## 23366 2018-04-06 1.22834
## 23367 2018-04-08 1.22751
## 23368 2018-04-09 1.22775
## 23369 2018-04-09 1.22802
## 23370 2018-04-09 1.23135
## 23371 2018-04-09 1.23184
## 23372 2018-04-09 1.23211
## 23373 2018-04-09 1.23255
## 23374 2018-04-10 1.23188
## 23375 2018-04-10 1.23252
## 23376 2018-04-10 1.23490
## 23377 2018-04-10 1.23405
## 23378 2018-04-10 1.23561
## 23379 2018-04-10 1.23612
## 23380 2018-04-11 1.23641
## 23381 2018-04-11 1.23774
## 23382 2018-04-11 1.23756
## 23383 2018-04-11 1.23749
## 23384 2018-04-11 1.23674
## 23385 2018-04-11 1.23761
## 23386 2018-04-12 1.23584
## 23387 2018-04-12 1.23462
## 23388 2018-04-12 1.23158
## 23389 2018-04-12 1.23346
## 23390 2018-04-12 1.23270
## 23391 2018-04-12 1.23288
## 23392 2018-04-13 1.23292
## 23393 2018-04-13 1.23352
## 23394 2018-04-13 1.23163
## 23395 2018-04-13 1.23420
## 23396 2018-04-13 1.23324
## 23397 2018-04-15 1.23393
## 23398 2018-04-16 1.23312
## 23399 2018-04-16 1.23648
## 23400 2018-04-16 1.23815
## 23401 2018-04-16 1.23831
## 23402 2018-04-16 1.23801
## 23403 2018-04-16 1.23838
## 23404 2018-04-17 1.23826
## 23405 2018-04-17 1.23860
## 23406 2018-04-17 1.23480
## 23407 2018-04-17 1.23555
## 23408 2018-04-17 1.23698
## 23409 2018-04-17 1.23704
## 23410 2018-04-18 1.23775
```

```
## 23411 2018-04-18 1.23602
## 23412 2018-04-18 1.23918
## 23413 2018-04-18 1.23903
## 23414 2018-04-18 1.23740
## 23415 2018-04-18 1.23725
## 23416 2018-04-19 1.23783
## 23417 2018-04-19 1.23664
## 23418 2018-04-19 1.23794
## 23419 2018-04-19 1.23451
## 23420 2018-04-19 1.23459
## 23421 2018-04-19 1.23475
## 23422 2018-04-20 1.23412
## 23423 2018-04-20 1.23150
## 23424 2018-04-20 1.22908
## 23425 2018-04-20 1.22970
## 23426 2018-04-20 1.22903
## 23427 2018-04-22 1.22710
## 23428 2018-04-23 1.22719
## 23429 2018-04-23 1.22387
## 23430 2018-04-23 1.22407
## 23431 2018-04-23 1.22184
## 23432 2018-04-23 1.22092
## 23433 2018-04-23 1.22069
## 23434 2018-04-24 1.22135
## 23435 2018-04-24 1.22033
## 23436 2018-04-24 1.22070
## 23437 2018-04-24 1.22408
## 23438 2018-04-24 1.22329
## 23439 2018-04-24 1.22297
## 23440 2018-04-25 1.22174
## 23441 2018-04-25 1.22029
## 23442 2018-04-25 1.21837
## 23443 2018-04-25 1.21852
## 23444 2018-04-25 1.21611
## 23445 2018-04-25 1.21727
## 23446 2018-04-26 1.21758
## 23447 2018-04-26 1.21716
## 23448 2018-04-26 1.21999
## 23449 2018-04-26 1.21262
## 23450 2018-04-26 1.21037
## 23451 2018-04-26 1.21079
## 23452 2018-04-27 1.21120
## 23453 2018-04-27 1.20719
## 23454 2018-04-27 1.20846
## 23455 2018-04-27 1.21118
## 23456 2018-04-27 1.21332
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN749

```
## 23457 2018-04-29 1.21288
## 23458 2018-04-30 1.21293
## 23459 2018-04-30 1.21043
## 23460 2018-04-30 1.20876
## 23461 2018-04-30 1.21009
## 23462 2018-04-30 1.20781
## 23463 2018-04-30 1.20797
## 23464 2018-05-01 1.20726
## 23465 2018-05-01 1.20344
## 23466 2018-05-01 1.20249
## 23467 2018-05-01 1.20167
## 23468 2018-05-01 1.19932
## 23469 2018-05-01 1.19910
## 23470 2018-05-02 1.20035
## 23471 2018-05-02 1.20002
## 23472 2018-05-02 1.20118
## 23473 2018-05-02 1.19676
## 23474 2018-05-02 1.19513
## 23475 2018-05-02 1.19673
## 23476 2018-05-03 1.19886
## 23477 2018-05-03 1.19863
## 23478 2018-05-03 1.19796
## 23479 2018-05-03 1.19883
## 23480 2018-05-03 1.19889
## 23481 2018-05-03 1.19843
## 23482 2018-05-04 1.19862
## 23483 2018-05-04 1.19633
## 23484 2018-05-04 1.19674
## 23485 2018-05-04 1.19635
## 23486 2018-05-04 1.19640
## 23487 2018-05-06 1.19699
## 23488 2018-05-07 1.19605
## 23489 2018-05-07 1.19310
## 23490 2018-05-07 1.19193
## 23491 2018-05-07 1.19333
## 23492 2018-05-07 1.19228
## 23493 2018-05-07 1.19364
## 23494 2018-05-08 1.19132
## 23495 2018-05-08 1.18887
## 23496 2018-05-08 1.18653
## 23497 2018-05-08 1.18799
## 23498 2018-05-08 1.18652
## 23499 2018-05-08 1.18543
## 23500 2018-05-09 1.18552
## 23501 2018-05-09 1.18563
## 23502 2018-05-09 1.18859
```

```
## 23503 2018-05-09 1.18556
## 23504 2018-05-09 1.18508
## 23505 2018-05-09 1.18494
## 23506 2018-05-10 1.18733
## 23507 2018-05-10 1.18740
## 23508 2018-05-10 1.19274
## 23509 2018-05-10 1.19109
## 23510 2018-05-10 1.19158
## 23511 2018-05-10 1.19235
## 23512 2018-05-11 1.19145
## 23513 2018-05-11 1.19216
## 23514 2018-05-11 1.19511
## 23515 2018-05-11 1.19581
## 23516 2018-05-11 1.19451
## 23517 2018-05-13 1.19645
## 23518 2018-05-14 1.19566
## 23519 2018-05-14 1.19846
## 23520 2018-05-14 1.19851
## 23521 2018-05-14 1.19763
## 23522 2018-05-14 1.19278
## 23523 2018-05-14 1.19368
## 23524 2018-05-15 1.19143
## 23525 2018-05-15 1.19187
## 23526 2018-05-15 1.18473
## 23527 2018-05-15 1.18655
## 23528 2018-05-15 1.18379
## 23529 2018-05-15 1.18309
## 23530 2018-05-16 1.18323
## 23531 2018-05-16 1.18376
## 23532 2018-05-16 1.17667
## 23533 2018-05-16 1.18128
## 23534 2018-05-16 1.18076
## 23535 2018-05-16 1.18119
## 23536 2018-05-17 1.18190
## 23537 2018-05-17 1.18148
## 23538 2018-05-17 1.18058
## 23539 2018-05-17 1.18048
## 23540 2018-05-17 1.17952
## 23541 2018-05-17 1.18056
## 23542 2018-05-18 1.18050
## 23543 2018-05-18 1.18066
## 23544 2018-05-18 1.17699
## 23545 2018-05-18 1.17845
## 23546 2018-05-18 1.17747
## 23547 2018-05-20 1.17478
## 23548 2018-05-21 1.17508
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN751

```
## 23549 2018-05-21 1.17420
## 23550 2018-05-21 1.17692
## 23551 2018-05-21 1.17715
## 23552 2018-05-21 1.17918
## 23553 2018-05-21 1.17917
## 23554 2018-05-22 1.17744
## 23555 2018-05-22 1.18084
## 23556 2018-05-22 1.17815
## 23557 2018-05-22 1.17848
## 23558 2018-05-22 1.17793
## 23559 2018-05-22 1.17829
## 23560 2018-05-23 1.17660
## 23561 2018-05-23 1.17292
## 23562 2018-05-23 1.17008
## 23563 2018-05-23 1.16935
## 23564 2018-05-23 1.16965
## 23565 2018-05-23 1.17072
## 23566 2018-05-24 1.17094
## 23567 2018-05-24 1.17384
## 23568 2018-05-24 1.17267
## 23569 2018-05-24 1.17322
## 23570 2018-05-24 1.17198
## 23571 2018-05-24 1.17181
## 23572 2018-05-25 1.17096
## 23573 2018-05-25 1.17273
## 23574 2018-05-25 1.16768
## 23575 2018-05-25 1.16614
## 23576 2018-05-25 1.16516
## 23577 2018-05-27 1.16980
## 23578 2018-05-28 1.17248
## 23579 2018-05-28 1.16781
## 23580 2018-05-28 1.16095
## 23581 2018-05-28 1.16290
## 23582 2018-05-28 1.16247
## 23583 2018-05-28 1.16274
## 23584 2018-05-29 1.16292
## 23585 2018-05-29 1.15431
## 23586 2018-05-29 1.15764
## 23587 2018-05-29 1.15463
## 23588 2018-05-29 1.15400
## 23589 2018-05-29 1.15344
## 23590 2018-05-30 1.15410
## 23591 2018-05-30 1.16119
## 23592 2018-05-30 1.16257
## 23593 2018-05-30 1.16640
## 23594 2018-05-30 1.16679
```

```
## 23595 2018-05-30 1.16630
## 23596 2018-05-31 1.16651
## 23597 2018-05-31 1.17202
## 23598 2018-05-31 1.16729
## 23599 2018-05-31 1.16710
## 23600 2018-05-31 1.16941
## 23601 2018-05-31 1.16942
## 23602 2018-06-01 1.16783
## 23603 2018-06-01 1.16821
## 23604 2018-06-01 1.16584
## 23605 2018-06-01 1.16657
## 23606 2018-06-01 1.16602
## 23607 2018-06-03 1.16761
## 23608 2018-06-04 1.16920
## 23609 2018-06-04 1.17100
## 23610 2018-06-04 1.17159
## 23611 2018-06-04 1.16856
## 23612 2018-06-04 1.16992
## 23613 2018-06-04 1.16939
## 23614 2018-06-05 1.16871
## 23615 2018-06-05 1.17051
## 23616 2018-06-05 1.16665
## 23617 2018-06-05 1.17155
## 23618 2018-06-05 1.17181
## 23619 2018-06-05 1.17250
## 23620 2018-06-06 1.17156
## 23621 2018-06-06 1.17427
## 23622 2018-06-06 1.17661
## 23623 2018-06-06 1.17769
## 23624 2018-06-06 1.17743
## 23625 2018-06-06 1.17920
## 23626 2018-06-07 1.17940
## 23627 2018-06-07 1.18217
## 23628 2018-06-07 1.18340
## 23629 2018-06-07 1.18084
## 23630 2018-06-07 1.17997
## 23631 2018-06-07 1.18062
## 23632 2018-06-08 1.18063
## 23633 2018-06-08 1.17644
## 23634 2018-06-08 1.17481
## 23635 2018-06-08 1.17729
## 23636 2018-06-08 1.17708
## 23637 2018-06-10 1.17983
## 23638 2018-06-11 1.17988
## 23639 2018-06-11 1.17843
## 23640 2018-06-11 1.17984
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN753

```
## 23641 2018-06-11 1.17884
## 23642 2018-06-11 1.17846
## 23643 2018-06-11 1.17531
## 23644 2018-06-12 1.17694
## 23645 2018-06-12 1.17943
## 23646 2018-06-12 1.18008
## 23647 2018-06-12 1.17738
## 23648 2018-06-12 1.17457
## 23649 2018-06-12 1.17461
## 23650 2018-06-13 1.17440
## 23651 2018-06-13 1.17442
## 23652 2018-06-13 1.17745
## 23653 2018-06-13 1.17910
## 23654 2018-06-13 1.17916
## 23655 2018-06-13 1.17957
## 23656 2018-06-14 1.18042
## 23657 2018-06-14 1.18257
## 23658 2018-06-14 1.16887
## 23659 2018-06-14 1.16338
## 23660 2018-06-14 1.15696
## 23661 2018-06-14 1.15595
## 23662 2018-06-15 1.15707
## 23663 2018-06-15 1.15928
## 23664 2018-06-15 1.16034
## 23665 2018-06-15 1.16054
## 23666 2018-06-15 1.16103
## 23667 2018-06-17 1.15779
## 23668 2018-06-18 1.15912
## 23669 2018-06-18 1.15901
## 23670 2018-06-18 1.16055
## 23671 2018-06-18 1.16048
## 23672 2018-06-18 1.16233
## 23673 2018-06-18 1.16346
## 23674 2018-06-19 1.16276
## 23675 2018-06-19 1.15543
## 23676 2018-06-19 1.15547
## 23677 2018-06-19 1.15704
## 23678 2018-06-19 1.15905
## 23679 2018-06-19 1.15763
## 23680 2018-06-20 1.15705
## 23681 2018-06-20 1.15578
## 23682 2018-06-20 1.15941
## 23683 2018-06-20 1.15892
## 23684 2018-06-20 1.15719
## 23685 2018-06-20 1.15769
## 23686 2018-06-21 1.15624
```

```
## 23687 2018-06-21 1.15197
## 23688 2018-06-21 1.15894
## 23689 2018-06-21 1.16074
## 23690 2018-06-21 1.16043
## 23691 2018-06-21 1.16120
## 23692 2018-06-22 1.16140
## 23693 2018-06-22 1.16692
## 23694 2018-06-22 1.16541
## 23695 2018-06-22 1.16481
## 23696 2018-06-22 1.16590
## 23697 2018-06-24 1.16570
## 23698 2018-06-25 1.16525
## 23699 2018-06-25 1.16592
## 23700 2018-06-25 1.16823
## 23701 2018-06-25 1.16920
## 23702 2018-06-25 1.17045
## 23703 2018-06-25 1.17045
## 23704 2018-06-26 1.17149
## 23705 2018-06-26 1.16730
## 23706 2018-06-26 1.16713
## 23707 2018-06-26 1.16583
## 23708 2018-06-26 1.16483
## 23709 2018-06-26 1.16544
## 23710 2018-06-27 1.16547
## 23711 2018-06-27 1.16279
## 23712 2018-06-27 1.15971
## 23713 2018-06-27 1.15830
## 23714 2018-06-27 1.15543
## 23715 2018-06-27 1.15654
## 23716 2018-06-28 1.15627
## 23717 2018-06-28 1.15554
## 23718 2018-06-28 1.15647
## 23719 2018-06-28 1.15833
## 23720 2018-06-28 1.15692
## 23721 2018-06-28 1.15697
## 23722 2018-06-29 1.16549
## 23723 2018-06-29 1.16500
## 23724 2018-06-29 1.16446
## 23725 2018-06-29 1.16772
## 23726 2018-06-29 1.16858
## 23727 2018-07-01 1.16649
## 23728 2018-07-02 1.16502
## 23729 2018-07-02 1.16437
## 23730 2018-07-02 1.16180
## 23731 2018-07-02 1.16002
## 23732 2018-07-02 1.16397
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN755

```
## 23733 2018-07-02 1.16348
## 23734 2018-07-03 1.16326
## 23735 2018-07-03 1.16598
## 23736 2018-07-03 1.16531
## 23737 2018-07-03 1.16498
## 23738 2018-07-03 1.16590
## 23739 2018-07-03 1.16710
## 23740 2018-07-04 1.16632
## 23741 2018-07-04 1.16446
## 23742 2018-07-04 1.16425
## 23743 2018-07-04 1.16670
## 23744 2018-07-04 1.16561
## 23745 2018-07-04 1.16575
## 23746 2018-07-05 1.16573
## 23747 2018-07-05 1.16933
## 23748 2018-07-05 1.17144
## 23749 2018-07-05 1.16979
## 23750 2018-07-05 1.16918
## 23751 2018-07-05 1.16929
## 23752 2018-07-06 1.16859
## 23753 2018-07-06 1.17135
## 23754 2018-07-06 1.17436
## 23755 2018-07-06 1.17458
## 23756 2018-07-06 1.17464
## 23757 2018-07-08 1.17561
## 23758 2018-07-09 1.17617
## 23759 2018-07-09 1.17724
## 23760 2018-07-09 1.17777
## 23761 2018-07-09 1.17468
## 23762 2018-07-09 1.17513
## 23763 2018-07-09 1.17598
## 23764 2018-07-10 1.17412
## 23765 2018-07-10 1.17270
## 23766 2018-07-10 1.17167
## 23767 2018-07-10 1.17332
## 23768 2018-07-10 1.17449
## 23769 2018-07-10 1.17269
## 23770 2018-07-11 1.17274
## 23771 2018-07-11 1.17088
## 23772 2018-07-11 1.17521
## 23773 2018-07-11 1.16996
## 23774 2018-07-11 1.16733
## 23775 2018-07-11 1.16730
## 23776 2018-07-12 1.16828
## 23777 2018-07-12 1.16745
## 23778 2018-07-12 1.16717
```

```
## 23779 2018-07-12 1.16823
## 23780 2018-07-12 1.16717
## 23781 2018-07-12 1.16672
## 23782 2018-07-13 1.16573
## 23783 2018-07-13 1.16271
## 23784 2018-07-13 1.16451
## 23785 2018-07-13 1.16737
## 23786 2018-07-13 1.16885
## 23787 2018-07-15 1.16843
## 23788 2018-07-16 1.16865
## 23789 2018-07-16 1.16968
## 23790 2018-07-16 1.17105
## 23791 2018-07-16 1.17059
## 23792 2018-07-16 1.17116
## 23793 2018-07-16 1.17077
## 23794 2018-07-17 1.17184
## 23795 2018-07-17 1.17417
## 23796 2018-07-17 1.16975
## 23797 2018-07-17 1.16539
## 23798 2018-07-17 1.16616
## 23799 2018-07-17 1.16583
## 23800 2018-07-18 1.16415
## 23801 2018-07-18 1.16223
## 23802 2018-07-18 1.16232
## 23803 2018-07-18 1.16529
## 23804 2018-07-18 1.16388
## 23805 2018-07-18 1.16535
## 23806 2018-07-19 1.16479
## 23807 2018-07-19 1.16129
## 23808 2018-07-19 1.15865
## 23809 2018-07-19 1.16075
## 23810 2018-07-19 1.16424
## 23811 2018-07-19 1.16545
## 23812 2018-07-20 1.16642
## 23813 2018-07-20 1.16413
## 23814 2018-07-20 1.17130
## 23815 2018-07-20 1.17096
## 23816 2018-07-20 1.17205
## 23817 2018-07-22 1.17442
## 23818 2018-07-23 1.17335
## 23819 2018-07-23 1.17064
## 23820 2018-07-23 1.17183
## 23821 2018-07-23 1.16997
## 23822 2018-07-23 1.16925
## 23823 2018-07-23 1.16928
## 23824 2018-07-24 1.16770
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN757

```
## 23825 2018-07-24 1.16848
## 23826 2018-07-24 1.16943
## 23827 2018-07-24 1.16821
## 23828 2018-07-24 1.16871
## 23829 2018-07-24 1.16885
## 23830 2018-07-25 1.16784
## 23831 2018-07-25 1.16965
## 23832 2018-07-25 1.16994
## 23833 2018-07-25 1.16788
## 23834 2018-07-25 1.17288
## 23835 2018-07-25 1.17353
## 23836 2018-07-26 1.17316
## 23837 2018-07-26 1.17136
## 23838 2018-07-26 1.16946
## 23839 2018-07-26 1.16632
## 23840 2018-07-26 1.16434
## 23841 2018-07-26 1.16418
## 23842 2018-07-27 1.16477
## 23843 2018-07-27 1.16265
## 23844 2018-07-27 1.16389
## 23845 2018-07-27 1.16582
## 23846 2018-07-27 1.16585
## 23847 2018-07-29 1.16603
## 23848 2018-07-30 1.16553
## 23849 2018-07-30 1.16769
## 23850 2018-07-30 1.16952
## 23851 2018-07-30 1.17160
## 23852 2018-07-30 1.17068
## 23853 2018-07-30 1.17095
## 23854 2018-07-31 1.17163
## 23855 2018-07-31 1.17267
## 23856 2018-07-31 1.17276
## 23857 2018-07-31 1.17052
## 23858 2018-07-31 1.16924
## 23859 2018-07-31 1.16905
## 23860 2018-08-01 1.16779
## 23861 2018-08-01 1.16820
## 23862 2018-08-01 1.16903
## 23863 2018-08-01 1.16680
## 23864 2018-08-01 1.16600
## 23865 2018-08-01 1.16620
## 23866 2018-08-02 1.16476
## 23867 2018-08-02 1.16204
## 23868 2018-08-02 1.16267
## 23869 2018-08-02 1.16094
## 23870 2018-08-02 1.15843
```

```
## 23871 2018-08-02 1.15882
## 23872 2018-08-03 1.15920
## 23873 2018-08-03 1.15794
## 23874 2018-08-03 1.15953
## 23875 2018-08-03 1.15951
## 23876 2018-08-03 1.15691
## 23877 2018-08-05 1.15622
## 23878 2018-08-06 1.15574
## 23879 2018-08-06 1.15579
## 23880 2018-08-06 1.15427
## 23881 2018-08-06 1.15621
## 23882 2018-08-06 1.15540
## 23883 2018-08-06 1.15614
## 23884 2018-08-07 1.15580
## 23885 2018-08-07 1.15876
## 23886 2018-08-07 1.16039
## 23887 2018-08-07 1.15935
## 23888 2018-08-07 1.15991
## 23889 2018-08-07 1.16011
## 23890 2018-08-08 1.16240
## 23891 2018-08-08 1.15889
## 23892 2018-08-08 1.15817
## 23893 2018-08-08 1.15951
## 23894 2018-08-08 1.16106
## 23895 2018-08-08 1.16077
## 23896 2018-08-09 1.16064
## 23897 2018-08-09 1.15932
## 23898 2018-08-09 1.15995
## 23899 2018-08-09 1.15574
## 23900 2018-08-09 1.15273
## 23901 2018-08-09 1.15346
## 23902 2018-08-10 1.15167
## 23903 2018-08-10 1.14570
## 23904 2018-08-10 1.14439
## 23905 2018-08-10 1.14023
## 23906 2018-08-10 1.14130
## 23907 2018-08-12 1.13783
## 23908 2018-08-13 1.13670
## 23909 2018-08-13 1.13831
## 23910 2018-08-13 1.14170
## 23911 2018-08-13 1.13939
## 23912 2018-08-13 1.14104
## 23913 2018-08-13 1.14034
## 23914 2018-08-14 1.14020
## 23915 2018-08-14 1.13865
## 23916 2018-08-14 1.13903
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN759

```
## 23917 2018-08-14 1.13419
## 23918 2018-08-14 1.13445
## 23919 2018-08-14 1.13375
## 23920 2018-08-15 1.13259
## 23921 2018-08-15 1.13256
## 23922 2018-08-15 1.13160
## 23923 2018-08-15 1.13436
## 23924 2018-08-15 1.13456
## 23925 2018-08-15 1.13445
## 23926 2018-08-16 1.13833
## 23927 2018-08-16 1.13826
## 23928 2018-08-16 1.13654
## 23929 2018-08-16 1.13644
## 23930 2018-08-16 1.13777
## 23931 2018-08-16 1.13728
## 23932 2018-08-17 1.13786
## 23933 2018-08-17 1.13969
## 23934 2018-08-17 1.14062
## 23935 2018-08-17 1.14095
## 23936 2018-08-17 1.14396
## 23937 2018-08-19 1.14330
## 23938 2018-08-20 1.14265
## 23939 2018-08-20 1.14070
## 23940 2018-08-20 1.14237
## 23941 2018-08-20 1.14589
## 23942 2018-08-20 1.14830
## 23943 2018-08-20 1.15225
## 23944 2018-08-21 1.15313
## 23945 2018-08-21 1.15340
## 23946 2018-08-21 1.15043
## 23947 2018-08-21 1.15597
## 23948 2018-08-21 1.15708
## 23949 2018-08-21 1.15774
## 23950 2018-08-22 1.15760
## 23951 2018-08-22 1.15736
## 23952 2018-08-22 1.16179
## 23953 2018-08-22 1.15902
## 23954 2018-08-22 1.15972
## 23955 2018-08-22 1.15666
## 23956 2018-08-23 1.15565
## 23957 2018-08-23 1.15639
## 23958 2018-08-23 1.15745
## 23959 2018-08-23 1.15555
## 23960 2018-08-23 1.15425
## 23961 2018-08-23 1.15479
## 23962 2018-08-24 1.15632
```

```
## 23963 2018-08-24 1.15633
## 23964 2018-08-24 1.15933
## 23965 2018-08-24 1.16243
## 23966 2018-08-24 1.16223
## 23967 2018-08-26 1.16369
## 23968 2018-08-27 1.16185
## 23969 2018-08-27 1.16102
## 23970 2018-08-27 1.16380
## 23971 2018-08-27 1.16884
## 23972 2018-08-27 1.16782
## 23973 2018-08-27 1.16915
## 23974 2018-08-28 1.16740
## 23975 2018-08-28 1.16921
## 23976 2018-08-28 1.17160
## 23977 2018-08-28 1.17178
## 23978 2018-08-28 1.16957
## 23979 2018-08-28 1.16861
## 23980 2018-08-29 1.16959
## 23981 2018-08-29 1.16665
## 23982 2018-08-29 1.16648
## 23983 2018-08-29 1.17053
## 23984 2018-08-29 1.17085
## 23985 2018-08-29 1.17060
## 23986 2018-08-30 1.16996
## 23987 2018-08-30 1.16869
## 23988 2018-08-30 1.16776
## 23989 2018-08-30 1.16574
## 23990 2018-08-30 1.16713
## 23991 2018-08-30 1.16651
## 23992 2018-08-31 1.16699
## 23993 2018-08-31 1.16693
## 23994 2018-08-31 1.16397
## 23995 2018-08-31 1.15952
## 23996 2018-08-31 1.16054
## 23997 2018-09-02 1.15967
## 23998 2018-09-03 1.16065
## 23999 2018-09-03 1.16117
## 24000 2018-09-03 1.16069
## 24001 2018-09-03 1.16170
## 24002 2018-09-03 1.16218
## 24003 2018-09-03 1.16038
## 24004 2018-09-04 1.16043
## 24005 2018-09-04 1.15656
## 24006 2018-09-04 1.15615
## 24007 2018-09-04 1.15800
## 24008 2018-09-04 1.15828
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN761

```
## 24009 2018-09-04 1.15856
## 24010 2018-09-05 1.15948
## 24011 2018-09-05 1.15689
## 24012 2018-09-05 1.15850
## 24013 2018-09-05 1.16213
## 24014 2018-09-05 1.16303
## 24015 2018-09-05 1.16451
## 24016 2018-09-06 1.16341
## 24017 2018-09-06 1.16357
## 24018 2018-09-06 1.16418
## 24019 2018-09-06 1.16248
## 24020 2018-09-06 1.16242
## 24021 2018-09-06 1.16185
## 24022 2018-09-07 1.16292
## 24023 2018-09-07 1.16444
## 24024 2018-09-07 1.15668
## 24025 2018-09-07 1.15614
## 24026 2018-09-07 1.15545
## 24027 2018-09-09 1.15645
## 24028 2018-09-10 1.15476
## 24029 2018-09-10 1.15712
## 24030 2018-09-10 1.16034
## 24031 2018-09-10 1.16016
## 24032 2018-09-10 1.15952
## 24033 2018-09-10 1.15895
## 24034 2018-09-11 1.16012
## 24035 2018-09-11 1.16152
## 24036 2018-09-11 1.15782
## 24037 2018-09-11 1.15881
## 24038 2018-09-11 1.16081
## 24039 2018-09-11 1.15977
## 24040 2018-09-12 1.15873
## 24041 2018-09-12 1.15909
## 24042 2018-09-12 1.15924
## 24043 2018-09-12 1.16294
## 24044 2018-09-12 1.16273
## 24045 2018-09-12 1.16355
## 24046 2018-09-13 1.16233
## 24047 2018-09-13 1.16148
## 24048 2018-09-13 1.16789
## 24049 2018-09-13 1.16787
## 24050 2018-09-13 1.16905
## 24051 2018-09-13 1.16909
## 24052 2018-09-14 1.16970
## 24053 2018-09-14 1.17061
## 24054 2018-09-14 1.16677
```

```
## 24055 2018-09-14 1.16383
## 24056 2018-09-14 1.16246
## 24057 2018-09-16 1.16300
## 24058 2018-09-17 1.16368
## 24059 2018-09-17 1.16541
## 24060 2018-09-17 1.16849
## 24061 2018-09-17 1.16962
## 24062 2018-09-17 1.16842
## 24063 2018-09-17 1.16743
## 24064 2018-09-18 1.16911
## 24065 2018-09-18 1.16872
## 24066 2018-09-18 1.17067
## 24067 2018-09-18 1.16597
## 24068 2018-09-18 1.16681
## 24069 2018-09-18 1.16676
## 24070 2018-09-19 1.16754
## 24071 2018-09-19 1.17025
## 24072 2018-09-19 1.16752
## 24073 2018-09-19 1.16833
## 24074 2018-09-19 1.16731
## 24075 2018-09-19 1.16810
## 24076 2018-09-20 1.16787
## 24077 2018-09-20 1.16918
## 24078 2018-09-20 1.17705
## 24079 2018-09-20 1.17581
## 24080 2018-09-20 1.17769
## 24081 2018-09-20 1.17836
## 24082 2018-09-21 1.17787
## 24083 2018-09-21 1.17933
## 24084 2018-09-21 1.17578
## 24085 2018-09-21 1.17423
## 24086 2018-09-21 1.17523
## 24087 2018-09-23 1.17472
## 24088 2018-09-24 1.17438
## 24089 2018-09-24 1.17680
## 24090 2018-09-24 1.17520
## 24091 2018-09-24 1.17657
## 24092 2018-09-24 1.17485
## 24093 2018-09-24 1.17526
## 24094 2018-09-25 1.17411
## 24095 2018-09-25 1.17607
## 24096 2018-09-25 1.17795
## 24097 2018-09-25 1.17725
## 24098 2018-09-25 1.17678
## 24099 2018-09-25 1.17578
## 24100 2018-09-26 1.17635
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN763

```
## 24101 2018-09-26 1.17674
## 24102 2018-09-26 1.17408
## 24103 2018-09-26 1.17520
## 24104 2018-09-26 1.17422
## 24105 2018-09-26 1.17540
## 24106 2018-09-27 1.17493
## 24107 2018-09-27 1.17116
## 24108 2018-09-27 1.16749
## 24109 2018-09-27 1.16735
## 24110 2018-09-27 1.16409
## 24111 2018-09-27 1.16428
## 24112 2018-09-28 1.16461
## 24113 2018-09-28 1.16149
## 24114 2018-09-28 1.15848
## 24115 2018-09-28 1.16138
## 24116 2018-09-28 1.16053
## 24117 2018-09-30 1.16070
## 24118 2018-10-01 1.15954
## 24119 2018-10-01 1.16073
## 24120 2018-10-01 1.16102
## 24121 2018-10-01 1.15686
## 24122 2018-10-01 1.15791
## 24123 2018-10-01 1.15759
## 24124 2018-10-02 1.15696
## 24125 2018-10-02 1.15147
## 24126 2018-10-02 1.15387
## 24127 2018-10-02 1.15509
## 24128 2018-10-02 1.15469
## 24129 2018-10-02 1.15447
## 24130 2018-10-03 1.15779
## 24131 2018-10-03 1.15752
## 24132 2018-10-03 1.15295
## 24133 2018-10-03 1.15149
## 24134 2018-10-03 1.14790
## 24135 2018-10-03 1.14770
## 24136 2018-10-04 1.14701
## 24137 2018-10-04 1.14866
## 24138 2018-10-04 1.15086
## 24139 2018-10-04 1.15042
## 24140 2018-10-04 1.15151
## 24141 2018-10-04 1.15134
## 24142 2018-10-05 1.15092
## 24143 2018-10-05 1.14922
## 24144 2018-10-05 1.15325
## 24145 2018-10-05 1.15135
## 24146 2018-10-05 1.15243
```

```
## 24147 2018-10-07 1.15210
## 24148 2018-10-08 1.15116
## 24149 2018-10-08 1.14742
## 24150 2018-10-08 1.14637
## 24151 2018-10-08 1.14799
## 24152 2018-10-08 1.14924
## 24153 2018-10-08 1.14891
## 24154 2018-10-09 1.14983
## 24155 2018-10-09 1.14782
## 24156 2018-10-09 1.14497
## 24157 2018-10-09 1.14806
## 24158 2018-10-09 1.14918
## 24159 2018-10-09 1.15085
## 24160 2018-10-10 1.15066
## 24161 2018-10-10 1.14865
## 24162 2018-10-10 1.15025
## 24163 2018-10-10 1.15388
## 24164 2018-10-10 1.15201
## 24165 2018-10-10 1.15368
## 24166 2018-10-11 1.15621
## 24167 2018-10-11 1.15459
## 24168 2018-10-11 1.15744
## 24169 2018-10-11 1.15750
## 24170 2018-10-11 1.15939
## 24171 2018-10-11 1.15978
## 24172 2018-10-12 1.16059
## 24173 2018-10-12 1.15870
## 24174 2018-10-12 1.15578
## 24175 2018-10-12 1.15626
## 24176 2018-10-12 1.15626
## 24177 2018-10-14 1.15497
## 24178 2018-10-15 1.15496
## 24179 2018-10-15 1.15728
## 24180 2018-10-15 1.16055
## 24181 2018-10-15 1.15846
## 24182 2018-10-15 1.15802
## 24183 2018-10-15 1.15903
## 24184 2018-10-16 1.15728
## 24185 2018-10-16 1.15880
## 24186 2018-10-16 1.15882
## 24187 2018-10-16 1.15835
## 24188 2018-10-16 1.15755
## 24189 2018-10-16 1.15774
## 24190 2018-10-17 1.15585
## 24191 2018-10-17 1.15658
## 24192 2018-10-17 1.15353
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN765

```
## 24193 2018-10-17 1.15278
## 24194 2018-10-17 1.15017
## 24195 2018-10-17 1.15018
## 24196 2018-10-18 1.15004
## 24197 2018-10-18 1.15179
## 24198 2018-10-18 1.15015
## 24199 2018-10-18 1.14718
## 24200 2018-10-18 1.14536
## 24201 2018-10-18 1.14583
## 24202 2018-10-19 1.14592
## 24203 2018-10-19 1.14496
## 24204 2018-10-19 1.14646
## 24205 2018-10-19 1.15199
## 24206 2018-10-19 1.15156
## 24207 2018-10-21 1.15033
## 24208 2018-10-22 1.15114
## 24209 2018-10-22 1.15156
## 24210 2018-10-22 1.14858
## 24211 2018-10-22 1.14691
## 24212 2018-10-22 1.14658
## 24213 2018-10-22 1.14610
## 24214 2018-10-23 1.14558
## 24215 2018-10-23 1.14669
## 24216 2018-10-23 1.14661
## 24217 2018-10-23 1.14823
## 24218 2018-10-23 1.14720
## 24219 2018-10-23 1.14687
## 24220 2018-10-24 1.14685
## 24221 2018-10-24 1.14162
## 24222 2018-10-24 1.14050
## 24223 2018-10-24 1.13935
## 24224 2018-10-24 1.13928
## 24225 2018-10-24 1.14070
## 24226 2018-10-25 1.14126
## 24227 2018-10-25 1.14099
## 24228 2018-10-25 1.14301
## 24229 2018-10-25 1.13724
## 24230 2018-10-25 1.13758
## 24231 2018-10-25 1.13681
## 24232 2018-10-26 1.13687
## 24233 2018-10-26 1.13793
## 24234 2018-10-26 1.13450
## 24235 2018-10-26 1.13962
## 24236 2018-10-26 1.14044
## 24237 2018-10-28 1.13900
## 24238 2018-10-29 1.13922
```

```
## 24239 2018-10-29 1.13835
## 24240 2018-10-29 1.13863
## 24241 2018-10-29 1.13793
## 24242 2018-10-29 1.13730
## 24243 2018-10-29 1.13766
## 24244 2018-10-30 1.13811
## 24245 2018-10-30 1.13782
## 24246 2018-10-30 1.13712
## 24247 2018-10-30 1.13526
## 24248 2018-10-30 1.13455
## 24249 2018-10-30 1.13427
## 24250 2018-10-31 1.13423
## 24251 2018-10-31 1.13543
## 24252 2018-10-31 1.13225
## 24253 2018-10-31 1.13139
## 24254 2018-10-31 1.13129
## 24255 2018-10-31 1.13282
## 24256 2018-11-01 1.13434
## 24257 2018-11-01 1.13786
## 24258 2018-11-01 1.13877
## 24259 2018-11-01 1.14076
## 24260 2018-11-01 1.14092
## 24261 2018-11-01 1.14016
## 24262 2018-11-02 1.14092
## 24263 2018-11-02 1.14307
## 24264 2018-11-02 1.14175
## 24265 2018-11-02 1.13859
## 24266 2018-11-02 1.13881
## 24267 2018-11-04 1.13893
## 24268 2018-11-05 1.13903
## 24269 2018-11-05 1.13817
## 24270 2018-11-05 1.13784
## 24271 2018-11-05 1.13953
## 24272 2018-11-05 1.14083
## 24273 2018-11-05 1.14073
## 24274 2018-11-06 1.14056
## 24275 2018-11-06 1.14064
## 24276 2018-11-06 1.14277
## 24277 2018-11-06 1.14119
## 24278 2018-11-06 1.14277
## 24279 2018-11-06 1.14203
## 24280 2018-11-07 1.14522
## 24281 2018-11-07 1.14916
## 24282 2018-11-07 1.14795
## 24283 2018-11-07 1.14643
## 24284 2018-11-07 1.14265
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN767

```
## 24285 2018-11-07 1.14330
## 24286 2018-11-08 1.14341
## 24287 2018-11-08 1.14233
## 24288 2018-11-08 1.14267
## 24289 2018-11-08 1.13929
## 24290 2018-11-08 1.13638
## 24291 2018-11-08 1.13592
## 24292 2018-11-09 1.13494
## 24293 2018-11-09 1.13378
## 24294 2018-11-09 1.13516
## 24295 2018-11-09 1.13325
## 24296 2018-11-09 1.13374
## 24297 2018-11-11 1.13251
## 24298 2018-11-12 1.13102
## 24299 2018-11-12 1.12568
## 24300 2018-11-12 1.12725
## 24301 2018-11-12 1.12449
## 24302 2018-11-12 1.12188
## 24303 2018-11-12 1.12360
## 24304 2018-11-13 1.12399
## 24305 2018-11-13 1.12355
## 24306 2018-11-13 1.12677
## 24307 2018-11-13 1.12790
## 24308 2018-11-13 1.12927
## 24309 2018-11-13 1.13076
## 24310 2018-11-14 1.12905
## 24311 2018-11-14 1.12704
## 24312 2018-11-14 1.12849
## 24313 2018-11-14 1.12935
## 24314 2018-11-14 1.13098
## 24315 2018-11-14 1.13155
## 24316 2018-11-15 1.13329
## 24317 2018-11-15 1.12857
## 24318 2018-11-15 1.12905
## 24319 2018-11-15 1.13155
## 24320 2018-11-15 1.13288
## 24321 2018-11-15 1.13397
## 24322 2018-11-16 1.13422
## 24323 2018-11-16 1.13407
## 24324 2018-11-16 1.13892
## 24325 2018-11-16 1.14123
## 24326 2018-11-16 1.14198
## 24327 2018-11-18 1.14118
## 24328 2018-11-19 1.13974
## 24329 2018-11-19 1.14278
## 24330 2018-11-19 1.14285
```

```
## 24331 2018-11-19 1.14580
## 24332 2018-11-19 1.14537
## 24333 2018-11-19 1.14471
## 24334 2018-11-20 1.14487
## 24335 2018-11-20 1.14281
## 24336 2018-11-20 1.14074
## 24337 2018-11-20 1.13761
## 24338 2018-11-20 1.13718
## 24339 2018-11-20 1.13698
## 24340 2018-11-21 1.13807
## 24341 2018-11-21 1.13845
## 24342 2018-11-21 1.14123
## 24343 2018-11-21 1.13964
## 24344 2018-11-21 1.13851
## 24345 2018-11-21 1.13909
## 24346 2018-11-22 1.13974
## 24347 2018-11-22 1.14035
## 24348 2018-11-22 1.14035
## 24349 2018-11-22 1.14084
## 24350 2018-11-22 1.14065
## 24351 2018-11-22 1.14071
## 24352 2018-11-23 1.14149
## 24353 2018-11-23 1.13745
## 24354 2018-11-23 1.13508
## 24355 2018-11-23 1.13351
## 24356 2018-11-23 1.13420
## 24357 2018-11-25 1.13308
## 24358 2018-11-26 1.13480
## 24359 2018-11-26 1.13745
## 24360 2018-11-26 1.13657
## 24361 2018-11-26 1.13392
## 24362 2018-11-26 1.13284
## 24363 2018-11-26 1.13295
## 24364 2018-11-27 1.13428
## 24365 2018-11-27 1.13100
## 24366 2018-11-27 1.13205
## 24367 2018-11-27 1.12854
## 24368 2018-11-27 1.12917
## 24369 2018-11-27 1.12881
## 24370 2018-11-28 1.12946
## 24371 2018-11-28 1.12809
## 24372 2018-11-28 1.12878
## 24373 2018-11-28 1.13443
## 24374 2018-11-28 1.13668
## 24375 2018-11-28 1.13702
## 24376 2018-11-29 1.13866
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN769

```
## 24377 2018-11-29 1.13710
## 24378 2018-11-29 1.13720
## 24379 2018-11-29 1.13730
## 24380 2018-11-29 1.13942
## 24381 2018-11-29 1.13908
## 24382 2018-11-30 1.13921
## 24383 2018-11-30 1.13713
## 24384 2018-11-30 1.13573
## 24385 2018-11-30 1.13152
## 24386 2018-11-30 1.13229
## 24387 2018-12-02 1.13389
## 24388 2018-12-03 1.13664
## 24389 2018-12-03 1.13658
## 24390 2018-12-03 1.13246
## 24391 2018-12-03 1.13537
## 24392 2018-12-03 1.13559
## 24393 2018-12-03 1.13664
## 24394 2018-12-04 1.13749
## 24395 2018-12-04 1.14110
## 24396 2018-12-04 1.13896
## 24397 2018-12-04 1.13430
## 24398 2018-12-04 1.13443
## 24399 2018-12-04 1.13364
## 24400 2018-12-05 1.13195
## 24401 2018-12-05 1.13377
## 24402 2018-12-05 1.13560
## 24403 2018-12-05 1.13502
## 24404 2018-12-05 1.13447
## 24405 2018-12-05 1.13479
## 24406 2018-12-06 1.13460
## 24407 2018-12-06 1.13408
## 24408 2018-12-06 1.13599
## 24409 2018-12-06 1.13868
## 24410 2018-12-06 1.13788
## 24411 2018-12-06 1.13761
## 24412 2018-12-07 1.13672
## 24413 2018-12-07 1.13666
## 24414 2018-12-07 1.13891
## 24415 2018-12-07 1.13947
## 24416 2018-12-07 1.13826
## 24417 2018-12-09 1.14373
## 24418 2018-12-10 1.14361
## 24419 2018-12-10 1.14126
## 24420 2018-12-10 1.14114
## 24421 2018-12-10 1.13601
## 24422 2018-12-10 1.13584
```

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```
## 24423 2018-12-10 1.13628
## 24424 2018-12-11 1.13710
## 24425 2018-12-11 1.13824
## 24426 2018-12-11 1.13699
## 24427 2018-12-11 1.13195
## 24428 2018-12-11 1.13176
## 24429 2018-12-11 1.13310
## 24430 2018-12-12 1.13329
## 24431 2018-12-12 1.13338
## 24432 2018-12-12 1.13597
## 24433 2018-12-12 1.13769
## 24434 2018-12-12 1.13689
## 24435 2018-12-12 1.13684
## 24436 2018-12-13 1.13662
## 24437 2018-12-13 1.13777
## 24438 2018-12-13 1.13449
## 24439 2018-12-13 1.13573
## 24440 2018-12-13 1.13622
## 24441 2018-12-13 1.13635
## 24442 2018-12-14 1.13606
## 24443 2018-12-14 1.12931
## 24444 2018-12-14 1.12739
## 24445 2018-12-14 1.13012
## 24446 2018-12-14 1.13073
## 24447 2018-12-16 1.13071
## 24448 2018-12-17 1.13083
## 24449 2018-12-17 1.13296
## 24450 2018-12-17 1.13506
## 24451 2018-12-17 1.13511
## 24452 2018-12-17 1.13479
## 24453 2018-12-17 1.13591
## 24454 2018-12-18 1.13454
## 24455 2018-12-18 1.13764
## 24456 2018-12-18 1.13792
## 24457 2018-12-18 1.13603
## 24458 2018-12-18 1.13619
## 24459 2018-12-18 1.13813
## 24460 2018-12-19 1.13880
## 24461 2018-12-19 1.13892
## 24462 2018-12-19 1.14017
## 24463 2018-12-19 1.14253
## 24464 2018-12-19 1.13788
## 24465 2018-12-19 1.13822
## 24466 2018-12-20 1.13892
## 24467 2018-12-20 1.14784
## 24468 2018-12-20 1.14461
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN771

```
## 24469 2018-12-20 1.14589
## 24470 2018-12-20 1.14468
## 24471 2018-12-20 1.14523
## 24472 2018-12-21 1.14468
## 24473 2018-12-21 1.14280
## 24474 2018-12-21 1.14110
## 24475 2018-12-21 1.13860
## 24476 2018-12-21 1.13718
## 24477 2018-12-23 1.13805
## 24478 2018-12-24 1.13911
## 24479 2018-12-24 1.13953
## 24480 2018-12-24 1.14142
## 24481 2018-12-24 1.14098
## 24482 2018-12-24 1.14131
## 24483 2018-12-24 1.14148
## 24484 2018-12-25 1.14189
## 24485 2018-12-25 1.14042
## 24486 2018-12-25 1.14103
## 24487 2018-12-26 1.14029
## 24488 2018-12-26 1.13847
## 24489 2018-12-26 1.13895
## 24490 2018-12-26 1.13561
## 24491 2018-12-26 1.13541
## 24492 2018-12-26 1.13740
## 24493 2018-12-27 1.13833
## 24494 2018-12-27 1.13944
## 24495 2018-12-27 1.13979
## 24496 2018-12-27 1.14362
## 24497 2018-12-27 1.14311
## 24498 2018-12-27 1.14484
## 24499 2018-12-28 1.14549
## 24500 2018-12-28 1.14431
## 24501 2018-12-28 1.14612
## 24502 2018-12-28 1.14408
## 24503 2018-12-28 1.14450
## 24504 2018-12-30 1.14390
## 24505 2018-12-31 1.14292
## 24506 2018-12-31 1.14366
## 24507 2018-12-31 1.14463
## 24508 2018-12-31 1.14520
## 24509 2018-12-31 1.14688
## 24510 2018-12-31 1.14711
## 24511 2019-01-01 1.14526
## 24512 2019-01-02 1.14783
## 24513 2019-01-02 1.14344
## 24514 2019-01-02 1.13720
```

```
## 24515 2019-01-02 1.13355
## 24516 2019-01-02 1.13456
## 24517 2019-01-02 1.13486
## 24518 2019-01-03 1.13613
## 24519 2019-01-03 1.13760
## 24520 2019-01-03 1.13658
## 24521 2019-01-03 1.13991
## 24522 2019-01-03 1.13944
## 24523 2019-01-03 1.14043
## 24524 2019-01-04 1.13904
## 24525 2019-01-04 1.14040
## 24526 2019-01-04 1.13718
## 24527 2019-01-04 1.14057
## 24528 2019-01-04 1.13975
## 24529 2019-01-06 1.14214
## 24530 2019-01-07 1.14237
## 24531 2019-01-07 1.14416
## 24532 2019-01-07 1.14578
## 24533 2019-01-07 1.14693
## 24534 2019-01-07 1.14749
## 24535 2019-01-07 1.14484
## 24536 2019-01-08 1.14440
## 24537 2019-01-08 1.14522
## 24538 2019-01-08 1.14277
## 24539 2019-01-08 1.14545
## 24540 2019-01-08 1.14422
## 24541 2019-01-08 1.14578
## 24542 2019-01-09 1.14608
## 24543 2019-01-09 1.14609
## 24544 2019-01-09 1.14625
## 24545 2019-01-09 1.15330
## 24546 2019-01-09 1.15430
## 24547 2019-01-09 1.15542
## 24548 2019-01-10 1.15607
## 24549 2019-01-10 1.15245
## 24550 2019-01-10 1.15205
## 24551 2019-01-10 1.15061
## 24552 2019-01-10 1.15008
## 24553 2019-01-10 1.15182
## 24554 2019-01-11 1.15256
## 24555 2019-01-11 1.15199
## 24556 2019-01-11 1.15268
## 24557 2019-01-11 1.14827
## 24558 2019-01-11 1.14729
## 24559 2019-01-13 1.14761
## 24560 2019-01-14 1.14787
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN773

```
## 24561 2019-01-14 1.14627
## 24562 2019-01-14 1.14597
## 24563 2019-01-14 1.14770
## 24564 2019-01-14 1.14693
## 24565 2019-01-14 1.14851
## 24566 2019-01-15 1.14835
## 24567 2019-01-15 1.14340
## 24568 2019-01-15 1.14388
## 24569 2019-01-15 1.13898
## 24570 2019-01-15 1.14141
## 24571 2019-01-15 1.13986
## 24572 2019-01-16 1.14120
## 24573 2019-01-16 1.14107
## 24574 2019-01-16 1.13905
## 24575 2019-01-16 1.13997
## 24576 2019-01-16 1.13926
## 24577 2019-01-16 1.13944
## 24578 2019-01-17 1.13880
## 24579 2019-01-17 1.13939
## 24580 2019-01-17 1.13983
## 24581 2019-01-17 1.13866
## 24582 2019-01-17 1.13893
## 24583 2019-01-17 1.13955
## 24584 2019-01-18 1.13895
## 24585 2019-01-18 1.13985
## 24586 2019-01-18 1.13979
## 24587 2019-01-18 1.13584
## 24588 2019-01-18 1.13643
## 24589 2019-01-20 1.13767
## 24590 2019-01-21 1.13781
## 24591 2019-01-21 1.13715
## 24592 2019-01-21 1.13613
## 24593 2019-01-21 1.13686
## 24594 2019-01-21 1.13661
## 24595 2019-01-21 1.13701
## 24596 2019-01-22 1.13576
## 24597 2019-01-22 1.13614
## 24598 2019-01-22 1.13457
## 24599 2019-01-22 1.13693
## 24600 2019-01-22 1.13606
## 24601 2019-01-22 1.13657
## 24602 2019-01-23 1.13685
## 24603 2019-01-23 1.13560
## 24604 2019-01-23 1.13548
## 24605 2019-01-23 1.13927
## 24606 2019-01-23 1.13812
```

```
## 24607 2019-01-23 1.13869
## 24608 2019-01-24 1.13856
## 24609 2019-01-24 1.13470
## 24610 2019-01-24 1.13357
## 24611 2019-01-24 1.12994
## 24612 2019-01-24 1.13064
## 24613 2019-01-24 1.13081
## 24614 2019-01-25 1.13225
## 24615 2019-01-25 1.13302
## 24616 2019-01-25 1.13574
## 24617 2019-01-25 1.14058
## 24618 2019-01-25 1.14089
## 24619 2019-01-27 1.14150
## 24620 2019-01-28 1.14119
## 24621 2019-01-28 1.14085
## 24622 2019-01-28 1.14174
## 24623 2019-01-28 1.14345
## 24624 2019-01-28 1.14292
## 24625 2019-01-28 1.14251
## 24626 2019-01-29 1.14331
## 24627 2019-01-29 1.14417
## 24628 2019-01-29 1.14263
## 24629 2019-01-29 1.14279
## 24630 2019-01-29 1.14347
## 24631 2019-01-29 1.14397
## 24632 2019-01-30 1.14452
## 24633 2019-01-30 1.14307
## 24634 2019-01-30 1.14257
## 24635 2019-01-30 1.14195
## 24636 2019-01-30 1.14797
## 24637 2019-01-30 1.14936
## 24638 2019-01-31 1.15052
## 24639 2019-01-31 1.14847
## 24640 2019-01-31 1.14947
## 24641 2019-01-31 1.14502
## 24642 2019-01-31 1.14478
## 24643 2019-01-31 1.14429
## 24644 2019-02-01 1.14368
## 24645 2019-02-01 1.14667
## 24646 2019-02-01 1.14739
## 24647 2019-02-01 1.14689
## 24648 2019-02-01 1.14578
## 24649 2019-02-03 1.14586
## 24650 2019-02-04 1.14437
## 24651 2019-02-04 1.14456
## 24652 2019-02-04 1.14490
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN775

```
## 24653 2019-02-04 1.14313
## 24654 2019-02-04 1.14392
## 24655 2019-02-04 1.14384
## 24656 2019-02-05 1.14343
## 24657 2019-02-05 1.14196
## 24658 2019-02-05 1.14290
## 24659 2019-02-05 1.14095
## 24660 2019-02-05 1.14061
## 24661 2019-02-05 1.14012
## 24662 2019-02-06 1.13969
## 24663 2019-02-06 1.13884
## 24664 2019-02-06 1.13868
## 24665 2019-02-06 1.13757
## 24666 2019-02-06 1.13627
## 24667 2019-02-06 1.13609
## 24668 2019-02-07 1.13599
## 24669 2019-02-07 1.13450
## 24670 2019-02-07 1.13309
## 24671 2019-02-07 1.13492
## 24672 2019-02-07 1.13393
## 24673 2019-02-07 1.13379
## 24674 2019-02-08 1.13396
## 24675 2019-02-08 1.13258
## 24676 2019-02-08 1.13471
## 24677 2019-02-08 1.13299
## 24678 2019-02-08 1.13231
## 24679 2019-02-10 1.13276
## 24680 2019-02-11 1.13244
## 24681 2019-02-11 1.13027
## 24682 2019-02-11 1.13107
## 24683 2019-02-11 1.12708
## 24684 2019-02-11 1.12763
## 24685 2019-02-11 1.12826
## 24686 2019-02-12 1.12796
## 24687 2019-02-12 1.12746
## 24688 2019-02-12 1.12929
## 24689 2019-02-12 1.13200
## 24690 2019-02-12 1.13259
## 24691 2019-02-12 1.13353
## 24692 2019-02-13 1.13384
## 24693 2019-02-13 1.13210
## 24694 2019-02-13 1.12915
## 24695 2019-02-13 1.12764
## 24696 2019-02-13 1.12611
## 24697 2019-02-13 1.12697
## 24698 2019-02-14 1.12802
```

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```
## 24699 2019-02-14 1.12669
## 24700 2019-02-14 1.13027
## 24701 2019-02-14 1.12970
## 24702 2019-02-14 1.12956
## 24703 2019-02-14 1.12876
## 24704 2019-02-15 1.12852
## 24705 2019-02-15 1.12835
## 24706 2019-02-15 1.12530
## 24707 2019-02-15 1.12733
## 24708 2019-02-15 1.12935
## 24709 2019-02-17 1.13099
## 24710 2019-02-18 1.13086
## 24711 2019-02-18 1.13158
## 24712 2019-02-18 1.13222
## 24713 2019-02-18 1.13112
## 24714 2019-02-18 1.13128
## 24715 2019-02-18 1.13043
## 24716 2019-02-19 1.12998
## 24717 2019-02-19 1.13038
## 24718 2019-02-19 1.12961
## 24719 2019-02-19 1.13483
## 24720 2019-02-19 1.13405
## 24721 2019-02-19 1.13547
## 24722 2019-02-20 1.13378
## 24723 2019-02-20 1.13470
## 24724 2019-02-20 1.13369
## 24725 2019-02-20 1.13660
## 24726 2019-02-20 1.13383
## 24727 2019-02-20 1.13347
## 24728 2019-02-21 1.13364
## 24729 2019-02-21 1.13275
## 24730 2019-02-21 1.13623
## 24731 2019-02-21 1.13307
## 24732 2019-02-21 1.13384
## 24733 2019-02-21 1.13377
## 24734 2019-02-22 1.13385
## 24735 2019-02-22 1.13400
## 24736 2019-02-22 1.13364
## 24737 2019-02-22 1.13457
## 24738 2019-02-22 1.13377
## 24739 2019-02-24 1.13448
## 24740 2019-02-25 1.13430
## 24741 2019-02-25 1.13495
## 24742 2019-02-25 1.13548
## 24743 2019-02-25 1.13480
## 24744 2019-02-25 1.13581
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN777

```
## 24745 2019-02-25 1.13571
## 24746 2019-02-26 1.13592
## 24747 2019-02-26 1.13675
## 24748 2019-02-26 1.13725
## 24749 2019-02-26 1.13798
## 24750 2019-02-26 1.13896
## 24751 2019-02-26 1.13858
## 24752 2019-02-27 1.13781
## 24753 2019-02-27 1.13953
## 24754 2019-02-27 1.13849
## 24755 2019-02-27 1.13692
## 24756 2019-02-27 1.13696
## 24757 2019-02-27 1.13775
## 24758 2019-02-28 1.13759
## 24759 2019-02-28 1.13913
## 24760 2019-02-28 1.13865
## 24761 2019-02-28 1.13819
## 24762 2019-02-28 1.13712
## 24763 2019-02-28 1.13723
## 24764 2019-03-01 1.13708
## 24765 2019-03-01 1.13605
## 24766 2019-03-01 1.13820
## 24767 2019-03-01 1.13653
## 24768 2019-03-01 1.13668
## 24769 2019-03-03 1.13689
## 24770 2019-03-04 1.13627
## 24771 2019-03-04 1.13432
## 24772 2019-03-04 1.13430
## 24773 2019-03-04 1.13323
## 24774 2019-03-04 1.13404
## 24775 2019-03-04 1.13337
## 24776 2019-03-05 1.13291
## 24777 2019-03-05 1.13273
## 24778 2019-03-05 1.13310
## 24779 2019-03-05 1.12974
## 24780 2019-03-05 1.13079
## 24781 2019-03-05 1.13029
## 24782 2019-03-06 1.12981
## 24783 2019-03-06 1.13014
## 24784 2019-03-06 1.13048
## 24785 2019-03-06 1.13083
## 24786 2019-03-06 1.13078
## 24787 2019-03-06 1.13087
## 24788 2019-03-07 1.13064
## 24789 2019-03-07 1.13097
## 24790 2019-03-07 1.12606
```

```
## 24791 2019-03-07 1.12256
## 24792 2019-03-07 1.11946
## 24793 2019-03-07 1.11886
## 24794 2019-03-08 1.12018
## 24795 2019-03-08 1.12130
## 24796 2019-03-08 1.12257
## 24797 2019-03-08 1.12405
## 24798 2019-03-08 1.12344
## 24799 2019-03-10 1.12280
## 24800 2019-03-11 1.12337
## 24801 2019-03-11 1.12466
## 24802 2019-03-11 1.12369
## 24803 2019-03-11 1.12336
## 24804 2019-03-11 1.12458
## 24805 2019-03-11 1.12594
## 24806 2019-03-12 1.12516
## 24807 2019-03-12 1.12826
## 24808 2019-03-12 1.12818
## 24809 2019-03-12 1.12938
## 24810 2019-03-12 1.12892
## 24811 2019-03-12 1.12883
## 24812 2019-03-13 1.12837
## 24813 2019-03-13 1.12945
## 24814 2019-03-13 1.12939
## 24815 2019-03-13 1.13055
## 24816 2019-03-13 1.13283
## 24817 2019-03-13 1.13276
## 24818 2019-03-14 1.13192
## 24819 2019-03-14 1.13265
## 24820 2019-03-14 1.13014
## 24821 2019-03-14 1.12998
## 24822 2019-03-14 1.13047
## 24823 2019-03-14 1.13062
## 24824 2019-03-15 1.13193
## 24825 2019-03-15 1.13238
## 24826 2019-03-15 1.13038
## 24827 2019-03-15 1.13179
## 24828 2019-03-15 1.13265
## 24829 2019-03-17 1.13212
## 24830 2019-03-18 1.13367
## 24831 2019-03-18 1.13448
## 24832 2019-03-18 1.13464
## 24833 2019-03-18 1.13298
## 24834 2019-03-18 1.13391
## 24835 2019-03-18 1.13381
## 24836 2019-03-19 1.13463
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN779

```
## 24837 2019-03-19 1.13549
## 24838 2019-03-19 1.13524
## 24839 2019-03-19 1.13497
## 24840 2019-03-19 1.13525
## 24841 2019-03-19 1.13474
## 24842 2019-03-20 1.13464
## 24843 2019-03-20 1.13433
## 24844 2019-03-20 1.13548
## 24845 2019-03-20 1.13500
## 24846 2019-03-20 1.14138
## 24847 2019-03-20 1.14320
## 24848 2019-03-21 1.14263
## 24849 2019-03-21 1.13989
## 24850 2019-03-21 1.13856
## 24851 2019-03-21 1.13524
## 24852 2019-03-21 1.13756
## 24853 2019-03-21 1.13674
## 24854 2019-03-22 1.13780
## 24855 2019-03-22 1.13034
## 24856 2019-03-22 1.13059
## 24857 2019-03-22 1.12843
## 24858 2019-03-22 1.13022
## 24859 2019-03-24 1.12902
## 24860 2019-03-25 1.12983
## 24861 2019-03-25 1.13088
## 24862 2019-03-25 1.13188
## 24863 2019-03-25 1.13118
## 24864 2019-03-25 1.13140
## 24865 2019-03-25 1.13178
## 24866 2019-03-26 1.13114
## 24867 2019-03-26 1.13067
## 24868 2019-03-26 1.12880
## 24869 2019-03-26 1.12886
## 24870 2019-03-26 1.12662
## 24871 2019-03-26 1.12672
## 24872 2019-03-27 1.12580
## 24873 2019-03-27 1.12760
## 24874 2019-03-27 1.12715
## 24875 2019-03-27 1.12631
## 24876 2019-03-27 1.12440
## 24877 2019-03-27 1.12486
## 24878 2019-03-28 1.12549
## 24879 2019-03-28 1.12525
## 24880 2019-03-28 1.12217
## 24881 2019-03-28 1.12277
## 24882 2019-03-28 1.12237
```

```
## 24883 2019-03-28 1.12325
## 24884 2019-03-29 1.12305
## 24885 2019-03-29 1.12304
## 24886 2019-03-29 1.12319
## 24887 2019-03-29 1.12253
## 24888 2019-03-29 1.12186
## 24889 2019-03-31 1.12283
## 24890 2019-04-01 1.12343
## 24891 2019-04-01 1.12464
## 24892 2019-04-01 1.12350
## 24893 2019-04-01 1.12066
## 24894 2019-04-01 1.12131
## 24895 2019-04-01 1.12059
## 24896 2019-04-02 1.12025
## 24897 2019-04-02 1.11981
## 24898 2019-04-02 1.12059
## 24899 2019-04-02 1.11972
## 24900 2019-04-02 1.12048
## 24901 2019-04-02 1.12167
## 24902 2019-04-03 1.12232
## 24903 2019-04-03 1.12437
## 24904 2019-04-03 1.12347
## 24905 2019-04-03 1.12445
## 24906 2019-04-03 1.12333
## 24907 2019-04-03 1.12446
## 24908 2019-04-04 1.12413
## 24909 2019-04-04 1.12318
## 24910 2019-04-04 1.12177
## 24911 2019-04-04 1.12194
## 24912 2019-04-04 1.12216
## 24913 2019-04-04 1.12226
## 24914 2019-04-05 1.12272
## 24915 2019-04-05 1.12302
## 24916 2019-04-05 1.12363
## 24917 2019-04-05 1.12149
## 24918 2019-04-05 1.12175
## 24919 2019-04-07 1.12180
## 24920 2019-04-08 1.12309
## 24921 2019-04-08 1.12337
## 24922 2019-04-08 1.12615
## 24923 2019-04-08 1.12675
## 24924 2019-04-08 1.12637
## 24925 2019-04-08 1.12596
## 24926 2019-04-09 1.12659
## 24927 2019-04-09 1.12803
## 24928 2019-04-09 1.12791
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN781

```
## 24929 2019-04-09 1.12704
## 24930 2019-04-09 1.12639
## 24931 2019-04-09 1.12588
## 24932 2019-04-10 1.12617
## 24933 2019-04-10 1.12698
## 24934 2019-04-10 1.12565
## 24935 2019-04-10 1.12758
## 24936 2019-04-10 1.12738
## 24937 2019-04-10 1.12762
## 24938 2019-04-11 1.12800
## 24939 2019-04-11 1.12794
## 24940 2019-04-11 1.12601
## 24941 2019-04-11 1.12584
## 24942 2019-04-11 1.12553
## 24943 2019-04-11 1.12838
## 24944 2019-04-12 1.12917
## 24945 2019-04-12 1.13055
## 24946 2019-04-12 1.13206
## 24947 2019-04-12 1.12988
## 24948 2019-04-12 1.13006
## 24949 2019-04-14 1.13043
## 24950 2019-04-15 1.13092
## 24951 2019-04-15 1.13183
## 24952 2019-04-15 1.13135
## 24953 2019-04-15 1.13069
## 24954 2019-04-15 1.13042
## 24955 2019-04-15 1.13059
## 24956 2019-04-16 1.13046
## 24957 2019-04-16 1.13057
## 24958 2019-04-16 1.12973
## 24959 2019-04-16 1.12842
## 24960 2019-04-16 1.12814
## 24961 2019-04-16 1.12868
## 24962 2019-04-17 1.13034
## 24963 2019-04-17 1.13163
## 24964 2019-04-17 1.13038
## 24965 2019-04-17 1.12965
## 24966 2019-04-17 1.12969
## 24967 2019-04-17 1.12986
## 24968 2019-04-18 1.12951
## 24969 2019-04-18 1.12610
## 24970 2019-04-18 1.12407
## 24971 2019-04-18 1.12299
## 24972 2019-04-18 1.12346
## 24973 2019-04-18 1.12401
## 24974 2019-04-19 1.12383
```

```
## 24975 2019-04-19 1.12466
## 24976 2019-04-19 1.12448
## 24977 2019-04-19 1.12455
## 24978 2019-04-19 1.12490
## 24979 2019-04-21 1.12427
## 24980 2019-04-22 1.12384
## 24981 2019-04-22 1.12462
## 24982 2019-04-22 1.12495
## 24983 2019-04-22 1.12584
## 24984 2019-04-22 1.12578
## 24985 2019-04-22 1.12449
## 24986 2019-04-23 1.12502
## 24987 2019-04-23 1.12504
## 24988 2019-04-23 1.12179
## 24989 2019-04-23 1.12138
## 24990 2019-04-23 1.12280
## 24991 2019-04-23 1.12179
## 24992 2019-04-24 1.12162
## 24993 2019-04-24 1.12184
## 24994 2019-04-24 1.12036
## 24995 2019-04-24 1.11592
## 24996 2019-04-24 1.11548
## 24997 2019-04-24 1.11528
## 24998 2019-04-25 1.11577
## 24999 2019-04-25 1.11474
## 25000 2019-04-25 1.11310
## 25001 2019-04-25 1.11368
## 25002 2019-04-25 1.11337
## 25003 2019-04-25 1.11297
## 25004 2019-04-26 1.11355
## 25005 2019-04-26 1.11425
## 25006 2019-04-26 1.11483
## 25007 2019-04-26 1.11632
## 25008 2019-04-26 1.11513
## 25009 2019-04-28 1.11491
## 25010 2019-04-29 1.11586
## 25011 2019-04-29 1.11652
## 25012 2019-04-29 1.11558
## 25013 2019-04-29 1.11813
## 25014 2019-04-29 1.11869
## 25015 2019-04-29 1.11900
## 25016 2019-04-30 1.11886
## 25017 2019-04-30 1.12067
## 25018 2019-04-30 1.12197
## 25019 2019-04-30 1.12169
## 25020 2019-04-30 1.12157
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN783

```
## 25021 2019-04-30 1.12184
## 25022 2019-05-01 1.12177
## 25023 2019-05-01 1.12284
## 25024 2019-05-01 1.12245
## 25025 2019-05-01 1.12421
## 25026 2019-05-01 1.11964
## 25027 2019-05-01 1.12062
## 25028 2019-05-02 1.12078
## 25029 2019-05-02 1.12085
## 25030 2019-05-02 1.11965
## 25031 2019-05-02 1.11781
## 25032 2019-05-02 1.11728
## 25033 2019-05-02 1.11776
## 25034 2019-05-03 1.11687
## 25035 2019-05-03 1.11657
## 25036 2019-05-03 1.11602
## 25037 2019-05-03 1.11959
## 25038 2019-05-03 1.12042
## 25039 2019-05-05 1.11855
## 25040 2019-05-06 1.11913
## 25041 2019-05-06 1.11841
## 25042 2019-05-06 1.11836
## 25043 2019-05-06 1.12032
## 25044 2019-05-06 1.11999
## 25045 2019-05-06 1.12003
## 25046 2019-05-07 1.12138
## 25047 2019-05-07 1.11967
## 25048 2019-05-07 1.11836
## 25049 2019-05-07 1.11752
## 25050 2019-05-07 1.11921
## 25051 2019-05-07 1.11928
## 25052 2019-05-08 1.12055
## 25053 2019-05-08 1.11978
## 25054 2019-05-08 1.11987
## 25055 2019-05-08 1.11887
## 25056 2019-05-08 1.11921
## 25057 2019-05-08 1.11918
## 25058 2019-05-09 1.11951
## 25059 2019-05-09 1.11888
## 25060 2019-05-09 1.11972
## 25061 2019-05-09 1.12156
## 25062 2019-05-09 1.12163
## 25063 2019-05-09 1.12296
## 25064 2019-05-10 1.12261
## 25065 2019-05-10 1.12312
## 25066 2019-05-10 1.12422
```

```
## 25067 2019-05-10 1.12369
## 25068 2019-05-10 1.12358
## 25069 2019-05-12 1.12318
## 25070 2019-05-13 1.12299
## 25071 2019-05-13 1.12300
## 25072 2019-05-13 1.12576
## 25073 2019-05-13 1.12355
## 25074 2019-05-13 1.12221
## 25075 2019-05-13 1.12365
## 25076 2019-05-14 1.12399
## 25077 2019-05-14 1.12428
## 25078 2019-05-14 1.12143
## 25079 2019-05-14 1.12100
## 25080 2019-05-14 1.12045
## 25081 2019-05-14 1.12038
## 25082 2019-05-15 1.12098
## 25083 2019-05-15 1.12147
## 25084 2019-05-15 1.11839
## 25085 2019-05-15 1.12066
## 25086 2019-05-15 1.12015
## 25087 2019-05-15 1.12067
## 25088 2019-05-16 1.12099
## 25089 2019-05-16 1.12207
## 25090 2019-05-16 1.11879
## 25091 2019-05-16 1.11774
## 25092 2019-05-16 1.11753
## 25093 2019-05-16 1.11753
## 25094 2019-05-17 1.11796
## 25095 2019-05-17 1.11743
## 25096 2019-05-17 1.11765
## 25097 2019-05-17 1.11647
## 25098 2019-05-17 1.11582
## 25099 2019-05-19 1.11642
## 25100 2019-05-20 1.11541
## 25101 2019-05-20 1.11554
## 25102 2019-05-20 1.11640
## 25103 2019-05-20 1.11684
## 25104 2019-05-20 1.11669
## 25105 2019-05-20 1.11652
## 25106 2019-05-21 1.11604
## 25107 2019-05-21 1.11474
## 25108 2019-05-21 1.11577
## 25109 2019-05-21 1.11603
## 25110 2019-05-21 1.11614
## 25111 2019-05-21 1.11611
## 25112 2019-05-22 1.11556
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN785

```
## 25113 2019-05-22 1.11597
## 25114 2019-05-22 1.11671
## 25115 2019-05-22 1.11572
## 25116 2019-05-22 1.11508
## 25117 2019-05-22 1.11529
## 25118 2019-05-23 1.11494
## 25119 2019-05-23 1.11397
## 25120 2019-05-23 1.11358
## 25121 2019-05-23 1.11824
## 25122 2019-05-23 1.11821
## 25123 2019-05-23 1.11804
## 25124 2019-05-24 1.11812
## 25125 2019-05-24 1.11849
## 25126 2019-05-24 1.11957
## 25127 2019-05-24 1.12054
## 25128 2019-05-24 1.12065
## 25129 2019-05-26 1.12072
## 25130 2019-05-27 1.12068
## 25131 2019-05-27 1.11929
## 25132 2019-05-27 1.11965
## 25133 2019-05-27 1.11914
## 25134 2019-05-27 1.11928
## 25135 2019-05-27 1.11926
## 25136 2019-05-28 1.11821
## 25137 2019-05-28 1.11926
## 25138 2019-05-28 1.11892
## 25139 2019-05-28 1.11655
## 25140 2019-05-28 1.11607
## 25141 2019-05-28 1.11695
## 25142 2019-05-29 1.11648
## 25143 2019-05-29 1.11549
## 25144 2019-05-29 1.11498
## 25145 2019-05-29 1.11340
## 25146 2019-05-29 1.11316
## 25147 2019-05-29 1.11399
## 25148 2019-05-30 1.11403
## 25149 2019-05-30 1.11341
## 25150 2019-05-30 1.11316
## 25151 2019-05-30 1.11362
## 25152 2019-05-30 1.11297
## 25153 2019-05-30 1.11345
## 25154 2019-05-31 1.11284
## 25155 2019-05-31 1.11483
## 25156 2019-05-31 1.11564
## 25157 2019-05-31 1.11617
## 25158 2019-05-31 1.11697
```

```
## 25159 2019-06-02 1.11794
## 25160 2019-06-03 1.11771
## 25161 2019-06-03 1.11798
## 25162 2019-06-03 1.11953
## 25163 2019-06-03 1.12158
## 25164 2019-06-03 1.12419
## 25165 2019-06-03 1.12503
## 25166 2019-06-04 1.12472
## 25167 2019-06-04 1.12481
## 25168 2019-06-04 1.12351
## 25169 2019-06-04 1.12448
## 25170 2019-06-04 1.12518
## 25171 2019-06-04 1.12583
## 25172 2019-06-05 1.12605
## 25173 2019-06-05 1.12794
## 25174 2019-06-05 1.12931
## 25175 2019-06-05 1.12355
## 25176 2019-06-05 1.12216
## 25177 2019-06-05 1.12272
## 25178 2019-06-06 1.12330
## 25179 2019-06-06 1.12398
## 25180 2019-06-06 1.12864
## 25181 2019-06-06 1.12935
## 25182 2019-06-06 1.12761
## 25183 2019-06-06 1.12751
## 25184 2019-06-07 1.12674
## 25185 2019-06-07 1.12654
## 25186 2019-06-07 1.13173
## 25187 2019-06-07 1.13398
## 25188 2019-06-07 1.13341
## 25189 2019-06-09 1.13166
## 25190 2019-06-10 1.13081
## 25191 2019-06-10 1.12967
## 25192 2019-06-10 1.13086
## 25193 2019-06-10 1.13165
## 25194 2019-06-10 1.13124
## 25195 2019-06-10 1.13150
## 25196 2019-06-11 1.13177
## 25197 2019-06-11 1.13131
## 25198 2019-06-11 1.13187
## 25199 2019-06-11 1.13294
## 25200 2019-06-11 1.13265
## 25201 2019-06-11 1.13296
## 25202 2019-06-12 1.13342
## 25203 2019-06-12 1.13343
## 25204 2019-06-12 1.13200
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN787

```
## 25205 2019-06-12 1.12974
## 25206 2019-06-12 1.12879
## 25207 2019-06-12 1.12908
## 25208 2019-06-13 1.12980
## 25209 2019-06-13 1.12918
## 25210 2019-06-13 1.12787
## 25211 2019-06-13 1.12763
## 25212 2019-06-13 1.12767
## 25213 2019-06-13 1.12791
## 25214 2019-06-14 1.12729
## 25215 2019-06-14 1.12799
## 25216 2019-06-14 1.12316
## 25217 2019-06-14 1.12088
## 25218 2019-06-14 1.12126
## 25219 2019-06-16 1.12194
## 25220 2019-06-17 1.12170
## 25221 2019-06-17 1.12140
## 25222 2019-06-17 1.12370
## 25223 2019-06-17 1.12268
## 25224 2019-06-17 1.12190
## 25225 2019-06-17 1.12252
## 25226 2019-06-18 1.12334
## 25227 2019-06-18 1.11912
## 25228 2019-06-18 1.11988
## 25229 2019-06-18 1.12015
## 25230 2019-06-18 1.11942
## 25231 2019-06-18 1.12006
## 25232 2019-06-19 1.11885
## 25233 2019-06-19 1.12003
## 25234 2019-06-19 1.12054
## 25235 2019-06-19 1.12153
## 25236 2019-06-19 1.12266
## 25237 2019-06-19 1.12577
## 25238 2019-06-20 1.12621
## 25239 2019-06-20 1.12897
## 25240 2019-06-20 1.13026
## 25241 2019-06-20 1.12925
## 25242 2019-06-20 1.12929
## 25243 2019-06-20 1.12949
## 25244 2019-06-21 1.12949
## 25245 2019-06-21 1.13032
## 25246 2019-06-21 1.13251
## 25247 2019-06-21 1.13410
## 25248 2019-06-21 1.13695
## 25249 2019-06-23 1.13820
## 25250 2019-06-24 1.13753
```

```
## 25251 2019-06-24 1.13861
## 25252 2019-06-24 1.13879
## 25253 2019-06-24 1.13894
## 25254 2019-06-24 1.13985
## 25255 2019-06-24 1.14020
## 25256 2019-06-25 1.14098
## 25257 2019-06-25 1.13854
## 25258 2019-06-25 1.13944
## 25259 2019-06-25 1.13632
## 25260 2019-06-25 1.13677
## 25261 2019-06-25 1.13624
## 25262 2019-06-26 1.13561
## 25263 2019-06-26 1.13588
## 25264 2019-06-26 1.13595
## 25265 2019-06-26 1.13830
## 25266 2019-06-26 1.13706
## 25267 2019-06-26 1.13730
## 25268 2019-06-27 1.13530
## 25269 2019-06-27 1.13719
## 25270 2019-06-27 1.13667
## 25271 2019-06-27 1.13664
## 25272 2019-06-27 1.13693
## 25273 2019-06-27 1.13702
## 25274 2019-06-28 1.13634
## 25275 2019-06-28 1.13905
## 25276 2019-06-28 1.13855
## 25277 2019-06-28 1.13590
## 25278 2019-06-28 1.13760
## 25279 2019-06-30 1.13542
## 25280 2019-07-01 1.13487
## 25281 2019-07-01 1.13310
## 25282 2019-07-01 1.13461
## 25283 2019-07-01 1.12945
## 25284 2019-07-01 1.12858
## 25285 2019-07-01 1.12843
## 25286 2019-07-02 1.12899
## 25287 2019-07-02 1.12937
## 25288 2019-07-02 1.12983
## 25289 2019-07-02 1.13068
## 25290 2019-07-02 1.12851
## 25291 2019-07-02 1.12934
## 25292 2019-07-03 1.12885
## 25293 2019-07-03 1.12886
## 25294 2019-07-03 1.12828
## 25295 2019-07-03 1.12816
## 25296 2019-07-03 1.12782
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN789

```
## 25297 2019-07-03 1.12870
## 25298 2019-07-04 1.12860
## 25299 2019-07-04 1.12800
## 25300 2019-07-04 1.12833
## 25301 2019-07-04 1.12814
## 25302 2019-07-04 1.12852
## 25303 2019-07-04 1.12802
## 25304 2019-07-05 1.12812
## 25305 2019-07-05 1.12626
## 25306 2019-07-05 1.12443
## 25307 2019-07-05 1.12189
## 25308 2019-07-05 1.12274
## 25309 2019-07-07 1.12212
## 25310 2019-07-08 1.12313
## 25311 2019-07-08 1.12316
## 25312 2019-07-08 1.12233
## 25313 2019-07-08 1.12149
## 25314 2019-07-08 1.12146
## 25315 2019-07-08 1.12158
## 25316 2019-07-09 1.12179
## 25317 2019-07-09 1.11989
## 25318 2019-07-09 1.12047
## 25319 2019-07-09 1.12087
## 25320 2019-07-09 1.12081
## 25321 2019-07-09 1.12037
## 25322 2019-07-10 1.12077
## 25323 2019-07-10 1.12255
## 25324 2019-07-10 1.12502
## 25325 2019-07-10 1.12594
## 25326 2019-07-10 1.12516
## 25327 2019-07-10 1.12613
## 25328 2019-07-11 1.12760
## 25329 2019-07-11 1.12738
## 25330 2019-07-11 1.12678
## 25331 2019-07-11 1.12547
## 25332 2019-07-11 1.12550
## 25333 2019-07-11 1.12587
## 25334 2019-07-12 1.12714
## 25335 2019-07-12 1.12624
## 25336 2019-07-12 1.12455
## 25337 2019-07-12 1.12679
## 25338 2019-07-12 1.12708
## 25339 2019-07-14 1.12742
## 25340 2019-07-15 1.12725
## 25341 2019-07-15 1.12731
## 25342 2019-07-15 1.12659
```

790 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 25343 2019-07-15 1.12594
## 25344 2019-07-15 1.12580
## 25345 2019-07-15 1.12587
## 25346 2019-07-16 1.12603
## 25347 2019-07-16 1.12454
## 25348 2019-07-16 1.12196
## 25349 2019-07-16 1.12126
## 25350 2019-07-16 1.12111
## 25351 2019-07-16 1.12118
## 25352 2019-07-17 1.12158
## 25353 2019-07-17 1.12109
## 25354 2019-07-17 1.12118
## 25355 2019-07-17 1.12249
## 25356 2019-07-17 1.12249
## 25357 2019-07-17 1.12380
## 25358 2019-07-18 1.12368
## 25359 2019-07-18 1.12397
## 25360 2019-07-18 1.12169
## 25361 2019-07-18 1.12243
## 25362 2019-07-18 1.12776
## 25363 2019-07-18 1.12613
## 25364 2019-07-19 1.12596
## 25365 2019-07-19 1.12513
## 25366 2019-07-19 1.12257
## 25367 2019-07-19 1.12288
## 25368 2019-07-19 1.12226
## 25369 2019-07-21 1.12119
## 25370 2019-07-22 1.12181
## 25371 2019-07-22 1.12175
## 25372 2019-07-22 1.12182
## 25373 2019-07-22 1.12186
## 25374 2019-07-22 1.12098
## 25375 2019-07-22 1.12048
## 25376 2019-07-23 1.11924
## 25377 2019-07-23 1.11833
## 25378 2019-07-23 1.11691
## 25379 2019-07-23 1.11509
## 25380 2019-07-23 1.11527
## 25381 2019-07-23 1.11486
## 25382 2019-07-24 1.11456
## 25383 2019-07-24 1.11387
## 25384 2019-07-24 1.11421
## 25385 2019-07-24 1.11453
## 25386 2019-07-24 1.11405
## 25387 2019-07-24 1.11364
## 25388 2019-07-25 1.11347
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN791

```
## 25389 2019-07-25 1.11294
## 25390 2019-07-25 1.11547
## 25391 2019-07-25 1.11337
## 25392 2019-07-25 1.11485
## 25393 2019-07-25 1.11467
## 25394 2019-07-26 1.11477
## 25395 2019-07-26 1.11360
## 25396 2019-07-26 1.11335
## 25397 2019-07-26 1.11221
## 25398 2019-07-26 1.11308
## 25399 2019-07-28 1.11366
## 25400 2019-07-29 1.11271
## 25401 2019-07-29 1.11234
## 25402 2019-07-29 1.11233
## 25403 2019-07-29 1.11402
## 25404 2019-07-29 1.11454
## 25405 2019-07-29 1.11417
## 25406 2019-07-30 1.11374
## 25407 2019-07-30 1.11469
## 25408 2019-07-30 1.11543
## 25409 2019-07-30 1.11525
## 25410 2019-07-30 1.11559
## 25411 2019-07-30 1.11538
## 25412 2019-07-31 1.11555
## 25413 2019-07-31 1.11448
## 25414 2019-07-31 1.11511
## 25415 2019-07-31 1.11283
## 25416 2019-07-31 1.10761
## 25417 2019-07-31 1.10417
## 25418 2019-08-01 1.10535
## 25419 2019-08-01 1.10474
## 25420 2019-08-01 1.10299
## 25421 2019-08-01 1.10686
## 25422 2019-08-01 1.10855
## 25423 2019-08-01 1.10893
## 25424 2019-08-02 1.10826
## 25425 2019-08-02 1.10962
## 25426 2019-08-02 1.10852
## 25427 2019-08-02 1.11146
## 25428 2019-08-02 1.11083
## 25429 2019-08-04 1.11259
## 25430 2019-08-05 1.11279
## 25431 2019-08-05 1.11469
## 25432 2019-08-05 1.11772
## 25433 2019-08-05 1.12111
## 25434 2019-08-05 1.12034
```

792 CHAPTER 6. MODELOS ESTACIONARIOS EN SERIES DE TIEMPO

```
## 25435 2019-08-05 1.12430
## 25436 2019-08-06 1.12030
## 25437 2019-08-06 1.11993
## 25438 2019-08-06 1.11799
## 25439 2019-08-06 1.11978
## 25440 2019-08-06 1.11998
## 25441 2019-08-06 1.12093
## 25442 2019-08-07 1.12114
## 25443 2019-08-07 1.11910
## 25444 2019-08-07 1.12072
## 25445 2019-08-07 1.12274
## 25446 2019-08-07 1.12001
## 25447 2019-08-07 1.12104
## 25448 2019-08-08 1.12098
## 25449 2019-08-08 1.12149
## 25450 2019-08-08 1.12044
## 25451 2019-08-08 1.12053
## 25452 2019-08-08 1.11810
## 25453 2019-08-08 1.11931
## 25454 2019-08-09 1.11950
## 25455 2019-08-09 1.11942
## 25456 2019-08-09 1.12018
## 25457 2019-08-09 1.12114
## 25458 2019-08-09 1.12032
## 25459 2019-08-11 1.12055
## 25460 2019-08-12 1.12094
## 25461 2019-08-12 1.11761
## 25462 2019-08-12 1.12096
## 25463 2019-08-12 1.12125
## 25464 2019-08-12 1.12140
## 25465 2019-08-12 1.12063
## 25466 2019-08-13 1.11900
## 25467 2019-08-13 1.11922
## 25468 2019-08-13 1.12171
## 25469 2019-08-13 1.11799
## 25470 2019-08-13 1.11717
## 25471 2019-08-13 1.11782
## 25472 2019-08-14 1.11722
## 25473 2019-08-14 1.11769
## 25474 2019-08-14 1.11777
## 25475 2019-08-14 1.11446
## 25476 2019-08-14 1.11396
## 25477 2019-08-14 1.11423
## 25478 2019-08-15 1.11515
## 25479 2019-08-15 1.11486
## 25480 2019-08-15 1.11423
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN793

```
## 25481 2019-08-15 1.10997
## 25482 2019-08-15 1.11076
## 25483 2019-08-15 1.11041
## 25484 2019-08-16 1.11036
## 25485 2019-08-16 1.10844
## 25486 2019-08-16 1.10741
## 25487 2019-08-16 1.10937
## 25488 2019-08-16 1.10911
## 25489 2019-08-18 1.10912
## 25490 2019-08-19 1.10919
## 25491 2019-08-19 1.11029
## 25492 2019-08-19 1.10997
## 25493 2019-08-19 1.10937
## 25494 2019-08-19 1.10788
## 25495 2019-08-19 1.10850
## 25496 2019-08-20 1.10870
## 25497 2019-08-20 1.10786
## 25498 2019-08-20 1.10777
## 25499 2019-08-20 1.10991
## 25500 2019-08-20 1.11007
## 25501 2019-08-20 1.10925
## 25502 2019-08-21 1.10942
## 25503 2019-08-21 1.10980
## 25504 2019-08-21 1.11035
## 25505 2019-08-21 1.11032
## 25506 2019-08-21 1.10848
## 25507 2019-08-21 1.10861
## 25508 2019-08-22 1.10819
## 25509 2019-08-22 1.10990
## 25510 2019-08-22 1.10801
## 25511 2019-08-22 1.10821
## 25512 2019-08-22 1.10802
## 25513 2019-08-22 1.10795
## 25514 2019-08-23 1.10696
## 25515 2019-08-23 1.10678
## 25516 2019-08-23 1.10637
## 25517 2019-08-23 1.11387
## 25518 2019-08-23 1.11450
## 25519 2019-08-25 1.11436
## 25520 2019-08-26 1.11436
## 25521 2019-08-26 1.11150
## 25522 2019-08-26 1.11119
## 25523 2019-08-26 1.11100
## 25524 2019-08-26 1.11042
## 25525 2019-08-26 1.11038
## 25526 2019-08-27 1.10988
```

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```
## 25527 2019-08-27 1.11134
## 25528 2019-08-27 1.11089
## 25529 2019-08-27 1.10969
## 25530 2019-08-27 1.10912
## 25531 2019-08-27 1.10884
## 25532 2019-08-28 1.10871
## 25533 2019-08-28 1.10889
## 25534 2019-08-28 1.10819
## 25535 2019-08-28 1.10789
## 25536 2019-08-28 1.10778
## 25537 2019-08-28 1.10855
## 25538 2019-08-29 1.10815
## 25539 2019-08-29 1.10767
## 25540 2019-08-29 1.10707
## 25541 2019-08-29 1.10533
## 25542 2019-08-29 1.10570
## 25543 2019-08-29 1.10542
## 25544 2019-08-30 1.10451
## 25545 2019-08-30 1.10381
## 25546 2019-08-30 1.10384
## 25547 2019-08-30 1.09877
## 25548 2019-08-30 1.09936
## 25549 2019-09-01 1.09879
## 25550 2019-09-02 1.09881
## 25551 2019-09-02 1.09729
## 25552 2019-09-02 1.09660
## 25553 2019-09-02 1.09740
## 25554 2019-09-02 1.09723
## 25555 2019-09-02 1.09539
## 25556 2019-09-03 1.09407
## 25557 2019-09-03 1.09495
## 25558 2019-09-03 1.09401
## 25559 2019-09-03 1.09703
## 25560 2019-09-03 1.09757
## 25561 2019-09-03 1.09746
## 25562 2019-09-04 1.09750
## 25563 2019-09-04 1.10076
## 25564 2019-09-04 1.10166
## 25565 2019-09-04 1.10261
## 25566 2019-09-04 1.10359
## 25567 2019-09-04 1.10345
## 25568 2019-09-05 1.10271
## 25569 2019-09-05 1.10378
## 25570 2019-09-05 1.10601
## 25571 2019-09-05 1.10412
## 25572 2019-09-05 1.10350
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN795

```
## 25573 2019-09-05 1.10303
## 25574 2019-09-06 1.10379
## 25575 2019-09-06 1.10373
## 25576 2019-09-06 1.10404
## 25577 2019-09-06 1.10355
## 25578 2019-09-06 1.10324
## 25579 2019-09-08 1.10178
## 25580 2019-09-09 1.10275
## 25581 2019-09-09 1.10341
## 25582 2019-09-09 1.10434
## 25583 2019-09-09 1.10599
## 25584 2019-09-09 1.10492
## 25585 2019-09-09 1.10431
## 25586 2019-09-10 1.10431
## 25587 2019-09-10 1.10387
## 25588 2019-09-10 1.10402
## 25589 2019-09-10 1.10412
## 25590 2019-09-10 1.10437
## 25591 2019-09-10 1.10470
## 25592 2019-09-11 1.10530
## 25593 2019-09-11 1.10259
## 25594 2019-09-11 1.10010
## 25595 2019-09-11 1.10074
## 25596 2019-09-11 1.10105
## 25597 2019-09-11 1.10110
## 25598 2019-09-12 1.10143
## 25599 2019-09-12 1.10273
## 25600 2019-09-12 1.09463
## 25601 2019-09-12 1.10680
## 25602 2019-09-12 1.10650
## 25603 2019-09-12 1.10646
## 25604 2019-09-13 1.10696
## 25605 2019-09-13 1.10923
## 25606 2019-09-13 1.10878
## 25607 2019-09-13 1.10761
## 25608 2019-09-13 1.10770
## 25609 2019-09-15 1.10760
## 25610 2019-09-16 1.10735
## 25611 2019-09-16 1.10597
## 25612 2019-09-16 1.10268
## 25613 2019-09-16 1.10028
## 25614 2019-09-16 1.10033
## 25615 2019-09-16 1.10093
## 25616 2019-09-17 1.10130
## 25617 2019-09-17 1.10147
## 25618 2019-09-17 1.10270
```

```
## 25619 2019-09-17 1.10698
## 25620 2019-09-17 1.10738
## 25621 2019-09-17 1.10701
## 25622 2019-09-18 1.10645
## 25623 2019-09-18 1.10423
## 25624 2019-09-18 1.10567
## 25625 2019-09-18 1.10635
## 25626 2019-09-18 1.10301
## 25627 2019-09-18 1.10258
## 25628 2019-09-19 1.10393
## 25629 2019-09-19 1.10591
## 25630 2019-09-19 1.10672
## 25631 2019-09-19 1.10458
## 25632 2019-09-19 1.10416
## 25633 2019-09-19 1.10508
## 25634 2019-09-20 1.10585
## 25635 2019-09-20 1.10477
## 25636 2019-09-20 1.10259
## 25637 2019-09-20 1.10075
## 25638 2019-09-20 1.10212
## 25639 2019-09-22 1.10172
## 25640 2019-09-23 1.10229
## 25641 2019-09-23 1.09777
## 25642 2019-09-23 1.09867
## 25643 2019-09-23 1.09874
## 25644 2019-09-23 1.09935
## 25645 2019-09-23 1.09918
## 25646 2019-09-24 1.09904
## 25647 2019-09-24 1.09943
## 25648 2019-09-24 1.10068
## 25649 2019-09-24 1.10145
## 25650 2019-09-24 1.10203
## 25651 2019-09-24 1.10078
## 25652 2019-09-25 1.09960
## 25653 2019-09-25 1.10019
## 25654 2019-09-25 1.09865
## 25655 2019-09-25 1.09435
## 25656 2019-09-25 1.09440
## 25657 2019-09-25 1.09519
## 25658 2019-09-26 1.09623
## 25659 2019-09-26 1.09397
## 25660 2019-09-26 1.09476
## 25661 2019-09-26 1.09258
## 25662 2019-09-26 1.09227
## 25663 2019-09-26 1.09166
## 25664 2019-09-27 1.09219
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN797

```
## 25665 2019-09-27 1.09239
## 25666 2019-09-27 1.09375
## 25667 2019-09-27 1.09444
## 25668 2019-09-27 1.09439
## 25669 2019-09-29 1.09370
## 25670 2019-09-30 1.09366
## 25671 2019-09-30 1.09339
## 25672 2019-09-30 1.08988
## 25673 2019-09-30 1.09033
## 25674 2019-09-30 1.09008
## 25675 2019-09-30 1.08966
## 25676 2019-10-01 1.08912
## 25677 2019-10-01 1.08938
## 25678 2019-10-01 1.08957
## 25679 2019-10-01 1.09380
## 25680 2019-10-01 1.09331
## 25681 2019-10-01 1.09392
## 25682 2019-10-02 1.09336
## 25683 2019-10-02 1.09056
## 25684 2019-10-02 1.09310
## 25685 2019-10-02 1.09583
## 25686 2019-10-02 1.09594
## 25687 2019-10-02 1.09607
## 25688 2019-10-03 1.09584
## 25689 2019-10-03 1.09636
## 25690 2019-10-03 1.09620
## 25691 2019-10-03 1.09831
## 25692 2019-10-03 1.09659
## 25693 2019-10-03 1.09793
## 25694 2019-10-04 1.09709
## 25695 2019-10-04 1.09737
## 25696 2019-10-04 1.09649
## 25697 2019-10-04 1.09842
## 25698 2019-10-04 1.09815
## 25699 2019-10-06 1.09881
## 25700 2019-10-07 1.09801
## 25701 2019-10-07 1.09642
## 25702 2019-10-07 1.09980
## 25703 2019-10-07 1.09830
## 25704 2019-10-07 1.09717
## 25705 2019-10-07 1.09690
## 25706 2019-10-08 1.09765
## 25707 2019-10-08 1.09907
## 25708 2019-10-08 1.09847
## 25709 2019-10-08 1.09529
## 25710 2019-10-08 1.09582
```

```
## 25711 2019-10-08 1.09579
## 25712 2019-10-09 1.09625
## 25713 2019-10-09 1.09842
## 25714 2019-10-09 1.09751
## 25715 2019-10-09 1.09732
## 25716 2019-10-09 1.09720
## 25717 2019-10-09 1.09820
## 25718 2019-10-10 1.09864
## 25719 2019-10-10 1.10178
## 25720 2019-10-10 1.10235
## 25721 2019-10-10 1.10166
## 25722 2019-10-10 1.10057
## 25723 2019-10-10 1.10062
## 25724 2019-10-11 1.10163
## 25725 2019-10-11 1.10096
## 25726 2019-10-11 1.10458
## 25727 2019-10-11 1.10508
## 25728 2019-10-11 1.10400
## 25729 2019-10-13 1.10280
## 25730 2019-10-14 1.10313
## 25731 2019-10-14 1.10301
## 25732 2019-10-14 1.10246
## 25733 2019-10-14 1.10298
## 25734 2019-10-14 1.10281
## 25735 2019-10-14 1.10257
## 25736 2019-10-15 1.10287
## 25737 2019-10-15 1.10270
## 25738 2019-10-15 1.10054
## 25739 2019-10-15 1.10228
## 25740 2019-10-15 1.10338
## 25741 2019-10-15 1.10321
## 25742 2019-10-16 1.10304
## 25743 2019-10-16 1.10365
## 25744 2019-10-16 1.10399
## 25745 2019-10-16 1.10812
## 25746 2019-10-16 1.10720
## 25747 2019-10-16 1.10829
## 25748 2019-10-17 1.10759
## 25749 2019-10-17 1.10900
## 25750 2019-10-17 1.11174
## 25751 2019-10-17 1.11262
## 25752 2019-10-17 1.11254
## 25753 2019-10-17 1.11284
## 25754 2019-10-18 1.11219
## 25755 2019-10-18 1.11279
## 25756 2019-10-18 1.11476
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN799

```
## 25757 2019-10-18 1.11585
## 25758 2019-10-18 1.11723
## 25759 2019-10-20 1.11624
## 25760 2019-10-21 1.11576
## 25761 2019-10-21 1.11668
## 25762 2019-10-21 1.11610
## 25763 2019-10-21 1.11517
## 25764 2019-10-21 1.11503
## 25765 2019-10-21 1.11543
## 25766 2019-10-22 1.11531
## 25767 2019-10-22 1.11411
## 25768 2019-10-22 1.11270
## 25769 2019-10-22 1.11407
## 25770 2019-10-22 1.11259
## 25771 2019-10-22 1.11262
## 25772 2019-10-23 1.11210
## 25773 2019-10-23 1.11184
## 25774 2019-10-23 1.11228
## 25775 2019-10-23 1.11211
## 25776 2019-10-23 1.11310
## 25777 2019-10-23 1.11318
## 25778 2019-10-24 1.11347
## 25779 2019-10-24 1.11322
## 25780 2019-10-24 1.11496
## 25781 2019-10-24 1.11069
## 25782 2019-10-24 1.11048
## 25783 2019-10-24 1.11018
## 25784 2019-10-25 1.11024
## 25785 2019-10-25 1.11210
## 25786 2019-10-25 1.11001
## 25787 2019-10-25 1.10739
## 25788 2019-10-25 1.10813
## 25789 2019-10-27 1.10824
## 25790 2019-10-28 1.10830
## 25791 2019-10-28 1.10918
## 25792 2019-10-28 1.10874
## 25793 2019-10-28 1.10988
## 25794 2019-10-28 1.11003
## 25795 2019-10-28 1.10980
## 25796 2019-10-29 1.10932
## 25797 2019-10-29 1.10796
## 25798 2019-10-29 1.10951
## 25799 2019-10-29 1.11096
## 25800 2019-10-29 1.11125
## 25801 2019-10-29 1.11092
## 25802 2019-10-30 1.11094
```

```
## 25803 2019-10-30 1.11193
## 25804 2019-10-30 1.11145
## 25805 2019-10-30 1.11210
## 25806 2019-10-30 1.11513
## 25807 2019-10-30 1.11625
## 25808 2019-10-31 1.11652
## 25809 2019-10-31 1.11751
## 25810 2019-10-31 1.11529
## 25811 2019-10-31 1.11506
## 25812 2019-10-31 1.11531
## 25813 2019-10-31 1.11550
## 25814 2019-11-01 1.11645
## 25815 2019-11-01 1.11608
## 25816 2019-11-01 1.11314
## 25817 2019-11-01 1.11683
## 25818 2019-11-01 1.11675
## 25819 2019-11-03 1.11674
## 25820 2019-11-04 1.11680
## 25821 2019-11-04 1.11652
## 25822 2019-11-04 1.11561
## 25823 2019-11-04 1.11415
## 25824 2019-11-04 1.11294
## 25825 2019-11-04 1.11258
## 25826 2019-11-05 1.11282
## 25827 2019-11-05 1.11294
## 25828 2019-11-05 1.10993
## 25829 2019-11-05 1.10679
## 25830 2019-11-05 1.10746
## 25831 2019-11-05 1.10755
## 25832 2019-11-06 1.10760
## 25833 2019-11-06 1.10915
## 25834 2019-11-06 1.10880
## 25835 2019-11-06 1.10664
## 25836 2019-11-06 1.10661
## 25837 2019-11-06 1.10648
## 25838 2019-11-07 1.10609
## 25839 2019-11-07 1.10781
## 25840 2019-11-07 1.10673
## 25841 2019-11-07 1.10410
## 25842 2019-11-07 1.10501
## 25843 2019-11-07 1.10519
## 25844 2019-11-08 1.10526
## 25845 2019-11-08 1.10387
## 25846 2019-11-08 1.10306
## 25847 2019-11-08 1.10202
## 25848 2019-11-08 1.10213
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN801

```
## 25849 2019-11-10 1.10185
## 25850 2019-11-11 1.10254
## 25851 2019-11-11 1.10297
## 25852 2019-11-11 1.10385
## 25853 2019-11-11 1.10390
## 25854 2019-11-11 1.10338
## 25855 2019-11-11 1.10284
## 25856 2019-11-12 1.10351
## 25857 2019-11-12 1.10334
## 25858 2019-11-12 1.10203
## 25859 2019-11-12 1.10110
## 25860 2019-11-12 1.10096
## 25861 2019-11-12 1.10108
## 25862 2019-11-13 1.10153
## 25863 2019-11-13 1.10154
## 25864 2019-11-13 1.10078
## 25865 2019-11-13 1.09991
## 25866 2019-11-13 1.10076
## 25867 2019-11-13 1.10044
## 25868 2019-11-14 1.09986
## 25869 2019-11-14 1.10012
## 25870 2019-11-14 1.09986
## 25871 2019-11-14 1.10180
## 25872 2019-11-14 1.10247
## 25873 2019-11-14 1.10253
## 25874 2019-11-15 1.10220
## 25875 2019-11-15 1.10193
## 25876 2019-11-15 1.10422
## 25877 2019-11-15 1.10539
## 25878 2019-11-15 1.10541
## 25879 2019-11-17 1.10579
## 25880 2019-11-18 1.10614
## 25881 2019-11-18 1.10620
## 25882 2019-11-18 1.10566
## 25883 2019-11-18 1.10818
## 25884 2019-11-18 1.10732
## 25885 2019-11-18 1.10698
## 25886 2019-11-19 1.10755
## 25887 2019-11-19 1.10685
## 25888 2019-11-19 1.10777
## 25889 2019-11-19 1.10806
## 25890 2019-11-19 1.10790
## 25891 2019-11-19 1.10725
## 25892 2019-11-20 1.10744
## 25893 2019-11-20 1.10639
## 25894 2019-11-20 1.10640
```

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```
## 25895 2019-11-20 1.10669
## 25896 2019-11-20 1.10725
## 25897 2019-11-20 1.10774
## 25898 2019-11-21 1.10760
## 25899 2019-11-21 1.10865
## 25900 2019-11-21 1.10760
## 25901 2019-11-21 1.10627
## 25902 2019-11-21 1.10593
## 25903 2019-11-21 1.10643
## 25904 2019-11-22 1.10663
## 25905 2019-11-22 1.10609
## 25906 2019-11-22 1.10583
## 25907 2019-11-22 1.10239
## 25908 2019-11-22 1.10245
## 25909 2019-11-24 1.10235
## 25910 2019-11-25 1.10294
## 25911 2019-11-25 1.10135
## 25912 2019-11-25 1.10167
## 25913 2019-11-25 1.10058
## 25914 2019-11-25 1.10152
## 25915 2019-11-25 1.10124
## 25916 2019-11-26 1.10150
## 25917 2019-11-26 1.10144
## 25918 2019-11-26 1.10176
## 25919 2019-11-26 1.10203
## 25920 2019-11-26 1.10214
## 25921 2019-11-26 1.10163
## 25922 2019-11-27 1.10097
## 25923 2019-11-27 1.10095
## 25924 2019-11-27 1.10024
## 25925 2019-11-27 1.10003
## 25926 2019-11-27 1.09997
## 25927 2019-11-27 1.10073
## 25928 2019-11-28 1.10071
## 25929 2019-11-28 1.10140
## 25930 2019-11-28 1.10083
## 25931 2019-11-28 1.10082
## 25932 2019-11-28 1.10109
## 25933 2019-11-28 1.10117
## 25934 2019-11-29 1.10105
## 25935 2019-11-29 1.10050
## 25936 2019-11-29 1.09926
## 25937 2019-11-29 1.10163
## 25938 2019-11-29 1.10213
## 25939 2019-12-01 1.10185
## 25940 2019-12-02 1.10193
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN803

```
## 25941 2019-12-02 1.10144
## 25942 2019-12-02 1.10328
## 25943 2019-12-02 1.10752
## 25944 2019-12-02 1.10792
## 25945 2019-12-02 1.10725
## 25946 2019-12-03 1.10734
## 25947 2019-12-03 1.10838
## 25948 2019-12-03 1.10726
## 25949 2019-12-03 1.10886
## 25950 2019-12-03 1.10826
## 25951 2019-12-03 1.10794
## 25952 2019-12-04 1.10755
## 25953 2019-12-04 1.10726
## 25954 2019-12-04 1.11074
## 25955 2019-12-04 1.10780
## 25956 2019-12-04 1.10785
## 25957 2019-12-04 1.10843
## 25958 2019-12-05 1.10833
## 25959 2019-12-05 1.10924
## 25960 2019-12-05 1.10929
## 25961 2019-12-05 1.11050
## 25962 2019-12-05 1.11043
## 25963 2019-12-05 1.11067
## 25964 2019-12-06 1.11066
## 25965 2019-12-06 1.10968
## 25966 2019-12-06 1.10784
## 25967 2019-12-06 1.10550
## 25968 2019-12-06 1.10630
## 25969 2019-12-08 1.10573
## 25970 2019-12-09 1.10591
## 25971 2019-12-09 1.10655
## 25972 2019-12-09 1.10753
## 25973 2019-12-09 1.10570
## 25974 2019-12-09 1.10644
## 25975 2019-12-09 1.10678
## 25976 2019-12-10 1.10673
## 25977 2019-12-10 1.10773
## 25978 2019-12-10 1.10787
## 25979 2019-12-10 1.10868
## 25980 2019-12-10 1.10930
## 25981 2019-12-10 1.10955
## 25982 2019-12-11 1.10896
## 25983 2019-12-11 1.10838
## 25984 2019-12-11 1.10855
## 25985 2019-12-11 1.10926
## 25986 2019-12-11 1.11300
```

```
## 25987 2019-12-11 1.11400
## 25988 2019-12-12 1.11401
## 25989 2019-12-12 1.11277
## 25990 2019-12-12 1.11387
## 25991 2019-12-12 1.11103
## 25992 2019-12-12 1.11313
## 25993 2019-12-12 1.11770
## 25994 2019-12-13 1.11747
## 25995 2019-12-13 1.11804
## 25996 2019-12-13 1.11698
## 25997 2019-12-13 1.11159
## 25998 2019-12-13 1.11236
## 25999 2019-12-15 1.11282
## 26000 2019-12-16 1.11351
## 26001 2019-12-16 1.11350
## 26002 2019-12-16 1.11537
## 26003 2019-12-16 1.11430
## 26004 2019-12-16 1.11446
## 26005 2019-12-16 1.11394
## 26006 2019-12-17 1.11476
## 26007 2019-12-17 1.11503
## 26008 2019-12-17 1.11464
## 26009 2019-12-17 1.11519
## 26010 2019-12-17 1.11507
## 26011 2019-12-17 1.11410
## 26012 2019-12-18 1.11353
## 26013 2019-12-18 1.11332
## 26014 2019-12-18 1.11175
## 26015 2019-12-18 1.11182
## 26016 2019-12-18 1.11144
## 26017 2019-12-18 1.11237
## 26018 2019-12-19 1.11270
## 26019 2019-12-19 1.11367
## 26020 2019-12-19 1.11152
## 26021 2019-12-19 1.11252
## 26022 2019-12-19 1.11236
## 26023 2019-12-19 1.11187
## 26024 2019-12-20 1.11197
## 26025 2019-12-20 1.11210
## 26026 2019-12-20 1.10914
## 26027 2019-12-20 1.10687
## 26028 2019-12-20 1.10812
## 26029 2019-12-22 1.10786
## 26030 2019-12-23 1.10823
## 26031 2019-12-23 1.10837
## 26032 2019-12-23 1.10803
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN805

```
## 26033 2019-12-23 1.10910
## 26034 2019-12-23 1.10898
## 26035 2019-12-23 1.10881
## 26036 2019-12-24 1.10897
## 26037 2019-12-24 1.10752
## 26038 2019-12-24 1.10784
## 26039 2019-12-24 1.10881
## 26040 2019-12-24 1.10894
## 26041 2019-12-24 1.10852
## 26042 2019-12-25 1.10862
## 26043 2019-12-25 1.10865
## 26044 2019-12-25 1.10913
## 26045 2019-12-26 1.10902
## 26046 2019-12-26 1.10917
## 26047 2019-12-26 1.10983
## 26048 2019-12-26 1.11028
## 26049 2019-12-26 1.10996
## 26050 2019-12-26 1.11096
## 26051 2019-12-27 1.11210
## 26052 2019-12-27 1.11388
## 26053 2019-12-27 1.11536
## 26054 2019-12-27 1.11838
## 26055 2019-12-27 1.11781
## 26056 2019-12-29 1.11949
## 26057 2019-12-30 1.12029
## 26058 2019-12-30 1.11996
## 26059 2019-12-30 1.11950
## 26060 2019-12-30 1.12107
## 26061 2019-12-30 1.11994
## 26062 2019-12-30 1.12128
## 26063 2019-12-31 1.12072
## 26064 2019-12-31 1.12138
## 26065 2019-12-31 1.12382
## 26066 2019-12-31 1.12292
## 26067 2019-12-31 1.12154
## 26068 2020-01-01 1.12213
## 26069 2020-01-02 1.12046
## 26070 2020-01-02 1.12032
## 26071 2020-01-02 1.11964
## 26072 2020-01-02 1.11700
## 26073 2020-01-02 1.11729
## 26074 2020-01-02 1.11738
## 26075 2020-01-03 1.11665
## 26076 2020-01-03 1.11403
## 26077 2020-01-03 1.11382
## 26078 2020-01-03 1.11724
```

```
## 26079 2020-01-03 1.11626
## 26080 2020-01-05 1.11630
## 26081 2020-01-06 1.11626
## 26082 2020-01-06 1.11935
## 26083 2020-01-06 1.11979
## 26084 2020-01-06 1.11953
## 26085 2020-01-06 1.11977
## 26086 2020-01-06 1.11936
## 26087 2020-01-07 1.11832
## 26088 2020-01-07 1.11849
## 26089 2020-01-07 1.11562
## 26090 2020-01-07 1.11426
## 26091 2020-01-07 1.11543
## 26092 2020-01-07 1.11560
## 26093 2020-01-08 1.11494
## 26094 2020-01-08 1.11386
## 26095 2020-01-08 1.11201
## 26096 2020-01-08 1.11182
## 26097 2020-01-08 1.11060
## 26098 2020-01-08 1.11176
## 26099 2020-01-09 1.11185
## 26100 2020-01-09 1.10997
## 26101 2020-01-09 1.11151
## 26102 2020-01-09 1.11049
## 26103 2020-01-09 1.11067
## 26104 2020-01-09 1.11044
## 26105 2020-01-10 1.11091
## 26106 2020-01-10 1.10965
## 26107 2020-01-10 1.10969
## 26108 2020-01-10 1.11226
## 26109 2020-01-10 1.11256
## 26110 2020-01-12 1.11214
## 26111 2020-01-13 1.11299
## 26112 2020-01-13 1.11153
## 26113 2020-01-13 1.11189
## 26114 2020-01-13 1.11400
## 26115 2020-01-13 1.11342
## 26116 2020-01-13 1.11374
## 26117 2020-01-14 1.11372
## 26118 2020-01-14 1.11316
## 26119 2020-01-14 1.11104
## 26120 2020-01-14 1.11312
## 26121 2020-01-14 1.11292
## 26122 2020-01-14 1.11298
## 26123 2020-01-15 1.11342
## 26124 2020-01-15 1.11286
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN807

```
## 26125 2020-01-15 1.11492
## 26126 2020-01-15 1.11577
## 26127 2020-01-15 1.11498
## 26128 2020-01-15 1.11537
## 26129 2020-01-16 1.11499
## 26130 2020-01-16 1.11535
## 26131 2020-01-16 1.11515
## 26132 2020-01-16 1.11348
## 26133 2020-01-16 1.11372
## 26134 2020-01-16 1.11370
## 26135 2020-01-17 1.11367
## 26136 2020-01-17 1.11279
## 26137 2020-01-17 1.11005
## 26138 2020-01-17 1.10913
## 26139 2020-01-17 1.10920
## 26140 2020-01-19 1.10965
## 26141 2020-01-20 1.10981
## 26142 2020-01-20 1.10898
## 26143 2020-01-20 1.10836
## 26144 2020-01-20 1.10836
## 26145 2020-01-20 1.10957
## 26146 2020-01-20 1.10907
## 26147 2020-01-21 1.10955
## 26148 2020-01-21 1.10912
## 26149 2020-01-21 1.11138
## 26150 2020-01-21 1.10919
## 26151 2020-01-21 1.10827
## 26152 2020-01-21 1.10820
## 26153 2020-01-22 1.10847
## 26154 2020-01-22 1.10909
## 26155 2020-01-22 1.10900
## 26156 2020-01-22 1.10858
## 26157 2020-01-22 1.10932
## 26158 2020-01-22 1.10895
## 26159 2020-01-23 1.10833
## 26160 2020-01-23 1.10845
## 26161 2020-01-23 1.10868
## 26162 2020-01-23 1.10511
## 26163 2020-01-23 1.10554
## 26164 2020-01-23 1.10540
## 26165 2020-01-24 1.10490
## 26166 2020-01-24 1.10361
## 26167 2020-01-24 1.10389
## 26168 2020-01-24 1.10273
## 26169 2020-01-24 1.10280
## 26170 2020-01-26 1.10338
```

```
## 26171 2020-01-27 1.10310
## 26172 2020-01-27 1.10211
## 26173 2020-01-27 1.10275
## 26174 2020-01-27 1.10154
## 26175 2020-01-27 1.10196
## 26176 2020-01-27 1.10201
## 26177 2020-01-28 1.10220
## 26178 2020-01-28 1.10169
## 26179 2020-01-28 1.10055
## 26180 2020-01-28 1.10091
## 26181 2020-01-28 1.10226
## 26182 2020-01-28 1.10169
## 26183 2020-01-29 1.10151
## 26184 2020-01-29 1.10023
## 26185 2020-01-29 1.09926
## 26186 2020-01-29 1.10051
## 26187 2020-01-29 1.10107
## 26188 2020-01-29 1.10112
## 26189 2020-01-30 1.10136
## 26190 2020-01-30 1.10192
## 26191 2020-01-30 1.10257
## 26192 2020-01-30 1.10379
## 26193 2020-01-30 1.10338
## 26194 2020-01-30 1.10294
## 26195 2020-01-31 1.10219
## 26196 2020-01-31 1.10290
## 26197 2020-01-31 1.10553
## 26198 2020-01-31 1.10831
## 26199 2020-01-31 1.10952
## 26200 2020-02-02 1.10832
## 26201 2020-02-03 1.10845
## 26202 2020-02-03 1.10729
## 26203 2020-02-03 1.10633
## 26204 2020-02-03 1.10589
## 26205 2020-02-03 1.10597
## 26206 2020-02-03 1.10604
## 26207 2020-02-04 1.10588
## 26208 2020-02-04 1.10561
## 26209 2020-02-04 1.10446
## 26210 2020-02-04 1.10373
## 26211 2020-02-04 1.10450
## 26212 2020-02-04 1.10406
## 26213 2020-02-05 1.10381
## 26214 2020-02-05 1.10262
## 26215 2020-02-05 1.10125
## 26216 2020-02-05 1.10013
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN809

```
## 26217 2020-02-05 1.09997
## 26218 2020-02-05 1.09984
## 26219 2020-02-06 1.10000
## 26220 2020-02-06 1.09993
## 26221 2020-02-06 1.10018
## 26222 2020-02-06 1.09752
## 26223 2020-02-06 1.09836
## 26224 2020-02-06 1.09831
## 26225 2020-02-07 1.09811
## 26226 2020-02-07 1.09545
## 26227 2020-02-07 1.09584
## 26228 2020-02-07 1.09428
## 26229 2020-02-07 1.09476
## 26230 2020-02-09 1.09508
## 26231 2020-02-10 1.09558
## 26232 2020-02-10 1.09500
## 26233 2020-02-10 1.09329
## 26234 2020-02-10 1.09104
## 26235 2020-02-10 1.09112
## 26236 2020-02-10 1.09143
## 26237 2020-02-11 1.09125
## 26238 2020-02-11 1.09139
## 26239 2020-02-11 1.09038
## 26240 2020-02-11 1.09222
## 26241 2020-02-11 1.09167
## 26242 2020-02-11 1.09186
## 26243 2020-02-12 1.09112
## 26244 2020-02-12 1.09206
## 26245 2020-02-12 1.09053
## 26246 2020-02-12 1.08790
## 26247 2020-02-12 1.08746
## 26248 2020-02-12 1.08731
## 26249 2020-02-13 1.08719
## 26250 2020-02-13 1.08831
## 26251 2020-02-13 1.08551
## 26252 2020-02-13 1.08426
## 26253 2020-02-13 1.08426
## 26254 2020-02-13 1.08364
## 26255 2020-02-14 1.08373
## 26256 2020-02-14 1.08451
## 26257 2020-02-14 1.08552
## 26258 2020-02-14 1.08436
## 26259 2020-02-14 1.08331
## 26260 2020-02-16 1.08368
## 26261 2020-02-17 1.08399
## 26262 2020-02-17 1.08443
```

```
## 26263 2020-02-17 1.08363
## 26264 2020-02-17 1.08323
## 26265 2020-02-17 1.08373
## 26266 2020-02-17 1.08279
## 26267 2020-02-18 1.08314
## 26268 2020-02-18 1.08281
## 26269 2020-02-18 1.08024
## 26270 2020-02-18 1.08044
## 26271 2020-02-18 1.07926
## 26272 2020-02-18 1.08023
## 26273 2020-02-19 1.07957
## 26274 2020-02-19 1.08034
## 26275 2020-02-19 1.07936
## 26276 2020-02-19 1.07921
## 26277 2020-02-19 1.08082
## 26278 2020-02-19 1.08004
## 26279 2020-02-20 1.07969
## 26280 2020-02-20 1.08000
## 26281 2020-02-20 1.08049
## 26282 2020-02-20 1.07932
## 26283 2020-02-20 1.07856
## 26284 2020-02-20 1.07930
## 26285 2020-02-21 1.07933
## 26286 2020-02-21 1.08101
## 26287 2020-02-21 1.08094
## 26288 2020-02-21 1.08577
## 26289 2020-02-21 1.08482
## 26290 2020-02-23 1.08285
## 26291 2020-02-24 1.08153
## 26292 2020-02-24 1.08159
## 26293 2020-02-24 1.08150
## 26294 2020-02-24 1.08711
## 26295 2020-02-24 1.08543
## 26296 2020-02-24 1.08588
## 26297 2020-02-25 1.08514
## 26298 2020-02-25 1.08508
## 26299 2020-02-25 1.08412
## 26300 2020-02-25 1.08828
## 26301 2020-02-25 1.08824
## 26302 2020-02-25 1.08742
## 26303 2020-02-26 1.08763
## 26304 2020-02-26 1.08892
## 26305 2020-02-26 1.08657
## 26306 2020-02-26 1.08789
## 26307 2020-02-26 1.08817
## 26308 2020-02-26 1.09014
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN811

```
## 26309 2020-02-27 1.09078
## 26310 2020-02-27 1.09357
## 26311 2020-02-27 1.09767
## 26312 2020-02-27 1.09799
## 26313 2020-02-27 1.10012
## 26314 2020-02-27 1.09881
## 26315 2020-02-28 1.10004
## 26316 2020-02-28 1.10448
## 26317 2020-02-28 1.09871
## 26318 2020-02-28 1.10013
## 26319 2020-02-28 1.10289
## 26320 2020-03-01 1.10568
## 26321 2020-03-02 1.10434
## 26322 2020-03-02 1.10798
## 26323 2020-03-02 1.11221
## 26324 2020-03-02 1.11800
## 26325 2020-03-02 1.11342
## 26326 2020-03-02 1.11325
## 26327 2020-03-03 1.11452
## 26328 2020-03-03 1.11274
## 26329 2020-03-03 1.11193
## 26330 2020-03-03 1.11590
## 26331 2020-03-03 1.11743
## 26332 2020-03-03 1.11667
## 26333 2020-03-04 1.11570
## 26334 2020-03-04 1.11570
## 26335 2020-03-04 1.11256
## 26336 2020-03-04 1.11238
## 26337 2020-03-04 1.11395
## 26338 2020-03-04 1.11371
## 26339 2020-03-05 1.11348
## 26340 2020-03-05 1.11736
## 26341 2020-03-05 1.11870
## 26342 2020-03-05 1.12142
## 26343 2020-03-05 1.12411
## 26344 2020-03-05 1.12458
## 26345 2020-03-06 1.12285
## 26346 2020-03-06 1.12942
## 26347 2020-03-06 1.13229
## 26348 2020-03-06 1.13057
## 26349 2020-03-06 1.12867
## 26350 2020-03-08 1.13601
## 26351 2020-03-09 1.14018
## 26352 2020-03-09 1.14029
## 26353 2020-03-09 1.14359
## 26354 2020-03-09 1.14710
```

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```
## 26355 2020-03-09 1.14478
## 26356 2020-03-09 1.13855
## 26357 2020-03-10 1.13755
## 26358 2020-03-10 1.13605
## 26359 2020-03-10 1.13804
## 26360 2020-03-10 1.13063
## 26361 2020-03-10 1.12848
## 26362 2020-03-10 1.13192
## 26363 2020-03-11 1.13378
## 26364 2020-03-11 1.13137
## 26365 2020-03-11 1.13393
## 26366 2020-03-11 1.12690
## 26367 2020-03-11 1.12702
## 26368 2020-03-11 1.12720
## 26369 2020-03-12 1.12963
## 26370 2020-03-12 1.12678
## 26371 2020-03-12 1.12162
## 26372 2020-03-12 1.11465
## 26373 2020-03-12 1.11864
## 26374 2020-03-12 1.11672
## 26375 2020-03-13 1.12195
## 26376 2020-03-13 1.12077
## 26377 2020-03-13 1.11106
## 26378 2020-03-13 1.10813
## 26379 2020-03-13 1.11004
## 26380 2020-03-15 1.11187
## 26381 2020-03-16 1.11337
## 26382 2020-03-16 1.12263
## 26383 2020-03-16 1.11662
## 26384 2020-03-16 1.11616
## 26385 2020-03-16 1.11829
## 26386 2020-03-16 1.11716
## 26387 2020-03-17 1.11798
## 26388 2020-03-17 1.11111
## 26389 2020-03-17 1.09887
## 26390 2020-03-17 1.09662
## 26391 2020-03-17 1.09993
## 26392 2020-03-17 1.09927
## 26393 2020-03-18 1.10311
## 26394 2020-03-18 1.09728
## 26395 2020-03-18 1.09308
## 26396 2020-03-18 1.08097
## 26397 2020-03-18 1.09154
## 26398 2020-03-18 1.09014
## 26399 2020-03-19 1.08971
## 26400 2020-03-19 1.08382
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN813

```
## 26401 2020-03-19 1.07992
## 26402 2020-03-19 1.06636
## 26403 2020-03-19 1.06945
## 26404 2020-03-19 1.06645
## 26405 2020-03-20 1.07654
## 26406 2020-03-20 1.07878
## 26407 2020-03-20 1.07098
## 26408 2020-03-20 1.06612
## 26409 2020-03-20 1.07018
## 26410 2020-03-22 1.06793
## 26411 2020-03-23 1.07362
## 26412 2020-03-23 1.07080
## 26413 2020-03-23 1.07795
## 26414 2020-03-23 1.07504
## 26415 2020-03-23 1.07285
## 26416 2020-03-23 1.07965
## 26417 2020-03-24 1.07893
## 26418 2020-03-24 1.08258
## 26419 2020-03-24 1.08227
## 26420 2020-03-24 1.07906
## 26421 2020-03-24 1.07894
## 26422 2020-03-24 1.07877
## 26423 2020-03-25 1.08122
## 26424 2020-03-25 1.08342
## 26425 2020-03-25 1.08202
## 26426 2020-03-25 1.08502
## 26427 2020-03-25 1.08841
## 26428 2020-03-25 1.09219
## 26429 2020-03-26 1.09068
## 26430 2020-03-26 1.09383
## 26431 2020-03-26 1.09725
## 26432 2020-03-26 1.10439
## 26433 2020-03-26 1.10319
## 26434 2020-03-26 1.10380
## 26435 2020-03-27 1.10588
## 26436 2020-03-27 1.10118
## 26437 2020-03-27 1.09864
## 26438 2020-03-27 1.10788
## 26439 2020-03-27 1.11457
## 26440 2020-03-29 1.11053
## 26441 2020-03-30 1.10817
## 26442 2020-03-30 1.10920
## 26443 2020-03-30 1.10157
## 26444 2020-03-30 1.10198
## 26445 2020-03-30 1.10479
## 26446 2020-03-30 1.10139
```

```
## 26447 2020-03-31 1.10167
## 26448 2020-03-31 1.09794
## 26449 2020-03-31 1.09726
## 26450 2020-03-31 1.09711
## 26451 2020-03-31 1.10351
## 26452 2020-03-31 1.10322
## 26453 2020-04-01 1.10169
## 26454 2020-04-01 1.09571
## 26455 2020-04-01 1.09299
## 26456 2020-04-01 1.09254
## 26457 2020-04-01 1.09649
## 26458 2020-04-01 1.09432
## 26459 2020-04-02 1.09443
## 26460 2020-04-02 1.09193
## 26461 2020-04-02 1.08798
## 26462 2020-04-02 1.08418
## 26463 2020-04-02 1.08604
## 26464 2020-04-02 1.08429
## 26465 2020-04-03 1.08440
## 26466 2020-04-03 1.07987
## 26467 2020-04-03 1.07765
## 26468 2020-04-03 1.07871
## 26469 2020-04-03 1.07996
## 26470 2020-04-05 1.08147
## 26471 2020-04-06 1.08150
## 26472 2020-04-06 1.07931
## 26473 2020-04-06 1.07923
## 26474 2020-04-06 1.08021
## 26475 2020-04-06 1.07939
## 26476 2020-04-06 1.07940
## 26477 2020-04-07 1.08267
## 26478 2020-04-07 1.08684
## 26479 2020-04-07 1.09055
## 26480 2020-04-07 1.08966
## 26481 2020-04-07 1.08930
## 26482 2020-04-07 1.08681
## 26483 2020-04-08 1.08678
## 26484 2020-04-08 1.08524
## 26485 2020-04-08 1.08730
## 26486 2020-04-08 1.08638
## 26487 2020-04-08 1.08591
## 26488 2020-04-08 1.08719
## 26489 2020-04-09 1.08654
## 26490 2020-04-09 1.08695
## 26491 2020-04-09 1.09043
## 26492 2020-04-09 1.09362
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN815

```
## 26493 2020-04-09 1.09299
## 26494 2020-04-09 1.09229
## 26495 2020-04-10 1.09387
## 26496 2020-04-10 1.09425
## 26497 2020-04-10 1.09433
## 26498 2020-04-10 1.09493
## 26499 2020-04-10 1.09419
## 26500 2020-04-12 1.09303
## 26501 2020-04-13 1.09370
## 26502 2020-04-13 1.09316
## 26503 2020-04-13 1.09228
## 26504 2020-04-13 1.09171
## 26505 2020-04-13 1.09160
## 26506 2020-04-13 1.09236
## 26507 2020-04-14 1.09439
## 26508 2020-04-14 1.09232
## 26509 2020-04-14 1.09712
## 26510 2020-04-14 1.09651
## 26511 2020-04-14 1.09825
## 26512 2020-04-14 1.09863
## 26513 2020-04-15 1.09755
## 26514 2020-04-15 1.09325
## 26515 2020-04-15 1.08607
## 26516 2020-04-15 1.09171
## 26517 2020-04-15 1.09118
## 26518 2020-04-15 1.08861
## 26519 2020-04-16 1.08795
## 26520 2020-04-16 1.08880
## 26521 2020-04-16 1.08896
## 26522 2020-04-16 1.08337
## 26523 2020-04-16 1.08407
## 26524 2020-04-16 1.08631
## 26525 2020-04-17 1.08708
## 26526 2020-04-17 1.08296
## 26527 2020-04-17 1.08646
## 26528 2020-04-17 1.08671
## 26529 2020-04-17 1.08786
## 26530 2020-04-19 1.08608
## 26531 2020-04-20 1.08713
## 26532 2020-04-20 1.08792
## 26533 2020-04-20 1.08629
## 26534 2020-04-20 1.08704
## 26535 2020-04-20 1.08632
## 26536 2020-04-20 1.08562
## 26537 2020-04-21 1.08332
## 26538 2020-04-21 1.08377
```

```
## 26539 2020-04-21 1.08294
## 26540 2020-04-21 1.08445
## 26541 2020-04-21 1.08596
## 26542 2020-04-21 1.08553
## 26543 2020-04-22 1.08467
## 26544 2020-04-22 1.08601
## 26545 2020-04-22 1.08688
## 26546 2020-04-22 1.08158
## 26547 2020-04-22 1.08239
## 26548 2020-04-22 1.08115
## 26549 2020-04-23 1.08158
## 26550 2020-04-23 1.07965
## 26551 2020-04-23 1.07886
## 26552 2020-04-23 1.08139
## 26553 2020-04-23 1.07783
## 26554 2020-04-23 1.07666
## 26555 2020-04-24 1.07717
## 26556 2020-04-24 1.07561
## 26557 2020-04-24 1.08033
## 26558 2020-04-24 1.07885
## 26559 2020-04-24 1.08245
## 26560 2020-04-26 1.08184
## 26561 2020-04-27 1.08387
## 26562 2020-04-27 1.08500
## 26563 2020-04-27 1.08513
## 26564 2020-04-27 1.08216
## 26565 2020-04-27 1.08308
## 26566 2020-04-27 1.08333
## 26567 2020-04-28 1.08219
## 26568 2020-04-28 1.08504
## 26569 2020-04-28 1.08705
## 26570 2020-04-28 1.08319
## 26571 2020-04-28 1.08209
## 26572 2020-04-28 1.08418
## 26573 2020-04-29 1.08500
## 26574 2020-04-29 1.08664
## 26575 2020-04-29 1.08575
## 26576 2020-04-29 1.08481
## 26577 2020-04-29 1.08775
## 26578 2020-04-29 1.08594
## 26579 2020-04-30 1.08601
## 26580 2020-04-30 1.08865
## 26581 2020-04-30 1.08763
## 26582 2020-04-30 1.09375
## 26583 2020-04-30 1.09560
## 26584 2020-04-30 1.09460
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN817

```
## 26585 2020-05-01 1.09494
## 26586 2020-05-01 1.09765
## 26587 2020-05-01 1.09808
## 26588 2020-05-01 1.09877
## 26589 2020-05-01 1.09829
## 26590 2020-05-03 1.09475
## 26591 2020-05-04 1.09366
## 26592 2020-05-04 1.09451
## 26593 2020-05-04 1.09350
## 26594 2020-05-04 1.09005
## 26595 2020-05-04 1.09082
## 26596 2020-05-04 1.09108
## 26597 2020-05-05 1.09069
## 26598 2020-05-05 1.08459
## 26599 2020-05-05 1.08420
## 26600 2020-05-05 1.08404
## 26601 2020-05-05 1.08425
## 26602 2020-05-05 1.08374
## 26603 2020-05-06 1.08410
## 26604 2020-05-06 1.08022
## 26605 2020-05-06 1.08128
## 26606 2020-05-06 1.08078
## 26607 2020-05-06 1.07951
## 26608 2020-05-06 1.07940
## 26609 2020-05-07 1.07993
## 26610 2020-05-07 1.07933
## 26611 2020-05-07 1.07947
## 26612 2020-05-07 1.08128
## 26613 2020-05-07 1.08350
## 26614 2020-05-07 1.08482
## 26615 2020-05-08 1.08435
## 26616 2020-05-08 1.08347
## 26617 2020-05-08 1.08361
## 26618 2020-05-08 1.08469
## 26619 2020-05-08 1.08419
## 26620 2020-05-10 1.08457
## 26621 2020-05-11 1.08469
## 26622 2020-05-11 1.08180
## 26623 2020-05-11 1.08205
## 26624 2020-05-11 1.08083
## 26625 2020-05-11 1.08084
## 26626 2020-05-11 1.07928
## 26627 2020-05-12 1.08048
## 26628 2020-05-12 1.08204
## 26629 2020-05-12 1.08598
## 26630 2020-05-12 1.08508
```

```
## 26631 2020-05-12 1.08483
## 26632 2020-05-12 1.08553
## 26633 2020-05-13 1.08497
## 26634 2020-05-13 1.08426
## 26635 2020-05-13 1.08794
## 26636 2020-05-13 1.08223
## 26637 2020-05-13 1.08191
## 26638 2020-05-13 1.08218
## 26639 2020-05-14 1.08098
## 26640 2020-05-14 1.08104
## 26641 2020-05-14 1.07890
## 26642 2020-05-14 1.07825
## 26643 2020-05-14 1.08055
## 26644 2020-05-14 1.08057
## 26645 2020-05-15 1.08055
## 26646 2020-05-15 1.08114
## 26647 2020-05-15 1.08299
## 26648 2020-05-15 1.08070
## 26649 2020-05-15 1.08198
## 26650 2020-05-17 1.08172
## 26651 2020-05-18 1.08207
## 26652 2020-05-18 1.08097
## 26653 2020-05-18 1.08378
## 26654 2020-05-18 1.09094
## 26655 2020-05-18 1.09163
## 26656 2020-05-18 1.09194
## 26657 2020-05-19 1.09098
## 26658 2020-05-19 1.09518
## 26659 2020-05-19 1.09509
## 26660 2020-05-19 1.09296
## 26661 2020-05-19 1.09241
## 26662 2020-05-19 1.09385
## 26663 2020-05-20 1.09414
## 26664 2020-05-20 1.09425
## 26665 2020-05-20 1.09653
## 26666 2020-05-20 1.09758
## 26667 2020-05-20 1.09803
## 26668 2020-05-20 1.09686
## 26669 2020-05-21 1.09609
## 26670 2020-05-21 1.09723
## 26671 2020-05-21 1.09957
## 26672 2020-05-21 1.09551
## 26673 2020-05-21 1.09524
## 26674 2020-05-21 1.09478
## 26675 2020-05-22 1.09297
## 26676 2020-05-22 1.08996
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN819

```
## 26677 2020-05-22 1.08984
## 26678 2020-05-22 1.08882
## 26679 2020-05-22 1.09063
## 26680 2020-05-24 1.09019
## 26681 2020-05-25 1.08908
## 26682 2020-05-25 1.08894
## 26683 2020-05-25 1.09045
## 26684 2020-05-25 1.08935
## 26685 2020-05-25 1.08983
## 26686 2020-05-25 1.09101
## 26687 2020-05-26 1.09196
## 26688 2020-05-26 1.09576
## 26689 2020-05-26 1.09709
## 26690 2020-05-26 1.09766
## 26691 2020-05-26 1.09826
## 26692 2020-05-26 1.09704
## 26693 2020-05-27 1.09553
## 26694 2020-05-27 1.09568
## 26695 2020-05-27 1.09984
## 26696 2020-05-27 1.09751
## 26697 2020-05-27 1.10078
## 26698 2020-05-27 1.10235
## 26699 2020-05-28 1.10083
## 26700 2020-05-28 1.09993
## 26701 2020-05-28 1.10217
## 26702 2020-05-28 1.10823
## 26703 2020-05-28 1.10782
## 26704 2020-05-28 1.10768
## 26705 2020-05-29 1.10997
## 26706 2020-05-29 1.11176
## 26707 2020-05-29 1.11300
## 26708 2020-05-29 1.10981
## 26709 2020-05-29 1.11071
## 26710 2020-05-31 1.11219
## 26711 2020-06-01 1.11338
## 26712 2020-06-01 1.11397
## 26713 2020-06-01 1.11103
## 26714 2020-06-01 1.11299
## 26715 2020-06-01 1.11357
## 26716 2020-06-01 1.11321
## 26717 2020-06-02 1.11258
## 26718 2020-06-02 1.11706
## 26719 2020-06-02 1.11653
## 26720 2020-06-02 1.11742
## 26721 2020-06-02 1.11711
## 26722 2020-06-02 1.11931
```

```
## 26723 2020-06-03 1.12034
## 26724 2020-06-03 1.12109
## 26725 2020-06-03 1.11915
## 26726 2020-06-03 1.12369
## 26727 2020-06-03 1.12339
## 26728 2020-06-03 1.12224
## 26729 2020-06-04 1.12157
## 26730 2020-06-04 1.12072
## 26731 2020-06-04 1.12379
## 26732 2020-06-04 1.13292
## 26733 2020-06-04 1.13392
## 26734 2020-06-04 1.13327
## 26735 2020-06-05 1.13469
## 26736 2020-06-05 1.13326
## 26737 2020-06-05 1.12956
## 26738 2020-06-05 1.12907
## 26739 2020-06-05 1.12920
## 26740 2020-06-07 1.12980
## 26741 2020-06-08 1.12890
## 26742 2020-06-08 1.13003
## 26743 2020-06-08 1.12941
## 26744 2020-06-08 1.12914
## 26745 2020-06-08 1.12950
## 26746 2020-06-08 1.13045
## 26747 2020-06-09 1.12857
## 26748 2020-06-09 1.12620
## 26749 2020-06-09 1.12999
## 26750 2020-06-09 1.13429
## 26751 2020-06-09 1.13411
## 26752 2020-06-09 1.13398
## 26753 2020-06-10 1.13430
## 26754 2020-06-10 1.13693
## 26755 2020-06-10 1.13804
## 26756 2020-06-10 1.13514
## 26757 2020-06-10 1.13756
## 26758 2020-06-10 1.13868
## 26759 2020-06-11 1.13514
## 26760 2020-06-11 1.13901
## 26761 2020-06-11 1.13569
## 26762 2020-06-11 1.13620
## 26763 2020-06-11 1.12994
## 26764 2020-06-11 1.12833
## 26765 2020-06-12 1.12973
## 26766 2020-06-12 1.13250
## 26767 2020-06-12 1.13055
## 26768 2020-06-12 1.12363
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN821

```
## 26769 2020-06-12 1.12564
## 26770 2020-06-14 1.12464
## 26771 2020-06-15 1.12608
## 26772 2020-06-15 1.12669
## 26773 2020-06-15 1.12478
## 26774 2020-06-15 1.12856
## 26775 2020-06-15 1.13235
## 26776 2020-06-15 1.13340
## 26777 2020-06-16 1.13331
## 26778 2020-06-16 1.13368
## 26779 2020-06-16 1.13019
## 26780 2020-06-16 1.12685
## 26781 2020-06-16 1.12641
## 26782 2020-06-16 1.12677
## 26783 2020-06-17 1.12718
## 26784 2020-06-17 1.12578
## 26785 2020-06-17 1.12371
## 26786 2020-06-17 1.12312
## 26787 2020-06-17 1.12451
## 26788 2020-06-17 1.12416
## 26789 2020-06-18 1.12557
## 26790 2020-06-18 1.12495
## 26791 2020-06-18 1.12276
## 26792 2020-06-18 1.11937
## 26793 2020-06-18 1.12059
## 26794 2020-06-18 1.12040
## 26795 2020-06-19 1.12136
## 26796 2020-06-19 1.12163
## 26797 2020-06-19 1.12382
## 26798 2020-06-19 1.11928
## 26799 2020-06-19 1.11788
## 26800 2020-06-21 1.11804
## 26801 2020-06-22 1.12036
## 26802 2020-06-22 1.12247
## 26803 2020-06-22 1.12209
## 26804 2020-06-22 1.12612
## 26805 2020-06-22 1.12606
## 26806 2020-06-22 1.12674
## 26807 2020-06-23 1.12619
## 26808 2020-06-23 1.12909
## 26809 2020-06-23 1.13300
## 26810 2020-06-23 1.13090
## 26811 2020-06-23 1.13091
## 26812 2020-06-23 1.13176
## 26813 2020-06-24 1.13148
## 26814 2020-06-24 1.13014
```

```
## 26815 2020-06-24 1.12739
## 26816 2020-06-24 1.12786
## 26817 2020-06-24 1.12517
## 26818 2020-06-24 1.12561
## 26819 2020-06-25 1.12488
## 26820 2020-06-25 1.12298
## 26821 2020-06-25 1.12115
## 26822 2020-06-25 1.12275
## 26823 2020-06-25 1.12183
## 26824 2020-06-25 1.12162
## 26825 2020-06-26 1.12238
## 26826 2020-06-26 1.12393
## 26827 2020-06-26 1.12189
## 26828 2020-06-26 1.12298
## 26829 2020-06-26 1.12204
## 26830 2020-06-28 1.12296
## 26831 2020-06-29 1.12421
## 26832 2020-06-29 1.12545
## 26833 2020-06-29 1.12862
## 26834 2020-06-29 1.12276
## 26835 2020-06-29 1.12420
## 26836 2020-06-29 1.12385
## 26837 2020-06-30 1.12388
## 26838 2020-06-30 1.12192
## 26839 2020-06-30 1.12094
## 26840 2020-06-30 1.12435
## 26841 2020-06-30 1.12341
## 26842 2020-06-30 1.12310
## 26843 2020-07-01 1.12184
## 26844 2020-07-01 1.12313
## 26845 2020-07-01 1.12179
## 26846 2020-07-01 1.12646
## 26847 2020-07-01 1.12519
## 26848 2020-07-01 1.12518
## 26849 2020-07-02 1.12651
## 26850 2020-07-02 1.12977
## 26851 2020-07-02 1.12639
## 26852 2020-07-02 1.12288
## 26853 2020-07-02 1.12399
## 26854 2020-07-02 1.12403
## 26855 2020-07-03 1.12293
## 26856 2020-07-03 1.12338
## 26857 2020-07-03 1.12296
## 26858 2020-07-03 1.12418
## 26859 2020-07-03 1.12510
## 26860 2020-07-05 1.12643
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN823

```
## 26861 2020-07-06 1.12920
## 26862 2020-07-06 1.12906
## 26863 2020-07-06 1.13299
## 26864 2020-07-06 1.13068
## 26865 2020-07-06 1.13098
## 26866 2020-07-06 1.13266
## 26867 2020-07-07 1.13118
## 26868 2020-07-07 1.12648
## 26869 2020-07-07 1.12983
## 26870 2020-07-07 1.12905
## 26871 2020-07-07 1.12743
## 26872 2020-07-07 1.12693
## 26873 2020-07-08 1.12767
## 26874 2020-07-08 1.12790
## 26875 2020-07-08 1.12884
## 26876 2020-07-08 1.13362
## 26877 2020-07-08 1.13307
## 26878 2020-07-08 1.13340
## 26879 2020-07-09 1.13652
## 26880 2020-07-09 1.13296
## 26881 2020-07-09 1.13439
## 26882 2020-07-09 1.12909
## 26883 2020-07-09 1.12858
## 26884 2020-07-09 1.12756
## 26885 2020-07-10 1.12714
## 26886 2020-07-10 1.12859
## 26887 2020-07-10 1.12934
## 26888 2020-07-10 1.13000
## 26889 2020-07-10 1.13003
## 26890 2020-07-12 1.13147
## 26891 2020-07-13 1.13227
## 26892 2020-07-13 1.13088
## 26893 2020-07-13 1.13259
## 26894 2020-07-13 1.13678
## 26895 2020-07-13 1.13444
## 26896 2020-07-13 1.13452
## 26897 2020-07-14 1.13452
## 26898 2020-07-14 1.13511
## 26899 2020-07-14 1.13722
## 26900 2020-07-14 1.14034
## 26901 2020-07-14 1.14004
## 26902 2020-07-14 1.14133
## 26903 2020-07-15 1.13954
## 26904 2020-07-15 1.14373
## 26905 2020-07-15 1.14354
## 26906 2020-07-15 1.14075
```

```
## 26907 2020-07-15 1.14123
## 26908 2020-07-15 1.14150
## 26909 2020-07-16 1.14064
## 26910 2020-07-16 1.13933
## 26911 2020-07-16 1.14111
## 26912 2020-07-16 1.14096
## 26913 2020-07-16 1.13845
## 26914 2020-07-16 1.13850
## 26915 2020-07-17 1.13876
## 26916 2020-07-17 1.14167
## 26917 2020-07-17 1.14191
## 26918 2020-07-17 1.14356
## 26919 2020-07-17 1.14285
## 26920 2020-07-19 1.14225
## 26921 2020-07-20 1.14425
## 26922 2020-07-20 1.14579
## 26923 2020-07-20 1.14186
## 26924 2020-07-20 1.14388
## 26925 2020-07-20 1.14482
## 26926 2020-07-20 1.14557
## 26927 2020-07-21 1.14309
## 26928 2020-07-21 1.14436
## 26929 2020-07-21 1.14389
## 26930 2020-07-21 1.15164
## 26931 2020-07-21 1.15274
## 26932 2020-07-21 1.15314
## 26933 2020-07-22 1.15394
## 26934 2020-07-22 1.15226
## 26935 2020-07-22 1.15960
## 26936 2020-07-22 1.15774
## 26937 2020-07-22 1.15702
## 26938 2020-07-22 1.15679
## 26939 2020-07-23 1.15807
## 26940 2020-07-23 1.15885
## 26941 2020-07-23 1.15423
## 26942 2020-07-23 1.16206
## 26943 2020-07-23 1.15971
## 26944 2020-07-23 1.16142
## 26945 2020-07-24 1.15985
## 26946 2020-07-24 1.16006
## 26947 2020-07-24 1.16150
## 26948 2020-07-24 1.16353
## 26949 2020-07-24 1.16565
## 26950 2020-07-26 1.16890
## 26951 2020-07-27 1.17054
## 26952 2020-07-27 1.16956
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN825

```
## 26953 2020-07-27 1.17394
## 26954 2020-07-27 1.17451
## 26955 2020-07-27 1.17522
## 26956 2020-07-27 1.17664
## 26957 2020-07-28 1.17316
## 26958 2020-07-28 1.17213
## 26959 2020-07-28 1.17333
## 26960 2020-07-28 1.17350
## 26961 2020-07-28 1.17167
## 26962 2020-07-28 1.17219
## 26963 2020-07-29 1.17299
## 26964 2020-07-29 1.17510
## 26965 2020-07-29 1.17438
## 26966 2020-07-29 1.17738
## 26967 2020-07-29 1.17917
## 26968 2020-07-29 1.17800
## 26969 2020-07-30 1.17687
## 26970 2020-07-30 1.17424
## 26971 2020-07-30 1.17775
## 26972 2020-07-30 1.18039
## 26973 2020-07-30 1.18478
## 26974 2020-07-30 1.18664
## 26975 2020-07-31 1.18979
## 26976 2020-07-31 1.18582
## 26977 2020-07-31 1.18439
## 26978 2020-07-31 1.17916
## 26979 2020-07-31 1.17839
## 26980 2020-08-02 1.17536
## 26981 2020-08-03 1.17760
## 26982 2020-08-03 1.17794
## 26983 2020-08-03 1.17076
## 26984 2020-08-03 1.17494
## 26985 2020-08-03 1.17626
## 26986 2020-08-03 1.17539
## 26987 2020-08-04 1.17742
## 26988 2020-08-04 1.17926
## 26989 2020-08-04 1.17286
## 26990 2020-08-04 1.17780
## 26991 2020-08-04 1.18030
## 26992 2020-08-04 1.18095
## 26993 2020-08-05 1.18172
## 26994 2020-08-05 1.18406
## 26995 2020-08-05 1.18780
## 26996 2020-08-05 1.18734
## 26997 2020-08-05 1.18639
## 26998 2020-08-05 1.18790
```

```
## 26999 2020-08-06 1.18795
## 27000 2020-08-06 1.18427
## 27001 2020-08-06 1.18491
## 27002 2020-08-06 1.18804
## 27003 2020-08-06 1.18769
## 27004 2020-08-06 1.18743
## 27005 2020-08-07 1.18355
## 27006 2020-08-07 1.18330
## 27007 2020-08-07 1.18314
## 27008 2020-08-07 1.17694
## 27009 2020-08-07 1.17892
## 27010 2020-08-09 1.17942
## 27011 2020-08-10 1.17913
## 27012 2020-08-10 1.17727
## 27013 2020-08-10 1.17680
## 27014 2020-08-10 1.17536
## 27015 2020-08-10 1.17387
## 27016 2020-08-10 1.17250
## 27017 2020-08-11 1.17525
## 27018 2020-08-11 1.17730
## 27019 2020-08-11 1.17978
## 27020 2020-08-11 1.17714
## 27021 2020-08-11 1.17404
## 27022 2020-08-11 1.17343
## 27023 2020-08-12 1.17146
## 27024 2020-08-12 1.17479
## 27025 2020-08-12 1.17909
## 27026 2020-08-12 1.17917
## 27027 2020-08-12 1.17849
## 27028 2020-08-12 1.18069
## 27029 2020-08-13 1.18014
## 27030 2020-08-13 1.18385
## 27031 2020-08-13 1.18492
## 27032 2020-08-13 1.18173
## 27033 2020-08-13 1.18141
## 27034 2020-08-13 1.18097
## 27035 2020-08-14 1.18134
## 27036 2020-08-14 1.18167
## 27037 2020-08-14 1.18188
## 27038 2020-08-14 1.18455
## 27039 2020-08-14 1.18434
## 27040 2020-08-16 1.18478
## 27041 2020-08-17 1.18566
## 27042 2020-08-17 1.18385
## 27043 2020-08-17 1.18572
## 27044 2020-08-17 1.18680
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN827

```
## 27045 2020-08-17 1.18711
## 27046 2020-08-17 1.18910
## 27047 2020-08-18 1.18921
## 27048 2020-08-18 1.19106
## 27049 2020-08-18 1.19366
## 27050 2020-08-18 1.19362
## 27051 2020-08-18 1.19317
## 27052 2020-08-18 1.19480
## 27053 2020-08-19 1.19314
## 27054 2020-08-19 1.19410
## 27055 2020-08-19 1.19311
## 27056 2020-08-19 1.18779
## 27057 2020-08-19 1.18390
## 27058 2020-08-19 1.18450
## 27059 2020-08-20 1.18481
## 27060 2020-08-20 1.18368
## 27061 2020-08-20 1.18310
## 27062 2020-08-20 1.18543
## 27063 2020-08-20 1.18609
## 27064 2020-08-20 1.18746
## 27065 2020-08-21 1.18773
## 27066 2020-08-21 1.18130
## 27067 2020-08-21 1.17853
## 27068 2020-08-21 1.17727
## 27069 2020-08-21 1.17974
## 27070 2020-08-23 1.17950
## 27071 2020-08-24 1.17947
## 27072 2020-08-24 1.18223
## 27073 2020-08-24 1.18424
## 27074 2020-08-24 1.17997
## 27075 2020-08-24 1.17884
## 27076 2020-08-24 1.17990
## 27077 2020-08-25 1.18107
## 27078 2020-08-25 1.18239
## 27079 2020-08-25 1.18169
## 27080 2020-08-25 1.18121
## 27081 2020-08-25 1.18349
## 27082 2020-08-25 1.18291
## 27083 2020-08-26 1.18123
## 27084 2020-08-26 1.18146
## 27085 2020-08-26 1.17888
## 27086 2020-08-26 1.18326
## 27087 2020-08-26 1.18308
## 27088 2020-08-26 1.18398
## 27089 2020-08-27 1.18331
## 27090 2020-08-27 1.18341
```

```
## 27091 2020-08-27 1.18331
## 27092 2020-08-27 1.17977
## 27093 2020-08-27 1.18228
## 27094 2020-08-27 1.18176
## 27095 2020-08-28 1.18737
## 27096 2020-08-28 1.19094
## 27097 2020-08-28 1.18860
## 27098 2020-08-28 1.18887
## 27099 2020-08-28 1.19065
## 27100 2020-08-30 1.19082
## 27101 2020-08-31 1.19014
## 27102 2020-08-31 1.19082
## 27103 2020-08-31 1.19343
## 27104 2020-08-31 1.19444
## 27105 2020-08-31 1.19375
## 27106 2020-08-31 1.19415
## 27107 2020-09-01 1.19876
## 27108 2020-09-01 1.19737
## 27109 2020-09-01 1.19889
## 27110 2020-09-01 1.19343
## 27111 2020-09-01 1.19125
## 27112 2020-09-01 1.19079
## 27113 2020-09-02 1.19054
## 27114 2020-09-02 1.18575
## 27115 2020-09-02 1.18594
## 27116 2020-09-02 1.18482
## 27117 2020-09-02 1.18555
## 27118 2020-09-02 1.18315
## 27119 2020-09-03 1.18106
## 27120 2020-09-03 1.18329
## 27121 2020-09-03 1.18326
## 27122 2020-09-03 1.18335
## 27123 2020-09-03 1.18520
## 27124 2020-09-03 1.18529
## 27125 2020-09-04 1.18520
## 27126 2020-09-04 1.18593
## 27127 2020-09-04 1.18118
## 27128 2020-09-04 1.18354
## 27129 2020-09-04 1.18393
## 27130 2020-09-06 1.18364
## 27131 2020-09-07 1.18342
## 27132 2020-09-07 1.18327
## 27133 2020-09-07 1.18227
## 27134 2020-09-07 1.18164
## 27135 2020-09-07 1.18166
## 27136 2020-09-07 1.18071
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN829

```
## 27137 2020-09-08 1.18115
## 27138 2020-09-08 1.18088
## 27139 2020-09-08 1.18007
## 27140 2020-09-08 1.17962
## 27141 2020-09-08 1.17759
## 27142 2020-09-08 1.17758
## 27143 2020-09-09 1.17787
## 27144 2020-09-09 1.17635
## 27145 2020-09-09 1.17988
## 27146 2020-09-09 1.18037
## 27147 2020-09-09 1.18036
## 27148 2020-09-09 1.18105
## 27149 2020-09-10 1.18195
## 27150 2020-09-10 1.18345
## 27151 2020-09-10 1.18878
## 27152 2020-09-10 1.18578
## 27153 2020-09-10 1.18154
## 27154 2020-09-10 1.18350
## 27155 2020-09-11 1.18356
## 27156 2020-09-11 1.18568
## 27157 2020-09-11 1.18467
## 27158 2020-09-11 1.18375
## 27159 2020-09-11 1.18476
## 27160 2020-09-13 1.18347
## 27161 2020-09-14 1.18477
## 27162 2020-09-14 1.18567
## 27163 2020-09-14 1.18779
## 27164 2020-09-14 1.18671
## 27165 2020-09-14 1.18658
## 27166 2020-09-14 1.18687
## 27167 2020-09-15 1.18940
## 27168 2020-09-15 1.18820
## 27169 2020-09-15 1.18752
## 27170 2020-09-15 1.18530
## 27171 2020-09-15 1.18469
## 27172 2020-09-15 1.18348
## 27173 2020-09-16 1.18480
## 27174 2020-09-16 1.18660
## 27175 2020-09-16 1.18582
## 27176 2020-09-16 1.18333
## 27177 2020-09-16 1.18166
## 27178 2020-09-16 1.17775
## 27179 2020-09-17 1.17590
## 27180 2020-09-17 1.18040
## 27181 2020-09-17 1.18084
## 27182 2020-09-17 1.18223
```

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## 27183 2020-09-17 1.18485
## 27184 2020-09-17 1.18541
## 27185 2020-09-18 1.18490
## 27186 2020-09-18 1.18594
## 27187 2020-09-18 1.18445
## 27188 2020-09-18 1.18658
## 27189 2020-09-18 1.18410
## 27190 2020-09-20 1.18595
## 27191 2020-09-21 1.18669
## 27192 2020-09-21 1.18014
## 27193 2020-09-21 1.17700
## 27194 2020-09-21 1.17408
## 27195 2020-09-21 1.17715
## 27196 2020-09-21 1.17684
## 27197 2020-09-22 1.17690
## 27198 2020-09-22 1.17450
## 27199 2020-09-22 1.17508
## 27200 2020-09-22 1.17043
## 27201 2020-09-22 1.17085
## 27202 2020-09-22 1.16807
## 27203 2020-09-23 1.16787
## 27204 2020-09-23 1.17045
## 27205 2020-09-23 1.16918
## 27206 2020-09-23 1.16815
## 27207 2020-09-23 1.16607
## 27208 2020-09-23 1.16732
## 27209 2020-09-24 1.16530
## 27210 2020-09-24 1.16571
## 27211 2020-09-24 1.16398
## 27212 2020-09-24 1.16626
## 27213 2020-09-24 1.16731
## 27214 2020-09-24 1.16682
## 27215 2020-09-25 1.16680
## 27216 2020-09-25 1.16559
## 27217 2020-09-25 1.16371
## 27218 2020-09-25 1.16195
## 27219 2020-09-25 1.16351
## 27220 2020-09-27 1.16166
## 27221 2020-09-28 1.16318
## 27222 2020-09-28 1.16411
## 27223 2020-09-28 1.16633
## 27224 2020-09-28 1.16561
## 27225 2020-09-28 1.16664
## 27226 2020-09-28 1.16772
## 27227 2020-09-29 1.16764
## 27228 2020-09-29 1.16835
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN831

```
## 27229 2020-09-29 1.17035
## 27230 2020-09-29 1.17378
## 27231 2020-09-29 1.17439
## 27232 2020-09-29 1.17383
## 27233 2020-09-30 1.17346
## 27234 2020-09-30 1.17099
## 27235 2020-09-30 1.17097
## 27236 2020-09-30 1.17218
## 27237 2020-09-30 1.17215
## 27238 2020-09-30 1.17184
## 27239 2020-10-01 1.17473
## 27240 2020-10-01 1.17248
## 27241 2020-10-01 1.17549
## 27242 2020-10-01 1.17449
## 27243 2020-10-01 1.17498
## 27244 2020-10-01 1.17351
## 27245 2020-10-02 1.17063
## 27246 2020-10-02 1.17140
## 27247 2020-10-02 1.17087
## 27248 2020-10-02 1.17179
## 27249 2020-10-02 1.17173
## 27250 2020-10-04 1.17256
## 27251 2020-10-05 1.17324
## 27252 2020-10-05 1.17494
## 27253 2020-10-05 1.17641
## 27254 2020-10-05 1.17866
## 27255 2020-10-05 1.17852
## 27256 2020-10-05 1.17910
## 27257 2020-10-06 1.17888
## 27258 2020-10-06 1.17779
## 27259 2020-10-06 1.17916
## 27260 2020-10-06 1.17812
## 27261 2020-10-06 1.17348
## 27262 2020-10-06 1.17356
## 27263 2020-10-07 1.17339
## 27264 2020-10-07 1.17580
## 27265 2020-10-07 1.17787
## 27266 2020-10-07 1.17720
## 27267 2020-10-07 1.17636
## 27268 2020-10-07 1.17652
## 27269 2020-10-08 1.17689
## 27270 2020-10-08 1.17610
## 27271 2020-10-08 1.17555
## 27272 2020-10-08 1.17547
## 27273 2020-10-08 1.17604
## 27274 2020-10-08 1.17612
```

```
## 27275 2020-10-09 1.17754
## 27276 2020-10-09 1.18020
## 27277 2020-10-09 1.18092
## 27278 2020-10-09 1.18233
## 27279 2020-10-09 1.18314
## 27280 2020-10-11 1.18131
## 27281 2020-10-12 1.18188
## 27282 2020-10-12 1.18112
## 27283 2020-10-12 1.18098
## 27284 2020-10-12 1.18110
## 27285 2020-10-12 1.18143
## 27286 2020-10-12 1.18004
## 27287 2020-10-13 1.17986
## 27288 2020-10-13 1.17936
## 27289 2020-10-13 1.17910
## 27290 2020-10-13 1.17348
## 27291 2020-10-13 1.17480
## 27292 2020-10-13 1.17457
## 27293 2020-10-14 1.17429
## 27294 2020-10-14 1.17406
## 27295 2020-10-14 1.17613
## 27296 2020-10-14 1.17516
## 27297 2020-10-14 1.17462
## 27298 2020-10-14 1.17482
## 27299 2020-10-15 1.17526
## 27300 2020-10-15 1.17068
## 27301 2020-10-15 1.16995
## 27302 2020-10-15 1.16973
## 27303 2020-10-15 1.17085
## 27304 2020-10-15 1.17122
## 27305 2020-10-16 1.17030
## 27306 2020-10-16 1.17048
## 27307 2020-10-16 1.17328
## 27308 2020-10-16 1.17192
## 27309 2020-10-16 1.17216
## 27310 2020-10-18 1.17237
## 27311 2020-10-19 1.17057
## 27312 2020-10-19 1.17378
## 27313 2020-10-19 1.17774
## 27314 2020-10-19 1.17819
## 27315 2020-10-19 1.17709
## 27316 2020-10-19 1.17751
## 27317 2020-10-20 1.17773
## 27318 2020-10-20 1.17821
## 27319 2020-10-20 1.18089
## 27320 2020-10-20 1.18266
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN833

```
## 27321 2020-10-20 1.18233
## 27322 2020-10-20 1.18337
## 27323 2020-10-21 1.18478
## 27324 2020-10-21 1.18508
## 27325 2020-10-21 1.18627
## 27326 2020-10-21 1.18736
## 27327 2020-10-21 1.18622
## 27328 2020-10-21 1.18460
## 27329 2020-10-22 1.18451
## 27330 2020-10-22 1.18446
## 27331 2020-10-22 1.18262
## 27332 2020-10-22 1.18224
## 27333 2020-10-22 1.18187
## 27334 2020-10-22 1.18001
## 27335 2020-10-23 1.18022
## 27336 2020-10-23 1.18388
## 27337 2020-10-23 1.18532
## 27338 2020-10-23 1.18436
## 27339 2020-10-23 1.18657
## 27340 2020-10-25 1.18447
## 27341 2020-10-26 1.18331
## 27342 2020-10-26 1.18185
## 27343 2020-10-26 1.18135
## 27344 2020-10-26 1.18242
## 27345 2020-10-26 1.18101
## 27346 2020-10-26 1.18209
## 27347 2020-10-27 1.18247
## 27348 2020-10-27 1.18095
## 27349 2020-10-27 1.18275
## 27350 2020-10-27 1.18292
## 27351 2020-10-27 1.17952
## 27352 2020-10-27 1.17791
## 27353 2020-10-28 1.17798
## 27354 2020-10-28 1.17650
## 27355 2020-10-28 1.17269
## 27356 2020-10-28 1.17514
## 27357 2020-10-28 1.17466
## 27358 2020-10-28 1.17517
## 27359 2020-10-29 1.17530
## 27360 2020-10-29 1.17295
## 27361 2020-10-29 1.17043
## 27362 2020-10-29 1.16607
## 27363 2020-10-29 1.16750
## 27364 2020-10-29 1.16743
## 27365 2020-10-30 1.16818
## 27366 2020-10-30 1.16690
```

```
## 27367 2020-10-30 1.16994
## 27368 2020-10-30 1.16511
## 27369 2020-10-30 1.16515
## 27370 2020-11-01 1.16420
## 27371 2020-11-02 1.16374
## 27372 2020-11-02 1.16404
## 27373 2020-11-02 1.16374
## 27374 2020-11-02 1.16279
## 27375 2020-11-02 1.16423
## 27376 2020-11-02 1.16502
## 27377 2020-11-03 1.16550
## 27378 2020-11-03 1.16968
## 27379 2020-11-03 1.17047
## 27380 2020-11-03 1.17097
## 27381 2020-11-03 1.17166
## 27382 2020-11-03 1.16841
## 27383 2020-11-04 1.16591
## 27384 2020-11-04 1.16760
## 27385 2020-11-04 1.17107
## 27386 2020-11-04 1.17152
## 27387 2020-11-04 1.17269
## 27388 2020-11-04 1.17216
## 27389 2020-11-05 1.17365
## 27390 2020-11-05 1.17947
## 27391 2020-11-05 1.18394
## 27392 2020-11-05 1.18035
## 27393 2020-11-05 1.18282
## 27394 2020-11-05 1.18120
## 27395 2020-11-06 1.18148
## 27396 2020-11-06 1.18534
## 27397 2020-11-06 1.18892
## 27398 2020-11-06 1.18812
## 27399 2020-11-06 1.18760
## 27400 2020-11-08 1.18881
## 27401 2020-11-09 1.18808
## 27402 2020-11-09 1.18740
## 27403 2020-11-09 1.18932
## 27404 2020-11-09 1.18190
## 27405 2020-11-09 1.18137
## 27406 2020-11-09 1.18244
## 27407 2020-11-10 1.18337
## 27408 2020-11-10 1.18068
## 27409 2020-11-10 1.18105
## 27410 2020-11-10 1.18198
## 27411 2020-11-10 1.18173
## 27412 2020-11-10 1.18274
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN835

```
## 27413 2020-11-11 1.18250
## 27414 2020-11-11 1.17931
## 27415 2020-11-11 1.17587
## 27416 2020-11-11 1.17732
## 27417 2020-11-11 1.17783
## 27418 2020-11-11 1.17822
## 27419 2020-11-12 1.17740
## 27420 2020-11-12 1.18093
## 27421 2020-11-12 1.18096
## 27422 2020-11-12 1.18002
## 27423 2020-11-12 1.18084
## 27424 2020-11-12 1.18087
## 27425 2020-11-13 1.18066
## 27426 2020-11-13 1.18270
## 27427 2020-11-13 1.18210
## 27428 2020-11-13 1.18266
## 27429 2020-11-13 1.18385
## 27430 2020-11-15 1.18484
## 27431 2020-11-16 1.18472
## 27432 2020-11-16 1.18451
## 27433 2020-11-16 1.18213
## 27434 2020-11-16 1.18420
## 27435 2020-11-16 1.18530
## 27436 2020-11-16 1.18601
## 27437 2020-11-17 1.18566
## 27438 2020-11-17 1.18682
## 27439 2020-11-17 1.18862
## 27440 2020-11-17 1.18632
## 27441 2020-11-17 1.18620
## 27442 2020-11-17 1.18548
## 27443 2020-11-18 1.18736
## 27444 2020-11-18 1.18884
## 27445 2020-11-18 1.18596
## 27446 2020-11-18 1.18697
## 27447 2020-11-18 1.18545
## 27448 2020-11-18 1.18430
## 27449 2020-11-19 1.18507
## 27450 2020-11-19 1.18297
## 27451 2020-11-19 1.18304
## 27452 2020-11-19 1.18466
## 27453 2020-11-19 1.18763
## 27454 2020-11-19 1.18769
## 27455 2020-11-20 1.18843
## 27456 2020-11-20 1.18594
## 27457 2020-11-20 1.18681
## 27458 2020-11-20 1.18544
```

```
## 27459 2020-11-20 1.18603
## 27460 2020-11-22 1.18769
## 27461 2020-11-23 1.18770
## 27462 2020-11-23 1.18778
## 27463 2020-11-23 1.18997
## 27464 2020-11-23 1.18415
## 27465 2020-11-23 1.18416
## 27466 2020-11-23 1.18421
## 27467 2020-11-24 1.18522
## 27468 2020-11-24 1.18838
## 27469 2020-11-24 1.18545
## 27470 2020-11-24 1.18729
## 27471 2020-11-24 1.18930
## 27472 2020-11-24 1.18983
## 27473 2020-11-25 1.18980
## 27474 2020-11-25 1.19048
## 27475 2020-11-25 1.19045
## 27476 2020-11-25 1.19158
## 27477 2020-11-25 1.19177
## 27478 2020-11-25 1.19269
## 27479 2020-11-26 1.19263
## 27480 2020-11-26 1.19038
## 27481 2020-11-26 1.18983
## 27482 2020-11-26 1.19133
## 27483 2020-11-26 1.19144
## 27484 2020-11-26 1.19138
## 27485 2020-11-27 1.19270
## 27486 2020-11-27 1.19231
## 27487 2020-11-27 1.19370
## 27488 2020-11-27 1.19569
## 27489 2020-11-27 1.19650
## 27490 2020-11-29 1.19740
## 27491 2020-11-30 1.19724
## 27492 2020-11-30 1.19848
## 27493 2020-11-30 1.19866
## 27494 2020-11-30 1.19545
## 27495 2020-11-30 1.19284
## 27496 2020-11-30 1.19496
## 27497 2020-12-01 1.19573
## 27498 2020-12-01 1.19809
## 27499 2020-12-01 1.19924
## 27500 2020-12-01 1.20454
## 27501 2020-12-01 1.20716
## 27502 2020-12-01 1.20687
## 27503 2020-12-02 1.20682
## 27504 2020-12-02 1.20539
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN837

```
## 27505 2020-12-02 1.20661
## 27506 2020-12-02 1.20936
## 27507 2020-12-02 1.21167
## 27508 2020-12-02 1.21135
## 27509 2020-12-03 1.21197
## 27510 2020-12-03 1.21116
## 27511 2020-12-03 1.21512
## 27512 2020-12-03 1.21464
## 27513 2020-12-03 1.21462
## 27514 2020-12-03 1.21441
## 27515 2020-12-04 1.21503
## 27516 2020-12-04 1.21671
## 27517 2020-12-04 1.21459
## 27518 2020-12-04 1.21438
## 27519 2020-12-04 1.21229
## 27520 2020-12-06 1.21352
## 27521 2020-12-07 1.21320
## 27522 2020-12-07 1.20932
## 27523 2020-12-07 1.21373
## 27524 2020-12-07 1.21333
## 27525 2020-12-07 1.21114
## 27526 2020-12-07 1.21072
## 27527 2020-12-08 1.21186
## 27528 2020-12-08 1.21296
## 27529 2020-12-08 1.21184
## 27530 2020-12-08 1.21154
## 27531 2020-12-08 1.21041
## 27532 2020-12-08 1.21114
## 27533 2020-12-09 1.21313
## 27534 2020-12-09 1.21258
## 27535 2020-12-09 1.21208
## 27536 2020-12-09 1.20726
## 27537 2020-12-09 1.20832
## 27538 2020-12-09 1.20818
## 27539 2020-12-10 1.20963
## 27540 2020-12-10 1.21065
## 27541 2020-12-10 1.21259
## 27542 2020-12-10 1.21204
## 27543 2020-12-10 1.21402
## 27544 2020-12-10 1.21559
## 27545 2020-12-11 1.21555
## 27546 2020-12-11 1.21177
## 27547 2020-12-11 1.21159
## 27548 2020-12-11 1.21167
## 27549 2020-12-11 1.21173
## 27550 2020-12-13 1.21293
```

```
## 27551 2020-12-14 1.21408
## 27552 2020-12-14 1.21579
## 27553 2020-12-14 1.21716
## 27554 2020-12-14 1.21577
## 27555 2020-12-14 1.21444
## 27556 2020-12-14 1.21603
## 27557 2020-12-15 1.21550
## 27558 2020-12-15 1.21581
## 27559 2020-12-15 1.21397
## 27560 2020-12-15 1.21612
## 27561 2020-12-15 1.21516
## 27562 2020-12-15 1.21514
## 27563 2020-12-16 1.21625
## 27564 2020-12-16 1.22064
## 27565 2020-12-16 1.21879
## 27566 2020-12-16 1.21689
## 27567 2020-12-16 1.22010
## 27568 2020-12-16 1.22026
## 27569 2020-12-17 1.22260
## 27570 2020-12-17 1.22328
## 27571 2020-12-17 1.22420
## 27572 2020-12-17 1.22605
## 27573 2020-12-17 1.22701
## 27574 2020-12-17 1.22564
## 27575 2020-12-18 1.22434
## 27576 2020-12-18 1.22496
## 27577 2020-12-18 1.22488
## 27578 2020-12-18 1.22368
## 27579 2020-12-18 1.22596
## 27580 2020-12-20 1.22085
## 27581 2020-12-21 1.21916
## 27582 2020-12-21 1.21756
## 27583 2020-12-21 1.21913
## 27584 2020-12-21 1.22365
## 27585 2020-12-21 1.22464
## 27586 2020-12-21 1.22316
## 27587 2020-12-22 1.22187
## 27588 2020-12-22 1.22074
## 27589 2020-12-22 1.22304
## 27590 2020-12-22 1.21748
## 27591 2020-12-22 1.21650
## 27592 2020-12-22 1.21777
## 27593 2020-12-23 1.21893
## 27594 2020-12-23 1.21941
## 27595 2020-12-23 1.21766
## 27596 2020-12-23 1.21870
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN839

```
## 27597 2020-12-23 1.21897
## 27598 2020-12-23 1.22087
## 27599 2020-12-24 1.22054
## 27600 2020-12-24 1.21916
## 27601 2020-12-24 1.21885
## 27602 2020-12-24 1.21836
## 27603 2020-12-24 1.21898
## 27604 2020-12-24 1.21904
## 27605 2020-12-25 1.22008
## 27606 2020-12-25 1.22000
## 27607 2020-12-27 1.22053
## 27608 2020-12-28 1.22237
## 27609 2020-12-28 1.22491
## 27610 2020-12-28 1.22133
## 27611 2020-12-28 1.22066
## 27612 2020-12-28 1.22182
## 27613 2020-12-28 1.22275
## 27614 2020-12-29 1.22365
## 27615 2020-12-29 1.22499
## 27616 2020-12-29 1.22537
## 27617 2020-12-29 1.22419
## 27618 2020-12-29 1.22514
## 27619 2020-12-29 1.22911
## 27620 2020-12-30 1.22852
## 27621 2020-12-30 1.22688
## 27622 2020-12-30 1.22915
## 27623 2020-12-30 1.22888
## 27624 2020-12-30 1.22998
## 27625 2020-12-30 1.23069
## 27626 2020-12-31 1.22899
## 27627 2020-12-31 1.22794
## 27628 2020-12-31 1.22845
## 27629 2020-12-31 1.22254
## 27630 2020-12-31 1.22174
## 27631 2021-01-03 1.22529
## 27632 2021-01-04 1.22556
## 27633 2021-01-04 1.22935
## 27634 2021-01-04 1.22988
## 27635 2021-01-04 1.22533
## 27636 2021-01-04 1.22494
## 27637 2021-01-04 1.22573
## 27638 2021-01-05 1.22725
## 27639 2021-01-05 1.22724
## 27640 2021-01-05 1.22626
## 27641 2021-01-05 1.22997
## 27642 2021-01-05 1.23001
```

```
## 27643 2021-01-05 1.22895
## 27644 2021-01-06 1.22967
## 27645 2021-01-06 1.23386
## 27646 2021-01-06 1.23198
## 27647 2021-01-06 1.22990
## 27648 2021-01-06 1.23292
## 27649 2021-01-06 1.23307
## 27650 2021-01-07 1.23129
## 27651 2021-01-07 1.22690
## 27652 2021-01-07 1.22689
## 27653 2021-01-07 1.22658
## 27654 2021-01-07 1.22724
## 27655 2021-01-07 1.22483
## 27656 2021-01-08 1.22579
## 27657 2021-01-08 1.22402
## 27658 2021-01-08 1.22717
## 27659 2021-01-08 1.22291
## 27660 2021-01-08 1.22234
## 27661 2021-01-10 1.21781
## 27662 2021-01-11 1.21820
## 27663 2021-01-11 1.21609
## 27664 2021-01-11 1.21446
## 27665 2021-01-11 1.21673
## 27666 2021-01-11 1.21525
## 27667 2021-01-11 1.21494
## 27668 2021-01-12 1.21536
## 27669 2021-01-12 1.21620
## 27670 2021-01-12 1.21464
## 27671 2021-01-12 1.21748
## 27672 2021-01-12 1.22083
## 27673 2021-01-12 1.22178
## 27674 2021-01-13 1.22093
## 27675 2021-01-13 1.21896
## 27676 2021-01-13 1.21615
## 27677 2021-01-13 1.21655
## 27678 2021-01-13 1.21582
## 27679 2021-01-13 1.21663
## 27680 2021-01-14 1.21555
## 27681 2021-01-14 1.21666
## 27682 2021-01-14 1.21201
## 27683 2021-01-14 1.21657
## 27684 2021-01-14 1.21577
## 27685 2021-01-14 1.21510
## 27686 2021-01-15 1.21401
## 27687 2021-01-15 1.21392
## 27688 2021-01-15 1.21161
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN841

```
## 27689 2021-01-15 1.20937
## 27690 2021-01-15 1.20795
## 27691 2021-01-17 1.20788
## 27692 2021-01-18 1.20779
## 27693 2021-01-18 1.20623
## 27694 2021-01-18 1.20662
## 27695 2021-01-18 1.20751
## 27696 2021-01-18 1.20794
## 27697 2021-01-18 1.20936
## 27698 2021-01-19 1.20973
## 27699 2021-01-19 1.21185
## 27700 2021-01-19 1.21362
## 27701 2021-01-19 1.21214
## 27702 2021-01-19 1.21291
## 27703 2021-01-19 1.21411
## 27704 2021-01-20 1.21445
## 27705 2021-01-20 1.21276
## 27706 2021-01-20 1.21073
## 27707 2021-01-20 1.21070
## 27708 2021-01-20 1.21075
## 27709 2021-01-20 1.21242
## 27710 2021-01-21 1.21349
## 27711 2021-01-21 1.21427
## 27712 2021-01-21 1.21516
## 27713 2021-01-21 1.21488
## 27714 2021-01-21 1.21658
## 27715 2021-01-21 1.21733
## 27716 2021-01-22 1.21723
## 27717 2021-01-22 1.21740
## 27718 2021-01-22 1.21656
## 27719 2021-01-22 1.21675
## 27720 2021-01-22 1.21745
## 27721 2021-01-24 1.21646
## 27722 2021-01-25 1.21810
## 27723 2021-01-25 1.21479
## 27724 2021-01-25 1.21471
## 27725 2021-01-25 1.21448
## 27726 2021-01-25 1.21408
## 27727 2021-01-25 1.21457
## 27728 2021-01-26 1.21314
## 27729 2021-01-26 1.21290
## 27730 2021-01-26 1.21570
## 27731 2021-01-26 1.21576
## 27732 2021-01-26 1.21604
## 27733 2021-01-26 1.21611
## 27734 2021-01-27 1.21631
```

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## 27735 2021-01-27 1.21228
## 27736 2021-01-27 1.21113
## 27737 2021-01-27 1.21181
## 27738 2021-01-27 1.21117
## 27739 2021-01-27 1.21017
## 27740 2021-01-28 1.21056
## 27741 2021-01-28 1.21090
## 27742 2021-01-28 1.21287
## 27743 2021-01-28 1.21252
## 27744 2021-01-28 1.21246
## 27745 2021-01-28 1.21085
## 27746 2021-01-29 1.20998
## 27747 2021-01-29 1.21168
## 27748 2021-01-29 1.21464
## 27749 2021-01-29 1.21326
## 27750 2021-01-29 1.21387
## 27751 2021-01-31 1.21275
## 27752 2021-02-01 1.21303
## 27753 2021-02-01 1.20940
## 27754 2021-02-01 1.20849
## 27755 2021-02-01 1.20699
## 27756 2021-02-01 1.20610
## 27757 2021-02-01 1.20842
## 27758 2021-02-02 1.20794
## 27759 2021-02-02 1.20673
## 27760 2021-02-02 1.20483
## 27761 2021-02-02 1.20190
## 27762 2021-02-02 1.20443
## 27763 2021-02-02 1.20470
## 27764 2021-02-03 1.20442
## 27765 2021-02-03 1.20229
## 27766 2021-02-03 1.20173
## 27767 2021-02-03 1.20269
## 27768 2021-02-03 1.20363
## 27769 2021-02-03 1.20352
## 27770 2021-02-04 1.20174
## 27771 2021-02-04 1.19861
## 27772 2021-02-04 1.19841
## 27773 2021-02-04 1.19605
## 27774 2021-02-04 1.19628
## 27775 2021-02-04 1.19662
## 27776 2021-02-05 1.19631
## 27777 2021-02-05 1.19770
## 27778 2021-02-05 1.20042
## 27779 2021-02-05 1.20381
## 27780 2021-02-05 1.20501
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN843

```
## 27781 2021-02-07 1.20386
## 27782 2021-02-08 1.20369
## 27783 2021-02-08 1.20283
## 27784 2021-02-08 1.20377
## 27785 2021-02-08 1.20473
## 27786 2021-02-08 1.20531
## 27787 2021-02-08 1.20597
## 27788 2021-02-09 1.20783
## 27789 2021-02-09 1.21099
## 27790 2021-02-09 1.21020
## 27791 2021-02-09 1.21056
## 27792 2021-02-09 1.21204
## 27793 2021-02-09 1.21162
## 27794 2021-02-10 1.21244
## 27795 2021-02-10 1.21194
## 27796 2021-02-10 1.21288
## 27797 2021-02-10 1.21384
## 27798 2021-02-10 1.21191
## 27799 2021-02-10 1.21175
## 27800 2021-02-11 1.21267
## 27801 2021-02-11 1.21304
## 27802 2021-02-11 1.21439
## 27803 2021-02-11 1.21272
## 27804 2021-02-11 1.21309
## 27805 2021-02-11 1.21274
## 27806 2021-02-12 1.21316
## 27807 2021-02-12 1.21086
## 27808 2021-02-12 1.20874
## 27809 2021-02-12 1.21235
## 27810 2021-02-12 1.21224
## 27811 2021-02-14 1.21271
## 27812 2021-02-15 1.21383
## 27813 2021-02-15 1.21348
## 27814 2021-02-15 1.21270
## 27815 2021-02-15 1.21311
## 27816 2021-02-15 1.21301
## 27817 2021-02-15 1.21429
## 27818 2021-02-16 1.21367
## 27819 2021-02-16 1.21528
## 27820 2021-02-16 1.21084
## 27821 2021-02-16 1.21090
## 27822 2021-02-16 1.21075
## 27823 2021-02-16 1.20933
## 27824 2021-02-17 1.20934
## 27825 2021-02-17 1.20680
## 27826 2021-02-17 1.20338
```

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## 27827 2021-02-17 1.20454
## 27828 2021-02-17 1.20403
## 27829 2021-02-17 1.20448
## 27830 2021-02-18 1.20461
## 27831 2021-02-18 1.20738
## 27832 2021-02-18 1.20849
## 27833 2021-02-18 1.20820
## 27834 2021-02-18 1.20926
## 27835 2021-02-18 1.20881
## 27836 2021-02-19 1.20946
## 27837 2021-02-19 1.21341
## 27838 2021-02-19 1.21309
## 27839 2021-02-19 1.21270
## 27840 2021-02-19 1.21213
## 27841 2021-02-21 1.21267
## 27842 2021-02-22 1.21205
## 27843 2021-02-22 1.21083
## 27844 2021-02-22 1.21475
## 27845 2021-02-22 1.21655
## 27846 2021-02-22 1.21584
## 27847 2021-02-22 1.21760
## 27848 2021-02-23 1.21704
## 27849 2021-02-23 1.21494
## 27850 2021-02-23 1.21495
## 27851 2021-02-23 1.21462
## 27852 2021-02-23 1.21502
## 27853 2021-02-23 1.21586
## 27854 2021-02-24 1.21483
## 27855 2021-02-24 1.21630
## 27856 2021-02-24 1.21336
## 27857 2021-02-24 1.21419
## 27858 2021-02-24 1.21693
## 27859 2021-02-24 1.21576
## 27860 2021-02-25 1.21782
## 27861 2021-02-25 1.22203
## 27862 2021-02-25 1.22123
## 27863 2021-02-25 1.22126
## 27864 2021-02-25 1.21775
## 27865 2021-02-25 1.21640
## 27866 2021-02-26 1.21541
## 27867 2021-02-26 1.21253
## 27868 2021-02-26 1.21238
## 27869 2021-02-26 1.20802
## 27870 2021-02-26 1.20754
## 27871 2021-02-28 1.20844
## 27872 2021-03-01 1.20849
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN845

```
## 27873 2021-03-01 1.20388
## 27874 2021-03-01 1.20531
## 27875 2021-03-01 1.20409
## 27876 2021-03-01 1.20500
## 27877 2021-03-01 1.20315
## 27878 2021-03-02 1.20218
## 27879 2021-03-02 1.20064
## 27880 2021-03-02 1.20292
## 27881 2021-03-02 1.20797
## 27882 2021-03-02 1.20919
## 27883 2021-03-02 1.20918
## 27884 2021-03-03 1.20842
## 27885 2021-03-03 1.21015
## 27886 2021-03-03 1.20548
## 27887 2021-03-03 1.20705
## 27888 2021-03-03 1.20643
## 27889 2021-03-03 1.20623
## 27890 2021-03-04 1.20565
## 27891 2021-03-04 1.20326
## 27892 2021-03-04 1.20359
## 27893 2021-03-04 1.19940
## 27894 2021-03-04 1.19723
## 27895 2021-03-04 1.19609
## 27896 2021-03-05 1.19599
## 27897 2021-03-05 1.19278
## 27898 2021-03-05 1.19181
## 27899 2021-03-05 1.19122
## 27900 2021-03-05 1.19200
## 27901 2021-03-07 1.19276
## 27902 2021-03-08 1.19124
## 27903 2021-03-08 1.18724
## 27904 2021-03-08 1.18714
## 27905 2021-03-08 1.18568
## 27906 2021-03-08 1.18480
## 27907 2021-03-08 1.18384
## 27908 2021-03-09 1.18542
## 27909 2021-03-09 1.19057
## 27910 2021-03-09 1.18918
## 27911 2021-03-09 1.18864
## 27912 2021-03-09 1.19019
## 27913 2021-03-09 1.18853
## 27914 2021-03-10 1.18753
## 27915 2021-03-10 1.19001
## 27916 2021-03-10 1.19108
## 27917 2021-03-10 1.19084
## 27918 2021-03-10 1.19293
```

```
## 27919 2021-03-10 1.19219
## 27920 2021-03-11 1.19275
## 27921 2021-03-11 1.19639
## 27922 2021-03-11 1.19573
## 27923 2021-03-11 1.19724
## 27924 2021-03-11 1.19886
## 27925 2021-03-11 1.19844
## 27926 2021-03-12 1.19636
## 27927 2021-03-12 1.19180
## 27928 2021-03-12 1.19265
## 27929 2021-03-12 1.19480
## 27930 2021-03-12 1.19562
## 27931 2021-03-14 1.19515
## 27932 2021-03-15 1.19435
## 27933 2021-03-15 1.19370
## 27934 2021-03-15 1.19250
## 27935 2021-03-15 1.19231
## 27936 2021-03-15 1.19308
## 27937 2021-03-15 1.19229
## 27938 2021-03-16 1.19380
## 27939 2021-03-16 1.19269
## 27940 2021-03-16 1.19231
## 27941 2021-03-16 1.18933
## 27942 2021-03-16 1.19029
## 27943 2021-03-16 1.19015
## 27944 2021-03-17 1.19037
## 27945 2021-03-17 1.18982
## 27946 2021-03-17 1.19118
## 27947 2021-03-17 1.19017
## 27948 2021-03-17 1.19800
## 27949 2021-03-17 1.19856
## 27950 2021-03-18 1.19616
## 27951 2021-03-18 1.19476
## 27952 2021-03-18 1.19283
## 27953 2021-03-18 1.19207
## 27954 2021-03-18 1.19166
## 27955 2021-03-18 1.19075
## 27956 2021-03-19 1.19190
## 27957 2021-03-19 1.19231
## 27958 2021-03-19 1.18999
## 27959 2021-03-19 1.19077
## 27960 2021-03-19 1.19049
## 27961 2021-03-21 1.18854
## 27962 2021-03-22 1.18937
## 27963 2021-03-22 1.19022
## 27964 2021-03-22 1.19232
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN847

```
## 27965 2021-03-22 1.19394
## 27966 2021-03-22 1.19329
## 27967 2021-03-22 1.19338
## 27968 2021-03-23 1.19234
## 27969 2021-03-23 1.18989
## 27970 2021-03-23 1.18893
## 27971 2021-03-23 1.18636
## 27972 2021-03-23 1.18506
## 27973 2021-03-23 1.18430
## 27974 2021-03-24 1.18467
## 27975 2021-03-24 1.18268
## 27976 2021-03-24 1.18338
## 27977 2021-03-24 1.18237
## 27978 2021-03-24 1.18139
## 27979 2021-03-24 1.18180
## 27980 2021-03-25 1.18208
## 27981 2021-03-25 1.18054
## 27982 2021-03-25 1.17974
## 27983 2021-03-25 1.17629
## 27984 2021-03-25 1.17647
## 27985 2021-03-25 1.17822
## 27986 2021-03-26 1.17767
## 27987 2021-03-26 1.17876
## 27988 2021-03-26 1.17764
## 27989 2021-03-26 1.17989
## 27990 2021-03-26 1.17952
## 27991 2021-03-28 1.17808
## 27992 2021-03-29 1.17790
## 27993 2021-03-29 1.17666
## 27994 2021-03-29 1.17857
## 27995 2021-03-29 1.17739
## 27996 2021-03-29 1.17660
## 27997 2021-03-29 1.17705
## 27998 2021-03-30 1.17644
## 27999 2021-03-30 1.17465
## 28000 2021-03-30 1.17315
## 28001 2021-03-30 1.17187
## 28002 2021-03-30 1.17174
## 28003 2021-03-30 1.17228
## 28004 2021-03-31 1.17079
## 28005 2021-03-31 1.17465
## 28006 2021-03-31 1.17258
## 28007 2021-03-31 1.17500
## 28008 2021-03-31 1.17313
## 28009 2021-03-31 1.17297
## 28010 2021-04-01 1.17159
```

```
## 28011 2021-04-01 1.17278
## 28012 2021-04-01 1.17454
## 28013 2021-04-01 1.17732
## 28014 2021-04-01 1.17779
## 28015 2021-04-01 1.17720
## 28016 2021-04-02 1.17783
## 28017 2021-04-02 1.17821
## 28018 2021-04-02 1.17690
## 28019 2021-04-02 1.17613
## 28020 2021-04-02 1.17645
## 28021 2021-04-04 1.17652
## 28022 2021-04-05 1.17594
## 28023 2021-04-05 1.17475
## 28024 2021-04-05 1.17789
## 28025 2021-04-05 1.18162
## 28026 2021-04-05 1.18145
## 28027 2021-04-05 1.18142
## 28028 2021-04-06 1.18058
## 28029 2021-04-06 1.18139
## 28030 2021-04-06 1.18289
## 28031 2021-04-06 1.18558
## 28032 2021-04-06 1.18764
## 28033 2021-04-06 1.18724
## 28034 2021-04-07 1.18710
## 28035 2021-04-07 1.18863
## 28036 2021-04-07 1.18849
## 28037 2021-04-07 1.18824
## 28038 2021-04-07 1.18707
## 28039 2021-04-07 1.18667
## 28040 2021-04-08 1.18730
## 28041 2021-04-08 1.18816
## 28042 2021-04-08 1.18928
## 28043 2021-04-08 1.19216
## 28044 2021-04-08 1.19141
## 28045 2021-04-08 1.19194
## 28046 2021-04-09 1.19043
## 28047 2021-04-09 1.18860
## 28048 2021-04-09 1.18762
## 28049 2021-04-09 1.19002
## 28050 2021-04-09 1.19025
## 28051 2021-04-11 1.18977
## 28052 2021-04-12 1.18882
## 28053 2021-04-12 1.18839
## 28054 2021-04-12 1.19143
## 28055 2021-04-12 1.19159
## 28056 2021-04-12 1.19110
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN849

```
## 28057 2021-04-12 1.19043
## 28058 2021-04-13 1.18875
## 28059 2021-04-13 1.19008
## 28060 2021-04-13 1.19246
## 28061 2021-04-13 1.19382
## 28062 2021-04-13 1.19488
## 28063 2021-04-13 1.19545
## 28064 2021-04-14 1.19629
## 28065 2021-04-14 1.19668
## 28066 2021-04-14 1.19639
## 28067 2021-04-14 1.19851
## 28068 2021-04-14 1.19803
## 28069 2021-04-14 1.19865
## 28070 2021-04-15 1.19705
## 28071 2021-04-15 1.19810
## 28072 2021-04-15 1.19584
## 28073 2021-04-15 1.19712
## 28074 2021-04-15 1.19682
## 28075 2021-04-15 1.19572
## 28076 2021-04-16 1.19636
## 28077 2021-04-16 1.19783
## 28078 2021-04-16 1.19838
## 28079 2021-04-16 1.19808
## 28080 2021-04-16 1.19888
## 28081 2021-04-18 1.19617
## 28082 2021-04-19 1.19588
## 28083 2021-04-19 1.20253
## 28084 2021-04-19 1.20404
## 28085 2021-04-19 1.20383
## 28086 2021-04-19 1.20393
## 28087 2021-04-19 1.20394
## 28088 2021-04-20 1.20634
## 28089 2021-04-20 1.20689
## 28090 2021-04-20 1.20348
## 28091 2021-04-20 1.20304
## 28092 2021-04-20 1.20372
## 28093 2021-04-20 1.20349
## 28094 2021-04-21 1.20277
## 28095 2021-04-21 1.20063
## 28096 2021-04-21 1.20142
## 28097 2021-04-21 1.20278
## 28098 2021-04-21 1.20358
## 28099 2021-04-21 1.20367
## 28100 2021-04-22 1.20340
## 28101 2021-04-22 1.20263
## 28102 2021-04-22 1.20647
```

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```
## 28103 2021-04-22 1.20089
## 28104 2021-04-22 1.20168
## 28105 2021-04-22 1.20208
## 28106 2021-04-23 1.20267
## 28107 2021-04-23 1.20591
## 28108 2021-04-23 1.20717
## 28109 2021-04-23 1.20769
## 28110 2021-04-23 1.20996
## 28111 2021-04-25 1.21034
## 28112 2021-04-26 1.21083
## 28113 2021-04-26 1.20999
## 28114 2021-04-26 1.20808
## 28115 2021-04-26 1.20893
## 28116 2021-04-26 1.20872
## 28117 2021-04-26 1.20793
## 28118 2021-04-27 1.20730
## 28119 2021-04-27 1.20585
## 28120 2021-04-27 1.20819
## 28121 2021-04-27 1.20709
## 28122 2021-04-27 1.20919
## 28123 2021-04-27 1.20787
## 28124 2021-04-28 1.20729
## 28125 2021-04-28 1.20751
## 28126 2021-04-28 1.20679
## 28127 2021-04-28 1.20904
## 28128 2021-04-28 1.21285
## 28129 2021-04-28 1.21420
## 28130 2021-04-29 1.21320
## 28131 2021-04-29 1.21157
## 28132 2021-04-29 1.21228
## 28133 2021-04-29 1.21179
## 28134 2021-04-29 1.21219
## 28135 2021-04-29 1.21220
## 28136 2021-04-30 1.21173
## 28137 2021-04-30 1.20952
## 28138 2021-04-30 1.20838
## 28139 2021-04-30 1.20268
## 28140 2021-04-30 1.20224
## 28141 2021-05-02 1.20340
## 28142 2021-05-03 1.20212
## 28143 2021-05-03 1.20474
## 28144 2021-05-03 1.20431
## 28145 2021-05-03 1.20531
## 28146 2021-05-03 1.20658
## 28147 2021-05-03 1.20558
## 28148 2021-05-04 1.20409
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN851

```
## 28149 2021-05-04 1.20035
## 28150 2021-05-04 1.20260
## 28151 2021-05-04 1.20177
## 28152 2021-05-04 1.20154
## 28153 2021-05-04 1.20199
## 28154 2021-05-05 1.20225
## 28155 2021-05-05 1.19968
## 28156 2021-05-05 1.19972
## 28157 2021-05-05 1.19940
## 28158 2021-05-05 1.20052
## 28159 2021-05-05 1.20004
## 28160 2021-05-06 1.20025
## 28161 2021-05-06 1.20399
## 28162 2021-05-06 1.20573
## 28163 2021-05-06 1.20500
## 28164 2021-05-06 1.20652
## 28165 2021-05-06 1.20637
## 28166 2021-05-07 1.20642
## 28167 2021-05-07 1.20877
## 28168 2021-05-07 1.21291
## 28169 2021-05-07 1.21514
## 28170 2021-05-07 1.21696
## 28171 2021-05-09 1.21619
## 28172 2021-05-10 1.21518
## 28173 2021-05-10 1.21712
## 28174 2021-05-10 1.21713
## 28175 2021-05-10 1.21591
## 28176 2021-05-10 1.21289
## 28177 2021-05-10 1.21280
## 28178 2021-05-11 1.21418
## 28179 2021-05-11 1.21625
## 28180 2021-05-11 1.21683
## 28181 2021-05-11 1.21639
## 28182 2021-05-11 1.21501
## 28183 2021-05-11 1.21382
## 28184 2021-05-12 1.21206
## 28185 2021-05-12 1.21344
## 28186 2021-05-12 1.21301
## 28187 2021-05-12 1.20664
## 28188 2021-05-12 1.20716
## 28189 2021-05-12 1.20821
## 28190 2021-05-13 1.20786
## 28191 2021-05-13 1.20624
## 28192 2021-05-13 1.20817
## 28193 2021-05-13 1.20798
## 28194 2021-05-13 1.20801
```

```
## 28195 2021-05-13 1.20754
## 28196 2021-05-14 1.20858
## 28197 2021-05-14 1.21253
## 28198 2021-05-14 1.21295
## 28199 2021-05-14 1.21370
## 28200 2021-05-14 1.21460
## 28201 2021-05-16 1.21342
## 28202 2021-05-17 1.21298
## 28203 2021-05-17 1.21481
## 28204 2021-05-17 1.21399
## 28205 2021-05-17 1.21560
## 28206 2021-05-17 1.21527
## 28207 2021-05-17 1.21566
## 28208 2021-05-18 1.21646
## 28209 2021-05-18 1.22189
## 28210 2021-05-18 1.22214
## 28211 2021-05-18 1.22169
## 28212 2021-05-18 1.22227
## 28213 2021-05-18 1.22266
## 28214 2021-05-19 1.22317
## 28215 2021-05-19 1.22168
## 28216 2021-05-19 1.22080
## 28217 2021-05-19 1.22109
## 28218 2021-05-19 1.21760
## 28219 2021-05-19 1.21853
## 28220 2021-05-20 1.21822
## 28221 2021-05-20 1.21885
## 28222 2021-05-20 1.22003
## 28223 2021-05-20 1.22184
## 28224 2021-05-20 1.22285
## 28225 2021-05-20 1.22341
## 28226 2021-05-21 1.22330
## 28227 2021-05-21 1.22238
## 28228 2021-05-21 1.22059
## 28229 2021-05-21 1.21643
## 28230 2021-05-21 1.21832
## 28231 2021-05-23 1.21806
## 28232 2021-05-24 1.21800
## 28233 2021-05-24 1.21970
## 28234 2021-05-24 1.22104
## 28235 2021-05-24 1.22153
## 28236 2021-05-24 1.22169
## 28237 2021-05-24 1.22220
## 28238 2021-05-25 1.22296
## 28239 2021-05-25 1.22591
## 28240 2021-05-25 1.22539
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN853

```
## 28241 2021-05-25 1.22399
## 28242 2021-05-25 1.22525
## 28243 2021-05-25 1.22454
## 28244 2021-05-26 1.22598
## 28245 2021-05-26 1.22411
## 28246 2021-05-26 1.22202
## 28247 2021-05-26 1.22000
## 28248 2021-05-26 1.21930
## 28249 2021-05-26 1.21885
## 28250 2021-05-27 1.21937
## 28251 2021-05-27 1.21827
## 28252 2021-05-27 1.21863
## 28253 2021-05-27 1.21878
## 28254 2021-05-27 1.21961
## 28255 2021-05-27 1.21844
## 28256 2021-05-28 1.21879
## 28257 2021-05-28 1.21976
## 28258 2021-05-28 1.21352
## 28259 2021-05-28 1.22007
## 28260 2021-05-28 1.21942
## 28261 2021-05-30 1.21918
## 28262 2021-05-31 1.21982
## 28263 2021-05-31 1.22007
## 28264 2021-05-31 1.21988
## 28265 2021-05-31 1.22284
## 28266 2021-05-31 1.22284
## 28267 2021-05-31 1.22299
## 28268 2021-06-01 1.22227
## 28269 2021-06-01 1.22302
## 28270 2021-06-01 1.22249
## 28271 2021-06-01 1.22332
## 28272 2021-06-01 1.22137
## 28273 2021-06-01 1.22204
## 28274 2021-06-02 1.22173
## 28275 2021-06-02 1.21815
## 28276 2021-06-02 1.21860
## 28277 2021-06-02 1.22122
## 28278 2021-06-02 1.22110
## 28279 2021-06-02 1.22125
## 28280 2021-06-03 1.22017
## 28281 2021-06-03 1.21878
## 28282 2021-06-03 1.21585
## 28283 2021-06-03 1.21206
## 28284 2021-06-03 1.21286
## 28285 2021-06-03 1.21277
## 28286 2021-06-04 1.21140
```

```
## 28287 2021-06-04 1.21121
## 28288 2021-06-04 1.21678
## 28289 2021-06-04 1.21615
## 28290 2021-06-04 1.21692
## 28291 2021-06-06 1.21675
## 28292 2021-06-07 1.21680
## 28293 2021-06-07 1.21622
## 28294 2021-06-07 1.21635
## 28295 2021-06-07 1.21949
## 28296 2021-06-07 1.21900
## 28297 2021-06-07 1.21858
## 28298 2021-06-08 1.21795
## 28299 2021-06-08 1.21765
## 28300 2021-06-08 1.21760
## 28301 2021-06-08 1.21783
## 28302 2021-06-08 1.21738
## 28303 2021-06-08 1.21751
## 28304 2021-06-09 1.21796
## 28305 2021-06-09 1.21884
## 28306 2021-06-09 1.21949
## 28307 2021-06-09 1.21763
## 28308 2021-06-09 1.21827
## 28309 2021-06-09 1.21732
## 28310 2021-06-10 1.21644
## 28311 2021-06-10 1.21668
## 28312 2021-06-10 1.21863
## 28313 2021-06-10 1.21768
## 28314 2021-06-10 1.21759
## 28315 2021-06-10 1.21784
## 28316 2021-06-11 1.21873
## 28317 2021-06-11 1.21660
## 28318 2021-06-11 1.21290
## 28319 2021-06-11 1.20966
## 28320 2021-06-11 1.21096
## 28321 2021-06-13 1.21004
## 28322 2021-06-14 1.21044
## 28323 2021-06-14 1.21092
## 28324 2021-06-14 1.21197
## 28325 2021-06-14 1.21223
## 28326 2021-06-14 1.21211
## 28327 2021-06-14 1.21201
## 28328 2021-06-15 1.21260
## 28329 2021-06-15 1.21306
## 28330 2021-06-15 1.21118
## 28331 2021-06-15 1.21243
## 28332 2021-06-15 1.21273
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN855

```
## 28333 2021-06-15 1.21229
## 28334 2021-06-16 1.21286
## 28335 2021-06-16 1.21290
## 28336 2021-06-16 1.21187
## 28337 2021-06-16 1.21178
## 28338 2021-06-16 1.19952
## 28339 2021-06-16 1.19882
## 28340 2021-06-17 1.20011
## 28341 2021-06-17 1.19478
## 28342 2021-06-17 1.19314
## 28343 2021-06-17 1.18962
## 28344 2021-06-17 1.19085
## 28345 2021-06-17 1.19076
## 28346 2021-06-18 1.19135
## 28347 2021-06-18 1.19130
## 28348 2021-06-18 1.18879
## 28349 2021-06-18 1.18747
## 28350 2021-06-18 1.18677
## 28351 2021-06-20 1.18727
## 28352 2021-06-21 1.18660
## 28353 2021-06-21 1.18933
## 28354 2021-06-21 1.18927
## 28355 2021-06-21 1.19192
## 28356 2021-06-21 1.19206
## 28357 2021-06-21 1.19083
## 28358 2021-06-22 1.19029
## 28359 2021-06-22 1.18967
## 28360 2021-06-22 1.18931
## 28361 2021-06-22 1.19346
## 28362 2021-06-22 1.19425
## 28363 2021-06-22 1.19321
## 28364 2021-06-23 1.19194
## 28365 2021-06-23 1.19328
## 28366 2021-06-23 1.19539
## 28367 2021-06-23 1.19358
## 28368 2021-06-23 1.19266
## 28369 2021-06-23 1.19312
## 28370 2021-06-24 1.19243
## 28371 2021-06-24 1.19254
## 28372 2021-06-24 1.19546
## 28373 2021-06-24 1.19269
## 28374 2021-06-24 1.19322
## 28375 2021-06-24 1.19311
## 28376 2021-06-25 1.19372
## 28377 2021-06-25 1.19434
## 28378 2021-06-25 1.19581
```

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```
## 28379 2021-06-25 1.19374
## 28380 2021-06-25 1.19392
## 28381 2021-06-27 1.19370
## 28382 2021-06-28 1.19228
## 28383 2021-06-28 1.19415
## 28384 2021-06-28 1.19217
## 28385 2021-06-28 1.19228
## 28386 2021-06-28 1.19260
## 28387 2021-06-28 1.19195
## 28388 2021-06-29 1.19106
## 28389 2021-06-29 1.19016
## 28390 2021-06-29 1.18828
## 28391 2021-06-29 1.18963
## 28392 2021-06-29 1.18973
## 28393 2021-06-29 1.19005
## 28394 2021-06-30 1.18999
## 28395 2021-06-30 1.18864
## 28396 2021-06-30 1.18825
## 28397 2021-06-30 1.18486
## 28398 2021-06-30 1.18567
## 28399 2021-06-30 1.18488
## 28400 2021-07-01 1.18494
## 28401 2021-07-01 1.18448
## 28402 2021-07-01 1.18785
## 28403 2021-07-01 1.18493
## 28404 2021-07-01 1.18508
## 28405 2021-07-01 1.18433
## 28406 2021-07-02 1.18449
## 28407 2021-07-02 1.18279
## 28408 2021-07-02 1.18476
## 28409 2021-07-02 1.18437
## 28410 2021-07-02 1.18673
## 28411 2021-07-04 1.18575
## 28412 2021-07-05 1.18572
## 28413 2021-07-05 1.18706
## 28414 2021-07-05 1.18635
## 28415 2021-07-05 1.18681
## 28416 2021-07-05 1.18653
## 28417 2021-07-05 1.18608
## 28418 2021-07-06 1.18745
## 28419 2021-07-06 1.18455
## 28420 2021-07-06 1.18363
## 28421 2021-07-06 1.18148
## 28422 2021-07-06 1.18242
## 28423 2021-07-06 1.18212
## 28424 2021-07-07 1.18237
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN857

```
## 28425 2021-07-07 1.18241
## 28426 2021-07-07 1.18160
## 28427 2021-07-07 1.18004
## 28428 2021-07-07 1.17912
## 28429 2021-07-07 1.17911
## 28430 2021-07-08 1.17964
## 28431 2021-07-08 1.18224
## 28432 2021-07-08 1.18517
## 28433 2021-07-08 1.18446
## 28434 2021-07-08 1.18462
## 28435 2021-07-08 1.18409
## 28436 2021-07-09 1.18320
## 28437 2021-07-09 1.18324
## 28438 2021-07-09 1.18687
## 28439 2021-07-09 1.18682
## 28440 2021-07-09 1.18802
## 28441 2021-07-11 1.18757
## 28442 2021-07-12 1.18686
## 28443 2021-07-12 1.18707
## 28444 2021-07-12 1.18533
## 28445 2021-07-12 1.18577
## 28446 2021-07-12 1.18621
## 28447 2021-07-12 1.18668
## 28448 2021-07-13 1.18640
## 28449 2021-07-13 1.18500
## 28450 2021-07-13 1.17996
## 28451 2021-07-13 1.18045
## 28452 2021-07-13 1.17770
## 28453 2021-07-13 1.17766
## 28454 2021-07-14 1.17839
## 28455 2021-07-14 1.17839
## 28456 2021-07-14 1.18220
## 28457 2021-07-14 1.18326
## 28458 2021-07-14 1.18367
## 28459 2021-07-14 1.18337
## 28460 2021-07-15 1.18310
## 28461 2021-07-15 1.18493
## 28462 2021-07-15 1.18066
## 28463 2021-07-15 1.18029
## 28464 2021-07-15 1.18121
## 28465 2021-07-15 1.18118
## 28466 2021-07-16 1.18098
## 28467 2021-07-16 1.18183
## 28468 2021-07-16 1.18019
## 28469 2021-07-16 1.18114
## 28470 2021-07-16 1.18067
```

```
## 28471 2021-07-18 1.18023
## 28472 2021-07-19 1.18065
## 28473 2021-07-19 1.17734
## 28474 2021-07-19 1.17869
## 28475 2021-07-19 1.17992
## 28476 2021-07-19 1.18012
## 28477 2021-07-19 1.17951
## 28478 2021-07-20 1.17888
## 28479 2021-07-20 1.17881
## 28480 2021-07-20 1.17726
## 28481 2021-07-20 1.17779
## 28482 2021-07-20 1.17815
## 28483 2021-07-20 1.17800
## 28484 2021-07-21 1.17725
## 28485 2021-07-21 1.17797
## 28486 2021-07-21 1.17662
## 28487 2021-07-21 1.17933
## 28488 2021-07-21 1.17958
## 28489 2021-07-21 1.17886
## 28490 2021-07-22 1.17972
## 28491 2021-07-22 1.17967
## 28492 2021-07-22 1.18002
## 28493 2021-07-22 1.17630
## 28494 2021-07-22 1.17714
## 28495 2021-07-22 1.17782
## 28496 2021-07-23 1.17680
## 28497 2021-07-23 1.17748
## 28498 2021-07-23 1.17798
## 28499 2021-07-23 1.17687
## 28500 2021-07-23 1.17733
## 28501 2021-07-25 1.17664
## 28502 2021-07-26 1.17788
## 28503 2021-07-26 1.17841
## 28504 2021-07-26 1.17832
## 28505 2021-07-26 1.18125
## 28506 2021-07-26 1.18040
## 28507 2021-07-26 1.18086
## 28508 2021-07-27 1.18026
## 28509 2021-07-27 1.17778
## 28510 2021-07-27 1.18189
## 28511 2021-07-27 1.18365
## 28512 2021-07-27 1.18171
## 28513 2021-07-27 1.18143
## 28514 2021-07-28 1.18199
## 28515 2021-07-28 1.18291
## 28516 2021-07-28 1.17991
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN859

```
## 28517 2021-07-28 1.18145
## 28518 2021-07-28 1.18455
## 28519 2021-07-28 1.18438
## 28520 2021-07-29 1.18566
## 28521 2021-07-29 1.18767
## 28522 2021-07-29 1.18844
## 28523 2021-07-29 1.18849
## 28524 2021-07-29 1.18876
## 28525 2021-07-29 1.18817
## 28526 2021-07-30 1.18787
## 28527 2021-07-30 1.19069
## 28528 2021-07-30 1.18793
## 28529 2021-07-30 1.18592
## 28530 2021-07-30 1.18743
## 28531 2021-08-01 1.18694
## 28532 2021-08-02 1.18707
## 28533 2021-08-02 1.18848
## 28534 2021-08-02 1.18732
## 28535 2021-08-02 1.18697
## 28536 2021-08-02 1.18706
## 28537 2021-08-02 1.18720
## 28538 2021-08-03 1.18805
## 28539 2021-08-03 1.18840
## 28540 2021-08-03 1.18861
## 28541 2021-08-03 1.18685
## 28542 2021-08-03 1.18647
## 28543 2021-08-03 1.18621
## 28544 2021-08-04 1.18717
## 28545 2021-08-04 1.18511
## 28546 2021-08-04 1.18893
## 28547 2021-08-04 1.18383
## 28548 2021-08-04 1.18374
## 28549 2021-08-04 1.18321
## 28550 2021-08-05 1.18365
## 28551 2021-08-05 1.18374
## 28552 2021-08-05 1.18360
## 28553 2021-08-05 1.18391
## 28554 2021-08-05 1.18339
## 28555 2021-08-05 1.18256
## 28556 2021-08-06 1.18257
## 28557 2021-08-06 1.18112
## 28558 2021-08-06 1.17846
## 28559 2021-08-06 1.17563
## 28560 2021-08-06 1.17639
## 28561 2021-08-08 1.17509
## 28562 2021-08-09 1.17635
```

```
## 28563 2021-08-09 1.17548
## 28564 2021-08-09 1.17611
## 28565 2021-08-09 1.17422
## 28566 2021-08-09 1.17370
## 28567 2021-08-09 1.17379
## 28568 2021-08-10 1.17386
## 28569 2021-08-10 1.17323
## 28570 2021-08-10 1.17164
## 28571 2021-08-10 1.17159
## 28572 2021-08-10 1.17227
## 28573 2021-08-10 1.17132
## 28574 2021-08-11 1.17183
## 28575 2021-08-11 1.17127
## 28576 2021-08-11 1.17369
## 28577 2021-08-11 1.17485
## 28578 2021-08-11 1.17399
## 28579 2021-08-11 1.17402
## 28580 2021-08-12 1.17399
## 28581 2021-08-12 1.17470
## 28582 2021-08-12 1.17402
## 28583 2021-08-12 1.17384
## 28584 2021-08-12 1.17305
## 28585 2021-08-12 1.17365
## 28586 2021-08-13 1.17392
## 28587 2021-08-13 1.17424
## 28588 2021-08-13 1.17660
## 28589 2021-08-13 1.18003
## 28590 2021-08-13 1.17966
## 28591 2021-08-15 1.17959
## 28592 2021-08-16 1.17938
## 28593 2021-08-16 1.17874
## 28594 2021-08-16 1.17776
## 28595 2021-08-16 1.17753
## 28596 2021-08-16 1.17777
## 28597 2021-08-16 1.17742
## 28598 2021-08-17 1.17687
## 28599 2021-08-17 1.17775
## 28600 2021-08-17 1.17441
## 28601 2021-08-17 1.17088
## 28602 2021-08-17 1.17094
## 28603 2021-08-17 1.17124
## 28604 2021-08-18 1.17184
## 28605 2021-08-18 1.17203
## 28606 2021-08-18 1.17177
## 28607 2021-08-18 1.16993
## 28608 2021-08-18 1.17134
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN861

```
## 28609 2021-08-18 1.16874
## 28610 2021-08-19 1.16772
## 28611 2021-08-19 1.16870
## 28612 2021-08-19 1.16990
## 28613 2021-08-19 1.16885
## 28614 2021-08-19 1.16765
## 28615 2021-08-19 1.16825
## 28616 2021-08-20 1.16862
## 28617 2021-08-20 1.16743
## 28618 2021-08-20 1.16686
## 28619 2021-08-20 1.17034
## 28620 2021-08-20 1.17041
## 28621 2021-08-22 1.16993
## 28622 2021-08-23 1.17190
## 28623 2021-08-23 1.17311
## 28624 2021-08-23 1.17323
## 28625 2021-08-23 1.17395
## 28626 2021-08-23 1.17481
## 28627 2021-08-23 1.17394
## 28628 2021-08-24 1.17414
## 28629 2021-08-24 1.17288
## 28630 2021-08-24 1.17508
## 28631 2021-08-24 1.17476
## 28632 2021-08-24 1.17584
## 28633 2021-08-24 1.17419
## 28634 2021-08-25 1.17408
## 28635 2021-08-25 1.17513
## 28636 2021-08-25 1.17327
## 28637 2021-08-25 1.17604
## 28638 2021-08-25 1.17737
## 28639 2021-08-25 1.17672
## 28640 2021-08-26 1.17644
## 28641 2021-08-26 1.17592
## 28642 2021-08-26 1.17560
## 28643 2021-08-26 1.17527
## 28644 2021-08-26 1.17530
## 28645 2021-08-26 1.17454
## 28646 2021-08-27 1.17635
## 28647 2021-08-27 1.17511
## 28648 2021-08-27 1.17562
## 28649 2021-08-27 1.18007
## 28650 2021-08-27 1.17996
## 28651 2021-08-29 1.18049
## 28652 2021-08-30 1.18039
## 28653 2021-08-30 1.17988
## 28654 2021-08-30 1.17865
```

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```
## 28655 2021-08-30 1.17975
## 28656 2021-08-30 1.17974
## 28657 2021-08-30 1.18021
## 28658 2021-08-31 1.18176
## 28659 2021-08-31 1.18204
## 28660 2021-08-31 1.18369
## 28661 2021-08-31 1.18071
## 28662 2021-08-31 1.18102
## 28663 2021-08-31 1.18030
## 28664 2021-09-01 1.17996
## 28665 2021-09-01 1.18142
## 28666 2021-09-01 1.18379
## 28667 2021-09-01 1.18482
## 28668 2021-09-01 1.18402
## 28669 2021-09-01 1.18452
## 28670 2021-09-02 1.18349
## 28671 2021-09-02 1.18457
## 28672 2021-09-02 1.18472
## 28673 2021-09-02 1.18651
## 28674 2021-09-02 1.18758
## 28675 2021-09-02 1.18822
## 28676 2021-09-03 1.18764
## 28677 2021-09-03 1.18748
## 28678 2021-09-03 1.18914
## 28679 2021-09-03 1.18897
## 28680 2021-09-03 1.18811
## 28681 2021-09-05 1.18789
## 28682 2021-09-06 1.18695
## 28683 2021-09-06 1.18642
## 28684 2021-09-06 1.18664
## 28685 2021-09-06 1.18714
## 28686 2021-09-06 1.18716
## 28687 2021-09-06 1.18796
## 28688 2021-09-07 1.18756
## 28689 2021-09-07 1.18764
## 28690 2021-09-07 1.18507
## 28691 2021-09-07 1.18457
## 28692 2021-09-07 1.18419
## 28693 2021-09-07 1.18483
## 28694 2021-09-08 1.18439
## 28695 2021-09-08 1.18216
## 28696 2021-09-08 1.18214
## 28697 2021-09-08 1.18188
## 28698 2021-09-08 1.18175
## 28699 2021-09-08 1.18143
## 28700 2021-09-09 1.18145
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN863

```
## 28701 2021-09-09 1.18341
## 28702 2021-09-09 1.18234
## 28703 2021-09-09 1.18317
## 28704 2021-09-09 1.18267
## 28705 2021-09-09 1.18243
## 28706 2021-09-10 1.18301
## 28707 2021-09-10 1.18479
## 28708 2021-09-10 1.18270
## 28709 2021-09-10 1.18189
## 28710 2021-09-10 1.18177
## 28711 2021-09-12 1.18054
## 28712 2021-09-13 1.17957
## 28713 2021-09-13 1.17897
## 28714 2021-09-13 1.17827
## 28715 2021-09-13 1.18074
## 28716 2021-09-13 1.18122
## 28717 2021-09-13 1.18087
## 28718 2021-09-14 1.18133
## 28719 2021-09-14 1.18214
## 28720 2021-09-14 1.18416
## 28721 2021-09-14 1.18222
## 28722 2021-09-14 1.18047
## 28723 2021-09-14 1.18057
## 28724 2021-09-15 1.18053
## 28725 2021-09-15 1.18263
## 28726 2021-09-15 1.18117
## 28727 2021-09-15 1.18040
## 28728 2021-09-15 1.18186
## 28729 2021-09-15 1.18192
## 28730 2021-09-16 1.18100
## 28731 2021-09-16 1.17729
## 28732 2021-09-16 1.17552
## 28733 2021-09-16 1.17598
## 28734 2021-09-16 1.17685
## 28735 2021-09-16 1.17600
## 28736 2021-09-17 1.17733
## 28737 2021-09-17 1.17774
## 28738 2021-09-17 1.17738
## 28739 2021-09-17 1.17257
## 28740 2021-09-17 1.17264
## 28741 2021-09-19 1.17238
## 28742 2021-09-20 1.17153
## 28743 2021-09-20 1.17098
## 28744 2021-09-20 1.17147
## 28745 2021-09-20 1.17226
## 28746 2021-09-20 1.17276
```

```
## 28747 2021-09-20 1.17258
## 28748 2021-09-21 1.17320
## 28749 2021-09-21 1.17343
## 28750 2021-09-21 1.17399
## 28751 2021-09-21 1.17287
## 28752 2021-09-21 1.17279
## 28753 2021-09-21 1.17198
## 28754 2021-09-22 1.17220
## 28755 2021-09-22 1.17346
## 28756 2021-09-22 1.17297
## 28757 2021-09-22 1.17353
## 28758 2021-09-22 1.16880
## 28759 2021-09-22 1.16890
## 28760 2021-09-23 1.17098
## 28761 2021-09-23 1.17210
## 28762 2021-09-23 1.17293
## 28763 2021-09-23 1.17443
## 28764 2021-09-23 1.17392
## 28765 2021-09-23 1.17462
## 28766 2021-09-24 1.17373
## 28767 2021-09-24 1.17362
## 28768 2021-09-24 1.17068
## 28769 2021-09-24 1.17164
## 28770 2021-09-24 1.17219
## 28771 2021-09-26 1.17174
## 28772 2021-09-27 1.17226
## 28773 2021-09-27 1.16896
## 28774 2021-09-27 1.17075
## 28775 2021-09-27 1.17022
## 28776 2021-09-27 1.16969
## 28777 2021-09-27 1.16890
## 28778 2021-09-28 1.16990
## 28779 2021-09-28 1.16807
## 28780 2021-09-28 1.16807
## 28781 2021-09-28 1.16821
## 28782 2021-09-28 1.16838
## 28783 2021-09-28 1.16814
## 28784 2021-09-29 1.16868
## 28785 2021-09-29 1.16639
## 28786 2021-09-29 1.16460
## 28787 2021-09-29 1.16016
## 28788 2021-09-29 1.15985
## 28789 2021-09-29 1.16037
## 28790 2021-09-30 1.16082
## 28791 2021-09-30 1.16044
## 28792 2021-09-30 1.15908
```

6.3. 3. DIVISIÓN DEL DATASET EN CONJUNTOS DE ENTRENAMIENTO Y VALIDACIÓN865

```
## 28793 2021-09-30 1.15708
## 28794 2021-09-30 1.15799
## 28795 2021-09-30 1.15653
## 28796 2021-10-01 1.15807
## 28797 2021-10-01 1.15788
## 28798 2021-10-01 1.16038
## 28799 2021-10-01 1.15971
## 28800 2021-10-01 1.16011
## 28801 2021-10-03 1.16031
## 28802 2021-10-04 1.15960
## 28803 2021-10-04 1.16127
## 28804 2021-10-04 1.16327
## 28805 2021-10-04 1.16192
## 28806 2021-10-04 1.16212
## 28807 2021-10-04 1.16116
## 28808 2021-10-05 1.15950
## 28809 2021-10-05 1.15990
## 28810 2021-10-05 1.16002
## 28811 2021-10-05 1.16053
## 28812 2021-10-05 1.15990
## 28813 2021-10-05 1.15939
## 28814 2021-10-06 1.15848
## 28815 2021-10-06 1.15523
## 28816 2021-10-06 1.15453
## 28817 2021-10-06 1.15435
## 28818 2021-10-06 1.15584
## 28819 2021-10-06 1.15586
## 28820 2021-10-07 1.15557
## 28821 2021-10-07 1.15603
## 28822 2021-10-07 1.15560
## 28823 2021-10-07 1.15557
## 28824 2021-10-07 1.15532
## 28825 2021-10-07 1.15585
## 28826 2021-10-08 1.15484
## 28827 2021-10-08 1.15537
## 28828 2021-10-08 1.15710
## 28829 2021-10-08 1.15645
## 28830 2021-10-08 1.15770
## 28831 2021-10-10 1.15748
## 28832 2021-10-11 1.15726
## 28833 2021-10-11 1.15700
## 28834 2021-10-11 1.15616
## 28835 2021-10-11 1.15635
## 28836 2021-10-11 1.15535
## 28837 2021-10-11 1.15494
## 28838 2021-10-12 1.15565
```

```

## 28839 2021-10-12 1.15622
## 28840 2021-10-12 1.15418
## 28841 2021-10-12 1.15283
## 28842 2021-10-12 1.15307
## 28843 2021-10-12 1.15414
## 28844 2021-10-13 1.15527
## 28845 2021-10-13 1.15565
## 28846 2021-10-13 1.15430
## 28847 2021-10-13 1.15780
## 28848 2021-10-13 1.15956
## 28849 2021-10-13 1.15992
## 28850 2021-10-14 1.15900
## 28851 2021-10-14 1.16166
## 28852 2021-10-14 1.16065
## 28853 2021-10-14 1.15883
## 28854 2021-10-14 1.15978
## 28855 2021-10-14 1.15940
## 28856 2021-10-15 1.16082
## 28857 2021-10-15 1.16034
## 28858 2021-10-15 1.15923
## 28859 2021-10-15 1.15953
## 28860 2021-10-15 1.16040

```

6.4 4. Ajuste del modelo

Los parametros necesarios para el promdeo prophet son la fecha y los datos por lo tanto asigmanos los nombres a cada uno y ajustamos el modelo con la función prophet, usamos predict para predecir los valores futuros según el modelo generado

```

##          ds
## 2331 2023-06-02
## 2332 2023-06-03
## 2333 2023-06-04
## 2334 2023-06-05
## 2335 2023-06-06
## 2336 2023-06-07

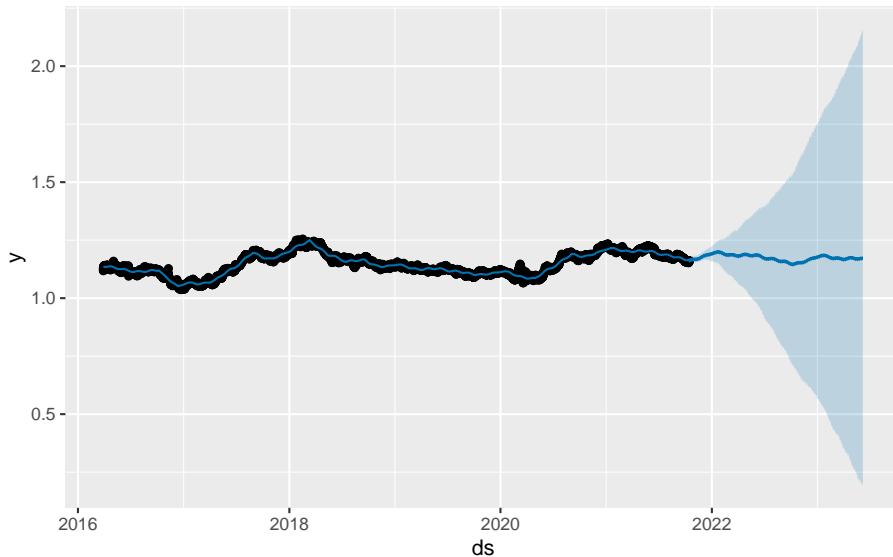
##          ds      yhat yhat_lower yhat_upper
## 2331 2023-06-02 1.174237  0.2010873  2.135583
## 2332 2023-06-03 1.166681  0.1950514  2.141664
## 2333 2023-06-04 1.174521  0.2017241  2.150587
## 2334 2023-06-05 1.174862  0.1956314  2.150934
## 2335 2023-06-06 1.174804  0.1974344  2.158708

```

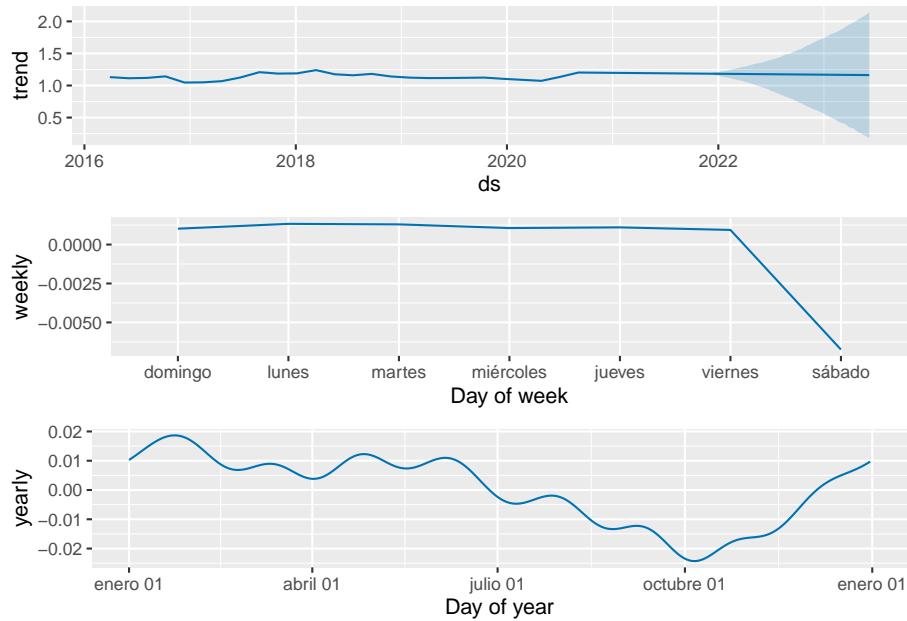
```
## 2336 2023-06-07 1.174490 0.1947059 2.152111
```

Como se puede, se puede evidenciar tenemos tres campos de salida, que corresponden al valor de la predicción y_{hat} y los límites inferiores y superiores.

Ahora graficamos la predicción:



Revisamos la tendencia, estacionalidad semanal y estacionalidad anual



6.5 5. Evaluación del modelo

```
## [1] "RMSE: 0.05"
```

```
## [1] "MAE: 0.05"
```

```
## [1] "MAPE: 0.04"
```

RMSE: 0.05, MAE: 0.05 and MAPE: 0.04 son los valores del modelo

Evaluación de Predicciones: - El MAE en el conjunto de entrenamiento fue de **0.05**