Nogizaka46 Singles Sales Regression from Member's Generation in Senbutsu using Neural Network

Wich Moonsarn

About Nogizaka46

Nogizaka46 is Japanese Idol girl group debut on 2011 August 21. Now they have 34 singles and 5 generation.

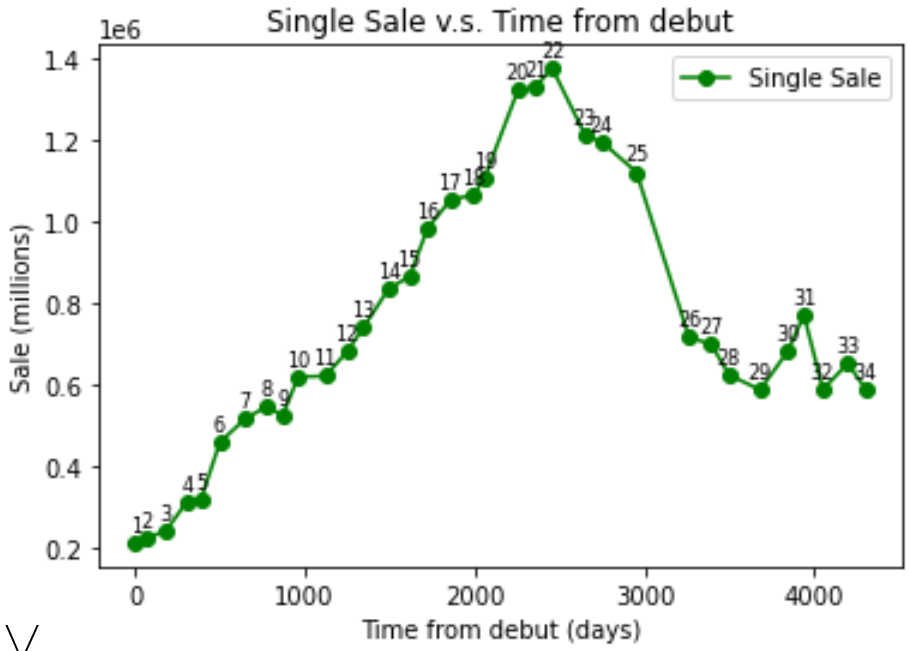
Members selected to be featured in the A-side (main song) of a single is called “Senbutsu”. Also, each single have 1-2 members that will be “center” of front row

All member (2023 December 31)

Double center

Senbutsu of 34th single (2023 December 6)

Single Sales prediction



Even now, CD sales are stilled used to Be one of indicator to measure popularity Of singer. The Oricon Singles Chart is the Japanese music industry–standard singles popularity chart issued daily, weekly, monthly and yearly

Want to know that can the number of member in each generation in Senbutsu and generation of center of the single predict sale of that single (that can interpreted as popularity of group in that time.

So, I use neural network as an approach this question.

Data Collection & Exploration

All of the data come from stage48.net then write in form of array

Monopoly is the 34th single released by Nogizaka46.

CD Information

Artist

Nogizaka46 (乃木坂46)

Single

Monopoly

Release Date

2023.12.06

"Monopoly"

★ **Senbatsu** (選抜) (20 Members) (Endo Sakura and Kaki Haruka Centers (in *italic*), Jyuuichi Fukujin in **bold**)

- **3rd Generation**: **Iwamoto Renka**, **Umezawa Minami**, **Kubo Shiori**, Mukai Hazuki, **Yamashita Mizuki**, **Yoda Yuuki**
- **4th Generation**: ***Endo Sakura***, ***Kaki Haruka***, Kuromi Haruka, Shibata Yuna, **Tamura Mayu**, Tsutsui Ayame, Yumiki Nao
- **5th Generation**: Ioki Mao, **Ikeda Teresa**, Ichinose Miku, **Inoue Nagi**, **Kawasaki Sakura**, Sugawara Satsuki, Tomisato Nao

№	Title	*	Weeks	Peak	*	Tue	Wed	Thu	Fri	Sat	Sun	*	1stWeek	2ndWeek	3rdWeek	4thWeek	5thWeek	*	Total
34	Monopoly	*	*5*	1	*	401,431	50,031	33,854	16,768	23,119	13,295	*	538,511	28,363	11,440	5,786	5,503	*	589,603
33	Ohitorisama Tengoku	*	*20*	1	*	411,534	45,501	21,265	34,190	27,788	25,782	*	566,060	41,942	11,339	5,933	6,297	*	653,180
32	Hito wa Yume wo Nido Miru	*	33	1	*	419,000	49,243	23,788	9,154	8,425	7,232	*	516,884	22,586	11,348	7,089	6,994	*	589,205
31	Koko ni wa Nai Mono	*	32	1	*	489,327	77,651	33,537	21,508	18,581	13,343	*	653,998	47,831	17,422	9,700	4,457	*	771,223
30	Suki to Iu no wa Rock daze!	*	34	1	*	435,467	67,617	26,956	17,773	16,222	12,544	*	576,597	40,931	19,894	10,635	9,157	*	680,866
29	Actually...	*	46	1	*	345,669	59,151	27,202	16,131	9,990	9,261	*	463,439	28,945	17,181	10,760	6,933	*	588,334
28	Kimi ni Shikarareta	*	51	1	*	408,815	56,282	26,825	21,481	13,017	9,367	*	535,794	30,853	14,261	7,723	4,743	*	624,823
27	Gomen ne Fingers crossed	*	53	1	*	450,171	63,879	35,196	14,362	15,386	10,734	*	589,751	34,127	21,024	10,227	9,488	*	698,601
26	Boku wa Boku wo Suki ni Naru	*	52	1	*	445,852	66,793	25,514	16,147	21,197	13,778	*	589,338	34,735	33,986	17,677	16,409	*	718,787

```
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    [30, 'Suki to Iu no wa Rock daze!', 576597, 40931, 19894, 10635, 9157, 680866, '2022.08.31', 3, 1, 6, 9, 0, 4],
    [31, 'Koko ni wa Nai Mono', 653998, 47831, 17422, 9700, 4457, 771223, '2022.12.07', 2, 1, 6, 9, 0, 1],
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    [33, 'Ohitorisama Tengoku', 566060, 41942, 11339, 5933, 6297, 653180, '2023.08.23', 0, 0, 7, 7, 6, 5],
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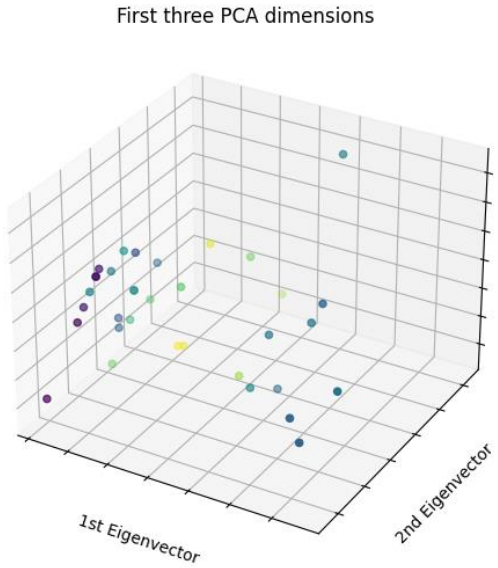
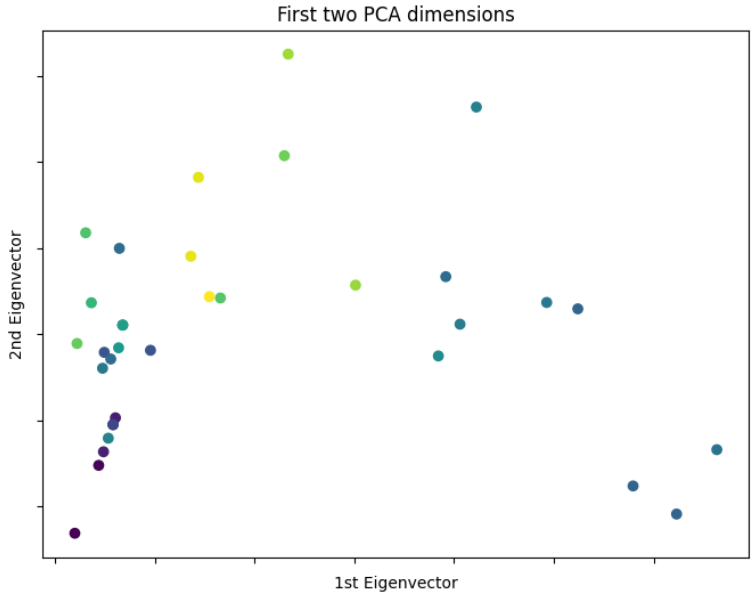
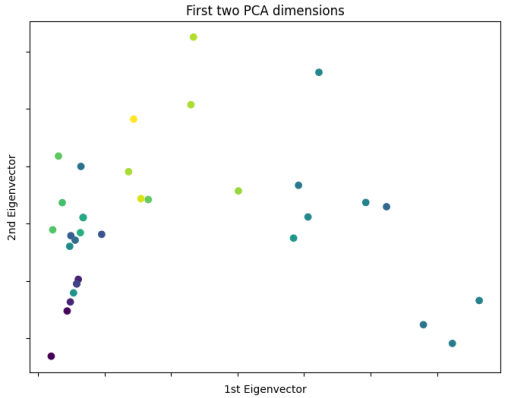
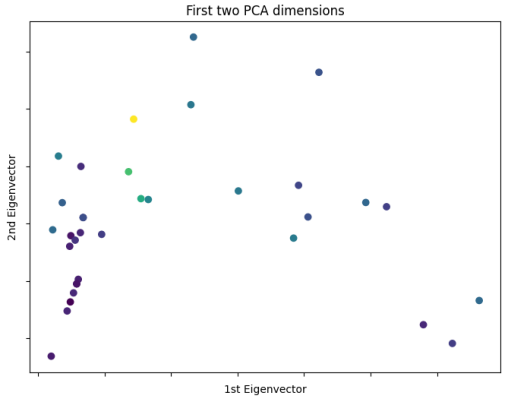




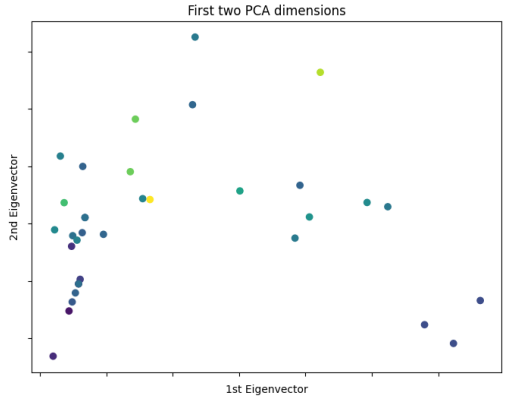
From PCA analysis 2 and 3 components we can see distribution of color (total sales) So, our feature might have some relation with sale value.



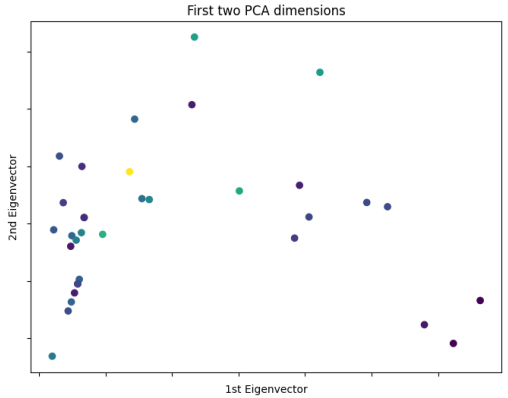
1st week



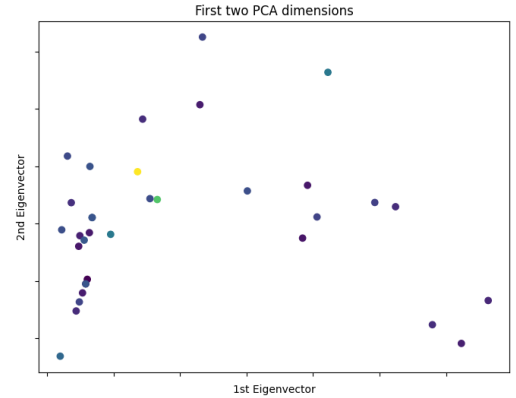
2nd week



3rd week



4th week



5th week

If change total sale to sale in each week, the distribution look not good.

So, we do not use this as a thing for model to predict.

```
X_train, X_test, y_train, y_test, time_train, time_test = train_test_split(np.array(X), np.array(y), np.array(time), test_size=0.1, random_state=0)
```

Data be splitting in 2 part for test and train

```
model = tf.keras.Sequential([
    tf.keras.layers.Dense(16, activation='relu', input_shape=(X_train.shape[1],)),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(32, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(326, activation='relu'),
    tf.keras.layers.Dense(1, activation='linear')
])
model.compile(optimizer='adam', loss='mean_squared_error')
history = model.fit(X_train, y_train, epochs=10000, validation_split=0.1)
loss = model.evaluate(X_test, y_test)
print(f"Test Loss: {loss}")
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense (Dense)                (None, 16)                128

dropout (Dropout)            (None, 16)                0

dense_1 (Dense)              (None, 32)                544

dropout_1 (Dropout)          (None, 32)                0

dense_2 (Dense)              (None, 326)               10758

dense_3 (Dense)              (None, 1)                 327

=================================================================
Total params: 11757 (45.93 KB)
Trainable params: 11757 (45.93 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

Build model using TensorFlow with 3 dense layers and 2 dropout layer as above with 10000 epochs and 0.1 validation split

Features and Label

Features

Number of 1st generation in that single

Number of 2nd generation in that single

Number of 3rd generation in that single

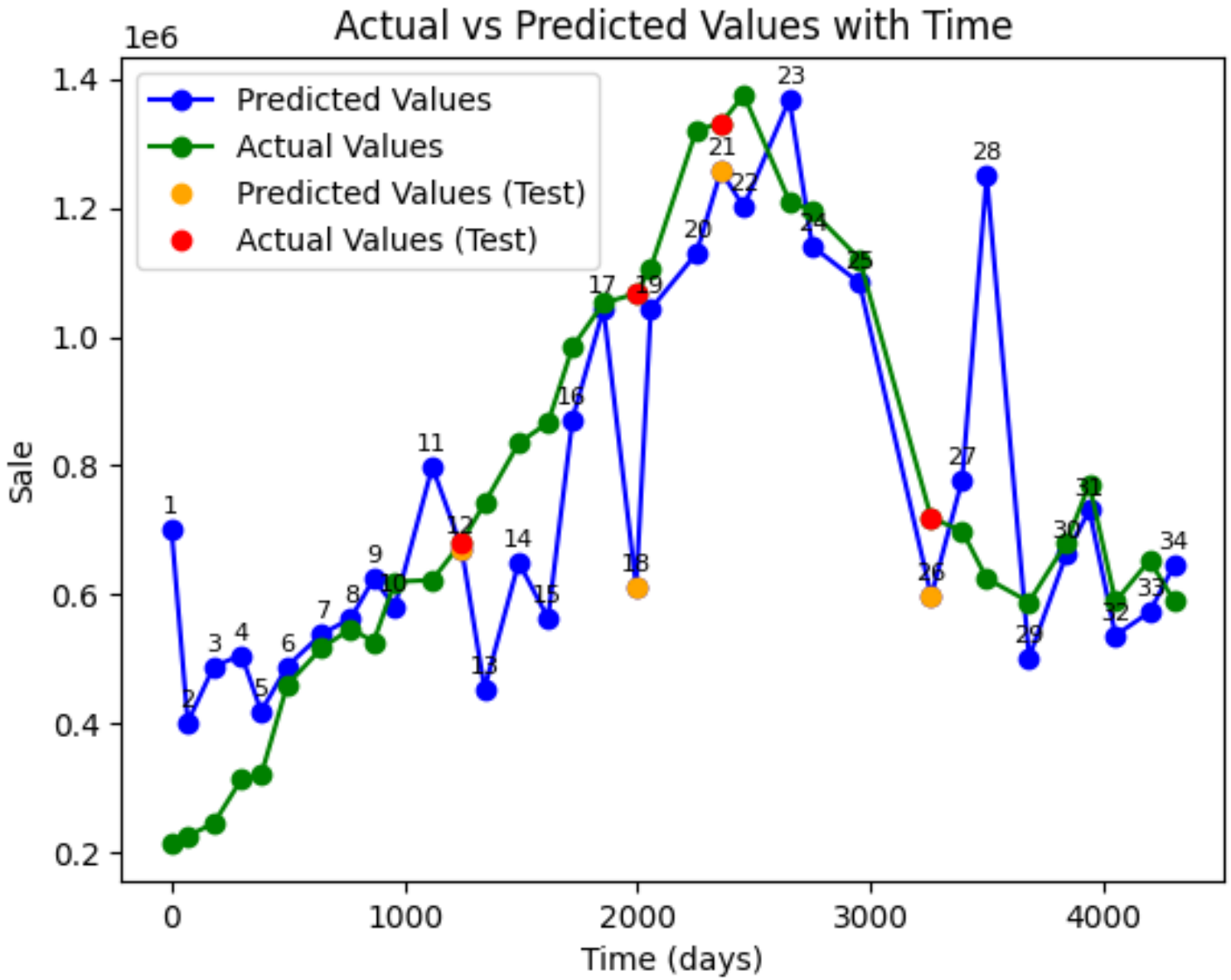
Number of 4th generation in that single

Number of 5th generation in that single

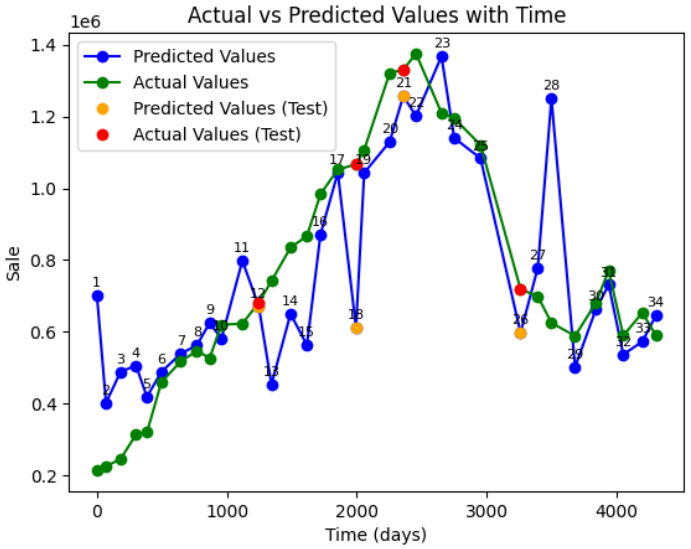
Generation of center of that single

Label

Total sale of that single



Plot the predict value from the model with the real single sale.



At single 1, 2, 3, 4, 5, 6, 11, 13, 15, 18, 23, and 28 model have a lot of different from real data.

(Try to find some fact of that single that might effect)

At 1st to 6th single all feature is the same (there was only 1st generation in that time) So, It is not surprised that model can not predict.

11th single is comeback of Nishino Nanase (My oshi:)) as a center after be a center in 8th and 9th single.

13th single is the first time that have double center.

15th single is the first time of Saito Asuka (youngest member of 1st generation) to be center.

18th single is the second time that have double center and first time that 3rd generation appear.

23rd single is the first single that have less than 10 1st generation member in Senbutsu.

28th single is the first single that have another generation in Senbutsu more than 1st generation.

ありがとうございました。