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Bayesian Network Analysis for the Questionnaire Investigation on Tourists' Behavior in the View Point of Service Marketing

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Abstract

Tourists from abroad are increasing rapidly in Japan. Kawazu town in Izu Peninsula is famous for its cherry trees. In the cherry blossom season, many tourists visit this town. The Kawazu Cherry Blossom Festival was carried out in February 2015. Our research investigation was performed during that period. In this paper, a questionnaire investigation is executed in order to clarify tourists' behavior, and to seek the possibility of developing regional collaboration among local government, tourism related industry and visitors. In this research, we construct the model utilizing Bayesian Network and causal relationship is sequentially chained by the characteristics of travelers, an objective to visit Izu Peninsula in Japan and the main occasion to visit them. We analyzed them by sensitivity analysis before but some difficulty had arisen that there arises too much response when the item has small sample size. In this paper, small sample size items are deleted and sensitivity analysis is conducted after that. The problem was resolved by this operation. This analysis is well utilized in designing the strategy of service marketing for this. To confirm the findings by utilizing the new consecutive visiting records would be the future works to be investigated.

Keywords: Tourism, Izu Peninsula, Kawazu Cherry Tree, Bayesian Network, Sensitivity analysis, service marketing.

1 Introduction

In recent years in Japan, the national and local governments have been trying to attract foreign tourists by using strategic approaches and developing tourist facilities, with the aim of promoting regional exchange and generating economic benefits. Particular aims of local government are to overcome the common problems of an aging population and declining birthrate through tourism-generated income and to stimulate

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the local society through regional exchange and migration.

However, in order to take measures that will increase tourism, it is necessary to understand the attraction of particular regions in Japan, as well as the resources they offer to tourists. Moreover, it is necessary to have a picture of the tourists that might want to such regions.

Although it is useful to have an understanding of an issue at a given time and under specific social conditions, it is difficult to analyze chronological changes or cross-regional trends statistically. It is standard practice to design a survey such that it permits examination of the statistics for a given region over time, but in order to investigate solutions to problems shared across regions it is necessary to carefully examine the critical basic data as well as appropriate methods of data collection.

To try to obtain such data, preceding studies on tourist destinations that have statistically analyzed trends in tourist behavior will now be reviewed.

Yoshida et al. designed and conducted a visitor survey on the spot, which used a questionnaire to investigate the activities of visitors to the Ueno district in Taito ward, Tokyo. Doi et al. analyzed the image of the Izu Peninsula as a tourist destination in their 2003 study "Questionnaire Survey on the Izu Peninsula." Kano conducted tourist behavior studies in Atami city in 2008, 2009, 2014 and in other years.

In this paper, a questionnaire investigation was executed in Kawazu town in February 2015, which was conducted to coincide with events on the Izu Peninsula featuring flowers; the Kawazu Sakura Festival (Feb-Mar), and ways that regions can collaborate to carry out surveys of tourist behavior was also performed.

This survey of tourist behavior was carried out in February 2015, during the Kawazu Cherry Blossom Festival. Given the geographical peculiarities of Kawazu town and its relative lack of accommodation facilities, some of the survey personnel were located also at Izukyu-Inatori Station and Izukyu-Shimoda Station. On the first day of the survey, the weather was good, while on the second it was raining.

The 25th Kawazu Cherry Blossom Festival was held from February 10 to March 10, 2015. It was attended by 801,330 people, which was an increase of 9% over the previous year.

On the first day of the survey, 30-50% of the flowers were in bloom, and the nighttime illuminations lit up on the evening of the 21st. According to the figures of the Kawazu town Tourist Association, there were 30,590 visitors on the 21st and 20,913 visitors on the 22nd.

During the Kawazu Cherry Blossom Festival, around 150 stores were offering food & drink or souvenirs on the road with the row of cherry trees linked to Kawazu Station. A number of events were held during the festival, including the "Semi Gourmet" and "Izu no Odoriko Photography Event."

In this paper, a questionnaire investigation is executed in order to clarify tourists' behavior, and to seek the possibility of developing regional collaboration among local government, tourism related industry and visitors. These are analyzed by using Bayesian Network. We analyzed them by sensitivity analysis before (Okubo et al.,2018) but some difficulty had arisen that there arises too much response when the item has small sample size. In this paper, small sample size items are deleted and sensitivity analysis is conducted after that.

In recent years, the Bayesian network is highlighted because it has the following good characteristics (Neapolitan, 2004).

- Structural Equation Modeling requires normal distribution to the data in the analysis. Therefore, it has a limitation in making analysis, but the Bayesian network does not require a specific distribution type to the data. It can handle any distribution type.
- It can handle the data which include partial data.
- Expert's know-how can be reflected in building a Bayesian Network model.
- Sensitivity analysis can be easily performed by settling evidence. We can estimate and predict the prospective purchaser by that analysis.
- It is a probability model having a network structure. Related items are connected with directional link. Therefore, understanding becomes easy by its visual chart.

The field of service marketing generally handles the shapeless products.

Therefore it is often the case that it is hard to catch the influence to consumers.

Bayesian Network analysis enables to visualize the relationship and/or influence of shapeless products to consumers which is the field of service marketing.

These are also applied to service engineering.

The analysis utilizing Bayesian Network enabled us to visualize the causal relationship among items. Furthermore, sensitivity analysis brought us estimating and predicting the prospective visitors.

Some interesting and instructive results are obtained. This analysis is well utilized in designing the strategy of service marketing for this.

The rest of the paper is organized as follows. Outline of questionnaire investigation is stated in section 2. In section 3, Bayesian Network analysis is executed which is followed by the sensitivity analysis in section 4. Remarks is stated in section 5.

2 Outline and the Basic Statistical Results of the Questionnaire Research

2.1 Outline of the Questionnaire Research

We make a questionnaire investigation on tourists' behavior who has visited Izu Peninsula and is studied mainly at Kawazu town in Shizuoka Prefecture. Kawazu town is famous for its cherry trees. The outline of questionnaire research is as follows. Questionnaire sheet is attached in Appendix 1.

- | | | | | |
|-----|--------|----|---|---|
| (1) | Scope | of | : | Tourists who have visited Kawazu town in Shizuoka Prefecture, Japan |
| (2) | Period | : | | February 21,22/ 2015 |
| (3) | Method | : | | Local site, Dispatch sheet, Self writing |

- (4) Collection : Number of distribution 500
 Number of collection 478(collection rate 95.6%)
 Valid answer 478

2.2 Basic Statistical Results

Now, we show the main summary results by single variable.

2.2.1 Characteristics of answers (Q4)

(1) Sex (Q2)

Male 37.24%, Female 59.83%, (Not filled in 2.93%)

(2) Age (Q3)

10th 2.51%, 20th 14.23%, 30th 12.76%, 40th 13.18%, 50th 18.41%, 60th 17.78%, More than 70 8.37%, (Not filled in 12.76%)

(3) Occupation (Q4)

Independents 3.77%, Office worker 48.74%, Student 4.81%, Housewife 16.53%, No job 12.13% Miscellaneous 1.26%, (Not filled in 12.76%)

(4) Residence (Q1)

Tokyou 28.16%, Kanagawa 22.15%, Shizuoka 10.35%, Saitama 10.14%, Chiba 6.63%, Aichi 2.48%, Tochigi 2.48%, Ibaraki 1.86%, Gunma 1.24%, Yamanashi 1.24%, Osaka 0.83%, Nagano 0.83%, Gifu 0.62%, Fukushima 0.62%, Miyagi 0.62%, Else

(5) Fellow travelers (Q5)

Solo trip 3.35%, Couple 34.31%, Family 28.45%, Male's small group 3.77%, Female's small group 12.76%, Male and female's small group 7.95%, Group (More than 7) 7.53%, Miscellaneous 0.42%, (Not filled in 1.46%)

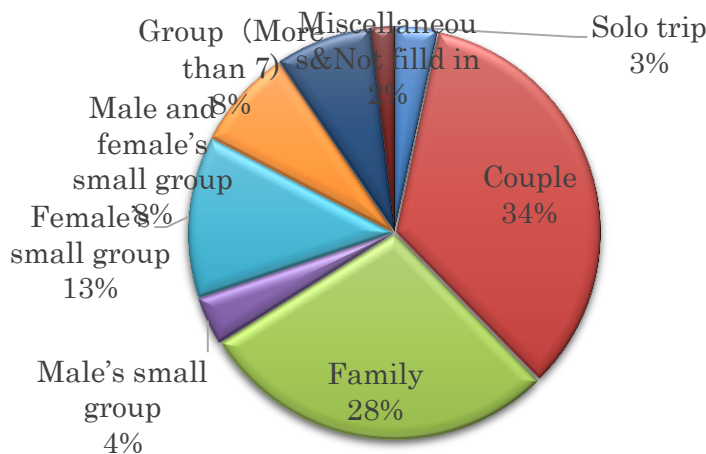


Figure 1: Fellow travelers

(6) Visiting frequency to Izu Peninsula and Kawazu Cherry Tree :

Izu Peninsula = ①First time 18.62% ②Second times 11.09% ③Third times 9.83% ④Fourth times 5.86% ⑤Fifth~Nine times 15.90% ⑥More than ten times 37.66%, (Not filled in 1.05%)

Kawazu Cherry Tree = ①First time 48.95% ②Second times 16.53% ③Third times 10.46% ④Fourth times 4.60% ⑤Fifth~Nine times 6.07% ⑥More than ten times 7.74% ⑦Has not been there 3.97%, (Not filled in 3.97%)

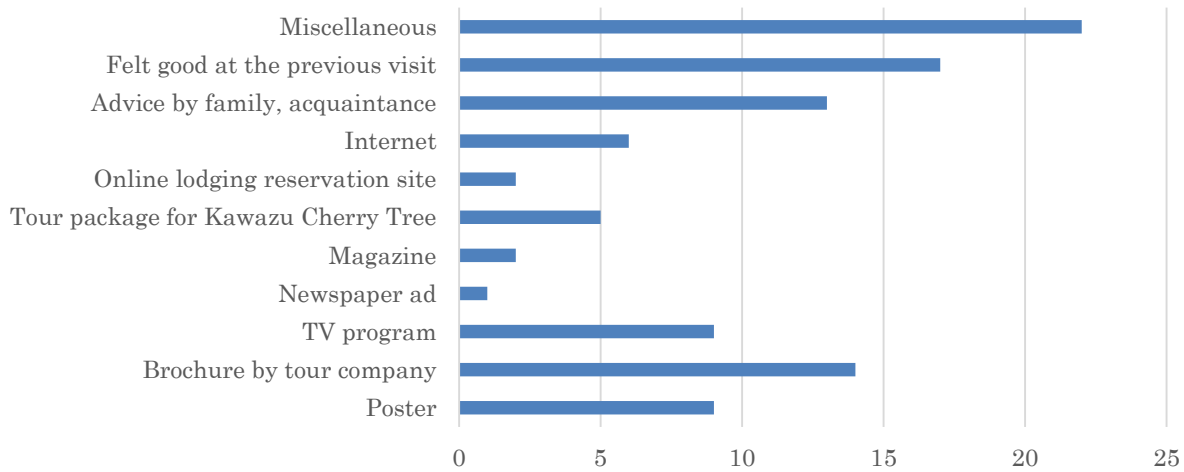


Figure 2: Main occasion to visit to Izu Peninsula

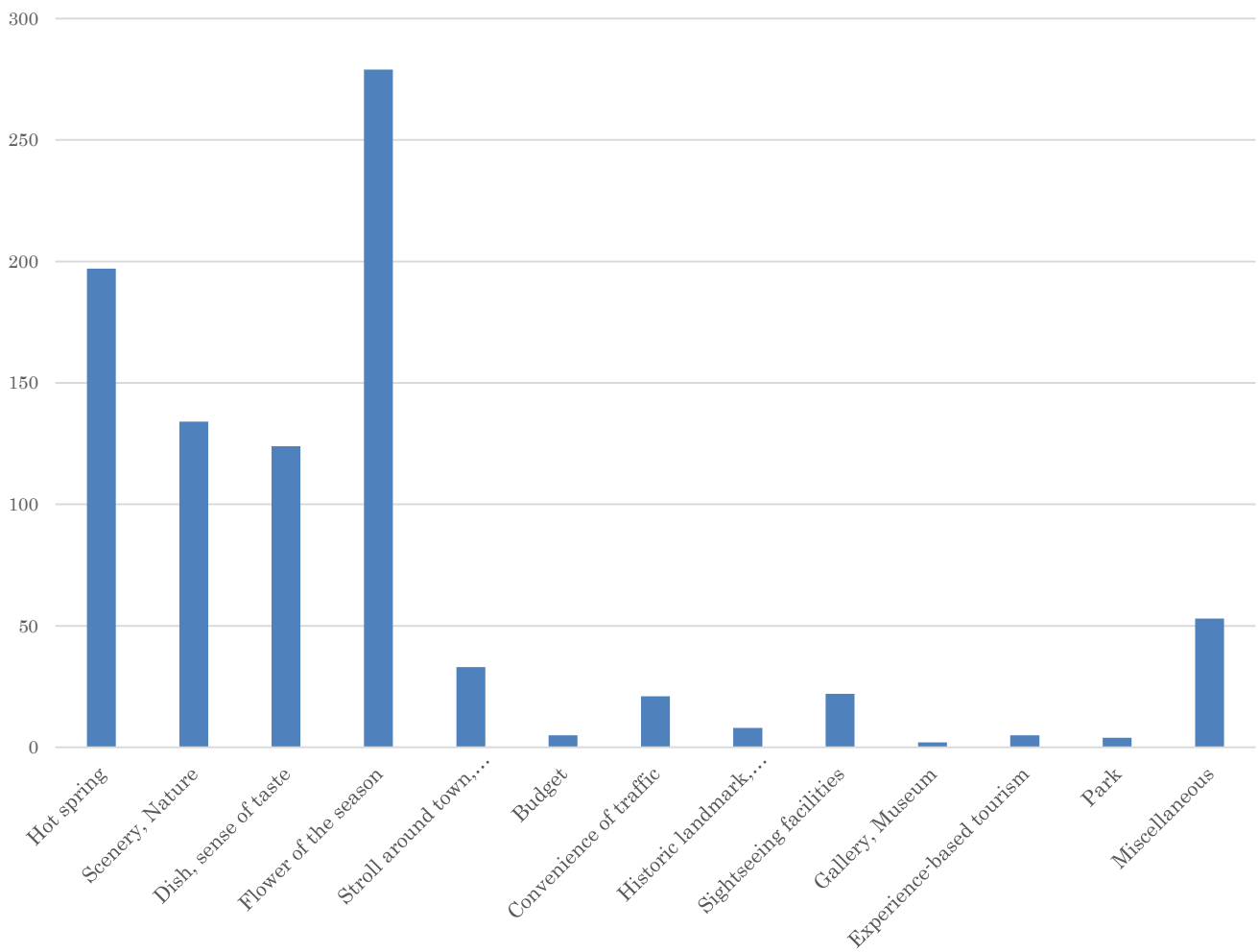


Figure 3: An objective to Izu peninsula

3 Bayesian Network Analysis

In constructing Bayesian Network, it is required to check the causal relationship among groups of items. Based on this, a model is built as is shown in Figure 1.

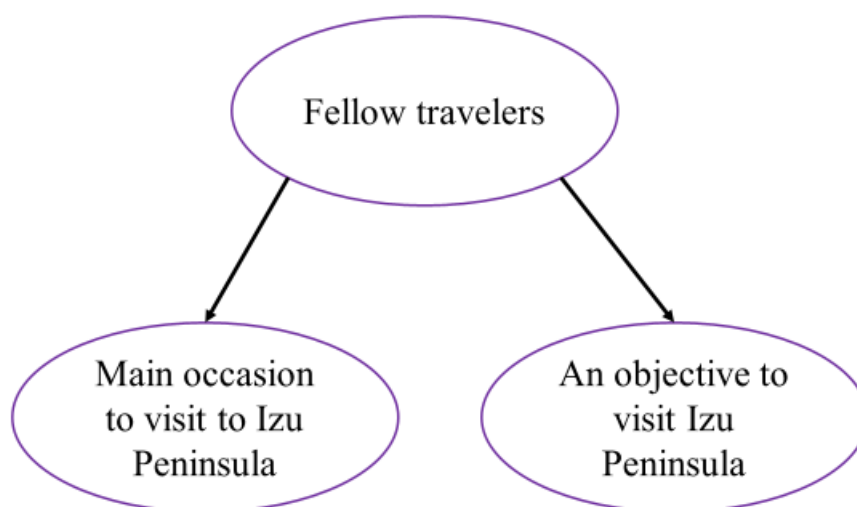


Figure 4: A Built Model

We used BAYONET software (<http://www.msi.co.jp/BAYONET/>). When plural nodes exist in the same group, it occurs that causal relationship is hard to set a priori. In that case, BAYONET system set the sequence automatically utilizing AIC standard.

4 Sensitivity Analysis

We executed sensitivity analysis before (Okubo et al.,2018) but some difficulty had arisen that there arises too much response when the item has small sample size. In this paper, small sample size items are deleted and sensitivity analysis is conducted after that. When the sample size of the item is less than 4%, these items are cul. Deleted items are as follows.

Q5 ④ Males small group

Q9 ④Newspaper ad ⑤Magazine ⑦Online lodging reservation site

Q10 ⑤Stroll around town, Eating tour ⑥Budget ⑧Historic landmark, Literature monument, Construction ⑨Sightseeing facilities ⑩Gallery, Museum ⑪Experience-based tourism ⑫Park

Now, posterior probability is calculated by setting evidence as, for example, 1.0. Comparing Prior probability and Posterior probability, we can seek the change and confirm the preference for tourism. We set evidence to all parameters. Therefore the analysis volume becomes too large. In this paper, we pick up half of the total cases and make analysis. Nodes we analyze here are “Fellow travelers”, “Main occasion to visit Izu Peninsula” and “An objective to visit Izu Peninsula”. We prepare another paper for the latter half.

As stated above, we set evidence for each parameter, and the calculated posterior probability is exhibited in Appendix 2. The value of “Posterior probability – Prior probability” (we call this “Difference of probability” hereafter) is exhibited in Appendix 3. The sensitivity analysis is executed by mainly using this table.

Here, we classify each item by the strength of the difference of probability.

- Strong (++, --): Select major parameter of which absolute value of difference of probability is more than 0.1
- Medium (+, -): Select major parameter of which absolute value of difference of probability is more than 0.05
- Weak: Else

In selecting items, negative value does not necessarily have distinct meaning, therefore we mainly pick up positive value in the case meaning is not clear.

Now we examine each for Strong and Medium case.

4.1 Sensitivity Analysis for “Fellow travelers”

(1) Setting evidence to “Couple”

After setting evidence to “Couple”, the result is exhibited in Table 1.

Table 1: Setting evidence to “Couple” case

Poster	+
Internet	++
Advice by family, acquaintance	--
Hot spring	++
Convenience of traffic	+

We can observe that “Those who are Couple had come by the occasion of “Poster” or “**Internet**” with an objective of visiting **Hot spring**” or “Convenience of traffic”

(2) Setting evidence to “Family”

After setting evidence to “Family”, the result is exhibited in Table 2.

Table 2: Setting evidence to “Family” case

TV program	-
Internet	-
Hot spring	-
Convenience of traffic	--

We can observe that “Those who are Family had not come with (Strong Medium) positive occasion nor positive objective”.

(3) Setting evidence to “Female’s small group”

After setting evidence to “Female’s small group”, the result is exhibited in Table 3.

Table 3: Setting evidence to “Female’s small group” case

TV program	+
Tour package for Kawazu Cherry Tree	–

We can observe that “Those who are Female’s small group had come by the occasion of “TV program”.

(4) Setting evidence to “Male and female’s small group”

After setting evidence to “Male and female’s small group”, the result is exhibited in Table 4.

Table 4: Setting evidence to “Male and female’s small group” case

Male	–
Poster	–
Advice by family, acquaintance	+

We can observe that “Those who are Male and female’s small group had come by the occasion of “Advice by family, acquaintance”.

(5) Setting evidence to “Group (More than 7) ”

After setting evidence to “Group (More than 7) ”, the result is exhibited in Table 5.

Table 5: Setting evidence to “Group (More than 7) ” case

Tour package for Kawazu Cherry Tree	+
Advice by family, acquaintance	+

We can observe that “Those who are Group (More than 7) had come by the occasion of “Tour package for Kawazu Cherry Tree” or “Advice by family, acquaintance”.

4.2 Sensitivity Analysis for “Main occasion to visit to Izu Peninsula”

(1) Setting Evidence to “Poster”

After setting evidence to “Poster”, the result is exhibited in Table 6.

Table 6: Setting evidence to “Poster” case

Male and female’s small group	–
Group (More than 7)	–

We can observe that “Those who put main occasion to visit to Izu Peninsula as “Poster” had not come with (Strong Medium) positive occasion nor positive objective”.

(2) Setting Evidence to “Brochure by tour company”

After setting evidence to “Brochure by tour company”, the result is exhibited in Table 7.

Table7: Setting evidence to “Brochure by tour company” case

Group (More than 7)	+
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We can observe that “Those who put main occasion to visit to Izu Peninsula as Brochure by tour company had come by “Group (More than 7) ”.

(3) Setting evidence to “TV program”

After setting evidence to “TV program”, the result is exhibited in Table 8.

Table 8: Setting evidence to “Poster” case

Female’s small group	+
Group (More than 7)	–

We can observe that those who put main occasion to visit to Izu Peninsula as “TV program” had come by “Female’s small group”.

(4) Setting Evidence to “Tour package for Kawazu Cherry Tree”

After setting evidence to “Tour package for Kawazu Cherry Tree”, the result is exhibited in Table 9.

Table 9: Setting evidence to “Tour package for Kawazu Cherry Tree” case

Group (More than 7)	++
---------------------	----

We can observe that “Those who put main occasion to visit to Izu Peninsula as Tour package for Kawazu Cherry Tree by tour company had come by **Group (More than 7)** ”.

(5) Setting Evidence to “Internet”

After setting evidence to “Internet”, the result is exhibited in Table 10.

Table 10: Setting evidence to “Internet” case

Male and female’s small group	–
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We can observe that those who put main occasion to visit to Izu Peninsula as “Internet” had not come with (Strong Medium) positive occasion nor positive fellow travelers.

(6) Setting Evidence to “Advice by family, acquaintance”

After setting evidence to “Advice by family, acquaintance”, the result is exhibited in Table 11.

Table 11: Setting evidence to “Advice by family, acquaintance” case

Couple	—
Female’s small group	+
Male and female’s small group	++
Group (More than 7)	++
Budget	+

We can observe that those who put main occasion to visit to Izu Peninsula as Advice by family, acquaintance had come by Female’s small group, **Male and female’s small group or Group (More than 7)** with an objective of visiting (suitable)Budget.

(7) Setting Evidence to “Felt good at the previous visit”

After setting evidence to “Felt good at the previous visit”, the result is exhibited in Table 12.

Table 12: Setting evidence to “Felt good at the previous visit” case

Male and female’s small group	+
Group (More than 7)	--

We can observe that those who felt good at the previous visit had come by male and female’s small group.

4.3 Sensitivity Analysis for “An objective to visit Izu Peninsula”

(1) Setting evidence to “Hot spring”

After setting evidence to “Hot spring”, the result is exhibited in Table 13.

Table 13: Setting evidence to “Hot spring” case

Couple	++
Family	—
Male’s small group	—

We can observe that those who put “Hot spring” as an objective to visit Izu Peninsula had come by “**Couple**”.

(Strong part is indicated by bold font.)

(2) Setting evidence to “Scenery, Nature”

After setting evidence to “Scenery, Nature”, the result is exhibited in Table 14.

Table 14: Setting evidence to “Scenery, Nature” case

Group (More than 7)	—
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We can observe that those who put “Scenery, Nature” as an objective to visit Izu Peninsula had not come with (Strong Medium) positive occasion nor positive objective.

(3) Setting evidence to “Dish, sense of taste”

After setting evidence to “Dish, sense of taste”, the result is exhibited in Table 15.

Table 15: Setting evidence to “Dish, sense of taste” case

Female’s small group	++
Male and female’s small group	+

We can observe that those who put “Dish, sense of taste” as an objective to visit Izu Peninsula had come by **“Female’s small group”** or **“Male and female’s small group”**.

(4) Setting evidence to “Flower of the season”

After setting evidence to “Flower of the season”, the result is exhibited in Table 16.

Table 16: Setting evidence to “Flower of the season” case

Group (More than 7)	— —
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We can observe that those who put “Flower of the season” as an objective to visit Izu Peninsula had come had not come with (Strong Medium) positive occasion nor positive objective.

(5) Setting evidence to “Budget”

After setting evidence to “Budget”, the result is exhibited in Table 17.

Table 17: Setting evidence to “Budget” case

Group (More than 7)	+
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We can observe that “Those who put “Budget” as an objective to visit Izu Peninsula had come by “Group (More than 7) ”.

5 Conclusion

In this paper, a questionnaire investigation is executed in order to clarify tourists' behavior, and to seek the possibility of developing regional collaboration among local government, tourism related industry and visitors. This survey of tourist behavior was carried out in February 2015, during the Kawazu Cherry Blossom Festival). The 25th Kawazu Cherry Blossom Festival was held from February 10 to March 10, 2015. It was attended by 801,330 people, which was an increase of 9% over the previous year. On the first day of the survey, 30-50% of the flowers were in bloom, and the nighttime illuminations lit up on the evening of the 21st. According to the figures of the Kawazu town Tourist Association, there were 30,590 visitors on the 21st and 20,913 visitors on the 22nd.

During the Kawazu Cherry Blossom Festival, around 150 stores were offering food & drink or souvenirs on the road with the row of cherry trees linked to Kawazu Station. A number of events were held during the festival, including the "Semi Gourmet" and "Izu no Odoriko Photography Event."

At around the same time (January 20 to March 31), the 18th "Hina no Tsurushikazari Festival" (Hanging Doll Festival) was held at Higashiizu town Inatori.

In order to look for policies for effective use of questionnaire surveys in tourist destinations, the present study reviewed preceding studies in the field. Moreover, an attempt was made to find possibilities for inter-regional cooperation based on the data.

In the Bayesian Network Analysis, model was built under the examination of the causal relationship among items. Sensitivity Analysis was conducted after that. The main result of sensitivity analysis is as follows.

We can observe that "Those who are Couple had come by the occasion of "Poster" or "Internet" with an objective of visiting Hot spring" or "Convenience of traffic"

We can observe that "Those who are Group (More than 7) had come by the occasion of "Tour package for Kawazu Cherry Tree" or "Advice by family, acquaintance".

We can observe that those who put main occasion to visit to Izu Peninsula as Advice by family, acquaintance had come by Female's small group, Male and female's small group or Group (More than 7) with an objective of visiting (suitable)Budget.

We can observe that those who put "Dish, sense of taste" as an objective to visit Izu Peninsula had come by "Female's small group" or "Male and female's small group".

Thus, we could obtain much more clearer results than those of the one obtained so far. This analysis is well utilized in designing the strategy of service marketing for this.

Although it has a limitation that it is restricted in the number of researchs, we could obtain the fruitful results.

In the future, it will be necessary to continue such surveys at various locations on the Izu Peninsula using a standardized set of questionnaire items and methods, and the efficacy of the study will have to be confirmed.

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APPENDIX 1

Questionnaire about the Tourism in Izu Peninsula

Please select the appropriate item in each column. Please write down the details in ().

Q1. Address : Prefecture ()

⇒If the prefecture is Tokyo, Kanagawa, Shizuoka, then City ()

Q2. Sex : ①Male ②Female

Q3. Age : ①10th ②20th ③30th ④4th ⑤50th ⑥6th ⑦70~

Q4. Occupation : ①Independents ②Office worker ③Student ④Housewife ⑤No job
⑥Miscellaneous ()

Q5. Fellow travelers :

①Solo trip ②Couple ③Family ④Male's small group ⑤Female's small group

⑥Male and female's small group ⑦Group (More than 7) ⑧Miscellaneous ()

Q6. Visiting frequency to Izu Peninsula and Kawazu Cherry Tree :

Izu Peninsula = ①First time ②Second times ③Third times ④Fourth times ⑤Fifth~
Nine

times ⑥More than ten times

Kawazu Cherry Tree = ①First time ②Second times ③Third times ④Fourth times
⑤Fifth~Nine times ⑥More than ten times

Q7. Means of transportation to IZU Peninsula :

①JR, Izu-kyuko train ②Sightseeing bus ③Private automobile ④Rent-a car ⑤Highway bus
⑥Shuttle bus service by the hotel ⑦ Miscellaneous ()

Q8. Means of movement in Izu Peninsula : (Plural answers allowed)

①Walking ②Fixed-route bus ③Sightseeing bus ④Private automobile ⑤Rent-a
car ⑥Taxi ⑦Miscellaneous ()

→To whom who has selected ⑤ : Starting point () End point ()

Q9. Main occasion to visit to Izu Peninsula (Plural answers allowed)

①Poster ②Brochure by tour company ③TV program ④Newspaper ad ⑤Magazine
⑥Tour package for Kawazu Cherry Tree ⑦Online lodging reservation site ⑧Internet
⑨Advice by family, acquaintance ⑩Felt good at the previous visit ⑪Miscellaneous
()

Q10. What is an objective to visit Izu Peninsula? (Plural answers allowed)

①Hot spring ②Scenery, Nature ③Dish, sense of taste ④Flower of the season ⑤Stroll
around town, Eating tour ⑥Budget ⑦Convenience of traffic ⑧Historic landmark,
Literature monument, Construction ⑨Sightseeing facilities ⑩Gallery, Museum
⑪Experience-based tourism ⑫Park ⑬Miscellaneous ()

APPENDIX 2

Calculated posterior probability

name	state	Prior	Fellow travelers							Main occasion to visit to Izu Peninsula									
			Solo trip	Couple	Family	Male's small group	Female's small group	Male and female's small group	Group(More than 7)	Poster	Brochure by tour company	TV program	Newspaper ad	Magazine	Tour package for Kawasumi Cherry Tree	Online lodging reservation site	Internet	Advice by family, acquaintance	Felt good at the previous visit
Fellow travelers	Solo trip	0.024	1	0	0	0	0	0	0	0.06	0.026	0.027	0.094	0.062	0.04	0.071	0.098	0.034	0.027
	Couple	0.337	0	1	0	0	0	0	0	0.375	0.295	0.331	0.317	0.278	0.313	0.402	0.405	0.191	0.334
	Family	0.353	0	0	1	0	0	0	0	0.341	0.324	0.346	0.106	0.209	0.314	0.08	0.258	0.325	0.38
	Male's small group	0.04	0	0	0	1	0	0	0	0.032	0.055	0.042	0.098	0.064	0.042	0.075	0.034	0.053	0.042
	Female's small group	0.099	0	0	0	0	1	0	0	0.1	0.086	0.1	0.103	0.135	0.044	0.157	0.072	0.13	0.089
	Male and female's small group	0.083	0	0	0	0	0	1	0	0.033	0.086	0.085	0.102	0.067	0.087	0.078	0.036	0.129	0.103
	Group(More than 7)	0.056	0	0	0	0	0	0	1	0.032	0.084	0.058	0.1	0.132	0.127	0.076	0.07	0.109	0.014
Main occasion to visit to Izu Peninsula	Poster	0.087	0.25	0.126	0.11	0.083	0.111	0.043	0.063	1	0.114	0.111	0.125	0.118	0.113	0.124	0.128	0.107	0.112
	Brochure by tour company	0.11	0.125	0.115	0.121	0.167	0.111	0.13	0.188	0.132	1	0.129	0.161	0.151	0.143	0.15	0.135	0.141	0.126
	TV program	0.087	0.094	0.094	0.094	0.094	0.096	0.098	0.101	0.092	0.09	1	0.088	0.099	0.101	0.088	0.094	0.09	0.089
	Newspaper ad	0.008	0.125	0.034	0.011	0.083	0.037	0.043	0.063	0.041	0.045	0.036	1	0.054	0.045	0.059	0.047	0.043	0.034
	Magazine	0.028	0.125	0.046	0.033	0.083	0.074	0.043	0.125	0.058	0.064	0.055	0.083	1	0.065	0.076	0.065	0.064	0.05
	Tour package for Kawasumi Cherry Tree	0.059	0.125	0.08	0.077	0.083	0.037	0.087	0.188	0.086	0.094	0.085	0.105	0.1	1	0.096	0.093	0.093	0.081
	Online lodging reservation site	0.02	0.125	0.057	0.011	0.083	0.074	0.043	0.063	0.053	0.055	0.047	0.078	0.066	0.053	1	0.059	0.053	0.045
	Internet	0.079	0.375	0.126	0.077	0.083	0.074	0.043	0.125	0.118	0.108	0.103	0.136	0.122	0.114	0.13	1	0.102	0.101
	Advice by family, acquaintance	0.181	0.25	0.115	0.187	0.25	0.259	0.304	0.375	0.191	0.217	0.199	0.24	0.234	0.217	0.221	0.197	1	0.192
	Felt good at the previous visit	0.244	0.25	0.253	0.275	0.25	0.222	0.304	0.063	0.252	0.245	0.251	0.237	0.231	0.238	0.239	0.244	0.242	1
An objective to visit Izu Peninsula	Hot spring	0.445	0.625	0.552	0.352	0.5	0.407	0.391	0.438	0.455	0.437	0.444	0.465	0.45	0.445	0.475	0.473	0.426	0.441
	Scenery, Nature	0.24	0.5	0.244	0.264	0.25	0.296	0.261	0.188	0.271	0.259	0.262	0.273	0.265	0.257	0.27	0.275	0.262	0.264
	Dish, sense of taste	0.295	0.125	0.287	0.264	0.5	0.407	0.391	0.25	0.296	0.313	0.305	0.327	0.316	0.299	0.327	0.288	0.317	0.306
	Flower of the season	0.669	0.375	0.701	0.703	0.417	0.667	0.696	0.563	0.653	0.643	0.664	0.589	0.616	0.642	0.613	0.635	0.642	0.67
	Stroll around town, Eating tour	0.059	0.125	0.103	0.033	0.333	0.111	0.043	0.063	0.089	0.092	0.084	0.123	0.104	0.087	0.119	0.095	0.087	0.083
	Budget	0.004	0.125	0.011	0.011	0.167	0.037	0.043	0.063	0.035	0.043	0.032	0.067	0.053	0.041	0.056	0.041	0.043	0.03
	Convenience of traffic	0.059	0.125	0.08	0.044	0.333	0.074	0.043	0.125	0.083	0.091	0.08	0.119	0.103	0.089	0.109	0.09	0.088	0.077
	Historic landmark, Literature monument, Construction	0.02	0.25	0.034	0.011	0.25	0.037	0.043	0.063	0.053	0.057	0.046	0.095	0.073	0.056	0.08	0.065	0.056	0.044
	Sightseeing facilities	0.051	0.25	0.023	0.066	0.333	0.074	0.043	0.125	0.076	0.085	0.072	0.115	0.1	0.083	0.097	0.085	0.088	0.069
	Gallery, Museum	0.004	0.125	0.011	0.011	0.167	0.037	0.043	0.063	0.035	0.043	0.032	0.067	0.053	0.041	0.056	0.041	0.043	0.03
	Experience-based tourism	0.008	0.125	0.011	0.011	0.167	0.037	0.043	0.063	0.035	0.043	0.032	0.067	0.053	0.041	0.056	0.041	0.043	0.03
	Park	0.008	0.125	0.023	0.011	0.167	0.037	0.043	0.063	0.039	0.046	0.036	0.071	0.056	0.044	0.061	0.046	0.046	0.034

An objective to visit Izu Peninsula											
Hot spring	Scenery, Nature	Dish, sense of taste	Flower of the season	Stroll around town, Eating tour	Budget	Convenience of traffic	Historic landmark, Literature monument, Construction	Sightseeing facilities	Gallery, Museum	Experience-based tourism	Park
0.038	0.051	0.011	0.015	0.04	0.106	0.042	0.145	0.093	0.164	0.106	0.094
0.411	0.309	0.312	0.349	0.406	0.119	0.331	0.246	0.105	0.017	0.119	0.213
0.274	0.349	0.299	0.367	0.135	0.119	0.189	0.082	0.315	0.049	0.119	0.107
0.048	0.04	0.069	0.027	0.167	0.221	0.175	0.228	0.195	0.458	0.221	0.198
0.092	0.113	0.134	0.1	0.132	0.116	0.092	0.08	0.102	0.053	0.116	0.104
0.075	0.084	0.109	0.089	0.044	0.115	0.046	0.079	0.051	0.031	0.115	0.103
0.057	0.041	0.047	0.049	0.043	0.113	0.09	0.078	0.1	0.088	0.113	0.101
0.114	0.115	0.108	0.11	0.118	0.121	0.114	0.128	0.117	0.134	0.121	0.121
0.127	0.128	0.132	0.125	0.141	0.173	0.146	0.159	0.151	0.201	0.173	0.166
0.096	0.092	0.088	0.088	0.09	0.098	0.095	0.096	0.09	0.093	0.091	0.088
0.038	0.038	0.039	0.032	0.052	0.076	0.053	0.073	0.057	0.104	0.076	0.072
0.055	0.056	0.057	0.051	0.068	0.091	0.07	0.086	0.075	0.112	0.091	0.087
0.085	0.084	0.083	0.082	0.087	0.109	0.094	0.103	0.097	0.12	0.109	0.106

0.051	0.049	0.051	0.044	0.067	0.083	0.064	0.082	0.063	0.106	0.083	0.08
0.11	0.109	0.098	0.099	0.116	0.133	0.116	0.145	0.121	0.157	0.133	0.132
0.191	0.2	0.207	0.193	0.204	0.27	0.217	0.242	0.242	0.293	0.27	0.254
0.249	0.253	0.252	0.253	0.245	0.235	0.239	0.24	0.239	0.235	0.235	0.237
1	0.446	0.441	0.442	0.478	0.449	0.466	0.482	0.439	0.465	0.449	0.46
0.262	1	0.259	0.259	0.263	0.277	0.26	0.286	0.276	0.289	0.277	0.273
0.303	0.303	1	0.302	0.339	0.355	0.333	0.338	0.329	0.393	0.355	0.348
0.661	0.659	0.658	1	0.615	0.543	0.606	0.547	0.581	0.44	0.543	0.56
0.091	0.085	0.094	0.078	1	0.151	0.131	0.155	0.127	0.224	0.151	0.146
0.032	0.034	0.037	0.026	0.057	1	0.06	0.087	0.071	0.141	0.092	0.083
0.084	0.08	0.088	0.073	0.125	0.152	1	0.152	0.131	0.228	0.152	0.144
0.05	0.051	0.052	0.038	0.085	0.126	0.088	1	0.101	0.2	0.126	0.116
0.072	0.076	0.078	0.063	0.109	0.161	0.118	0.158	1	0.063	0.161	0.146
0.032	0.034	0.037	0.026	0.057	0.092	0.06	0.087	0.071	1	0.092	0.083
0.032	0.034	0.037	0.026	0.057	0.092	0.06	0.087	0.071	0.141	1	0.083
0.037	0.037	0.041	0.03	0.062	0.093	0.064	0.089	0.072	0.142	0.093	1

APPENDIX 3

Difference of probability

name	state	Prior	Fellow travelers							Main occasion to visit to Izu Peninsula									
			Solo trip	Couple	Family	Male's small group	Female's small group	Male and female's small group	Group(More than 7)	Poster	Brochure by tour company	TV program	Newspaper ad	Magazine	Tour package for Kawasaki Cherry Tree	Online lodging reservation site	Internet	Advice by family, acquaintance	Felt good at the previous visit
Fellow travelers	Solo trip	0.024	1	0	0	0	0	0	0	0.036	0.002	0.003	0.07	0.038	0.016	0.047	0.074	0.01	0.003
	Couple	0.337	0	1	0	0	0	0	0	0.038	-0.042	-0.006	-0.02	-0.059	-0.024	0.065	0.068	-0.146	-0.003
	Family	0.353	0	0	1	0	0	0	0	-0.012	-0.029	-0.007	-0.247	-0.144	-0.039	-0.273	-0.095	-0.028	0.027
	Male's small group	0.04	0	0	0	1	0	0	0	-0.008	0.015	0.002	0.058	0.024	0.002	0.035	-0.006	0.013	0.002
	Female's small group	0.099	0	0	0	0	1	0	0	0.001	-0.013	0.001	0.004	0.036	-0.055	0.058	-0.027	0.031	-0.01
	Male and female's small group	0.083	0	0	0	0	0	1	0	-0.05	0.003	0.002	0.019	-0.016	0.004	-0.005	-0.047	0.046	0.02
	Group(More than 7)	0.056	0	0	0	0	0	0	1	-0.024	0.028	0.002	0.044	0.076	0.071	0.02	0.014	0.053	-0.042
Main occasion to visit to Izu Peninsula	Poster	0.087	0.163	0.039	0.023	-0.004	0.024	-0.044	-0.024	1	0.027	0.024	0.038	0.031	0.026	0.037	0.041	0.02	0.025
	Brochure by tour company	0.11	0.015	0.005	0.011	0.057	0.001	0.02	0.078	0.022	1	0.019	0.051	0.041	0.033	0.04	0.025	0.031	0.016
	TV program	0.087	0.007	0.007	0.007	0.007	0.009	0.011	0.014	0.005	0.003	1	0.01	0.012	0.014	0.01	0.007	0.003	0.002
	Newspaper ad	0.008	0.117	0.026	0.003	0.075	0.029	0.035	0.055	0.033	0.037	0.028	1	0.046	0.037	0.051	0.039	0.035	0.026
	Magazine	0.028	0.097	0.018	0.005	0.055	0.046	0.015	0.097	0.03	0.036	0.027	0.055	1	0.037	0.048	0.037	0.036	0.022
	Tour package for Kawasaki Cherry Tree	0.059	0.066	0.021	0.018	0.024	-0.022	0.028	0.129	0.027	0.035	0.026	0.046	0.041	1	0.037	0.034	0.034	0.022
	Online lodging reservation site	0.02	0.105	0.037	-0.009	0.063	0.054	0.023	0.043	0.033	0.035	0.027	0.058	0.046	0.033	1	-0.079	0.033	0.025
	Internet	0.079	0.296	0.047	-0.002	0.004	-0.005	-0.036	0.046	0.039	0.029	0.024	0.057	0.043	0.035	0.051	1	0.023	0.022
	Advice by family, acquaintance	0.181	0.069	-0.066	0.006	0.069	0.078	0.123	0.194	0.01	0.036	0.018	0.059	0.053	0.036	0.04	0.016	1	0.011
	Felt good at the previous visit	0.244	0.006	0.009	0.031	0.006	-0.022	0.06	-0.181	0.008	0.001	0.007	-0.007	-0.013	-0.006	-0.005	0	-0.002	1
An objective to visit Izu Peninsula	Hot spring	0.445	0.18	0.107	-0.093	0.055	-0.038	-0.054	-0.007	0.01	-0.008	-0.001	0.02	0.005	0	0.03	0.028	-0.019	-0.004
	Scenery, Nature	0.24	0.26	0.004	0.024	0.01	0.056	0.021	-0.052	0.031	0.019	0.022	0.033	0.025	0.017	0.03	0.035	0.022	0.024
	Dish, sense of taste	0.295	-0.17	-0.008	-0.031	0.205	0.112	0.096	-0.045	0.001	0.018	0.01	0.032	0.021	0.004	0.032	-0.007	0.022	0.011
	Flower of the season	0.669	-0.294	0.032	0.034	-0.252	-0.002	0.027	-0.106	-0.016	-0.026	-0.005	-0.08	-0.053	-0.027	-0.056	-0.034	-0.027	0.001
	Stroll around town, Eating tour	0.059	0.066	0.044	-0.026	0.274	0.052	-0.016	0.004	0.03	0.033	0.025	0.064	0.045	0.028	0.06	0.036	0.028	0.024
	Budget	0.004	0.121	0.007	0.007	0.163	0.033	0.039	0.059	0.031	0.039	0.028	0.063	0.049	0.037	0.052	0.037	0.039	0.026
	Convenience of traffic	0.059	0.066	0.021	-0.015	0.274	0.015	-0.016	0.066	0.024	0.032	0.021	0.06	0.044	0.03	0.05	0.031	0.029	0.018
	Historic landmark, Literature monument, Construction	0.02	0.23	0.014	-0.009	0.23	0.017	0.023	0.043	0.033	0.037	0.026	0.075	0.053	0.036	0.06	0.045	0.036	0.024
	Sightseeing facilities	0.051	0.199	-0.028	0.015	0.282	0.023	-0.008	0.074	0.025	0.034	0.021	0.064	0.049	0.032	0.046	0.034	0.037	0.018
	Gallery, Museum	0.004	0.121	0.007	0.007	0.163	0.033	0.039	0.059	0.031	0.039	0.028	0.063	0.049	0.037	0.052	0.037	0.039	0.026
	Experience-based tourism	0.008	0.117	0.003	0.003	0.159	0.029	0.035	0.055	0.027	0.035	0.024	0.059	0.045	0.033	0.048	0.033	0.035	0.022
	Park	0.008	0.117	0.015	0.003	0.159	0.029	0.035	0.055	0.031	0.038	0.028	0.063	0.048	0.036	0.053	0.038	0.038	0.026

An objective to visit Izu Peninsula											
Hot spring	Scenery, Nature	Dish, sense of taste	Flower of the season	Stroll around town, Eating tour	Budget	Convenience of traffic	Historic landmark, Literature monument, Construction	Sightseeing facilities	Gallery, Museum	Experience-based tourism	Park
0.014	0.027	-0.013	-0.009	0.016	0.082	0.018	0.121	0.069	0.14	0.082	0.07
0.074	-0.028	-0.025	0.012	0.069	-0.218	-0.006	-0.091	-0.232	-0.32	-0.218	-0.124
-0.079	-0.004	-0.054	0.014	-0.218	-0.234	-0.164	-0.271	-0.038	-0.304	-0.234	-0.246
0.008	0	0.029	-0.013	0.127	0.181	0.135	0.188	0.155	0.418	0.181	0.158
-0.007	0.014	0.035	0.001	0.033	0.017	-0.007	-0.019	0.003	-0.046	0.017	0.005
-0.008	0.001	0.026	0.006	-0.039	0.032	-0.037	-0.004	-0.032	-0.052	0.032	0.02
0.001	-0.015	-0.009	-0.007	-0.013	0.057	0.034	0.022	0.044	0.032	0.057	0.045
0.027	0.028	0.021	0.023	0.031	0.034	0.027	0.041	0.03	0.047	0.034	0.034
0.017	0.018	0.022	0.015	0.031	0.063	0.036	0.049	0.041	0.091	0.063	0.056
0.009	0.005	0.001	0.001	0.003	0.011	0.008	0.009	0.003	0.006	0.014	0.001
0.03	0.03	0.031	0.024	0.044	0.068	0.045	0.065	0.049	0.096	0.068	0.064
0.027	0.028	0.029	0.023	0.04	0.063	0.042	0.058	0.047	0.084	0.063	0.059
0.026	0.025	0.024	0.023	0.028	0.05	0.035	0.044	0.038	0.061	0.05	0.047

0.031	0.029	0.031	0.024	0.047	0.063	0.044	0.062	0.043	0.086	0.063	0.06
0.031	0.03	0.019	0.02	0.037	0.054	0.037	0.066	0.042	0.078	0.054	0.053
0.01	0.019	0.026	0.012	0.023	0.089	0.036	0.061	0.061	0.112	0.089	0.073
0.005	0.009	0.008	0.009	0.001	-0.009	-0.005	-0.004	-0.005	-0.009	-0.009	-0.007
1	0.001	-0.004	-0.003	0.033	0.004	0.021	0.037	-0.006	0.02	0.004	0.015
0.022	1	0.019	0.019	0.023	0.037	0.02	0.046	0.036	0.049	0.037	0.033
0.008	0.008	1	0.007	0.044	0.06	0.038	0.043	0.034	0.098	0.06	0.053
-0.008	-0.01	-0.011	1	-0.054	-0.126	-0.063	-0.122	-0.088	-0.229	-0.126	-0.109
0.032	0.026	0.035	0.019	1	0.092	0.072	0.096	0.068	0.165	0.092	0.087
0.028	0.03	0.033	0.022	0.053	1	0.056	0.083	0.067	0.137	0.088	0.079
0.025	0.021	0.029	0.014	0.066	0.093	1	0.093	0.072	0.169	0.093	0.085
0.03	0.031	0.032	0.018	0.065	0.106	0.068	1	0.081	0.18	0.106	0.096
0.021	0.025	0.027	0.012	0.058	0.11	0.067	0.107	1	0.012	0.11	0.095
0.028	0.03	0.033	0.022	0.053	0.088	0.056	0.083	0.067	1	0.088	0.079
0.024	0.026	0.029	0.018	0.049	0.084	0.052	0.079	0.063	0.133	1	0.075
0.029	0.029	0.033	0.022	0.054	0.085	0.056	0.081	0.064	0.134	0.085	1