



CLUSTER ANALYSIS ON SMARTPHONE ADDICTION OF PG STUDENTS

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RESEARCH ARTICLE



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Abstract

Smartphone addiction has become one of the common factors for the students in all levels. The present study aims to find out the important predictors that forms the cluster in smartphone addiction of PG students of Purulia district of West Bengal. It is a Descriptive research following survey type study. The population of this study comprises all the PG students studying in Purulia district of West Bengal. A sum of 140 PG students have been identified as the sample for the study through a simple random sampling technique. “*Smartphone Addiction Scale*” by Kwon et al. (2013) is applied to collect the data. Cluster analysis technique has been applied to analyze the data in SPSS version 26.0. The result revealed that as the number of clusters upsurges, the range of influential predictors enlarges in complexity. Initially, with just two and three clusters, locality and stream emerge as pivotal factors. However, in five clusters, gender has emerged as important predictors besides stream and locality. But in ten clusters, stream, smartphone addiction and locality have become major predictor of clusters, whereas gender, overuse and cyberspace-oriented relationship become the moderate predictors of the cluster.

Keywords: *smartphone addiction, PG students, daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, tolerance, and cluster analysis*

Introduction

The obsessive abuse of mobile devices that characterizes smartphone addiction is typically measured by counting the number of times a person accesses their device or by the amount of time they spend online overall during a given period of time (Hanna and Wigmore, 2024). Utilizing smartphones obsessively is merely one kind of technological addiction. Nonetheless, mobile devices are frequently used to access other technologies that are prone to misuse, such as social networking and gaming. Because smartphones are so portable and easy to carry around, unlike desktop or laptop computers, they are prone to being overused.

The hazards and effects of smartphone addiction on one's physical and mental well-being are substantial. In India, the prevalence of addiction varied from 39 to 44%. Compared to young adults, it was discovered that younger adolescents had a higher prevalence of smartphone addiction. Students were highly likely to be addicted to their smartphones. Some traits that characterise a typical Nomophobe include: never turning off the phone; checking missed texts and calls obsessively; carrying the phone everywhere; using phones at inappropriate times; and passing up opportunities for in-person interactions in favour of phone contact. In severe circumstances, individuals may also have physical side effects as sweating, trembling, panic episodes, rapid heartbeat, hand joint discomfort, back and neck pain, etc. Besides all these, a desktop or laptop computer may cause impulse control issues, but because of their portability and small size, cell phones and tablets allow us to satisfy our compulsive needs whenever and wherever we want. Actually, the majority of us hardly ever leave our iPhones more than five feet away. They can affect your mood and cause the release of the neurotransmitter dopamine, just like using drugs and alcohol. Additionally, you can quickly increase your tolerance to the point where it takes longer and longer to experience the same satisfying result from staring at these screens. Addiction to smartphones can result in a range of issues with impulse control. Firstly, a person may grow so dependent on social media, dating apps, texting, and messaging that they start to value virtual friendships over in-person connections. Secondly, the obsessive use of adult messaging services, sexting, nude-swapping, or pornography online can have a detrimental effect on your general emotional well-being and personal relationships in real life. Thirdly, compulsive online activities like gaming, betting, stock trading, shopping, and bidding on eBay and other auction sites can frequently result in issues with money and employment. Excessive smartphone use is frequently a sign of other underlying issues, like loneliness, stress, anxiety, or depression. However, it can potentially make these issues worse.

In current modern 21st century, educational research has reached to another level. Various new statistical tools are being employed by researchers such as t-tests, correlation, cluster analysis, Mahalanobis distance, Mann Whitney U test etc. Several studies have been found on correlation, such as Gayen, Sen and Adhikari (2023), Das and Mahato (2024b), Mahato and Das (2024), Sutradhar et al. (2023), Gayen and Sen (2021), Sutradhar and Sen (2022a; 2022b), Mahato, Sen and Adhikari (2023), Mahato and Sen (2023b), Sen et al. (2023b), Adhikari, Mahato and Sen (2023), Kar and Saha (2021a; 2021b), Karim et al. (2024), Panda and Sen (2020), Sen, Saha and Maji (2021), Sutradhar and Sen (2021), Saha (2013), Saha (2012b), Mahato, Das and Gayen (2024), Mahato, Gayen and Mahato (2023a; 2023b; 2023c), Gayen (2024), Das, Gayen and Sen (2023a), Das, Mahato and Gayen (2024) etc. Several studies have been found on Cluster analysis, such as Adhikari and Sen (2023a; 2023b), Das and Mahato (2024a), Das, Mahato and Sen (2023), Mahato, Das and Sen (2024), Mohanta et al. (2023a; 2023d), Ansary et al. (2023), Gorain et al. (2022), Sen et al. (2023a), Saha, Sen and Adhikari (2021), Adhikari et al. (2023a; 2023b) etc. Several studies have been done using t-tests such as, Ahmed et al. (2018), Ahmed et al. (2024), Mondal et al. (2014), Gayen and Sen (2022), Ghosh and Sen (2023; 2024), Ansary (2023), Adhikari et al. (2023c), Mahato and Sen (2021a), Mondal et al. (2018), Mahato and Sen (2023a), Mondal and Saha (2023), Saha (2012a; 2021), Karmakar et al. (2016), Mahanti, Mondal and Saha (2016), Sen, Mondal and Saha (2013), Mondal and Saha (2013), Dandapat et al. (2021), Khan et al. (2023), Khatun, Ansary and Adhikari (2022), Ansary, Ansary and Adhikari (2022), Gayen et al. (2021), Rajak and Gayen (2022), Bag et al. (2021), Gayen and Sen (2023a; 2023b), Ansary, Saha and Gorain (2021), Das, Gayen and Sen (2023b) etc. Several studies have been found on Mann Whitney U Test, such as Sen et al. (2021a; 2021b), Halder et al. (2022), Saha and Adhikari (2021), Mahato et al. (2022) etc. Several studies have been found on Mahalanobis distance, such as Mahato and Sen (2021b), Das (2023), Sen and Pal (2020), Ahmed et al. (2022), Adhikari (2023a; 2023b), Mohanta et al. (2023b; 2023c), Sen et al. (2023c), Sen, Pal and Adhikari (2023) etc.

Since cluster analysis is an unsupervised learning approach, the number of clusters in the data is unknown before the model is run. Cluster analysis is usually applied when no assumptions are made regarding the expected linkages within the data, in contrast to many other statistical techniques. The present study deals with cluster analysis using dichotomous variables like gender, stream, locality and research variables like daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance of smartphone addiction of PG students of Purulia district of West Bengal.

Literature Review

According to a study by Gayen and Mahato (2023), among postgraduate students, there is a statistically significant positive correlation between the different aspects of smartphone addiction, such as overuse, tolerance, withdrawal, disruptions in daily life, positive anticipation, and relationships focused on cyberspace. García-Santillán & Espinosa-Ramos (2021) looked at high school pupils in a public school in Port of Veracruz, Mexico, for their study on smartphone addiction. There was no discernible statistical difference in smartphone addiction amongst students who identified as male or female. In a study on smartphone addiction among school-age children (8-12 years old) done during the COVID-19 pandemic, Vyas et al. (2021) discovered a mediocrelly strong correlation between the impacts of smartphone addiction and school-age children in Nadiad City. A study by Singh and Kumari (2021) on youth smartphone addiction and loneliness found a strong, positive correlation between the two conditions among teenagers who plan to attend college. Jabeen, Sarvat, and Hashmi's (2021) study on adult smartphone addiction and family communication found no evidence of a relationship between smartphone addiction and communication inside the family. In addition, people between the ages of 18 and 20 had a greater rate of smartphone addiction than people in other age groups. In Ahmedabad, Gujarat, India, Pandya, Christian, and Patel (2021) studied smartphone addiction in late teens and young adults (ages 15-24). They found that there were significant variations in these people's age groups, daily smartphone usage, typical smartphone usage reasons, streams, and monthly smartphone recharging costs.

Objectives of the Study

To find out the cluster using dichotomous variables like gender, stream, locality and research variables like daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance of smartphone addiction of PG students of Purulia district of West Bengal.

Methodology of the Study

- a. Method: It is a Descriptive research following survey type study.
- b. Population: The population of this study comprises all the PG students studying in Purulia district of West Bengal.
- c. Sample and Sampling Technique: A sum of 140 PG students have been identified as the sample for the study through a simple random sampling technique.
- d. Tools used: "Smartphone Addiction Scale" by Kwon et al. (2013) is applied to collect the data.
- e. Statistic used: Cluster analysis technique has been applied to analyze the data. To analyze the data, SPSS version 26.0 is used.

Results and Discussions

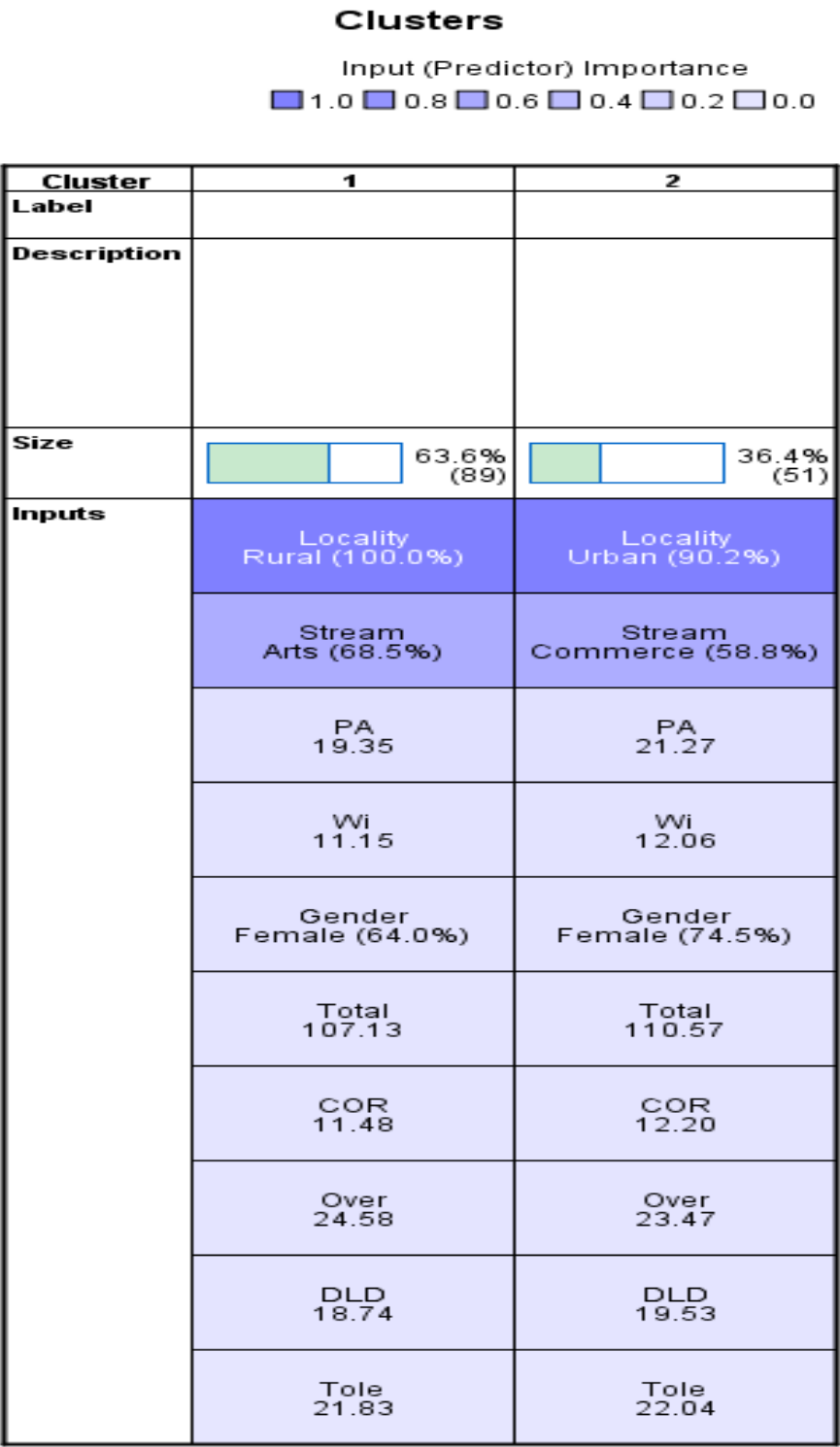


Table 1: Formulation of 2 clusters

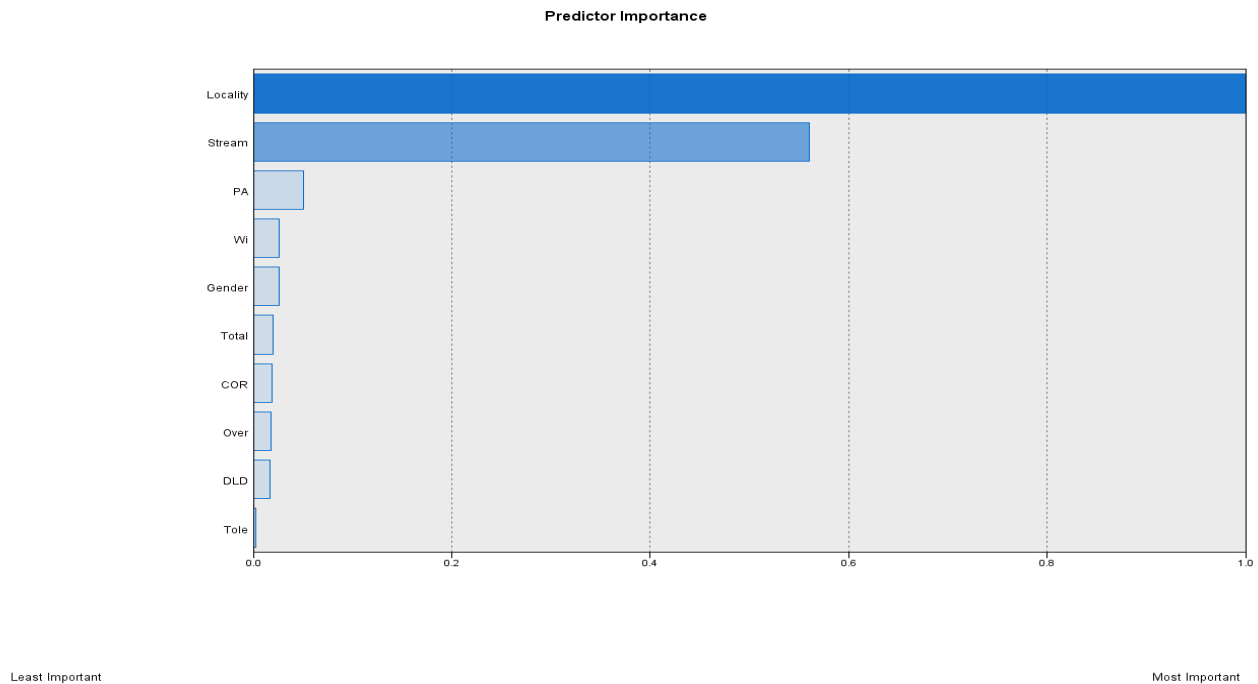


Figure 1: Predictor importance for the clusters described in table

Table 1 represents the clusters formed by PG students in which cluster 1 is consisting of rural PG students (100%), dominated by arts PG students (68.5%), and female PG students (64.0%) and made up of 63.6% of total sample size. Cluster 2 is consisting of urban students (90.2%), dominated by commerce PG students (58.8%) and female PG students (74.5%) and is 36.4% of the total sample size. From figure 1 it is clear that locality and stream are major predictor of clusters, where daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance of smartphone addiction are very low predictors of the cluster.

Clusters

Input (Predictor) Importance
■ 1.0 ■ 0.8 ■ 0.6 ■ 0.4 ■ 0.2 ■ 0.0

Cluster Label	1	3	2
Description			
Size	43.6% (61)	35.7% (50)	20.7% (29)
Inputs	Stream Arts (100.0%)	Stream Commerce (58.0%)	Stream Science (96.6%)
	Locality Rural (100.0%)	Locality Urban (92.0%)	Locality Rural (100.0%)
	Over 26.51	Over 23.64	Over 20.21
	Total 112.28	Total 111.04	Total 95.62
	COR 12.23	COR 12.32	COR 9.72
	PA 20.08	PA 21.42	PA 17.62
	Wi 11.77	Wi 12.14	Wi 9.72
	Gender Female (57.4%)	Gender Female (74.0%)	Gender Female (79.3%)
	Tole 22.69	Tole 22.12	Tole 19.90
	DLD 19.00	DLD 19.40	DLD 18.45

Table 2: Formulation of 3 clusters

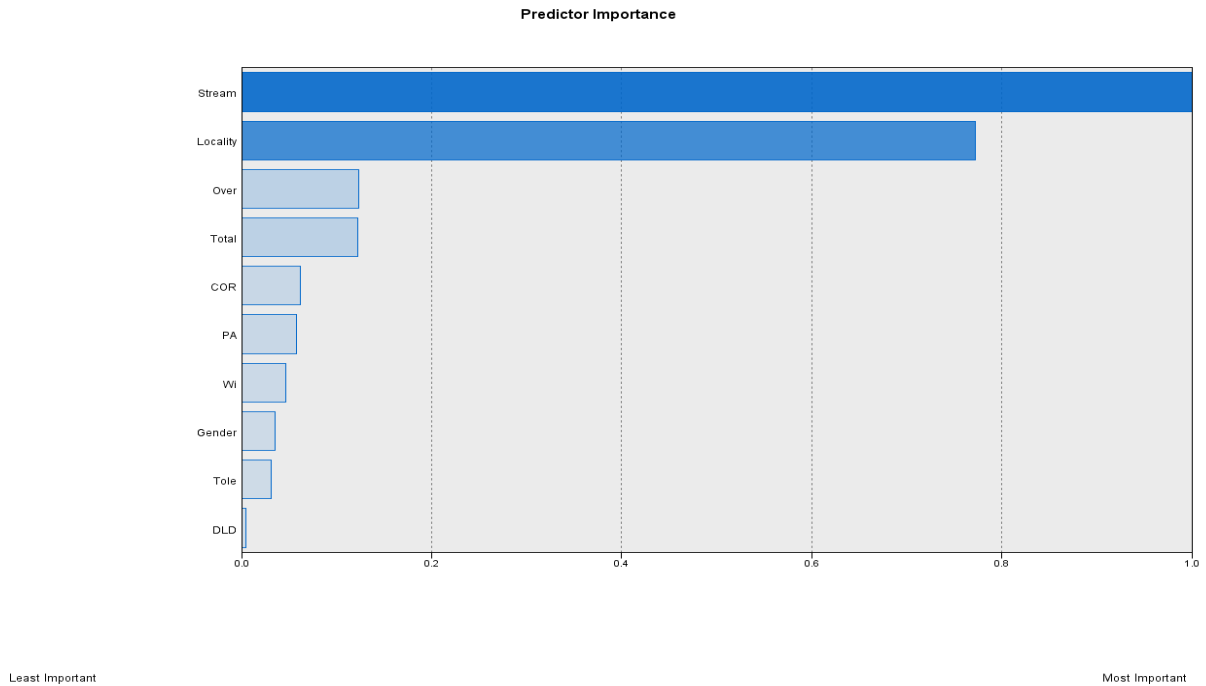


Figure 2: Predictor importance for the clusters described in table

Table 2 represents the clusters formed by PG students in which cluster 1 is consisting of arts students (100%), dominated by rural PG students (100%) and female PG students (57.4%) and is 43.6% of the total sample size. Cluster 2 is consisting of science PG students (96.6%), dominated by rural PG students (100%), and female PG students (79.3%) and made up of 20.7% of total sample size. Cluster 3 is consisting of commerce PG students (58%), dominated by urban PG students (92%), and female PG students (74%) and made up of 35.7% of total sample size. From figure 2 it is clear that stream and locality are major predictor of clusters, where daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance of smartphone addiction are very low predictors of the cluster.

Clusters

Input (Predictor) Importance
■ 1.0 ■ 0.8 ■ 0.6 ■ 0.4 ■ 0.2 ■ 0.0

Cluster	5	3	2	1	4
Label					
Description					
Size	25.0% (35)	21.4% (30)	20.0% (28)	19.3% (27)	14.3% (20)
Inputs	Stream Arts (100.0%)	Stream Commerce (100.0%)	Stream Science (100.0%)	Stream Arts (100.0%)	Stream Science (60.0%)
	Locality Rural (100.0%)	Locality Urban (83.3%)	Locality Rural (100.0%)	Locality Rural (96.3%)	Locality Urban (100.0%)
	Gender Female (100.0%)	Gender Female (73.3%)	Gender Female (78.6%)	Gender Male (100.0%)	Gender Female (80.0%)
	Over 26.80	Over 21.83	Over 20.39	Over 26.15	Over 25.75
	Total 112.60	Total 108.20	Total 95.93	Total 110.78	Total 115.50
	PA 19.71	PA 20.00	PA 17.75	PA 20.37	PA 23.50
	WI 11.11	WI 11.47	WI 9.79	WI 12.52	WI 13.10
	COR 11.77	COR 12.47	COR 9.86	COR 12.59	COR 12.10
	Tole 23.54	Tole 22.27	Tole 19.96	Tole 21.07	Tole 22.35
	DLD 19.66	DLD 20.17	DLD 18.18	DLD 18.07	DLD 18.70

Table 3: Formulation of 5 clusters

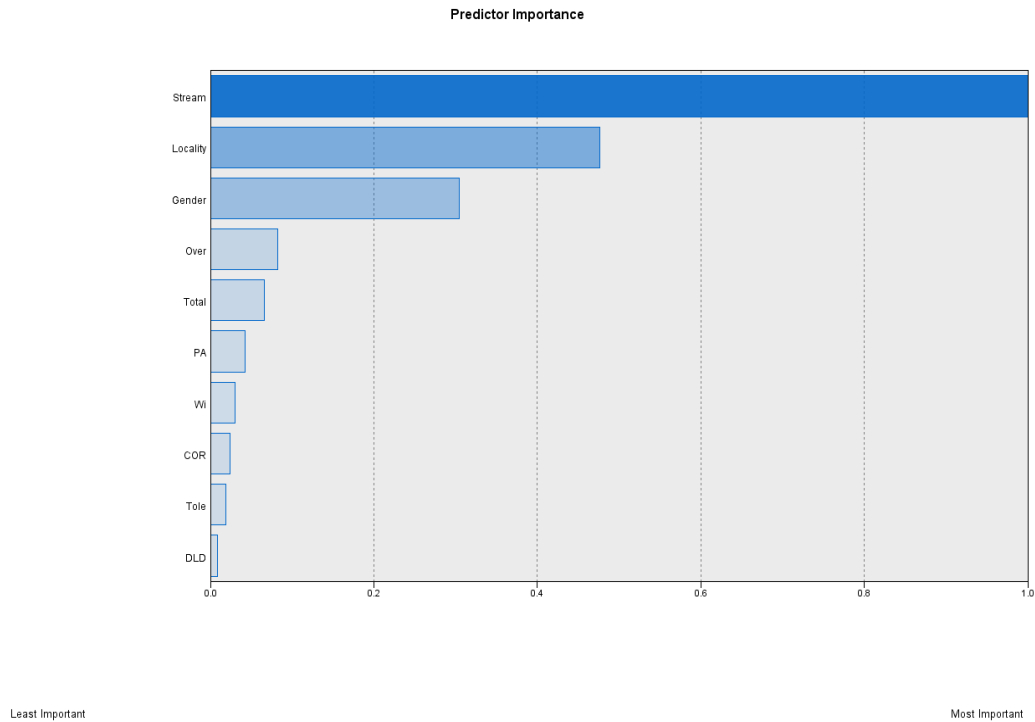


Figure 3: Predictor importance for the clusters described in table

Table 3 represents the clusters formed by PG students in which cluster 1 is consisting of arts students (100%), dominated by rural PG students (96.3%) and male PG students (100%) and is 19.3% of the total sample size. Cluster 2 is consisting of science PG students (100%), dominated by rural PG students (100%), and female PG students (78.6%) and made up of 20% of total sample size. Cluster 3 is consisting of commerce PG students (100%), dominated by urban PG students (83.3%), and female PG students (73.3%) and made up of 21.4% of total sample size. Cluster 4 is consisting of science PG students (60%), dominated by urban PG students (100%), and female PG students (80%) and made up of 14.3% of total sample size. Cluster 5 is consisting of arts PG students (100%), dominated by urban PG students (100%), and female PG students (100%) and made up of 25% of total sample size. From figure 3 it is clear that stream and locality are major predictor of clusters, where gender is the moderate predictors and daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance of smartphone addiction are very low predictors of the cluster.

Clusters

Input (Predictor) Importance
1.0 0.8 0.6 0.4 0.2 0.0

Cluster Label	7	3	4	8	2	9	10	1	6	5
Description										
Size	17.9% (25)	12.1% (17)	11.4% (16)	10.7% (15)	9.3% (13)	9.3% (13)	9.3% (13)	7.9% (11)	7.1% (10)	5.0% (7)
Inputs	Stream Arts (100.0%)	Stream Commerce (100.0%)	Stream Arts (100.0%)	Stream Science (100.0%)	Stream Science (100.0%)	Stream Science (53.8%)	Stream Commerce (100.0%)	Stream Arts (100.0%)	Stream Arts (100.0%)	Stream Science (71.4%)
	Total 104.20	Total 100.35	Total 125.12	Total 82.20	Total 111.77	Total 107.54	Total 118.46	Total 89.91	Total 133.60	Total 130.29
	Locality Rural (100.0%)	Locality Urban (70.6%)	Locality Rural (100.0%)	Locality Rural (100.0%)	Locality Rural (100.0%)	Locality Urban (100.0%)	Locality Urban (100.0%)	Locality Rural (96.9%)	Locality Rural (100.0%)	Locality Urban (100.0%)
	Gender Female (100.0%)	Gender Female (52.9%)	Gender Male (100.0%)	Gender Female (100.0%)	Gender Female (53.8%)	Gender Female (100.0%)	Gender Female (100.0%)	Gender Male (100.0%)	Gender Female (100.0%)	Gender Male (57.1%)
	Over 24.88	Over 18.41	Over 29.62	Over 16.07	Over 25.38	Over 24.85	Over 26.31	Over 21.09	Over 31.60	Over 27.43
	COR 10.32	COR 12.47	COR 14.81	COR 8.07	COR 11.92	COR 10.05	COR 12.46	COR 9.30	COR 15.40	COR 16.00
	PA 18.68	PA 18.00	PA 23.31	PA 15.67	PA 20.15	PA 20.92	PA 22.62	PA 16.09	PA 22.30	PA 28.29
	Wi 10.40	Wi 9.94	Wi 14.75	Wi 8.53	Wi 11.23	Wi 10.85	Wi 13.46	Wi 9.27	Wi 12.90	Wi 17.29
	Tole 21.60	Tole 21.24	Tole 23.75	Tole 17.20	Tole 23.15	Tole 21.77	Tole 23.62	Tole 17.18	Tole 28.40	Tole 23.43
	DLD 18.32	DLD 20.29	DLD 18.88	DLD 16.67	DLD 19.92	DLD 19.15	DLD 20.00	DLD 16.91	DLD 23.00	DLD 17.86

Table 4: Formulation of 10 clusters

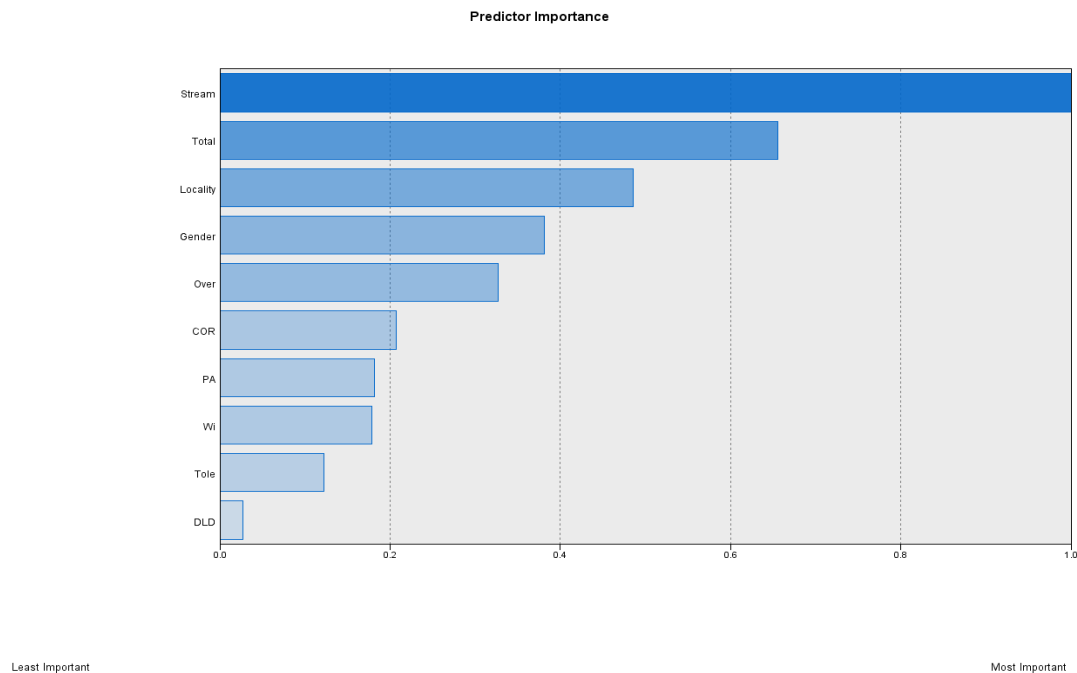


Figure 4: Predictor importance for the clusters described in table

Table 4 represents the clusters formed by PG students in which cluster 1 is consisting of arts students (100%), dominated by rural PG students (90.9%) and male PG students (100%) and is 7.9% of the total sample size. Cluster 2 is consisting of science PG students (100%), dominated by rural PG students (100%), and female PG students (53.8%) and made up of 9.3% of total sample size. Cluster 3 is consisting of commerce PG students (100%), dominated by urban PG students (70.6%), and female PG students (52.9%) and made up of 12.1% of total sample size. Cluster 4 is consisting of arts PG students (100%), dominated by rural PG students (100%), and male PG students (100%) and made up of 11.4% of total sample size. Cluster 5 is consisting of science PG students (100%), dominated by urban PG students (100%), and male PG students (57.1%) and made up of 5% of total sample size. Cluster 6 is consisting of arts PG students (100%), dominated by rural PG students (100%), and female PG students (100%) and made up of 7.1% of total sample size. Cluster 7 is consisting of arts PG students (100%), dominated by rural PG students (100%), and female PG students (100%) and made up of 17.9% of total sample size. Cluster 8 is consisting of science PG students (100%), dominated by rural PG students (100%), and female PG students (100%) and made up of 10.7% of total sample size. Cluster 9 is consisting of science PG students (53.8%), dominated by urban PG students (100%), and female PG students (100%) and made up of 9.3% of total sample size. Cluster 10 is consisting of commerce PG students (100%), dominated by urban PG students (100%), and female PG students (100%) and made up of 9.3% of total sample size. From figure 4 it is clear that stream, smartphone addiction and locality are major predictor of clusters, where gender, overuse and cyberspace-oriented relationship are the moderate predictors and daily-life disturbances, positive anticipation, withdrawal, and tolerance of smartphone addiction are very low predictors of the cluster.

Conclusions

In conclusion, it can be said that the cluster analysis of smartphone addiction of PG students of Purulia district of West Bengal reveals a fascinating pattern. It is showed that as the number of clusters upsurges, the range of influential predictors enlarges in complexity. Initially, with just two and three clusters, locality and stream emerge as pivotal factors. However in five clusters, gender has emerged as important predictors besides stream and locality. But in ten clusters, stream, smartphone addiction and locality have become major predictor of clusters, where gender, overuse and cyberspace-oriented relationship become the moderate predictors of the cluster.

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