

# Prediction of Audience Behaviour Based on Indian Television Channel Market Data Using Genetic Algorithm Simulation

Krishnan Rajamany<sup>1\*</sup>, Gayatri Devi Rajamany<sup>2</sup>

<sup>1\*</sup> Associate Professor, Department of Computer Science and Applications, Krupanidhi Degree College, Bangalore

<sup>2</sup> Assistant Professor, Department of EEE, KCG College of Technology, Chennai

## Article Info

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## Abstract:

Channel ratings directly proportional to audience behaviour towards the entertainment programmes available in channels over India. Advertising agencies broadcast their advertisement based on ratings of the channel. This paper describes the prediction of audience behaviour towards channel entertainment using genetic algorithm. It also focuses on switch over behaviour of audience for viewing channels, age groups and other categories. Results of the genetic algorithm and the existing data of audience behaviour are discussed here.

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## 1. Introduction

India has a largest global market in newspaper circulation, has largest film market based on the viewers and number of films produced; and television sales in second place globally. According to Invest India: National Investment Promotion and Facilitation Agency's 2019 data, India has reached 5<sup>th</sup> place in media and entertainment market in the world. India's broadcasting and distribution industry comprises with 6000 Multi-system operators, 900 satellite television channels, 7 direct to home operators, 60,000 cable operators locally and few internet protocol television service providers. There are 114,820 hardcopy print publishers including newspaper industry and periodicals, 2,500 cinema complexes and extra 450 million internet customers which likely to attain 640 million customers by 2019 in India.

In the year 2019, digital broadcasting of advertisement is predicted to highest compound annual growth rate (CAGR) of 30.2%, whereas all other areas are predicted to grow at a CAGR of 8.0% to 18.0%; and around 2020, advertising media market is predicted to attain \$33.7 billion. From 2016 to 2021, 11.8% CAGR is expecting in entertainment industry, revenue share of 44.20% is expecting in TV industry, 38.10% revenue share is expecting in advertising and 24.0% is expecting in print media.

In connection with industry scenario, by 2021 the Indian Media & Entertainment industry will grow up to \$34.8 billion and expected to grow at the rate of 14% over the period 2016-2021. This sector is expecting an average global value of 4.2% CAGR, with an increase in advertising revenue of 15.3% CAGR in same year. The

market of television is predicted to gain at a CAGR of 14.7% for coming 5 years as profit from both subscription and advertisement are predicted with a strong growth rate of 14.8% and 14.4% respectively.

In tier II and III cities, the printing sectors are predicted to continue its growth at a rate of 7.3%, mainly based on back of regular readership gain in regional language markets and assurance of advertisements in the publishing or printing medium. The film industry sector is predicted to gain at CAGR of 7.7% revenue where as the digital telecast of advertisement is predicted to gain at a CAGR of 32% in the year 2020. Animation with VFX is predicted to gain 20.4% CAGR between 2016 and 2021. As per current industry trends in India from 2014-19, 86 television teleport authorization granted, print industry CAGR is 9.7%, film industry modernized with increasing digitization in display and 3D movies and with mobile VAS (value added services) and 4G lead to paid digital download. Likelihood that advertisement influence consumers to purchase by medium TV/broadcast video 60%, print 45%, online 43%, social media 42%, out of home 31% and radio 30%. Advertisement influences 81% of people with age group between 18 and 34 to make buy and 57% of in the age of 55 and older

Audience behaviour is an important key component of success of the channel. Advertisement will broadcast based on the target rating point (TRP) of the programmes on the channel. TRP prediction will help all stakeholders to take better decision. Audience's behaviour towards the programme directly affects the TRP. So it is essential to predict the audience behaviour. The behaviour of the audience is predicted using the probability based genetic algorithm simulation model. Broadcast Audience Research Council (BARC), India is listing TRP of the programmes

telecasted across India. According to BARC, India, youths 15-30 years, from all India watches serials from 06:00 pm to 12:00 am 56-58% viewership in weekdays. Historical dataset is considered for fixing the probability and also used for fixing the chromosome of the parent in genetic algorithm. The simulation results are depicting the prediction of the audiences

### Literature Review

According to localitics blog, audiences are classified as casual viewer, super fans, multi show viewer, season viewers and viewer based on TRP. The casual viewer prefers series style shows that have episodes, requiring least amount of commitment. Super fan knows when new episodes of favourite shows are available, knows about the character, analyses episodes, and spend time debating theories in online forums. Next category, a multi show viewer tends to keep up with several different shows at once, but considers channel programmes more seriously than casual viewers. Season viewers selecting their time to watch may be night or week end. This viewer prefers watching an entire season by using Amazon Video, Hotstar or Netflix instead of watching daily episodes. Last category is viewers based TRP, relay on television rating and refuse to watch anything under an 80% of rating.

Another way of classification based on time is Type 1: continuously watching TV without changing the channel, Type 2: continuously watching the programme without changing the channel, Type 3: channel switchover if advertisement is telecasted, Type 4: frequent channel switchover and Type 5: watching channels using other medium of telecast

The research work implemented a method for customers to pay based on total duration of watching the TV, so that a proper billing structure generated. This methodology use direct to home

as the use case for explaining the solution and it can be applicable to other broadcast technologies with little modification. This pay by ‘view-time’ provides advantages to consumer, service providers and content providers [1]. Channel logo detection, real time audience measurement, low cost TRP tracking, with good accuracy and visualization are implemented in real time audience measurement tracker. This system visualizes hourly trend report, TRP report of all channels [2].

The News channels compete for good TRP and regular viewership, which turns into an important factor to know the viewers’ expectation and perception about the content of the broadcasted programme so that the channels get a high popularity. This research was carried out in Chennai for evaluating and criticising the news, watching behaviour of customers and to discover the customer’s attitude towards the news channels with reference to knowledge, positioning, program content and how it affect the viewers’ satisfaction point. The survey of 200 respondents using with a structured questionnaire based on objectives. The results point out that there is a high preference in the viewers side for an awareness programme instead of simple telecasted news. More over customers are expecting awareness related to health, travel and lifestyle programmes [3]. The mining of viewer’s behaviour is accomplished by focusing on change points in the TRP data, i.e., the points in time where many viewers change the channel to another or turn the television switch on-mode or off-mode. Well defined descriptions that classified these points which indicate features retrieved from multimedia contents, and then apply different filtering mechanisms are used to extract the inferences and insights of particular patterns. Using this methodology, mining the knowledge is established effectively which extract different categories of viewer’s behaviour. It analyzes the

use of TRP of data in combination with various multimedia content data [4] [5].

**Methodology**

The algorithm used for predicting the customer behaviour is genetic algorithm. Steps in genetic algorithm includes parameters like population size, process of selection, types of crossover, rate of crossover and mutation. The size of the population indicates the number of chromosomes available in each step of generation as shown in Fig1.

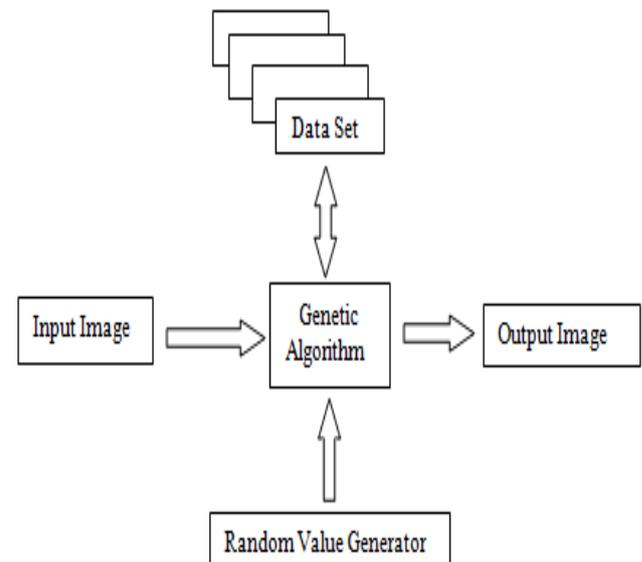


Fig 1: Block Diagram of Genetic Algorithm

The process of selection is carried out to choose the individual chromosomes for next step of iteration or generation. Method for recombining gene information is focused in the crossover process after selection. To reproduce child or string which is better crossover combines the two strings. Two binary strings used for the crossover process is considered are the parents and the resulting strings generated are the offspring respectively as shown in Tab.1.

Tab. 1: Channel Vierership

	St ar Pl us	So ny T V	Z e T	Col ors	S a b T	C N Ne	Sta r Sp ort	ND TV	St ar O n	Sah ara On e
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			V		V	ws	s		e	
Da y1	1	0	1	1	1	1	0	0	0	0
Da y2	1	0	1	1	0	1	1	0	0	0

Now consider Day1 bits are parent A and Day 2 bits are parent B

Uniform crossover: the bits of Parent A & B are verified if both are same, then same value will confirm in child A and B, if it is not same put the gene value as 'x' as shown in Tab 2.

Tab 2: Uniform Crossover

Parent A	1	0	1	1	1	1	0	0	0	0
Parent B	1	0	1	1	0	1	1	0	0	0
Child A	1	0	1	1	x	1	x	0	0	0

Where x is determined based on the randomly generated values. These values are compared with the 0.5 of probabilistic value. Value of x is 0 otherwise value of x becomes 1 based on the generated random number value, above of 0.5 is 1 else 0.

Generate random values and substitute for x, for 100 iterations

Child Generated	A	1	0	1	1	0	1	0	0	0	0
Child Generated	B	1	0	1	1	1	1	1	0	0	0
Child Generated	A	1	0	1	1	0	1	0	0	0	0
Child Generated	A	1	0	1	1	0	1	0	0	0	0
Child Generated	B	1	0	1	1	1	1	1	0	0	0

Child Generated	A	1	0	1	1	0	1	0	0	0	0
Child Generated	A	1	0	1	1	0	1	0	0	0	0
Child Generated	A	1	0	1	1	0	1	0	0	0	0
..... Up to 100 iterations											

The fitness function is done by using the Eq.1  
 $F(i) = \text{Frequent occurrences} / \text{Total iterations}$   
 (1)

After 100 iterations the predicted value is Child A, because fitness value child A is 0.88 and for B is 0.12. Now the predicted value for Day3 from Day1 and Day2. That is the person watching SabTV in Day1 and not watching in Day2, after applying genetic algorithm probability for not watching Sab TV is 0.88. Same logic applies for Star Sports also. The details are shown in Tab 3.

Tab 3: Predicted Result

	S ta r P lu s	S o n T V	Z e e T V	C o l o r s	S a b T V	C N S p o r t s	S t a r S p o r t s	N o t w a t c h i n g	S a h a r a O n e	S a h a r a O n e
Day 1	1	0	1	1	1	1	0	0	0	0
Day 2	1	0	1	1	0	1	1	0	0	0
Day 3	1	0	1	1	0	1	0	0	0	0

**Results and Analysis**

After applying genetic algorithm for this application above 80% of efficiency is achieved

with different data set. The DTH subscribers and GDP year wise as shown in Tab 4

Tab. 4: DTH Subscribers Vs GDP of India

	<b>DTH Millions</b>	<b>GDP of India Trillions</b>
<b>2017</b>	67.56	131.7
<b>2018</b>	69.37	140.7
<b>2019</b>	74.36	150.7

The DTH values are fitted in the linear equation  $9.5x+122.0$  with  $R^2$  value 0.999 and data related to GDP of India are fitted in the equation  $3.4x+63.63$  with  $R^2$  value 0.932, with a correlation of 0.973 and forecast of two years as shown in Fig 2. The forecasted values of DTH in 2020, 2021 are 76 and 80 millions, and forecasted GDP-India values in 2020, 2021 are 155 and 162 respectively.

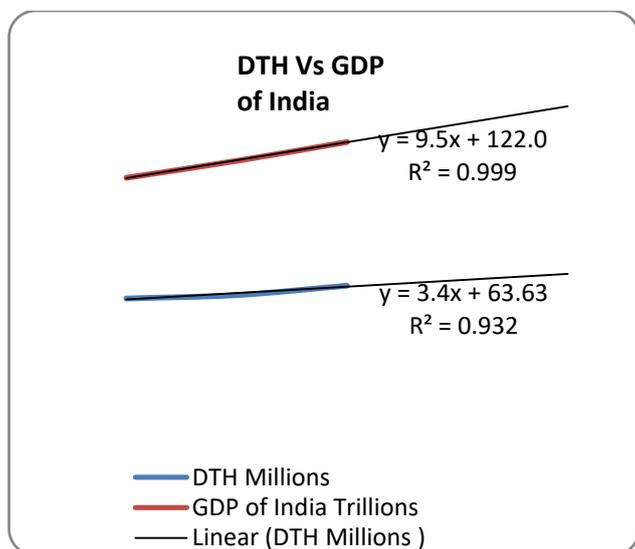


Fig 2: Forecast for 2020 and 2021

Advertising revenue and GDP of India is plotted; correlation between these is 0.966. The forecasted GDP – India values in 2020, 2021 are 3000 and

3150 respectively with  $R^2=0.958$ . The forecasted advertisement revenue- India values in 2020, 2021 are 1100 and 1200 respectively with  $R^2=0.991$  as shown in Fig 3.

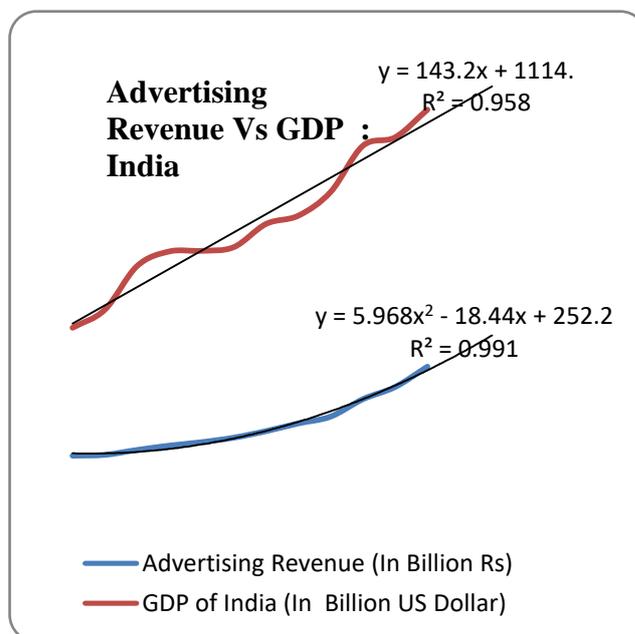


Fig 3: Advertisement Revenue Vs GDP

### Conclusions

After applying genetic algorithm for this application above 80% of efficiency is achieved with different data set. Forecasting of GDP and DTH subscribers in India with good  $R^2$  values are achieved. Forecasting of advertisement revenue Vs GDP are done for two years. Correlation between the GDP with DTH Subscribers and Advertisement Revenue with GDP are found positive correlation.

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