

The study and survey of crowd computing towards solution of future prediction model

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Abstract

Computers provide high degree of accuracy and performance to solve many complex problems efficiently. The major difference between human being and computers are intelligence. Computer have the artificial intelligence, they are totally dependent upon the algorithm and programming code/logic. But human has the emotion and decision making capabilities. Crowd sourcing is a bridge which connects human perceptions with machine learning. Crowd sourcing is the most popular tool for engaging people in journalism, crowd funding, urban planning, democratic process and other social welfare development activities. It can collect variety of innovative ideas as well as knowledge from distributed heterogeneous users to solve complex scientific problems and non algorithmic real world problem. The main aim of this paper is to blend machine learning technology with crowd sourcing to solve a problem. Computers can solve algorithmic problem efficiently and accurately but they are unable to participate in decision making procedure. Crowd computing is a method which utilise human perception, intelligence and ability to understand the complexity of the real world problem. The paper is based on GWAP model of crowd sourcing to predict the result of two matches of FIFA 2014.

Keywords: *Crowd computing, Future prediction model, GWAP, crowd sourcing, non-algorithmic problem.*

I. Introduction

Crowd computing is a technique to solve a problem through computer system by utilising human perception and their ability to solve real life problems. In this approach a group of humans participated to solve a problem that cannot be solved by individuals or computers. Nowadays there are many problems which are trivial for humans but can challenge efficient computer systems. Suppose there is a problem of finding a ship in an ocean. Satellite sends lots of pictures of ocean, may be 50 thousands in numbers. Now the task is to check all the pictures and find the ship. Though computer system is efficient today but finding an object from an image is not very easy task. But it is very easy for a human to find an object from an image. It is very tough task for an individual to check all the images sent by the satellite. If we distribute the images to a group of humans

or crowds and ask them to find the ship from an image then it becomes very easy. So with the help of a group of humans the problem is solved very easily. So the crowd computing utilizes human's understanding and intellectual abilities to solve non-algorithmic problems. Crowd sourcing means a group of people who are asked to do a collective task which is impossible for an individual. One of the best examples of crowd computing is Wikipedia, in which thousands of internet users participate to make largest encyclopaedia in world.

It is expected that crowd sourcing change the future world of economy and business. According to a survey of crowd sourcing Jafar Mohammadi and Hamid R. Rabiee[2] mentioned the important applications of crowd sourcing. They are: creation, standby human resources, R&D, crowd funding, forecasting, organization and crowd computing or collective intelligence.

There are many drawbacks in crowd computing. All the participating humans are not experts and their knowledge is limited. Moreover human decision may be erroneous and noisy. So the solution suggested by the crowd is not always perfect. Further there is no existence of generative model which can predict the answers of future problem.

In this paper we are introducing a model for predicting answers of future problems.

Recently by using this model we have been successful on predicting the results of final match and third place deciding match of FIFA football world cup 2014.

II Necessity of Crowd Computing

Computers are very fast, efficient and accurate in computation. But they are not capable of realises world environment as well as human being. Computers can solve algorithmic problem efficiently. If they are aware about the steps of processes then they can solve a problem easily. But they have no powers to take decision. In the other words computers are not efficient to solve non-algorithmic problem. On the other hand human being cannot compute as fast and accurate as computers although they understand the world more efficiently than computers. There are two main reasons for which the computers cannot be used to solve all problems – (i) It is not possible to console a computer system the real world situation. There is a huge difference between the intelligence of human and computer system. (ii) Recent computers only operate the algorithmic methods [2]. They cannot be operated on non-algorithmic problems.

Crowd computing combines both human perception, brain power and computer's accuracy and speed to solve non-machine

solvable problems. Crowd computing can be solved the problem with the help of the human conciseness and human common sense.

III How to compute crowd

All problems in crowd computing system are divided into sub problems. Some of them are solved by the computers and some of them are solved by human through their intelligence. The solutions given by human being are erroneous, noisy and biased. A checking mechanism is required to remove noise, biasness from human solutions. Finally the solution from the human being and computers are integrated to produce final solution. There are several models in crowd computing. They are Multipurpose Checking, Games with a Purpose (GWAP) [1], Iterative or Collaborative task etc. In the case of GWAP designers are trying to make a game in order to solve the problem. Then human are asked to play the game and the activity of the human in the game leads to a solution of the problem. This model is quite useful because it can attract crowd to participate in the crowd computing. The problems having undernoted features can be solved by the crowd computing [2].

i) The problem should be divided into independent sub problems. Sub problems can be solved in parallel. They should be static in time.

ii) A large no of non machine solvable problems can be solved by the human.

iii) There should be a short group of expert people who will integrate the sub problems to solve the main problem.

iv) There should be feasible method for dividing the whole problem into sub problems and for integrating the solutions.

Three steps which are needed to design a typical crowd computing system. They are given below [2]

- *Defining the system strategies:* Designer should define the strategy to solve the problem. The strategy selection means selecting the crowd computing models.
- *Generating the Sub-problems:* The main problem is divided into several sub problems. The sub problems should be solved in a finite time. The sub problem creation is the most important step.
- *Designing and optimizing the process:* In order to get the best result the biasness, errors should be removed from the humans' solution. An optimized process is required to remove errors from the sub problems.

IV The Game

With the help of the crowd sourcing we built a crowd computing application to predict the winner of the FIFA football world cup 2014 matches. To predict the winner of a match is not a problem which can be solved by efficient computer system because it is a non-algorithmic problem. There are no such step by step processes or algorithms to solve this problem. So, computers cannot solve the problem and human intelligence must be needed to solve this problem. We were able to solve the problem to make a game. The game is very simple and can be played by any person. The player of the game has to answer some questions related to football and submit the answer.

A. Methodology

Since there are no such models in predicting the answer of future problem we are using GWAP model of crowd sourcing. In this model designers of the system embed the problem into game and asked the crowd to play the game. Humans are playing the game to solve the problem. This approach is useful to attract people to take part for solving a problem. In order to solve a crowd sourcing problem designer should divide the problems into sub problems which can be solved by the human with general knowledge and common sense. The sub

problems are the part of the game. By analyzing the performance of the participants of the game, designers are able to solve the original problem. An optimizing process is required to verify humans' solutions.

Our game was very simple. We selected some questions related to football and asked people to answer the questions. The selection of the question was very important. All participating people were not expert. So there were chances for noisy, erroneous result of the questions. With that there might be chance of biasness. The blind supporters of a team always wish their team will win. So the prediction will be erroneous. So we had to face the challenge to execute the people's intelligence. The questions were set to judge the participating people. So we arranged the questions for computing the participant's intelligence. There were three types of questions – The questions to predict the participant's mind, the questions to predict the knowledge about football of the participant and last one was the "Who will win the match today". The biasness of the participant was predicted by the first type of questions. The second type questions were asked to make the people's solution error free and noise free. Then the questions were distributed among crowd. There was a task for designers to motivate the crowd to

participate the game. The answers of individual were collected in a database. Then a marking system was introduced to validate the participants answer set. The error free, low biased answer set got the highest marks and erroneous, biased answer set got lowest number. After analyzing the scored by the participants we were able to predict the winner.

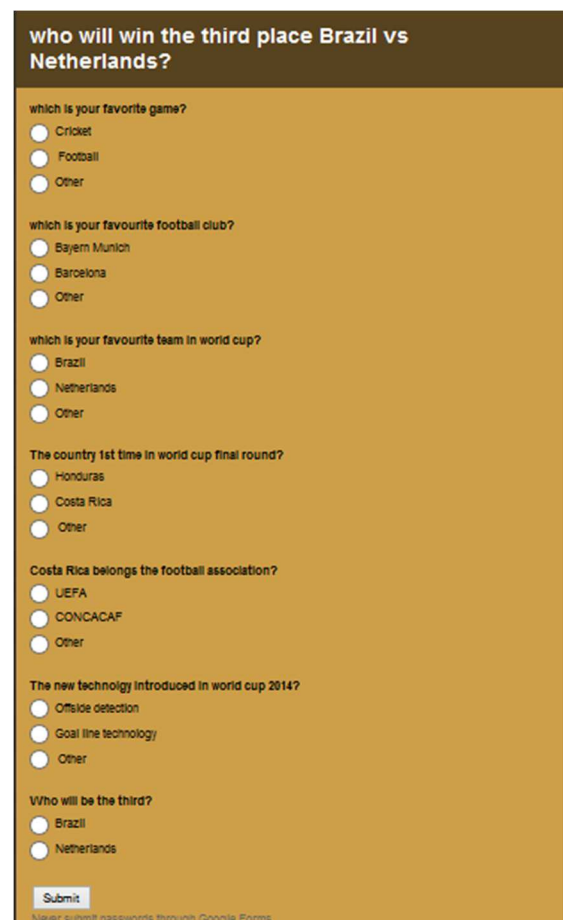
B. Implementation

We implemented the game with simple things available in internet. We used Google drive to make the question sheet. Google drive has the feature to store the individuals result in excel sheet. We were using facebook to distribute the question sets among people. As we all know, facebook is a great place to interact with a lot of people. So we selected facebook to reach to the crowd. The answers given by the people were collected in an excel sheet and it could be viewed to enter in the google drive account. After getting answers of the questions we checked the answers and marked them. Each participant scored marks as his/her performance and mentality. Suppose there are two team named team A & team B. We calculated the total marks scored by the participants who predict team A would be the winner. Then we divide it with the no of participants. So we got the average marks of the participants

for both the team. The teams which got higher average marks ultimately won the Final and third place deciding match. This marks system was introduced to validate the participant's prediction. The satisfactory thing was that we were able to successfully predict the winner of two matches by using the game.

V Experiment & Result

We predicted about the result of two games of FIFA world cup 2014. The third place deciding match held between Brazil and Netherland and the final match held between Germany and Argentina.



The screenshot shows a Google Form titled "who will win the third place Brazil vs Netherlands?". The form contains several multiple-choice questions:

- which is your favorite game?
 - Cricket
 - Football
 - Other
- which is your favourite football club?
 - Bayern Munich
 - Barcelona
 - Other
- which is your favourite team in world cup?
 - Brazil
 - Netherlands
 - Other
- The country 1st time in world cup final round?
 - Honduras
 - Costa Rica
 - Other
- Costa Rica belongs the football association?
 - UEFA
 - CONCACAF
 - Other
- The new technology introduced in world cup 2014?
 - Offside detection
 - Goal line technology
 - Other
- Who will be the third?
 - Brazil
 - Netherlands

At the bottom, there is a "Submit" button and a note: "Never submit passwords through Google Forms."

Figure 1 The questions asked for the third place deciding match.

For the third place deciding match, the question set is shown in figure1. There are three types of question. The questions were

—

	C	D	E	F	G	H	I	J
1	which is your favourite footba	which is your favourite team in world cup?		The country 1st time in w	Costa Rica belongs the fo	The new technology introdu	Who will be the third?	
2	Barcelona 10	Netherlands 6		Other 10	CONCACAF 10	Goal line technology 10	Netherlands	51
3	Barcelona 10	Netherlands 6		Other 10	CONCACAF 10	Goal line technology 10	Netherlands	56
4	Other 8	Brazil 6		Costa Rica 0	CONCACAF 10	Goal line technology 10	Brazil	39
5	Barcelona 6	Other 8		Other 10	Other 0	Goal line technology 10	Brazil	39
6	Barcelona 6	Other 8		Costa Rica 0	Other 0	Goal line technology 10	Netherlands	29
7	Barcelona 10	Netherlands 6		Other 10	CONCACAF 10	Goal line technology 10	Netherlands	56
8	Other 8	Other 8		Costa Rica 0	UEFA 0	Offside detection 0	Netherlands	26
9	Barcelona 0	Brazil 0		Other 10	Other 0	0		
10	Barcelona 6	Brazil 6		Other 10	Other 0	Other 0	Brazil	27

Figure 2 The first 10 responses with given marks for the third place deciding match

1. Which is your favourite game?
2. Which is your favourite football club?
3. Which is your favourite team in world cup?
4. The country 1st time in world cup final round?
5. Costa Rica belong the football association?
6. The new technology introduced in world cup 2014?
7. Who will be the third?

The top three questions were set to read the mental strength of the player, the next three questions (SL NO. 4-6) were set to study their knowledge about football and final question was about to predict the result of the match.

In the figure 2 various responses of first 10 respondents are shown. The responses were

collected and marks obtained by respondents were entered in the excel sheet. For the first question if the result is cricket the respondent got less mark than the

if the result is cricket the respondent got less mark than the respondent giving the answer football. The respondent, who likes football, must have more knowledge than



Figure 3 The question set for final match

others about football. The next two questions were set to check the biasness of

the respondents. The supporters of a team always hope for victory of their team. So the respondents, who gave the answer “other”, got highest marks. The questions 4-6 were asked to check the knowledge of respondents about football. If answers were correct then respondents got full marks else 0.

For the final match, the question set is shown in figure 3. There are 8 questions. The questions were as follows.

First three were asked to decide the mentality of the respondent. Next four tested the knowledge of the respondents about football and last question was the actual question. The responses of first 10 respondents are shown in figure 4. The marks giving system was same as 3rd place deciding match. It was predicted that Germany would won and finally Germany was the champion of FIFA football world cup 2014.

VI Conclusion

1	Timestamp	Which is your favo	What is your Favo	which is your favo	Australia belongs	Position played in ser	A player is in an offside position if	The term "Super Sub" refe	Who will be the champion	
2	7-11-2014 9:01:09	Football	10	Barcelona 6	Argentina 6	AFC 10	Other 10	He is nearer to his opponents' goal line than both the	Substitution who saves th	Argentina
3	7-11-2014 9:16:18	Football	10	Other 8	Germany 6	CAF 0	Attacking 0	He is nearer to his opponents' goal line than both the	A substitution made after	Germany
4	7-12-2014 7:33:06	Cricket	05	Other 8	Brazil 8	CAF 0	Other 10	He is nearer to his opponents' goal line than the secon	A substitution made after	Germany
5	7-12-2014 9:27:51	Cricket	05	Other	Germany	AFC 10	Midfielder 0	He is nearer to his opponents' goal line than the second-last opponent		
6	7-12-2014 9:29:07	Cricket	05	Barcelona 10	Germany 6	AFC 10	Forward 0	He is nearer to his opponents' goal line than both the	Substitution who score gc	Germany
7	7-12-2014 9:29:53	Cricket	05	Barcelona 10	Germany 6	CAF 0	Forward 0	He is nearer to his opponents' goal line than the secon	Substitution who score gc	Germany
8	7-12-2014 10:15:52	Cricket	05	Other 8	Brazil 8	AFC 10	Forward 0	He is nearer to his opponents' goal line than both the	A substitution made after	Germany
9	7-12-2014 8:16:50	Football	10	Bayern Munich 6	Germany 6	AFC 10	Other 10	He is nearer to his opponents' goal line than both the	Substitution who saves th	Germany
10	7-12-2014 8:17:21	Cricket	05	Other 8	Brazil 8	AFC 10	Forward 0	He is nearer to his opponents' goal line than the secon	Substitution who score gc	Argentina
11	7-13-2014 9:49:04	Cricket	05	Barcelona 6	Argentina 6	AFC 10	Midfielder 0	He is nearer to his opponents' goal line than both the	Other	Argentina

Figure 4 Responses for the final match with marks

1. Which is your favourite sport?
2. What is your Favourite Football club?
3. Which is your favourite team in world cup?
4. Australia belong the football association (in world cup 2014)?
5. Position played in semi final by Muller (Germany)?
6. A player is in an offside position if...
7. The term "Super Sub" refers that ..
8. Who will be the champion of world cup 2014?

the satisfactory result. But the pitfall of this experiment is we could not motivate large section of public for participate in this game. As a result of which the sample size is not satisfactory. We will have to involve more people and motivate them for participation in this game. Another drawback is we have conducted only two experiments to judging the quality of participants. The game study titled as “Who will win the FIFA world cup 2014” was undertaken small group of people. If

the sizable group of public could be engaged in this process, the experiment would have been more successful. As we have said earlier that there is no standard model for predicting the answer of future prediction model still we hope this game make thing easier to solve the problem through future prediction model.

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