K. J. Somaiya Institute of Management Studies & Research

JULY 2012 *Volume 3: Issue 3*

Quantinuum Newsletter

Quantinuum -
The Quants Forum

Its all about NUMBERS...

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JULY 2012 VOLUME 3:ISSUE 3

From the Mentor's Desk...

Hi All,

We are happy to announce that Quantinuum has become an exclusive committee and we are very satisfied with the good response from the students. Our first batch of juniors has arrived and we welcome the members from PGDM, PGDM-IB, FS, RM & IMC. We still will be recruiting members from other batches coming in.

We are constantly striving to improve the content of newsletter and Book review has become a regular feature with this month Book Review's covering "Outlier". While standard Quantitative analysis tries to identify the outliers and exclude them from the data, Malcom Gladwell take is all about giving due importance to Outliers. The issue also carries regular feature like Main story, News digest, quant puzzle etc .

We welcome suggestions for further improvement.
Happy reading.

Regards
Prof N.S.Nilakantan

TEAM QUANTINUUM

MAIN STORY: THE "GOD PARTICLE"

The Higgs boson is a harder word for people to identify. It is perhaps better known by its rather glamorous nickname: the "God particle."

The history of the name is itself an accident. In 1993 when American physicist Leon Lederman was writing a book on the Higgs boson, he dubbed it "the goddamn particle." An editor suggested "the God particle" instead because it is powerful and everywhere, yet so hard to find. But in fact, many scientists, including the physicist for whom it is named, dislike the term.

So, what is the "God particle" about? It explains why particles have mass and in turn why we exist. Without it, the universe would have no physical matter, and it will have only energy.

Mooted by Higgs and several others, the boson is believed to exist in a treacly, invisible, ubiquitous field created by the Big Bang some 13.7 billion years ago. When some particles encounter the Higgs, they slow down and acquire mass, according to the theory. Others, such as particles of light, encounter no obstacle.

CERN uses a giant underground laboratory where protons are smashed together at nearly the speed of light, yielding sub-atomic debris that is then scrutinized for signs of the fleeting Higgs. The task is arduous because there are trillions of signals, occurring among particles at different ranges of mass. Over the years, tens of thousands of physicists and billions of dollars have been thrown into the search, gradually narrowing down the mass range where it might exist.

Two CERN laboratories, working independently of each other to avoid bias, found the new particle in the mass region of around 125-126 Giga electron volts (GeV), according to data they presented on July 4th.
Both said that the results were "five sigma," meaning there was just a 0.00006 per cent chance that what the two laboratories found is a mathematical quirk.

When the scientists announced it on July 4th, History was then feted with beer and champagne. Scientists began to pore over what the find could mean.

But one thing the July 4th discovery did is it reignited the debate over the universe's origins. When the physicists claim that they have found out the origin of universe, religious believers see things differently. They say "It only strengthens the notion that the universe comes out of a nothingness which is everything".

This much is true: Higgs bosons which permeate the universe help us understand how something comes from nothing.

SABARI NATHAN
PGDM – FINANCE
2011-13 BATCH

A TRIBUTE TO ALAN TURING

Alan Mathison Turing (June 23, 1912 - June 7, 1954) was a British mathematician, logician, and cryptographer. Turing is often considered to be a father of modern computer science.

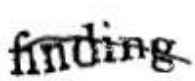
Turing provided an influential formalisation of the concept of the algorithm and computation with the Turing machine, formulating the now widely accepted "Turing" version of the Church-Turing thesis, namely that any practical computing model has either the equivalent or a subset of the capabilities of a Turing machine.

In 1936, as a prodigious mathematician at the age of 23, Turing published a paper that laid out the basic framework of the modern computer. It was a by-product of an altogether different goal, a theoretical tool for tackling - technically reformulating - a long-standing puzzle of mathematics known as the Entscheidungsproblem- the quest for a sort of algorithm, one by means of which the validity or provability of any argument can be determined. Turing proved the problem could not be solved - but he gave the Turing Machine in the process. This was a mathematical model of digital computing that has completely withstood the test of time. Turing had no intention of building the machine - and might not have even fully grasped the importance of what he had done. But with the onset of World War II, his theoretical work soon took on life-or-death dimensions. At the now famed Bletchley Park in Buckinghamshire, England, Turing directed his faculties to code breaking. He was the mastermind behind the Turing Bombe, an electronic device designed to ascertain the continually changing settings of Germany's Enigma encryption machines. They could decrypt secret messages discovered, revealing critical military secrets. The Turing Bombes were deciphering thousands of military intercepts every day: processing information, that is, on a scale never before seen."

After the war, Turing went on to design pioneering computers and software at the National Physical Laboratory and the University of Manchester. In 1950, he wrote a seminal paper on thinking machines, or what would later be called artificial intelligence.

The "Turing test" is a rallying point for artificial intelligence, driving the field forward. Conversation bots are evaluated each year against his benchmark at the Loebner Prize competition. At the same time, computer scientists have hit upon better uses for the AI that Turing envisioned, by leveraging computing powers that supersede rather than mimic human abilities. Simultaneously translating across dozens of languages, for example, or sorting and searching the corpus of human knowledge.

All of us would have encountered the random alpha-numeric combination during online transactions. This popular and ubiquitous security test, widely known as **Captcha**, requires us to enter characters that we are



A TRIBUTE TO ALAN TURING contd..

shown to convince the system that we are human. Technologists know this as a reverse Turing test. Short for 'Completely Automated Public Turing test to tell Computers and Humans Apart', Captcha is the converse of the Turing test.

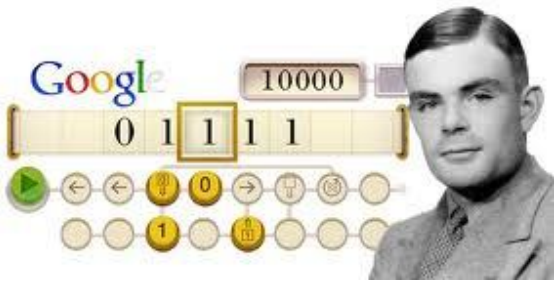
Two years after Turing's landmark paper, he was arrested and prosecuted for acts of "gross indecency." He committed suicide subsequently.

The tragedy of his arrest and death were compounded as his contributions to computer science and top-secret war efforts were ignored or misattributed for years.

The scientific world, at least, has honoured him with the redemption he deserves. The Turing Award is considered the highest honour in computer science. The field's practitioners have declared 2012 the Alan Turing Year.

Normally when Google creates Doodle, it uses its brain to create art that everyone can grasp and feel. However on 100th birthday of Alan Turing on June 23rd, 2012 it created a conundrum that majority of humanity simply won't understand. This was done with a series of 1's & 0's and arrows pointing to left and right.

Alan Turing Google Doodle - 23th June 2012



ABIN ABRAHAM
PGDM – OPERATIONS
2011-13 BATCH

QUANTS NEWS DIGEST

Traveling Salesman: A Seemingly Unsolvable Problem Offers a Glimpse of the Limits of Computation
The travelling salesman problem (TSP) is a problem in combinatorial optimization studied in operations research and theoretical computer science. Given a list of cities and their pair-wise distances, the task is to find the shortest possible route that visits each city exactly once and returns to the origin city. The task of finding not just a good route but the guaranteed shortest is the long-standing challenge known as the travelling salesman problem, or TSP for short.

Finding a method that can quickly solve every example of the TSP would be a stunning breakthrough in mathematics. Using complexity theory, such a method would allow us to solve efficiently any computational problem for which answers can be easily verified. Most mathematicians expect this to be impossible.

A tool called linear programming allows us to find the quickest way around the specific locations. This is done by assigning fractions to roads that join pairs of cities rather than deciding immediately whether to use a road or not. In this model, it is perfectly fine to send half a salesman along both branches of the fork. The process begins with the requirement that, for every city, the fractions assigned to the arriving and departing roads each sum to 1. Then, step by step, further restrictions are added, each involving sums of fractions assigned to roads. Linear programming eventually points us to the best decision for each road and thus the shortest possible route.

Note: - For more details, please refer http://www.scientificamerican.com/article.cfm?id=case-traveling-salesman-unsolvable-limits-computation

The Tories' manipulation of education statistics
Topology is the branch of mathematics concerned with the geometric deformations of objects. According to its rules, a certain type of flat square - in which opposite edges have been mathematically linked - is equivalent to a holed-doughnut, or torus, because one can easily be turned into the other. First, form a cylinder by joining the top edge of the square to the bottom edge, then bend that cylinder into a circle and join its two open ends.

There is just one problem: for the two ends to meet, the torus must be stretched in a way that distorts the original shape of the square. Any horizontal lines on the original square will be stretched on the torus, while vertical lines will remain the same.

To visualize the shape of this torus, a shrunken version of the regular, smooth torus was taken and the surface was wrinkled in the horizontal direction, increasing the length of just the vertical lines. Then further wrinkles were applied in other directions until the lengths of both vertical and horizontal lines are equal to the lengths of these lines on the square. This resulted in a bizarre-looking torus.

The method of wrinkling is known as convex integration theory.

Note: - For more details, please refer http://www.newscientist.com/article/dn21760-wrinkled-doughnut-solves-geometrical-mystery.html

QUANTS NEWS DIGEST contd....

Coming Soon: The New York City Math Museum
New York's newest museum is anything but formulaic

For everyone who finds mathematics incomprehensible, boring, pointless, or all of the above, New York Museum will prove you wrong. The whole point of Manhattan's Museum of Mathematics which will be opening in few months, has what many consider a tough mission: teaching kids that math is exciting.

Glen Whitney, who raised a huge sum to build this museum, calls a "safe place to love math." It will whole new experience and inspiration for students to explore many things in an exciting way.
Note: - For more details, please refer http://www.smithsonianmag.com/science-nature/Coming-Soon-The-New-York-City-Math-Museum.html

EDITORIAL TEAM

BOOK REVIEW: OUTLIERS

Outliers: The Story of Success by Malcolm Gladwell, November 2008

Outliers is all about being successful, but it's different in its approach, because it doesn't discuss what you can do to be successful, it instead covers all of the things you can't change that are responsible for success. The entire book investigates the environmental and circumstantial factors that influence the success of a person.

"Story of Success", is a very apt description here because the book is filled with case studies of successful people and stories. He explains all of the external factors that helped the various personalities succeed.
The most interesting part about this book is that it is entirely about things that are essentially unchangeable. One of the things we can't do is to go back and change the circumstances and situations of our upbringing.

Some of the key learning's are:-

Hard work is critical to success, **but**,
Successful people were often lucky to be in the right place at the right time, **AND**
10,000 hours of working on skills seems to be a rule of thumb.
Customize your environment- our environment and surroundings matter, not all of these will be under your control but some will be under your control.
Don't get stuck- small factors can influence the outcome of our life, and important decision we can take in our life is to look for these factors and work at changing them.

One thing that author feels strongly is the value of expertise, and "how it takes approximately 10,000 hours to become an expert". Many of the most successful people had their 10,000 hours of experience just at the right time and right place to create a business from it so that they were perfectly positioned. We may not have the timing perfectly correct, but it is important to think about what we want to become an expert in, and then about the circumstances necessary to make that happen.

If you disagree that, external factors are a huge part of being successful? Then, read this book as Malcolm Gladwell shows you just how important these opportunities and external situations can be.

SATYADEV KALRA
EDITORIAL TEAM

18th August 1685- 29th December 1731

QUANT GURU of the MONTH

Brook Taylor (18 August 1685 – 29 December 1731) was an English mathematician who is best known for Taylor's theorem and the Taylor series.

He was born in Edmonton on 18th August, 1685. He did degrees in LLB and LLD in 1709 and 1714 and studied mathematics. He obtained solution of the problem of "*Centre of Oscillation*". He added a new branch to higher mathematics –"*Calculus of Finite Differences*". In 1715 he introduced Taylor series which is a representation of function as an infinite sum of terms that are calculated from the values of the function derivatives at a single point. He used it to determine the form of movement of a vibrating string, by him first successfully reduced to mechanical principles. The same work contained the celebrated formula known as Taylor's theorem, the importance of which remained unrecognized until 1772, when J. L. Lagrange realized its powers and termed it "*le principal fondement du calcul différentiel*"

Taylor series is given by (for a real or complex valued function f(x), a is the power of series)

$$\sum_{n=0}^{\infty} \frac{f^{(n)}(a)}{n!}(x-a)^n$$

Where n! is the factorial of n , f (n)(a) is the nth derivative of f at the point a.
In Maclaurin series, a = 0, The derivative of order zero f is defined to be f itself and $(x-a)^0$ and $0!$ are both defined to be 1.

Taylor died on 30 November 1731when he was only 46 in Somerset House, London.

SATYADEV KALRA
EDITORIAL TEAM

QUANT TRIVIA

"118 is the smallest number that has 4 different partitions into 3 parts with the same product."

QUANTS IN LIGHTER VEIN

Who Stole the Ginger Cookie from the Cookie Jar?
There are five people - Holly, Cameron, Julie, Alex and Jackie.

Each one stole a special cookie of their favorite brand which was kept in a jar.

Each person ate it in a particular place and drank their flavored milk with it.

- Jackie is next to the person who eats on the lounge.
- Arnotts brand cookies are kept in a round jar.
- The person beside Cameron eats cookies at a table.
- The person who eats Oreos eats in the closet
- Julie likes Paradise brand cookies
- The person who drinks banana milk is in the middle and owns a tall jar
- The first person likes vanilla milk
- Holly is the person on the far right
- The person who eats in the bedroom drinks strawberry milk
- The person who owns the tall jar is next to the person who owns square jar
- Cameron drinks caramel milk
- The person who likes the Dick Smith brand is next to the person who likes the Coles brand
- The person who likes the No Frills brand is next to the person who owns a round jar
- The person who stole the 100s and 1000s cookies is next to the person who owns the brass jar
- The second person from the right eats No Frills brand and is next to the person who owns a round jar
- The first person on the left stole the choc chip cookies
- The person who eats Dick Smith brand is next to the person who eats Paradise brand
- The second from the left has a brass jar
- Julie is to the right of the person who drinks strawberry milk
- The person who drinks chocolate milk does it at the table
- The Paradise brand cookies are eaten in the kitchen
- The person who eats Tiny Teddies doesn't keep them in a round jar
- The Coles brand cookies are kept in a mini sized jar

A Ginger Cookie was also stolen. Who stole it?

EDITORIAL TEAM

QUANTS QUIZ OF THE MONTH

Q1. A group of friends went on a holiday to a hill station. It rained for 13 days. But when it rained in the morning, the afternoon was lovely. And when it rained in the afternoon, the day was preceded by clear morning. Altogether there were 11 very nice mornings and 12 very nice afternoons. How many days did their holiday last?

Q2. Which of the following numbers is the odd one out, and why?
1, 2, 3, 5, 9, 13, 21
Note that 2 is not the odd one.

Q3. A drinks machine offers three selections - Tea, Coffee or Random (Either tea or Coffee) but the machine has been wired up wrongly so that each button does not give what it claims. If each drink costs 50p, how much minimum money do you have to put into the machine to work out which button gives which selection?

Q4. The secret agent X emailed a code word to his head office. They are "AIM DUE OAT TIE MOD". But four of these five words are fake and only one contains the information. The agent X also mailed a sentence as a clue - if I tell you any one character of the code word, you would be able to tell the number of vowels in the code word. Can you tell which the code word is?

Q5. In a hotel, rooms are numbered from 101 to 550. A room is chosen at random. What is the probability that room number starts with 1, 2 or 3 and ends with 4, 5 or 6?

Please send us the answers at simsr.quantinuum@gmail.com. Answers and Name of the winner (first all-correct/most correct entry) will be published in the next issue.

The correct answer to last issue's Quiz was given by Gaurav Mehra, PGDM-Finance 2008-10 batch, Srinivas K. K., PGDM-Finance 2011-13. Congratulations!

Solutions to last issue's Quiz of the month

1. Use the first two cuts to cut an 'X' in the top of the cake. Now you have four pieces. Make the third cut horizontal, which will divide the four pieces into eight. Think of a two by two by two Rubik's cube. There are four pieces on the top tier and four more just underneath it.

2. 16 men, 12 women and 72 children were working with the constructor.
Let's assume that there were X men, Y women and Z children working with the constructor. Hence,
$X + Y + Z = 100$
$5X + 4Y + Z = 200$

QUANTS QUIZ OF THE MONTH contd...

Eliminating X and Y in turn from these equations, we get

X = 3Z - 200

Y = 300 - 4Z

As if woman works, her husband also works and atleast half the men working came with their wives; the value of Y lies between X and X/2. Substituting these limiting values in equations, we get

if Y = X,

300 - 4Z = 3Z - 200

7Z = 500

Z = 500/7 i.e. 71.428

if Y = X/2,

300 - 4Z = (3Z - 200)/2

600 - 8Z = 3Z - 200

11Z = 800

Z = 800/11 i.e. 72.727

But Z must be an integer, hence Z=72. Also, X=16 and Y=12

There were 16 men, 12 women and 72 children working with the constructor.

3. 65292

As per given conditions, there are three possible combinations for 2nd, 3rd and 4th digits. They are (3, 0, 7) or (4, 1, 8) or (5, 2, 9)

It is given that there are 3 pairs whose sum is 11. All possible pairs are (2, 9), (3, 8), (4, 7), (5, 6). Now required number is 5 digit number and it contains 3 pairs of 11. So it must not be having 0 and 1 in it. Hence, the only possible combination for 2nd, 3rd and 4th digits is (5, 2, 9)

Also, 1st digit is thrice the last digit. The possible combinations are (3, 1), (6, 2) and (9, 3), out of which only (6, 2) with (5, 2, 9) gives 3 pairs of 11. Hence, the answer is 65292.

4. Let distance between home and church is D.

A person took 4 hours to reach church. So speed while travelling towards church is D/4.

Similarly, he took 3 hours to reach home. So speed while coming back is D/3.

There is a speed difference of 7*D/12, which is the wind helping person in 1 direction, & slowing him in the other direction. Average the 2 speeds, & you have the speed that person can travel in no wind, which is 7*D/24.

Hence, person will take D / (7*D/24) hours to travel distance D which is 24/7 hours.

Answer is 3 hours 25 minutes 42 seconds

5. Two possible answers.

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  97166      98533
+517013    + 258056
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 614179     356589
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QUANTIZ TEAM

QUANT TRIVIA

"Go down deep enough into anything and you will find mathematics." - Dean Schlicter

QUANT FUN

Sudoku of the Month

	9		5				6	
4				6				9
		3	1					4
9						6		1
	8			4			7	
1		4						2
2					9	4		
3				1				8
	1				2			5

Answers and name of solvers will be published in the next issue.

Mail your answers to simsr.quantinuum@gmail.com

Solution to last month's Sudoku of the month

5	8	7	3	9	1	2	4	6
1	3	6	8	4	2	7	9	5
2	9	4	5	6	7	8	1	3
6	2	3	1	8	4	9	5	7
8	1	5	9	7	3	4	6	2
4	7	9	2	5	6	3	8	1
3	6	8	7	1	9	5	2	4
9	4	2	6	3	5	1	7	8
7	5	1	4	2	8	6	3	9

The correct answer to Sudoku was given by Gaurav Mehra, PGDM-Finance 2008-10 batch and Mrs. Kumud Dubey. Congratulations! We invite anyone interested to come forward and solve the Sudoku through Solver.

Quantconnect

Quantinuum, the Quant's forum of KJ Somaiya Institute of Management Studies and Research is formed with two objectives. Firstly to remove the common myth from the students mind that mathematics is difficult. Secondly to give students an exposure on how to make decisions in real life business problems using quantitative techniques. This helps to bridge the gap between theory and the practical application.

For any further queries and feedback, please contact the following address
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