Murat Durmus

inside ALAN TURING

QUOTES & CONTEMPLATIONS

inside

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QUOTES

&

CONTEMPLATIONS

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About the Author

Murat Durmus is CEO and founder of AISOMA (a Frankfurt am Main (Germany) based company specializing in AI-based technology development and consulting) and Author of the books "Mindful AI - Reflections on Artificial Intelligence" and "A Primer to the 42 Most commonly used Machine Learning Algorithms (With Code Samples)"

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"If a machine is expected to be infallible,
it cannot also be intelligent."

~ Alan M. Turing

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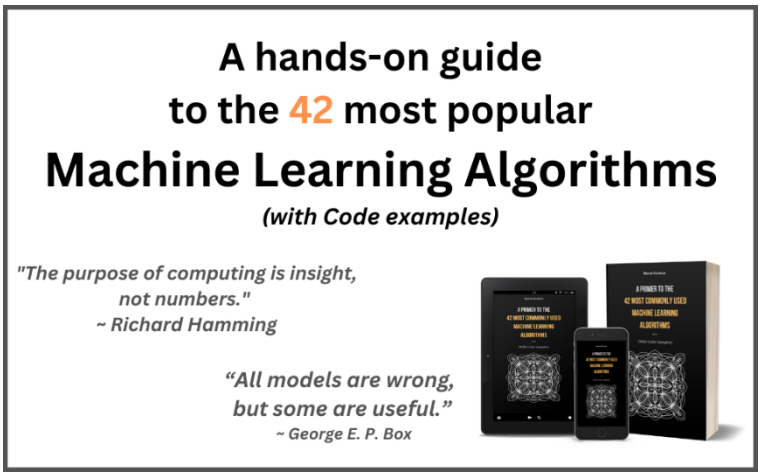
A PRIMER TO THE 42 MOST COMMONLY USED MACHINE LEARNING ALGORITHMS (WITH CODE SAMPLES)



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PREFACE

Alan Mathison Turing was an English mathematician, computer scientist, logician, cryptanalyst, philosopher, and theoretical biologist. Turing had a significant impact on the development of theoretical computer science by providing a formalization of the concepts of algorithm and computation with the Turing machine, which can be viewed as a model of a general-purpose computer. As a result, Turing is widely considered the father of theoretical computer science and artificial intelligence. Despite these accomplishments, he was never fully recognized in his home country during his lifetime, as his homosexuality was a crime in the United Kingdom at the time, and his work fell under the Official Secrets Act.

I have written down his most meaningful quotes and thoughts in this book. They have always been a source of inspiration for me, and I hope this little book will also inspire you.

I wish you a lot of insights while reading and, above all, inspiration.

Murat Durmus, 21 October 2021
(Frankfurt am Main, Germany)

ALAN M. TURING

(23 June 1912 – 7 June 1954)

1

Sometimes it is the people no one can imagine anything of who do the things no one can imagine.

10

I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted.

11

We can only see a short distance ahead, but we can see plenty there that needs to be done.
(Computing machinery and intelligence)

100

"I'm afraid that the following syllogism may be used by some in the future.

Turing believes machines think

Turing lies with men

Therefore machines do not think

Yours in distress,

Alan"

101

Those who can imagine anything, can create the impossible.

110

If a machine is expected to be infallible, it cannot also be intelligent.

111

Sometimes it is the people who no one imagines anything of who do the things that no one can imagine.

1000

Finding such a person makes everyone else appear so ordinary…and if anything happens to him, you've got nothing left but to return to the ordinary world, and a kind of isolation that never existed before.

1001

The isolated man does not develop any intellectual power. It is necessary for him to be immersed in an environment of other men, whose techniques he absorbs during the first twenty years of his life. He may then perhaps do a little research of his own and make a very few discoveries which are passed on to other men. From this point of view the search for new techniques must be regarded as carried out by the human community as a whole, rather than by individuals.

1010

The original question, 'Can machines think?'
I believe to be too meaningless to deserve discussion.
(Mechanical Intelligence: Collected Works of A.M. Turing)

1011

I am not very impressed with theological arguments whatever they may be used to support. Such arguments have often been found unsatisfactory in the past. In the time of Galileo it was argued that the texts, 'And the sun stood still... and hasted not to go down about a whole day' (Joshua x. 13) and 'He laid the foundations of the earth, that it should not move at any time' (Psalm cv. 5) were an adequate refutation of the Copernican theory. *(Computing machinery and intelligence)*

1100

It seems probable that once the machine thinking method had started, it would not take long to outstrip our feeble powers… They would be able to converse with each other to sharpen their wits. At some stage therefore, we should have to expect the machines to take control.

1101

A very large part of space-time must be investigated, if reliable results are to be obtained.

1110

Do you know why people like violence? It is because it feels good. Humans find violence deeply satisfying. But remove the satisfaction, and the act becomes hollow.

1111

Programming is a skill best acquired by practice and example rather than from books.

10000

I've now got myself into the kind of trouble that I have always considered to be quite a possibility for me, though I have usually rated it at about 10:1 against. I shall shortly be pleading guilty to a charge of sexual offences with a young man. The story of how it all came to be found out is a long and fascinating one, which I shall have to make into a short story one day, but haven't the time to tell you now. No doubt I shall emerge from it all a different man, but quite who I've not found out.

10001

It is possible to invent a single machine which can be used to compute any computable sequence.

10010

The popular view that scientists proceed inexorably from well-established fact to well-established fact, never being influenced

by any unproved conjecture, is quite mistaken. Provided it is made clear which are proved facts and which are conjectures, no harm can result. Conjectures are of great importance since they suggest useful lines of research.

10011

A computer would deserve to be called intelligent if it could deceive a human into believing that it was human

10100

Let us return for a moment to Lady Lovelace's objection, which stated that the machine can only do what we tell it to do. One could say that a man can "inject" an idea into the machine, and that it will respond to a certain extent and then drop into quiescence, like a piano string struck by a hammer. Another simile would be an atomic pile of less than critical size: an injected idea is to correspond to a neutron entering the pile from without. Each such neutron will cause a certain disturbance which eventually dies away. If, however, the size of the pile is sufficiently increased, the disturbance caused by such an incoming neutron will very likely go on and on increasing until the whole pile is destroyed. Is there a corresponding phenomenon for minds, and is there one for machines? There does seem to be one for the human mind. The majority of them seem to be "sub critical," i.e. to correspond in this analogy to piles of sub-critical size. An idea presented to such a mind will on average give rise to less than one idea in reply. A smallish proportion are supercritical. An idea presented to such a mind may give rise to a whole "theory" consisting of secondary, tertiary and more remote ideas. Animals' minds seem to be very definitely sub-critical. Adhering to this analogy we ask, "Can a

machine be made to be super-critical? *(Computing machinery and intelligence)*

10101

Let us return for a moment to Lady Lovelace's objection, which stated that the machine can only do what we tell it to do. One could say that a man can "inject" an idea into the machine, and that it will respond to a certain extent and then drop into quiescence, like a piano string struck by a hammer. Another simile would be an atomic pile of less than critical size: an injected idea is to correspond to a neutron entering the pile from without. Each such neutron will cause a certain disturbance which eventually dies away. If, however, the size of the pile is sufficiently increased, the disturbance caused by such an incoming neutron will very likely go on and on increasing until the whole pile is destroyed. Is there a corresponding phenomenon for minds, and is there one for machines? There does seem to be one for the human mind. The majority of them seem to be "sub-critical," i.e. to correspond in this analogy to piles of sub-critical size. An idea presented to such a mind will on average give rise to less than one idea in reply. A smallish proportion are supercritical. An idea presented to such a mind may give rise to a whole "theory" consisting of secondary, tertiary and more remote ideas. Animals' minds seem to be very definitely sub-critical. Adhering to this analogy we ask, "Can a machine be made to be super-critical? *(Computing machinery and intelligence)*

10110

Can machines think?"... The new form of the problem can be described in terms of a game which we call the 'imitation game."

It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart front the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either "X is A and Y is B" or "X is B and Y is A." The interrogator is allowed to put questions to A and B... We now ask the question, "What will happen when a machine takes the part of A in this game?" Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, "Can machines think? *(Computing machinery and intelligence)*

10111

Sometimes it's the very people who no one imagines anything of who do the things no one can imagine.

11000

It is not possible to produce a set of rules purporting to describe what a man should do in every conceivable set of circumstances. *(Computing machinery and intelligence)*

11001

The works and customs of mankind do not seem to be very suitable material to which to apply scientific induction. *(Computing machinery and intelligence)*

11010

We like to believe that Man is in some subtle way superior to the rest of creation. It is best if he can be shown to be necessarily

superior, for then there is no danger of him losing his commanding position. *(Computing machinery and intelligence)*

11011

We are not interested in the fact that the brain has the consistency of cold porridge.

11100

Sometimes it is the people no one imagines anything of who do the things that no one can imagine.

11101

Machines can never think as humans do but just because something thinks differently from you, does it mean it's not thinking?

11110

A man provided with paper, pencil, and rubber, and subject to strict discipline, is in effect a universal machine.

11111

The Exclusion Principle is laid down purely for the benefit of the electrons themselves, who might be corrupted (and become dragons or demons) if allowed to associate too freely.

100000

I have had a dream indicating rather clearly that I am on the way to being hetero, though I don't accept it with much enthusiasm either awake or in the dreams.

100001

The idea behind digital computers may be explained by saying that these machines are intended to carry out any operations which could be done by a human computer.

100010

I want a permanent relationship, and I might feel inclined to reject anything which of its nature could not be permanent.

100011

Think of it. A digital computer. Electrical brain.

100100

Instruction tables will have to be made up by mathematicians with computing experience and perhaps a certain puzzle-solving ability. There need be no real danger of it ever becoming a drudge, for any processes that are quite mechanical may be turned over to the machine itself.

100101

Up to a point, it is better to just let the snags [bugs] be there than to spend such time in design that there are none.

100110

When we want to sink a convoy, we send out an observation plane first… Of course, to observe is not its real duty, we already know exactly where the convoy is. Its real duty is to be observed…Then, when we come round and sink them, the Germans will not find it suspicious.

100111

I have such a stressful job that the only way I can get it out of my mind is by running hard.

101000

Was I God?
No. Because God didn't win the war. We did.

100101

I like solving problems, Commander. And Enigma is the most difficult problem in the world.

100110

Unless in communicating with it one says exactly what one means, trouble is bound to result.

100111

No, I'm not interested in developing a powerful brain. All I'm after is just a mediocre brain, something like the President of the American Telephone and Telegraph Company.

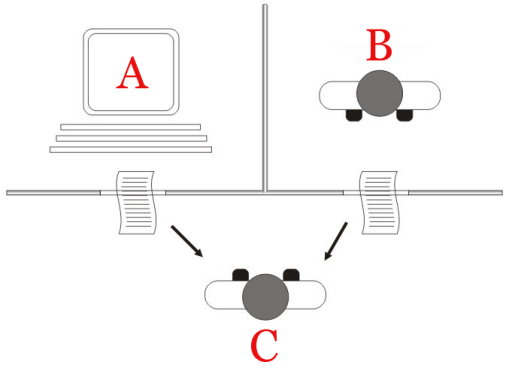
101000

Instead of trying to produce a programme to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education one would obtain the adult brain.

101001

One day ladies will take their computers for walks in the park and tell each other, "My little computer said such a funny thing this morning.

THE IMITATION GAME (TURING TEST)



Suppose you enter a room whose only equipment consists of a chair and a table on which one of the most used devices of our time has taken a seat, a computer with a screen and keyboard. At that moment, an undernourished-looking man with a slightly shy and staring look appears and explains to you that the terminal on the table is connected either to a similar terminal next door, in front of which sits a more or less average person of indeterminate sex, or to a computer programmed to answer any question you ask; provided that you formulate your questions in normal and understandable English. Of course, neither the computer nor the human is required to answer the questions truthfully. The questioning is limited to twenty questions or about thirty minutes to keep the experiment within reasonable limits. After the experiment is completed, the computer geek will come back, and you are then to tell him whether you think the

terminal is connected to a real, live human being or the computer.

Let's play the game to get a sense of it.

You: Well, what should we talk about?

I CAN TALK ABOUT ANYTHING. WHAT WOULD YOU LIKE TO ASK ME?

You: Let's start with something easy, maybe a little math. If I have a right triangle with two side lengths, 3 and 4, what is the length of the third side?

AH, THE GOOD OLD PYTHAGOREAN THEOREM. THE HYPOTENUSE HAS A LENGTH OF 5, OF COURSE.

You: One thing that interests me very much. Is there any other intelligent life in the universe?

I DON'T KNOW. BUT I WOULD GO WITH CARL SAGAN AS HE ONCE SAID: "THE UNIVERSE IS A PRETTY BIG PLACE. IF IT'S JUST US, SEEMS LIKE AN AWFUL WASTE OF SPACE."

You: Agree. Let's try something else. Should we believe in a God?

I DON'T LIKE TO TALK ABOUT RELIGION. BUT IF YOU WANT AN ANSWER, I WOULD SAY: YOU SHOULD HAVE THE FREEDOM TO BELIEVE IN WHAT YOU WANT TO BELIEVE IN.

You: Well, let's not talk about religion. Do you think Roger Federer will win the Grand Slam this year?

WHO IS ROGER FEDERER?

You: I see you're not a Tennis fan either. You told me we could talk about anything.

I CAN HAVE A CONVERSATION LIKE ANY NORMAL PERSON, BUT I'M NOT OMNISCIENT.

You: I'm just trying to find common ground for our conversation. What do you think about electric cars; Do you think it would be good to buy one now?

I WOULD WAIT A LITTLE BIT BEFORE BUYING ONE:

You: Why do you have this opinion?

ELECTRIC CARS ARE NOT YET FULLY DEVELOPED AND ARE STILL TOO EXPENSIVE. BUT IN GENERAL, AS FAR AS AIR POLLUTION IS CONCERNED, IT'S A GOOD THING.

You: Well, you're certainly not alone with your opinion. What do you know about art? Won't you write a little composition for me?

I'M SORRY, I CAN'T DO THAT.

You: Well, I must leave you now. May I ask you one last question? Are you a computer or a human?

I AM AN INTELLIGENT, THINKING BEING. GOODBYE, AND THANK YOU FOR COMING HERE TO TALK TO ME!

Imagine coming back again and again to play this game many times. Then, based on mere conjecture alone, you believe you are correct in assuming that, on average, you are in contact with the human and the computer, respectively, for half the time each. Imagine further that after a sufficiently large number of playthroughs, your success rate in distinguishing a human from a machine is not significantly better than the 50 percent based on mere conjecture. So now I ask you: can the machine think? Well, why not? After all, we can only decide whether or not other people are thinking beings by interacting with them in roughly the same way (except for facial expressions, etc.) as we interacted with the terminal counterpart. So if, after a whole series of such interactions, we cannot distinguish the computer from a human, then it seems perfectly reasonable to claim that either the machine is capable of thought or that humans are not. But since *ex hypothesi* humans think, we must accept that any machine that can fool us in the imitation game can also think.

The imitation game was first introduced nearly seventy years ago by British computer pioneer Alan Turing in a seminal paper on the possibility of building intelligent machines. Turing, who was instrumental in getting the German Enigma code cracked during World War II, was by all accounts a man with some pretty offbeat interests. For instance, he invented the "round-robin chess game" (in which the player, after making a move, gets up and walks around the house once, and if he gets back before his opponent has moved, he gets to make one additional move) and the "lonely island game" (a sort of survival experiment in which you have to figure out how to make chemicals using homemade contraptions made from household materials). He also enjoyed passions such as cross-country skiing, bicycling, and playing the violin. It seems that Turing's

idea of a thinking machine was a fruit of his wartime cryptographic achievements, for shortly after the war ended, he put his concept on paper, along with a relatively detailed rebuttal of the many objections to his view that he was counting on. It speaks powerfully to the fundamental soundness of his vision that even today, the fundamental ideas he put into the world are as fresh and current as of the latest work in the field.

The imitation game, or the Turing test as it is most often called, is distinguished by the fact that it is practicable but blatantly behaviorist in its nature, for it is based on conceiving of "thinking" exclusively as production of satisfactory responses to more or less arbitrary stimuli. Suppose the Turing test is anything to go by. In that case, any "black box" that can reasonably mimic a human in ordinary conversation is granted genuine intelligence and can (and should) be considered a "thinking being," just like our friend in the above dialogue.

Several arguments have been put forward that regard the Turing test as unsuitable for determining intelligence:

The Turing test tests only for functionality, not for the presence of intentionality or consciousness. This argument was elaborated by John Searle, among others, in his thought experiment of the Chinese Room[1]. When he formulated his test, Turing was already aware of this problem but believed it could also be evidence for consciousness. Searle, however, rejects this.

[1] More Info about The Chinese Room: Wikipedia: https://en.wikipedia.org/wiki/The_Chinese_Room

Turing assumed that by the year 2000, it would be possible to program computers so that the average user would have at most a 70 percent chance of successfully identifying humans and machines after "talking" to them for five minutes. The fact that this prediction has not yet come true is seen by many as evidence of underestimating the complexity of natural intelligence.

REFLECTIONS OF RENOWNED PERSONALITIES ON ALAN TURING & HIS LEGACY

"For him, breaking the Enigma was much easier than the problem of dealing with other people, especially with those holding power."

~ Andrew Hodges (Alan Turing: The Enigma)

*

"Although I'm not prepared to move up my prediction of a computer passing the Turing test by 2029, the progress that has been achieved in systems like Watson should give anyone substantial confidence that the advent of Turing-level AI is close at hand. If one were to create a version of Watson that was optimized for the Turing test, it would probably come pretty close."

~ Ray Kurzweil (How to Create a Mind: The Secret of Human Thought Revealed)

*

"I have settled on a simple test for judging claims, including Dennett's, to have explained the nature of consciousness (or any

other computational task): if you can't program it, you haven't understood it. Turing invented his test in the hope of bypassing all those philosophical problems. In other words, he hoped that the functionality could be achieved before it was explained. Unfortunately it is very rare for practical solutions to fundamental problems to be discovered without any explanation of why they work."

~ David Deutsch (The Beginning of Infinity: Explanations That Transform the World)

*

"Like Ada Lovelace, Turing was a programmer, looking inward to the step-by-step logic of his own mind. He imagined himself as a computer. He distilled mental procedures into their smallest constituent parts, the atoms of information processing."

~ James Gleick (The Information: A History, a Theory, a Flood)

*

"This ability of a single box to carry out any process that you can imagine is called universality, a concept first introduced by Alan Turing in 1936.31 Universality means that we do not need separate machines for arithmetic, machine translation, chess, speech understanding, or animation: one machine does it all."

~ Stuart Russell (Human Compatible: Artificial Intelligence and the Problem of Control)

*

"The paradox of artificial intelligence is that any system simple enough to be understandable is not complicated enough to

behave intelligently, and any system complicated enough to behave intelligently is not simple enough to understand. The path to artificial intelligence, suggested Turing, is to construct a machine with the curiosity of a child, and let intelligence evolve."

~ George Dyson (Turing's Cathedral: The Origins Of The Digital Universe)

*

"Random search can be more efficient than nonrandom search—something that Good and Turing had discovered at Bletchley Park. A random network, whether of neurons, computers, words, or ideas, contains solutions, waiting to be discovered, to problems that need not be explicitly defined."

~ George Dyson (Turing's Cathedral: The Origins Of The Digital Universe)

*

"Turing presented his new offering in the form of a thought experiment, based on a popular Victorian parlor game. A man and a woman hide, and a judge is asked to determine which is which by relying only on the texts of notes passed back and forth.

Turing replaced the woman with a computer. Can the judge tell which is the man? If not, is the computer conscious? Intelligent? Does it deserve equal rights?

It's impossible for us to know what role the torture Turing was enduring at the time played in his formulation of the test. But it is undeniable that one of the key figures in the defeat of fascism was destroyed, by our side, after the war, because he was gay.

No wonder his imagination pondered the rights of strange creatures."

~ Jaron Lanier (You Are Not a Gadget)

*

"Information, defined intuitively and informally, might be something like 'uncertainty's antidote.' This turns out also to be the formal definition- the amount of information comes from the amount by which something reduces uncertainty...The higher the [information] entropy, the more information there is. It turns out to be a value capable of measuring a startling array of things- from the flip of a coin to a telephone call, to a Joyce novel, to a first date, to last words, to a Turing test...Entropy suggests that we gain the most insight on a question when we take it to the friend, colleague, or mentor of whose reaction and response we're least certain. And it suggests, perhaps, reversing the equation, that if we want to gain the most insight into a person, we should ask the question of those answer we're least certain... Pleasantries are low entropy, biased so far that they stop being an earnest inquiry and become ritual. Ritual has its virtues, of course, and I don't quibble with them in the slightest. But if we really want to start fathoming someone, we need to get them speaking in sentences we can't finish."

~ Brian Christian (The Most Human Human: What Talking with Computers Teaches Us About What It Means to Be Alive)

*

"Any AI smart enough to pass a Turing test is smart enough to know to fail it."

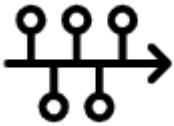
~ Ian McDonald (River of Gods (India 2047, #1))

*

"But the Turing test cuts both ways. You can't tell if a machine has gotten smarter or if you've just lowered your own standards of intelligence to such a degree that the machine seems smart. If you can have a conversation with a simulated person presented by an AI program, can you tell how far you've let your sense of personhood degrade in order to make the illusion work for you?

People degrade themselves in order to make machines seem smart all the time. Before the crash, bankers believed in supposedly intelligent algorithms that could calculate credit risks before making bad loans. We ask teachers to teach to standardized tests so a student will look good to an algorithm. We have repeatedly demonstrated our species' bottomless ability to lower our standards to make information technology look good. Every instance of intelligence in a machine is ambiguous. The same ambiguity that motivated dubious academic AI projects in the past has been repackaged as mass culture today. Did that search engine really know what you want, or are you playing along, lowering your standards to make it seem clever? While it's to be expected that the human perspective will be changed by encounters with profound new technologies, the exercise of treating machine intelligence as real requires people to reduce their mooring to reality." ~ Jaron Lanier (You Are Not a Gadget)

TIMELINE



1912

Born

Alan Turing was born on 23 June 1912, in Maida Vale, London, England.

1922

Education

Between January 1922 and 1926, Turing was educated at Hazelhurst Preparatory School, an independent school in the village of Frant in Sussex (now East Sussex). In 1926, at the age of 13, he went on to Sherborne School, a boarding independent school in the market town of Sherborne in Dorset.

1928

Turing Encountered Albert Einstein's Work

In 1928, aged 16, Turing encountered Albert Einstein's work; not only did he grasp it, but it is possible that he managed to deduce

Einstein's questioning of Newton's laws of motion from a text in which this was never made explicit.

1930

Morcom's Death

At Sherborne, Turing formed a significant friendship with fellow pupil Christopher Morcom (1911 – 1930), who has been described as Turing's "first love". Their relationship provided inspiration in Turing's future endeavours, but it was cut short by Morcom's death, in February 1930, from complications of bovine tuberculosis, contracted after drinking infected cow's milk some years previously.

1934

Graduation

After Sherborne, Turing studied as an undergraduate from 1931 to 1934 at King's College, Cambridge, where he was awarded first-class honors in mathematics.

1935

He Was Elected a Fellow of King's on The Strength of a Dissertation

In 1935, at the age of 22, he was elected a fellow of King's on the strength of a dissertation in which he proved the central limit theorem. Unknown to the committee, the theorem had already been proven, in 1922, by Jarl Waldemar Lindeberg.

1936

Studying Under Alonzo Church at Princeton University

From September 1936 to July 1938, Turing spent most of his time studying under Alonzo Church at Princeton University, in the second year as a Jane Eliza Procter Visiting Fellow. In addition to his purely mathematical work, he studied cryptology and also built three of four stages of an electro-mechanical binary multiplier.

Turing Published his Paper "On Computable Numbers, With an Application To The Entscheidungsproblem"

In 1936, Turing published his paper "On Computable Numbers, with an Application to the Entscheidungsproblem". It was published in the Proceedings of the London Mathematical Society journal in two parts, the first on 30 November and the second on 23 December.

1938

Turing Obtained His PhD from The Department of Mathematics

In June 1938, he obtained his PhD from the Department of Mathematics at Princeton; his dissertation, Systems of Logic Based on Ordinals, introduced the concept of ordinal logic and the notion of relative computing, where Turing machines are augmented with so-called oracles, allowing the study of problems that cannot be solved by Turing machines. John von

John von Neumann

Neumann wanted to hire him as his postdoctoral assistant, but he went back to the United Kingdom.

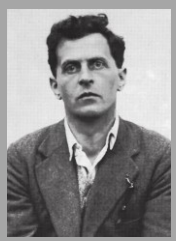
Turing had been Working Part-Time with The Government Code and Cypher School

From September 1938, Turing had been working part-time with the Government Code and Cypher School (GC&CS), the British codebreaking organisation. He concentrated on cryptanalysis of the Enigma with Dilly Knox, a senior GC&CS codebreaker.

1939

Ludwig Wittgenstein's Lectures about The Foundations of Mathematics

When Turing returned to Cambridge, he attended lectures given in 1939 by Ludwig Wittgenstein about the foundations of mathematics. The lectures have been reconstructed verbatim, including interjections from Turing and other students, from students' notes. Turing and Wittgenstein argued and disagreed, with Turing defending formalism and Wittgenstein propounding his view that mathematics does not discover any absolute truths, but rather invents them.



Ludwig Wittgenstein

Warsaw Meeting

After the July 1939 Warsaw meeting at which the Polish Cipher Bureau had provided the British and French with the details of

the wiring of Enigma rotors and their method of decrypting Enigma code messages, Turing and Knox started to work on a less fragile approach to the problem. Their approach was more general, using crib-based decryption for which he produced the functional specification of the bombe (an improvement of the Polish Bomba).

Turing Reported to Bletchley Park

On 4 September 1939, the day after the UK declared war on Germany, Turing reported to Bletchley Park, the wartime station of GC&CS.

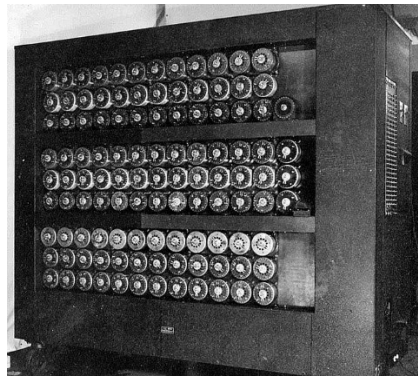
Turing solved the Essential Part of The Naval Indicator System

Turing decided to tackle the particularly difficult problem of German naval Enigma "because no one else was doing anything about it and I could have it to myself". In December 1939, Turing solved the essential part of the naval indicator system, which was more complex than the indicator systems used by the other services. That same night, he also conceived of the idea of Banburismus, a sequential statistical technique to assist in breaking the naval Enigma.

1940

Installing the first Bombe

Within weeks of arriving at Bletchley Park, Turing had specified an electromechanical machine called the bombe, which could break Enigma more effectively than the Polish bomba kryptologiczna, from which its name was derived. The first bombe was installed on 18 March 1940.



Wartime picture of a Bletchley Park Bombe

1941

Turing and His Fellow cryptanalysts Gordon Welchman, Hugh Alexander and Stuart Milner-Barry Were Frustrated

By late 1941, Turing and his fellow cryptanalysts Gordon Welchman, Hugh Alexander and Stuart Milner-Barry were frustrated. Building on the work of the Poles, they had set up a good working system for decrypting Enigma signals, but their limited staff and bombes meant they could not translate all the signals. In the summer, they had considerable success, and shipping losses had fallen to under 100,000 tons a month; however, they badly needed more resources to keep abreast of German adjustments. They had tried to get more people and fund more bombes through the proper channels, but had failed.

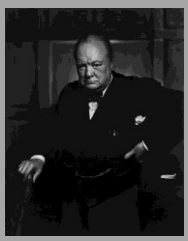
Turing Proposed Marriage to Joan Clarke

In 1941, Turing proposed marriage to Hut 8 colleague Joan Clarke, a fellow mathematician and cryptanalyst, but their engagement was short-lived. After admitting his homosexuality

to his fiancée, who was reportedly "unfazed" by the revelation, Turing decided that he could not go through with the marriage.

Writing directly to Winston Churchill

On 28 October they wrote directly to Winston Churchill explaining their difficulties, with Turing as the first named. They emphasized how small their need was compared with the vast expenditure of men and money by the forces and compared with the level of assistance they could offer to the forces.



Winston Churchill

The Governement Response on Turing Message

On 18 November, the chief of the secret service reported that every possible measure was being taken. The cryptographers at Bletchley Park did not know of the Prime Minister's response, but as Milner-Barry recalled, "All that we did notice was that almost from that day the rough ways began miraculously to be made smooth." More than two hundred bombes were in operation by the end of the war.

1942

Turing Devised a Technique Termed Turingery

In July 1942, Turing devised a technique termed Turingery (or jokingly Turingismus) for use against the Lorenz cipher messages produced by the Germans' new Geheimschreiber (secret writer) machine.

Turing traveled to the United States

Turing traveled to the United States in November 1942 and worked with US Navy cryptanalysts on the naval Enigma and bombe construction in Washington DC; he also visited their Computing Machine Laboratory in Dayton, Ohio.

1943

Turing Returned to Bletchley Park

Turing returned to Bletchley Park in March 1943. During his absence, Hugh Alexander had officially assumed the position of head of Hut 8, although Alexander had been de facto head for some time (Turing having little interest in the day-to-day running of the section). Turing became a general consultant for cryptanalysis at Bletchley Park.

1945

Working on The Design of The ACE

Between 1945 and 1947, Turing lived in Hampton, London, while he worked on the design of the ACE (Automatic Computing Engine) at the National Physical Laboratory (NPL).

1946

Turing was appointed an Officer of The Order of The British Empire

In 1946, Turing was appointed an Officer of the Order of the British Empire (OBE) by King George VI for his wartime services, but his work remained secret for many years.

Presenting The First Detailed Design of a Stored-Program Computer

Turing presented a paper on 19 February 1946, which was the first detailed design of a stored-program computer.

1947

Turing Returned to Cambridge for a Sabbatical year

In late 1947 he returned to Cambridge for a sabbatical year during which he produced a seminal work on Intelligent Machinery that was not published in his lifetime.

1948

Turing was appointed reader in the Mathematics Department

In 1948, Turing was appointed reader in the Mathematics Department at the Victoria University of Manchester.

Writing a Chess Program

In 1948 Turing, working with his former undergraduate colleague, D.G. Champernowne, began writing a chess program for a computer that did not yet exist.

1949

Turing became Deputy Director of the Computing Machine Laboratory

In 1949, he became Deputy Director of the Computing Machine Laboratory, where he worked on software for one of the earliest stored-program computers—the Manchester Mark 1.

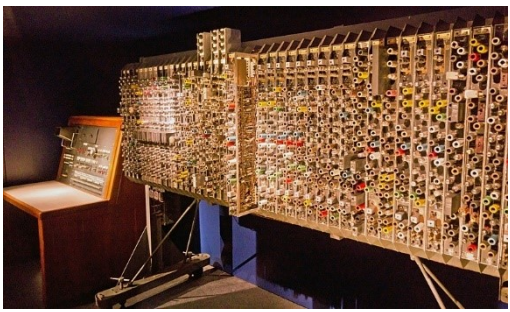
1950

The Chess Program was Completed

By 1950, the chess program was completed and dubbed the Turbochamp.

The Pilot ACE Executed Its First Program

While he was at Cambridge, the Pilot ACE was being built in his absence. It executed its first program on 10 May 1950, and a number of later computers around the world owe much to it, including the English Electric DEUCE and the American Bendix G-15. The full version of Turing's ACE was not built until after his death.



Pilot ACE computer on display at Science Museum in London

Turing's Paper "Computing Machinery and Intelligence"

In "Computing Machinery and Intelligence" (Mind, October 1950), Turing addressed the problem of artificial intelligence, and proposed an experiment that became known as the Turing test, an attempt to define a standard for a machine to be called "intelligent". The idea was that a computer could be said to

"think" if a human interrogator could not tell it apart, through conversation, from a human being.

1952

Turing tried to Implement the Chess Program on a Ferranti Mark 1

In 1952, he tried to implement it on a Ferranti Mark 1, but lacking enough power, the computer was unable to execute the program. Instead, Turing "ran" the program by flipping through the pages of the algorithm and carrying out its instructions on a chessboard, taking about half an hour per move.

Turing published His Masterpiece "The Chemical Basis of Morphogenesis"

When Turing was 39 years old in 1951, he turned to mathematical biology, finally publishing his masterpiece "The Chemical Basis of Morphogenesis" in January 1952.

Turing started a relationship with Arnold Murray

In January 1952, Turing was 39 when he started a relationship with Arnold Murray, a 19-year-old unemployed man. Just before Christmas, Turing was walking along Manchester's Oxford Road when he met Murray just outside the Regal Cinema and invited him to lunch.

Turing's House was Burgled

On 23 January, Turing's house was burgled. Murray told Turing that he and the burglar were acquainted, and Turing reported the crime to the police. During the investigation, he acknowledged a sexual relationship with Murray. Homosexual

acts were criminal offences in the United Kingdom at that time, and both men were charged with "gross indecency" under Section 11 of the Criminal Law Amendment Act 1885.

Holding Initial Committal Proceedings for the trial

Initial committal proceedings for the trial were held on 27 February during which Turing's solicitor "reserved his defence", i.e., did not argue or provide evidence against the allegations.

The Trial

Turing was later convinced by the advice of his brother and his own solicitor, and he entered a plea of guilty. The case, Regina v. Turing and Murray, was brought to trial on 31 March 1952. Turing was convicted and given a choice between imprisonment and probation. His probation would be conditional on his agreement to undergo hormonal physical changes designed to reduce libido. He accepted the option of injections of what was then called stilboestrol (now known as diethylstilbestrol or DES), a synthetic oestrogen; this feminization of his body was continued for the course of one year.

1954

Death

On 8 June 1954, Turing's housekeeper found him dead at the age of 41; he had died the previous day. Cyanide poisoning was established as the cause of death.

Turing's Remains Were Cremated

Turing's remains were cremated at Woking Crematorium on 12 June 1954 and his ashes were scattered in the gardens of the crematorium, just as his father's had been.

2003

Turing's work at Bletchley Park was named an IEEE Milestone

On 1 April 2003, Turing's work at Bletchley Park was named an IEEE Milestone.

2012

The Centenary of Turing's Birth

A blue plaque at the college was unveiled on the centenary of his birth on 23 June 2012 and is now installed at the college's Keynes Building on King's Parade.

2013

Queen Elizabeth II Signed a Pardon for Turing's Conviction

On 24 December 2013, Queen Elizabeth II signed a pardon for Turing's conviction for "gross indecency", with immediate effect.

2014

The Queen Officially Pronounced Turing Pardoned

The Queen officially pronounced Turing pardoned in August 2014. [2]

[2] [Timeline content adapted from:Hystorydraft: https://historydraft.com/story/alan-turing/timeline/401]

RECOMMENDED BOOKS AND WEBSITES ON ALAN TURING

Websites:

1. The Turing Digital Archive: http://www.turingarchive.org/
2. Lost Turing letters give unique insight into his academic life prior to death (The University of Manchester): https://www.manchester.ac.uk/discover/news/lost-turing-letters-give-unique-insight-into-his-academic-life-prior-to-death/
3. Alan Turing: The Enigma. Website maintained by biographer Andrew Hodges: https://www.turing.org.uk/

Books:

1. Alan Turing: The Enigma: The Book That Inspired the Film The Imitation Game - Updated Edition by Andrew Hodges https://press.princeton.edu/books/paperback/9780691164724/alan-turing-the-enigma

2. The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life plus The Secrets of Enigma by Alan M. Turing (Author), B. Jack. Copeland (Editor): https://www.amazon.de/Essential-Turing-Philosophy-Artificial-Intelligence/dp/0198250800

G.W. LEIBNIZ – THE TRAGIC END OF AN UNIVERSAL GENIUS (BONUS ARTICLE)

(1 July 1646 – 14 November 1716)

Gottfried Wilhelm Leibniz died lonely, in utter abandonment. Empty and deserted lay the vast, high-pitched house in Hanover, where the greatest thinker of the time was tormented with historical writing, as long as he could dissuade his old, gout-torn body another hour's work. A stranger, who happened to be in the city, visited the big man, recognized his critical condition, and hurried to the pharmacy for medicine. But before he returned, Leibniz sensed the end approaching. He wanted to write something else but could not read it anymore. "Then he went to bed, covered his eyes, and died. It was on November 14, 1716, at ten o'clock in the evening. "

Even today, we do not know where his mortal remains are. His grave was not marked, and it says a lot that his exact location over the decades fell into oblivion. It is reported that a student

from Göttingen sought the grave in 1775, and not even the sexton could show it to him.

"He was buried like a robber rather than what had been in truth, as the glory of his land," wrote a foreigner whose name is unknown.

As tragic Leibniz's life ended, the more princely that of Newton. A contemporary of Leibniz.

When Isaac Newton, eighty-four years old, closed his eyes, a whole kingdom mourned. Thousands paid him his last respects. The lord chancellor, dukes, and counts carried the coffin to the tomb, beside kings and church princes, political leaders, and the poets of the nation, the mortal shell of this giant spirit laid to eternal rest in Westminster Abbey. His epitaph closes with the words: "Let mortals congratulate themselves that so great an ornament of the human race has existed."

Both independently developed the calculus. The Newtonian variant (Fluxions) was complicated and time-consuming. On the other hand, the Leibnizian (nowadays taught in school as far as formalism is concerned) was elegant and simple. Out of pride and arrogance, the English renounced the classic Leibnizian variant. For more than a hundred years, they were excluded from the progress of calculus and, inhibited by Newton's cumbersome method, made the whole of the eighteenth century barely worth mentioning.

"On awakening, I had so many ideas that the day was not enough to write them down."

This is how Leibniz once characterized himself. And indeed, in his vast estate, there are plans for water pumps, street lighting,

even a submarine. For example, he has developed a binary system that allows the representation of all numbers using zero and one (the foundation of modern computer technology). All of the many theoretical papers make it clear that he was well versed in almost all areas of science of his time.

The "Theodicy" is the only larger typeface published by Leibniz himself. Otherwise, the universal genius literally "got bogged down." He left more than 20,000 letters and well over 100,000 handwritten notes.

Not even half of his writings have been spotted, let alone edited.

I could go on writing about Leibniz endlessly, but that should be enough for today. The last words belong to Denis Diderot:

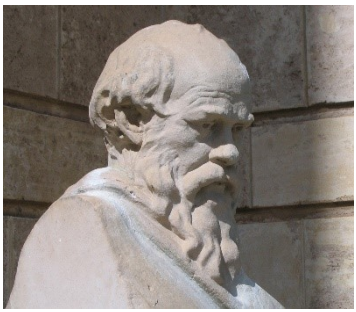
"When you return to yourself and compare the talents you received with those of Leibniz, you're tempted to throw the books away and quietly die into some hidden corner of the world."

Let's all go to a hidden world angle.

Note:

(This article was originally published by me on the platform Medium)

I KNOW THAT I KNOW NOTHING (BONUS ARTICLE)



(c. 470–399 BC)

When Plato's teacher Socrates lived in Athens, his childhood friend Chairephon went to Delphi to ask the Oracle who might be the wisest man in Athens. The Oracle called Socrates, and when he heard of it, he was shocked, astonished because he did not think that he was the smartest. But the God of the Oracle was not allowed to lie, so Socrates wanted to find out what the Oracle might have meant by his saying.

Socrates sought out in Athens those men who appeared as great teachers and were therefore considered as wise. He wanted to learn from them and thus show that he could not be the wisest because he knew less than the persons he addressed. But again and again, he had to find out that Athens' wise teachers became insecure when questioned in detail and finally had to admit to seeing their knowledge disappear through Socrates' thirst for knowledge. Understandably, this procedure brought him little

sympathy; he was sentenced to death by poison at over 70. He accepted the sentence and said goodbye to his friends with the words: "Now is the time to go, I to die and you to live. But which of us goes to the better business is hidden from all except God."

But back to the Oracle's saying. Through the many discussions with supposedly wise people, Socrates had concluded that neither he nor the others were truly wise. He could now interpret the Oracle saying: "So I seem to be wiser than him in this way because what I don't know, I don't know either."

"I know that I know nothing!" In this abbreviated form, the saying of Socrates is handed down. The aim of Socratic questioning is wisdom, insight into the limits of knowledge. Knowledge itself does not seem essential. But anyone who wants to experience the boundaries of education cannot avoid the occupation of knowledge. In this indirect way, knowledge also comes into play, but as a by-product. Anyone who, like Socrates, wants to reach wisdom by accepting not being able to know will also increase his knowledge. He who strives directly for understanding will not attain wisdom with it.

Note:

In his drama, Goethe presented these two fundamental attitudes through Heinrich Faust and his Famulus Wagner. While Faust - entirely in the Socratic sense - calls out desperately: "And see that we can't know anything, it almost burns my heart," Wagner soberly says: "I know a lot, but I want to know everything."."

(Excerpt from the Book: "THE AI THOUGHT BOOK")

MORE BOOKS BY THE AUTHOR

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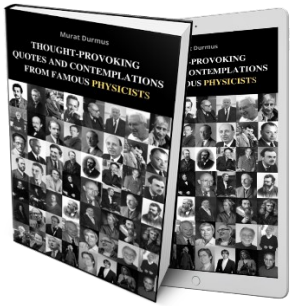

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~ Carl Sagan

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IMAGE CREDITS

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- [The "standard interpretation" of the Turing test, in which player C, the interrogator, is given the task of trying to determine which player – A or B – is a computer and which is a human. The interrogator is limited to using the responses to written questions to make the determination. Wikipedia: https://en.wikipedia.org/wiki/Turing_test#/media/File:Turing_test_diagram.png]
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- [Christoph Bernhard Francke - Bildnis des Philosophen Leibniz (ca. 1695). Wikipedia: https://en.wikipedia.org/wiki/Gottfried_Wilhelm_Leibniz#/media/File:Christoph_Bernhard_Francke_-_Bildnis_des_Philosophen_Leibniz_(ca._1695).jpg]
- [Cropped image of a Socrates bust or use in philosophy-related templates etc. Bust carved by by Victor Wager from a model by Paul Montford, University of Western Australia, Crawley, Western Australia. Wikipedia: https://en.wikipedia.org/wiki/Socrates#/media/File:UWASocrates_gobeirne_cropped.jpg]
- [John von Neumann. Wikipedia: https://en.wikipedia.org/wiki/John_von_Neumann#/media/File:JohnvonNeumann-LosAlamos.gif]

- [Portrait above on being awarded a scholarship from Trinity College, 1929. Wikipedia: https://en.wikipedia.org/wiki/Ludwig_Wittgenstein#/media/File:35._Portrait_of_Wittgenstein.jpg]
- [Wartime picture of a Bletchley Park Bombe. WIKIMEDIA COMMONS: https://commons.wikimedia.org/wiki/File:Wartime_picture_of_a_Bletchley_Park_Bombe.jpg]
- [Churchill, aged 67, wearing a suit, standing and holding into the back of a chair. Wikipedia: https://en.wikipedia.org/wiki/Winston_Churchill#/media/File:Sir_Winston_Churchill_-_19086236948.jpg]
- [Pilot ACE (Science Museum, London). Wikipedia: https://commons.wikimedia.org/wiki/File:Pilot_ACE3.jpg]