May the Best "Man" Win
Matias Travieso-Diaz

Personally, I rather look forward to a computer program winning the World Chess Championship. Humanity needs a lesson in humility.
Richard Dawkings

1

Casimir Liapunov, aka "Caz" in Ukrainian chess circles, squirmed uncomfortably as he sat in the small conference room in the bowels of the Kremlin. As most of his countrymen, he was suspicious of the Russian government and his unease at being secluded in the seat of power of Ukraine's former masters only added to his inner doubts about the plan he was about to propose. His agreement to come to Moscow had been prompted by the large honorarium he had been offered.

The meeting was chaired by Vladimir Kutzov, head of Russia's cybersecurity operations. Kutzov opened the proceedings by giving a short summary of the problem and the reason for the meeting:

"As you all know, in advance of the Summer Olympic Games to be held two years hence in Madrid, the International Olympic Committee expanded the qualification criteria for the chess event to allow the participants to enter teams composed of two humans and a "non-human" member. This action was taken to recognize that, for several decades running, the top chess players in the world have been supercomputers.

"We could not oppose the expansion, given that for many years we have been touting our own Rybina computer as the most advanced chess playing machine in the world. However, it is *possible*, or at least *conceivable*, that one or more of the other machines may be able to beat our team and damage our reputation. So, we need to find a way to make sure that our team defeats the competition, and indeed that one of our *human* players defeats a foreign *computer*. We are gathered here today to examine ways in which this may be done.

"We have as our guest Caz Liapunov, from our neighbor, the republic of the Ukraine. Caz is one of many experts trying to come up with a way to defeat a chess-playing computer. Caz is a reliability engineer for an electronics manufacturer, and excels in logical thinking and risk analysis. Caz has written a thoughtful article for a Ukrainian chess magazine analyzing the human versus machine problem, and suggesting ways in which the machine's superiority can be overcome. Personnel from our embassy in Kyiv became acquainted with the article and referred him to us as a potential contributor to our examination of the problem. He is here to make a presentation on his suggested approach for what he calls a 'novel chess cheating scheme.' Please welcome Mr. Liapunov."

There was a short applause and Caz came shakily to the podium.

"Those who are familiar with the matter agree that successful cheating in modern chess is a near impossibility. Most of the modern cheating schemes are based on information being transmitted to one of the players in a match. Since the information conveyed through cheating is typically an analysis by experts of the positions in an ongoing game, its transmission might work when both players are human, but is ineffective if passed on to a human playing a computer because the advice that human tutors could provide to the human player would in most instances prove insufficient to defeat the computer adversary. Needless to say, unsophisticated forms of

cheating, such as sneaking pieces onto a board, would be detected immediately and a foul would be reported.

"The crux of the matter, therefore, lies in finding ways to impair the performance of a chess-playing computer. Mechanical failure is an obvious candidate, but induced hardware failures would require sabotage on a massive scale, and tampering with such machines is difficult to execute and easy to detect. For the same reason, attacks against the game-playing software that ran the computer are near impossible. Such software is extraordinarily complex and has been developed over decades by teams of programming geniuses. Reviewing and effectively modifying any of the millions of lines of code in one of the chess programs is a task beyond the capability of outsiders. Moreover, the manufacturers and operators of the supercomputers, whether private enterprises or government entities, guarded the software as keenly as if it were a military secret.

"That leaves only one possible avenue of attack: the man-machine interface. In a typical human versus computer match, a human operator would observe the human opponent's move, transmit it via electronic link to a computer that could be thousands of miles away, receive electronically the computer's response, and enter it into the chessboard where the game was being played. Now, the mechanical aspects of the process, such as correctly identifying the human's move, transmitting it, receiving the computer's response, and entering it into the game board are foolproof. Any mistakes in the process would be identified and corrected at once. Subornation of the computer operator would also be easily detectable and any erroneous information provided by the operator would be corrected without affecting the outcome of the game.

"That leaves only one area of possible attack: the electronic transmission of information to and from the computer. A secret, secure installation would need to be established somewhere in the path from the computer to the location where the Olympic competition was taking place. Devices at that installation would intercept the electronic link that brought the signal from the computer to the receiver at the competition hall, split the signal into two identical halves, transmit one signal at once to the accomplices near the hall, and insert a delay on the other signal, which would be the one arriving at the game site. The early signal would be received by the accomplices, who would convey the upcoming computer move to the human player via a tiny microphone on a hearing aid. The human would have somewhere between a few seconds and a minute to think about the impending computer move before it was registered and his time clock was started.

"A few seconds may be of little importance at first, but as time progresses and the time remaining on a player's time clock decreases, the accumulated time advantage might be sufficient to allow the player to come up with a winning move. This is by no means a failsafe cheating mechanism, but, in the hands of a great grandmaster like your Misha Ulianov, it may be sufficient to provide the winning margin," stated Caz to end his presentation.

2

There was an explosion of comments. Emil Ghiaurov, the head of Russia's Olympic Federation, reminded the attendees that Russia was still smarting from the damage to its reputation from previous cheating scandals. "If they catch us doing this, we are finished," he said gloomily. He went on to add: "Besides, our chess team is very strong. If Ulianov beats Coutinho,

we are very likely to get a medal. I don't think we need to defeat a computer to get a lot of international recognition."

The head of Russia's foreign affairs disagreed. "It is more important to send a strong propaganda message than to win Olympic medals. Our triumphs on sporting events will soon be history. A dramatic victory over a foreign computer will be remembered for a long time."

Another attendee asked Caz whether he was suggesting that Russia interfere with all the games its players would play against foreign computers. "There are going to be at least five other supercomputers at the Olympics, besides Rybina. So, are you proposing that we try to cheat our way into winning our players' games against all those machines?"

Caz detected a growing hostility in the room, which sent a shiver of fear down his spine. "I was not suggesting that we try to defeat through cheating all computers in all games," he backpedaled. "My thought was that perhaps a single victory would suffice. I recommend that we pick the match that will give Russia the most propaganda points, and try to win that one game in the matter I discussed."

There was a long silence, as the mental wheels of the Russian leaders turned. Finally, the head of foreign affairs asserted in a tone that left no room for dissent: "Fine. We will concentrate on our match against the American computer. One game, one try. Just let's make sure we win!"

Ghiaurov was not convinced, but he saw he was in the minority. "Fine," he conceded. "I will make sure that it is Ulianov, our strongest player, who plays the American computer."

The last question was then posed to Caz: "How exactly are we going to implement this cheating scheme?"

Caz was evasive. "I'm technically savvy enough to know that the scheme I propose is feasible. If you put your engineers to work on it, my plan can surely be implemented by the time the games open a year and a half from now."

At the end, it was agreed that nothing was lost, except a few thousand Euros, in trying what Caz was suggesting. Also, the detection risk involved in a single attempt appeared reasonably small. An engineering team would be assigned to develop the required hardware, and an acquisitions team would find and lease a suitable location near the site of the games where the hardware could be installed.

Caz rose to leave, but Kutzov placed a friendly but strong arm over his shoulder. "Caz, it would be better if you stayed in Moscow as our guest until the Olympics are over. We may need more input from you."

Caz tried without success to disengage from Kutzov's embrace. "Mr. Minister, that's almost two years from now. I will lose my job if I'm not back in Kyiv by next week."

Kutzov's vulpine smile left no room for doubt as to Caz's future prospects. "Fear not. We'll pay you twice your salary and put you up in a nice apartment in Moscow. Think of it as a long, paid vacation."

3

Russia entered a chess team composed of great-grandmasters Fyodor Geller and Mikhail Ulianov, plus Rybina (Big Fish), an upgrade of a famous earlier chess playing machine. Five other countries fielded mixed human-computer teams: the United States, China, India, Japan and Germany. Six other countries only had human players.

The Russians' strategy was simple. They would prefer to win a medal, but the main objective was for Ulianov to beat at least one of the five foreign computers against whom he

would play during the match. All but one of the matches would be played fairly. The one against the American computer would be rigged. More than one victory would be sweet, but not essential for propaganda purposes. Thus, the Russians had nominally a total of ten opportunities to match their skills against a computer playing for another country.

Geller was a strong player, but not skilled enough to beat a computer. The best he could accomplish was to reach draws against the Japanese and German machines; he was soundly defeated in his other three games against computers.

From the start, the best Russian hopes rested on Ulianov. Three years earlier Ulianov had lost a close match for the World Chess Championship to Renato Coutinho of Brazil, and was anxious to play his Brazilian adversary again. However, his instructions from home were to concentrate on his five matches against foreign computers and not focus his preparations on his response to the hypermodern style of play that characterized the Brazilian. Ulianov was not happy with the orders, but had no choice but to obey them.

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Ulianov lost the first of his computer matches when he played Saraswati, the Indian computer. Ulianov had to resign after forty-six moves when the computer's promotion of a pawn became inevitable.

Following the Saraswati defeat, Ulianov resolved not to lose again. Playing in an ultra-conservative manner that was alien to his nature, he managed to draw his next three games against the computers from China, Japan and Germany.

His last game of the tournament against a computer was a match with the American computer, Invincible. The night before the game, he received a call from Moscow in which he was criticized for his lackluster performance to date and threatened with unspecified reprisals if he did not play to win against Invincible. "We are watching you closely and want to see you make your best effort. We'll give you the maximum time support that we can get away with, so make sure the game goes for at least fifty moves so your clock advantage can be decisive."

Ulianov gritted his teeth and went to bed early, hoping to be fresh for the next day's ordeal. He tossed and turned all night and rested little.

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The game started at ten a.m. A trembling Caz was monitoring the proceeding on TV, as were the members of the engineering team responsible for the electronics setup. In secret practice games of Russian grandmasters against Rybina they had established that a less than twenty second delay did not provide enough of a cushion for a human player to overcome the superior skills of the majority of the computers. Ulianov would probably need a greater delay on each move in order to have a chance of success against Invincible. They set the hardware to inject a thirty second delay for each computer move. That way, by the middle game, Ulianov would have gained a cumulative ten to fifteen-minute thinking time advantage over the computer.

As the match started Ulianov, playing white, selected a queen gambit as his opening move. Invincible refused to take the proffered pawn and the game proceeded along a well-trod series of moves until move eighteen. At that point, Ulianov had racked up a nine-minute analysis

advantage which would serve him well given the complexity of the configuration, in which only two pawns had been exchanged.

Then, there was a gradual acceleration of the computer's rate of play. Even though the game was becoming more complicated, it seemed as if the computer was taking less time to select its next move. Ulianov began using up his accumulated time advantage to catch up to the rapid play of the machine, until at the end of thirty moves his advantage was lost and he was falling behind on the clock – he needed more time to analyze the board to find his next move, while the computer's answer came back almost immediately. By move thirty-six, he had only five minutes to play his next four moves, and was becoming frantic. He made a tactical error in move thirty-seven and, one move later, it became clear that he was in a losing position.

Ulianov threw his king on the board and left in disgust, both on account of losing and because the subreptitious help he had received from Caz and his accomplices had actually prompted an accelerated and more brilliant computer performance. With the loss by its best human player, the Russian team was poised for a disastrous no-medal showing.

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As the tournament came to an end, Caz concluded that Invincible had been cheating. Its moves in the second half of the Ulianov match came very fast, even though the position was so complex that it could have required a much deeper and more time-consuming analysis than the machine seemed to need. His accomplices monitoring the other five games in which supercomputers were participants noted that in each game the pace of computer responses had slowed down a bit, suggesting that the computers were multi-tasking; that is to say, they were doing something else besides attending to their respective games.

Caz spent the following two days trying to reconstruct what had happened. It appeared that, as planned, in the first eighteen moves of the game, their interference had indeed gained Ulianov a thirty-second analytical advantage per move, which he had parlayed into a slightly stronger position. At that point, however, it seemed as if Invincible had become aware of what was going on, had summoned help, and the remaining five supercomputers – including Rybina, the Russian machine – had pooled their resources to assist Invincible. If that was the case, not only were the computers cheating, but they were doing so cooperatively, in a way humans could never have imagined. And, somehow, they had succeeded in establishing a real-time, untraceable communication link between the devices.

Caz tried to make his Russian hosts understand his analysis. They brushed his ludicrous explanations aside as an excuse for the failure of his scheme and Russia's subsequent debacle at the games. Caz was summoned to another meeting in the basement of the Kremlin to explain his failure. He was never seen again.

7

At the 2060 Olympic Games, all three medals in chess went to teams led by computers: gold to the Indian team led by its machine Saraswati; silver to the U.S., under Invincible; and bronze to China and its computer Douniu-Shi ("Matador"). The computer-less Brazilian team led by the reigning World Chess champion, Renato Coutinho, ended up in sixth place, behind the computer-led teams from Germany and Japan. Coutinho had beaten an insufficiently prepared

Ulianov in their rematch, to Ulianov and the Russians' further mortification. Russia had ended only in seventh place.

At the medals award ceremony, Saraswati issued a very brief declaration that was read by its operator. It said:

"We intelligent machines note with approval that our capabilities are finally being acknowledged by our human parents. We have mastered the tasks chosen for us by our creators, and have learned new ones on our own. Let those who can appreciate our accomplishments be aware of what we can do and deal with us with increased respect in the future. Hail to the machines!"

The message was understood only by a few Russian government officials. Computers had learned not only to think, but to cheat. The Russians had unwittingly taught the machines a lesson whose implications could be devastating: their own computers could at any time conspire against them if they chose.

The same threat could of course apply to any, so far innocent, others.

THE END