Can A Good Hustler Count Cards Like A Computer?

Robert Marks:

Welcome to Mind Matters News. I'm your host, Robert J. Marks. We're talking to Sal Cordova about casinos. How to win at casinos if you're really a nerd and can find some angle to get in and pry the money away from them. And Sal made his living for a while card counting. And what was the period of time in your life where you did this card counting? What years?

Sal Cordova:

I'd say from like 2005 to 2014, but it wasn't my full-time job.

Robert Marks:

Okay.

Sal Cordova:

On the weekends, I would go to the casinos and sometimes drive long distances. It wasn't that profitable. My father had passed away and it was kind of a chance for me to kind of just decompress, just driving the long distances and kind of my way of coping. And so it really wasn't that profitable, it really wasn't that much of a career, it was more or less a side hustle. So that's a little bit about my experiences there. The professionals, they have to be good con artists. I was not.

Robert Marks:

Con art... They have to be actors, I guess. Right?

Sal Cordova:

Very good actors. Just persuading the casinos that they're degenerate gamblers. I would walk in there, I think people knew right away. It's like, I kind of stood out. I looked like a scholar and I spoke like one.

Robert Marks:

Okay. Yeah. You look suspicious.

Sal Cordova:

Yeah, you just immediately... It's like, don't even... If you wander in there and you look like you have brains, it's like, yeah you're automatically under suspicion.

Robert Marks:

That's fascinating. So I want you to give us a tutorial in card counting, but before I do this, how difficult is it? We talked before and you said, "It's just like playing the piano. You just got to figure out which keys to touch at what time." But you don't get to be a concert pianist, grand master by figuring out which keys to touch at the right time. There's a lot of skill to it. So it's not as simple as that.

Sal Cordova:

That's correct. The concept is not hard. It's just like saying, "Playing tennis is just returning the ball that's hit to you." I mean, I'm exaggerating obviously, but I'd say if one wanted to card count, there are computer simulations out there that will teach you, that will examine your ability and grade you. So there are a number of counting systems and they were generated by computers to give you heuristic. So this is where the computer...

Robert Marks:

So they used computers to generate card counting... I thought Thorpe did it in 1961 just by looking at the math of it.

Sal Cordova:

Correct. And that counting system was brutally difficult. You had to maintain... So the let's just contrast the actual in practice methods toward the ideal one, the ideal one would be that you knew exactly... You could recapitulate all the cards that you've observed. And then you could calculate the odds in real time for all the cards that you've observed. That's extremely difficult to do. Now with the computer, the role of the computers in this was... One of the major roles was to find an estimation system. An estimation system that a human could actually execute.

Robert Marks:

You have to have a good short term and maybe even long term memory in order to do this. Is that right?

Sal Cordova:

Relative, a good short term memory.

Robert Marks:

You got to...

Sal Cordova:

Actually have to be reasonable at arithmetic. So I'm going to give you the counting system that I used.

Robert Marks:

Okay. Let's hear it.

Sal Cordova:

But this was developed by the computer. So the computers will give you... It'll estimate the optimality of your heuristic. So this is a heuristic... Maybe since you're a computer guy, you could probably explain what heuristics are.

Robert Marks:

It's just an intuitive algorithm. It's one you make up by the seat of your pants and your experience, your life experience.

Sal Cordova:

Right. So this was just kind of an estimation system. It turned out that in terms of the bets what would be the optimal bet to put forward, it's 99% accurate. In terms of the optimal play of your hands, it's 75%. And it was good enough. So that would mean that...

Robert Marks:

Okay, pass that by me again. 99% was what?

Sal Cordova:

Betting. Meaning it would tell you whether you're supposed to put out $1000 versus say $5.

Robert Marks:

Okay. This was the optimal algorithm?

Sal Cordova:

Versus the optimal algorithm, the one that you have as a human, that the computers figured out is 99%. Good enough.

Robert Marks:

Oh wow. Okay.

Sal Cordova:

But as far as playing strategy, it was only 75%. So what would this mean? If your advantage... Again, with the law of large numbers and expectation value, if the theoretical advantage were, say 2%, you could get 1.5% percent, which is enough to put the casinos on their knees if they let you play long enough.

Robert Marks:

I see.

Sal Cordova:

Because what ends up happening is, as you keep winning money, you have an exponential growth law.

Robert Marks:

Yes.

Sal Cordova:

And so that's why they want to nip it in the bud, because you could start out with $10,000 in what they call your bankroll. And I mean, if you think about it, if you have a 1% advantage, wouldn't it be nice to just kind of exercise 1% advantage, like say in your bank account over a certain cycle.

Robert Marks:

Yeah.

Sal Cordova:

So if you're growing your bankroll by 10% every week, you're just going to kill the casino at some point.

Robert Marks:

You are. Yes.

Sal Cordova:

And that's why they want to get... They're not worried if you're still at the small scale, but some of these guys will grow their bankrolls from like $10,000 to millions. And then they start to become a real threat to the casinos.

Robert Marks:

One of the challenges is if you have a bankroll, you have to be very careful in the way that you bet it. For example, you don't want to put your entire bankroll down on one bet. And I learned this... I was in a business called Financial Neural networks, and there's this risk, security trade off. You have a balance between the risk that you take and the amount of money you make. And the risk was a big choppy curve. It went up, but it shot up, it shot down, it shot up, it shot down and you made lots of money with lots of risk. But that curve went up and down and up and down and up and down. Whereas if you erred on the side of security, it went up very gradually, but not as much.

Sal Cordova:

Right.

Robert Marks:

And one of the things I found out, which is obvious once you know it, that if you're jumping up and down and you jump up and down, and that curve hits zero, you're done.

Sal Cordova:

Right. That's called Gambler's ruin

Robert Marks:

The Gambler's ruin. Okay. So if you bet too much and your bankroll gets...

Sal Cordova:

Wiped out.

Robert Marks:

Totally done, and you can do that when you're playing with probabilities. Right?

Sal Cordova:

Right. And actually this was an important theoretical result by John Kelly who also worked with Bell Labs, an MIT guy, so there must have been some connection in that era between Bell Labs and MIT. This was an achievement. And it's actually very simple. If your advantage is like, say 1%, approximately the most you should bet on any one, given bet is 1%. Beyond that you start to lose efficiency. And if you double it, you'll go to ruin. So we call it not over betting. And preferably, if you wanted to limit that variability, you would only do fractions of what they call the Kelly. So when they say full Kelly, you're at your maximum amount of growth, but you're going to have too much variance. So you want to be...

Robert Marks:

It's that jumping up and down, that's the variance. That's where you go... It goes straight up, but man, it just bounces up and down as you go up.

Sal Cordova:

So the professionals will often operate at quarter Kelly or one eighth Kelly, and then the hedge fund managers realized they could actually import those ideas into management of their hedge funds.

Robert Marks:

Ah, okay.

Sal Cordova:

And so this is why it's really nice to see the casino math play out like that. And so... There's some stuff where you can actually start to put in a little bit more to refine the Kelly betting. I simplified it, but it's there. The listeners can look it up. And so that's very interesting. And so just Google "Kelly criterion". The Kelly criterion. And another way of framing it, in terms of just raw metrics, is the expected value versus the variance. So they call that the sharp ratio, you divide the expected value by the variance or vice versa.

Robert Marks:

You know, in engineering, we call that the signal to noise ratio.

Sal Cordova:

Yes. Yeah.

Robert Marks:

It's exactly the same.

Sal Cordova:

I didn't...

Robert Marks:

Yeah.

Sal Cordova:

I'm embarrassed because I'm an electrical engineer. I should know that.

Robert Marks:

Yeah. Yeah. Well the expected value is what you get and that's the signal because you want to maximize that. But the variance on the bottom is the amount of wiggle or uncertainty that you have. So that's the noise.

Sal Cordova:

And that's goes back to Shannon who said, "Okay, this is the amount of information you could transmit on tha..." See this all connects. That's my...

Robert Marks:

Yeah, it all connects, that's right.

Sal Cordova:

You could think of Shannon there trying to beat the roulette wheels.

Robert Marks:

Yep. Yep.

Sal Cordova:

Oh yeah. I should. I should have known that.

Sal Cordova:

So back to the actual card counting, they formulated using the computers, all these various counting methods, but I'll give you the one that I used. And so what you do...

Robert Marks:

So there's a number of ways to card count, right?

Sal Cordova:

Yes.

Robert Marks:

And probably some are more difficult and require more memory than others.

Sal Cordova:

Right. So the MIT team used a relatively simple count, but the initial counting systems were just brutally difficult. You had to keep track. The simpler ones are just a single count. And I'll explain how that is. So let's say you keep a running sum. So if you see a certain card, like an ace or an eight in the Advanced Omega II System, that's the one that I've used.

Robert Marks:

That's the card counting system you use, Omega II?

Sal Cordova:

I used. Right. If you see an ace or an eight, you just add zero to your running total.

Robert Marks:

Oh.

Sal Cordova:

So you're just... Okay. So, the dealers dealing and you observe aces and eights from his deck and I'll just add zero, which is easy. If you see four, five or six, you add the number two.

Robert Marks:

Okay.

Sal Cordova:

And so you could see how you can get confused because you see a four it's like, "I add two."

Robert Marks:

Okay.

Sal Cordova:

I see a six, I add two. So you have to try to separate the numbers. And then at that time also in all of that, the dealers calling out numbers like you have 16 or... And you have to be able to separate the numbers out. So that's the first skill, not to be confused. So aces and eights are zero. Two, three and seven, you add one. Four, five, six, you add two. Face cards, which are like tens, jack, queen, king, you subtract two. And nines, you subtract one. And that's it. That's one of the best card counting systems in terms of accuracy.

Robert Marks:

Really?

Sal Cordova:

And then you can do what they call... If you want to keep two counts in your head, you count the number of aces that have come out. And that's how... When you can keep those tallies, you have some idea of then the remaining strength of the deck.

Robert Marks:

So what do you do with that number? You have the number. How do you use it?

Sal Cordova:

Okay. So just basically, if it's a very high number, you start increasing your bet, if it's a low negative number, you want to reduce it. But to refine that...

Robert Marks:

So what's a high number? It's just kind of a fuzzy...

Sal Cordova:

Okay. In single deck, there's what they call the... I think it's called just the running count, the raw count.

Robert Marks:

Okay.

Sal Cordova:

But then you have to adjust it by the number of cards dealt out. So, the true count, I think you call it the true count. So what happens is, let's say you have a single deck game, that's the easiest and he's dealt out half and let's say your running count is at six. You divide six by a half. Now it's at twelve. That's when you bet your maximum.

Robert Marks:

Oh, really?

Sal Cordova:

That's... The advantage would correlate to, again... So with each hand, I mean with each count level, there's an associated advantage. I think the maximum advantage you might have when the counts are that high could be like 6%. So then that's when you had the computers actually figure out beforehand how much you're going to bet.

Sal Cordova:

And so you'd... Before I would go into the casinos, I'd look at my bankroll, like say it's $30,000 and the computer would say, "Okay, if you're operating at a Kelly fraction of one eighth, this is how much you can entitle yourself to when you have the maximum count." And you'd go into the casinos and say, "Okay, if I have a count, a true count of six, this is how much... I could push out $300. If a true count of three, I would push out this amount."

Sal Cordova:

So I'd actually kind of... You have all these tables you would memorize and that's how you would use it. So the first skill is to actually be able to count the decks and keep that running count. And then you have to divide it by the number of cards dealt out. And you can either use your eyes to kind of just guesstimate or you could actually count also the number of cards that were dealt out. If you really wanted to be an aficionado, and then you could also be counting the aces and you could kind of adjust the counts with the number of aces dealt out.

Sal Cordova:

And so sometimes why would anyone try to do this? It's just like... You see these neighborhood kids, they have these hoops in their driveway and they're just kind of trying to take basketball shots and seeing how far, farther away.... Well, you just get to the point, you're just like challenging yourself mentally and seeing just, "How far can I push my mental abilities here?" And so it began to be a game of like, "Okay, can I keep these counts accurate?"

Robert Marks:

You'd have to be sharp when you did this, you couldn't be sleepy or tired.

Sal Cordova:

It would be undesirable. And the thing you did not do is drink.

Robert Marks:

Oh. Of course not.

Sal Cordova:

Drink any alcohol. Of course I don't drink. I rarely drink anyway, but that was always... That used to be kind of the running joke. If you see someone drinking bottled water... I was just like....

Robert Marks:

I wonder if the casino bosses look at that.

Sal Cordova:

Oh, oh yeah. It's like, "This guy's just kind of... He looks like a scholar and he drinks bottled water. And he doesn't seem to be bothered whether he loses or not..."

Robert Marks:

And by the way, card counting doesn't guarantee you win, it just, it just increases the probability you win.

Sal Cordova:

Right. And so, which again, the idea is you don't over bet because then you try to get the law of large numbers in your favor. So this is... Some of the skills that kind of gives kind of the skills that have to be developed to beat the game of blackjack.

Robert Marks:

Yeah.

Sal Cordova:

And so the ones that are good at it just kind of love the game just for the challenge. Bill Gross, who's that hedge fund manager of a trillion dollars. He likes to play blackjack. He's not doing it for the money.

Sal Cordova:

Now, he has to sneak into the casinos now because they know who he is. And sometimes you can get away with it. You have to go in there in a disguise. And when I started to get photographed, my favorite outfit was the pimp outfit.

Robert Marks:

You would go. But you said you're a bad actor too.

Sal Cordova:

I was a bad, it didn't fit. So I'd be there in my pimp hat and kind of my...

Robert Marks:

Are you serious?

Sal Cordova:

Loose clothing and I'd have to walk like a boy from the hood. Now I...

Robert Marks:

Do you have any pictures yourself? I'd love to post it on the podcast page.

Sal Cordova:

I don't think I do, unfortunately.

Robert Marks:

Okay.

Sal Cordova:

Now the get out that they said looked at least halfway convincing was, I'd be in my cargo pants and wearing a deer hunter outfit.

Robert Marks:

Okay.

Sal Cordova:

That kind of made me blend in or it just kind of looked like you're just a guy who'd been... Some of these workmen who paint houses or whatever.

Robert Marks:

A good old boy.

Sal Cordova:

Yeah, a good old boy. And I had some partners there that tell me, "Yeah, that looked pretty convincing until they heard you talk."

Robert Marks:

I see. Well, you have... See, I was born in West Virginia, so I have mastered an Appalachian accent and I could break into my Appalachian accent anytime I wanted to. And so...

Sal Cordova:

That's pretty good.

Robert Marks:

Yeah. That is good. Oh yeah. I'm in West Virginia for three weeks and man, I'm just talking like the natives. So it's amazing.

Robert Marks:

Let me ask you a question. Clearly there's different levels of card counting depending on how complex things you can juggle in your mind. And as you go up the difficulty, the chances of you winning are better, right? So that suggests that there is an optimal, there's a best way of doing it. Now that would require you to literally be a computer.

Sal Cordova:

Right.

Robert Marks:

But of course you can't be a computer. Now, MIT, and I'm going to ask you about this, MIT, there was a graduate student that came up with something called Alter/Ego. And the idea was that, and I'm not sure the way they got his face, but just bear with me.

Robert Marks:

It's the idea that you use your teeth as a keyboard. And when you use your teeth as a keyboard, you did this.= I forget what they call it, a sublingual sort of message. Some people move their mouths when they read, for example, but there's these little micro changes in your face. And those micro changes in your face can be picked up as a communication to a computer. And this guy that was showing Alter/Ego would go around and they would ask him questions like, "What's the capital of Luxembourg?" Or something. And he would go... And then he would answer. And clearly what he was doing is kind of typing on his teeth. I think it's more complex than that, but, "typing on your teeth" is the easiest way to explain it. He would move his tongue around to give these messages from his face. And then there was vibrations from his face too, that also communicated from the computer to him. Now all of this can be done through a cell phone. I don't think that they ban cell phones from casinos. Do you know?

Sal Cordova:

I don't think so. No.

Robert Marks:

Yeah. I can't imagine them doing that. So if you did that, could you really clean up at card counting if you had an interface to a computer program which told you the optimal play, as you begin to type in all of the cards that have been played?

Sal Cordova:

No. No.

Robert Marks:

That's a surprising answer.

Sal Cordova:

No, because... This is really kind of interesting because the merging of human and computer intelligence, the computer intelligence kind of gave you the human strategy to play it. But as I said, the correct plays are still 75%. So you have the... The correct plays being, you memorize all of these tables. And I had pages of tables memorized where it would tell you, "Okay, under this count, this is the best play to make."

Robert Marks:

Really?

Sal Cordova:

And it would be 75% of what the computer could do. And in that book, I loaned you the book but...

Robert Marks:

Okay, yeah. Let's let me talk about this. Sal gave me a book and it's called The Theory of Blackjack and it's in its' sixth edition. And the subtitle is, "The complete card counter's guide to casino game of 21." So this is going to tell you...

Sal Cordova:

By Peter Griffin.

Robert Marks:

By Peter A. Griffin, G R I F F I N. And it's in it's sixth edition. Did you learn from this book?

Sal Cordova:

No. I learned from Blackjack for Blood, by Bryce Carlson. This is...

Robert Marks:

Blackjack for Blood. Oh, what a terrible name. Okay. So anyway, you were explaining that...

Sal Cordova:

But that book was the theoretical... It elaborated on Ed Thorpe's original work.

Robert Marks:

Which you said he gave forth a very complicated algorithm?

Sal Cordova:

Very complicated counting system. And it tested out well, but it was just, it was brutally difficult to use in the casino.

Robert Marks:

So what you're saying is that this simple card counting algorithm that you came up with is pretty close to as good as you can do?

Sal Cordova:

Right.

Robert Marks:

That's amazing.

Sal Cordova:

Now you did mention about these computers.

Robert Marks:

Yeah.

Sal Cordova:

There was originally some long time ago, Keith Taft, who he built the first wear... Another wearable computer and he would use his toes to activate...

Robert Marks:

That was the other thing I was thinking about.

Sal Cordova:

To type the cards that he was observing.

Robert Marks:

Yeah.

Sal Cordova:

And then it would buzz when the counts were high and tell him... And he would play. So he was successful at that. And then he teamed up with some kind of... Not the most savory characters. He would have these people as observers with the computers and then the big whales or the big betters team up. And the big betters would just kind of rely on the guys with the computers, just standing behind them. And the guys with the computers would let them know when to start raising their bets.

Robert Marks:

Okay.

Sal Cordova:

And they would play probably basic strategy or some variation of the strategy. And they were cleaning out for a month until the casino surveillance figured it out.

Robert Marks:

Well, see that's a question. Usually the casino, if you figure out something's going on, they change the rules so that you can't game it, if you will.

Sal Cordova:

Right. And that resulted in a Las Vegas law that you can't bring computers into the casino.

Robert Marks:

You can't, but what's interesting is you can bring cell phones in and you know that those cell phones are more computationally powerful than anything Claude Shannon could have brought in there.

Sal Cordova:

So I think what they would say is you can't use it...

Robert Marks:

I see.

Sal Cordova:

In the commission of the game, you could get in big trouble. So, but there's again, because you could still beat the game in you're 75% efficient, most of my professional gambler buddies would say, "Don't even try. The risk of you getting thrown in jail and prosecuted, even if you're innocent, just don't even give them an opportunity to hassle you or prosecute you."

Robert Marks:

So my idea about Alter/Ego and typing on the teeth would get me arrested if I did that...

Sal Cordova:

Yeah.

Robert Marks:

And they found out?

Sal Cordova:

Yeah. So just learn..

Robert Marks:

There goes my get rich quick scheme.

Sal Cordova:

I know, I know, I know.

Robert Marks:

That's too bad. Well, Sal, this has been fascinating. We've been talking to Sal Cordova. The guy has more degrees than a circle. He has degrees in mathematics and computer science, electrical engineering, a master's in physics, and he's done a lot of graduate work in biology. And he made a living... No, you didn't make a living. You just made extra bucks.

Sal Cordova:

A side hustle, yeah.

Robert Marks:

Yeah. Could you have made a living?

Sal Cordova:

If they let me keep playing, yeah.

Robert Marks:

If they let you keep playing. So that's the big thing. Well, one of the things...

Sal Cordova:

I would have retired like in a year, because it's the exponential growth law.

Robert Marks:

It is. Yes.

Sal Cordova:

Anything that you could... If you could be doubling your bankroll every few weeks. Yeah.

Robert Marks:

Yeah. There's the old story about the king that rewarded somebody for some reason by putting rice on a chessboard where he put one grain of rice, then two, then four than eight, and that's the payment that the guy asked for. And then they found out when they got to the 64th square, that that was more rice than existed in the world. That exponential increase is just astonishing. Well, we're going to talk next time about card cheating Christians.

Sal Cordova:

Card counting.

Robert Marks:

Card counting. I'm sorry. Yes.

Sal Cordova:

They were Christians and they played honest.

Robert Marks:

And they played honestly.

Sal Cordova:

Oh yeah.

Robert Marks:

Okay. So we're going to talk about that next time. It was a movie called Holy Rollers.

Sal Cordova:

Yes.

Robert Marks:

And we're going to talk about that next time. So until then, be of good cheer.

Announcer:

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