WHITE PAPER | Willy Allison 2026

Seeing is Believing: The Impact of Computer Vision On Table Games

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EXECUTIVE SUMMARY

This white paper puts forward the case that casino table games are not effectively being monitored by humans. They could more effectively be monitored by computers. Instead of relying on a few people to “keep an eye” on everything, computer vision technology would effectively monitor and analyze each table game automatically. The result: increased protection and profits.

The writer believes that artificial intelligence (AI) and machine learning will open up new opportunities for table games, specifically through the use of computer vision technology. Smart cameras will be programmed to not only protect table games more effectively, but to also provide valuable business intelligence.

This is not a technical paper. It’s a vision for the future written by a casino guy who has spent over 38 years in the industry, primarily in operations and educational roles focused on surveillance and game protection of casinos. He sees the current way of doing things as outdated and puts forward a solution – automated surveillance.

This paper offers insight into current casino practices around the world and takes a peek at computer vision solutions some innovative casinos are currently testing on their gaming floor. Above all else, it’s designed to provoke thought on how things are done in a casino and how they could be done better.

A business case is included for casino executives to consider. It concludes that the ROI of automated surveillance would come primarily from four major benefits that would positively impact the casino’s bottom line; determining true player value, dealer proficiency, games protection and game performance analysis.

The Problem With Casino Surveillance

1% of a casino is being watched

For a long time now casinos have perpetuated the myth that everything is being watched by Surveillance. It's not. Although casinos can legitimately lay claim to recording almost everything, I conservatively estimate only about 1% of casino transactions are actually being watched at any given time.

Let's do the math…

An average mid-sized to large casino looks like this: 100 table games + 1,000 slot machines, electronic table games, 10 cage windows, a cash count room, the chip bank, cash and chip deliveries, bars, restaurants and TITO kiosks. That is the financial ecosystem of a standard casino.

Then add compliance obligations. Restricting thousands of barred people from entering the casino, underage person detection, responsible gaming and drinking, federal requirements to know your customers financial history and report AML suspicious transactions.

Then add recording or reviewing security incidents. Intoxicated people, irate gamblers, assaults, medical incidents, drug selling, human trafficking, customer on customer theft, alerts on criminal persons of interest, general tomfoolery.

Finally, throw in investigations. Patron complaints, slip and falls, harassment claims, human resources internal investigations, legal cases, management surveys, regulatory assistance (a big one) and law enforcement requests.

Question: So on average, how many surveillance operators monitor a casino?
Answer: 4.

Why 4? No reason really. Bookies would probably make cost a 2-touchdown favorite. Over the years, minimum staffing levels for Surveillance has been the topic of debate (without logical argument) between regulators, surveillance directors and CFOs. It's been accepted by the industry that surveillance staffing should be dictated by table game numbers. That's somewhat logical given the volume of gambling and human intervention required. Arguably, the risk of cheating and fraud is greater in the table games department.

Based on the surveillance/table game formula I estimate the average casino has a staffing ratio of 1:25. One surveillance operator per 25 tables. Other areas like the slots, cage, F&B and security are monitored to some degree with electronic assistance using interfaces and alerts. However, table games still remains a very analog type environment. Cash, plastic chips and the reliance on humans make for a world of errors, inefficiencies, estimations and fraud.

Lets do some more math…

Casinos have a lot of cameras. I would estimate that the average casino has approximately 500 cameras. But cameras don't catch people. People catch people. Let's take my estimation that 4 surveillance staff are monitoring the complex.

500 cameras/4 surveillance staff = 1 observer per 125 cameras

That's 0.8% of all cameras in the system being watched by surveillance staff at any given time. That doesn't take into account staff members going on breaks, on the phone, reviewing video, writing reports, training, or responding to what has been deemed a high-priority event.

For most casinos, surveillance staffing ratios haven't changed much since casinos and regulators deemed surveillance essential 50 years ago. Rewind the tape to back then, and you'll find surveillance's job was to "watch the games." As the years have gone by, monitoring responsibilities and obligations have grown exponentially. Staffing levels have not.

The staffing challenges are exasperated by a number of factors including a lack of experienced people in the labour force, the extensive training required to get someone up to speed, a competitive salary needed to attract quality applicants, shift work and internal policies that restrict a career path.

99% of surveillance video is not used

Casino executives can rest assured, however, that although there are only a few people in Surveillance watching their casino, almost 100% of activity in the casino is being recorded. Somewhere.

Casinos used to retain video records for 7 days. After VCRs ended up as landfill and digital storage became the norm, regulators began pushing to increase video retention for longer periods. It is now more normal to see retention periods of 14 days to a month. I have heard that some regulators are absurdly forcing casinos to keep all video for up to 1 year.

Years ago, an internal study was done by a large casino in Australia (over 200 gaming tables) to ascertain how much of the 7 day video retained in Surveillance was actually reviewed. The number was around 1%. I was a Surveillance Director for another property at the time, so I cross referenced the data with my own in-house study to confirm 1% to be about right.

Fast forward to today, and arguably there are more reviews conducted by Surveillance now. However, the percentage of video used is even less due to the fact that we store and keep more video, and staffing levels have remained the same. We're taking a bite and throwing away the apple.

We're only human

Although Surveillance staff try hard, they can't see everything that goes on in a casino. Assuming they're adequately trained, motivated and awake, 4 people can only be expected to see so much. They rely heavily on the precise adherence to dealing procedures, tip-offs from staff and customers on the floor, quality training, intelligence from other casinos and electronic notifications.

But humans are human. They're not always reliable. They're not always dependable. Dealers don't always deal the way procedures dictate. Staff and customers don't always say something when they see something. Training is often outdated and basic. Casinos are sharing less information with others. Electronic systems rely on timely and accurate information inputted by humans. (Most of us are familiar with the saying - "garbage in, garbage out.")

There is one source of intelligence that is often used as a call for action. Losing. When a table game is losing, Surveillance is often called in, like the Ghost Busters. They initiate a video review and/or investigation into the players and the conduct of the game. It's a reactive measure where findings usually conclude luck. However, sometimes the reason is cheating. The question then becomes, "How long has it been going on?"

The universal: "When in doubt - check it out" measure is a sound Surveillance philosophy. But Surveillance doesn't want, or need to investigate every time a table loses. That's not practical. Surveillance needs to be notified of human behavior during the game that raises known game protection red flags, without subjectivity or prejudice.

A lot of cheats, at least the good ones, don't linger at the scene of the crime. They get in and out and come back and forward. It makes good business sense to investigate large losses over long periods but casinos should not be lured into a false sense of security.

Often when staff are involved in a major collusion scam with players, they cheat tables that they know have been winning to avoid being detected from the table loss review process. Basically, they're skimming a bit of cream off the top, which goes unnoticed in the numbers.

When high-performing surveillance operations catch cheating or fraud it's very impressive. Given the numerous responsibilities bestowed on Surveillance and the limited resources they have, it's often against all odds.

For some operations detections can be few and far between. They may have a few star observers but often they carry a few benchwarmers. This decreases the odds of detecting cheating and fraud even more.

Without human assistance, live detection of cheating and fraud is often the result of a motivated and knowledgeable individual being in the right place at the right time.

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When it happens, scam detections are a high-five moment for surveillance professionals. However, the applause is sometimes followed with outside skepticism and questions about how long had it been going on, how much did the casino lose over time and why wasn't it caught earlier. In the case of a dealer colluding with a player, there's often a suspicion that other floor staff are involved or doing the same thing. Where do you start to look? What video do you review?

Game protection up until now has primarily been reliant on humans. Whether it is direct communication or inputting data into a computer, information originating from humans is essential. In the digital age that we live in – and the AI age that we're going into – it doesn't need, or shouldn't be that way.

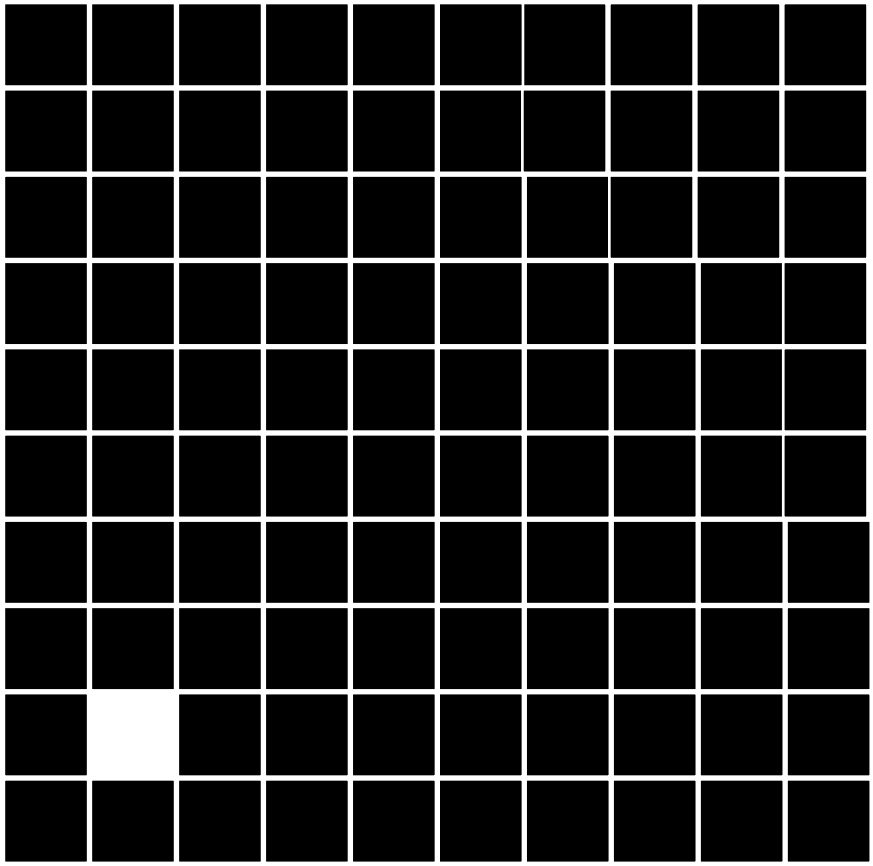
Can't see the forest for the trees

Almost every square inch of a casino is video recorded and the data kept for weeks, however, the raw data collected is hardly ever converted to useful information. Instead casinos pick away at the data with their limited resources, often in response to events requiring reviews or manager assistance.

In today's fast-paced business environment, data is king. I believe casinos are underutilizing video. Video data should not be looked at as a last resort library. It should be looked at like an engine for a high performance vehicle that displays a dashboard full of actionable intelligence for a manager sitting in the driver's seat.

I believe it's time for video data to play a bigger role in providing casino executives, owners and investors with the complete picture of the gaming operation. Not only could assurance be given that the integrity of all games would be 100% preserved but practices would constantly be analyzed by computer technology and adjusted to grow and maximize profits.

My vision is computer vision. Casino games watched by smart cameras and constantly analyzed by a computer. Every game, every second of the day.



It's time for video data to play a bigger role

The Solution: Computer Vision

What is computer vision?

Computer vision enables machines to interpret, analyze and gather useful information from images and video. It's a subfield of artificial intelligence (AI) that helps computers recognize objects, people and patterns. Computer vision replicates human sight and automatically derives meaningful information.

Computer vision technology is changing the world. Tesla driverless cars use it. Drivers of other cars use it to help park or find available parks in multi-level parking lots. Jet pilots use it for taking off and landing their aircraft. Doctors use it to identify cancerous tumors in a MRI scan. Manufacturers use it to detect defects and improve productivity. Retail stores use it to enable check-out free shopping. Farmers use it to monitor crops and detect pests.

Computer vision replicates human sight and automatically derives meaningful information

The development of this magical technology has been hotting up in recent years with a number of the world's big tech players investing in it. Recognizing images from visual data has been around since the late 50s. However, the high-speed pace in which digital product development is moving and the promise of automating critical tasks has kickstarted a revolution.

In the casino industry one of the pioneers of computer vision technology is Tangam Systems. Founded in 2004, they have been using this type of technology to power their table games yield management system for two decades now.

Another byproduct of computer vision technology that most people are familiar with is facial recognition. FR products came on to casino radars a few decades ago but they didn't really catch on because of accuracy issues, mainly attributed to inadequate camera image quality. You would be hard pressed to actually find a casino using it 20 years ago, but now you would be hard pressed to find a casino that is not using it, or at least considering it.

Another computer vision product that has become popular with casinos in recent times is license plate recognition. LPR cameras in casino parking lots increase the chances of identifying suspects of crime and assisting law enforcement apprehend persons of interest. Surveillance investigators love it.

In response to COVID, eConnect developed a computer vision product that essentially would conduct real-time head counts to ensure regulatory mandated occupancy restrictions on the property were adhered to.

Security has been one of the industries quick to adopt computer vision technology. Like casino surveillance they have relied on camera technology for decades and have the infrastructure in place. Products that have been developed using this type of technology include real-time weapon detection, anomaly and behavior analysis, perimeter breach detection, object and unattended object detection and retail theft detection.

More start-up software companies are looking to develop computer vision technology to solve problems in casinos. Large existing casino suppliers are pivoting to take advantage of the technology. Buzz phrases like AI-powered and video analytics are being added to tech company taglines and websites.

There's a good reason for the hype when it comes to computer vision technology. The timing is right for a few reasons. Camera image quality has gotten really good. Processing and storage capacity has gotten better. Labor costs are blowing out. Artificial intelligence (AI) and machine learning has arrived.

Artificial Intelligence and machine learning has arrived

We are on the cusp of a technological evolution. Casinos have dipped their feet into computer vision technology for security purposes. Now it's time to explore the potential in making money from it.

How computer vision could change table games

Computer vision could unlock the full potential of a casino. Essentially, it would place the entire gaming operation under the watch of computers programmed to protect and maximize profits. Instead of 1% of the casino being watched by people making $20 an hour, 100% of the casino would be continuously analyzed by computers programmed using the collective expertise of the best operational and financial minds in the business.

To get from 1% to 100% will take some work but the good news is that the infrastructure is already in place. Casinos have the camera systems and computer power. If there's a deficiency in those two areas, well – it's only money. The missing piece right now is the computer vision software. Not to oversimplify this but 2 out of 3 ain't bad. We're well on the way..

Wanted: Computer vision and casino experts

There are a number of tech companies out there right now in different stages of developing computer vision products for casinos. The AI genie is out of the bottle, and the race is on.

Before a programmer's finger hits the keyboard, or a Zoom call takes place with someone who doesn't know whether to hit or double down on a 9 against a 2, a discussion needs to be had on the casino's priorities and goals. In particular, what is useful information and what features would have the biggest impact on the business.

To that end, I have listed what I feel should be the four objectives of a table games computer vision product. The objectives are listed in order of what would initially have the most financial impact to a casino:

4 objectives of a table games computer vision product

1. Player Value

What's a player worth to a casino? Casinos spend billions of dollars a year comping or "reinvesting" in players. This marketing strategy, which has become the industry norm, serves to induce players to return and play longer by offering financial incentives primarily based on how much a player wagers. Whoever came up with the idea of comping systems created a monster. A monster that needs to be fed more and more due to increasing competition.

The problem with existing table games comping systems is that billions of dollars of goods and services are given away to players each year, without management actually knowing what they bet. They guess what players bet.

Floor staff, responsible for supervising 4-8 tables, are tasked with tracking how long every player plays. That's easy enough as most rated players swipe in and out of the game with a players card. The flaw in the process comes when at the end of play a supervisor has to return to that players table and blindly guesstimate what there average bet was over their period of play.

Over the years internal surveillance investigations have shown that floor staff overestimate what players wager by up to 20%. The honesty box system that casinos use to give away billions of dollars a year is fraught with inaccuracy, favoritism and corruption. The result is wasted dollars on customers that are not as valuable to the casinos as they were led to believe.

Computer vision has the potential to automatically identify and confirm a player's bet. By using dedicated cameras that focus on the chips, the system is able to recognize chip denominations and accurately calculate the total amount of the stack. By automating the process the guesswork is taken away.

Casinos will not only be able to get an accurate account of what a player wagers but also how and when they wager. This could lead to casinos truly getting to know their customers and subsequently, marketing promotions could be tailored accordingly.

I believe the potential impact to a casino of knowing what table games players actually wager could be an annual savings of 10-20% in comps.

Casinos could save **10-20%** annually in comp costs

2. Dealer Proficiency

Spoiler alert: Dealers make mistakes. Overpayments, misdeals and take and pay errors cost casinos money. How much money? Who knows. Only 1% of games are being watched remember. What we do know is Surveillance departments advise table game managers when they observe errors, and a list is compiled every month for them to review.

The question is, “How much is lost due to errors?” This question could be answered by computer vision. Most mid-to-large casinos report tens of thousands of dollars in monetary losses detected by Surveillance observers each month. Most are recovered from players by floor staff. It’s safe to say that errors detected by Surveillance represent a small sample size of what is probably lost.

Retrieving money from customers is time-consuming and awkward. In my experience the longer it takes to review and confirm errors, communicate to busy floor staff and request the money back, the more it becomes awkward for everyone. This could be rectified by an on-table alert system that immediately lets the dealer, players and surveillance know an error has been made. The system would detect errors when they happen and allow dealers to correct them, avoiding the need for asking for the money back.

Besides detecting monetary errors, another aspect of dealing proficiency is efficiency. Game speed is a key factor in generating the amount of gambling outcomes needed to maximize long term profitability. Computer vision would essentially put all dealers on the clock. Internal efficiency standards could be devised and introduced to the floor. Weak dealers would be retrained. Strong dealers could be rewarded.

Right now, we check game speed like we check milk – only after it’s already sour. It’s not a concern when casinos are winning but when the daily numbers start going south, and the reasons can’t be explained, the topic of game speed is often raised. It’s a reactive consideration when all other reasons have been explored. Why can’t game speed be a proactive process monitored, measured and maintained?

A common practice, which once again confirms the lack of science used in managing casinos, is using Surveillance to do game speed audits. Surveillance personnel are asked to review video of a random sample of dealers and manually count how many rounds per hour are dealt. The sample size is ridiculously small (remember the 1%); however, that number is often placed on record as fact across the operation.

I think it is safe to say that the introduction of computer vision will show more errors occur than what is currently being recorded. I think over time if management subsequently address the causes of weak dealing highlighted by the system, error rates could be reduced and money saved.

Dealer error rates could be reduced and money saved

The monitoring and measuring of game speed through computer vision could have a significant impact on casino profitability. Going from not knowing to knowing everything about how dealers conduct the games could usher in a learning culture similar to professional sports teams where individual team members are trained and coached to become optimum performers.

3. Games Protection

Casinos are candy stores for thieves and opportunists. Cheating. Theft. Advantage Play. They're ever-present threats and concerns in a casino. Cheating and theft are criminal acts that don't occur that often but when they do it can be costly.

There are 3 ways to cheat on table games: 1) alter the wager after the result, 2) alter the result, and 3) use inside information. It is easier to see cheating when it happens than to see advantage play. Almost all cheating involves a breach of procedure by a dealer or player. A procedural breach is a red flag for a trained eye.

The first and second ways to cheat shouldn't be too difficult for computer vision to detect. Gaining inside information is a little more advanced and guidance for computer vision programming should be sought from seasoned game protection experts who have a universal and historical knowledge of the intricacies of more sophisticated cheating scams.

Advantage play, on the other hand, is not a criminal act – more a skill that exploits table games with changing probabilities (e.g.,blackjack), flawed equipment or poor practices. Advantage play techniques are usually designed to shift odds in the players favor so a long-term advantage can be gained.

Advantage play is more prevalent in casinos than cheating and theft because it is not illegal and players are willing to patiently grind out profits over the long term. Inevitably, unless they get greedy or get caught, they sometimes are able to fly under the radar of a casino and make a career of it.

Instead of relying on a human's radar, computer vision could be used more like a satellite. It would offer a casino-wide, continuous monitoring tool that would be programmed to identify play and betting strategies that correlate with known advantage play techniques. Regardless of whether a player is winning or losing, (advantage play is not a sure thing like cheating or theft) the advantage player's moves would be identified.

What about theft? Casinos attract thieves like bees to honey. Chips from table games are a valuable commodity that are easy to steal and conceal. A $1,000 chip is much easier to steal than $1,000 in cash. Players steal chips from table games occasionally. Gaming floor staff steal chips from table games more than we would like to think.

Computer vision could be programmed to recognize movements and behavior that constitute theft on a game. It could also be used to secure chips on a closed game.

I suspect if a games protection feature was introduced covertly, it could be very enlightening to casino management. On the other hand, if the presence of the new system was openly announced and promoted, I believe it would act as a major deterrent for staff and players who have become wise to the fact there are only a few people watching the entire casino – that cat's out of the bag.

Computer vision could be a major deterrent for players and staff thinking about cheating the casino

If cheats and thieves know they are being watched 100% of the time by an AI-assisted computer, it may scare away any larceny in their hearts.

4. Games Performance

Table games profitability is under attack in the US. In some markets revenues are falling, at best they're staying the same. Threats from the growth of online gaming, sports betting, prediction markets, video parlors, illegal gambling and an uncertain economy are challenging the traditional bricks and mortar casinos.

Table Games executives are looking to new games, side bets, payout structures, floor mixes, player (and dealer) likes and game speed factors. Although a lot of managers subscribe to the one-size-fits-all philosophy (it worked over there, it should work here) others subscribe to improving profitability by using reliable and meaningful data.

I personally think that after the first three features have resulted in better practices and increased profits, moving forward the game performance feature will be an invaluable tool for table games. It will allow management to effectively analyze new games, side bets and practices. They'll be able to accurately measure the effect of change and experimentation. The result will be continued economic growth.

Picture this: table games management being able to bring up a dashboard of every game that displays realtime information and long term analysis of game performance. Information gathered but not limited to: effect of side bets on game speed, time from place your bets to all bets placed, time from all bets placed to first card dealt, how long it takes to deal the game, time to complete take and pay procedures after result, time of shuffle and cut, time to open table, time to close table, time to receive and check new cards, time to process a fill or credit.

At the same time computer vision could give insight into player and dealer acceptance of new games, bets or practices through recognizing engagement. Through facial expression recognition we could get an idea of peoples emotions through different stages of the game.

Dealer acceptance is a key factor to the success of a new game. Acceptance is often won by how much dealers make in tips. Potentially "tip ability" could be analyzed and that information shared with dealers to incentivize them to want to learn how to deal the game better. If players are not tipping much on a game being trialled, analysis could provide reasons and practices tweaked.

Computer vision analysis could also be provided as guidance or feedback to casino game developers. It could save time when trialling different products by giving developers "your specs" based on historical computer vision analysis.

The impact of computer analysis on games performance could potentially revolutionize and revitalize table games.

The impact of computer analysis on games performance could potentially revolutionize and revitalize table games

What would it take to make it happen?

The casino computer vision revolution starts with humans. A coalition of colleagues from within the casino in partnership with computer vision experts. Key employees from table games, surveillance, IT and finance should play a key role in the successful implementation. Outside contractors consisting of mathematicians, game protection experts and business analysts could be called on to provide knowledge to programmers.

As mentioned earlier, a number of tech companies are currently working with casinos to develop computer vision solutions for table games. The race to automating surveillance is still in its infancy. However, AI and machine learning technology is progressing at a rapid speed, and the race is attracting a larger field and plenty of interest.

The tip of the spear for a computer vision system are cameras. High quality, strategically positioned cameras will be needed that will provide every detail and data point to assist in the continual analysis of the game. This may take a rethink in traditional camera positioning. A decision will need to be made on whether the existing surveillance cameras can be used or will cameras have to be added.

Technology can be bought or developed but the key to developing a useful system that will make the greatest impact to a casino is to get the right people in place to drive it. Knowledgeable people that are data-driven, proven successful gaming operators who are focused on improving profits.

The obstacle: bet identification

There is one major obstacle to achieving computer vision magnificence. Most casino card games have one designated fixed camera per table. They are unable to accurately confirm the amount of a player's wager because they are positioned in the ceiling to provide an overview of the gaming table, floor staff and customers. They can only see the top chip of a wager.

To confirm chip amounts surveillance operators use pan tilt zoom (PTZ) cameras to zoom in to the chip stack. Normally PTZ cameras are positioned to provide pit overviews, but when a surveillance operator is watching a live game, they remove them from their primary position to use them to zoom in and identify how many chips make up the bet.

If a surveillance operator is asked to review a dispute at a table, the video of the designated fixed overhead camera is the only option for review. Often when wagers consist of multiple chips, insider powers of deduction or "guesstimation" are used to resolve the dispute.

Bet identification is a must for computer vision technology to realize its potential and provide all the things mentioned in this paper. It is of paramount importance to be able to accurately identify and confirm players bets. The solution to this problem is reasonably simple but may take some experimentation with the placement and mounting of cameras.

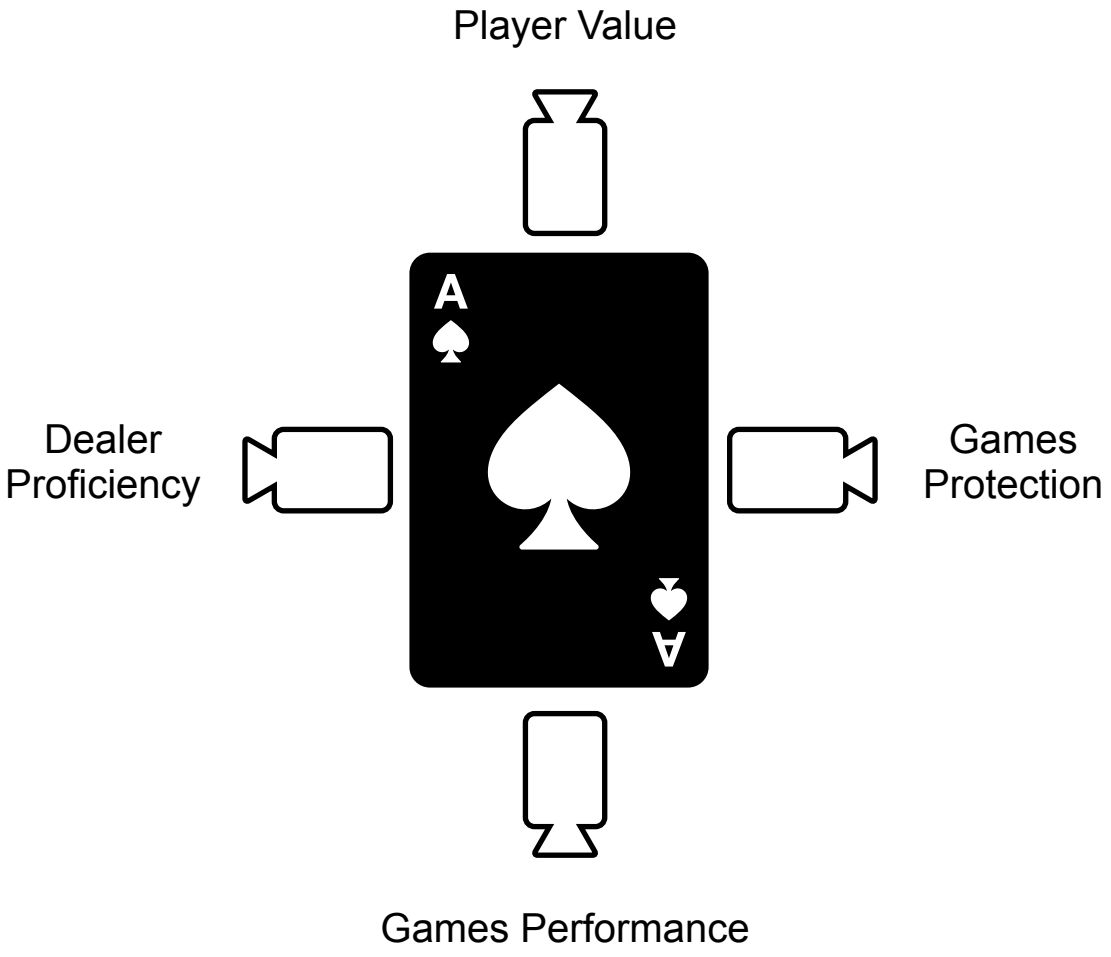
Bet identification is a must for computer vision technology to realize it's potential

The way that casinos are achieving this right now are through additional table-mounted cameras that are focused in on the bets. It's an additional hardware requirement but the payoff is huge. Not only does the additional coverage enable the effective implementation of computer vision technology, it gives surveillance the ability to confirm bets visually without using a PTZ camera. The additional camera view enhances surveillance capabilities and effectiveness. It's long overdue.

There are a couple of other options that could be considered: RFID chips or digital chips (cashless). Both options potentially could be interfaced to provide bet identification for a computer vision system.

Casino chips are the main obstacle right now, but whether you're in the diehard must keep chips camp, the RFID chips camp or the digital chips camp, a total computer vision table games operation can be achieved.

Casino chips are the main obstacle right now



Smart Cameras, Smart Casinos

20/20 vision

For a long time now casino executives have relied on the savviness of the head of table games to captain the ship. However, the waters of competition and economic climate change today require a more technology assisted data-driven approach.

Non-growth should not be accepted or downturns in revenues arbitrarily dealt with by changing or moving the furniture, blaming marketing, cost-cutting, taking short cuts, copying what other casinos are doing or using Surveillance resources to look for ghosts.

Sometimes arbitrary measures work. Sometimes they don't. Sometimes a number of changes are introduced that produce positive results on the profit & loss statement, but no one is quite sure what change was effective or why. Cause and effect should be understood using actual data obtained from an adequate sample size.

I see a day when automated surveillance will provide casino executives with a total picture of what's happening on each table. Algo alerts will be sent to in-house experts who will respond appropriately and professionally by taking immediate action or further investigation.

A dashboard will be set up for casino analysts to view each table's key metrics: the financials, dealer proficiency and security risks. New games could be analyzed automatically based on your casino's key metrics. Trend analysis will be automated to provide analysts with suggestions for improving profitability long term. AI and machine learning could provide AI overviews at the press of a button from executives who may have questions about their table games operation.

Better decisions, better practices, better profits

There's a shrinking pool of expertise in the casino industry. Gambling is exploding in all shapes and forms and professionals with gaming expertise and savvy are moving on. It's time to bottle up the years of knowledge and wisdom in a secure server before the expertise is gone.

Doing things the way they have always been done should be banned from a casino directors meeting. Instead, a picture with "Show me the Data" should be hung on the wall. The competitive landscape we're in and the ever-changing economic conditions require business strategies that balance useful, accurate data with the occasional use of one's gut.

It's time to bottle up the years of knowledge and wisdom in a secure server before the expertise is gone

A byproduct of computer vision will inevitably be redefining the roles of supervisory staff. The obvious position that would be most affected is the floor supervisor. Their role has been diminishing for years. Is it game protection? Is it rating people? Is it customer service? Computer vision could perform most of their functions more efficiently and effectively with dealers and pit managers taking a bigger role in customer service.

The goal of any business is to make money. The goal of a dynamic organization is to make more money. To be dynamic I believe there is no such thing as best practices. What happens yesterday isn't always the best thing for today or tomorrow. What happens in Vegas may not happen in Wisconsin, it may just stay in Vegas. I believe in always searching for better practices.

Is what we are doing the best way it can be done? Are we leaving money on the table?

Are we leaving money on the table?

Continuous improvement can only be achieved by continuous learning. Too often result-focused casinos set budgetary goals based on unsubstantiated financial forecasts. They kick for goal 60 yards out, and place unnecessary pressure on the kicker. Getting closer to the goalposts by continual learning from real-time data and historical analysis would increase the chances of kicking a goal every time.

Computer vision technology will make table games and surveillance operations more proficient and efficient. It will promote a learning culture where science takes a larger part in running the business and new ways of doing things will be encouraged. Not based on a whim or what someone else is doing, but on what computer analysis of history reveals and what it suggests is the best, most profitable way forward.

Computer vision in casinos today: it's out there

As mentioned earlier, casinos are currently testing and trialing computer vision technology on table games – more so than you would think. I am aware of trials currently taking places in the United States, Asia and Australia. My sources are excited about the technology's potential, although all admit there's still a ways to go. We are in the early stages of development but it is progressing rapidly.

This is what I've heard. The largest impact so far has been the surprisingly high amount of dealer error alerts. Basic category 1 cheating alerts (altering bets after the result) are coming up also. I've been told that often at the start of a pilot program the accuracy (true or false notification) is often less than 50%. However, through adjusting camera positions, lighting and working close with their computer vision partner, some casinos have achieved over 90% accuracy…and it's climbing.

Some casinos are looking at integrating computer vision with smart table solutions incorporating RFID chips and other smart technologies. In Australia the introduction of smart table technology is more than a want. It's a need that has been forced on casinos by regulators as a result of investigations uncovering anti-money laundering (AML) and know your customer (KYC) issues. Smart tables are viewed by Australian regulators as a solution for better compliance.

The technology, although showing a lot of promise, is currently only delivering a fraction of the potential I propose. There is still a long way to go. However, comments like "operational game changer" and "we're looking to introduce that in the next phase" are common amongst its beta-testers. All I have spoken to claim the technology is making a significant impact in their operation and they are already realizing positive ROI.

The technology is making a significant impact and casinos are already realizing positive R.O.I

Conclusion

It takes a village

Often there are many obstacles to introducing new technology and practices to an organization, especially for casinos. I believe computer vision technology is a game changer.

Computer vision is being used in numerous ways to make the world a better place. There's a revolution going on, and the development of its potential is moving at a rapid pace.

The success of its implementation will not be dependent on the technology but the spirits and minds of the people in the organization. Ironically, the key to transitioning to an automated digital powered table game operation is human.

Teamwork will make the dream work. A collaboration of gaming, financial and information technology experts all bound with the mission of automating surveillance and running a table game operation that is data-driven and always searching for better practices and better profits.

The team should be led by a visionary who has a good grasp on successful performance metrics and data points needed to deliver useful information and analysis. A visionary that values protection and profits.

A word on tech partners. Choose carefully. Treat them right. For casinos to realize the full potential of computer vision technology as I have laid out in this paper, it will take a strong partnership with shared investment in intellect, time and money.

Far too often I see casinos leading tech developers and suppliers down a path of customization, where development priorities are often misguided by personal preferences and wishlists, instead of the organizations prosperity and clear reasoning as to what the financial benefits would be.

Personal wishlists don't always lead to developing a sellable product elsewhere. Customizing a product for one organization often delays the progress of technology across the industry. Instead, I feel it would be better for the casino industry to collectively collaborate on the future path of development of computer vision in casinos.

Computer vision is a proven technology that is being used in incredible ways right now to make the world a better place

Finally, as someone who loves table games and has spent most of his working life dedicated to protecting them, I am concerned about the future. The gambling explosion has given customers plenty of alternative options. Digital gambling has experienced rapid growth. Electronic table games are replacing live table games. The costs of running a competitive tables games operation are rising. Computer vision may be a table games saver.

“If we want things to stay the same, things will have to change.”
- G.T. di Lampedusa

Willy Allison has worked in the casino industry for over 38 years. He is the founder of the *World Game Protection Conference* and publisher of the online newsletter *The Monitor Room.* Willy has provided consulting and training services to major casino organizations worldwide. He is passionate about computer vision technology and the potential of it in the casino industry. If you would like to discuss the topic more contact willy@worldgameprotection.com