

S1E13 - Overview

Mystics and statistics - Why is prediction hard?

In this episode, Mark and Howard explore why forecasting is so often wrong and what prediction really requires. From homicides to the stock market, prediction sounds simple until the future fights back. Statistics and logic can take you far, but judgement, context, and humility do the rest.

Transcript

Mark

Welcome everybody back to the pod. Thank you for listening. We're getting to the back end of the season now. We're starting to think about season two. We'd really like to hear your thoughts about what you'd like to hear.

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I can't stress this enough. We really want to hear everything you have to say, good or bad, and any ideas we would really welcome. Thanks for your support so far. We're little bit taken aback to be honest, but we really appreciate it.

So the topic for today is prediction and why it's difficult. In my career, as an analyst and as an intel officer. Prediction is perhaps the most sought after ability, but it's the one that's the hardest to do.

Because it's very difficult to predict when and where and how things will happen. And I'm going to start the show off by going straight to Howard and saying, start us off. Why is prediction so difficult?

Howard

We do in these podcasts take the biggest subjects and then pick the hardest aspect of them. I agree with you. Prediction is a whole different level of difficult over the things we've talked about so far: information, intelligence, analysis and decision-making. First things first what do we mean by prediction?

All we mean in simple terms is presenting information about an event in the future rather than an event in the past or things that are going on currently. So it's this prediction of something in the future hence the phrase

And we can all think of Nostradamus and the various publications predictions something that like you say people want throughout life not just in law enforcement but because they want to know what's in the future so they can be aware of it and plan for it maybe to avoid something or take an advantage of something.

I wish I could predict next week's lottery numbers because then I'd be potentially a millionaire. I wish I could predict the date of my death or my insurance companies do because then actuarially they could work out when to stop insuring me so they don't have to pay out to my good lady and save having to beat me to death with an ice pick.

First thing I'd say is you need to make a distinction because we're talking about prediction here versus non-predictive analysis, i.e. non-future. There's a distinction between prediction and certainty and you mentioned certainty.

Prediction, what do you think will happen in the future? Certainty, by contrast, how confident are you in your analytic product? How correct do think it might be? That's something we've already dealt with in other podcasts. But they are two different things.

When you are predicting the future, there's a level of confidence in that prediction just as when you're creating a piece of analysis right now based on current and or historic information. But they are two different scalars that you would need to measure.

So if I said I think next week an asteroid is going to hit the earth if that was my prediction next Friday. Part of that question should be okay if that's your prediction, how confident are you that your prediction is correct? And I say well I've virtually no confidence because I'm basing it on no information. It's a blind guess, not just a best guess.

Why do I think that's important?

We've already highlighted in previous episodes that ultimately all intelligence products and processes are a best guess. The product we turn up is a best guess. In other words, they're extrapolating from data and information from multiple sources, differing or unknown quality and quantity. How relevant are they to the issue in question? All that kind of stuff. And no matter how good the processing is that we go through to generate that product it's never a guarantee of correctness.

You could have the best methodology but it will always be limited by the type and form and quantity and quality of the data that informs that analytic process. Now in those situations I'd argue you're working with known historic data issues because current data is historic data, you know, even though you're collecting it right now, it's about events in the past, even if it's only a microsecond between your eyes registering it and your brain processing it, there is a time delay.

That being the case, in that kind of analysis, the better and more relevant your data is to the issue that you're trying to explore, the more that good analysis of that data should lead, should, to better products.

You might even say, and this is me being really contradictory, you're predicting current rightness. So you are predicting something, but you're predicting that your assessment is correct. It's this idea of confidences. And I shouldn't really merge the terms, but I am just have a bit of fun. Are you with me so far?

Mark

But I am. Let me just come in a little second because so when I first joined in a role where prediction was one of the expected things, right? In Intel capacity. I'll be honest, I was out of my depth. At uni, I did information science. Never really dealt with prediction before. And I was kind of like a blank slate when it came to predictive techniques. And I kind of panicked a little bit because I kind of thought, right, I had this kind of mental model in my head that these senior officers and senior Intel officers and analysts would have this kind of secret sauce, this magic about how they would predict stuff.

But that was very early on. I'm literally talking the first few weeks and months while I'm into role. So I desperately tried to, without asking anybody at work, because that's the other thing, right? Sometimes you're a new job. The last thing... you should talk to your peers and colleagues about how you improve in role, but you don't wanna show yourself up, you? It's human nature to kind of, well, back then I was irresponsible and I thought, now I'm gonna solve this problem on my own and struggled.

So I went, set myself the task of how do people predict? And pretty much I found two main ways. The first way I think is stats. People use the past to predict the future. Basically they look at observations and say from these observations can we mathematically say something is going to happen.

The second main way, is essentially that kind of mental alchemy, that inference development that I you know almost that kind of I think because I think it's going to happen this Friday because of reasons one, two, three or in informal language, I infer something's going to happen this Friday because of premise one, two, three.

But here's the problem I had, right? And this is why it kind of failed in the police context is why I struggled a lot. When you're trying to predict crime, you know, you get, I've literally I've been this, I've been a volume crime analyst, asked to predict house burglaries, car theft, even assault.

So you get to work and they say, okay, look at either, you know, this is now Monday, look at yesterday's data, last week's data. Who's going to get burgled? Who's going to get attacked? Which cars are going to get stolen?

So you look at that data, the first off you think, well, the first big problem is all the victims of crime last week, pretty unlikely they're going to be victims of crime the following week. Happens, but rare.

Second problem. I don't know if all these observations are relating to the same person. So there are many criminals out there. So you don't know from your sample, if you're trying to do it mathematically, you know, when you've got all the crime that's gonna happen, you don't know if you're dealing with 10 criminals, 100, one, no idea. Third problem, the world changes. The doors that were left open last week and the doors are gonna be left open next week. So there's all the stats side has got problems.

Then we get through to the logic bit. Then we get through to the kind of mental model making a prediction using logic. Well, again, essentially you can't, you can say very general things. You know, I think these are our top three burglars in this town and we didn't arrest them for burglary last week. So I think they're going to be out there this week.

But as for when or for where, it's tough. I mean, you can do things. You could look at their prior record, but people change their behavior when they get locked up. People change their behavior because the weather's bad. People change whether...

So what I'm driving at Howard is that I think the barrier, and I think it's not just in the police context, right, it's across the board. I see this in every walk of life. We lean into the stats or we lean into the professional judgment, but truth be told, neither approach is perfect. And I think in any sector, it's pretty evident that prediction is pretty impossible, to be frank, and not to rely on.

Howard

I agree with what you're saying and there's maybe some perspectives that I use that might help get your head around that. Unlike analyzing current and historic data to deal with things as this is what I think is happening right now or happened last week. With prediction as well as all the factors that I talked about a few minutes ago about quality or certainty of our products.

The moment you venture into what I'm going to call predictive analytics, you introduce a raft of factors and variables over which you have certainly no control or almost no control, but you may not even have awareness that they exist. So that's why it's not only hard, the same as any other kind of analysis, but multiple times harder than non-predictive analysis.

In normal analysis of current or historic events, I would argue you have a better idea of what the whole arena of data is, either you know it or you know you don't know it, because it already exists. But in predictive analysis, there could be a whole new data set or a whole new sequence of events in the future that you couldn't, as part of your predictive analysis, predict. And they could blow your analysis out of the water.

One of ways I think about that, have you ever watched these films where you see the pirate walking the plank? Or the pirates got people walking the plank. I like planks because they're a good measure of the moments of force, this kind of model in physics. So the person takes one or two steps away from the focal point, the deck.

The plank starts to bend a bit and after that for every step although the steps might be the same length the plank bends a lot more, it's not a linear scale and ultimately it breaks

So the further we predict into the future or the more focused our prediction the more likely the plank is to bend a lot further than we expected. It's not a linear prediction, there's no such thing as linear data [in terms of complex situations], despite what statistics will tell you and we'll come to that later on hopefully.

I don't want to get into the methodology too much just yet. Come back to one of our great people that we discuss quite a lot, you and I, Donald Rumsfeld. We had the old known known-knowns. We know what we know. No known-knowns. We know we don't know something so that the task is to go out and collect what we don't know. There's a data collection exercise there. There's the unknown knowns. We don't know that there's some stuff but if we did know about it we could know it. And that's where Rumsfeld finished.

Now you introduced me to a guy who is one of my all-time heroes Slavoj Zizek. This Slovenian philosopher, thinker and what Zizek said, look him up, but people can google him, the guy's got a legacy, he's alive now he's not dead, that's all over the internet.

Very well presented both in his texts, he does loads of TED Talks and podcasts, he's very entertaining to watch. One of the things he said was, well that model is all very well but the one that we're missing are the unknown unknowns.

We don't even know that we don't know it. Now that for me is really important because when we're talking about prediction in the future, it's the unknown unknown that's really going to catch us out exponentially more than anything else.

Give you an example. Linear trends. You've got an object in space. We fire, we throw a stone on it, we throw it hard enough so that it gets out of the Earth's gravity field and it's traveling at a speed in a straight line. Now the physics of the universe are that that thing, there's nothing to slow it down, although there is a tiny bit of space dust, but there's nothing really to slow it down so it has a lot of inertia.

It will keep going at that speed for a long time and I mean thousands, millions of years, not just a few seconds. Secondly, it won't change direction because there's no force pulling on it, until it enters a gravitational field of something else like a planet or a sun. That's what you might call a linear trend and you could predict that with great certainty.

However what you can't predict is if the thing flies into some other object in space. It physically flies into it and is destroyed or bounces off and goes into a completely different direction.

Despite the accuracy of your prediction, you couldn't deal with the unknown unknown. And that for me is the Achilles heel of every single prediction. So what the other point I would make is the data that you collect to do analysis right now on historic and current events may be really good for that. And we always talk about collecting the right data and processing it in the right way to do good, to create good products, relevant products for the issue we're looking at.

Even though that data might be the best for historic and current analysis, it may be the wrong data to use for predicting the future. The problem is, we as human beings, never mind as intelligence operatives, data scientists, decision makers, tend to be lazy. We tend to get familiar with certain types of data.

And therefore, we try and use data, that imagine it's a ball of clay we use the same type and ball of clay to make a bowl, because we always make bowls and it works very well but when we try and make a narrow stemmed goblet, something different from the same clay it always breaks because the physics are all wrong I don't know I'm just making something up here

And I'll give you a really good example in crime data and it's something I've taught for years you talked about predicting crime. Law enforcement loves something called a hotspot. Right, you have a concentration of crime in geography or type, burglary dwelling, theft of DVDs, rape, in a certain geographical area or in a certain time period and they call those hotspots. That's all it means. And this happens not just in law enforcement, but law enforcement is the example I'm using.

You'll find a lot of law enforcement will spend lots of time saying right that hotspot is what we're going to use to inform our future planning for crime. Now if you think about a hotspot all it means is, lots of people in that area or in that grouping suffered a similar or the same type of crime, maybe what kind of thing was stolen how the method of the crime took place or just the fact that it's in that location or a similar time.

But at the same time, you mentioned Mark, that lots of other factors can affect whether that crime carries on on that trend in the future. If that area has been blitzed, say they're stealing rare antiques, and there's a hotspot of rare antique thefts, they'd reach a point in that area where there's no antiques left to steal. So they would have to change. So the antique theft in that area will go down merely as a factor that's not reflected in the data.

And you think, oh, our methodology of crime intervention must be successful here. No, they've just run out of stuff to steal. You can't commit crime in a certain way if the opportunity is not going to lead to the outcome you want. So I've always been really interested in the other data, the data of where crime isn't committed.

And I call them cold spots because for every hot spot, there are areas in time or methodology or location where no crime is committed and then I guarantee you they're always a lot bigger than the hotspots. The hotspots are crimes that we know about that were reported. If people don't report a crime it doesn't appear in your data set, so it's limited and flawed therefore it's incomplete. But cold spot data, areas where there's no crime, you don't need people to report it.

It's a negative report that's the actual data. Nobody came to my house and stole my antiques. Nobody attempted to assault me and rob me of my mobile phone when I was walking down the street. And that forces you to look at different datasets to understand the mental choice. Why are criminals not committing crime in those areas? I'd suggest if you use cold spot data, it might be a better predictor of crime going forwards into the future because the reasons for hotspot areas to decline in crime, all the choice factors that go on, are far less statistically, we've also got a bigger volume of data, than in a cold spot area. Does that make sense?

Mark

It does. I want to pick up a couple of things you said. I mean, and I want to clear up something that I've said before. I'm not saying prediction is impossible. There are circumstances. I think we, think it was Neptune that was discovered by prediction. Essentially it was mathematical in nature. It was, if the maths added up correctly, there should be a planet there. Look at that. Yes, there was a planet there. We discovered Neptune. That's cool.

That absolutely prediction can be used, but it's, I like your example about the plank and the further you go, the more it kind of wobbles because that's what I'm getting at. Some of the shouts that we really want are really far along that plank.

And I think with crime data, but not just crime data, I mean, one of my bug bears is I have seen over several decades the same methods presented as new technique. And hotspots is one of them. Okay, I am sick of seeing hotspot maps of areas where they say, look, we've done analysis of this data and here's this hotspot map.

And essentially what the map is telling you is, hey, did you know that a bunch of people live, work and move here? Because essentially when you go back to your negative data, positive data part, I agree with that method and I've used your method in a real life context because the thing about places is that places change, let's say over time. I don't mean of a lot, they do change over a long, period of time, but they change throughout the day.

If I walk into town, you know, so like Leeds is my nearest city. If I walk through Leeds city center at 9 a.m. there's going to be a certain type of crew on the streets, walking around and you know, and I'm going to see, there'll be a certain amount of people.

The type of people I will see at 11 p.m. are very different. The types of behavior I'm gonna see

are very different. It's the same place. It's the same street. It's the same thing. So to me, the negative data that you talk about, when I've used that practically in the past, that's when, okay, yes, the hotspot's telling me that the high street is a bad place or that this particular residential street is a bad place.

But it's when I can find a similar street that has the same number of people living in it with the same amount of human activity, but doesn't have that level of crime, that's when that kind of negative data really comes in powerful because you say, okay, what is it? And I think it's also, and I'll be honest, when I was first started, back in the early days of when I worked in Bradford, I didn't know the city that well. And I would literally get on buses and occasionally go for walks around different bits, just to get a sense of, because when you're looking at a two dimensional top down, diagram or map with some heat spots.

All you see is kind of strange lines and words, right? You just see kind of these place names and these area names. You've never really heard before. There might be grids or sectors or villages or towns or whatever.

But you don't really get the sense of what they are because they're just abstract, right? You need to actually kind of walk down these streets. I mean, there wasn't Street View when I first started, but now I guess you could just do it from your desktop and use Google Street View and walk through and give you a sense of it.

But I think that's it's important for the, and I know I'm getting a little bit further away from prediction, but what I'm trying to say is that the reason why it's difficult is there are so many variables that that plank is so long. You're so far along that, that whether it be, and you've seen this all the time, right? If you, if anybody follows this stuff, you will find in your inbox every six months, "police use software to predict crime".

And, you know, and there's usually, there might be, if they've managed to get the rights, the shot of minority report or whatever. you know, and it's the same thing year after year, decade after decade.

We're going to use stats. I mean, in the nineties, it was, what was it called then? Data mining. Then it was big data. Now it's data science and whatever it's going to be. yeah, it just. And that's not to say there's not merit there. There is merit in some of this stuff, but it's oversold, I think.

And the reason why I'm saying the prediction is hard is because it's hard to identify all those variables where you need to, but I think this way your plank and negative comes in handy because it helps to know how big is a shout you are making me to ask.

Howard

You're absolutely bang on and this is what that opens up for me as a generic learning point is

the further ahead in time you go the further away you are from the data that you know right now so the risk goes up exponentially.

The more focused your prediction the less statistically likely it is, so predictive analysis in statistical terms works best on volume data. Good example, the health service. We use predictive models on data of thousands and hundreds of thousands of patients to figure out that the likelihood is there's a trend in an increase in heart disease or some other feature based on a factor in the environment.

Good example in the UK. The theory that sugar, the increase of sugar in diets leads to obesity, diabetes and all the other knock-on health effects. Solution; we will introduce a tax on sugar. So if you buy a drink that's full of sugar, you pay a tax. Where if you buy the drink that's full of fake sugar or no sugar, you don't pay the tax.

That assumes that tax is a barrier to people buying these things. Now when people are wanting a dopamine hit, it's a drug addict's almost. Sometimes the fact that the cost has gone up doesn't put people off so that prediction is based on right my theory is if the price goes up people will have less and because they'll have less there'll be an impact on health and there's so many the what, all data are variables and some of those bits of data some of those variables are independent, they just exist but some are dependent on others right.

I guarantee you that if I went out and ate junk food for the rest of my life it wouldn't be very long that's true for a generic population everybody statistically but it's also kind of true to Howard, because it affects majority of people. There are very few people who've lived a long and happy lifetime on nothing but junk food.

The kind of supersize me approach. It's still not guaranteed. Like you find the old person at 110, I've only ever eaten [BEEP] and smoked every day of my life and drank like a fish and I'm still healthy. There's always an outlier on any bell curve but statistically, chances are you're right.

That's when you've got variables that you do they they are dependent i.e. if i change that variable one will it change variable two. That's a good model but finding out which dependence a variable is as hard a task, it's kind of the prep work for predictive analysis in the same way of choosing the right type of data. How are they interconnected...

Mark

Can I just, sorry, can I just interrupt you? Sorry, because I think this is, so I think another thing that we could touch on if you're happy to talk about it is like behavioral profiling and murders. You've worked with murder for a long time. You've caught many murderers and other serial offenders.

I don't, am I right in saying I don't think behavioral profiling has ever helped you in your career? I

right in saying that? Or do you have a take on behavioral profiling? I think I know what it is, but think it helps for people to hear it.

Howard

Oh boy yes I do. Like many things come along as the latest new hot technique, behavioural profiling came along. Now I have to say as a scientist, as an investigator, I'm open to any new method that helps me to put it in my box of tools. So I have had instances where that

additional information has helped an investigation. But the problem was, like many things, and we've talked about this before, there was a time when behavioural profiling was viewed as the secret sauce. This is the guarantee of success. So instead of being a contributor, it was the magic, the magic wand. So other methodologies that are tried and tested suddenly were devalued, incorrectly so. Even science, DNA, things like that.

And my experience was that the people who practiced it, some of them were empire builders who relied on this new methodology being their secret to academic or career success. That's a pretty bad factor to use, to drive a homicide or any kind of investigation. And you'd get a situation where they never had all the data.

You know they weren't thinking like investigators. They couldn't access all the information because they weren't part of the same culture and regime. They were outsiders as academics. But they would come in and they would bang the table. I can tell you that your murderer is six foot three. He walks with a limp. He wears yellow corduroy trousers. He supports Manchester United football team and picks his nose on a Wednesday.

Whether right or wrong, nine out ten of those factors may not be relevant as to why he committed the murder, which is the only thing I'm interested in. I don't need to know everything about the guy. I just need to know did he commit the murder and why. It's the so what box. But the other thing was it was so specific because they were looking to shock value. Look how accurate and important... accuracy, confidence.

Eventually when a murder is caught, it turns out there are completely different race, color, creed, size, shape, different habits. Instead of saying, hmm, our methods were wrong, we used the wrong data or incomplete data to come to our conclusions, or the analytic process we went through to come to those conclusions is flawed, or a combination of all of those. They'd say, well, if we'd have been told x, y, z, we wouldn't have come to that conclusion.

Well telling me why you got it wrong after the fact isn't actually a very good indicator of to have confidence in your methodology and unfortunately there were a lot of or some bad practitioners who came to the fore in that because the police are like we'll take anything come in new ideas you know if it's going to help me catch a murderer or a criminal I'll take anything I'm a thief.

Mark

But let me ask you at this point though, because I think going back to your plank analogy, I kind of see profiling, as like almost they're walking in the other direction along the plank, right? Usually the shout goes out for profiling when there's been multiple incidents. There are very few lines of inquiry or the cases, you know, there's close to a dead end. And we're at that kind of, not a panic mode, but kind of, we need to start doing unconventional things to get there.

Shake the box and then they land and this is where I'll try to be generous to profiling. They've got a tough call, right? They may come in and say, right, I have these, of these five events, I'll study these five events and I'll look for patterns and trends. I'll come up with some assessments and I'll give you your profile. But the criticism that I've heard over my career in law enforcement, granted it was a long time ago, was that the problem was, by the time the profile became full enough to use operationally, a lot of people were down already.

So it's kind of, you can't deploy them at point zero, point one of murder one. And so, and I think that's the thing with the prediction side of it is because they're in that spot, right? As are the investigators, the investigators are there with a blank piece of paper thinking, how they, it's a little bit like Jim said. I'm in the jungle trying to work out, sorry, Dr. Jim Wilson, when he was trying to track the diseases in the jungle.

He's there thinking, right, okay, I've got species around me that haven't even been seen before by science, and I've got to try and work out where this disease is coming from. What's it like? Just out of curiosity, I think people might want to hear from you on this, because obviously, how...

You've been a senior investigating officer in murder inquiries and other serious inquiries. And I guess the question I'm asking is for the jobs where you think this isn't gonna be the last one, there's another one coming.

Can you take us through what that's like? What's running through your mind about like, okay, it is predictive about, okay, what are we? And I'm not asking for trade craft, I'm asking for anything operationally sensitive.

I'm just saying, what's it like in that space where it's like you found body one or body two perhaps, because body two might indicate the pattern and you think there's a body three coming. What kind of things are going through your mind?

Howard

It's a minefield because what you've got to understand is that you enter the sequence of events that is a homicide at any point of those sequence of events. You may enter it at the point where you find out that somebody's planning to kill somebody else. So there isn't actually a homicide

yet, and have to try and quality risk assess is there going to be one who was the victim because ideally rather than investigate one after the fact and convict somebody of homicide, if I could save somebody dying everybody's a winner including society.

So finding out where you are on the chain that particular like lifetime of that homicide is important second thing is well is this just one on its own; one person has decided to kill another person they never intended to kill anybody before or after they're not looking for other victims or is this somebody who and again this is where the behavioral psychology comes in has gone through a lifetime of behavior of escalating violence for whatever reason or maybe an escalating medical condition that's affecting their behavior and it's coming out as violence or homicide so that if I don't intervene, you know potentially there are more than one offences.

One's already been committed, two are in the process of being committed and the same person is also scouting victims for others in the future but they haven't identified them yet. You've got all of that going on in your mind. Your focus has got to be, because we've all got limited time and resources, you are doing this real time.

It's not like a cold case where it's been and gone and you can spend all the time, well you can't spend all the time and resources in the world, but the time you invest, the kind of slow thinking approach and the care is very different to a homicide happened four hours ago and the evidence is disappearing fast, the criminals still out there, the media are all over you, senior managers are all over you, the public has an expectation, we need to get a grip of this quick.

They are chalk and cheese ends of a bell curve of homicide investigation or any serious crime, particularly homicide. And in that situation you're probably not going to focus on behavioural psychology straight out of the box. You've got other priorities.

But at any one point, and I've done this as well as being a senior investigating officer, which is a particular professional qualification and role in UK policing. It has similarities around the world, but it means something in the UK. It's not just a phrase.

There are also things called review officers. These are people who are trained to review major investigations and look for, even when they're going on, look for potential flaws and opportunities to improve. Lessons learned or how can we improve it so that has a greater chance of success.

It's called the review process. All the time, as well as being the investigator, I'm a review officer. Human nature, I'm thinking, well, how does this impact on other cases? I might be investigating the homicide of Mark Lockwood, but, and think, well, I haven't time to think of a behavioral psychologist right now. There are other priorities. We may never get to that. Not least because of the time lag he talked about and the lack of accuracy in what they're to come up with.

A witness or a piece of CCTV or a piece of forensic evidence or a confession, an interview.

There's things that can really make a difference very quickly. [Behavioural] psychology doesn't. That's just how it is and I'm not criticising it, it's a tool.

But if I was sat as a head of crime or as some national review body looking at serial crimes or just generic homicides where I'm trying to improve the investigative processes overall for a series of crimes or for many crimes that are individuals not series i.e. multiple committed by the same people, I may well involve a behavioural psychologist because they may see overarching patterns and trends that you wouldn't see in a single investigation because of your other priorities that are competing.

So it's horses for courses. It's kind of like analysis where if you think about us in law enforcement, if you've got an immediate tactical requirement where you need some kind of analysis, incomplete though is, to inform decision making very quickly because of events in the real world.

It's not the same as a piece of strategic analysis where somebody's saying, what are the likely trends in crime or organized crime behavior over the next ten years in our area? Predictive analysis. So that's where I'd put behavioral science. I'm not against it. There are some tried and tested methods within it that are of value, but it's no more a secret sauce than anything else. It's just one of the tools in the toolbox of an SIO.

And the reality is, like I talk about with my analyst hat on, whenever I'm thinking as an investigator in my day job, I'm also thinking from an analytic point of view or an information science point of view. When you're thinking as an investigator or as an SIO, you're thinking this job, history, current situation, future, future tense, other jobs, the profession as a whole, crime as a whole, you have to do, you know.

Homicide isn't always just homicide. There are often other crimes around it. A serial homicide or a serial, a person who commits serial homicides probably didn't start just with homicides. They may have started with minor incidents of violence. So you don't just look at previous homicides. You look at previous serious violence or violence against a particular group of people, particular methodology.

Look at the Yorkshire Ripper. His methodology was to beat working girls to death with a hammer versus the crossbow cannibal who shot women with a crossbow. Two completely different methodologies. Does that make sense?

Mark

It does not and I wasn't asking you to sorry I wasn't trying to do a hit job on behavioral science.

Howard

I'm not either but it's the behavioural, some behavioural scientists themselves who've dug a hole for it for the wrong reasons. It's not the customers. I'm a client of behavioural science like I am a forensic scientist.

Mark

Yeah, I guess what I was trying to explore and I think I did it in maybe a clumsy way was in my career, there have been times and you've been in this place, we've both been in this place, know, thousands of times where a crime occurs and you have certain lines of inquiry and then they all stop. And then you sat in the office and there are no more lines of inquiry, but there's still an expectation to try and predict, to try and detect or find out what happened, find out, get a suspect, get generate more lines of inquiry.

And the police have this tension all the time about whether to go public, that generates false leads or all that type of stuff. And I think what I was trying to get with prediction was, I mean, I'm restricted in what I can say. I'm desperately trying to think of an example I can share. And the best one I've got is this one. Because there have been times in my career where I have literally got nothing else to go on. Absolutely nothing else to go on. And the best I can do is,

Well, I don't know anything about the offender. I know little bits about the crime. I need to kind of start speculating and I have to kind of make predictions that are highly speculative and I have to kind of test those to see if they come true just to get a starting point.

So for instance, here's the example I can share, which is many years ago when we were both involved at looking at industrial cannabis cultivation. I remember at the time there were lots of national interviews with senior police officers saying, and I'm going back to the early 2000s here, why is cannabis cultivation going through the roof?

And the prevailing view amongst some very senior officers was; we're clearly exporting it as a country. The notion we were growing locally and pushing it back overseas. Many law enforcement people involved in drug trafficking will tell you that that kind of didn't make sense for a lot of reasons because smuggling is hard and it's expensive, right?

And to be honest, in some respects, if you can grow it somewhere and get it to mainland, you can grow it in mainland Europe, you know, the chances of, I'm not saying it's impossible, but the chance of a syndicate growing it here and getting it back into middle of Europe cheaper than the local European group seems to be quite small.

So I had this hypothesis that said, well look, okay, what's the counter hypothesis? The counter hypothesis, we're not exporting it. If we're not exporting it, we're consuming it. If we're consuming it, then we've got to be seeing something, some sort of signal that's out there that we're not picking up on.

And at the time it was the stronger variants of cannabis that were coming through. And I decided to look at medical data for the first time. It was the first time I actually left my law enforcement job and kind of looked in the the medical pot of data and sure enough, it turned out that psychiatric admissions were increasing due to cannabis use.

There were other psychological metrics from healthcare that showed that people with problems relating to cannabis were drastically increasing, is increasing across kids. So you had all these metrics that suddenly said, look, okay, we've had cannabis for a long time, but for some reason,

these metrics are rising significantly at the same time this other kind of industrial cannabis cultivation trend occurred.

Now it's difficult. I can't necessarily because we don't have film crews and we don't have knowledge of all the syndicates involved, we can't conclusively prove, but we have got a sufficient base there to make it a bit of a shout. And the prediction then became, I don't think we are exporting it in the round. I think we're just consuming more of it than we think.

Yes, we have the British Crime Survey telling us about drug use, but actually it's limited sometimes. It's a good piece of, it's the best survey that we have in terms of national collection for data, but for drug use specifically, there's limitations with the British Crime Survey.

And yeah, so I guess bringing it all back to what you're saying about behavioral science and all the rest of it is that, and why is prediction hard?

It's because when you're on the fire and that plank, that plank is vibrating up and down quite far. Sometimes you have to play about in that space and you have to try and find something to kind of get yourself back towards the ship. And it's tricky, right? It's difficult. And there is, and sometimes it's blind luck. But I guess what we can say is it's not a constant. It's not something you can't say. Some situations you can use predictions, some you can't, but it is always difficult.

Howard

The thing for me and I don't disagree with what you're saying, something we've talked about before is with all analysis there's a risk and we've always spoken I certainly have about you need to consider what are the contingencies what if our analytic product results in decisions that turn out to be wrong.

What's the likely consequence of being wrong? You can either have a success or a null result where it doesn't really affect anything or you can be wrong. If you're wrong in a homicide investigation, to quote the mother of a victim, hell freezes over because you've left a suspect out who may kill somebody else.

If you watch anything about the history of the Yorkshire Ripper Inquiry which went on and on as

this series of offenses were carrying on very much in the public eye. Those detectives were not incompetent or not committed but every day they were getting up to trying to deal with not just the investigation but loads of other information and other people who were becoming stakeholders like the media getting in the way of the investigation but they would be going to bed thinking we haven't caught them yet.

And that kind of pressure can lead to mistakes and those mistakes are well documented and it's not unique. I've reviewed many homicide investigations in this country and abroad. You will always find opportunities for improvements or critical points in the decision path where they took a wrong turn. And it's not always because they're lazy or stupid or deliberately bad. They are human and they are under certain pressures at the time that average people if you're not in that situation you wouldn't understand but to come back to prediction...

One of things that always makes me smile is we predict into the future, the plank scenario assuming nothing's going to change and that's what a trend is. Now if you think about the guy walking the plank, if it's a guy, you could say well of a hundred guys walking the plank and that even if they were all the same weight and walked with the same gait, the variation in the plank thickness or the wood meant that some it broke and some fell off before others.

The rolling of the ship on the sea affected the physics of the plank and the weight on it and when it broke. The wind... you know I watched I love Formula One and last week they were at Monza in Italy and it's a high-speed track with lots of straights so there's very little variation where you could make a difference in your driving or machine performance style by saving time in the corners.

So the times were all very very close all the cars were very similar and you'd see people go from first to tenth for a small fraction of time, you know a fraction of a fraction of a second and it'd be because there was a gust of wind moved them five centimeters further that way and it affected that whole lap.

It's the same with the plank and it's the same with predictive analysis. Even when you're trying to predict a linear future, the ideal one, and statistics, mathematical models, all tend to work on linear predictions. They work best on linear predictions because they're the least likely to fail. Nothing else changes like the rock we've thrown into space. Chances are that's where it'll end up.

If you look at linear regression, statistical regression, all those models are mathematical models on volume data that are hypothesized around this is a linear projection. It's not something that's going to move about. Yeah?

Mark

Can I just add some thoughts there though? Cause I think when we talk about probability versus

prediction, I think we talk about odds, don't we? And I think like, and I've often struggled with this in every role that involves prediction. Yes, a dice has six sides. Yes, the probability is one in six.

The problem with situations and complex stuff, the stuff that's far along the plank is the dice is on the deck, right? The dice is really easy to predict. You know it's gonna be between one and six. However, you also know that it's an equal chance in theory. Obviously it's mechanistic, it depends on aerodynamics and how you throw the dice...

Howard

There are a lot of known knowns.

Mark

Sure. The problem you have in real life with predictions that are meaningful is the first problem is, you don't know the outcome space completely. So you don't know all the possible things that could have happened. It's, can imagine a few, but that's sort of spectrum, right? So that's a broad spectrum.

The second thing is you can't repeat the experiment. So like in Intel, we talk about the Cuban missile crisis or Pearl Harbor. We can't run the Cuban missile crisis 10,000 times to see statistically what the distribution was.

That's the other problem is that we'd love to apply some hard numbers and some hard signs to this, but we need a universe times how many, know, to reach our satisfaction a hundred times, thousand times...

Howard

You need a massive data sample.

Mark

Yeah, absolutely. But here's the kicker. The kicker of the other is, that the, in a police context, but also in broader context, the things you're trying to predict are actively trying to hide or obfuscate what they're doing, right?

Howard

Bang on. That that that's one of my key points I was coming up to make. All of this that we've talked about up to now presupposes that any changes in the future weren't planned or intentional they just happened you know there was a I don't know a meteor hit the planet or suddenly there was a an incident where all mobile phones went down like remember the Millennium Bug, which never happened but that was a real prediction

Unlike most things in life, particularly in crime but actually in a lot of things, wars are the same, politics are the same, business is the same. Rather than events occurring by chance or at random or passively almost, players, stakeholders who want to undermine the accuracy or the confidence you have in your prediction will deliberately do something different.

They are following the same models but they deliberately do something different because that makes the prediction model that you've used irrelevant. I'll give you a really good example. I love looking at terrorism as a form of influence, because it's a business. A business based on we're small, we're attacking a larger opponent. It's kind of the David and Goliath.

So how can we be effective with our limited resources? It's all about this business model of bang for your buck if you want to call it that. Go back to 9-11.

Awful event, terrorists fly planes into the Twin Towers and the Pentagon and others failed. Think about the terrorist organisations behind that. One, you have to convince your actors that they're going to die and they've got to be prepared to. And I know we talk about that glibly with the military, I'll die for my country and all this business. But human nature is, I don't want to die. There's a survival that overtakes everything.

So one you've got to get over that hurdle and have confidence that your actors know and knowing that they're going to die will do it and they have ways of doing that. Number two you need the training and the resources. If you and I were going to fly a plane into a building not only do you need to know about the building and the location and what kind of plane there's a small thing of how do you learn to fly a plane if you've never flown a plane before.

So there's a massive logistics operation and finance and training and communications to get to the points where your actors can actually go out and carry out the act. So it's a massive investment. And on this occasion, there are many that fail, it worked. They were successful in their terms. The planes hit the buildings and the world went mad over it.

So as a business win for terrorism, it was massive, phenomenal. I'm not moralizing on it, I'm looking at business. What was the next thing? Well immediately the whole world is sensitized to repeatability. Where else might they fly planes into? We'll have massive airport security, we'll limit planes flying. If planes fly off a different route we'll have them intercepted by military jets with permission to shoot them down if needs be.

Suddenly the whole system is sensitized to that method of terrorism, that method of crime. What do the criminals do? Well we've had the big investment, we'll go a completely different way. If we fly more planes, that's another big cost in resources that are finite and limited, but they're expecting us. The target is now hardened in police terminology.

What can we do that has, now that the community is sensitized to our actions, what can we do

that has a big bang but cost less? And the next phase, if you remember, key government departments in the USA started receiving envelopes in the post, the normal post, with anthrax in. So all the security services are looking in the skies for more planes. Meanwhile, there's an envelope winging its way in the back of a mail delivery van to a building.

To send an envelope full of anthrax, I would suggest through an existing system, the mail, is a lot more cost effective and it doesn't burn your actors. You know, you're not flying a plane into a building where you're assured to die. You might get caught and shot putting the envelope in a mailbox but risk versus reward. It had just the same impact because the victim who was already sensitized, they're now looking over their shoulders thinking well not only are watching for planes, we now have to watch for these envelopes.

At the third stage, once having sent the first two or three with anthrax in, people are now sensitized to looking for envelopes with white powder in. It doesn't need to be anthrax. It's about poking the stick to keep the terror of the fear going. So they send envelopes with baking soda or baby powder in.

So they've gone from high cost, high reward, to very low cost, repeatable at low cost, very low risk for the same impact on the victims, the terror. That's a brilliant business model and all the time the authorities are playing catch up. They were never looking ahead. They couldn't. I'm not decrying any of the services, security services. I was part of that globally.

They were trying their best but you have to act on the basis of historic information. How do you get out ahead of it, in an ideal world you sit people down and say can I predict what they might do in the future? because they're looking for this de-escalation we've gone out it's like a business that will go out and sell things, under sell things in the market to get market share and then they put the prices up. It's a business tactic.

To explain that, so what I'm saying is, law enforcement in terms of predictive analysis, you need to understand what's going on in the heads of your opponents, the criminals. Because if you can understand their thought processes, you have a better chance of predicting their future behaviour. And I'm not a great believer in past behaviour as a good predictor of future behaviour. There's a bit missing off the end, except when it's not.

You know, it's like... It's a cheap phrase, a cheap win for something that has very little value. It's true to an extent, but it's not true more often than not. If you don't change, you will die.

The one constant should be change and good criminals change their behaviour. And we should, law enforcement in this case, or any business, change our behaviour.

Good example of that. And I don't think we've discussed it before. Coming back to crime and mapping. At what time I worked in an area and I wasn't involved in it. I was actually doing another job. I was known as the guy who did analysis. Because I do my day job as a police

officer and then once in a blue moon go off and teach analysis at headquarters.

And people would come to me with analytic problems saying have a look at this would you Howard. And I'd do it alongside my day job. And a particular area at the time they were suffering car thefts.

High powered cars were being stolen in a particular geographic area and they couldn't get their heads around it. They couldn't interject physically because chasing a high powered car being raced around the streets at high speed creates a risk to the public. So intervening in that way was no good. You needed to find a way of intervening before or after the crime was committed when they're not racing around like idiots.

Kind of like Sun Tzu. You need to bring the battle into an area where you have power, not the area where they have power. So they brought me all the data. And like you talk about hotspots, I looked at all this data. Crime reports. And there was no pattern in terms of time or type of car, make, model, anything like that. Time of day, method of stealing. There was no pattern in where the cars were being disposed of. Often they were just burnt out.

The criminals could have made a fortune selling these cars on the second hand market as stolen cars, they high powered cars but they'd ram them into a garage and steal 200 cigarettes you know if they'd have sold the car they'd have had a lifetime supply of cigarettes in those days and when I kept looking at the I'm looking for patterns with my abstract analytic head on and I started looking at colour of cars and I noticed that they'd steal a red one and then sometimes another red one but then a colour and the sequence of colours was kind of what is it green brown blue pink and black and I thought I mean I'm no sportsman I suddenly realized well that's the sequence of colours in a game of billiards or snooker.

So that was my theory that what these kids were doing, and they were young teenage men, was yes they were stealing cars, but the object of the exercise was kind of bragging rights. They were doing it playing snooker for points like you might play a computer game, only they were doing it with real cars. If that theory, so the next step is right, if I'm correct and I've now got myself in the head of the criminal, and it could be any kind of criminal...

How does this help us to intervene? And the answer is in the colours. There are loads of red cars in the UK and in the area that these crimes are happening. Loads of brown, loads of green, loads of black, loads of white, loads of blue. Not many pink cars. So what I did was I told the... when we looked at the national database to see how many people owned pink cars in the particular geographic area and there weren't many.

So those cars when they were at home at night would be the likely place that they'd be stolen from. So you've got a physical place to go look and put your know your interdictory resources.

Secondly when are they going to steal a pink one? Well you play these billiard these ball games

in a sequence so you'd watch the theft of other cars and when it came to the point where they stole the red and they'd done all the other colors and the next one had to be a pink.

That's when you press the button. You wouldn't be watching these pink cars all the time. You only watch them when the criminals got to the point where they needed a pink. And that's what we did. I can remember, not me, they sat on three addresses, I think it was, in the whole area. And sure enough, the criminals turned up at one to steal the car and they were able to arrest them. They hadn't stolen the car, so they weren't driving around being dangerous, but we'd got in the head of them and were able to use that predictive analysis and the success was A, knowing which data to collect and B, understanding what it was that was driving their future behaviour.

When it wouldn't have worked was if one of the criminals had got arrested or got into hospital or been killed on one of these high-speed drives because that would have broken the pattern but we were lucky and that makes the point that no matter how lucky you are, an unforeseen event can always screw with any kind of predictive analysis.

So I'd always say, look, whenever you predict, if you accept all analysis, need to have it with a caution and health warning. Predictive analysis, your health warning and cautionary qualifiers, your QA to your customers needs to be exponentially greater. And it's just the same. That's a law enforcement example, but think about business.

Companies use predictive analysis to figure out where the population centers are and places that traffic flows with a view to putting the next fast food restaurant or a petrol station. The health service do it to think about where do we need to put the next hospital or fire station or police station or bus terminus, the logistics of life.

In business, in the stock market. The stock market is all about predicting the future of those stocks. There's even something called the futures market where you bet on for argument's sake a particular raw material. It might be coal, might be eggs, might be pork. Some kind of product that next year it's going to be more expensive to buy. The predictive analysis models used for that will look at, I don't know, if it's pork. Is there a big disease coming?

Or are there some kind of issues with food supplies for pork or legislation that's coming out that might result in an increase in demand or a lack of supply to meet the current demand? Is the next greatest meal going to be spare ribs? Because if so, the demand for pork might go up. And they predict that and you bet on it. But the thing is with that, all you're betting is money.

Mark

But they don't just predict though. Sometimes that's the thing is the money goes into the advertising and they try and create the self-fulfilling prophecy, right? But I think we're coming to the end of the pod. I think we need to come back to this and we need to talk more about

confidence in predictions.

I think we need to talk a bit more detail, but I'm going to wind things up there. Is there anything else you want to say on it before we draw it to a close?

Howard

Just to underline that issue about QA. Remember what we said at the start. Prediction is different to confidence in your product. The further you predict into the future, the more focused your prediction, the more likely it is that the plank will break for factors that you don't know. So when you get into predictive analysis and your customers will force you into it, the decision makers...

For your own professional credibility and personal credibility you need to always put a government health warning if you will underneath it that's exponentially bigger than what you would do for a piece of normal analysis because it's far more likely to be wrong than right and in some of the areas that certain areas of predictive analysis work it's not just losing a bit of money on the stock exchange. It's losing life or affecting people's lives. Think of the military, think of politics, think of health service, think of law and order.

It can have a massive impact. The consequences of being wrong can be phenomenal.

Mark

Thank you very much, Howard. I think that is a good place to close it there. Just want to thank everybody for listening. Don't forget to get in contact with the show. We want to hear everything you think about the show. Visit thecollators.com and we'll see you on the next episode. All the best. Bye bye.