

Episode 9 - Patterns and Trends: What is a pattern?

Overview:

Musical spreadsheets, a string of car thefts, and a chance observation spark a question at the heart of this episode: what exactly is a pattern, and how do we recognise one?

Mark and Howard explore Florence Nightingale's statistical diagrams to modern AI pattern recognition, exploring how humans find meaning in data and how sometimes, meaning finds us. They discuss the risks of seeing structure where none exists, the value of curiosity, and why luck and lateral thinking still matter in an age of algorithms.

Mark

So today Howard, the topic is patterns. What are they? How do we find them? What do they mean? I wanted to talk about patterns and include it in the pod list because when you're hired in any analytical capacity and it doesn't matter if it's Intel analysis or qual or quant, doesn't matter if it's public sector or fintech, the phrase patterns and trends is usually there.

You're usually hired as the sniffer dog to say, okay, there is a data set or a series of data out there and we want you to find that pattern or trend. And sometimes those things might sound very similar.

What I wanted to kind of explore was your thoughts on patterns and how they are identified and things like that. So I'll just hand it over to you.

Howard

Thanks. That's yet another massive question from my experience. And to begin from first principles, if we accept that all biological and physical functions create data and if that was just noise data, it had no pattern or significance or meaning, there will be no such thing as information or intelligence or analysis it would just be this thing this indigestible product but luckily for us data and the information that we create from data i.e. worked version of data that puts it into a form that we can then use as human beings to look for patterns

It does generally conform to patterns when there's something interesting happening. And in our field of law enforcement, what we're looking at ultimately is human behaviour. Be it criminal activity or the impact on victims or the impact on bystander society as a whole. Human behaviour forms patterns. So for me, the issue with patterns is...

The expectation of us is that we should be able to correctly look at information in a way that allows us to identify patterns or identify a shortfall. Maybe there's not enough data to, sorry, information and the data that led to the information to create a meaningful pattern. In which case

we go back into the intelligence cycle, the information cycle and try and generate more data than turn it into information and more dots on the map shall we say might create a clearer picture.

Or we're looking at it in the wrong way. We haven't got the mental capacity the insight to extract the meaning of that pattern in a sensible way. That in a nutshell is how patterns work it's not what they are. What patterns are are nothing more than a repeatable, recognisable distribution of data and from that data the information that we use for Intel analysis. And what's really important here that everybody seems to miss, that stage of going from data to information.

You need to understand that the way that we or our processors choose to model data and the features of the data, the various variables and features of that data form can restrict or enhance the opportunity to look for certain kinds of patterns. And being really simplistic.

Data that has a geographic or a spatial element but has no time element is not likely to be very useful in analyzing time related patterns. In the same way as time related data that has no geographical spatial reference relative to each other or to some baseline, maybe a point on the globe.

That's not likely to allow us to come up with any geographically or spatially relevant patterns. So one affects the other, affects the other. But ultimately what we're trying to do, our objective is to squeeze as analysts is to squeeze as much information as we can from the information and the patterns that the information creates by looking at it in different ways, trying the same data in different forms, looking for different data for corroboration or correlation with what we're finding.

And then hopefully those patterns, they may be patterns that are completely irrelevant to the question that we're being asked or the issue that we're trying to explore, but they're still patterns. But hopefully out of all that noise, we can identify patterns that may be relevant to the issue that we're trying to look at. And in our field, that would be criminal behavior. Does that get us started?

Mark

Absolutely. I think when I was starting my career, I remember having a lot of anxiety about what is this thing they're trying to get me to find, right? Because within certain data sets or certain fields, certain patterns are self-evident and almost common sense.

Certain other patterns are not. And I think it's because the term pattern, when you trace it back to its origin, it literally means to medieval times like the pattern you would get on on cloth or material.

It's something that is repeated and usually a pattern is a recognition of some sort of connection or repeated event. It has to be like kind of a, we should say that basically it has to include some

sort of more than one data point. You don't have a pattern with a single data point. It has to be multiple.

And at that point you can say, If you remember like the old 1950s, Moscow rules, once is chance, twice is coincidence, you three times a pattern, that kind of observational rule about, when is something significant? And that goes back to, I think, Ian Fleming, think, to then one of the James Bond books. don't remember which one. But also it's also, it's a TV and movie trope, right? Where you see the character, you know, you, the director's got to kind of visually demonstrate to the audience, right, with this character, they are gathering data. So part one is you see like the wall or the note and the chalkboard or the cork board and they start to put news clippings on the wall, right? Sometimes you see the detective shows too. You see the clippings get added to the wall and you get this visualization of these data items. These data points are slowly getting added.

And then sometimes the trope gets extended even further because then you see the person getting bits of string and then connecting one to another, one to another, trying to show you that there's a separate process here of saying, yes, I've got this data now. I've collected these data points.

However, actually, when you start to connect these things, it's not new. You start to see connections there. And sometimes the aha moment comes. Sometimes the aha moment doesn't come at all until a Rosetta Stone data point, something that will cause the character to step back and say, aha, that's the pattern. That's what makes everything click.

And I'm thinking of a practical example and I'm going to put you on the spot here. But if you think to what I'll refer to as the car crime example, if you don't mind telling us about that example, because it's a great example of where you had an exercise of analyzing a fairly conventional car crime pattern, but you recognized almost by accident that it was something very different.

Howard

I do. It was an awfully long time ago. But yes, the problem for the police force at the time was that motor vehicles were being stolen regularly by anyone over a number of local gangs in the area. The practical problem for the police was that when these vehicles were stolen they would get to know about the theft after the vehicle was stolen and the crime was reported.

They couldn't predict that the vehicles would be stolen. And the operational limitation on that was that when the criminals were driving these cars, if the police came across them, the criminals could drive and behave in a completely irresponsible and unsafe manner towards the public and to anybody else where the police could not. So there were limits on what the police could do to actually apprehend the criminals and recover the vehicles.

So it was a kind of a self-defeating process where the situation was we knew lots of cars were being stolen in a particular area and it's quite a large area but nobody could understand what the pattern was because they were looking at data based on the crime report. So the officers involved came to me as the Intel analyst at the time and said what can you do with this?

So I took the crime data and the crime data was a reasonably large number of crime reports. A location, a time, a date and the type of car that was stolen and maybe a little bit about the MO at the time. And I started looking at that and geographically, if you're looking for geographical patterns, they were all within the area where the crimes were reported.

But couldn't say, oh they're all along this particular vehicle route or on a particular estate that might be well known for high crime or where, or there were a particular kind of vehicle that had no security. So it was very easy to steal. For example, there was nothing like that. But go back to what I said at the start of this episode. Crime is human behavior and crime follows patterns.

Looking at this data, I played with every variable in the data set of the information. And virtually the last one I played with, regardless of make of car, CC, know, capacity of the engine, what it was in terms of value, where it was stolen, when. I came back to colour. None of those things came up with a pattern.

But when I ran colour as a pattern, there was a pattern there that I identified. Now the reason I identified the pattern was the police station in which I worked at a social club in which was the usual snooker table and pool and billiards. And of course my knowledge of those patterns in that completely not crime related area made me realize that when you play billiards or snooker, there's a sequence of events in terms of the colour.

You always play a red before you can pot another colour. And eventually there is a sequence of all the colours from the beginnings of the greens and the browns through the blues, the pink and finally the black. And the white is the neutral ball in all of this. Now when you looked at the theft of these cars, regardless of when, where, how they were stolen, what the car was, the pattern was red, brown, back to red, green, back to red, pink, so on and so forth.

So my theory was the criminals, we knew they weren't stealing the cars to sell. They'd steal these cars and drive them around like joyriders, probably crash them into a petrol station or a shop and steal cigarettes. The car may be worth several thousand pounds but they'd wreck it and steal a fraction of that value in cigarettes. So they weren't doing it for crime. They were doing it for kicks for fun. Yes, yeah, they could have sold one car and had a year supply of cigarettes, legitimately. Less risk from them for being caught or for hurting themselves driving around or hurting somebody else, getting convicted of a more serious offense.

So I decided they were playing this game in their head. So you think well okay that's a theory how does that help us operationally or how does that help the investigators the people tasked with catching these people? Well I don't know about the rest of the world but in the UK we have

databases of every car that's registered, including its colour. And as you can imagine, even though we're a fairly small island, there are hundreds and thousands of red cars, loads of brown, loads of green, blue. But the one colour there aren't very many of, or there weren't in those days, was pink.

So if you think about it, if you look at the trend of those colours as a billiards or a snooker game and every time one got stolen it was reported usually within a few minutes of being stolen so we were very close to the theft events in time shall we say from them occurring to when they were reported and we became aware of them as law enforcement you'd see red and I say another red red brown all the way up until and forgive me I'm getting old I can't remember the last color before pink

But when you got to that colour, so it went red, blue, I was able to say to the law enforcement, the next car that's going to be stolen, regardless of where or when or how or what make, is probably going to be pink. Now one of the advantages for us in law enforcement is we can look on that same national database and identify all the pink cars in the area where they were being stolen that were registered.

It's not a perfect science but basically it gave us where we'd had hundreds of red cars and probably 20, 30 green or brown and lots of blue. If I remember rightly we had something like three pink. So suddenly if my theory was right and the next car to be stolen would be pink by deploying officers undercover, well covert not undercover, to those three locations to watch those three pink cars we had the opportunity.

If the theory was correct to arrest the thieves when they were stealing the car not once they'd stolen it when we couldn't pursue them for safety reasons and policy reasons and we did that and it worked it was cost-effective because we only deployed officers on observations for a very short period of time and in three locations, it was successful in terms of arresting these kids without there being a chase and maybe an accident or members of the public or somebody getting hurt and it stopped the series of crime and because we'd identified the pattern we were able to use that as information for the detectives to then look for evidence to link them to the brown, green, blue and red cars that had been installed previously in that sequence.

And when they were brought in they were quite happy to interview."Yes, we were playing snooker". You know it was the game between themselves to see who could score the most points. It's kind of like tokens in an online computer game now but they were doing it with real cards.

So the point about the exercise was patterns were what led to a successful interception of crime in a safe way and an efficient way but it wasn't just the patterns in crime it was human patterns in this case snooker and it could have been anything and this is one important point I would again go back to the start all patterns we aren't born knowing patterns as far as I'm aware as biological machines when we're babies we aren't born with all these mental models and part of

how data appears, patterns or information appears in patterns.

We learn that through life. We're taught what these symbols mean and what the patterns are. Had I not known anything about the ballgame of snooker and billiards and the rest of it I wouldn't have been able to make that correlation between two different kinds of patterns. So the more rounded any specialist is in looking at different kinds of patterns in human behavior and in the environment, the more likely they are to make a connection between that and the problem that they're looking at and what might be a potential pattern. If we aren't trained in that, you'd be the best trained investigator or data scientist or intelligence officer or analyst. You can't identify patterns that you are not aware of, even if they're staring you right in the face.

Mark

That's exactly right. And I think that's why your example, I mean, yeah, it's, it's a stroke of genius, but it's also terrifying in the sense that when you are tasked with that pattern recognition, what you've essentially just said is to be the perfect analyst, need to be aware of almost every potential pattern in every potential context. And not just every data point, but the relationship between all data points across all contexts, which certainly beyond the scope of most human beings.

I think it'll be beyond the scope of things like chat GPT and AI. Certainly for the, I'm pretty sure AI is gonna come along and do things like basic qual and quant type patterns and trends when there's kind of linear kind of progression or certain kind of spikes. But in that example, I think that's a crucial example to highlight that actually we can only do so much, but some of these patterns, they're kind of almost bound to hindsight to a certain degree. You got luck, sorry, luck doesn't do it justice, but you know what I mean? As in there's a degree of luck.

The question would you have seen that pattern if there weren't tables in that police station? Or if how, know, that's, I guess the real challenge for, and it's not just analysts right? It's staff of all grades and experiences kind of when we are faced with these data points, sometimes seemingly unrelated or potentially even related.

Cause the other thing in your example I wanted to look at was you went by the numbers analytically, you went, okay, let's look at time. And then you probably got to the same space where most of us do, which is, yeah, it turns out a lot of, lot of cars get nicked at night when no one's looking, shock horror. Then you might try geospatial and work out well, actually it's kind of it's more about the availability of the unlocked car maybe than, you know, and you can, you could limit it down to maybe a town or maybe a part of town, but the street level is a bit tricky.

But then you were running out of variables, right? You ran out of the normal, the usual suspects of patterns, time, place, vehicle type, because obviously we're indoctrinated aren't we, to say high value cars or cars that are easy to break into if the joyride is that type of thing.

Going through the list of the usual suspects, but that's the problem with pattern, isn't it? Because for every situation, there will always be a usual suspect list, but it does make you, think, one of the challenges, but it's also an opportunity for people in this space, be they analysts or otherwise, is the non-usual suspects. What is that kind of that non-usual left field out of a clear blue sky? What is that? And sometimes it's impossible to do.

But I think sometimes it does show you that going back to that Hollywood analogy, sometimes that Rosetta Stone does happen in real life. Sometimes you get that kind of aha. So I'm picking on the snooker example. Is there any other examples that you think are more relevant than that or anything else you want to talk about?

Howard

Not in terms of examples because I could bore you all day with war stories shall we say or examples. What I would say is yes okay a good analyst or any human being needs to recognize patterns and you have to be taught to do this, you have to learn this through your life but good intelligence operatives and analysts can be trained.

We've trained people to recognise different kinds of patterns and to open their sort of boundaries of thinking to look for the most unusual patterns. There used to be a saying I was very fond of many years ago, a quotation by a famous philosopher called Schopenhauer. And again, it's all over the internet and Intel training. It's not down to me.

The quotation was, the task is not as much to see what no one has yet seen, but to think what nobody has yet thought about that which everybody sees. And for me, that's kind of one of my credos. Data and information, everybody can see it. A good intelligence operative will see it and by making patterns and connections that other people may not make will think things about that information and those patterns that nobody else can think of and it's not that they're superhuman.

It's just that they've spent time to develop that skill in the same way that a doctor or radiologist will be trained to read x-rays a fingerprint expert or a scenes of crime expert will be trained to read and understand the walls and the points on the fingerprint.

I can see them I can see the same data that they see but I don't have the skill or the training or the experience to recognize the patterns and therefore the second step the significance of what those patterns mean because there are patterns that have no value to a particular question if that makes sense you can identify a pattern and machines are very good at this but it doesn't always correlate with something that's useful to the particular issue that you're being asked to look at and analyze in terms of trying to extract something of value

We've got many examples of that where machines have made mistakes and here if anybody wants to go to Google it, Google Abel Archer [Stanislav Petrov]. That's a great example one that

you showed me that I'd not seen before where machine pattern recognition arguably could have caused the end of the world but was stopped when a human being with shall we say their feet planted on the ground had the intellectual and moral courage to say "hang on the machine's making a mistake here" I think and basically to save the world.

So what I'm saying is just because there's a pattern there doesn't mean it's relevant. If you see a pattern and it doesn't seem to be relevant, it's kind of like going back to scientific method. Either it's not relevant and you can check for that or it is relevant and your theory or your understanding of what you're seeing is actually incomplete or incorrect so you need to go back to your theorizing your hypothesizing of what it means.

So a pattern is another stage in this process from data to information to Intel. We look for patterns in information which are in part patterns in the data and from that we carry out analysis and come up with intelligence products and intelligence hopefully of real operational value. Does that make sense?

Mark

It does. I think the point for me is that patterns do not announce their presence. You have to kind of do lots of different things to bring them out. You can have automatic software, automatic processes, try and collect them. But I'm thinking about like, you go back to like Florence Nightingale. Okay. And the, the diagram, Cox Grove Cox Co, Cox Comb diagram, think. so as I recall,

It's a chart that basically talks about kind of your deaths of soldiers and cause of death. And basically the visualization of this data distinctly shows the disease being the main causal factors. And basically proving that actually, okay, yes, a lot of soldiers are dying, but a lot of soldiers are dying needlessly.

There's preventable death there, and it's visually getting that picture across, showing, look. This is how much of this, it's not a bar chart, it's like a rose diagram, isn't it? But you know, this is a stack. This is how many we could save if we treated disease more seriously. But the thing I always find interesting about that example and Florence Nightingale is absolutely, you know, a million points for data viz and having the awkward conversation. But the decision makers and the generals had access to that data, right? The data was there in tabular form. It was recorded in technical documents, tables and structures, but Florence went away and collected it.

So it was that have the presence of mind to A, collect the data, then to visualize the data. I suspect she probably knew, had some anecdotal experience, but perhaps maybe had other kind of environmental experience to say, hang on a second, I haven't got the data to prove this yet, but there's got to be one in three that are dropping from some sort of disease element here. And then, collects the data and as the data's being collected, then you've got this point where it's like, okay, well I could just present these tables of data, right? She could have just gone to decision

makers and said, right, okay, turns out, yeah, statistically, yeah,

I'm misquoting now. I'll have to go and check. But let's say whatever, let's just pick a ratio. Let's say it's one in four. The visualization element though, I think is a little bit of extra flair that's kind of essential, isn't it? Because I think the visualization itself, makes that kind of impact to say, this is in the data. And also that visualization brings to bear that comparison and that pattern, that pattern of "look in month one..", was, and again, making these numbers up, but in month one, it was one in three, month two, it's one in four, that kind of repeated story. And I think, you know, from a data visualization point of view,

Data visualization is often given as like one of the main pattern detection methods, right? A lot of IT software we see with like Power BI dashboards or Tableau or Qlick View or other things. There's usually quant data. It's like, you know, you get a kind of guy, you'd usually get some sort of two dimensional graph and with, you know, plot the lines. You might get a network chart maybe if you're lucky, but quite rare.

But I think from a pattern point of view, the problem that I worry about sometimes in my previous roles is again, it's knowing where to go and collect the data from, right? It's one thing to have that nice shiny dashboard where lots of organizational thinking has taken place and said, we're selling apples, we're in the business of selling apples, so we're gonna tabulate how many apples we've sold and we're gonna do some market research on how much people like apples. And that's the two metrics we will measure.

But there might be a whole other thing out there about why things could be looking at. I think, again, and apologies for my shoddy memory, but I think I recall when McDonald's added apples to their kids' healthy lunch packs or something. I think the global demand for apples went up by like a quarter or something, Daft. There's all sorts of kind of vectors and approaches. You can open many desk drawers, right, or many filing cabinets, and it's knowing I guess it's as a practical advice we can give people interested in this stuff is to perhaps explore the data fully in the way that your organization has trained you and has indicated to you because what they deem important is important, but it's also about, well, how can you explore your data that you currently have in different ways in the unusual suspects, the unusual ways.

But also what other data can you bring in? Because there might be other data out there that needs to be brought in and it might not be recognized as relevant yet, but just because the data is not recognized doesn't mean it's not relevant. And at the end of the day, the relevancy test comes back to the situation, that person who is tasked with finding the patterns in, They'll usually be tasked for a reason. We don't usually task Intel analysts and staff to look for things unless there's a reason. So yeah, sorry, I covered a lot of ground there. Do you want to come in?

Howard

I agree with you. One of the things for me is part of the role of a good intelligence operative and analyst is to be able to advise the client and the people who are providing information or data that they're wanting the intelligence team to look at or the analyst to look at is to be able to tell them look, the kind of data you've given me is either not enough of a sample, i.e. are two not enough pieces of that data to form any useful pattern.

You know, if you're trying to draw a picture of the Mona Lisa and all they give you is four dots, four pixels of a painting, the chances of you coming up with the fully rendered picture are virtually zero. It could be anything.

But the second thing is to get the information and data gatherers to understand, like I said at the beginning, the type and form of data that they're collecting affects the kind of patterns that you're going to be able to identify or anybody can identify.

So the way the analogy I think of is a doctor. When you go to the doctor, you say, I've got a problem. I don't know. Sore arm. And the doctor says, well, what are the symptoms? So you describe the symptoms. Then he or she will say, right, I'm going to send you for an x-ray or a blood test or something else before they give you any medication. So what they're in effect doing is kind of that Intel process or the analytic process.

They're gathering the data that you've given him and saying, I realized from this, can't form a strong and substantial diagnosis, I need to gather more data and more information.

That's what we do. I think that analysts often forget this and intelligence operative, particularly when there's a hierarchy in an organization and they are usually junior or somewhere way down the command chain. Or there's this kind of culture between analyst versus investigator and who is more important and who isn't. And I have my own opinions on that. I've worn both hats and they're neither more or less important than each other depending on the circumstances.

But that ability to guide the data gathering and the data structure is just as important an ability to a good intelligence operative and analyst as it is to being able to then use that data to come up with patterns of meaning. The second point I would make is patterns need to be repeatable or recognisable but like I say if you go back to human behaviour and the environment and criminal behaviour is part of that it always changes.

If a criminal only goes out and does the crime in exactly the same way day in and day out it doesn't need an intelligence hand list to identify that. Anybody could because it becomes obvious.

Certain types of crime evolve and a good intelligence operative like a good investigator will recognize that as a trait of human behavior. Now I'll give you an example. Sexual offenses and obviously I'm speaking here as a former senior investigator very experienced in serious crime that includes sexual offenses and homicide and violent crime.

You can follow a process whereby a sexual criminal starts out small maybe making phone calls to a lady what underwear are you wearing or man or stealing underwear from a clothesline you know it's about power and control it's not about sex, sex is merely a means to power and control, but then it might move on to actually physically interacting with somebody in a way that they don't want that in turn can lead on to forcible some kind of sexual contact and ultimately if they're not caught, because all the time they're needing a bigger and bigger fix, they are evolving in their physical problem, their mental problem and therefore their crime behavior. It can end up god forbid in situations where victims actually die so if you were looking for a pattern just of the very early small relatively small scale impact on the victim offences, you wouldn't be looking for the pattern that is that one criminal you might be looking across loads of what you might call early starter trainee sexual criminals. You need to be able to find a different pattern that looks for the steps in that pattern.

I can give you another example. One of the things with patterns, to create a pattern in information or data, we tend to hang it on an axis. Think of a graph. And there are usually two axes. There's an X and a Y axis, we then plot axes, and then we plot the data. And each point on that graph has a point on the X axis and a point on the Y. Great.

The scale on the axes is what tells us about what the data is. But we will look for the pattern in the dots on the chart, not on the axes particularly. Many years ago, and again I'm going back to the early 90s, we had a series of criminal offences that I was asked to look at. They weren't for my force, I was asked to look at them on behalf of other forces because it was a series of growing crime problems and I a bit like the billiard example what I received were loads of crime reports from different forces and they included the MOs

And again there was no clear pattern in terms of location or anything else but what I did, I plotted the MOs, the modus operandi the way that the criminal committed the crime and I found there were three patterns. There was a really simple one, then there was a version 2.0 that was a bit more complex and then there was a super complex one

But I couldn't find any way of plotting it because the locations weren't relevant the victims were different, there was no clear pattern and the question a bit like the sexual offender was, is this one person or is this actually a trending crime where there are many criminals just happening to commit the same crime because there's an opportunity presented itself in the environment that makes that a better crime to commit than something else?

If you're going to be a career criminal, which path do you take? So what I did, I was so stuck. I took the X and Y axes and I made both of them time. Normally you'd have time versus a value on the other axis but I made both time. And this is just me playing with the data and the information to try and look for patterns.

When I drew the dots on the map obviously every offense had a time and it was in the same

position on both axes so you've got a straight line

But what was interesting is when I annotated each one of those dots for which MO it was, simple, version 2, complex, the first ones, the ones that were oldest, were the simple ones. The middle group were the more complex and the final ones, the ones that were the most recent, were all, no exceptions, the most complex.

Yes you could say, well, everybody's learning to do this better and evolving at the same time. But the chances of that in crime, in my experience, are pretty small. Because we weren't talking about millions of offenses here, we're talking about hundreds. So my theory was this is one person or one group that is evolving its methodology.

That then led ultimately, and I won't bore you with the full story, but it did lead ultimately to this person being caught. He's still in prison now. It was using false identities and all sorts of banking, know, banking shell companies and all this to bounce money around. But the theory behind that was just me as the analyst thinking, I can't find any way to create a pattern that has any value.

So let's try something different. Time versus time. It seems stupid. it, you know, I was laughing at myself at the time. That method is now written up in the annals of intelligence analysis, good practice, and it's called axis pattern analysis, which is a fancy way of saying Howard's weird and wonderful back of a fag packet way of trying to find a solution. It could have failed miserably, but it didn't.

And a bit like the billiard ball, it's just...you can't find the pattern that you want in the data don't just stop keep playing around because if you right, like you say if you think there should be a pattern there maybe you just not either you haven't got the right data or you're not looking at it in the right way so the second skill of the intelligence operative and analyst is not just in getting the right quantity and type and form of data but having the widest possible toolkit of pattern tools or equipment to come up with as wide a variety of patterns as possible.

And on that point, many of the ones that we use are very standard and structured and basic. That doesn't mean they're not valuable. Link charts or associating matrices, event charts, flow charts, activity charts. These are basic groups of visualizations that analysts have been in law enforcement and beyond have been trained to use over the years. It's a good common language but I live with those and I use them every day. Still do. They are the bread and butter of intelligence and analysis.

But one of the things that came out in the late 90s early 2000s that really floated my boat at the time it really excited me was the introduction of something called factor analysis or small space analysis and there are now many other versions of that.

Basically all that meant was that the data was being thrown according to what these days would

be called algorithms, basically structures that might make no sense to you or I as human beings but led to patterns. And the problem was you got these charts back and I still have some now. I still teach with them. Some of them are in three dimensions on a two-dimensional paper so trying to read them is an absolute recipe for taking out and having you know headaches and needing a good dose of some kind of alcohol or relief.

The skill was you could see there's a pattern there. I don't know what its relevance is but clearly there's a pattern. So the question then was is that pattern relevant to something of use to me in trying to understand the criminal behaviour that's going on because it's a crime data that we were using or is it just some abstract pattern you know I don't know the criminals support of different football teams or where they go on holiday which might actually be relevant to crime.

But you know can't say automatically it is. Those tools for me are really sexy because a bit like my back of the cigarette packet axis pattern analysis. This is another way where analysts and experts in analysis and mathematicians have thrown crime data at different models, very technical models, to create patterns just like the x-ray or the fingerprint.

It's a machine generated pattern, thanks to physics, of a biological phenomenon. Imagine the first X-ray, who actually figured out what it meant. You know, that's the really exciting area. It goes to prove the point about how important and critical good pattern recognition is, and understanding of patterns and relating it to human behaviour, to be an effective intelligence analyst.

Mark

There's two things I think we should reflect on with that in your example. I think the first thing is, and correct me if I'm wrong, if I may have misunderstood the details, but in that single offenders plot, okay. So the first lesson is sometimes it's useful to have happy accidents, right? There's no reason why you'd plot the same variable on two different axes. But hey, just messing about, see what happens.

Howard

That's what it was.

Mark

Yeah, yeah, yeah. And I've done very similar things and had, and sometimes the accidents pay off and it sounds almost kind of a bit Hollywood, but it is true. Sometimes you do things that are frustration or desperation and sometimes just daftness. And then actually think, okay, bloody hell, this actually might work. And this actually does yield something.

In that example. What it yielded though, in some respects was what's interesting in that example is we could slip into a semantic argument about what is a pattern or trend. But as I understood it, you had codified the crime report. You said, I've got a stack of minor ones, I've got a stack of moderate ones, and I've got a stack of complex ones. And the visualization allowed you to see the clustering of the minor, the medium, and the complex. And so then from that, technically you could say, yes, there is a pattern, If I have the working assumption, this is one or a series of people who are escalating and they're offending.

And you, even in your own explanation, you said you were still playing with the idea of, I dealing with multiple people? Am I dealing with multiple people in different enterprises, multiple people in the same enterprise? Am I dealing with a single person in the same enterprise?

So I think, yeah, the two things mess about with data and tools because absolutely, that happy accidents can happen. And the second thing is though that your assumption was part of that pattern identification and that was kind of crucial. And it's also kind of a lesson to kind of converting data into different ways and not to turn this into a data visualization pod.

But I've had similar experiences where sometimes when all the usuals fail, you are led to try and do different things. I remember many years ago now, I was given a boatload of mobile phone traffic to deal with, many, many, many phone numbers because we dealing with a smuggling network and that smuggling network, it was at the time when SIM cards were so cheap, you know, you could just buy loads without any details and yeah, they're just, it was, it was crazy.

And to be honest, we tried to do all the usual data viz, tried to use the kind of usual kind of mathematical tools. So, okay, is there a pattern in any of this comms traffic? And out of sheer desperation, and I think it may have even been a Friday afternoon, because I was trying so hard to find a pattern and failing, I, as an experiment, basically, anytime I basically created a database of relationships between numbers and every time there's a relationship between a number, I kind of gave it like a, chord, a sound, a noise and the time between the, uh, I came up with like an interval to basically work out that if if you do it, going to call back for an hour, it'd be like a full, like 10 seconds or something like that. And basically try to convert the traffic into sound.

So it's like, I have data audio, I think they call it sonification. So rather than data viz, try and turn it into noise. And then what that yielded was that sometimes you would get kind of little bits of the network that would repeat.

The numbers might change, but the melody would be similar. And sometimes things would fall out of that. Not all the time, not guaranteed. But from the outside, if before going into that, if you just said to somebody, I'm gonna take your data and I'm gonna turn it into music, and I'm gonna listen to it. That sounds nuts.

But actually, it worked in that very, very narrow context. And I say worked, it wasn't like yours. It

wasn't a slam dunk we found the guy. It just, it gave us some insight into how the hierarchy worked, who was higher up and who was lower down. But it's the same thing. It's the same thing of turning data into different things. Sorry, using the same data and displaying it different ways, messing with it, visualizing it, audioizing it, whatever you wanna do, can have real, real benefits, especially with that patterns.

Because sometimes those patterns are hidden until you do something to that data. And I do also want to pass one more comment, which we won't do it today, but I think you've opened the door on another topic we should cover, which is the role of the analyst. Because what I thought was fascinating about your example was you described yourself as, and I happen to notice about your career, you were the force analyst, almost like the force medical officer or the force underwater search team.

This notion that there was a singular person, this specialist who it's almost like well you're the guy, because the police are like this, we pigeonhole stuff, right? It's like okay we have the armed police, we the mounted police, we have the dog section. It's almost like right well we've got the NSA, they somebody called the Puzzle Palace. It's almost like right well we've got a puzzle, who are the puzzle guys? And the puzzle guys are the intel usually.

But it does raise the question of, should they? and I, and again, we will cover this in another episode, but I know one question that's haunted me and I, and I, like a pendulum, I swing from one side to the other, roughly every couple of years. And the pendulum swings between one side of me says that absolutely, analysts should be a discrete thing and a separate thing. And you need analysts and analysis.

And then the pendulum will swing and it'll say, well, actually if we got our processes right and we got our IT right and we got our kind of our operational BAU, sorry, our business as usual, the things we do, our standard operating procedures right, we would not need that distinct role. And so, yeah, maybe that's something for next episode. you've got any initial thoughts about that as we wind it up.

Howard

Yeah, I'd agree. I think it's a lot more complex and grayer than that and it also comes down to organizational structure and the individuals involved and the cultures that are involved. But from my point of view, I was 34 years a police officer, an investigator, most of which I was a detective involved in serious organized crime, volume crime, homicide, terrorism, all the sexy stuff and around the world, not just in my own local area.

But throughout most of that time, from the moment I discovered analysis, I realized that the intelligence system and processes and analysis would help me do my job better as an investigator. So for all but the first five years of my service, I was also an intelligence analyst in different forms and just for clarity my job title was deputy force analyst. I had a manager but I

was still the the alien that they fed with plates under the door and kept in a locker room locked room you know kind of the the gimp of intel, that was me I still have the suit for the till this day.

Mark

You need that t-shirt, right? The Intel gimp.

Howard

the yeah the other thing I would say is going back to patterns, we've talked a lot about patterns and data but sometimes the absence of data is a problem because it's I don't know what's there but sometimes the very absence of data if you check and find it's really not there can actually give you as much value as a pattern of what's missing.

Then the data is telling you a pattern of what's there and I call this negative data and it's not just a hole where I don't know if you look and you say I know there's no data there imagine crime reports a big I don't want to go off on this because it's I teach all this stuff for weeks and months but crime reports are after the event reports of a crime, time, place, location, methodology.

But provided you're happy that all crime in the area is being reported, which is a different issue, then you also have areas where crime is not being reported. Now, intelligence and analysis spends a lot of time looking at where crimes are reported and geographically or in time creating what they call hotspots. Hotspots of crime. we'll go, we'll target resources there because that's where it's always happening,

But for me the far more interesting question, because there's more data there, is what about the areas where there's no crime happening? If it's human behaviour, why are the criminals, or criminal or criminals plural, making a decision, if it's an informed decision, to attack location A for this type of crime, but not location B? And from the law enforcement's point of view, a crime hotspot is a problem.

Quite rightly are complaining because they're the victims of crime. The police are under pressure to detect the crime, recover stolen goods or resolve whatever the issue, bring the offenders to justice. But a cold spot, the area where no crime is being committed, is actually an opportunity for the police to be able to look at that community and say why is this section of society not being targeted? Are they doing something that the people who are doing being targeted are not doing and it might be burglar alarms it might be people having guardians people who live in the house all day so you can't break in when they're at work but whatever it is is there something we can learn from the cold spot area that's of value in dealing with hot spots

A far more practical example of that. Not long away from the time of the billiard example I was working in a non-analytic role. I was doing my normal job as at the time I was a sergeant in uniform but I was trained in Intel analysis. People used to come to me and say Howard would

you mind having a look at this data which is what happened with the billiard example.

We had a series or the area I worked in had a series where they were attacking shops, large retail stores with vehicles driving through the front doors and stealing stuff, alcohol cigarettes in large quantities

And the investigators had an idea who was doing it and it was in the early days of mobile phones. And we were able to access not what the criminals were saying to each other but what you and I would call traffic data. Phone A contacted Phone B at such at such point in time and there was a connection there for 30 seconds.

You don't know who's using the phone and what's going down that connection but you know there was a connection.

So they were looking at this phone traffic and saying, Howard, would you analyze this and see if we can link it to the actual real time events of the crimes taking place? Because obviously they had witnesses, had CCTV of vehicles crashing through the front doors and alarms going off and hooded figures running around, all the kind of things you'll see every day long on social media.

And I looked at the phone data and what was significant to me was, there was loads of traffic. The investigators told me these phones belonged to the people they suspected were the criminals and there was quite a significant number of them. It was a group. It was a crime group.

But every time that these offences took place there was zero traffic. So the investigators were saying, well that can't be right. You know, we know that those are their phones. They must be talking to each other because clearly they're not all on site shouting at each other, which is right if you come up with a model of how they were committing the crime. know, planning, preparation, communication, lookouts. You know, it's safe to go lookouts whilst they're in there, distribution of the stolen goods afterwards, exit routes, all that kind of stuff. Method, organisation, preparation, subsequent conduct is what we'd call it in law enforcement. The sequence of events of crime.

So I said, well, hang on a minute. Are you happy that it's essential that these criminals, if they're the right criminals, are talking to each other, communicating via mobile phone when they are committing the crimes, before, during and after? Yes. Right. That case, the logical answer is either these aren't those criminals, it's somebody else and you haven't got their phones to see the traffic data.

Or B they, the people you're looking at, aren't using those phones. Now for me that was a simple logical conclusion, but to the investigators who've got really tunnel vision because they're in that pressured environment of 'we want to catch these individuals'. They'd never thought of that and they'd never come across this idea and I say this was the early days of mobile phones. There was no such thing as burner phones then.

You know. People had a mobile phone in the UK. It was a Harry Enfield, the big loads of money, you know, handset. There were that level of mobile phone just about. They'd never actually thought maybe they've got more than one phone.

So what they did, they then carried out observations on these individuals when they weren't committing crime, figured out where they may be storing stuff, both in their homes and elsewhere and they executed search warrants on all these premises and they did find other devices and they brought those devices to me and sure enough those those phones that they gathered that they never knew about until we did a bit of analysis and looked at the pattern in time of the traffic data filled in all the gaps so criminal A would be Monday to Friday if that's his family week, going to the football, going to the pub, seeing his friends, taking his girlfriend out, kids to school, whatever.

Come Saturday night, Sunday morning, whenever he's going out for the crime, he'd leave that phone at home, pick up the crime phone, if you want to call it that, and all his other colleagues would do the same. And for the three or four hours of the criminal operation, they were on those phones. Super simple example, because there were simple times technologically, but it was a pattern.

So this idea of negative data means you haven't got enough data isn't always true. Sometimes the lack of data is in itself a pattern of value.

Mark

There's just one other thing I want to include, which is you mentioned about the mapping and the kind of where is crime occurring? and where is crime not occurring? I think that's absolutely crucial because it's one of my bugbears that I see a lot of geospatial analysis presented as like the kind of the default answer. Let's map it. Let's map it. Let's map it. And a lot of time, yeah, you should map it, but you've...

You think of all the maps we've looked at, look how many dots on maps we've looked at. And a lot of the time, the dots are just where people live, right? Do you know mean? You know, it be a semi-rural map. It's like, well, obviously not all that crime occurred in the lake or the forest or the motorway or, you know, a lot of the street crime tended to occur on streets, shock horror.

But the point to take out the negative data side is the streets where no crime took place. It's looking at that map and saying, okay, maybe the map and the dots of the map isn't the thing here. But if I could list all the streets in this visual, and then I could create a collection, a collection which all the streets where crime took place, and collection B is all the streets where crime did not take place, that little, that's a separate pattern, right? It's a separate kind of, it may not be directly relevant to what you're looking at, but essentially it might help you say, well, actually, why is that subset like with your phones? Why is that either featuring or not featuring?

And I think that's really important. So that's...

That's great. think we'll wrap it up for today and we will see everybody on the next pod. Thanks again, Howard.