**Craig2:** Hi, I’m Craig Smith and this is Eye. on. AI.

**Craig2:** This week, I talk to Aaron Patzer, founder of both Mint, the popular personal finance app, and VITAL, an AI-based healthcare company.

**Craig2:** Aaron talked about the challenges of building businesses that rely on trust and safety and described the security protocols that both compAnies use to keep user data safe.

**Craig2:** Before we begin, I want to mention again ClearML, an open-source MLOps solution, which is sponsoring the podcast. I really appreciate their support. ClearML allows users to easily Track, Orchestrate, and Automate ML Workflows at Scale. Signup for free, log your entire process, version data, build model repositories, provision machines, schedule containers, and deploy pipelines directly from code. If you're a Data Engineer, ML engineer, DevOps, or a Data Scientist, go checkout ClearML today at clear.ml.

**Craig2:** I hope you find the conversation with Aaron as fascinating as I did.

**CRAIG:** Yeah. Aaron. the way I do this is start by having you introduce yourself, what your educational background is and what your career has been.

**CRAIG:** I know you were involved with mint, which I'm a great fan of.

**AARON:** Thank you. I'm Aaron Patzer I'm the co-founder and CEO of Vital software.

**AARON:** We make software for the hospital patient experience that uses artificial intelligence to predict things like wait time, septic shock, and try to make your hospital stay passively positive instead of dramatically negative.

**AARON:** My background is as an engineer.

**AARON:** So I went to duke university for electrical engineering, computer engineering, and computer science. I've actually had a computer since I was about six years old. I ran a bulletin board system pre-internet in 1990. And I actually put myself through university by building websites for people.

**AARON:** After duke, I went to Princeton and I was doing a PhD there in electrical engineering and algorithms. And I had passed my qualifications. I was teaching at Princeton. My first mentor, a guy named Sandy Frazier , had just retired as the CTO of AT&T labs. He taught me how to be practical and I became a bit disillusioned with the academic world and ended up dropping outta my PhD. I started working for a startup in Austin, Texas designing chips.

**AARON:** It was really fantastic to see how a company was built from the ground up. I eventually started the San Jose division of that company when I was all of 23 and one day I decided that I was really fed up with managing my finances.

**AARON:** I had been doing that since I owned a business as a teenager using Quicken and Microsoft money. I had to categorize all of the transactions. Like, it didn't know what Amazon was or that Safeway or Kroger were groceries, or that vodafone or AT&T were phone ... Things that just seemed obvious to humans.

**AARON:** And so I got a database of the US yellow pages, and I wrote an algorithm to basically correlate financial transactions with yellow pages data. And I ended up being able to categorize like 90, 95% of all transactions. Super useful because I was spending two hours every weekend doing it.

**AARON:** I don't know, obsessive compulsive, anal retentive disorder on my part. I didn't like doing it, but I had to do it for some reason. And. I got an algorithm to do it. And then I was like, oh, if I can categorize all these transactions, then I can set budgets. And I could create software where you could say, ah I'm gonna put, $200 budget this month on dining out and a hundred dollars on bars.

**AARON:** And this is how much I wanna spend on this or that. And it could alert you when you go over. And if I know where you're spending, then I was always into optimizing credit card rewards and things like that. You could get the maximum amount of cash back and the maximum of discounts. And if I knew how much your bank balances were, I could tell you that, bank of America at the time is only paying you half a percent interest and you could be earning four or 5% interest at that time with a different bank.

**AARON:** And so we could all of a sudden do ads, quote unquote, that make you money because they know your financial situation. And that became the business plan or the engine for Mint I actually called it money intelligence at first, which was a long name. And my second engineer was like why don't you just call it MINT and I was like, oh my God, it's a contraction of money intelligence. It's a place where money is made it's mint condition. It's fresh. It was like one of those epiphany moments. I was like, this is a great brand name. And so started MINT

**AARON:** and it was a wild ride . we launched September 2nd, 2007. We had 50,000 signups in the first day, crashed the database.

**AARON:** And the rest is history. We sold exactly two years later when we had around 3 million users. I think MINT has eventually gotten up to 20, 25 million users at Intuit. I found myself as an officer of a public trade company when I was all of 28 years old. I was the CEO and I ended up having to do, all of the press and it built a lot of self confidence in me as an individual. I eventually ran this division of 120 people, a hundred million dollar line of business cause they gave me Quicken. My old competitor gave that to me to run, which was just a great irony.

**AARON:** I had to improve the product that I was talking trash about for years. And eventually I became the vice president of product innovation across the whole company. And so I worked on QuickBooks and I worked on TurboTax and I did that until 2013 started another company called ??Fountain, which was on demand, video expertise.

**AARON:** It uses natural language processing. You could type in any question, my knee hurts and it would connect you with a doctor or a nurse. I can't get this to compile , it would connect you with a programmer. My dog has been throwing up and it would connect you with a veterinarian.

**AARON:** And so it was this market for expertise and it worked pretty well, but we never cracked that, million, 2 million, 5 million, 10 million user mark. And so I sold that in 2015 and what had struck me about that product was how popular medical questions were.

**AARON:** And it was one of the only categories that people were willing to pay for. And I come from a family of healthcare professionals. So I'm a programmer. My sister is a professor of epidemiology. She does kidney transplant research. My brother-in-law, who's now my co-founder at vital, he's an emergency room doctor at Emory university.

**AARON:** My dad worked for Bristol Myers ?? Had been cancer research for many decades and so I was exposed to a lot of healthcare and, literally at a Thanksgiving, I was asking my brother-in-law, why aren't you hanging out?

**AARON:** And I went to see what he was up to. He was using windows 98 software that sort of looks like trash in my opinion. And he said, we paid a hundred million for this software and it's brand new. And I was like, oh, I smell an opportunity there.

**AARON:** And then I started to go into the emergency room with my brother-in-law.

**AARON:** Which is a very different place than you expect. It's mostly people who are really sick, but they're sick with chronic diseases or they've got a bad flu or now COVID, and it struck me you're having one of the worst days of your life. And no one tells you what's going on. You have no idea how long you're gonna be waiting there. You have no idea what's going to happen next.

**AARON:** You have no idea what's expected of you. You have no idea how to make it go any faster. You have no idea whether people are working fast or not. It seems like people are idly milling around. And I just like, this is the worst day of my life. I'm gonna lose my arm and.

**AARON:** What we've done at VITAL now in over a hundred hospitals, our flagship product is called ER advisor, effectively it looks at all the things that are going on in your electronic medical record system, that what I consider to be old clunky system, and it tries to interpret all of that using AI and good product design to talk to you the same way that like a good nurse or a good doctor would, if you had infinite nurses and doctors and they had the time to explain everything to you and they weren't frustrated and burnt out and could be nice to you.

**AARON:** And it's Hey Craig, the first thing that's gonna happen is a triage nurse is gonna see you. I know you want to see a doctor straight away and you wanna get straight into a room, but the nurse is gonna triage you. And they're gonna take your vital signs and maybe ask you for a urine sample. So if you have to go collect that right away.

**AARON:** Cause if you can't, you're gonna wait two hours until you can. And just little tips and what's gonna happen. And after that, you're gonna go into the waiting area. And if you're not too severe, you might go into a communal waiting area where you're gonna be treated. And that's okay. That's just a safety precaution when things are overloaded to make sure that you get treatment more quickly.

**AARON:** And by the way, the MRI or the CT scanner is a little bit backed up today. And so it's gonna be three hours on this, but here's, what's happening in the background. The doctor has already started the note, those six vials of blood. Here's what happened to them. These are the tests that they're running.

**AARON:** Cause you have no idea. You're just like, why did they take so many vials of blood? What are they doing with all of them? Sometimes they go into a little pneumatic tube and you never see them again, nobody tells you what's happening. Nobody tells you how long it's gonna take for these tests to come back or what they're for, even in places that show you your results.

**AARON:** They're like, Hey Craig, your BUN and your creatinine are high. And you're like, what are BUN and creatinine? Should I be concerned? What does it mean if my chloride level is high or low? so we try to explain, okay, this one is to determine if you're dehydrated. This one has to do with muscle strength.

**AARON:** This one. Is related to your kidney function. So like an eighth grade explanation of what are the things that actually matter? And then at the end of a hospital visit, you get like 10 to 15 printed pages of stuff. And people are like, what do I do with this? I think 80% of them actually end up throwing it away pretty much immediately.

**AARON:** And so what we do is we use natural language processing parse out the boiler plate that everybody gets. And we say, Craig, this is the stuff that the doctor wrote for you. And it's only usually a couple of paragraphs. It's here's what you should do. Here's what you shouldn't do.

**AARON:** Here's the warning signs if things get worse to come back. Here's the follow up appointment that you need to make. Because a lot of people don't make follow up appointments. They end up worse. They end up coming back into the hospital. There are different studies on this, but 30 to 60%. Hospital admissions or ER, visits are related to medication either non-adherence or ah, I feel better, so I'm gonna stop taking them or I didn't get them in the first place cause they were too expensive. There's a lot of things that we can solve and help explain just by adding clarity. You can tick off the four things that you need to do in 10 minutes if you know what to do.

**AARON:** That's the premise to take boring anxiety prone industries. And make them understandable, clear, actionable, and just relatable. Kind of like my life's mission is to simplify the hard things.

**CRAIG:** Let me ask you a couple of questions on the ER advisor, you're tapping into medical records in individual hospitals. Is it the hospital records database or is there a siloed database for the ER and also this is related to MINT.

**CRAIG:** I use MINT, I absolutely love it. And I'm trying to get my brother to use it, who is very suspicious of turning over any personal information to any computer system or internet connected device. And so in both those cases, MINT and VITAL privacy is front and center an issue.

**CRAIG:** So on MINT, how did you deal with that? And then on VITAL how do you deal with that? Because vital, actually, my understanding is hospital records or health records are really bundled up in all kinds of regulation. And there are a lot of AI solutions that could do amazing things if you could get access to those records.

**AARON:** That's right. So there are a lot of similarities between vital VITAL and MINT when it comes to data and privacy and security. So with MINT I got about 50 venture capitalists tell me no before I got my first. Yes, because they said no one is ever gonna trust a startup with their bank, username and password.

**AARON:** I won't even give that information to my brother. And I said, all right this is an issue of trust. trust is almost emotional thing. So we're gonna make sure that we have a really good brand name, mint.com, not some, long obscure domain name. We needed to make sure that everything looked really professional and really sharp that we put a lot of time and effort into making sure that it looked trustworthy and then most importantly, making sure that it was trustworthy. So I was fortunate enough to live in the San Francisco bay area, Silicon valley area.

**AARON:** And I was friends with a bunch of photographers. So there was a guy named Paul Kocher. He invented SSL version two when he was a student at Stanford. I think we're on version four now. Carter Lara, Josh Jaffe. These were all cryptographers who were friends of mine who worked at cryptography research.

**AARON:** And we had them actually design us a custom crypto system. I used to have a USB key sort of that you'd wear around your neck. And it had part of the special encryption key. And so in order for us to decrypt certain things or in bulk, or to change the encryption scheme, no one person could do it.

**AARON:** I'd have to get together with my VP of engineering or, the directive engineering. And we'd both have to go into the data centers. This is before AWS and we'd have to enter this partial key. It wasn't complete until, two outta five or three outta five of these pieces were put together .

**AARON:** Liken it to how they have the keys in a nuclear submarine that are, 12 feet apart longer than your arms can reach. One person can't turn both keys at the same time. So you have to get two people involved . That's a mechanical way to do it. We did a digital equivalent.

**AARON:** There were no hacks or data losses while I was at MINT all your bank, username and passwords are secure. We had an amazing crypto system and security system. We audited all the time to my knowledge, they're still using that or similar system. And I haven't heard of any breaches or any issues with MINT since I left in 2011.

**AARON:** So pretty good record for system like that. With VITAL there's a lot of the same dynamic, which is at MINT we had to connect up to 12,000 different banks and brokerages, lots of siloed data, lots of dirty data that we had to normalize which means to get rid of the spurious things to make it all presentable in the same way.

**AARON:** And we have to do that at hospitals as well. The data that comes out of different medical record systems is very different. The way that lab tests are named at different hospitals is different. And we have to clean up all the data. We have to get data that hospitals don't necessarily want to give up, or that electronic medical records companies don't wanna necessarily give up.

**AARON:** So it's a similar problem of data connectivity, and just like, at Mint, it's hard. And it takes like half of my time, dealing with data and cleaning data and doing the hard work and there's no substitute for it. Likewise, we have an incredible security system it's of course HIPAA compliant, but now you have things like SOC two and high trust certifications.

**AARON:** That we either have, or halfway through the process on, so you get outside auditors and there's a lot of provisions that you have not just on, on network security, but on phishing and internal controls and access. If you fire an employee, how do you make sure that they don't have credentials -even an hour later, let alone months later to your AWS servers. So we do all of that very well. And we've passed all of our security reviews. We've had a number of health systems say, wow, your security is effectively better than ours, which doesn't surprise me because they have a lot of like physical infrastructure and we use an AWS private network and they do things very well and everything is end to end encrypted.

**CRAIG:** Can you talk a little bit about the encryption, there's, homomorphic encryption, there's differential privacy there's federated learning on training, AI models. . And then there is data layer security, that monitors all traffic in and out of the data storage and does a verification. So can you just talk a little bit specifically about the security architecture and protocol?

**AARON:** Sure. So there's number of things that you want to think about when you think about security. Of course the traffic itself from the patient or from the hospital to us is encrypted. So that's your HTTPS or SS L type connection. Then when the information is being processed, you know, to figure out male or female urine test or blood test , it has to be decrypted in order to go through the logic of the software. So where and how it's decrypted is an important component, and it has to be done inside of effectively, your safe zone on the processing side. So before you get into that safe zone, you typically have a server that will handle things like, denial of service attacks that will block bad IP addresses.

**AARON:** For anybody who is not in network IT, as soon as you put a server out there that has any IP address that can be accessed externally, you will almost immediately start to be scanned by universities in China, hackers in Russia, who are trying the basic, most obvious stuff.

**AARON:** They're doing this blindly, assuming that you have different things installed. And they're just trying a bunch of random combinations on the off chance that you have WordPress installed and it's an old version, or you have, such and such software installed.

**AARON:** And so you start to see that immediately. So you want to block a lot of that . you can get rid of like 95% of the dumb stuff, pretty easily through software and through pattern recognition. Then when you're done processing how you store information is really important. So all your databases should be encrypted at rest.

**AARON:** Which means if somebody, you know, this is an AWS, it's not so relevant, but if somebody went into your data center and they literally stole a hard drive, And they took it home and they plugged it in that the data on it would still be encrypted. It wouldn't be in plain text, the most important fields for you to not have in plain text, even in your database, even if the hard drive is encrypted, are your password fields.

**AARON:** There are a lot of dumb websites out there, and these are responsible, frankly, for most of the security breaches out there. If you've ever reused the same password on different site. Your favorite password is out on somebody's dumb website, where they stored it in plain text and where hackers have gotten in, and they've looked up database column called password and just taken it.

**AARON:** Our password column is encrypted itself. And it's also salted, which means that you're using things that have to do with time of day or when it was encrypted, as well as the encryption key in order to encrypt it. So even I who have like root access to the database, I don't know what your password is. It just looks like a jumble of a thousand different hash characters and, and keys.

**AARON:** So that is another part of it. The last part of it, I would say is from a technology stand point is monitoring. So you had better have alerts that are going off that, you know, tell you when there's an unusually high amount of traffic going between two locations. Does that mean somebody's bombarding you with requests?

**AARON:** Does that mean somebody got in and is transferring your data out? Well, is there a way that you can rate limit it so that if you get hacked you don't lose 10 million customers accounts. You lose a hundred because you rate limited it.

**AARON:** No system you could argue is unhackable, but you can make it so that if it is, then you get the data out very, very slowly, right? No ship is unsinkable, but can you make a ship that takes on water very, very slowly. You plan for all these disastrous scenarios, and then you start to think about the social aspect of it.

**AARON:** So what if I have an employee who hates me, the company, everything, what do you do when you have a rogue employee? Who's an engineer and who has potentially root access? How many people does it take, who has permissions to delete or to move data around? What do you do about fishing and scam attacks?

**AARON:** What protection do you have on your email? Do you enforce all of your accounts and all of your employees to have two factor authentication? We do, honestly. It's kind of a pain in the ass. You know, we use Okta for a lot of this and. It times out every day or two and I have to sign into there.

**AARON:** And then from there I have to sign into, you know, the federated services and, you know, those time out periodically and like it's sort of a hassle and like you have to use a password manager use. We use one password. We use Google authenticator or duo for two factor authentication because that's better than text messages is your second fact of authentication because

**AARON:** your cell phone carrier is actually more vulnerable than you think it's a good, if that's the only option, that's a decent option, but there are better options. And so you can't just use the same easy password for everything you have to use. Two-factor authentication.

**AARON:** It's a pain. Some of your employees who are not technical are gonna be like, ah, why do we have to do this? I don't even touch the database. And you're like, well, because you have a corporate email address that could then be used to spoof the rest of us and like your weakest link sort of thing. So you have to do all of those.

**AARON:** And we did those at MINT and we're doing them at VITAL and it's a whole discipline. That you have to get, right. It's it's table stakes in order for you to then build great software on top of,

**CRAIG:** So you have access to the records and I won't get into the regulatory and, and individual **hospital system negotiations.**

**CRAIG:** **I'm** sure **that's intense,** but you have access to the records. What kinds of AI systems are you training with that data?

**AARON:** So we have about 10 different AI models and I'll describe a few of them. So some of them are related to wait times. How long are you gonna wait when you show up at any given hospital?

**AARON:** Wait time depends on several hundred different factors, actually. Naively you'd think, okay, well it's like a traffic queue. How many people are ahead of me? Well, it doesn't exactly work that way. If somebody comes in with a heart attack or a stroke, they're gonna move ahead of you.

**AARON:** So it depends on your severity. Your severity depends on your age. It depends on your past medical history. It depends on your vital signs. It depends on what the nurse wrote about you. It depends on how many people came in in the last hour or three hours. How many beds are left available? How fast are patients being discharged?

**AARON:** Are they backing up or is the system clearing out ? You can't just use, how long did the last three people wait? Well, what if they're waiting five hours? You don't know how long they ultimately ended up waiting for that bed until five hours later. And then you're making predictions that are at least five hours old.

**AARON:** And those patients look a lot different than the patients who came in at this moment. So that tends to be called a rolling average, but rolling averages are a lagging indicator. So you actually have to use artificial intelligence to predict this and predict it using observation effectively of all the past scenarios, where five people showed up in 20 minutes and they were of this severity.

**AARON:** And here's how long that affected the wait but it's not absolutely how much it affected the wait it's almost like what percentage did it affect the wait among the distribution of wait times that you could have on any given day? There's some really interesting things that come out of wait time data.

**AARON:** The one that is useful for listeners is Saturday or Sunday morning are a great time to have an emergency. Don't have an emergency, you know, between 6:00 PM and about 10:00 PM. Monday Tuesday in particular are the busiest days because I don't know people don't like to go in on the weekends or they don't like to take family members in on the weekends.

**AARON:** So there are actual patterns of how busy the emergency department comes. But if you have the choice any day in the morning is better than any evening and definitely a lot more pleasant.

**AARON:** The other types of AI that we do are predictions about what's going happen in the emergency department. So I can tell you with like 90% accuracy, about 15 minutes after you walk in, whether you're gonna be in the hospital or not. That means your gonna stay overnight. We don't necessarily tell the patients that, but we can tell the floor or bed coordinators, Hey, you're gonna, you're gonna need another six beds.

**AARON:** You're gonna need to call people in to, to shift cause there's a slug in the emergency department, or you can send people home because there's not that many coming. And so we look at again, a number of different factors, your vital signs, your lab results, what the nurse has written. And our key differentiating factor is, we're really good at natural language processing.

**AARON:** We use multi-layer neural network. AKA deep learning. And then we use natural language processing techniques that are bidirectional. We use a Google model that they have open sourced that they trained on every book ever written. And then their medical version looked at every PubMed publication ever.

**AARON:** They use something like 56 million dollars worth of compute time. And so now we have the medical version of that that understands the context that heart attack is related to myocardial infarction and that their synonyms and they have similar vector form and all of that. And then on top of that, we take our own data sets across these hundred hospitals.

**AARON:** And the bigger we get, the better our data gets and we tweak that model even further for our own purposes. And so now we're able to do things like admission prediction and the big one that we're working on, that we're having really good results with. Is prediction of sepsis or septic shock where all of a sudden, there's this systemic infection that spreads throughout the body.

**AARON:** It can be fatal. It can come on very, very quickly. And it's also very difficult to detect. And it turns out the key thing that we can do that no one else can, is to find little things in nurses notes, where they're like, oh, the patient was a little lethargic. If they say lethargic, and there's no history of alzheimer's or, or some disease that might make them lethargic. That's a higher correlation that they're septic. So it's these little subtle things that you only get when you see we've got from one of our partners, 10 years worth of data.

**AARON:** Must be two, 3 million visits now that we have whether they're septic or not. It is every note, every vital sign, every lab result. It is insane the amount of data that we have that goes into making this model really good, our preliminary results are that it has a sensitivity, which is true positive over true positive plus false negatives that is 600% better than Epic's model .

**AARON:** Epic would be the multibillion dollar company who runs some of the biggest EMRs. They're very good at EMRs, but in this particular area, you know, we're really good at AI. And so this is a preliminary result. We'll do a, you know, proper peer reviewed study, but the first results look really good.

**CRAIG:** On the inputs, do you, tie into, you know, every hospital has a certain area where EMT services are feeding into it? Do you tap into the EMT coms or anything. So you, you have an early indication of the traffic coming into the ER,

**AARON:** That's an interesting question, which is how much do we pay attention to ambulance operators?

**AARON:** We haven't integration with ambulances yet. In fact, just as an indication of how healthcare is so siloed, every ambulance company uses its own version of an EMR. So they'll take, you know, vital signs and a little bit of their history. And then, because healthcare is generally not interoperable, none of that gets transmitted to the hospital. At best, it's somebody on the phone. That's like 56 year old male with a heart attack. You collected 10 times the amount of information, where did it all go? And so the interoperability is one of the problems that we're trying to. The answer is no, we don't like listen to the radios or anything to determine what the volume is going to be.

**AARON:** We can actually determine the volume much better just because of trends of weekday versus weekend time of day, our better indicators post holiday. Again, people don't like to use their weekends and holidays for taking relatives who are sick.

**AARON:** A little bit cruel, but apparently it is true. Part of human nature here. So those things help us predict emergency department volume

**CRAIG:** You see a lot of papers and a lot of media coverage about the potential for wearable sensors to detect early, signs of disease.

**CRAIG:** Do you have a sense of why that hasn't happened? And are you going in that direction of disease detection

**AARON:** We're not going in the direction of disease detection. I think a lot of people are.

**AARON:** Are scared of that area, because then you become a regulated medical device. What we do instead is when we detect something, we don't change a medication or place an order or anything that is ultimately the doctor's decision that would affect the patient, what we do instead. Highlight to the doctor.

**AARON:** Here's something you may have missed. And here's why we think you may have missed it. And here's the paragraph of text that you or a nurse wrote. And it's got a couple of words highlighted and they're like, Hmm, that is interesting. That may be an indication that we should do this or that same thing with admission.

**AARON:** That's more for improving the of the hospital and the efficiency of the hospital. The doctors and nurses generally know who's going to be admitted, but they are so busy, they can't communicate that effectively the people upstairs who need to prepare a bed and need to prepare certain tests or whatnot.

**AARON:** AI doesn't ever replace doctors and nurses. It supplements them. And it's kind of like a tireless doctor or a nurse who is really good at communication with everyone else who's not sitting there in, in this case the emergency room.

**CRAIG:** But even if you're not making diagnoses, two or three years ago now there was a paper on predicting a very high degree of accuracy, diabetes, or, or some different diseases using eye scans.

**CRAIG:** There's a lot of the world where there aren't doctors available. And it seems to me that would be a no brainer. You just create an iPhone app that scans your eye and gives you a probability of certain diseases.

**CRAIG:** And the recommendation of whether or not you should see a doctor . Why isn't that happening?

**AARON:** The single biggest problem in healthcare in terms of AI adoption, is it. data being blocked and

**AARON:** not having a distribution mechanism. So most of these algorithms that look like they're producing fantastic results they're done with after the fact data that's out of a data warehouse. You know, six months or a year old. And in order to affect patient outcomes and health and improve the lives of doctors and nurses, you need to be able to do it in real time, which means you need to be able to recognize this vital sign has gone off the rails.

**AARON:** And here's what we need to do about it. And then alert somebody immediately. You can't do it a day later or a week later, you need to do it right then and there in order to do that, you have to have a real time feed from hospital electronic medical record systems. Those are very, very difficult to come by.

**AARON:** We have a hundred of them. It has been the pain of my existence to get those. IT always has a six or a nine month queue of stuff. That's, they quote have to do.

**AARON:** EMRs do not want to share their data. They don't make interoperability a top priority because hospitals and EMR companies think, ah, well, if we have all the data, then that's a captured market. We at this health system have all of your data, Craig. So of course you're gonna come back because we have your medical history and you're like, well, I should be able to choose where I want to go.

**AARON:** And they're like, We might burn a CD for you or fax it over, and we'll probably charge you for it too. And so. Any of these systems that rely on real time data just immediately die because the IT burden is too great. You need the security that we talked about earlier.

**AARON:** You need software that is not a minimum viable product. You need it to be solid from day one. It's. Million or multimillion dollar investment to get any one of these up and running and it's way too much for any researcher and most startups to do. It was only because I had done VITAL and had a track record and could raise enough capital on my reputational loan that we were able to cross this chasm of IT death.

**AARON:** And it's still a slog.

**CRAIG:** I've been talking to people recently about ambient intelligence, there's a researcher. I'm sure you know, her Fei-Fei Li at Stanford who created ImageNet and was instrumental in the validation of deep learning. And she's very focused right now on ambient intelligence , particularly in healthcare and particularly elder care where you have a mesh of sensors, that sense everything from movement to, to temperature, to speech or whatever.

**CRAIG:** And. Feeding all of that into an AI that, that learns a patient's pattern and then can recognize changes in that pattern that might indicate some change in their conditions. That would be in addition to what you're doing in an ER setting, is that something you've looked at

**AARON:** that would be the follow on component of what happens once you leave the hospital, have your follow up appointments, get your medications, adhere your medications.

**AARON:** And then beyond that, the next step would be something like this, which is monitor your wearables monitor. Even just a simple GPS tracker. How fast do you move when you're walking? if you've slowed down all of a sudden by 20%, that's an indication that something may have happened. Your gate as well.

**AARON:** How you walk, whether it's smooth or jerky. We actually have a, a researcher that we work with at Emory that's what his PhD is in, is detecting Alzheimer's using gate and, and deep learning.

**AARON:** So I think there's great promise in it, but it's not an area that we'll get to for a few years. Research quite easily dies without distribution the first order of business is to get to as many hospitals as we can. We're at a hundred hospitals now Once we get to a thousand hospitals.

**AARON:** That gives us a massive amount of data and a, a way to trial, dozens of AI algorithms like this . We're already serving 700,000 patients a year, you know, should be soon about a million. You know, a thousand hospitals would probably be on the order of 30, 40 million patients a year. That has a real impact.

**AARON:** And that's just the US

**CRAIG:** and how do you go about building that distribution? Is it just hospital board by hospital board?

**AARON:** It is unfortunately hospital by hospital and our reputation hopefully preceding us in certain places, but we are in 28 health systems, we've expanded rapidly, this has all happened in the last 12 to 18 months.

**AARON:** They wait for six months or a year because hospitals are conservative and then they expand. So the couple of places that we have where we've been around for a year or more, or either in all of the hospitals in the health system, or our biggest client is common spirit dignity in CHI, they have a 100-130 hospitals and, we're in dozens of them now after starting in one about 18 months ago.

**AARON:** So we're expanding rapidly, but it's just the pace of healthcare, you know, it will take us another few years to simply take a single client and get all of their hospitals on here. Let alone get all of the hospitals across all of the health system . Each of these is, a local or a regional business.

**AARON:** And they're big. Some of these are the biggest employers in the state have tens of thousands of employees, billions of dollars in, in revenue. But their practice is not necessarily in buying software. It's in buying MRIs and surgical equipment and saving lives. So it's an interesting business.

**CRAIG:** So you have an app. When a patient is admitted to the ER in these hospitals, do they then ask if the patient or a family member has a smartphone and if so, instructs them to download the app and then register. And then their online.

**AARON:** It actually works a little more simply than that

**AARON:** when a patient walks into the emergency department or into stay overnight in the hospital, they're registered, which means somebody takes their name and address, date of birth, and typically a phone number. We ask that the hospital acquire a, a mobile or a cellular number as well. We can figure out which number is a home number, which one's a mobile number.

**AARON:** And we'll send you a text message that says, Hey, Craig do you wanna know how long you're gonna wait, get updates on your labs and imaging and share your progress with family members. And then we effectively send a password reset link. So your code is going to be different than my code. And it expires at a certain period of time.

**AARON:** You click on that link and then it's a progressive web app. So you don't have to download anything. You don't have to set up a new user and password and because we've made it so easy, but at the same time secure, We get between 50 and 70% of all patients using the software. That is unheard of. Most software that requires somebody download something or user name and password.

**AARON:** Even if they're motivated in the healthcare setting has a 10 or 15% utilization rate. We are literally four to six times higher adoption, higher usage than most people in this space because I come from a consumer background and it's all about making things easy.

**Craig2:** That's it for this week's episode. I want to thank Aron for his time. If you'd like to read a transcript of this episode, you can find one on our website, eye-on.ai. Please also check out our sponsor, Clear M L, an end-to-end MLOps solution at clear.ml.

**Craig2:** And remember, the Singularity may not be near. But AI is about to change your world. So. Pay. Attention.