Jacob Morgan 00:00
People say differently.

Dr. Wang 00:02
Bastion one does one.

Jacob Morgan 00:05
Okay? Yeah, that's what I thought I saw a YouTube video where you introduced yourself and you said dotchin one? Yeah. Alright, let me push record on my camera here. And then have you ever used Riverside before? No. Okay, so after I say thank you for joining me, you know by, don't hang up yet because it's going to upload your audio and video it will maybe take like 20 seconds. But then it just uploads all of your recordings that I can download it later. Okay, so just don't exit right away. And then I have Professor of Management and organizations at the Kellogg School of Management and McCormick School of Engineering at Northwestern University. at Kellogg, also the founding director of the Center for Science of science and innovation is what I'm was going to introduce you is right now, and then later, I'll do much longer stuff. Yeah, they'll work for you. Yep. All right. Cool. And then you can see and hear me okay. Yeah. All right. Perfect. Well, then, unless anything else, I'll jump right in if that works for you. Yeah, sounds good. All right. Hello, everyone. Welcome to another episode of the future of work. My guest today, Joshua Wong, Professor of Management and organizations at the Kellogg School of Management, and the McCormick School of Engineering at Northwestern University, at Kellogg. He's also the founding director of the Center for Science of science and innovation, which we will be talking about today as well. daSun, thank you for joining me.

Dr. Wang 01:31
Thanks for having me here.

Jacob Morgan 01:33
Well, before we get started with all the cool stuff that you've been working on, why don't we talk just a little bit about you and your background? So take us to, you know, back when you were a kid, where you grew up how you were raised? And how did you ultimately end up at Kellogg and studying all this stuff?

Dr. Wang 01:51
Oh, okay. Well, so for the next 20 hours, let me walk you through everything. Oh, my God, where do I go? Maybe

Jacob Morgan 01:59
dotchin.

Dr. Wang 02:01
So, you know, I grew up in China, in a town north east of China called Shenyang, you know, it's a three small town is, you know, 7 million people. And, and that sort of follow up pretty typical trajectory, I would

say, in terms of as a students in terms of career, you know, I did my undergraduate in China, and I came to the US to do a PhD. And then I basically been stuck here ever since then.

Jacob Morgan 02:34
Kill, I'm trapped you they close the door and throw away the key.

Dr. Wang 02:38
Yeah, different ways. I was just hard to imagine, actually, that life turned out this way. But I think the only probably unusual case is I sometimes still be introduced as the recovering physicist at the Kellogg School. Because, you know, I started my career thinking, I will be a physicist, you know, I did my undergraduate in physics. And I did my PhD in physics and thinking about trying to be a physicist, and, and just halfway through my PhD, you know, I started to, you know, that's where around the time where a lot of the big data become available. That's around the time that Mark Zuckerberg was called Mark Zuckerberg, by people. You know, I think that's where I started realized, you know, actually, maybe maybe interesting to apply what I learned in physics, to social sciences. So so that's kind of the beginning of a lot of the stuff we do today shape, our whole research agenda. And what my research team focus on is to think about how do we leverage all those new computational tools and new data about human behavior and social connections? And also innovation more recently? And then how do we make sense of these through a data driven perspective?

Jacob Morgan 04:02
Very cool. I actually spent a month in China. So yeah, I went to this was a couple years ago, I went to Beijing. I went to eunan. I went to Chengdu I went to Tibet. I went to man, a couple other places as well. Yeah, yeah. I did the Tiger Leaping Gorge hike. There was a mountain I think was called like yellow mountain where you go there and you see, they wake you up at like, four in the morning. And you do a two mile hike to see the sunset and I was like freezing cold. So I did all that stuff over there. It was a lot of

Dr. Wang 04:46
really serious hike. You know, I think, yeah, really serious hike. Yeah, no,

Jacob Morgan 04:51
it was one of my favorite trips. I mean, it's such an amazing an amazing place to visit. I had such a blast. So I I'm curious, is there anything about your your background as far as how you were raised and how you grew up that got you involved in physics? Like why? Why physics? What was the gravitation towards that?

Dr. Wang 05:15
Oh, good question. I wasn't, you know, I was thinking when I was thinking about like his college major, I did pick physics. So there's no denial on that, because that's

Jacob Morgan 05:26
pretty hard.

Dr. Wang 05:31
Yeah, so I, you know, I saw, why did I pick it? You know, it wasn't clear if there's any thing else I wanted to pick. And, you know, back in my days, I guess it wasn't, it's not like today, I think people have better understanding of what are the majors that, you know, how do you pick a major, like, people start to experiment from, you know, maybe their elementary school started planning things out for college? You know, back to my days, there was no planning whatsoever, right. So we just got to the college stage, and then I pick a major. And yeah, I wasn't, I mean, I actually I don't think I can nail down the reason say, I want to be a physicist, I wish I can be one of those people that lucky people say, Oh, I grew up I had the dream, that I won't be, you know, firefighter. Oh, I want to be I never had any dreams like this. Just to make sure I'm not disappointed, you know, but yeah, so So I picked it. But I one thing I can say is I actually never also thought, oh, did I make a round pick? Because I also fell, it is hard at times, but I never felt that's, you know, you know, that's pretty, I think it's a pretty thrilling ride overall. And then was the interesting turn as I was doing PhD, them gravitate more and more toward social science. And now, I think many people call this computational social science sort of a new paradigm within social science. And that more and more people identify with. So yeah, so it's been a really interesting, intellectual journey, that I'm enjoying the right so far. So

Jacob Morgan 07:21
very cool. Well, let's talk a little bit about some of the stuff that you're working on now. So you mentioned switching from physics to social sciences, you're using a lot of these concepts of big data, computational analysis in the business world. So what what are you working on now? What are you teaching?

Dr. Wang 07:39
Yeah, so I teach at Kellogg, a class, sort of thinking about the principles of social dynamics and networks. One of and this is closely related to what we research on right now in my lab, you know, in right now, I think we're very focused on this idea of science of science and thinking about how do we use all the data that's now becoming available in a very rapid miner, about the inner workings of science and innovation enterprise? And then how do we then leverage all these new tools such as machine learning, network science, all these tools to make sense of this data with increasing robust accuracy and robustness? So, so combined with data and tools, I think we really now have an opportunity to try to understand how science works and where innovation occurs. And so that took us to the journey of trying to understand what are the signals of career success, you know, individual careers, you know, how, what are the general patterns for a career lifecycle, and this is something that I, myself was really interested in this virus self serving purpose. And also help us to think about collaborations, you know, how do we put a team together that will be more effective? And also, how about think about, you know, the other set of questions, including more recently, we're also getting really interested in this idea of failure. And in my view, is something that is under studied and poorly understood. So we're also hoping to make some progress in helping us understand the role of failure in shaping individual careers.

Jacob Morgan 09:29
Oh, very cool. Well, let's start with one of the things that I was very fascinated by, was this idea of hot streaks. So maybe give us a little bit of background information first, just on the study and how it was

done and the research that went into it, because it sounded like it was a pretty intense thing that you guys did. So I'd love to get some information on that. And then maybe you can talk a little bit about what you actually found after doing all this work.

Dr. Wang 09:54
Sounds good? Yeah. So the hot streak is something that really consumed us for I think is about five years now will be really hard at work and thinking about this. Actually a little bit over five years, but you know, it's so the overall the beginning, we were really interested in this question of, you know, what are the general patterns of a successful career? You know, I remember when I started out the project, I'm starting out as an, you know, young assistant professor, I'm looking at all this people around me that are done very well. And I'm just thinking, you know, what, if I collect the data, I should analyze, you know, what, what are the patterns of the careers. And in this case, I work with my PhD students, Lou Lille, here, we collected a large variety of career histories. So this includes, you know, 10s of 1000s of scientists, and choice their career publications, along their careers, but also includes, you know, 1000s of artists over the past 404 to 500 years, and then choice the old artworks they produced along their career. And then we also analyzed, you know, 1000s of film directors over the past nearly 100 years, and twist all the movies that they produced, right, so So what we then have is this remarkable database of career histories across three, arguably quite different creative professions, arts, films, and science, right. And across all this, we can also choose not just the publications or the products, we can also see how good these products are, for example, for scientists, you can look at the citations of the papers they produce for artists, you know, there are different measures, but commonly accepted measure in the literature is to think about auction prizes for each artwork they produce, right? And then for movies, you can think about IMDb ratings for each movies, right? So that's where once we have that data, then the intuitive question emerges is, when do you do your best work?

Jacob Morgan 12:18
Yeah, okay. First of all, I can't even imagine how you collected all of that data, like the amount of work to go track 100 years of film directors and all the movies and all the rankings. I mean, that's just, it was that like, manga, I think, an entering into a spreadsheet?

Dr. Wang 12:36
Oh, you know, obviously, this is not manually doable. So computational, I think this is, you know, part of the thrill of the current error is that precisely, we're able to assemble this kind of datasets, thanks to all the computational tools and big data that we have, you know, and this sort of, you know, pushes the state of art in that, you know, in the past, if you want to analyze a career history, what do you do, you have to go through the biographies and do it by hand, right. And, and so that basically limits the number of people, you can actually analyze, sometimes people analyze 30 people, sometimes people analyze 15 people, and these are all very famous selection of people. Whereas, for our case, not only we have much, much larger scale of data, but arguably, this people are also a little bit more now more than normal, like, similar to us is that of the, you know, immortals that usually people look at, you know, so So I think there are many benefits where this new approach is kind of taking us to a new level in thinking about what are the general patterns across these careers? And I think the initial question was rather self serving, I call that the hope question. So the idea is, you know, when do you do your best work? Is there a hope left, you know, after you produce your best work or are retired, you know,

scientifically speaking, you know, that, historically speaking, so that that was the initial work. So so but once we analyze all the three kinds of careers, we find something quite interesting. Is this Is that okay? When do you do your best work? It turns out across all this careers, artists, film directors and scientists, there's always this four to five year period in the career where you do your base work, second base work, third base work. In other words, all the work that matter in your career, are all tightly clustered together within a short period of time. So, and this is interesting, because also despite differences that across all these careers, this patterns always holds true for all artists and feel directors are scientists. Okay. And then what's interesting then is once we discover this, we can actually build a model. This is the period where we call Health Week, you know, this is the hot period for everybody, then we can actually build a model to fit to real careers machine learning approach to say, Okay, now let's learn a little bit about the properties of these houses across this careers. And that's where we have a couple of properties that will be hopefully useful for all the audience here. First, we find houses.

Jacob Morgan 15:34
I have a few questions, actually. Yeah, so first, okay, so you looked at film, you looked at art, you looked at science? I guess in a business context, for a lot of people who are listening to this, who are leaders or employees, it's probably much harder right to maybe try to identify that because they're not publishing things. It's not publicly available data. So is the stuff that you found isn't applicable to business professionals as well.

Dr. Wang 16:00
So it depends on how we think about this, I think in I think, in my view, I feel like these insights are very informative, you know, to my, you know, students as well, I part of reason is, I think later we'll talk about how I, the way I look at it is to think first and foremost, think about artists, film directors and scientists, as the proxy careers, prototypical careers that we can now analyze systematically, just like you said, when you look at a corporate, within a corporate, you know, the different kinds of careers they differ, but I think, you know, and it's difficult to analyze at this point, but these are the initial set of careers, we can we do have data to analyze. And then I think a lot of times what we find is that a lot of insights we extract they're also quite applicable to other domains. I think that's kind of later, as we keep going. I know we'll talk about Okay, so how do you create how sweet and and I think that's something to me, at least to my students, people find quite useful to think about how do you divide up your career so that maybe you are more likely to succeed? Yeah, so. Yeah, what you were saying? Yeah, going with, you know, so we, we discovered, it seems like everybody have hot streak, then we fit a model to the data to infer, you know, what are the properties of hot streak? So we can't we find a couple of properties that piqued my attention. First, we find hot streaks are rather ubiquitous. Most people like about 90% of people we analyze, oh, have a hot streak. Wow. A second, we find this usually unique. Most people have just one. Much, much fewer people have two people have three, exceedingly rare, extremely rare. Okay. So that's kind of interesting about like, you know, most people have a hot streak, but most people have just one. And second, we find that hot streak doesn't last forever, you know, most likely is last just four to five year period. And also this is here is a crucial insight where we find, you know, how streaks are in terms of where it occurs, we find that actually occurs randomly within the sequence of work you produce. In other words, it can be your very first work or very last work, or somewhere in the middle. Okay, interesting. So this is where you see it's going to be relevant to all the business leaders, in the sense that, you know, this actually contests or further informs a traditional wisdom, the traditional

wisdom of when do you do your best work? The wisdom goes like this, you do your best work around your mid career, somewhere 40 To 30 to 40 years period. Now, why? Because the reason seemed quite intuitive. You know, there's no four years old has ever won the Nobel Prize, because in the beginning, you're gonna learn and then as you get older, you know, there's other sort of responsibilities and also other health concerns that all the meet your ability to break through, right? So you'll always find this kind of the peak somewhere in the middle. And so that, to me, is a quite a pessimistic picture because it's telling us once you go over the peak, there's this depressing,

Jacob Morgan 19:26
it's a little depressing, hey,

Dr. Wang 19:29
of you making contribution, great contributions. Okay. And this is where once we have this hot streak results, we realize, aha, the reason you peak in the middle is not because you're Asian creativity are intertwined, is simply because you produce more in the middle. Think about your bias work as a deck of cards, okay? And then if your ace card is completely random, but if you're in the middle, you keep drawing a lot more from that devil deck of cards, you're more likely to draw that ace card during that period. Okay? So so what we have been able to look at is, if we get all your works, the sequence of works, you see the hot streak occurs, you guys will occur occurs completely randomly within that sequence of the word. Okay. So that then change the way I think about this question is because then it's tiring me, this decay we're looking at is not as depressing as it seems. Because per production, given that your producer work, your hit rate actually stays remarkably constant across your career. Okay. So this is where a lot of people call me Mr. Hopeful in some venues, where they are like, Oh, my God, that is telling me there is hope. Because, you know, if you keep producing what is decaying is not the quality of the work is the quality. So if you can keep up the quality, maybe your best work is yet to come. So that, to me is a very important message.

Jacob Morgan 21:10
What? So how do you classify a hot streak? So for example, I'm looking at myself or, you know, maybe other authors out there. So you know, the work that I do, I give speeches, I write books, I create a lot of content. So for me, what a hot streak, because it's not the same thing. Like I mean, I could write a bunch of books really quickly, it doesn't mean they're gonna do well. Similarly, you might publish a lot of things, it doesn't mean they get recognized, or like you said, for film directors, they might make a lot of movies, but they might not do well. So what is the criteria for a hot streak? Is it just how much you produce? Or is there some sort of like, impact metric that defines where the hot streak is?

Dr. Wang 21:50
Yeah, so here, the key here is specifically about the impact of the work, okay, in fact, we're actually fine during your house streak, you're actually not producing more than we would expect you to otherwise. Okay, it's really just what you produce during this period, seems to be substantially better than your produce outside of this period. Okay. And so here is really about the impact of the work for scientists that citations for the papers for artists, that's the option prizes. And for film directors, that's the IMDB ratings for the movies. So for Jackson Pollock, his house, specifically, you see the drape period, as well as the three period starts. That's where the house week begins, four or five years. For Vaughn gall is

specifically on a year of 1888 when he moved from Paris to South of France, that's where he produced all this famous paintings. One after another. So so so it's all about the impact of the work.

Jacob Morgan 23:03
Interesting. Okay. All right. So it's good to know that and you said 90% of the people have have hot streaks, which is great. Around a four to five year period. So I guess, some of the questions that a lot of people would have. One is how do you know if you're in a hot streak, or not? Because it's obviously you know, it's easier to look back after time has passed and say, Oh, here's how much movie My or how much money my movie brought? Or how many millions of copies my book sold? So how do you know? And can you identify if you are in a hot streak? would be the first question. And I have a bunch of follow ups after that.

Dr. Wang 23:42
Yep. So you know, I It's so interesting. Every time I do public speaking about this, there, there are different kinds of audience come to me. Did you know One type of audience will be your right, my hot streak sort of 1989 to 1991? And then that was it. That was my career. I was like, Okay, well, you know, good. Good to know. And, and there comes another type of audience comes on me. So sec. I think I'm in the middle. I think it started two years ago, I think, is right now. So in some ways, as I've been asked, you know, this question, I try to think about, like, why do we need to know the answer to this? Because we want to think about what should we do? And then and then it's almost doesn't matter. What's the case because what we should do is basically the same. Think about it because if you are in the hot streak, then no brainer, seize the moment, you know, produce, this is the period and it's not gonna last forever. You know, if you're suspecting then produce. If you're not in a hot streak, then yeah, then similar advice applies then remember House rakes rate stays constant per production. So the only way to guarantee will not have a house week is to stop producing altogether. That's the way I can guarantee you, you will not have a house free. And so if you want to think about how strict at least keep up the production, but but I think the crucial question remains, I think the so what we want to talk about, I think it was the first paper about this, and that that was a paper published in Nature. In 2018. When the paper was published, I actually wrote a op ed to Wall Street Journal. And because I, you know, while the paper the nature route is happy, in some ways, to me is also deeply unsatisfying, because we documented a very intriguing phenomena. But we did not have any explanations for why it happens. And to me, that is the essential questions. Because if we can understand what triggers how sweet that will allow us once a range of new questions, for example, how do we facilitate the onset of housework? You know, how do we create an environment to help people realize their potential? And how do we extend the house week when somebody has had it? And then how do we, for someone who has higher house week? Can we treat that as an indication of that person's potential, and help them realize their potential again? You know, I think these are all range of Yeah, fascinating questions that I didn't have the answer. So let's where? For many years, I've been hunting for the answer. And then that's why if you interviewed me, a year ago, two years ago, I wouldn't have but now I have the I have at least one answer. So I'm,

Jacob Morgan 26:51
no, I definitely want to unpack that. So you know, I'm people who listen to this show, know that I'm a big fan of like visuals and metaphors and stuff like that. And so, you know, I used to play a lot of video

games. And when I think of a hot streak, I think like a power up, right, you get like some sort of a power up and it lasts for a certain amount of time, and it makes you makes you bigger, it makes you stronger, but then the power up wears off, and you go kind of back to normal. And that's kind of the visual I get for the hot streak. But it also made me wonder if there's a relationship between this concept of hot streaks and being in a state of flow. For me, like a hot streak just seems like it's an extended, it's like a long flow state, like, you know, instead of being in a state of flow for a couple hours or something, it's like, you're in that mode for a year, is there a relationship between hot streaks and flow?

Dr. Wang 27:41
Ah, there might be I think, in some ways, it will be interesting to think about related phenomena, I think are related phenomena that people have discussed for at least the past 30 years, is to think about this idea of how streak in sports. Okay, well, so that's what people called how hand phenomena in basketball, for example, or if you have a worry of failed a short run extremely short live the basketball career. And so if you're like, have a, you know, make three, three pointers in a row, then you make the fourth one you feel like, you know, is going to go in, right? So, yes, where you're in the zone, right? It's

Jacob Morgan 28:24
like the NBA. I don't know if you remember this game NBA Jam. It was old, old video game. And after you make a couple of three pointers, the announcer goes he's on fire. And then you get like fire. Yes, yeah, you get like a power up and you make all your shots.

Dr. Wang 28:38
But this is, this is the area I want to clarify. Right. So within psychology, this is an area that's heavily debated. I don't think right now there's a steel answer. Whether or not there's how hand phenomenon? Because there are people also say this is a bias of small numbers. So it's illusion. So it's a false how some call this hot hand fallacy. And some called this how can the fallacy itself is a fallacy? So there's a lot of debate around this. I'm not taking part in that debate, right. But I think it's useful to think of draw analogy between this because the state of flow of how hands in basketball, that's a matter of a couple of minutes, right? So you can definitely think of flow in that case. If there is a flow in the scenario I talked about, there is a very long period of flow, right? We're talking about four to five year period. So is a substantial the long period of time where a lot of things can happen. I think that's what also makes the this mystery to why house recall occurs that and I can just sustain for this long, right? Because if you think about okay, I'm motivated All of a sudden by something, but it's hard to think about what can motivate you for five years straight, right sort of now never aware of. I can see people being motivated for a week, for example, right? Yeah.

Jacob Morgan 30:14
Alright, so let's get into some of those questions that you say because you asked a bunch of I think you were talking about like six questions. I was fascinated, and all of them. And you said, if we were to ask you a year or two, you wouldn't know but at least know, you know, now you know the answer to one of them. So

Dr. Wang 30:29

this is the question that's been haunting me for a long time, as you can imagine, it's like, what is AI? So interesting, but why it happens. And then before COVID, the summer before COVID, I was visiting Amsterdam. And then I was walking around the Van Gogh Museum. And I'm an art amateur, right? I don't know much about art. But I was walking around a museum because I know Bongo is one of my data points. And I know his house, we start at nada. And we know, you know, and that's the point. And that's where house week lasted for four or five year period. So I was walking around the museum, I'm just as an armature, I'm looking at those paintings. I feel like I can see something that's different for the paintings he did after 1888 or versus before. Okay, so that's where it hit me is that if I want to understand why how street hawkers, I got a look at the work they produce before and after house Rico curse, and see how, how they look. Right. And this is where you realize, wow, you know, we have so many artists who have so many paintings, you know, we then go ahead and collected all the paintings these artists produced. So we have in total of something like 800,000 paintings out of these artists, okay. And that's where we realize it's gonna take a while for us to go through. Okay, and this is where I want to illustrate why this area of research is particularly exciting. This is where if I were to have this data 10 years ago, I wouldn't know what to do. But now today, since thanks to machine learning, what we're able to do is basically repurpose the typical image recognition, deep neural network, and then train them on the paintings to ask this neural network to classify the paintings, okay? Once they classify the paintings with very high accuracy, what we did is then open up the hood of this neural network, and analyze what these deep neural network is seeing out of these paintings, okay, then we can actually systematically the deep neural network, they actually don't sleep, so you can actually apply them ever. And then I know, we can apply systematically to all the painting until we have a look at how this neural network you see in differently in terms of the paintings before and after a house trigger occurs. And then we can do the same for film directors, by analyzing the plots of the movies, and the costs information of each movies. And we can do similar things for scientists, by looking at a publications each paper, what are references cited in each paper. Okay, once we have all this machinery based on AI, build and look at, you know, millions of papers, paintings, and movies, we have one simple results that actually emerge, okay. So when we compare that line everybody up for when their house trigger occurs, we look at what the work published before the House week and after house week, what we find is that before the House week, people are systematically more likely to explore different styles or topics, okay, doing a lot of sampling of different kinds of things. And they're doing so more than they otherwise we would expect. Okay, when the hot streak occurs, we realize they're actually have become a lot more focused than what we would expect, trying to be exploitative on usually one or two styles or topics been very focused on what they work on. Okay. And, and this, so it's a no what we find is that this this exploration before, how strict and exploitation during how strict this transition from exploration to exploitation, that's the transition closely freezes, warehouse Rico curves. And now we also find that despite the differences of the three kinds careers we study, this exploration followed by exploitation is consistently the strategy that's associated with the onset of health risks. So,

Jacob Morgan 35:12
yeah, I mean, just thinking about the work that had to go into this. So I'm actually just curious how, how long did it take to and how big was the team like to figure this out? I mean, looking at millions of data points, and Art and Film, like, what, what was that process?

Dr. Wang 35:29

Yeah, so I mean, thankfully, you know, this is all thanks to my great team members and collaborators. The lead officer was, again, my PhD student, Lulu, who was the lead author on a first Nature paper. And then the second author, Nima, who is a, you know, who was at the time a research assistant professor in my center, he's an AI expert. So two of them really put their heads together, and really build this remarkable machinery. First, collect all this data. And second is to build all this neural network. To train a neural network, I apply them to analyze the data, and then open the hood of the neural network and analyze what the neural network is seeing, and then apply them to the house tricks. Yeah. So another year or two years to get on the stand, but but it's

Jacob Morgan 36:25
just a small handful of you was like, what, three, three of you, maybe four or five of you. So the

Dr. Wang 36:30
total team for the latest paper, this paper, who reports this finding, has five officers on it, and includes two other collaborators that we have, who's, you know, one is professor in my department. The other one is, professor at Penn State. So yeah, so it was a but it was a lot of work. But I think it's worth it. We're really having a lot of fun in this.

Jacob Morgan 36:59
So it's interesting that it's like exploration, exploration, and then it sounds like you find something that hits and then or is that what happens, like, something hits? And then you go all in into that? Or do they specialize without knowing that what they're specializing in is going to become? Big?

Dr. Wang 37:17
That's a that's a really good question. So I think there are a couple of things, we let me sort of talk about them a couple of data points that may be useful, right? One thing we were thinking is, so this exploration followed by exploitation, right? So if you think about exploitation, people will be like, Oh, that makes a lot of sense, right? Is, is the tweet period. Like that's the period you only just do drip, right? Or is that the Lord of rings for Peter Jackson? Right. So then there is one question is okay, maybe it's really just exploitation, the focus part is was important. Okay. Yeah. So then we identify people who are worried focused, but didn't have exploration beforehand. What do we see is that you're actually less likely to be associated with the house weak? Okay. Interesting. I know, we also see, okay, what if people just explore because that says the prior exploration, the sampling period may be useful? What are you just people who explore but didn't follow up with exploitation? Again, we see less likely to be associated with how three is really this combination of exploration followed by exploitation. That's the only combination that's consistent with history. Okay. And then so the question is, okay, then, can we then study what exactly you exploited your focus? In the end? Think about the characteristics among the things you explored? Okay. That's where we find something kind of counterintuitive. When we analyze that we find the stuff you're in the end focus on is not the most the last one you explored. Okay, it's less likely to be the last one explored, is also not the most popular one, among the things we explored. Okay. So so that seems suggests to me this idea that you're doing a bunch of sampling. And then you're, you have this deliberation phase, where you look at all the things you're sampled, and then pick one that worked for you. And then this is sort of your personal sort of work for you as a person and may not be the most popular one that everybody else like, and, and then that's where it works for you

when you explore. So I think this is where to me. I think the couple of aha moments, we're now thinking about this very simple finding once I find that much, you know the answer, right? Oh, yeah, that makes a lot of sense. But but but when I when I think more about this, I actually realize this actually being quite informative. Think about this. That's what this is telling me is that when you think about create successful careers, we always kind of think about what makes them successful. I keep using Jackson Pollock, we always think about the trade period. Okay, well, but what do you have? What that period alone is not? What makes them successful? What if, is also what they did before they become successful? You know, what if the secret for why somebody becomes somebody, is what we did when they were a nobody? Right? So so that's where I, to me, it was quite useful. In fact, if you like Peter Jackson, the years before, he made a lot of rains, he was doing unusually unusual variation of different kinds of movies, including horror comedies, I think all sampling seems to be arguably plausibly quite helpful in thinking about generating the breakthroughs. In the end.

Jacob Morgan 41:06
I wonder if it's something to do with finding or discovering your passion like, is the exploration phase, you know, kind of you, you're trying to figure out your passion and what you love, and then the exploitation is, once you've identified that passion, or what you love, you're kind of taking advantage of it? Or do you not think there's any relation there between those things?

Dr. Wang 41:26
I think, I hope is related to passion. You know, in our data, we don't have the data for sort of subjective feelings on the topic. And now is one of the limitations of the data despite, you know, the large amount of data we can assemble. Yeah, so I hope, you know, that's consistent with people's passion. And that's also helpful in thinking about what exactly in the end people focus on?

Jacob Morgan 41:58
Yeah, for me, what's really interesting is how how these people decided what to focus on, like, how do you know, because everyone's gonna eventually go through that process, right? If you go through the exploration, and you're kind of believing in this concept of hot streaks, you're going to go through exploration, and eventually, you're going to get to a point where you have to pick something to exploit. And it's kind of like, how do you pick that right thing? Do you know, you're picking the right thing? Like, how do you, you seem to me, like why are they picking these things?

Dr. Wang 42:27
That's really interesting, you know, I actually feel based on my experience, you know, I don't have systematic data. But all the anecdotal data I encountered actually feel people jump into exploitation too quickly. You know, you know, we think about, you know, all the stories of Tiger rules, play golf, two years old, you know, that's kind of what he specializes in. And you actually hear over and over, a lot of people jumped into exploitation without enough of prior exploration. And I also feel like society as a society, we have ordered a lot of different forces that actually run counter to this idea of exploration followed by exploitation. I'll give you an example. Right? If you see my science, which is a domain that I think, you know, in terms of science funding, you know, we have funding specifically designed for exploration, such as the Howard Hughes Medical Institute, where people are given $5 million dollars to say you go explore new things, okay. We also have funding specifically for exploitation, such as a

NASA career or work. So this is five years, you just work on this. But I don't I'm not aware of a funding that says, Here is five year period, but I want two years of exploration. And then three years of exploitation, that seems quite counterintuitive, if you think about a funding mechanism like that, right. So in many ways, actually is, you know, sort of the current system where we nurture talents, or we identify talents, you know, we actually have not had enough conversations about this idea of how do we think about what if the secret is neither exploration nor exploitation by itself, but the combination of exploration followed by exploitation, and so where if you just exploit without a prior exploration, then the simple focus without great new ideas may not be as productive, right. So but but on the other hand, is this kind of experimentation coupled with the implementation maybe is the combination that we need to generate ground breaking results?

Jacob Morgan 44:56
Did you also look at why hot streaks end? So why is it 40 Five years what happens after that time period? Is there any way to extend them? You know, can you get the power up to last a little bit longer?

Dr. Wang 45:09
Rivals? So yeah, no, is is a great question is an open question. I don't have an answer, unfortunately. And I hope. I hope we may have answers, or somebody else can help me find answer, but I might, we don't have we don't know. Right? Yeah,

Jacob Morgan 45:31
that would be an interesting thing to find. Um, so for a lot of people listening to this, you know, they're their employees and companies, they're their leaders, or they want to be leaders. And they're probably listening to this thinking like, Oh, my God, am I in a hot streak? How do I know? What do I do? How do I exploit? How do I explore? What sort of guidance or feedback or steps or action items do you think people should be taking? In their lives and in their careers, if they want to be able to become aware of hot streaks and maybe take advantage of them if they come up?

Dr. Wang 46:06
Yeah, I think to me, it to me one, one thing, I think a lot is this idea of patience. Yeah. So here is what I think is kind of my my own results is teaching myself is if you think about what we're saying is that you have this exploitation period. And that's kind of an easy period, because you're in the role, you know, you're getting the market reaction, you're doing great work, you're you're loving it. I think what's important is to think about exploration period, because that's the period that you're sampling, and you're running around trying different things. And you're seemingly going nowhere. Yeah. So to me, that's the period that people need to think about, how do you stay focused? How do you have the patience, of thinking about trying different things? Because that's the period, probably you don't have a lot of good feedback. Maybe that's the period you're running around. Like, you're you're going nowhere, nothing is working. But maybe that is the period that will make your house streak sing. Yeah. So to me that I think a lot in terms of people who are seemingly in a period like that, and then you know, you can call this perseverance you can call this you know, optimism. But to me, that's a period that's very important. Seems to me to generate new ideas, testing different hypothesis and try some different things that may work for you. Yeah. But also, that's a period that's difficult to stick to.

Jacob Morgan 48:00
Yeah, so it seems like the exploration and the curiosity is a very, very important thing for a lot of people to embrace if they want to have a hot streak, or even if they're in a hot streak. Is there a way so a lot of people I'm sure, who are watching or listening to this, who are in the business world are probably thinking, How do I know if I'm in a hot streak? Are there any, like, signs or signals or things that you can look out for in the business world to identify a hot streak?

Dr. Wang 48:27
So I think, you know, I think my my thinking house is mainly related to the impact of the work or the quality of the work, if you will. So I think depends on the profession. Sometimes you have market reactions, you know, if you are bad stellar, you know, if your author, you know, you put out a book and you see a bestseller, you know, that's an indication that maybe this is a period that, you know, this is working pretty well, maybe you should keep going, this is not a time to slow down. So, so that is sort of you can tap into a market reaction to think about the quality of the work, but some domains market reaction is not doesn't come that quickly. Like, you know, the, the drip paintings wasn't recognized by the time you know, so so a lot of times it takes time for people to recognize this as the masterpiece. So, you know, in that case, you know, so this different feedback timescale. Yeah, well, I think in science, it already you know, it also takes a long time for you to see which discovery you know, really has made an impact also depends on the nature of discovery. If the discovery is really a you know, they're sleeping beauties in science were a discovery whose importance are not recognized. For our extended period of time, and he'll often by researchers and other community, recognize them and receive His well deserving recognition.

Jacob Morgan 50:12
Well, we only have a couple minutes left, maybe we could just spend the last two, three minutes just talking about team effectiveness. You mentioned that earlier and team effectiveness and how some of the things either around hot streaks or science of science might be applicable for leaders out there who are thinking about how to build effective teams to create effective teams, can you share some of the things that you've learned around? What makes a team effective? And how to create them? Yeah,

Dr. Wang 50:37
so. So let me think about what are the things we can given the short, maybe the short time we have maybe one, let's actually build our house big idea. And then think about what kind of teams are optimized for innovation. And this also perfect complex tool, another paper we published in 2019 in nature. So so we actually look at in science, for example, you actually have a lot of papers are in collaboration with each other. Right? So why policies we tested is other collaboration patterns. That happens before and after house three coworkers. Okay. And and here's what do we find? We find that before how streak when you're doing the sampling, you're more likely to engage with small teams. Okay, interesting. People. Once hot streak occurs during the your focus period, you're more likely to engage with large teams, right. And this is what connects to a paper that we published 2019 was actually on the cover of nature, that we're where we find this worry is simple conclusion. That is, you know, across science and technology, we find that small to large teams are more likely to develop current way of thinking, but a small teams are more likely to disrupt the way of thinking with new ideas, opportunities, okay, so the idea of large teams are doing so more developmental work in excel at

solving problems, but small teams are the ones are more likely to come up with problems to solve. So that is also another very important pattern that I think leaders needs to really think about is this very simple, deceptively simple concept of team size is being very important factor in thinking about the nature of the work you produce, right. So to me, that is also being very useful in informing my own work, because I manage teams in a daily basis. So so sometimes I actually know, it makes me change my own practice, because in I'm more of a collaborative person, and then in the old times, I always think about, okay, so why not add another member to the team, you know, it may not may not help, but it doesn't hurt, right? But our research is showing, it actually depends on what kind of work you want it to do. You're the type of disruptive innovative work that's really trying to move the needle, you may actually want to shrink the team size at first. Because if you, you know, if you have a if you have more members than you need, then you lock the team into a large team inertia that reduced the disruptiveness of the work you produce. So this is something that and we show this very consistently across three large scale team settings, from science, to patenting to software development, and across all these different domains. And this is a this is like a hundreds of millions of data points. We see a worry consistent patterns.

Jacob Morgan 53:58
That's amazing. I mean, I think the work that you're doing is so cool. I'm so interested in it. Maybe before we wrap up, what are you working on now? What's going to be the next paper that you're publishing?

Dr. Wang 54:09
Hold next paper. Okay, um,

Jacob Morgan 54:12
the next topic that you're exploring couple

Dr. Wang 54:15
papers, a couple of topics. One of them is to think about failure, you know, and and I think this is something that in particular, have not received the proportional attention. And this is something that I think data is I despised because this is an area where

Jacob Morgan 54:34
lots of failures are very prone to

Dr. Wang 54:38
the survivorship bias, confirmation bias, etc. If we just rely on human intuition, and if we actually now have data across multiple domains are not just people who have succeeded, but also people who have failed of not just people who have succeeded, but also for these people before they succeed. What are the Failure histories that they tried all of this, all of these kinds of data services are now become available that allow us to systematically analyze people who succeed and fail. And I think that is sort of generating new size of insights. For me to think about failure, it'll be exciting relationship. Yeah, success. So yeah. Next time about failure.

Jacob Morgan 55:26
Oh, yeah, we're definitely gonna have to have you back. We didn't even get into talking a lot about the science of science stuff. I mean, this, this whole concept of hot streaks in the research is just so fascinating. Why don't you let people know where they can go to learn more about you maybe get some of your, your publications, anything that you want to mention for people to check out to connect with you or get access to your resources?

Dr. Wang 55:50
Yeah, sounds good. So this is the era of internet. So it's very easy to hunt me down. So just Google my name. Ashwin, Wang on Google, you will find my webpage right there. Or just a follow my web page patreon.com. And, you know, you will be able to see most of my all of my writings. And as well as my book, that's now actually freely available to download on my website. And obviously, you can order on Amazon, but I would recommend, just read the book first. If you like it, then you can order it. And or just read from my website. And yeah, follow me on Twitter is at fashion wall. Yeah.

Jacob Morgan 56:36
Very cool. Thank you so much for taking time out of your day. I really appreciate it. I learned so much. So thank you for being so gracious with your with your time and your insights.

Dr. Wang 56:45
Thank you so much for having me. It's a real pleasure to be

Jacob Morgan 56:49
calm. Thanks, everyone, for tuning in my guest again, Dustin long make sure to check out his site, his Twitter. Like he said he's pretty easy to find and I will see all of you next week. All right, we are all done. Let me push