Today, we have the opportunity to speak with Dr. Tan a graduate of AeU’s Industrial doctorate program. As a technopreneur and educator, Dr. Tan shared his passion for technopreneurism and big data science from engineering disciplines to analyzing financial markets. We sat down to discuss his upcoming participation at the AeU Orientation event on Jan 30th 2016. He shares with AeU his views on entrepreneurship and innovation.

Brief background

Dr. Tan started the AeU part-time Industrial doctorate program in 2013. His proposal defense was in Dec 2014 and Viva voce was in Oct 2015. He has two supervisors: Prof Dr. Merouane Lakehal and Mr. Scott Connor. His examiners include Prof Dr. Hank Pruden from Golden Gate University in San Francisco and Prof Dr. Belal E. Baaquie from National University of Singapore and Prof. Dato’ Dr. Sayed Mushtaq Hussain. Prior to this programme, Dr. Tan was chief executive for Oceana Ventures, an engineering services company. Before joining Oceana, he was VP of product development at YTL Communications where he led the device development and procurement, including chipset selection for 4G. Prior to that, he built his career primarily in the US with about 20 years in Silicon Valley, California and 5 years in the Midwest (where he started his career with AT&T Bell Laboratories as a telecommunications engineer). A veteran in the communications industry, Dr. Tan has more than 35 years of experience in the networking and telecommunications industry. He has held a variety of executive level positions in academic research, sales, marketing, business development and consulting in both startups and conglomerates. He has also experienced standards, regulatory, product and services development in the whole spectrum of the networking industry ranging from standards development, semiconductor, OEMs/ODMs and service provider. In his former roles as Chair of the wireless next generation committee of the IEEE
802.11 and Vice-Chair of 802.11n marketing of the Wi-Fi Alliance, Dr.Tan has pioneered several major initiatives in high speed wireless networking industry starting from his role with AT&T Bell laboratories. Prior to his current role as chief executive of Oceana Ventures, Dr.Tan was the VP of YTL Communications (4G operator) where he was responsible for product development and services for the greenfield operator. He also held executive level positions in Philips Semiconductor, GCT Semiconductor and 3Com before YTL.

A frequent panelist and speaker, Dr.Tan is also the author of several books and published in technical and marketing journals. He will be on the panel of a global IEEE conference in May speaking on 5G Landscape. Dr.Tan is still active in the broadband networking industry, having pioneered various ATM development efforts worldwide. He was the VP of The ATM Forum with responsibilities in technology and market development prior to moving into the broadband wireless space. For his global efforts in broadband networking, Dr.Tan was listed in the International Who’s Who of Professionals in 1998. A technopreneur at heart, Dr.Tan has founded several startups, having been through the product development life cycles multiple times for MNCs in networking equipment and the semiconductor industry.

**Congratulations to your recent nomination as a Fellow at the recent NETAPPS 2015 conference. What did you learn from this experience?**

Firstly, I was honored to be selected as a Fellow for this prestigious event. The forum allows Internet researchers from Malaysian universities to attend and participate in the NETAPPS2015 conference. I believe that as an innovation-promotion event, NETAPPS2015 aims to promote greater engagement from Malaysian researchers in the work of Internet Engineering Task Force (IETF) and the Internet Research Task Force (IRTF) by motivating greater participation in the
technical aspects of Internet technology research and development, specifically in producing RFCs/Internet Drafts, as well as writing high-quality, top-rated technical journal articles on Internet technology from among Internet researchers in the Asia Pacific region. I hope more of such events will help spur the level of innovation and entrepreneurism in Malaysia.

While we’re on the subject of entrepreneurship and innovation, how do you view entrepreneurship and innovation in the context of our digital economy today?

For as long as I can remember, entrepreneurship has always been imbued in my philosophy as early as my teens. To me, entrepreneurship is an embodiment of who you really are rather than an artificial façade built on the myths around Steve Jobs and Mark Zuckerberg. As a founder of several startups and mentor, I believe the key to successful entrepreneurship rests on several characteristics of the individual key amongst which is the vision for spotting opportunities where others haven’t.

The second trait lies in the confidence which is substantiated by passion, desire and preparation. Innovation, on the other hand is centered on creating new ideas and is very much process focused. Innovation is often used by business as a tool to increase productivity or to create a new product to gain competitive advantage. As far as differences go, Innovation creates changes, but this can be outside the realm of entrepreneurship. For example, one could innovate positively and cause a positive change to society and still have nothing to do with starting or growing a business (entrepreneurship). Perhaps the quote from Delia Smith (Greenfield Ventures) sums up the differences succinctly, “If innovation is the creation of new capacities for wealth creation, entrepreneurship is the exploitation of these capacities.”

As far as my experience tells me, both entrepreneurship and innovation go hand in hand in furthering the success of the entrepreneur. Throughout my 30 years of being in private and public organizations, I have found that starting a business or declaring myself an entrepreneur is easy, but it’s not so easy to convince investors, your team and customers that you are that special one to fund and follow. If you don’t consistently display the right entrepreneur mindset traits, people won’t follow and business success will likely elude you. And don’t even think you can fake the important attributes once the going gets tough.

As an entrepreneur, I am constantly aware of my strengths and weaknesses. While it’s generally true that one can leverage ones’ strength and hire for weakness, I found the latter to be less enjoyable. Being the competitor that I am, it has taken me awhile to accept that I cannot be good in every aspect of
the entrepreneurial journey. In particular, the exit strategies for businesses seem particularly challenging. I have had numerous experiences, which I have learned tremendously from. One such instance was the IPO process for a semiconductor company I was involved in for four years. Even though we had planned and prepared well, the circumstances did not prevail to allow the IPO process to happen. Another experience with a smaller startup has contributed to my awareness that this is an aspect of the journey which I need most help in.

As an academic trained in electrical engineering and software engineer, I have strong analytic skills. As a founder of several startups, I have developed a strong intuition in terms of how to start and run a technology business and I find that in this time of great transformation, a lot is up for grabs. Everything from mobility to wireless communications to consumers’ relationships with technology is being disrupted. Predictive analytics, cloud computing, big data sciences and next generation wireless communications will be key enablers for the next generation of entrepreneurs to capitalize on.

You were in the top three winners at the London hedge fund competition in 2014 which inspired you to pursue an Industrial doctorate with emphasis in Finance. How did you win it and what have you done since?

The hedge fund competition was my first attempt at applying my quantitative skills combined with Bayesian analysis for Big Data in the finance industry. I was representing AeU and competed against others like University College London. Having little to no experience in the finance industry, I relied primarily on my quantitative skills and Bayesian knowledge to build the portfolio of companies which led to the top selection in the final rounds. Looking back it was an eye opening experience for me because I developed a methodology of portfolio selection which enabled the fund to maintain its high net return in both bullish and bearish markets. Since then I have further refined the technique for robustness and risk mitigation for optimum capital...
allocation. Part of this work was presented last year and this year at recent IEEE conference. The bulk of the industrial doctorate research stems from tracking the companies in the S&P 500 with results averaging net return of almost 65%.

You have a Bachelor's degree in Electrical and Computer engineering and a Master's in Software engineering (Summa Cum Laude). You were accepted into Stanford's engineering program for PhD. Why did you decide to pursue an industrial doctorate with emphasis on Finance at AeU?

It all boils down to being where I am needed most in order to run the business successfully. Pursuing a PhD at Stanford requires more time commitment in California (of which I already spent a good part of my life). My business revolves around the electronics industry which requires me to travel mainly in North Asia (Taiwan, S. Korea, Japan and China) and since AeU provided me the flexibility in schedule, I was able to continue working while pursuing my doctorate. Why Finance? After winning the hedge fund competition in London, I was psyched and further encouraged by the potential of applying high probability techniques to stock selection. On top of the schedule flexibility, I was able to work with the top practitioners in the finance industry and engage them as my supervisors with AeU's blessings. For example, one of my supervisors was a former market maker at the Chicago Board of Options Exchange (CBOE) for 30 years and he was able to impart the knowledge of a market maker to my studies. The other supervisor is also a Professor of Business (and Fulbright scholar) at a US university and was on assignment as an advisor to bank Negara at that time. Hence, it was a very easy decision for me when given access to such well accomplished individuals who are at the top of their field to be my supervisors. Having an analytical background such as simulation, network queueing and graph theories, I was inspired by the tremendous advances in the physical sciences, and many of them tried to apply quantitative methods and especially probabilistic methods to problems in finance.
You spent over 2 decades of your life in Silicon Valley, California. What was your key learning there?

Although Silicon Valley is no longer the center of tech manufacturing, it still creates some of the greatest tech companies and technology. To me, the Valley is an area where we have a high concentration of people working in the same industry, moving fast, taking risks, and innovating. However the ecosystem it feeds upon is fairly global. When I first started out, I was literally learning the nuts and bolts of product design, development, management and retirement of high tech products from some of the best OEMs in the world. Due to my experience in the Asia Pacific, I was often the one to take the design from US companies and shop around for the best outsourcing partner to build the products. As we all know, the electronics manufacturing mecca has always been in North Asia (Taiwan, Japan, Korea, and China) and that’s where I often end up as part my completing the product design cycle. Interestingly the talent in the valley is not home grown, but rather globally. Silicon Valley has talent, but they don’t grow talent. The area is wonderfully diverse. Finally, as much as Silicon Valley glorifies failure, we all know that failure is awful. It doesn’t feel awesome at all. No one should ever set out to fail. The key, really, shouldn’t be to embrace failure, but to embrace resilience and the ability to bounce back. And the goal shouldn’t be to glorify mistakes and errors and catastrophes, but to cultivate the ability to adapt and learn from them.

Your first experience with big data problems was with AT&T Bell Laboratories, New Jersey. Back then it wasn’t even called Big Data but your job involved processing millions of data involving voice and data networks. How has that helped you in your research?

Most networks today, especially 4G and now emerging 5G networks are using big data and network analytics to better understand its customers’ network experience and thereby improve on that. Back then, the tools available were not mature enough to gain insights from the data. I had to rely primarily on simulation techniques and analyze using queueing and graph theories to understand the nature of the voice and data units. On a typical day, the major networks can measure at least 2 billion quality checkpoints from its wireless network. In a typical hour, it’s taking about 40 billion network quality data measurements across their wired and wireless networks. With this underlying background, I was able to develop technologies that use sophisticated analytics to make sense of this massive volume of financial data dating back 30 - 50 years of the US financial markets. This effort has cut down the analysis work from my research by half, allowing me to focus on other key areas of research.
Tell us about how you applied your engineering discipline to the world of finance?

The finance industry needs people who possess deep mathematical modeling skills and computational expertise. The mathematics used in finance ranges from basic mathematics, such as numerical analysis, calculus, and statistics to more advanced ones, stochastic processes and stochastic differential equations, non-linear optimization etc. The areas I use the most in practice are numerical analysis and statistics. These topics are well covered in engineering courses. By utilizing mathematical tools and probabilistic reasoning such as Bayesian analysis, one can develop a methodology for data mining and manipulation (using appropriate tools) and applying the engineering discipline towards the entire process. The rest of it involves statistical analysis for verification and validation. Ultimately the objectives of applying skills from the engineering domain are to maintain consistency and streamlining the predictive power of data analytics.

Your research generated two papers that were accepted by IEEE journal, a high impact ISI journal with strong positive reviews. We are very proud of you. What advice can you provide to future researchers on getting their papers accepted in high impact ISI journals?

Quite simply - never give up! We live in a society where instant-fix has become the norm. When we have a problem we want an instant solution. This is often carried into the research industry. Getting a paper or journal accepted by reputable societies like IEEE, ACM, Springer etc... is always a good start due to the quality of their peer review process. The mechanics of submission are well known. The journals which are indexed by Science Citation Index tend to be the most trusted one. Beginners can even go for conference proceedings indexed in scopus. As a guideline, first confirm registration to Thomson Reuters, IBBS, ISS and ranking. Match the scope of the journal with the paper; review the impact factor (5 years), total issues per year etc. to get a sense of the importance and relevance. Unfortunately, there is no silver bullet for this aspect of research if you want to pursue it earnestly. Just go in with lots of patience and treat each failure as an opportunity to succeed. With the right mindset, your paper will eventually be accepted.
Your research is heavily inclined towards using Bayesian methodology to analysis of volatility in financial networks/systems. How effective has that been towards the actual implementation of your trading system so far?

It is widely known that any successful trading strategy hinges on 3 Ms: Mind, Method and Money. While the mechanics of the method and money management are quite easily quantified in books and research literature, the mind management or behavioral psychology aspect of successful trading is pretty much as art. In this respect, Bayesian analysis when applied correctly provides a mechanical and more manageable way to overcome traders’ psychological biases. The volatility expressed in the financial markets refers to the amount of uncertainty or risk about the size of changes in a security’s value. A higher volatility means that a security’s value can potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that a security’s value does not fluctuate dramatically, but changes in value at a steady pace over a period of time. The use of Bayesian probabilities coupled with historical analysis and contextual information gathered from current conditions form the crux of the research. This method is gaining acceptance amongst a growing base of hedge funds today. Thus far, this system as reported in the published papers has generated a compounded annual growth rate (CAGR) of 22%.

The literature on finance for Bayesian methods have been applied to portfolio optimization strategies thus far. You have chosen to apply the technique towards forecasting volatility during earnings season.

In a nutshell, Bayesian methodology or statistics is the field of statistics in which the evidence about the true state of the world is expressed in terms of degrees of belief or, more specifically, Bayesian probabilities. Bayesian analysis is distinguished from classical statistics by the concept of inverse probability: some information about past events is used to predict future events. The differences between Bayesian and classical statistics make Bayesian methods especially appropriate for finance applications. Bayesian methods are especially appropriate for applications where subjectivity may lead researchers to inadvertently misrepresent findings or to be influenced by their own preconceived notions. The core principle of the research is on the analysis of an option’s value (which is heavily influenced by volatility during earnings season). The valuation of options and many other derivative instruments requires an estimation of ex ante or forward looking volatility. Fundamentally, the research adopts a Bayesian approach to estimate stock price volatility. The results find that overall Bayesian volatility estimates more closely approximate the implied volatility of stocks derived from traded call and put options prices compared to historical volatility estimates sourced from standard options chain. This coupled with the use of simulation-based estimation and predictions via Markov Chain Monte Carlo (MCMC) algorithms provide a robust and accurate risk reward system. The evidence suggests the use of the Bayesian approach to estimate volatility can provide a more accurate measure of ex-ante stock price volatility and will be useful in the pricing of derivative securities where the implied stock price volatility cannot be observed. Knowing this information provides a
larger margin of safety and a higher probability of success when trading the volatility crush that follows an earnings announcement in the security's underlying options.

Before developing this profitable system, you led a luminous career in the 4G telecommunication industry as VP of telco and also Chairman of various IEEE committees responsible for development of next generation wireless standards. Even before that, you were the VP of Global ATM Forum championing the cause for broadband networking arena. Your strong understanding of the supply chain in high tech industry has also helped shaped next generation products globally. How have these leadership roles in the technology space shaped your current thinking and are you still active in the next generation wireless industry?

For one thing the high tech industry is highly dynamic and equally volatile. Demand uncertainty represents one of the major problems in the high tech industry today. The high tech supply chain faces some unique challenge. In addition to the issues of product recalls, geographic dispersions and tight margins that mandate a lean operating model, high tech companies need to grapple with shrinking product life cycles, emerging markets and the supply chain visibility gap. In essence, OEMs and ODMs need highly adaptive, “sense and respond” supply chains in which demand signals are synchronized across all parties in the supply-production-delivery ecosystem from basic semiconductor to OTA software delivery mechanisms. This understanding has helped organizations I work in save millions in terms of product life cycle wastage and demand prediction.

Final question: How will the fruits of your Industrial doctorate help bridge the gap between industry and academia?

I have already started enhancing the methodology and expanding it to larger and more diverse markets. From my experience of fundraising in Silicon Valley, I plan to embark on raising some seed funding to move this project to the next level. I am also a strong believer in nurturing other researchers who are willing to go the distance to build innovative products and services. This is part of holistic nature of technopreneurship – giving back towards building next generation of technopreneur.