IIT Madras Technology Summit

About 250 people gathered on Saturday September 8, 2018 in Santa Clara at the ServiceNow Offices to listen to, learn from and be inspired by some of the leading experts in AI/ML and Data Sciences with deep dives in how AI/ML would impact the Smart Manufacturing, FinTech and Smart Transportation domains.

"AI is Empowerment: How it could shape this world!"
The summit started off on a high note with an opening keynote address by Joseph Sirosh (Microsoft) followed by an engaging fireside chat with Krishna Bharat (Founder of Google News). Joseph was amazing - articulate, high energy, and engaging. The talk was quite interactive and compelling. Joseph used video-based storytelling of AI applications in preventive healthcare. He opened the session with 'AI meets AI' on how **A**rtificial **I**ntelligence is being used for **A**rtificial **I**nsemination in cows and how AI based gait analysis in the cloud improved their chances of reproduction and boosted the farmers' milk production. Another example - Remote patient monitoring use case was very touching. Joseph also demonstrated a prosthetics Arm and Cloud based object recognition as a true boon to those in need of smart prosthetics. This was followed by a series of exchanges between Krishna and Joseph on the positives and negatives about AI as it was being applied in many fields of commerce and academia. He also addressed several questions from the audience on the relevance of AI on topics including corruption and black money in India. Overall, this was a highly engaging keynote address with excellent audience participation and appreciation.

IIT Madras: "Research collaboration with Industry Globally"
Ashok Krishna, IITM 1974 Alum, retired VP from Chevron, moderated this session and shared his own positive R&D collaboration with IIT Kanpur and IIT Madras almost a decade ago.

Mahesh Panchagnula, IITM Professor of Applied Mechanics, and the new Dean of International and Alumni Relations opened by stating that there has been a steady growth in Industry sponsored projects at IITM, approaching $20MM/yr. He described activities such as consulting, licensing IP, and Faculty/student start-ups incubated at the IIT Madras Incubation Cell (IITMIC). He stressed the ease of doing business with IITM (projects can launch in ~3 weeks). Further, he reviewed four ways to sponsoring projects: direct R&D collaboration, VC investment in IITMIC Startups, Corporate Social Responsibility (CSR) contributions focused on Research outcomes, and establishing Chair Professorships in Academic Departments.

Om Nalamasu, CTO of Applied Materials, shared their success story with R&D collaboration in India. He prefaced his remarks by insisting that AI can potentially improve yield by 30% and supply chain by 50%, in the semiconductor industry. They set up their Corporate presence in India in 2002, and now have over 2500 employees with investments of $10 million. Their engagement with IITM was initiated in March 2018, with a focus on AI/ ML and they are just beginning to ramp up their research collaboration activities with Faculty.

Eshwar Belani, Partner at Symphony AI, talked about a new VC firm founded by Romesh & Sunil Wadhwani, with interests in Healthcare, Retail and Industrial applications. They have funded two startups at IITMIC, Krystal AI and Exacto, whose founders are collaborating with IITM Faculty as they build out their product portfolio.

Finally, Vijendran Venkoparao of Robert Bosch in Bangalore shared an example of a CSR-like long term grant they have provided to IITM, focused on Data Sciences and AI. They have had a similar engagement with IISc., Bangalore in Cyber systems. Their goal at IITM is long-term research collaboration, talent acquisition, and they will manage their investment with a governance board focused on planned outcomes.

"FinTech: Fact, Fiction and Future!"

The FinTech panel was moderated by Srinivasan Ramaswamy (JP Morgan Chase), an IITM Alum. It included a couple of Faculty members and a great mix of Industry Experts from a broad range of areas within Financial Services, who engaged in a lively discussion about a wide range of topics.

Panelists included IITM Profs. Nandan Sudarsanam and Rahul Marathe, FinTech Investors Anju Patwardhan (CreditEase) and Schwark Satyavolu (Trinity Ventures), Entrepreneur Arvind Parthasarathi (Founder of Cyence, recently acquired by Guidewire), as well as Senior Executives from Financial Institutions Krishna Bhagavatula (Chase) and Suhas Yerra (AIG).

The discussion covered a lot of ground, ranging from IITM Research work into Financial Health estimation in less data rich economies, data aggregation technologies and privacy concerns, the acquisition and use of non-traditional data in pricing actuarial risk including cyber risk, use of AI and ML in scoring and underwriting credit risk in banking, the rapid evolution of payment technologies, developments in High Frequency Trading and its economic benefits, as well as the merits/ risks from the recent trend towards Robo-investing. This session was very well attended with excellent audience participation that continued during the lunch hour!

"Can AI make Manufacturing great again?"

This panel was moderated by Prasad Akella, IITM Alum, CEO of Drishti, and had a good mix of IITM Faculty and Industry Experts – both large-cap and start-ups – and a technology research institute. Profs. Ramesh Babu (Head of Mechanical Engineering Department) and Raghu Rengaswamy (Chemical Engineering/AI) represented IITM Faculty. Dr. Om Nalamasu, CTO, Applied Materials, and Peter Marcotullio, VP, SRI International, provided industry perspectives. Prasad painted a panoramic picture of how historically manufacturing has been pivotal in national and global economies through the present-day influence of AI technologies. He also connected the dots on recent developments on the "Made in India" initiative and the role IITM could play in ideating and collaborating on Smart Manufacturing with its assets - Faculty, students and facilities. Prof. Ramesh described the role of IITM's Advanced Manufacturing Technology Development Center (AMTDC) and the ongoing projects at the intersection of manufacturing and AI & related technologies – Process Automation, Smart Sensor Development, using AI to compensate for errors in machine tools, etc. Prof. Ramesh also highlighted the areas that AMTDC is positioned to collaborate with industry – Robotics/Automation, AR/VR, Smart HMIs, etc. Prof. Raghu provided several manufacturing use cases of Machine Learning – Predictive Analytics, Reliability & Cause-Effect modeling, Early warning signals on the shop floor and Condition Monitoring of Equipment/Valve/Sensor data. Om Nalamasu provided a wide-ranging view of AI's global inflection effect on semiconductor manufacturing and Industry 4.0. He touched on Applied Materials' footprint in India and the engagement with IITM – a Center of Excellence to collaborate on AI/ML in semiconductor Fab, Representational neural networks, and Machine Learning for combined time-series data and images. He called out specific Faculty members in current engagements – Prof. Ravindran (ML algorithms to model semi-manufacturing) and Prof. Marathe (statistical models for wafer defect data). Peter Marcotullio described SRI's experiences in commercializing AI technologies and provided examples of SRI Innovations, Research areas and recent AI Ventures. Prasad wrapped up the discussion by pointing out that IITM – with its talented Faculty & students, and facilities – is ready to form partnerships and execute on solving challenging problems in AI and Manufacturing.

"How can sensors and hardware enable the vision of AI in Manufacturing?"

The second of the two panels to explore the broader theme of the intersection of AI and Manufacturing, kicked off right after lunch. Dr. Raji Baskaran, Director, Saffron Group, Intel as the panel moderator, provided the introductory remarks by posing the question - what happens when the world of bits & bytes (representing AI/ML) collides with the world of atoms & molecules (representing the physical manufacturing processes). Prof. Barbara Linke (UC Davis), provided an overview of her research interests in sustainable and energy efficient manufacturing. She presented an interesting perspective on how the size of data scales with the type of decisions it is used for. She provided an example of her work in manual process control, by looking at data on worker influence & attention, that could potentially improve worker training in the future. She also provided examples of how data could be leveraged to enable sustainable manufacturing in the future. This was followed by a presentation by Dr. S.Subbiah (Ansys) who leads their fluid dynamics simulation product line. He gave an interesting overview of the work that Ansys is doing in digital simulations; how that enables the new concept of the Digital Twin and its uses in predictive maintenance & asset management optimization. Prof. MSR Rao (IITM), followed next and gave a presentation in lieu of Prof. Sathyan Subbiah. Prof. MSR Rao presented Prof. Sathyan's work in the areas of Sensors, CAE Modeling and Digital Twins and how they can be leveraged for Smart Manufacturing (specifically in the grinding process). Prof. Rahul Marathe (IITM) talked about his research work focusing on the tools & techniques he has used in modeling /simulation work across a wide variety of domains like manufacturing, logistics, govt agencies and retail. He also talked about his successful industry consulting work and executive education (on topics ranging from manufacturing management, optimization/analytics) with companies like AMAT, IBM, DFMSim, Visteon etc. Finally, Arun Santhebennur, (PetaSense) provided a startup perspective on where IOT and AI are headed. He described his company as a Fitbit for industrial machinery, providing an end-to-end system for asset reliability and optimization. Following this was an engaging exchange between the audience, panel on the topics presented above. Overall, the panel discussion was appreciated by everyone present including IITM Faculty on where the technology is headed.

"The future of Urban Transportation in India!"

Muthu Muthusrinivasan of Google (Uber and Bell Labs) kicked off this session with a review of technological evolution in this sector, from the horse-drawn buggies of the late 1800s to the advent of the Ford assembly line to the current push for Autonomous Vehicles (AVs). Rob Schwiers of Chevron kicked off the session by reviewing global oil & gas demand: ~100 MMbbls/day, of which 60% goes to transportation (21-24%of gasoline and diesel each to personal vehicles and heavy-duty trucks, and 13% to planes, ships and railroads). Future growth is predominantly in Asia (China and India). Oil demand expected to be flat over the next couple of decades as Vehicles Miles Travelled (VMT) growth is offset by fuel efficiency and renewables. AVs expected to increase VMTs but not sure of the impact on fuel demand. Prof. Gitakrishnan described the IITM Center of Excellence for Urban Transportation, with 11 years of experience in this area. They have a state-of-the-art Intelligent Transportation Systems Lab, possibly one of a kind in India. Their work has included GPS-based data collection from public buses; congestion studies using video cameras and wireless; inductive loop detection, video image processing, modeling & analysis, traffic simulations, etc. Nandu Ramani described the explosive growth of ridesharing in India, and Uber's plans for the future, with India being a key country. T. R. Ramachandran of Velodyne described five levels of autonomy and stated that AVs are already here. Key drivers are safety, efficiency, commute times, cost (ride sharing will breakeven with personal car ownership by 2027), reduced emissions, and mobility for seniors/disabled. While drivers may lose their jobs, there will be new job creation in modeling, fleet operations, mobility services. LiDAR (same as RADAR but uses light rays instead of radio waves) is a game changer for AVs.

"AI - Hype vs Reality!"

This session was moderated by Anand Rajaraman (Rocketship VC) and he was engaging Peter Norvig (Google) in an extensive fireside chat. Anand and Peter are deep minds and there was a deep fireside chat as a result. The session started with Anand probing Peter's history in AI and tracking his career and trajectory across Academia, Industrial Research, Companies and of course as an Educator. The discussion covered a wide range of topics in AI - ranging from Explainability of the Models to the Developer and the End User (and how lack of explainability is a challenge)!

The conversation continued to deeper questions such as:

Is Deep Learning the path to general purpose machine intelligence or will new tools need to be invented? Peter gave an insightful answer: "The term Deep Learning is a great marketing term. We will keep the term but the actual techniques will evolve over time." Then, the conversation went even deeper: Will machine learning lead to conscious machines? Peter answered that we will know the machine is conscious when we ask a question and it replies "That's the wrong question!."

IIT Madras - "Quest for Eminence"

The Closing Session was a series of presentations by Director Ramamurthi, Prof. Indumathi, Mr. Rao and Dean Nagarajan sharing the various initiatives IIT Madras has been engaged with that showcase enhanced research capabilities through the establishment of several multi-disciplinary Research Centers, increased collaborations with Industry Globally, the implementation of a robust ecosystem of Innovation & Entrepreneurship, as well as extensive engagement with Alumni for fundraising and Internationalization of IIT Madras - all leading to fulfilling the "Quest for Eminence" as manifested by improved global academic rankings!

This event was organized, as a follow-on to a successful inaugural Summit in June 2017, by the IIT Madras Alumni Association and the IIT Madras Foundation that brought together 12 IITM Faculty along with 24 Industry Experts (many IIT Madras Alumni) in various domains from all over the US to showcase the Research capabilities of IIT Madras Faculty and their existing collaborations with US Industry to further broaden and deepen these relationships through engagement with IITM Alumni in the US for IITM's benefit.

While the event was a grand success and we may have exceeded the expectations of some, we also learned a lot. We need to build on this momentum, and take this to the next level in the coming years. We look forward to your feedback and active engagement on how you can help nurture the Institute and support its vision and continue propelling IIT Madras to achieve its "Quest for Eminence"!