Point of View with Dharmendra Modha

Dharmendra Modha is one of the top minds in technology with potential to change the world, according to IEEE, the world's largest technical professional association. And he's a UC San Diego graduate. He received his Ph.D. at the Jacobs School of Engineering in 1995 and is now manager of Cognitive Computing at IBM's Almaden Research Center and a Master Inventor. Over the last two decades, he's founded two start-up companies, been issued 26 U.S. patents and has authored over 40 publications in international journals and conferences. Now he and his team are working to design a cutting-edge computer that will have the brain's abilities for sensation, perception, action, interaction and cognition.

1. Why did you choose to attend UC San Diego's Jacobs School of Engineering?

Modha: My B. Tech. thesis at the Indian Institute of Technology, Bombay was on optical computing and UC San Diego has one of the best optical signal processing groups in the world. At UC San Diego, through interactions with various professors—most important, Jeffrey Rabin and Ramesh Rao—I uncovered a natural love for mathematics and information theory which I did not even know lay within me.

2. How did your time at UC San Diego contribute to your career and life success?

Modha: At UC San Diego, with the help of my mentors, I was able to craft a custom and interdisciplinary curriculum that spanned electrical and computer engineering, computer science, applied and pure mathematics, econometrics, neural networks, statistics and probability theory, control systems and robotics, as well as venture capital and entrepreneurship (via UCSD Connect). Every quarter, I used to anxiously await the catalog of courses and scour through it to decide the next set of courses to undertake. UC San Diego offered a wealth of

opportunities to learn, grow and shape my future, and presented no walls to impede my curiosity. Most important, the professors always took the time for a discussion.

3. Who have been the most influential people in your life?

Modha: I am immensely grateful to my teachers, coaches, mentors and friends who have played key roles at defining moments of my life. The people who influenced me early in life in Mumbai, India include my maternal grandfather, Ladharam Dave, Taru Ben, Kirit Damani and Mayur Kapani. At UC San Diego, Elias Masry and Robert Hecht-Nielsen had a tremendous impact on me. And at IBM, I am grateful to Mark Dean, Jai Menon, Stuart Parkin and Norm Pass. In addition, I am indebted to my yoga teachers and time-management/financial coaches. Together these people have helped me define, pursue and achieve goals along various dimensions of life.

4. What sparked your interest in engineering computing systems?

Modha: Neuroscience has experienced a veritable revolution furnishing a tremendous amount of quantitative data about the structure and dynamics of the brain. At the same time, supercomputers with exponentially increasing computation, communication and memory capacities are becoming available. As I became aware of the possibilities engendered by a convergence of these two trends, I realized that the time is now ripe for a bottom-up approach to understanding how the mind arises from the brain. As a first step in this quest, at IBM, we have recently built a near-real-time mammalian scale simulator (C2) that can integrate—in a single computational platform—the wealth of neuroscience. C2 is akin to a linear accelerator, an electron microscope, and is kind of a wind-tunnel for the mind.

5. How will your current project to design a computer similar to the human

brain change the everyday computing experience?

Modha: While we have algorithms and computers to deal with structured data (for example, age, salary, etc.) and semi-structured data (for example, text and web pages), no mechanisms exist that parallel the brain's uncanny ability to act in a context-dependent fashion while integrating ambiguous information across different senses (for example, sight, hearing, touch, taste, and smell) and coordinating multiple motor modalities. Success of cognitive computing will allow us to man and mine the boundary between digital and physical worlds where raw sensory information abounds. Imagine, for example, instrumenting the world's oceans with temperature, pressure, wave height, humidity and turbidity sensors, and imagine streaming this information in real-time to a cognitive computer that may be able to detect spatiotemporal correlations, much like we can pick out a face in a crowd. We can profoundly transform the productivity and security of the society.

6. How does it feel to be recognized as one of the top minds in technology with potential to change the world?

Modha: I feel a profound sense of gratitude. I want to seize this moment to truly make meaningful positive forward progress on the problem of discovering, demonstrating and delivering the algorithm(s) of the brain given the obvious time and money constraints. Technology is simply a means, and not the end. My real goal is to create constructive change as it affects revenue and costs of the businesses and health, happiness and harmony of the people.

Fun Faves

Favorite UC San Diego memory: Sitting in a class called "How to Win a Nobel Prize"

Favorite place on the UC San Diego campus: Ocean View Terrace

Favorite place on Earth: Marine Drive in Mumbai

Favorite food: Fine vegan cuisine

Favorite hobby: Investing

Favorite gadget you can't live without: Paper and pencil

Favorite words to live by:
God grant me the serenity
To accept the things I cannot change;
Courage to change the things I can;
And wisdom to know the difference.