



# “Creating a Brain out of a Brain From mind-boggling to mental conditioning”

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Mind conditioning is like the Rate Determining Step of a reaction. The most time taking. But, unavoidable and essential. Well, I'm an engineer so I make the above statement through my experiments in permutations and combinations of circumstances. To be really honest, I was sceptical about studying in IIT, considering a failed attempt in joining it for bachelors, despite the efforts, owing to technical glitches, to be able to match up, to be able to survive the pressure. But, one year later, here I am writing this article, as an IITian. It definitely is a pressure cooker, but for all good reasons. I think that is what IIT does to you, it induces performance, it will grill you until you push your limits until you put your best foot forward. Till last semester as an M.Tech, in AI, getting back to studying after corporate life and trying to cope up my health and ongoing competition with the changed cuisine and climate, I thought surviving here would be a mammoth task. It still is. But, the mindset has changed. I've started to enjoy the pressure. I tried to take one step at a time, slowly and consistently.

I read it somewhere, that consider life as an hourglass, the sand doesn't go all together down, it goes some particles at a time, the decision of which particles would go down depends on either destiny or your efforts. And until all sand settles at the bottom, we have to take one day at a time. So, I started putting my best efforts each day. Inquisitiveness was the driving force to study, I studied because I liked studying, but somewhere in the race for marks, this inquisitiveness and liking took a back seat. But, once it was put back in the driver's seat, things got on track and went on smoothly. I used to sit for courses, prioritizing the sheer will to learn. This metamorphosis took time but happened. Also, managing my interests in sports and EML made it a little complicated. But, I do not regret being

involved in them. If coursework was taking care of my technical skills, EML took care in honing my personality and sports took care of my physical and mental strength. I'm glad I ended up at IIT and got those opportunities and the right people to support me in the form of friends, seniors, juniors, professors, counsellors. Sure enough, I haven't achieved much, I'm still hustling, but a battle won in the mind makes plans easier to crystallize. It's the process that is important.

## Why did I choose AI?

Why would I not? It's creating a brain out of a brain. It's a branch of engineering that could couple with any other branch and produce astonishing results. It's interdisciplinary, it's impact projection is large, it has maths, it has coding and it has domain acumen. Surviving in a century that has devices and data all around AI is the next big thing. Professionally, I wanted to be in a career, where technology channelizes resources for development where needed. AI finds its applications everywhere. You name it, you have it. Let's consider a simple example, we have a tailor X and he stitches for rupees 20 per hour and works for 10 hours a day, making it to 200 rupees a day, costing manual labor and at times inaccuracy. Now, we handover a stitching machine to this Mr. X, the accuracy and time to stitch shoots by five times making it 100 rupees an hour, Plus the machine can be used in a cycle of 10 hours each with a break of 2 hours in between. So making up to 2000 rupees a day. Surprising right? This stitching machine is metaphorically AI. Yes, one might say that this is a product of mechanical engineering or product design domain. I am not opposing that. But, what about the tailor's intellect to know what to cut, where to cut? What about creativity?

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What about learning with experience? How can you bring that? One can definitely not completely imitate the human brain and its intricacies, but some parts of it can be imitated through AI, that is the beauty of it, that is what I am glued on, it can sit on top of anything and enhance the process. One definitely cannot completely imitate the human brain and its intricacies, or can we? Albert Einstein once said, "There is not the slightest indication that nuclear energy will ever be obtainable." and here we are running major economies on nuclear power. Can we really achieve artificial general intelligence? If AI can help us achieve par-human performance in healthcare applications and beat champs of complex games like Go then the so-called technological singularity is pretty much a possibility. This is what inspires me to study AI.

#### **Little bit Technical.**

To be able to put this phenomenal domain into action, one needs the right technical skillset, this is taken care of by the coursework, learning about optimization, hardware implementation, machine learning methods, stochastic processes, reinforcement learning, representation learning, deep Learning, surveillance video analytics, natural language processing etc. I am excitedly looking forward to my thesis this year. I am keen on working in the medical domain, where even a little accuracy increase can impact hundreds. We have medical data in eclectic forms of signals, images, texts, video etc and using Neural Networks depending on the problem statement, we can make sense of this data to find abnormalities beforehand or the degree of medical issues in them. Moreover, drug discovery is a new horizon to explore yet an important one, COVID crisis has only reemphasized its importance. I am right now on a literature survey for the above domains. As a recent project, under the able supervision of Professor Vineeth N Balasubramanian, I

studied the nature of loss surfaces, qualitatively, quantitatively, visually, theoretically.

For a machine learning practitioner, the importance of loss surface cannot be ignored. It determines how well your model learns and how accurate would the results be. There have been several optimization techniques to mitigate the stochasticity of gradients and move from non-convexity to convexity, not getting stuck in saddles, local minima or plateaus. Analysis of loss surfaces has been through hessian spectral density, double derivation methods, experimentally playing with hyper parameters, etc. Skip connections and batch normalization techniques are proven to work in bringing convexity to loss surfaces, which helps in generalization and reaching correct hyper parameters for optimization. I have also worked on a project that uses natural language processing through gated CNNs that predicts the sentiment of a review. On a personal level, I have worked on a customer segmentation model through purchase history, that helps in prioritizing campaigns and discounts for customers through businesses, I tried to work the pipeline in Big Data. I am now preparing for placements and simultaneously working on my thesis under the able guidance of Prof. Sumohana Channappayya. I endeavor to come up with beneficial outcomes in the work and match my guide's expectations. I want to make the most of the research culture, the commendable expertise of professors and the discussions with colleagues before I graduate from IIT Hyderabad.