Optimization of Clinical Trials using Bandit Algorithm

Shubham Jain[1], Dr. K. Laksmanan[2], Dr. M.S. Muthu[1]

[1] Department of Pharmaceutical Engineering and Technology, Indian Institute of Technology (Banaras Hindu University), Varanasi- 221005, Uttar Pradesh, INDIA.

[2] Department of Computer Science and Engineering, Indian Institute of Technology (Banaras Hindu University), Varanasi-221005, Uttar Pradesh, INDIA.

Abstract

The Current gold standard design for clinical trials is known as Randomized Clinical Trials (RCT). After the assessment of eligibility and patient recruitment, patients are allocated **randomly** to the treatments. Randomisation minimises allocation by balancing both known and unknown prognostic factors in the assignment of treatments. The use of RCT lead to the use of the **scientific method** in the Medical Research and had a significant impact in the knowledge of the incidence and causes of diseases. Lengthy and expensive trials, high rates of drug failures and increased safety concerns. Average cost of developing a new drug by 2017 was estimated $2.7 Billion, pressure to shorten trials, reduce the number of required patients and produce *conclusive* results. In RCT, patient allocation is randomised but fixed during the trial (main goal is the learning by the end of the trial). Adaptive design allowed to **change** patient allocation data is gathered. If used properly, it provides efficiency gains (the smallest sample size and increase chance of correctly answering the clinical questions of interest etc.). Factors, determining the statistical properties of a particular adaptive design requires careful consideration to avoid biased studies. The Multi-Arm Bandit approach "learn and exploits", sensible approaches for clinical trials on rare diseases.

Corresponding Author:

Dr. M. S. Muthu
Assistant Professor
Department of Pharmaceutical Engineering and Technology,
IIT BHU, Varanasi
msmuthu.phe@itbhu.ac.in