School of Engineering and Applied Science (SEAS), Ahmedabad University

BTech(ICT) Semester IV: Probability and Random Processes (MAT202)
Special Assignment Abstract
Date: February 14, 2019 (Thursday)

- Area: Biology

- Group Members:

    1. Kalagee Anjaria (1741052)
    2. Nidhi Golakiya (1741062)
    3. Rajvee Kadchha (1741064)
    4. Rajvi Patel (1741078)

- Background:

    The problem that we will work on in the field of biology is the control of transmission of thalassemia. Thalassemia is an inherited blood disease which is caused due to the deficiency of hemoglobin and red blood cells compared to a healthy body. There are two types depending on the two types of proteins present in the hemoglobin : alpha and beta. Which type is inherited depends on the number of gene mutations and which part of hemoglobin is affected, alpha or beta. It is considered severe, if the mutations are more.

- Importance of Topic:

    Thalessemia cannot be completely stopped or controlled, but we can predict at which generation the thalassemia genotype becomes minor and is not severe. One way is to select an appropriate spouse that has no sign of any traits of thalassemia, if you have major/minor traits, so the chances that the child may inherit any trait of thalassemia will completely eliminate. If both the parents have major thalassemia traits, then there are full chances that the child will also inherit the same, In such cases, the couple should decide not to reproduce so as to stop the transmission to any future generations. Thus, it is important to accordingly model the transmission of thalassemia to bring it in control with generations.

- Inference:

    To solve our problem statement i.e. determining in which generation the born child will be free of severe thalassemia traits, we are going to use Markov's process. Markov process is a stochastic process having the property that, given its present state, the future states are independent of the past. That is, the future, which is the next generation will be determined by the the present generation, i.e. it's parents and not the past(former generation). Our probability distribution model will be modelled based on this Markov's process. Thus, through this, we can find the probability that in which generation of a family affected by thalassemia, the lower incidence genotype will be inherited and the transmission will be controlled. Lower incidence category means that the traits of thalassemia inherited are not severe and no remarkable symptoms are observed. Whereas, in higher incidence category, the disease will be severe and all symptoms will be fairly visible.

- References:

    1. S. Thakur, S. N. Raw and R. Sharma, "A Mathematical Model to Control the Transmission of Thalassemia Disease using Pure Fractions" Indian Journal of Science and Technology, Vol 9(4), January 2016
    2. Dr. Hamidreza Shirzadfar , " Critical Review on Thalassemia: Types,Symptoms and Treatment " April 20,2018