國立高雄大學應用數學系105學年度第2學期碩士班書報討論報告

地 點：應用數學系多媒體教室（理408室）

日 期：106年6月7日（星期三）

演講者	時　間	講題	摘要
蘇育萱	14：00 ～ 14：30	Unraveling the Mystery of Alzheimer's Disease - A Mathematical Model for Onset and Progression	Alzheimer's disease (AD) is a progressive and irreversible neurodegenerative disease that destroys memory and eventually causes the loss of cognitive skills. AD is characterized clinically by a progressive and gradual decline in cognitive function and neuropathologically by the presence of extracellular senile plaques consisting of Amyloid-β peptides and intracellular neurofibrillary tangles consisting of τ -protein. Substantial evidence now indicates that the quantity of Amyloid-β may be more closely and directly related to the onset of the disease. However, if the deposits of Amyloid-β is the only indicator for the onset of the disease, the patient may be wrongly diagnosed. The research found that the mentally healthy elderly with high level of Amyloid-β deposits has no obvious negative effects. Despite the extensive research, the pathogenesis of AD remains incompletely understood and no effective cure is available till now. Alternatively, mathematical modeling plays a powerful role to help us better know the complicated cross-talks involving multiple cell types throughout the deterioration process. In this poster, we present a mathematical model focusing on the interactions among Aβ peptides, microglia, astrocytes and neurons. According to the law of mass action, a system of ordinary differential equations describe the cross-talks of multiple type cells. Our results reveal that the activation of microglia can serve as a critical biomarker for the onset of AD. Consequently, targeting microglia may be a pragmatic option in the prediction of AD and provide appropriate therapeutics for AD.

國立高雄大學應用數學系105學年度第2學期碩士班書報討論報告

地 點：應用數學系多媒體教室（理408室）

日 期：106年6月7日（星期三）

演講者	時　間	講題	摘要
鄭怡玟	14：30 ～ 15：00	PNP Equations with Steric Efficts: A Model of Ion Flow through Channels	The main features of the organisms are growing, breeding, keeping structure, and reacting to the environment. These require energy consuming and nutrients assimilating which involve the transportation of substances through a cell. Large substance can be internalized into a cell by endocytosis, while small particles, e.g. ions, can pass the cell membrane through channel proteins (embedded on the cell membrane). In nerve conduction, it is important to study the mechanisms of the dynamics of channel proteins and the interaction among different types of channel proteins. Ions are charged particles, and the process is the change of voltage, and we apply Poisson-Nernst-Planck equation which describes the behavior of voltage to simulate the model of ion channels. But the model ignores the volume of ions, and it does not consider the interaction between ions. In fact, the channel is so narrow that it only allow a ion pass at a time, so the interaction can not be ignored. Therefore, we give Poisson-Nernst-Planck equation the steric effect term, and it would fit the real simulation of ion channels more. And we will present the numerical result about Poisson-Nernst-Planck equation with steric effect.
蘇靖壹	15：00 ～ 15：30	Feasibility of Machine Learning	We live in a data-driven world. How we deal with such more data is becoming an important problem. Machine learning is a kind of way to do it. In this talk, I will give a basic introduction to machine learning and a simple example. With the help of probability, the feasibility of machine learning will be confirmed. Once the problem is solved, we start to study some properties like the complexity of models and the complexity of samples.