Project 5. Fisher-Kolmogorov equation for neurodegenerative diseases

$$\begin{cases} \dfrac{\partial c}{\partial t} - \boldsymbol{\nabla} \cdot (D \boldsymbol{\nabla} c) - \alpha c(1-c) = 0 & \text{in } \Omega\,, \\ D \boldsymbol{\nabla} c \mathbf{n} = 0 & \text{on } \partial\Omega\,, \\ c(t=0) = c_0 & \text{in } \Omega\,. \end{cases} \tag{7}$$

Consider the Fisher-Kolmogorov equation (7). The equationc an be used to model the spread of misfolded proteins through the brain, associated to neurodegenerative diseases [13].Implement a solver for the equation, with the aim of reproducing the results observed in the proposed literature.

For the domain Ω, consider idealized or realistic domains (or both) as in [13]. A sample realistic mesh can be downloaded at this link: https://polimi365-my.sharepoint.com/:u:/g/personal/10461512_polimi_it/EY9ZPoq279JArvbXLPR1pNcB-wjU5tPZLClfO_4O9EYbtg?e=C1aIRH (the mesh is in STL format, and requires preprocessing through `gmsh`).

Discuss the results, the methods employed, their stability and accuracy, and their algorithmic and computational aspects.

Difficulty: moderate.

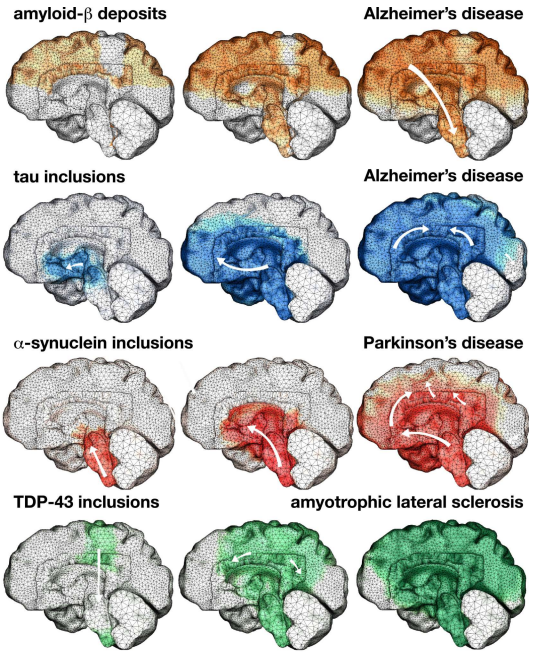

Figure 4: Example solutions to Fisher-Kolmogorov equation. Image taken from [13].