Problem 1
Imagine you want to do a forecast of tomorrow’s weather in the Öresund region. You want to wait at most 4 hours and the code you have performs on the machine you have at your disposal at one GFLOPs. What is a reasonable resolution you can do with these parameters?

Problem 2
Consider the discretized Laplace equation on the unit square with zero Dirichlet data on the boundary and the right hand side

\[
\begin{align*}
  f(x, y) &= \sin \pi y^2 (\pi \cos \pi x^2 - \pi^2 x^2 \sin \pi x^2) \\
  &\quad + \sin \pi x^2 (2\pi \cos \pi y^2 - 4\pi^2 y^2 \sin \pi y^2).
\end{align*}
\]

Use second order central differences on an equidistant mesh.

- Write a class that instantiates the above discretization with mesh width $\Delta x$ in the form of a linear equation system $Ax = b$. This class should have separate variables for the boundary conditions on each edge and allow for different types of boundary conditions (for now, only Dirichlet is fine, but allow for others). You do not need a variable for the matrix.

- To represent the matrix, write a function matvec(double*, double*) where the matrix vector product for the above problem is hardcoded.

- Test this!

Return: Tuesday 5th of September, by email