Optimization problem Discretization Neural Network $\mathbf{u}(\mathbf{x}_i, \theta)$ **Variables** θ θ (LOSS MINIMIZATION) **Target functions** System of PDEs Automatic differentiation $\partial_{x_1}^2 u_1 + \partial_{x_2}^2 u_1 + \dots - F_1 = 0$ Substitution $\partial_{x_1}^2 u_m + \partial_{x_2}^2 u_m + \dots - F_m = 0$ TRAINING Substitution Substitution **Initial conditions** $\partial_{x_1}^2 u \ (t = 0) \ \dots - A = 0 \ \dots$ **Boundary conditions** Loss function **PINN** $\partial_{x_1}^2 u (x_1 = 0) \dots - A = 0 \dots$