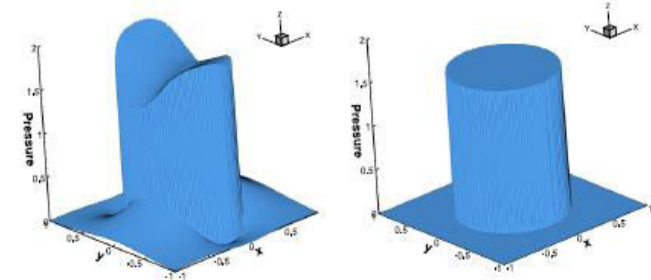


## Prof. Jiten Chandra Kalita, Department of Mathematics

**Objective:** To solve the Navier-Stokes equations in irregular domains in the  $\psi$ - $v$  or pure streamfunction formulation through Immersed Interface Method on Cartesian grids.

- ❖ Formulated the scheme outlined in the original project proposal to tackle problems in surface-tension driven flows.
- ❖ Successfully applied the scheme developed in second phases to problems involving flow past bluff bodies of different shapes and complicated geometries.
- ❖ We proposed an HOC EJIIM (explicit jump immersed interface method) approach for the 2D convection-diffusion with discontinuities by clubbing an existing HOC method with the explicit jump immersed interface approach.
- ❖ **Publication 1:** A Novel Higher Order Compact-Immersed Interface Approach For Elliptic Problems, Raghav Singhal and Jiten C Kalita, *PHYSICS OF FLUIDS*, 33 (8): 087112 (2021).
- ❖ **Publication 2:** A comprehensive study of secondary and tertiary vortex phenomena of flow past a circular cylinder: A Cartesian grid approach, Pankaj Kumar and Jiten C Kalita, *PHYSICS OF FLUIDS* 33, 053608 (2021).
- ❖ **Publication 3:** A hybrid  $\psi$ - $v$  HOC approach for surface tension driven flows in level set framework, H V R Mittal, Jiten C Kalita, and Oasem M Al-Mdallal. *Computers and Mathematics with Applications*. 79 (8): 2350-2375, 2020.



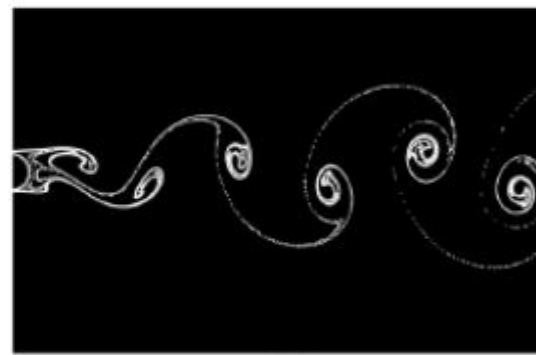
Surface plots of pressure for the oscillatory bubble problem

### Vortex shedding for the flow past circular cylinder for $Re=105$



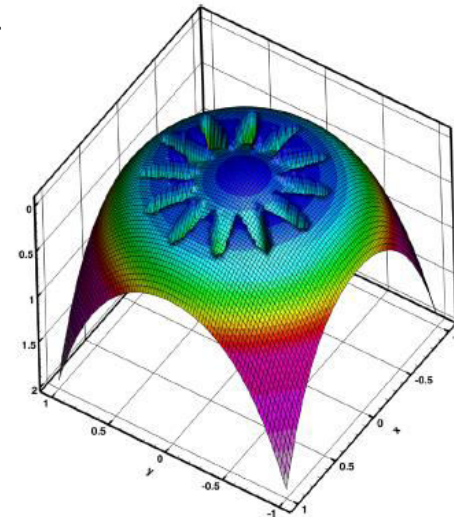
(a)

Experimental (Taneda)

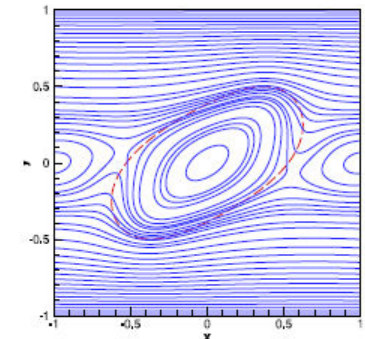
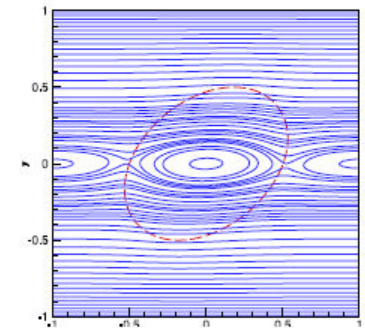


(b)

Numerical (Present computation)



Numerical solution of the elliptic equation with star shaped interface



Oscillations at drop interfaces