Ankush G. K. (un-koo-sh)

(Ankush Gargeshwari Kumar)

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EDUCATION

M.Sc. **Physics** and B.E. **Mechanical Engineering** (Integrated) with **Thesis**
CGPA: **7.862/10.0**

BITS Pilani
Hyderabad Campus
Hyderabad, India
2017 – 2022

EXPERIENCE / PROJECTS

Active Nematic Patterns on Manifolds
Project
Supervisor: Dr. Vijaykumar Krishnamurthy

International Centre for Theoretical Sciences (ICTS-TIFR)
Bengaluru, India

Aug 2022 – Present

- Simulating nematics with second-rank tensor order parameter under the Landau - De Gennes framework using FEniCS – a Finite Element Method based computing platform.
- Working on the hydrodynamics of active nematics on a 2D disk, a sphere and finally an arbitrary manifold, to observe patterns with topological defects.

Quantification of mixing of two liquids in small-scale, low *Re* flows
Project – [**preprint**]
Supervisors: Dr. Meenakshi Viswanathan *and* Dr. Aravinda N. Raghavan

BITS Pilani
Hyderabad Campus
Hyderabad, India

Jan 2020 – Present

- Quantified two different flow fields: An Oscillatory flow (in the presence of a Tear-Drop shaped obstacle), and a flow with an entrained vortex (due to a pair of baffles), using the Okubo-Weiss parameter (Q) distinguishing the stretched and rotational parts of the flow.
- Established that the stirring due to the Tear-drop obstacle and baffles gave rise to a sequence of stretch, rotation and stretch, which sharpened the concentration gradient leading to higher mixing.
- Attempting to connect the topological features of the flow, Q and the onset of chaotic behaviour to quantify mixing in small-scale open flows.

Growth Dynamics of Filamentous Fungal Biofilms
Thesis *(Remote Work)* – [**pdf**]
Supervisor: Dr. Aravinda N. Raghavan

BITS Pilani
Hyderabad Campus
Hyderabad, India

Jan 2022 – May 2022

- Worked with the team involved in studying the properties of filamentous fungal biofilms – used in treating industrial effluents.
- Simulated a mesoscopic biofilm growth model with five main components: active part density, inactive part density, tip density, and internal and external concentration.
- Tested various internal and external concentrations and geometry to mimic the experimental observations.

Coupling of Electrophysiology and Mechanics of Heart Muscle
Thesis *(Remote Work)* – [**pdf**]
Supervisor: Dr. Yong Wang

Max-Planck Institute for Dynamics and Self-organization (MPI-DS)
Gottingen, Germany

Aug 2021 – Dec 2021

- Worked as part of the group whose aim is to build an Engineered Heart Muscle patch to treat diseased hearts.
- Simulated a coupled model of an excitable domain where an electrical impulse propagates, and deforms the domain in its wake – using COMSOL.
- Focussed on one-way coupling where the electrophysiology (FitzHugh Nagumo model) dictates how the domain deforms (hyperelastic material model) and not vice versa.

SCHOOLS & WORKSHOP

- **Bangalore School on Statistical Physics – XIII**
  - Pattern Formation in Biology
  - Statistical Physics of Long-range Systems

International Centre for Theoretical Sciences (ICTS TIFR)
Bangalore, India

July 2022

- **FINESSE Workshop: Hands-On Interferometer Modelling**

Inter-University Centre for Astronomy and Astrophysics (IUCAA)
Pune, India

Dec 2019

PREPRINTS

1. **Kumar, A.,** Vishal, P., Meenakshi, V., & Narayanan, R.. (2022). Spatially resolved stretching-rotation-stretching sequence in flow topology as elementary structure of fluid mixing. https://doi.org/10.48550/arXiv.2210.12171

SKILLS & ACTIVITIES

- **Programming/Software:** Python, MATLAB, COMSOL Multiphysics, LaTeX
- **Activities:**
  - Captain of the University Ultimate Frisbee Team – led the South-Central Sectionals of the National Championship Series 2018, Played in the National College Ultimate Championship – 2019, and Played in the South Regionals of the National Championship Series 2022.
  - Part of the Physics Association and the Astronomy Club – conducting events and organising talks for the University.