NSFE 2022 PANEL OUTCOMES

Here is a summary of topics and open problems that the mini-course lecturers and invited speakers addressed during the panel session at NSFE 2022.

- **Outreach/Funding.** There is a need to diversify the workforce. In particular, efforts are needed to attract, recruit and retain students belonging to underrepresented and minority groups; to advocate for, identify and secure funding that supports the research of such groups; and to foster their access to job opportunities.
- **Applications.** More research is needed to understand the connection between micro and macro scales in nonlocal modeling. A question from both the applications and theoretical points of view arises: can we discover something new in the local setting using nonlocal setup? Special attention needs to be paid to fractional in time equations as models with memory effects.
- **Peridynamics.** Problems such as dislocations and crack propagation in elastic materials cannot be solved using traditional PDE approaches. Peridynamics offers an effective alternative tool to attack these problems and there is still much to uncover.
- **Nonlocal Calculus.** Its development is continuing and its use as a tool to approach nonlocal models needs further attention.
- **Nonlocal and fractional PDEs.** A general open problem is the lack of explicit solutions, especially for one dimensional problems. Even simple problems need careful thinking in the nonlocal case.
- **Optimal control.** Open problems regard exterior and interior control for fractional PDEs and the behavior of solutions as the time horizon tends to infinity (turnpike property).
- **Regularity theory.** Regularity of solutions is essential for numerical methods. The Calderón–Zygmund commutator approach needs to be further explored as it has the potential to tackle a variety of nonlocal problems.
- **Nonlocal minimal surfaces.** Open problems include the classification of minimal cones, the construction of explicit one dimensional solutions, the identification of low-dimensional features, the thin obstacle problem and other free boundary problems for nonlocal minimal surfaces, and the study of singularities in nonlocal mean curvature flows.
- **Numerical methods.** Quadrature rules are a major hurdle to approximate singular integral operators.