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### Research interests include:

- **Statistical estimation and filtering theory**
- **Statistical inference of stochastic process**
- **Control and optimization theory**
- **Mathematical finance and economics**

### On-going GRF project

## **Forward-backward Filtering, Nonsmooth Optimization and Their Applications**

### **Abstract**

The forward-backward stochastic differential equation (FBSDE) is a backward stochastic differential equation (BSDE) coupled with a forward stochastic differential equation (SDE). During the last few decades, the FBSDE and its dynamic optimization problems have already been extensively investigated and applied in many areas, especially in mathematical finance and economics. Our project aims to study the dynamic optimization problems of FBSDE in the setup of partial information and nonsmooth generators which is very important for both theoretical analysis and real applications.

### **Objective:**

- (1) Introduce and develop the forward-backward filtering theory, and develop the corresponding forward-backward particle filtering method.
- (2) Derive some separation principle for FBSDE system and use it to study the FBSDE optimization under partial information.
- (3) Using superprocess theory and variational inequalities to derive a new nonsmooth maximum principle and study the nonsmooth optimization of FBSDE.
- (4) Investigate some concrete (nonsmooth, partial information) FBSDE optimization problems for real applications. In particular, we will extensively study some important quadratic optimization problems (nonsmooth in forward equation, linear in backward equation).