

优化控制及相关领域学术研讨会
暨山东大学-香港理工大学合作项目进展会

程序册

线上线下结合会议
2021年9月19日

优化控制及相关领域学术研讨会 暨山东大学-香港理工大学合作项目进展会 通知

各位老师：

为促进优化控制、金融数学及相关领域的学术交流，以及国家自然科学基金委与香港研究资助局合作研究项目“模型不确定性下的随机控制理论及其在金融风险中的应用”的开展，拟定于2021年9月18日-9月20日通过线上线下结合方式举办“优化控制及相关领域学术研讨会暨山东大学-香港理工大学合作项目进展会”。会议邀请相关领域的专家学者做学术报告，介绍相关领域的最新进展和学术前沿动态，促进学术交流。

一、会议名称：

优化控制及相关领域学术研讨会暨山东大学-香港理工大学合作项目进展会

主办单位：山东大学、香港理工大学

组织委员会：吴臻教授、孙德锋教授、王光臣教授、姚嘉晖教授

会务组：黄建辉、聂天洋

二、会议报到

时间：2021年09月18日 **地点：**山东省济南市山东大学中心校区

三、会议日程

2021年09月19日，学术报告

2021年09月20日，自由讨论、离会

四、会议地点

线下：山东济南山东大学中心校区知新 B924 **线上：**腾讯会议

五、会务组联系方式

联系人：聂天洋（15288861361） **E-mail:** nietianyang@sdu.edu.cn

山东大学、香港理工大学

2021年9月10日

会议程序

2021年9月19日 学术报告			
时间	主持人	报告人	报告题目
09:00-09:15		吴臻	致开幕词
		孙德锋	
09:15-09:45	王光臣	戴民	Portfolio Rebalancing with Realization Utility
09:45-10:15		王军民	Generalized solution and ISS stability of PDE-ODE system with discontinuous control
10:15-10:30	休息		
10:30-11:00	史敬涛	吕琦	Stochastic Transposition Method and Its Applications
11:00-11:30		许左权	Moral-hazard-free insurance
12:00-14:30	午餐		
14:30-15:00	张德涛	郜传厚	Time domain boundedness of noise-to-state exponentially stable systems
15:00-15:30		黄建辉	Social Optima in Robust Mean Field LQG Control: From Finite to Infinite Horizon
15:30-15:40	休息		
15:40-16:10	聂天洋	李迅	Optimal Consumption with Loss Aversion and Reference to Past Spending Maximum
16:10-16:40		周华成	Minimizing the output measurement for some partial differential systems with uncertainties
16:40-17:10		王天啸	Closed-loop equilibrium strategies for general time-inconsistent optimal control problems
17:10-18:00	讨论		
18:00-20:00	晚宴		

会议ID: Join Zoom

Meeting <https://polyu.zoom.us/j/94070112039?pwd=V3dmVUVUaEpJVC83czVXVXFNeUU2Zz09>

Meeting ID: 940 7011 2039

Passcode: 0919

Portfolio Rebalancing with Realization Utility

戴民

National University of Singapore

摘要: We develop a dynamic tractable model where an investor derives realization utility as in Barberis and Xiong(2012) and Ingersoll and Jin (2013), but importantly can dynamically rebalance her portfolio between a risky asset and a risk-free asset. We show that the option of investing in the risk-free asset is quite valuable, even though the investor only derives utility from realized gains and losses of trading the risky asset. This work is jointly with Cong Qin and Neng Wang.

Generalized solution and ISS stability of PDE-ODE system with discontinuous control

王军民

北京理工大学

摘要: It is known that an ODE equation has a unique local solution if the right side function has the Lipschitz continuity. However, for a control system, the control input is usually discontinuous. The new concept of Filippov solution is introduced to overcome the mathematical obstructions of the discontinuous ODE in 1990's, and a generalized solution is developed by Levaggi in 2002 to treat for an PDE system with discontinuous input.

In this talk, we discuss the generalized solution and ISS stability for a PDE-ODE cascaded system with disturbances appearing in all channels subject to discontinuous boundary controller. Firstly, we extend the definition of Filippov solution of ODE with discontinuous right hand to PDE subject to discontinuous boundary controller. Secondly, we take an ODE cascaded with a reaction- diffusion equation as an example to illustrate the solution of PDE-ODE cascaded system with discontinuous boundary controller. Finally, based on the Lyapunov method, the input-to-state stability of an ODE cascaded with a reaction-diffusion equation subject to discontinuous boundary controller is achieved.

简介: 王军民，北京理工大学教授、博导。研究领域：控制理论与应用。2004 年在香港大学获博士学位，2009 年为北京理工大学教授。主持国家自然科学基金 5 项，自然科学基金重点基金子课题 1 项，发表学术期刊论文 100 多篇，撰写专著 2 部。2007 年入选教育部新世纪优秀人才、2012 年获北京市科学技术二等奖、2019 年获教育部自然科学二等奖、《Control Theory and Technology》期刊副主编，毕业博士研究生 12 名，硕士研究生 13 名。

Stochastic Transposition Method and Its Applications

吕琦

四川大学

摘要: In this talk, we present the stochastic transposition method which is an advanced duality method, to solve backward stochastic evolution equations. As typical examples, we main focus on three classes of backward stochastic evolution equations: vector-valued backward stochastic evolution equation, operator-valued backward stochastic Lyapunov equation and operator-valued backward stochastic Riccati equation. As applications of the well-posedness of these equations, we give some recent results in optimal control problems for stochastic evolution equations, including a general Pontryagin-type maximum principle for optimal controls of stochastic evolution equations in infinite dimensions, some second order necessary conditions for optimal controls and the existence of an optimal feedback control of linear quadratic optimal control problems.

简介: 吕琦，四川大学数学学院教授，博士生导师，主要研究偏微分方程和随机微分方程的控制理论。主要成果发表在 *Communications on Pure and Applied Mathematics*、*Journal of the European Mathematical Society*、*Journal de Mathématiques Pures et Appliquées*、*SIAM Journal on Control and Optimization* 等刊物上，并在 Springer-Verlag 出版专著三部；担任 *SIAM Journal on Control and Optimization*、*ESAIM: Control, Optimisation and Calculus of Variations* 和 *Systems & Control Letters* 等刊物的编委。

Moral-hazard-free insurance

许左权

Hong Kong Polytechnic University

摘要: This paper investigates Pareto optimal (PO, for short) insurance contracts in a behavioral finance framework, in which the insured evaluates contracts by the rank-dependent utility (RDU) theory and the insurer by the expected value premium principle. The incentive compatibility constraint is taken into account, so the contracts are free of moral hazard. The problem is initially formulated as a non-concave maximization problem involving Choquet expectation, then turned into a quantile optimization problem and tackled by calculus of variations method. The optimal contracts are expressed by a double-obstacle ordinary differential equation for a semi-linear second-order elliptic operator with nonlocal boundary conditions. We provide a simple numerical scheme as well as a numerical example to calculate the optimal contracts. Let θ and m_0 denote the relative safety loading and the mass of the potential loss at 0. We find that every moral-hazard-free contract is optimal for infinitely many RDU insureds if $0 < \theta < \frac{m_0}{1-m_0}$; by contrast, some contracts such as the full coverage contract are never optimal for any RDU insured if $\theta > \frac{m_0}{1-m_0}$. We also derive all the PO contracts when either the compensations or the retentions loss monotonicity.

Time domain boundedness of noise-to-state exponentially stable systems

郜传厚

浙江大学

摘要: In this talk we prove the time-domain boundedness for noise-to-state exponentially stable systems, and further make an estimation of its lower bound function, which allows to answer the question that how long the solution of a stochastic noise-to-state exponentially stable system stays in the domain of attraction and what happens with it if it escapes from this region for a while. The results will complement the probability-domain boundedness of noise-to-state exponentially stable systems, and provide a new insight into noise-to-state exponential stability.

简介: 郜传厚，男，浙江大学数学科学学院教授、博士生导师，现任浙江大学数学科学学院副院长。主要从事数学系统生物学、热力学系统控制、采样系统控制、机器学习和优化研究，近年来已承担 7 项国家自然科学基金，5 项省部级项目。在国内外重要期刊/会议上发表相关学术论文近 60 篇，包括 SIAM Journal of Applied Mathematics, SIAM Journal of Applied Dynamical Systems, ESAIM: Control, Optimisation and Calculus of Variations, IEEE Transactions on Automatic Control 等国际著名期刊。现任 IEEE Transactions on Automatic Control 期刊 Associate Editor；曾担任 IEEE Transactions on Industrial Informatics, Journal of Applied Mathematics, ISIJ International 等杂志客座编委。

Social Optima in Robust Mean Field LQG Control: From Finite to Infinite Horizon

黄建辉

Hong Kong Polytechnic University

摘要: This article studies social optimal control of mean field linear-quadratic-Gaussian models with uncertainty. Specially, the uncertainty is represented by an uncertain drift, which is common for all agents. A robust optimization approach is applied by assuming all agents treat the uncertain drift as an adversarial player. In our model, both dynamics and costs of agents are coupled by mean field terms, and both finite- and infinite-time horizon cases are considered. By examining social functional variation and exploiting person-by-person optimality principle, we construct an auxiliary control problem for the generic agent via a class of forward-backward stochastic differential equation system. By solving the auxiliary problem and constructing consistent mean field approximation, a set of decentralized control strategies is designed and shown to be asymptotically optimal. (Joint with Dr. Wang Bing-Chang and Prof. Zhang Ji-feng).

Optimal Consumption with Loss Aversion and Reference to Past

Spending Maximum

李迅

Hong Kong Polytechnic University

摘要: This work studies an optimal consumption problem for a loss-averse agent with reference to past consumption maximum. To account for loss aversion on relative consumption, an S-shaped utility is adopted that measures the difference between the non-negative consumption rate and a fraction of the historical spending peak. We consider the concave envelope of the realization utility with respect to consumption, allowing us to focus on an auxiliary HJB variational inequality on the strength of concavification principle and dynamic programming arguments. By applying the dual transform and smooth-fit conditions, the auxiliary HJB variational inequality is solved in closed-form piecewisely and some thresholds of the wealth variable are obtained. The optimal consumption and investment control of the original problem can be derived analytically in the piecewise feedback form. The rigorous verification proofs on optimality and concavification principle are provided. (Joint with Xiang Yu and Qinyi Zhang)

Minimizing the output measurement for some partial differential systems with uncertainties

周华成

中南大学

摘要: Output feedback design and analysis of partial differential systems with uncertainties are challenge problems in the fields of distributed parameter control systems. The measurements in the existing literatures, however, are either the full state feedback or the output feedback with more output signals. Minimizing the output measurement becomes interesting. In this talk, we survey some recent progress on the minimal measured output for PDEs to achieve the stability and output tracking by optimizing the control design.

简介: 周华成, 中南大学特聘教授。主要从事偏微分方程控制理论与抗扰控制研究。曾获中国科学院院长特别奖。学术成果发表在《IEEE Trans. Automat. Control》, 《Automatica》, 《SIAM J. Control Optim.》, 《ESAIM Control Optim. Calc. Var.》, 《J. Differential Equations》,《Eur. J. Control》, 《Internat. J. Control》,《Internat. J. Robust Nonlinear Control》、《J. Franklin Inst.》,《J. Math. Anal. Appl.》,《Nonlinear Dynamics》, 《Nonlinear Analysis》等享有较高国际学术声誉的数学和控制领域主流刊物。担任 IEEE TAC, Automatica,SICON, COCV, MCSS, IJRNC, IJC, SCL, JFI, ND, ISA Transaction, IET CTA, 《中国科学:信息科学》, IEEE TIE, IEEE TCST,TIMC, FCAA, AMM, AMC 等 30 余个杂志的审稿人并多次被多个期刊(如 SCL,JFI 等)评为杰出审稿人(outstanding reviewer)。

Closed-loop equilibrium strategies for general time-inconsistent optimal control problems

王天啸

四川大学

摘要: In this talk we introduce a general framework for time-inconsistent optimal control problems with random coefficients. We characterize the closed-loop equilibrium strategy in both the integral and pointwise forms with the newly developed methodology. We recover, compare and improve the results of some well-known models, including the classical optimal control, Bjork et al.(2017), He and Jiang (2020), and Yong (2012) models, and reveal several interesting aspects that appear for the first time in the literature. We illustrate the usefulness of the model and the results by a number of examples in dynamic portfolio selection, including mean-variance with state-dependent risk aversion, investment consumption with non-exponential discounting, and utility-deviation-risk with coupled terminal state and expected terminal state. This is joint work with Harry Zheng (Imperial College, London).

简介: 四川大学数学学院副教授、博士研究生导师。主要从事随机分析，随机最优控制理论等方面的研究。曾赴美国中佛罗里达大学、堪萨斯大学、香港理工大学等知名高校访问交流。主持和参与多项国家自然科学基金青年项目、面上项目与重点项目。发表论文涉及《SIAM J. Control Optim.》，《IEEE Trans. Automat. Control》，《ESAIM: Control Optim. Calc. Var.》，《Appl. Math. Optim.》，《Insurance: Math. Econom.》，《Stochastic Process Appl.》等杂志。