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前沿经典

学科热点

学术动态

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2021 年数学学科研究前沿(一) 2022-第 9 期

科学研究的世界呈现出蔓延生长、不断演化的景象。科研管理者和政策制定者需要掌握科研的进展和动态，以有限的资源来支持和推进科学进步。对于他们而言，洞察科研动向、尤其是跟踪新兴专业领域对其工作具有重大的意义。

科睿唯安通过持续跟踪全球最重要的科研和学术论文，研究分析论文被引用的模式和聚类，通过揭示成簇的高被引论文共同被引用的活跃度和频率来反映研究前沿。

本期快报结合中国科学院科技战略咨询研究院、中国科学院文献情报中心及科睿唯安联合发布的《2021 研究前沿》，介绍数学学科的部分研究前沿。

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《2021 研究前沿》¹报告的结论指出：数学领域位居前十位的热点前沿主要集中于双相各向异性变分问题、光孤子传输特性的解析研究、基于深度卷积神经网络的医学图像分析算法、分裂公共不动点问题的迭代算法、用于优化机器人操作的动态神经网络算法、高维非线性偏微分方程的求解方法、非线性时间序列的复杂网络分析、多层贝叶斯建模、分数阶反应扩散方程的数值解法、有限差分格式的能量稳定性研究等领域。

其中，偏微分方程性质及求解研究以及非线性系统方向等多个热点前沿连续多年入选数学领域的热点前沿或新兴前沿，而统计学领域的非线性时间序列的复杂网络分析首次入选。本快报向大家重点介绍**非线性时间序列的复杂网络分析**这一研究前沿。



2021 研究前沿相关报道

复杂网络高度概括了复杂系统的重要特征，即由多个基本单元（或节点）与它们之间的相互作用组成。借助图论和统计学的相关方法，复杂网络理论可以捕捉并描述复杂系统的演化机制、演化规律和整体行为。目前，复杂网络理论已经从数理科学渗透到生命科学、工程科学甚至社会科学等众多不同学科，并已经成为相关领域的研究热点。

时间序列是由观察时间得到的数据点序列，时间点之间通常都是等间隔且离散性的。近年来，基于时间序列测量信号的复杂网络动力学研究受到了不同领域研究人员的广泛关注，不同的时间序列复杂网络构建与分析算法相继提出并已成功应用于不同的复杂动力学系统研究之中，复杂网络方法已经成为研究时间序列的重要工具。

热点研究前沿“非线性时间序列的复杂网络分析”聚合了 12 篇核心论文，主要探讨了运用多种复杂网络理论和方法进行非线性时间序列分析，以表征流体的非线性动力学特征；以及分析脑电图时间序列，构建脑电图功能脑网络，实现对人类的情感分析与识别等主题。

¹ 《2021 研究前沿》下载地址：<https://mp.weixin.qq.com/s/kprzKH0pAN01ZdmyoEDyiw>



核心论文推荐

利用 ESI 数据库的“Research Fronts”，从 12610 个研究前沿中筛选出同时包含“complex networks”、“time”、“nonlinear”等关键词的 6 个前沿。

前沿 1： EVENT-TRIGGERED RECURSIVE STATE ESTIMATION;MOVING HORIZON ESTIMATION;VARIANCE-CONSTRAINED RECURSIVE STATE ESTIMATION;DELAY COMPENSATION-BASED STATE ESTIMATION;TIME-VARYING COMPLEX NETWORKS

前沿 2： HIGH-ORDER MULTIAGENT SYSTEMS;ROBUST TIME-VARYING FORMATION;ROBUST FORMATION CONTROL;MULTIAGENT SYSTEMS;DYNAMICAL COMPLEX NETWORKS

前沿 3： DISTRIBUTED STATE-SATURATED RECURSIVE FILTERING;STOCHASTIC TIME-VARYING NONLINEAR COMPLEX NETWORKS;SENSOR NETWORKS;STATE-SATURATED RECURSIVE FILTER;LINEAR DYNAMIC NETWORKS

前沿 4： DELAYED SEMI-MARKOVIAN JUMP NEURAL NETWORKS;SEMI-MARKOVIAN JUMPING NEURAL NETWORKS;FRACTIONAL-ORDER DISCONTINUOUS COMPLEX NETWORKS;NON-FRAGILE ROBUST FINITE-TIME SYNCHRONIZATION;EVENT-TRIGGERED STOCHASTIC SYNCHRONIZATION

前沿 5： ANALYZING MULTIVARIATE NONLINEAR TIME SERIES;WAVELET MULTIREOLUTION COMPLEX NETWORK;COMPLEX NETWORK ANALYSIS;TIME SERIES;ADAPTIVE OPTIMAL KERNEL TIME-FREQUENCY REPRESENTATION

前沿 6： FINITE-TIME DISTRIBUTED STATE ESTIMATION;ASYNCHRONOUS DISSIPATIVE STATE ESTIMATION;STOCHASTIC COMPLEX NETWORKS;NEURAL NETWORKS;ROBUST ESTIMATION

下表是上述前沿中 2020 年以来的 5 篇高被引论文。

学院	标题	作者	出处	研究机构	出版年
1	MOVING HORIZON ESTIMATION WITH UNKNOWN INPUTS UNDER DYNAMIC QUANTIZATION EFFECTS	ZOU, L;WANG, ZD;HU, J;ZHOU, DH	IEEE TRANSACTIONS ON AUTOMATIC CONTROL 65 (12): 5368-5375 DEC 2020	BRUNEL UNIVERSITY;TSINGHUA UNIVERSITY;SHANDONG UNIVERSITY OF SCIENCE & TECHNOLOGY;HARBIN UNIVERSITY OF SCIENCE	2020

				& TECHNOLOGY;	
2	VARIANCE-CONSTRAINED RECURSIVE STATE ESTIMATION FOR TIME-VARYING COMPLEX NETWORKS WITH QUANTIZED MEASUREMENTS AND UNCERTAIN INNER COUPLING	HU, J;WANG, ZD;LIU, GP;ZHANG, HX	IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS 31 (6): 1955-1967 JUN 2020	BRUNEL UNIVERSITY; WUHAN UNIVERSITY; UNIVERSITY OF SOUTH WALES; HARBIN UNIVERSITY OF SCIENCE & TECHNOLOGY;	2020
3	MOVING HORIZON ESTIMATION OF NETWORKED NONLINEAR SYSTEMS WITH RANDOM ACCESS PROTOCOL	ZOU, L;WANG, ZD;HAN, QL;ZHOU, DH	IEEE TRANSACTIONS ON SYSTEMS MAN CYBERNETICS-SYSTEMS 51 (5): 2937-2948 MAY 2021	BRUNEL UNIVERSITY; TSINGHUA UNIVERSITY; SWINBURNE UNIVERSITY OF TECHNOLOGY; SHANDONG UNIVERSITY OF SCIENCE & TECHNOLOGY;	2021
4	MOVING HORIZON ESTIMATION WITH NON-UNIFORM SAMPLING UNDER COMPONENT-BASED DYNAMIC EVENT-TRIGGERED TRANSMISSION	ZOU, L;WANG, ZD;ZHOU, DH	AUTOMATICA 120: - OCT 2020	BRUNEL UNIVERSITY; SHANDONG UNIVERSITY OF SCIENCE & TECHNOLOGY;	2020
5	EVENT-TRIGGERED RECURSIVE STATE ESTIMATION FOR DYNAMICAL NETWORKS UNDER RANDOMLY	HU, J;WANG, ZD;LIU, GP;JIA, CQ;WILL	AUTOMATICA 115: - MAY 2020	BRUNEL UNIVERSITY; WUHAN UNIVERSITY; UNIVERSITY OF SOUTH WALES; HARBIN UNIVERSITY OF SCIENCE	2020

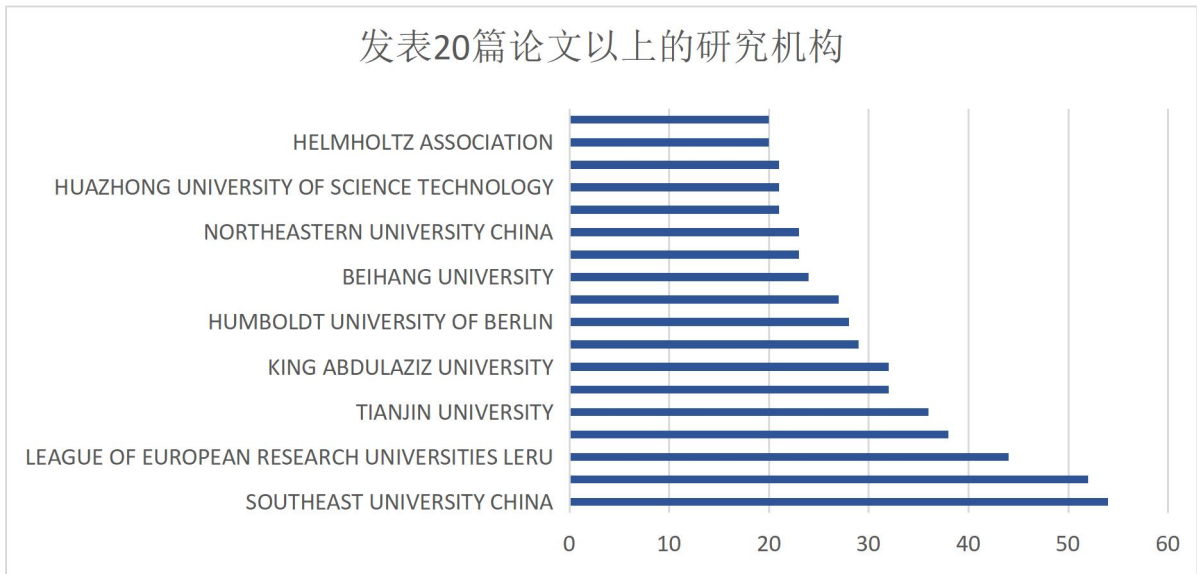
	SWITCHING TOPOLOGIES AND MULTIPLE MISSING MEASUREMENTS	IAMS, J		& TECHNOLOGY;	
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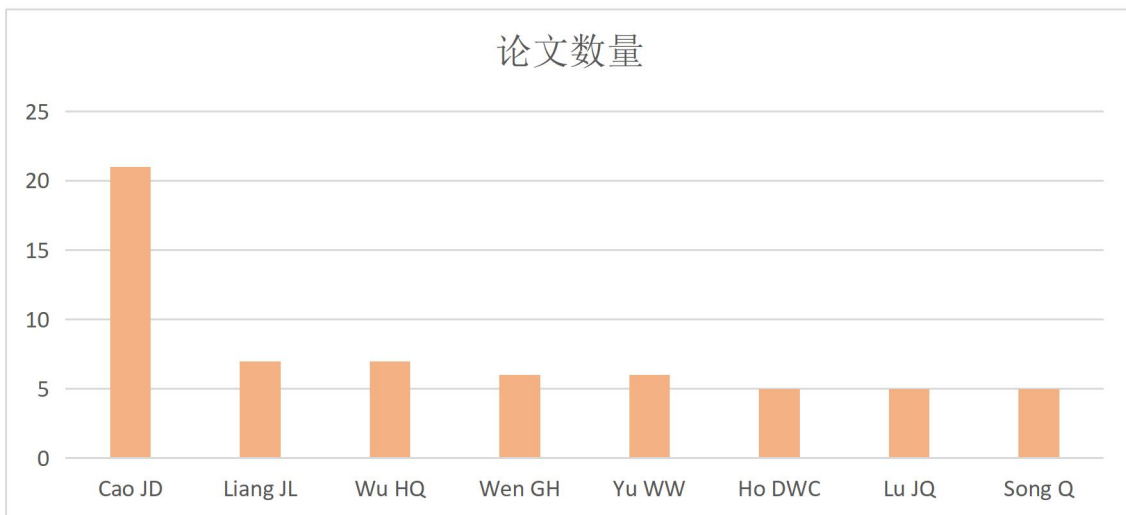
东南大学相关研究

在 Web of Science 中, 构建检索式 “complex network* anal* time nonlinear ” (主题)。

截止 2022 年 5 月 5 日, 共有 2145 条检索结果。在这些结果中, 东南大学是发表量最多的机构 (见下图)。



东南大学的 54 篇论文中, 共有 8 个研究人员发表 5 篇以上论文 (见下图)。



署名单位为东南大学的 54 篇论文中, 共有 7 篇高被引论文。

1.

标题: Non-fragile robust finite-time synchronization for fractional-order discontinuous complex networks with multi-weights and uncertain couplings under asynchronous switching

作者: Jia, Y (Jia, You); Wu, HQ (Wu, Huaiqin); Cao, JD (Cao, Jinde)

来源出版物: APPLIED MATHEMATICS AND COMPUTATION 卷: 370 文献号: 124929 DOI: 10.1016/j.amc.2019.124929 出版年: APR 1 2020

入藏号: WOS:000502588900024

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2.

标题: Distributed Tracking of Nonlinear Multiagent Systems Under Directed Switching Topology: An Observer-Based Protocol

作者: Wen, GH (Wen, Guanghui); Yu, WW (Yu, Wenwu); Xia, YQ (Xia, Yuanqing); Yu, XH (Yu, Xinghuo); Hu, JQ (Hu, Jianqiang)

来源出版物: IEEE TRANSACTIONS ON SYSTEMS MAN CYBERNETICS-SYSTEMS 卷: 47 期: 5 页: 869-881 DOI: 10.1109/TSMC.2016.2564929 出版年: MAY 2017

入藏号: WOS:000399790600013

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3.

标题: Nonsmooth Finite-Time Synchronization of Switched Coupled Neural Networks

作者: Liu, XY (Liu, Xiaoyang); Cao, JD (Cao, Jinde); Yu, WW (Yu, Wenwu); Song, Q (Song, Qiang)

来源出版物: IEEE TRANSACTIONS ON CYBERNETICS 卷: 46 期: 10 页: 2360-2371 DOI: 10.1109/TCYB.2015.2477366 出版年: OCT 2016

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4.

标题: Distributed finite-time tracking of multiple non-identical second-order nonlinear systems with settling time estimation

作者: Zhao, Y (Zhao, Yu); Duan, ZS (Duan, Zhisheng); Wen, GH (Wen, Guanghui); Chen, GR (Chen, Guanrong)

来源出版物: AUTOMATICA 卷: 64 页: 86-93 DOI: 10.1016/j.automatica.2015.11.005 出版年: FEB 2016

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5.

标题: Finite-time synchronization of fractional-order memristor-based neural networks with time delays

作者: Velmurugan, G (Velmurugan, G.); Rakkiyappan, R (Rakkiyappan, R.); Cao, JD (Cao, Jinde)

来源出版物: NEURAL NETWORKS 卷: 73 页: 36-46 DOI: 10.1016/j.neunet.2015.09.012 出版年: JAN 2016

入藏号: WOS:000366703600004

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6.

标题: Finite-Time Cluster Synchronization of T-S Fuzzy Complex Networks With Discontinuous Subsystems and Random Coupling Delays

作者: Yang, XS (Yang, Xinsong); Ho, DWC (Ho, Daniel W. C.); Lu, JQ (Lu, Jianquan); Song, Q (Song, Qiang)

来源出版物: IEEE TRANSACTIONS ON FUZZY SYSTEMS 卷: 23 期: 6 页: 2302-2316
DOI: 10.1109/TFUZZ.2015.2417973 出版年: DEC 2015

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7.

标题: PINNING IMPULSIVE STABILIZATION OF NONLINEAR DYNAMICAL NETWORKS WITH TIME-VARYING DELAY

作者: Lu, JQ (Lu, Jianquan); Wang, ZD (Wang, Zidong); Cao, JD (Cao, Jinde); Ho, DWC (Ho, Daniel W. C.); Kurths, J (Kurths, Juergen)

来源出版物: INTERNATIONAL JOURNAL OF BIFURCATION AND CHAOS 卷: 22 期: 7
文献号: 1250176 DOI: 10.1142/S0218127412501763 出版年: JUL 2012

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