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**AI科学前沿系列学术讲座**

**报告题目：**Mathematical Modeling in Image Restoration, Image Analysis and Beyond

**报告人：**董彬（北京大学）

**报告摘要：**Image restoration, including image denoising, deblurring, inpainting, computed tomography, etc., is one of the most important areas in imaging science. In image restoration, wavelet frame based approach and PDE based approach (including variational models and PDE models) are two of the most successful approaches and are widely adopted in both academia and industry. Although the development of the two approaches took rather different paths, an intriguing and fundamental question is whether the two approaches are deeply connected. The main portion of this talk is based on a series of papers, where we established rigorous and generic connections between wavelet frame and PDE based approach. This includes connections of wavelet frame based approach to total variation model and the Mumford-Shah model. Furthermore, connections of wavelet frame shrinkage to a rather general form of nonlinear evolution PDEs are also established. Other than the establishment of the links between the two approaches, brand new models for both approaches are also discovered, which combine merits from both approaches, and thus outperform existing models in various applications in image restoration. Our theoretical studies also enable us to connect mathematical modeling and computations with deep learning. The connections not only can provide guidance to deep network design, which is a central task in deep learning, but also enable us to tackle challenging problems in applied and computation mathematics. In the end of my talk, I will present one of our recent works on bridging numerical differential equations with deep neural network design for PDE identification from observed dynamics data.

**报告人简介：**董彬，北京大学，北京国际数学研究中心长聘副教授、主任助理，北京大数据研究院深度学习实验室研究员、生物医学影像分析实验室副主任。主要研究领域为应用调和分析、优化方法、机器学习、深度学习及其在图像和数据科学中的应用。在理论上，将图像领域独立发展近30年的两个数学分支（PDE/变分方法和小波方法）建立深刻的联系，改变了领域内对这两类方法的认识，拓宽了这两类方法的应用范畴。应用上，以数学理论为指导思想，为来源于医学影像、计算机视觉、深度学习等领域中的重要问题提供行之有效的解决方案。董彬在包括《Journal of the American Mathematical Society》、《Applied and Computational Harmonic Analysis》、《SIAM系列期刊》、《Inverse Problems》、《ICML》在内的国际重要学术期刊和会议上发表论文50余篇，拥有2项美国专利，现任期刊《Inverse Problems and Imaging》编委。于2014年获得香港求是基金会的求是杰出青年学者奖，2015年入选中组部第十一批“千人计划”青年人才。

**时间：**2019年4月11-12日8:30--17:30

**地点：**中教一、二层报告厅，7号楼报告厅，研究生院101报告厅

**主办**：研究生院

**承办**：图书馆

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