BRITISH COUNCIL

RESEARCHER LINKS

Newton Fund

Research Profile

Name: Ankush Aggarwal

Position: National Research Network Research Fellow

Institute/division: Zienkiewicz Centre for Computational Engineering

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SUMMARY OF MY RELEVANT RESEARCH AREAS:

Computational biomechanics using multi-scale methods, focus on cardiovascular technology. Interested in mechanical characterization of biological and tissue engineered materials.

Brief summary of your research areas, in Chinese *we will translate this for non-Chinese speaking UK participants*

Primary Research interests: *A fuller description of your main research areas.*

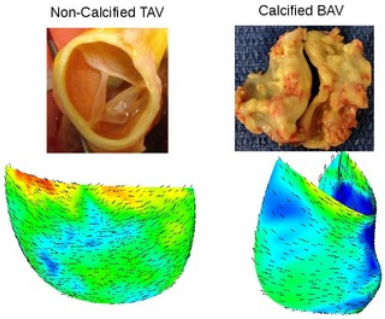
My research interests are at the interface of biology and mechanics with application to healthcare technology, primarily using advanced computational tools and multiscale methods. I am working on identifying and predicting the calcification of aortic valve and ways to emulate the mechanical properties of native valves so as to improve the performance of bioprosthetic ones. I am interested in a particular phenomenon called residual stress or pre-stress, which is present in almost all biological structures. However, its functional role is not entirely clear. I am working on elucidating its function and developing methods to incorporate it into bioprosthetics such that their performance is improved. I am also interested in mechanical characterization of other biological and tissue engineered materials.

Topics in which you would like to develop collaborative research:

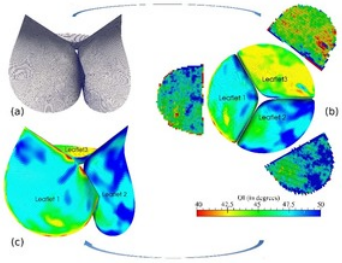
I am looking to complement my computational work with an experimentalist in areas such as tissue engineering, polymer bioprosthetics, and effect of cellular function on the macro scale mechanical properties.

Relevant existing collaborations (academic/clinical/commercial) inside or outside China.
USA: University of Pennsylvania, University of Texas at Austin, University of Oklahoma
UK: Durham University, King's College London

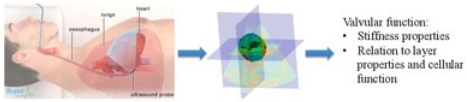
Relevant graphics, figures, pictures:



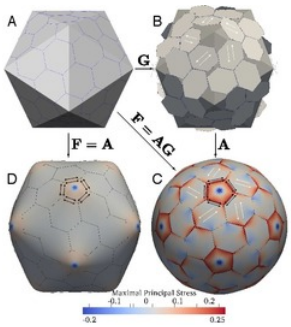
Architecture differences due to congenital valve disease



Computational model of tricuspid valve from patient specific fiber structure



Overall aim: In-vivo identification of valvular function



Conformational changes in protein shell explained by elasticity theory

Publications and other outputs relevant to your interest in this programme (up to 5)

[1] Ankush Aggarwal. An improved parameter estimation and comparison for soft tissue constitutive models containing exponential function. Biomechanics and Modeling in Mechanobiology, (under review)
[2] Ankush Aggarwal, Alison M. Pouch, Eric Lai, John Lesicko, Paul A. Yushkevich, Joseph H. Gorman III, Robert C. Gorman, and Michael S. Sacks. In-vivo heterogeneous func- tional and residual strains in human aortic valve leaflets. Journal of Biomechanics, 49(12):2481 – 2490, 2016. Special Issue on Cardiovascular Biomechanics in Health and Disease
[3] Ankush Aggarwal and Michael S. Sacks. An inverse modeling approach for semilunar heart valve leaflet mechanics: exploitation of tissue structure. Biomechanics and Modeling in Mechanobiology, 15(4):909–932, 2016
[4] Ankush Aggarwal, Giovanni Ferrari, Erin Joyce, Michael J. Daniels, Rachana Sainger, Joseph H. Gorman III, Robert Gorman, and Michael S. Sacks. Architectural trends in the human normal and bicuspid aortic valve leaflet and its relevance to valve disease. Annals of Biomedical Engineering, 42(5): 986–998, 2014
[5] Ankush Aggarwal, Joseph Rudnick, Robijn F. Bruinsma, and William S. Klug. Elasticity theory of macromolecular aggregates. Physical Review Letters, 109:148102, Oct 2012