



蔡小川 教授

Prof Cai Xiao-Chuan

## 澳門大學發展基金會應用數學講座教授

蔡小川教授現為科技學院應用數學講座教授、科研與研究生教育副院長及應用數學中心主任，擁有超過30年的教研經驗，其區域分解演算法及高性能計算之研究享負盛名。“如果說，我能夠透過數學算法就可得知你身體動脈血液流動的情況，你會感覺驚訝嗎？”他接著說：“沒錯，這個就是我加入澳大後著手研究的主要方向。”

蔡教授於2020年初加入澳大，致力引領數學系走向學術前沿，開展與人體有關的跨學科研究，透過把物理學、醫學、計算機學和數學有機結合，準確計算和描繪出人體血流的分佈，尤其是腦部血壓的狀態，這對探索大腦運作、觀察腦血管的研究具創新性的啟示。他的研究成果傑出和豐碩，包括發表超過170篇研究著作及取得32個美國及內地的研究資助項目。

蔡教授也感謝基金會擔當學者們的後盾，支持推進不同的研究項目。他表示，澳大配備先進的科研設施，使團隊研究工作事半功倍，如功能磁力共振成像平台，透過清晰的腦影像能有效輔助團隊進行分析。“我希望在過往算法研究的基礎上，能與大學不同科研單位合作，推進相關人體智能的研究，為人類科學貢獻。”

下圖影像為蔡教授腦血流的動態分佈，透過澳大黃瑞松助理教授的技術及認知與腦科學研究中心的MRI先進設備生成影像，而圖中顯示的流場則由超級電腦通過解Navier-Stokes方程計算所得。

## UMDF Chair Professor of Applied Mathematics

Prof Cai Xiao-Chuan, presently chair professor of Applied Mathematics at the Faculty of Science and Technology (FST), FST Associate Dean (Research and Graduate Studies) and Director of Centre for Applied Mathematics, has over 30 years of experience in research and teaching. He is world renowned for his work on parallel algorithms and high performance computing. 'Would it surprise you if I say I could know the blood flow in your arteries through mathematical algorithms? That is the main direction of my research since I joined UM.'

Prof Cai joined the university in early 2020 and has been committed to taking the Department of Mathematics to forefront of cutting-edge interdisciplinary research related to the human body. He aims to accurately calculate and depict blood flow, especially the blood pressure in the brain, through interdisciplinary studies that organically bring together physics, medical science, computer science and mathematics. This research project offers insights for exploration of human brain functions and observation of cerebral blood vessels. Over the years, Prof Cai has achieved outstanding research outcomes, publishing more than 170 research papers and obtaining 32 research funding projects from in the United States and the Chinese Mainland.



The image shows the flow field calculated on a supercomputer by solving the Navier-Stokes equations in Prof Cai's cerebral artery imaged by Prof Ruey-Song Huang on the MRI machine at UM's Centre for Cognitive and Brain Sciences.

Prof Cai expresses gratitude to the UMDF for its support to scholars that enables them to advance their research projects in various fields. He is appreciative that the university's laboratories are equipped with state-of-the-art research facilities, such as the functional magnetic resonance imaging system, which enables his team to conduct research more effectively. The detailed images of the brain and the brain stem produced by the system enable the team to carry out effective analysis and assessment. 'On the basis of my previous research, I look forward to collaborating with different research units of the university to promote exploration of human intelligence, and thereby making scientific contributions for the advancement of humanity.'