

**List of 2018 Summer Research Programmes
(as at 2018-01-26)**

Faculty/ Institutes	Ref No.	Project Title in English	Project Title in Chinese	Project Description	Application Requirement	Contact Points		
						Contact Person(s)	Contacts	Consultation hours (29 Jan - 2 Mar 2018)
FST	MYRG2015-00194-FST	Development of Guidance, Navigation and Control System of Small-scale Multi-rotor UAV Helicopters	小型多旋翼無人直升飛機導引導航控制系統的開發	In the project, student will design and test prototypes to detect corrosion in hard-to-access areas within one square inch by using the robots/small-scale Multi-rotor UAV Helicopters. Student will learn the skills in design, robots, control, manufacturing, testing, materials science and corrosion engineering.	Students studying EME major, interested in robotics and corrosion engineering	Prof. Chi Tat Kwok	Email: fstctk@umac.mo	Monday - Friday 11:00 - 12:00 by appointment
FST	MYRG2015-00128-FST	Temporal Data Stream Mining by Using Incrementally Optimized Very Fast Decision Forest (IOVDF)	非常快速及優化的決策森林用於時態數據流挖掘 (IOVDF)	This project is to research and develop a new breed of data stream algorithms/tools, for temporal data stream mining which is currently an emerging research hot topic in Big Data Analytics. The significance of the new model is to provide possibilities of stream mining temporal patterns in real-time that include time-critical applications for real-time sentiments analysis, opinion mining from social media, wireless sensor network data, human gesture recognition, physiological data streams and bioinformatics. In this project we focus on incremental learning, which makes real-time temporal data stream mining possible for the new breed of applications that fed on continuous data streams in nature.	Cumulative GPA at 2.50 or above, interest in data mining tools, experience in Java Programming preferred.	Prof. Simon Fong	Email: ccfung@umac.mo	Thursday - Friday 15:00 - 17:00
FST	MYRG2015-00043-FST	Semantically integrating information resources of disconnected virtual worlds to build an open virtual marketplace	語義整合離散虛擬世界信息資源以構建一個開放的虛擬集市	3D virtual world designs and the approaches to integrate the existing heterogeneous virtual worlds for resource interoperability	Cumulative GPA 3.0 or above; experiences on social network and virtual world; experiences on programming	Prof. Jingzhi Guo	Email: jzguo@umac.mo	Thursday - Friday 11:00 - 12:00
FST	MYRG2016-00240-FST	Prediction of learning effectiveness in neurofeedback training	神經反饋訓練中學習有效性的預測	Neurofeedback training (NFT) has shown the promise to enhance human behavioral performance and health by regulating the corresponding brain activity. The training effectiveness has crucial link with the learning ability which represents how well the individuals learn to modulate their brain activity. The objective of this research is to systematically investigate the NFT and its prediction under various training protocols with different training feedbacks, different training parameters for different behavior outcomes, and to identify corresponding predictors for NFT effectiveness.	Strong interests with academic research and serious working attitude. Knowledge about statistical analysis is a plus.	Prof. Feng Wan	Office: E11-3055 Tel: 8822 4473	Wednesday 11:30 - 12:30 Thursday 16:00 - 17:00
FST	MYRG2016-00217-FST	Improving the Protein-Ligand Scoring Function for Molecular Docking by Fuzzy Rule-based Machine Learning Approaches	研究以機器學習技法以改善蛋白質與配體嵌合強度的評分函數	Protein-ligand docking is an essential step in modern drug discovery process. The challenge here is to accurately predict and efficiently optimize the position and orientation of ligands in the binding pocket of a target protein. In this research, we investigate into applying machine learning algorithms for developing a ML-based protein-ligand scoring function. In particular, rule-based induction and swarm search optimization algorithms will be looked into. These two enable finding insights in the form of human-interpretable decision rules in protein-ligand interaction in virtual screening, and solving high-dimensional feature space problems, respectively. So if the virtual screening by computer technology works quickly and works very accurately, a lot of efforts (cost, time, money) by expensive software and laboratory equipment could be saved. New drugs can be developed sooner as vaccine for saving lives, especially when new epidemic virus emerge.	Cumulative GPA at 2.50 or above, interest in data mining or machine learning tools, experience in Java Programming preferred.	Prof. Simon Fong	Email: ccfung@umac.mo	Thursday - Friday 15:00 - 17:00
FST	MYRG2016-00212-FST	Design, control and applications of a novel hybrid active air suspension system for automobiles	汽車新製複合式主動空氣懸架系統設計、控制與應用	Hybrid active air suspension (HAAS) is a new automotive system to control the ride height, spring stiffness and damping force individually or concurrently according to the vehicle states. The duties of the student are to support the modelling and experimental validation of HAAS. Moreover, the student is also responsible to support the development of an intelligent algorithm for HAAS control.	1. Good English reading skill; 2. Good electromechanical engineering knowledge	Prof. Pak Kin Wong	Office: E11-4042b Email: fstpkw@umac.mo Tel: 8822 4956	Monday 11:30 - 12:30 Wednesday - Friday 17:45 - 18:45
FST	MYRG2016-00202-FST	Preconditioning techniques for high-dimensional nonlocal diffusion problems	高維非局部擴散問題的預處理技巧	This project involves fast algorithms for solving large linear systems with special structure. The fast methods developed can be applied to solving nonlocal diffusion problems.	Cumulative GPA is above 2.8.	Prof. Siu-Long Lei	Tel: 8822 4449	Tuesday 11:00 - 12:00 Thursday 11:00 - 12:00
FST	MYRG2016-00182-FST	Task Assignment Problems in Spatial Crowdsourcing	空間眾包環境下的工作匹配問題	Crowdsourcing is viewed as an emerging technique to solve computer hostile but human friendly problems. In this project, we are going to design a new algorithm to estimate and evaluate the traffic flow based on public transportation trajectory data. The tasks include (but not limited to) solution design, system implementation, data collection, and experiments, etc. You will work closely with me and my research students.	basic programming skills, fundamental data structure and algorithm design, hardworking, (preferable) good in statistics and mathematics	Prof. Leong Hou U	Email: ryanhu@umac.mo	Monday 11:00-12:00 Tuesday 11:00-12:00 Wednesday 11:00-12:00
FST	MYRG2016-00171-FST	Research on User Activity and System Optimization for Mobile Crowd Sensing	移動群智感知中的用戶行為以及系統優化研究	This project is to analytically investigate the following challenging issues: (1) We will design efficient incentive mechanisms to motivate high reputation mobile users to join the sensing activities such that enough number of high quality sensing data can be collected and desired services can be achieved. (2) We will study the activity of mobile users to optimize their individual or group utility by analyzing their competition and cooperation. (3) We will analyze mobile crowd sensing (MCS) network from system's point of view and design efficient mechanisms to achieve optimal system performance. (4) We will study how to efficiently model the social collection and similarity of mobile users in MCS, and then investigate the impacts of social network of mobile users on the performance of MCS applications.	The applicants should have some basic knowledge on the network and wireless communications, and also have some background about the optimization theory, probability and random process.	Prof. Fen Hou	Office: E11-3051	Friday 17:30 - 18:00
FST	MYRG2016-00169-FST	Formation Control of Nonlinear Multi-agent Systems using an Observer-Based Adaptive Backstepping Approach	非線性多智能體用觀測器的自適應編隊控制	This project aims to develop new deep models and learning algorithms for multi-agent control.	(1) have interests in artificial intelligence, and machine learning algorithms; (2) good background in mathematics or statistics; (3) programming skills in Matlab, or C	Mr. Jack Wong	Email: jackwong@umac.mo	Monday - Friday 15:00 - 17:00
FST	MYRG2016-00160-FST	A Study on Fisher Vector based Shape Modeling for Non-rigid 3D Shape Retrieval and Innovative Product Design	研究用於非剛性三維形體檢索和創新性產品設計的形體費舍爾向量建模方法	With the booming applications of 3D model in various product design fields, non-rigid 3D shape retrieval technology plays a pivotal role in design knowledge reuse and innovation. It is to recognize query shapes from a large shape database where each target shape may undertake different transformations. The most challenging issue is how to represent and recognize a deformable object's shape in accurate and efficient manner. In this project, a strong and fast shape Fisher Vector model for non-rigid 3D shape retrieval is proposed. The heat kernel signatures and its variant are used to convert a 3D shape model into a set of local descriptors. Their zero to second-order statistical terms are further computed to construct the Fisher vector. The high order moments enable a more informative representation of the latent shape properties. For shape classification, instead of the traditional metric learning method, a linear SVM is adopted to improve the generalization effectiveness. We will show the proposed method is superior to the state-of-the-art approaches via theoretical analysis, and experimental verifications on various latest benchmarks. A novel feature based product design framework that integrates 3D shape retrieval system is proposed to facilitate design innovation and knowledge acquisition.	1) Interested in design and analyze 3D data using computer; 2) interested to program for solving big data problem.	1. Ms. Lulu Tang 2. Ms. Luqing Luo 3. Prof. Zhixin Yang	Email: 1. yb57421@connect.umac.mo; 2. yb67456@connect.umac.mo; 3. zxyang@umac.mo	By appointment
FST	MYRG2016-00159-FST	Traffic Information Monitoring and Processing System based on Wireless Sensor Networks	基於無線感應器網路的交通資訊監測和處理系統的應用研究	The project aims to investigate new big data processing technologies and techniques in intelligent transportation systems.	(1) basic data mining knowledge (2) programming skills about Java, or R, or Scala, or Python.	Mr. Jack Wong	Email: jackwong@umac.mo	Monday - Friday 15:00 - 17:00

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FST	MYRG2016-00134-FST	HIGHLY EFFICIENT SEMANTIC SEMI-DENSE 3D RECONSTRUCTION USING QUADCOPTERS	基於四旋翼飛行器的高效語義半稠密三維重構方法	Development of a highly-efficient semantic 3D reconstruction system which i) captures accurate geometric structure and semantic interpretation in efficient manner; ii) provides usable 3D reconstruction output; iii) is applicable to quadcopter-based wide-area (horizontal and vertical area) semantic 3D reconstruction; iv) can be applied to embedded/wearable devices.	i) Familiar with C++ or Python or Matlab; ii) Experienced in computer vision or image processing or machine learning is a plus.	Prof. Chi Man Vong	Email: cmvong@umac.mo	Wednesday 15:00 - 17:00 Friday 15:00 - 17:00
FST	MYRG2016-00121-FST	Matrix Inequalities	矩陣不等式	In this project, we consider establishing some norm inequalities for matrix commutators.	Finished year 2, with GPA not less than 2.7.	Prof. Che Man Cheng	Office: E11-3065 Email: fstcmc@umac.mo	Monday 11:00 - 12:00 Friday 11:00 - 12:00
FST	MYRG2016-00093-FST	Novel Radiofrequency Identification System based on Nonlinear Harmonic Communication Technique	應用於新型射頻識別系統的非線性諧波通信技術	This project is about the use of harmonic theory for modern communications including RFID and; relevant microwave circuits like power amplifier, mixer will be designed.	Applicants with solid microwave engineering background are invited	Prof. Kam Weng Tam	Email: kentam@umac.mo Tel: 8822 4373	Tuesday and Friday by appointment
FST	MYRG2016-00069-FST	Nature-Inspired Computing and Metaheuristics Algorithms for Optimizing Data Mining Performance	超啟發式算法於優化數據挖掘計算性能	Nature-inspired computing and metaheuristics (NiCam) are gaining popularity in research community for their advantages applicable in computational intelligence, data-mining and their applications. Borrowed from the wonders of nature, NiCam algorithms .computationally optimize complex search problems, and they show an edge in performance and search efficiency, compared to earlier optimization techniques. In this project, the trio-team proposed to further innovate NiCam algorithms by mainly two directions: (1) applying NiCam for solving bottlenecks in data-mining algorithms; (2) extending current NiCam algorithms to novel ones by studying the technical details in greater depth, such as mathematical analysis of algorithm structures and convergence	Cumulative GPA at 2.50 or above, interest in data mining tools, experience in Java Programming preferred.	Prof. Simon Fong	Email: ccfong@umac.mo	Thursday - Friday 15:00 - 17:00
FST	MYRG2016-00025-FST	Applications of coupling method to studying the ergodicity of stochastic PDEs driven by degenerated pure jump Levy processes	耦合方法在研究退化純跳Levy 過程驅動的隨機偏微分方程遍歷性中的應用	To make some program to simulate the behaviour of stochastic approximation	Having learnt the courses Probability and Statistics in Mathematics Department	Prof. Lihu Xu	Email: lihuxu@umac.mo	By appointment
FST	MYRG2017-00218-FST	An Improved Background Reconstruction Based Disocclusion Filling Study in 3D Video Generation	改進的三維視頻生成過程中基於背景重建的遮蔽區域修補方法研究	The depth image based rendering (DIBR) plays a key role in converting the 2D videos into the stereoscopic 3D ones, in which the virtual views can be generated from a 2D video and its depth map. However, in the virtual view synthesis process, the background occluded by the foreground objects might be exposed in the new view, resulting in some holes in the generated 3D video. In this project, a hole filling approach based on background reconstruction is proposed, in which the temporal correlation information in both the 2D video and its corresponding depth map are exploited to construct a background video.	Familiar with Matlab programming. The main task is program code optimization.	Prof. Liming Zhang	Email: lmzhang@umac.mo Tel: 8822 8467	Monday 11:00 - 12:00 Wednesday 11:00 - 12:00 or by appointment via email
FST	MYRG2017-00207-FST	Steady-State Visual Evoked Potential-Based Brain Computer Interface Illiteracy: Its Assessment, Prediction and Improvement	基於穩態視覺誘發電位的腦機接口中的文盲問題：其評估、預測及改善	The BCI illiteracy problem has attracted serious attention of the community, however the existing research is limited to some preliminary, partial, isolated or indirect investigations. This project aims to study the illiteracy problem with SSVEP-based BCIs in a systematic manner. Based on a comprehensive analysis on the whole SSVEP-based BCI from the visual stimulus, the subject, the hardware and the algorithm parts, three main issues are identified, namely, the assessment, prediction and improvement on the SSVEP-based BCI illiteracy, to be explored in detail.	Strong interests with academic research and serious working attitude. Knowledge about statistical analysis is a plus.	Prof. Feng Wan	Office: E11-3055 Tel: 8822 4473	Wednesday 11:30 - 12:30 Thursday 16:00 - 17:00
FST	MYRG2017-00181-FST	Reutilization of waste materials to enhance the bioremediation of volatile organic compounds and heavy metals in contaminated soil and water	重複利用廢棄物加深生物降解土壤和水中的有機污染物和重金屬	Remediate a mixture of benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl <i>tert</i> -butyl ether (MTBE), trichloroethylene (TCE), <i>cis</i> -1,2-dichloroethylene (<i>cis</i> -DCE), and heavy metals coexisting in contaminated soil and water by the development of a hybrid remediation technology (biological and physical). The inhibitory/stimulatory effects of heavy metals on bioremediation of these contaminants will also be evaluated.	N/A	Dr. Renata Alves de Toledo	Office: E11-3095 Email: toledora@gmail.com	Monday - Friday 14:30 - 16:30
FST	MYRG2017-00146-FST	Structure, Function, and Natural Compound Inhibitor Identification of the Inflammatory Complement C5a Receptors By Combined In silico and In vitro Methods	結合電腦模擬及生物活體外實驗技術研究發炎補體蛋白 C5a受體的結構及功能，和其天然化合物抑制劑的鑑定	As part of this project is to construct the natural product database, the candidate is required to harvest molecular datasets online, preprocess them into structural format suitable for doing virtual screening by docking program. The candidate will also design a web query system for users to access these datasets, visualize the molecule, provide information, and to perform filtering of the dataset for specific needs.	Familiar with linux and linux commands. Willing to learn (if not yet familiar) Bash and Python programming.	Prof. Shirley Siu	Email: shirleysiu@umac.mo	Monday 15:00 - 17:00
FST	MYRG2017-00135-FST	Study on Dynamic Characteristics of Automotive Hydraulic Adjustable Dampers and its Application to Semi-active Suspension Systems	車用液壓可調減振器之動力學特性的研究與其半主動懸架系統之應用	The stepper-motor driven adjustable hydraulic damper (SMDAHD) is an emerging shock absorber for modern automobiles. In this project, the student will be asked to support the modelling and experimental validation of a SMDAHD. The student will also support to apply the SMDAHD to automotive semi-active suspension systems in order to provide a low-cost solution for improving the vehicle dynamic performance.	1. Good English reading skill; 2. Good electromechanical engineering knowledge	Prof. Pak Kin Wong	Office: E11-4042b Email: fstpkw@umac.mo Tel. 8822 4956	Monday 11:30 - 12:30 Wednesday - Friday 17:45 - 18:45
FST	MYRG2017-00044-FST	Measurement of Vertical Profiles for Particulate Matters in Suburban and Pristine Environments Using an Unmanned Aerial Vehicle Platform	基於無人機的大氣顆粒物垂直分佈測量系統及其在城市近郊和原生環境中的應用	Atmospheric particulate matter (PM) pollution is one of the most serious environmental issues, which have impacts on human health and on the global climatic system. There is currently a lack of studies in the spatial distributions of PM pollution for better model prediction of PM transport and transformation. The current study proposes to investigate vertical distributions of PM characteristics including mass concentration, number concentration, and black carbon (BC), using an unmanned aerial vehicle (UAV) equipped with miniature PM measurement devices. The objectives of the proposed study include firstly a thorough evaluation of the UAV-based system, then applications of the system in both urbanized (Macau) and pristine (Amazon forest) environments, and finally investigation on how synoptic conditions and chemical processes affect the vertical distributions of PM. The results from the proposed study will be beneficial in a number of ways, including a better understanding of the transport of urban PM pollution in densely populated areas, a more complete picture for modeling the climate-modifying species (e.g. BC) in different environments, as well as an assessment of the role of secondary formation on PM spatial distribution.	GPA 3.0 or above; ability to use Python or other software for data treatment preferred.	Prof. Yongjie Li	Office: E11-3017 Email: yongjeli@umac.mo	Monday 16:00 - 17:00 Tuesday 16:00 - 17:00
FST	MYRG2017-00003-FST	Parallel Non-Dimensional Lattice Boltzmann Simulations of Fluid Flow and Heat Transfer in Solar Thermal Collectors	適用於太陽熱能收集器中的流動和傳熱模擬的並行無量綱玻爾茲曼算法	The first objective of the present study is to develop a new Parallel Non-Dimensional Lattice Boltzmann Method (P-NDLBM) to dramatically speed up the computation of transient fluid flow and heat transfer inside real solar collectors with larger grid numbers. The second objective is to compile a uniform computational code using Message Passing Interface (MPI). This code will be in uniform structure for both direct simulations and porous medium model simulations. And the code will be validated by comparison to experimental and single core computational studies, and the CPU effectiveness will be obtained for various CPU numbers. The third objective is to obtain the optimal design of solar thermal collectors with immersed heat exchangers or encapsulated phase change material (PCM) tubes for energy storage enhancement based on the transient simulations results obtained by the new MPI P-NDLBM code.	Familiar with Matlab and C Programming	Prof. Yan Su	Email: yansu@umac.mo	Tuesday 12:00 - 13:00 Friday 12:00 - 13:00