上海交通大學
SHANGHAI JIAO TONG UNIVERSITY

SJTU SUMMER RESEARCH INTERNSHIP PROGRAM

2019

Contact :
http://summerprogram.sjtu.edu.cn/
Email: isc.mobility@sjtu.edu.cn

S J T U

20 SUMMER RESEARCH INTERNSHIP PROGRAM 19

Shanghai Jiao Tong University (SJTU) is a higher education institute in China, which enjoys a long history and a world-renowned reputation. Through 122 years of unrelenting effort, SJTU has become a comprehensive and research-oriented top international university in China. SJTU enjoys an ever-increasing level of scientific research excellence and technological innovation. During 2015, SJTU was named the leading institute in the nation, in terms of project numbers and amount of money issued by the National Natural Science Foundation of China, for the 6th consecutive year. SJTU also ranks second in the nation for sponsored research grants.

SJTU Summer Research Internship Program aims to promote international research collaboration and enhance the academic environment at Shanghai Jiao Tong University. It offers excellent undergraduate students from around the world the opportunity to spend a summer studying at world-class research laboratories, alongside prominent research professors. It will prepare undergraduate students for further study through intensive research experience with faculty mentors and enrichment activities.

In addition, participants will develop their research skills by enjoying lectures with topics such as "How to Write a Research Essay", "How to Cooperate in a Project". Participants will also learn about Chinese language and culture which will enhance their intercultural awareness and communication.

What Participants will receive?

> Knowledge of the top research projects in China
> The opportunity to work with top Chinese professors, fellows, and students
> A good basis for a career in academic research
> The opportunity to co-author a scientific paper
> Knowledge of Chinese language and culture
> A rewarding and unforgettable experience in China

Eligibility Requirements

> Students from overseas, Hong Kong, Taiwan, and Macao are eligible to apply.
> Students must have completed at least one year of an undergraduate program and be enrolled as a current undergraduate.
> Hold at least a 3.0 GPA on a 4.0 scale or equivalent.
> Students from non-English speaking countries must provide an English language proficiency certificate: an IELTS with a score no less than 6.0 or a TOEFL with a score no less than 78 points. If you are studying a fully English taught program, you must provide the relevant certificates.
> Additional requirements vary per laboratory.

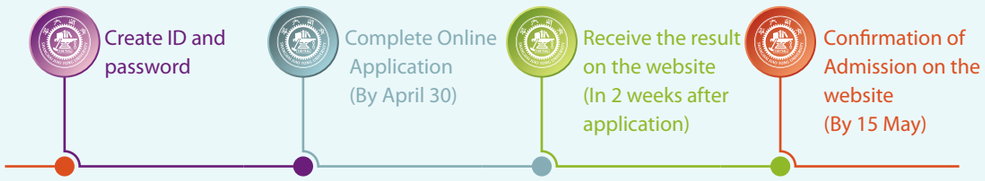
Duration

11 July, 2019-23 August, 2019

Academic Information

Credit	3 SJTU Credits	
Program duration	In-Lab Hours: 20 hours/week	
Assessment	There are three grading sections in this program:	
	Attendance	=30%
	Midterm presentation	=30%
	Final written report	=40%

Application Procedures



Please apply through the website: ***http://apply.sjtu.edu.cn*** [1]

The following items shall be uploaded alongside the online application:

- A scan of the identification page of your passport. The passport must be valid for at least 6 more months for the visa application.
- ID photo (similar to a passport photo)
- Curriculum vitae (CV)
- Copy of your most recent academic transcript
- Motivation letter
- Recommendation letter
- Report of your past research experience (if available)
- Language proficiency certificate (if available)

Program Fee

Application fee (Non-refundable)	400RMB
Tuition fee	8000RMB

** Tuition fee waived for all participants*

[1] It is very important that you fill in your name correctly on the online application. You should type in your legal name as it appears on your passport exactly.

Online Application Deadline

30 April, 2019

Announcement

You will be notified of the results through our website and an email within two weeks of completing the application.

Certificate and Transcript

After completing the program and submitting the final report, participants will receive an official certificate from the university.

Official transcripts will be sent to the mailing address you provided in the application in September, 2019. Students who wish to transfer credits need to obtain pre-approval from the relevant authorities at your home universities.

Accommodation

SJTU Summer Research Internship Program will be conducted at two campuses: Xuhui and Minhang. Students are able to choose on-campus and off- campus accommodation dependent on the location of the lab.

For on-campus accommodation, room reservations should be made online at dorm.sjtu.edu.cn and the accommodation fee should be paid online. As the on campus accommodation is limited, you can also choose the off-campus accommodation.

More detailed information regarding the accommodation reservation will be released once you have been admitted to Summer Research Internship.

For more information, please contact International Student Service Center
Minhang Campus: issc_minhang@sjtu.edu.cn +86-21-34203955
Xuhui Campus: issc_xuhui@sjtu.edu.cn +86-21-62933305

Visa

SJTU will provide students with a JW 202 and an admission notice. Applicants should bring the visa paperwork, admission notice, JW 202 form and a valid passport to the local Chinese embassy or consulate to apply for a short-term student visa (usually the visa type "X 2"). Those who are already in China need to submit a copy of the visa page, residence registration notice and the above application documents to the PCB in Shanghai after registering at SJTU.
The JW 202 form and the admission notice will be sent to the applicant via an international courier within two weeks after April 30, 2019.

* If you are a local student from Hong Kong, Macao or Taiwan, you do not need the JW202 form.

Insurance

Students who plan to attend this program should obtain insurance before coming to study in China. Each student needs to present the insurance certificate to the administrative staff on the day of registration.

Timeline

Preparation for the application	*September to December, 2018*
Completion of the online application	*January to April, 2019*
Notification of the application result	*February to May, 2019*
Visa application and insurance	*May to June, 2019*
Online accommodation reservation	*June, 2019*
Check-in at the dormitory and Registration	*11 July, 2019*
Opening Ceremony	*12 July, 2019*
Internship	*11 July- 23 August, 2019*
Finishing the program survey of issuing of certificates	*30 August, 2019*
Check-out at the dormitory	*23 August, 2019*
Transcript delivery	*September, 2019*

Contact

Email: isc.mobility@sjtu.edu.cn
Website: http://summerprogram.sjtu.edu.cn/

List of Research Projects

Mechanical Engineering

Project 1 Hand-Eye Coordination Algorithm for Minimally Invasive Surgical Robot

Project 2 Optimal Design of Neural Electrode Coating

Project 3 Key Technology in Microscopic/Endoscopic Surgical Robotics Based on Augmented Reality

Project 4 The Research on Digital Design and Manufacturing of Customized Implants(Surgical Templates) Based on Virtual Reality and 3D-Printing

Project 5 Mechanism Design of Medical Robotic System

Project 6 Creative Design of Novel Neural Electrode

Project 7 Chemistry in Clean Combustion

Project 8 Gas Turbine Model Reactor: Swirling Flame Dynamics Investigated by Laser Diagnostics

Project 9 Electrocatalyst Development for Proton Exchange Membrane Fuel Cells

Project 10 Electric Vehicle Range Extender and Testing

Project 11 Computer Vision for Intelligent Vehicles

Electronic Information and Electrical Engineering

Project 12 Autonomous Quadrotor Landing on a Moving Platform

Project 13 Fabrication and Modeling of Underwater Bio-inspired Soft Robot

Project 14 Unmanned Delivery Robot

Project 15 Pricing and Protection Mechanisms for Big Data

Project 16 Human Gesture Detection and Classification Using Mm-wave Radar with Machine Learning

Project 17 Parameters Estimation for Randomly Polarized Signals Using a Nested Array

Project 18 Computer Aided Diagnosis based on Artificial Intelligence and Medical Image Analysis

Project 19 Advanced Kernel Methods for Machine Learning

Project 20 Machine Learning for Optical Communications

Project 21 Neural Patterns among Different Cultures for EEG-based Emotion Recognition

Naval Architecture, Ocean and Civil Engineering

Project 22 Model Tests on Marine Renewable Energy Devices

Project 23 Numerical Simulations of the Unsteady Aerodynamics of Offshore Floating Vertical Axis Wind Turbines

Project 24 Flow Instabilities in the Wake of a Circular Cylinder with Parallel Dual Splitter Plates Attached

Project 25 Green Building Materials

Project 26 Modular Construction

Project 27 Automated Construction Systems of High Rising Building

Materials Science and Engineering

Project 28 Chemical Characterization Technology Based on Attenuation Contrast of X-ray

Project 29 Fabrication and Characterization of a Al/HEAs(High Entropy Alloys) Laminated Composite

Environmental Science and Engineering

Project 30 Environmentally-Friendly Technology for Rapid On-line Recycling of Waste Plastics from E-waste using Near-infrared Spectroscopy

Project 31 "In-situ remediation of contaminated lake-sediments via synergistic effects of adsorption, catalytic degradation and oxygen-regeneration of a novel Metal (Hydr)oxide", a National Key Project on Prevention and Control of Water Pollution from Ministry of Environmental Protection of China (2017ZX07203-005)

Project 32 Sulfonated Hyperbranched Polymers Assisted Nanofiltration Membrane with Enhanced Water Flux and Anti-fouling Property

Project 33 Mechanism Analysis for the Pollutant Mass Transfer and Removal in Extractive Membrane Bioreactor

Project 34 Adsorption of Trivalent Antimony from Aqueous Solution Using Amidoxime-modified Polyacrylonitrile

Biomedical Engineering

Project 35 Techniques for Multimodal Neuroimaging and Neuromudulation

Project 36 Tuning Neural Stem Cells with Physical and Biochemical Cues

Project 37 bFGF Gene Engineered Endothelial Progenitor Cells for Ischemic Stroke Treatment

Project 38 Mechanisms of New Targets in Tumor Metastasis and Development of Therapeutic Methods

Project 39 Developing Molecular Probes for Tracking Stem Cell Derived Exosomes in Live Animal

Physics

Project 40 Imaging Topological Materials via a Scanning Tunnelling Microscopy

Project 41 Molecular Beam Epitaxy Growth of Topological Insulator Thin Films

Life Sciences and Biotechnology

Project 42 Cloning and Functional Characterization of Rice Male Sterile Genes

Project 43 Molecular Mechanisms Controlling Inflorescence and Spikelet Development in Rice and Barley

Project 44 Molecular Characterization of GMOs.

Project 45 Long Noncoding RNA Modulate Migration of Vascular Smooth Muscle Cells

Agriculture and Biology

Project 46 Metabolic Regulation and Engineering of Medicinal Plants

Pharmacy

Project 47 Recombinant Biologics and Monoclonal Antibody Medicine Discovery

Medicine

Project 48 Molecular Biology of Leukemia and Targeted Cancer Therapies

Design

Project 49 Visual Inspection and Non-destructive Test on Chinese Ancient Building

Project 50 Digital Mapping and Survey of Architectural Heritage

Project 51 Shanghai Industrial Heritage Research

Project 52 Climate Adaptive Smart City Research

Project 53 Big Data and Smart Urban Design

Project 54 Research on Spatial Experience Design Based on the Study of User Needs

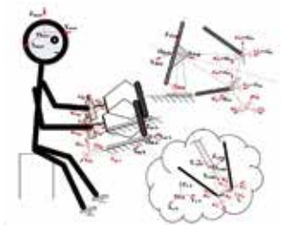
Project 55 Research on User Experience Design Based on the Study of User Needs

Mechanical Engineering

Project 1
Hand-Eye Coordination Algorithm for Minimally Invasive Surgical Robot

Contact Information
Prof. Qixin Cao
Email: qxcao@sjtu.edu.cn

Project Description and Objectives



Typical minimally invasive surgical robots are generally used for remote operations. This involves doctors carrying out surgical operations according to endoscopic images, through a handheld device to control the distal surgical robot. This approach has a variety of advantages, the robot is more stable and accurate than the doctor's hand and it's very useful for surgeries that need to be operated in the X-ray environment, such as some orthopedic surgeries. The sharing of genuine medical resources can be realized in the future for doctors and patients who are isolated by geographical location. Excellent doctors can be accessible to people around the world.

The hand-eye coordination algorithm studied in this project is established by mapping the correlation between hand movements and the endoscopic images to enhance the surgeon's presence. Hand-eye coordination, including control of the robot, coordinate system transformation and so on, is one of the core technologies used in the remote operation problem.

Eligibility Requirements
Interested students should have basic knowledge of robot control and coordinate transformation.

Main Tasks
Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website
Lab: http://robolab.sjtu.edu.cn/
School: http://me.sjtu.edu.cn/English/Default.aspx

Project 2
Optimal Design of Neural Electrode Coating

Contact Information
Dr. Wenguang Zhang
Email: zhwg@sjtu.edu.cn

Project Description and Objectives
Neural electrode coating is aimed at assisting people with neurological disabilities by stimulating or recording neural tissue and creating a link between the nervous system and the outside world. Recent progress in nanotechnology has been applied to improve neural electrode coating with nanomaterials, such as conducting polymers, carbon nanotubes, silicon nanowires and hybrid organic-inorganic nanomaterials. This is done to enrich the application of neural electrodes, reduce the damage to neural tissues and to make the electrode work longer. A different combination of materials, dimensions for coating and manufacturing processes can be considered for change.

In the project, both software simulations and experiments are possible. You can choose to do simulations of your own design or take advantage of the advanced manufacture and test technology at the university to conduct experiments.

The objective of the internship is to contribute to our long-term project with new ideas and designs based on what we are doing now.

Eligibility Requirements
Basic knowledge of mechanical engineering is mandatory and of finite elements method is a plus.
Basic knowledge of ANSYS, ABAQUS or other simulation software is preferred.
Proficiency in writing and speaking is mandatory.
Carefulness, patience and interest in the experiment.

Main Tasks
Propose a new idea to improve neural electrode coating.
Present the design result with either a simulation or an experiment.
Finish a report of the internship.

Website
Lab:http://en.sjtu.edu.cn/research/centers-labs/state-key-laboratory-of-mechanical-systems-and-vibration
School: http://me.sjtu.edu.cn/

Project 3
Key Technology in Microscopic / Endoscopic Surgical Robotics Based on Augmented Reality

Contact Information
Asso.Prof. Xiaojun Chen
Email: xiaojunchen@sjtu.edu.cn

Project Description and Objectives
As a modern minimally-invasive surgery, microscopic/endoscopic techniques are widely used in the field of surgery, however, the current orthopedic robots are only applicable for traditional open surgery, their working principles, operation mode, as well as the software and hardware systems simply do not apply to microscopic/endoscopic surgery. In this project, some leading-edge algorithms regarding multi-modal image registration, automatic segmentation, high quality visualization, and precise planning are proposed for important anatomical structures in musculoskeletal system. Then, a surgical navigation system based on Augmented Reality is established on the basis of real time segmentation, non-rigid registration and 3D reconstruction for intra-operative ultrasound and endoscopic images, aiming at solving the problems of soft tissue deformation and tracking. Finally, the comprehensive, light, and smart mechanical structures and control systems for surgical robots in endoscopic orthopedics are designed and integrated with our previously self-developed surgical navigation and robotic system, achieving the ultimate prototype of "Microscopic/Endoscopic Surgical Robotics Based on Augmented Reality ". The accuracy, effectiveness and reliability of the whole system will be validated through phantom experiments and clinical trials, for the goal of the mass clinical application. The research outcome of this project will promote the personalization, safety, accuracy, and minimal invasion of microscopic/endoscopic orthopedics, leading the direction in the international field of orthopedic robotics.

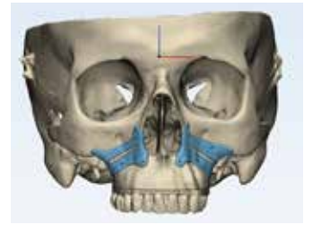
Eligibility Requirements
Interested students should be very proficient in C++ programming and have basic knowledge of medical image computing.

Main Tasks
Develop a software.
Finish a research report.
Give two research presentations (a. references review; b. technical presentation).
Submit one paper to a journal as a co-author.

Website
Lab: http://sseme.sjtu.edu.cn/EN/Default.aspx
School: http://me.sjtu.edu.cn/English/Default.aspx

Project 4:
The Research on Digital Design and Manufacturing of Customized Implants (Surgical Templates) Based on Virtual Reality and 3D-Printing

Contact Information
Asso. Prof. Xiaojun Chen
Email: xiaojunchen@sjtu.edu.cn

Project Description and Objectives


Oral disease is one of the most common diseases for mankind. As the treatment of oral diseases, oral and maxillofacial surgery, aims to treat the entire cranio-maxillofacial complex: anatomical area of the mouth, jaws, face, skull, as well as associated structures. However, the limited intrao-perative visibility, especially the anatomical intricacies, makes this kind of surgery a demanding procedure. In addition, the accuracy and stability of the operations is very difficult to be guaranteed. In this project, with the integration of computer-assisted surgical planning, virtual reality, computer graphics, and 3D-Printing, the methodology of the design and manufacturing of customized template is presented for oral and maxillofacial surgery, aiming to meet the unique demands of China's clinical application.
On the basis of relevant basic theory and innovative algorithms, computer-assisted preoperative planning system and virtual simulation system will be realized to determine the optimal surgical path for oral and maxillofacial surgery. Then, the system for digital design and manufacturing of customized templates will be presented. Through phantom experiments and clinical trials, the influence of the factors such as the geometrical contours, material properties, and processing parameters of the devices on the processing quality and clinical accuracy will be revealed. Therefore, those parameters can be optimized to demonstrate its accuracy, validity and reliability. Ultimately, an integrated platform for digital design and manufacturing of customized templates will be formed, aiming to provide innovative technical methods for the personalization, digitalization, and minimal invasion of oral and maxillofacial surgery, and greatly improve the general life quality of the patients. .

Eligibility Requirements
Interested students should be very proficient in C++ programming and have basic knowledge of medical image computing.

Main Tasks
Develop a software.
Finish a research report.
Give two research presentations (a. references review; b. technical presentation).
Submit one paper to a journal as a co-author.

Website
Lab:http://sseme.sjtu.edu.cn/EN/Default.aspx
School: http://me.sjtu.edu.cn/English/Default.aspx

Project 5
Mechanism Design of Medical Robotic System

Contact Information
Asso.Prof Yanping Lin
Email: yanping_lin@sjtu.edu.cn

Project Description and Objectives
This medical robotic system which is designed and researched on would be used in surgical operation. And it was mainly used to accomplish puncturing or drilling operation accurately. In order to meet the requirement of surgical operation, the robotic system should have the following functions: 1) Locating different surgical tools conveniently such as puncture needle or drill in right location and orientation. 2) Driving the surgical tools moving along its axis. This project mainly researches and designs a novel mechanical structure of the medical robotic system to meet the above functional requirements.

Eligibility Requirements
Interested students should have basic knowledge of mechanical engineering.

Main Tasks
Complete mechanical structure design of the surgical robot end-effector.
Finish 3D modeling and 2D drawing of the end-effector.

Website
Lab: http://sseme.sjtu.edu.cn/CN/Default.aspx
School: http://me.sjtu.edu.cn/English/Default.aspx

Project 6
Creative Design of Novel Neural Electrode

Contact Information
Dr. Wenguang Zhang
Email: zhwg@sjtu.edu.cn

Project Description and Objectives
Neural electrode is aimed at assisting people with neurological disabilities by stimulating or recording from neural tissue and then creating a link between the nervous system and the outside world. However, the short life is a great limitation for the development of neural electrode.

To improve the longevity of neural electrodes, many researches try to change the shape of the neural electrodes and design new structures. In our previous work, several kinds of optimized neural electrodes were designed, such as the microelectrodes with convex streamline and electrodes with the capability of vibration attenuation, which are confirmed reasonable.

This project is aimed to design novel electrode with new structure and beneficial characteristics to improve the longevity of the electrode. In the project, both simulation with software and experiment are possible. You can choose to do some simulation of your own design or take advantage of advanced manufacture and test technology in the university to do some experiment.

The objective of the internship is to make some contribution to our long-term project with some new idea and design based on what we are doing now.

Eligibility Requirements
Basic knowledge of mechanical engineering is mandatory, finite elements method is a plus.
Basic knowledge of ANSYS, ABAQUS or other simulation and modeling software is preferred.
Excellent writing and speaking communication are mandatory.
Carefulness, patience and interest in experiment.

Main Tasks
Propose a new idea to improve the neural electrode.
Present the result of design either with simulation or with experiment.
Finish a report of the internship.

Website
Lab:http://en.sjtu.edu.cn/research/centers-labs/state-key-laboratory-of-mechanical-systems-and-vibration
School: http://me.sjtu.edu.cn/English/Default.aspx

Project 7
Chemistry in Clean Combustion

Contact Information

Prof. Fei Qi
Email: fqi@sjtu.edu.cn

Project Description and Objectives

Combustion provides over 85% global primary energy supply nowadays. Clean combustion is one of the most important approaches to achieve environmental-friendly energy supply. To reduce the air pollutants in combustion, many novel combustion concepts have been proposed, where chemistry plays a crucial role and should be thoroughly understood. In this study, the chemistry in low-temperature combustion (LTC), which is a novel combustion concept to reduce both NOx and PM emissions in engine combustion, will be investigated with advanced experimental approaches. Key elementary LTC reactions will be investigated using a newly designed shock tube over a wide range of pressures and temperatures. A flow reactor and a jet-stirred reactor combined with mass spectrometry (MS), gas chromatography (GC) and GC×GC technique will be used to understand the secrets in LTC engine-relevant conditions. Kinetic models for the investigated fuel will be developed and validated based on the experimental findings. The outcome from these studies will be used to explore strategies for the control of combustion pollutant emissions in a more intelligent way.

Eligibility Requirements

Understanding of lab safety.

Knowledge of physical chemistry is necessary.

Students who have experiences in labs is preferred.

Main Tasks

Measurements of key elementary LTC reactions in a shock tube.

Measurements of key intermediates in a flow reactor and a jet-stirred reactor using various diagnostic tools.

Development of a kinetic model for a specific engine fuel.

Website

Lab: http://combustion.sjtu.edu.cn/home/

School: http://202.120.53.238/English/Default.aspx

Project 8
Gas Turbine Model Reactor: Swirling Flame Dynamics Investigated by Laser Diagnostics

Contact Information

Prof. Fei Qi
Email: fqi@sjtu.edu.cn

Project Description and Objectives

Combustion diagnostics techniques based on laser spectroscopy is an accurate and nonintrusive technique that have emerged to become an indispensable tool of combustion science and development of combustion technology. In this study, a swirl-stabilized burner is constructed to investigate flame dynamics and thermoacoustic instability. It consists of a driver unit, a settling chamber, a contraction ended by a constant diameter duct, a horizontal end piece and an enclosed chamber. The rotation of the flow is induced by an axial swirler equipped with eight twisted airfoil vanes. A small bluff body is used to stabilize the flame during the unsteady motion of the flow. A loud speaker installed at the bottom of the setup provides acoustic excitation to the flame. Air and fuel are premixed and enter the bottom of the burner through two tubes connected to the burner.

To investigate the response of the swirling flame to the acoustic excitation, both the unsteady flow field and the evolution of the flame surface are measured simultaneously. The measurement techniques mainly depend on a high-speed burst mode Nd:YAG laser with a repetition rate of up to 100 kHz and two intensified high-speed CMOS cameras. High speed PIV is used for the measurement of the unsteady flow field. PLIF for the distribution of CH2O/acetone is used to capture the evolution of the flame front. Tunable diode laser absorption spectroscopy is adopted for the measurement of flame temperature and concentrations of CO2/H2O. A hot wire is equipped in the downstream of the swirler used to measure the flow velocity variation due to the acoustic excitation. Raman scattering techniques have also been used in this study.

Eligibility Requirements

Understanding of lab safety.

Knowledge of combustion and flame is necessary.

Interested students should have basic knowledge of laser and photonics

Main Tasks

Measurement of swirling flames dynamics using laser diagnostics techniques based on burst mode pump laser, Raman spectroscopy, or absorption spectroscopy.

Development of transverse sound measurement of the annular ring combustor.

Developing flame transfer function between the upstream forcing and flame response.

Website

Lab: combustion.sjtu.edu.cn

School: http://202.120.53.238/English/Default.aspx

Project 9
Electrocatalyst Development for Proton Exchange Membrane Fuel Cells

Contact Information

Prof. Junliang Zhang
Email: junliang.zhang@sjtu.edu.cn

Project Description and Objectives

A burgeoning global demand for clean, efficient, and sustainable energy sources makes fuel cells, especially hydrogen-based proton exchange membrane fuel cells (PEMFCs), has led to increased attention in alternatives to fossil-fuel-based power sources. A key component of PEMFC is the electrocatalyst, which catalyze the oxygen reduction reaction and directly determines the fuel cell performance. Platinum is the mostly used electrocatalyst, however, it suffers from the high cost and low reserve issue that limits its widespread application. Therefore, the development of alternative materials to replace platinum is necessary.

This project aims to introduce the basic design principle of electrocatalyst for fuel cells, and to practice the design, preparation and optimization of high performance novel electrocatalysts.

Eligibility Requirements

Interested students should have a basic knowledge of chemical engineering or material science.

Main Tasks

Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website

Lab: http://junliang.sjtu.edu.cn
School: http://me.sjtu.edu.cn/

Project 10
Electric Vehicle Range Extender and Testing

Contact Information

Assoc. Prof. Xuesong Li
Email: xuesonl@sjtu.edu.cn

Project Description and Objectives

Automotive engineering and related technologies have gained substantial attention and investment in this information era, surprising or not. With the technology of hybrid vehicle, electric vehicle, vehicle-to-everything (V2X), assisted driving and autonomous driving, etc., new insights and rapid growth are seen in this industry, with the embrace of both traditional technologies and new methodologies. This summer research program will focus on some of the hot topics in this field, more specifically, electric vehicle range extension with 2-cylinder internal combustion engines. This program will aim at both theoretical studies including literature review and report drafting, as well as gaining hands-on experience in the laboratory. The objective of the project is to help the students build up ideas about how research projects and engineering projects are performed, and also help the students to understand the fundamentals for the chosen topic so that they would be better equipped in continuing or starting education/employment in the field of automotive engineering.

Eligibility Requirements

Basic knowledge/coursework in thermodynamics or mechanical engineering

Main Tasks

Complete three lab experimental reports.
Midterm technical presentation.
Finish a program final report.

Website

Lab: http://www.auto.sjtu.edu.cn/index_ywz.aspx
School: http://me.sjtu.edu.cn/

Project 11
Computer Vision for Intelligent Vehicles

Contact Information
Assoc. Prof. Xuesong Li
Email: xuesonl@sjtu.edu.cn

Project Description and Objectives
Automotive engineering and related technologies have gained substantial attention and investment in this information era, surprising or not. With the technology of hybrid vehicle, electric vehicle, vehicle-to-everything (V2X), assisted driving and autonomous driving, etc., new insights and rapid growth are seen in this industry, with the embrace of both traditional technologies and new methodologies. This summer research program will focus on some of the hot topics in this field, such as computer vision for the application of assisted-driving and autonomous driving. This program will aim at both theoretical studies including literature review and report drafting, as well as gaining hands-on experience from programming and image processing to recognize vehicles/pedestrian/signal lights from real images captured. The objective of the project is to help the students build up ideas about how research projects and engineering projects are performed, and also help the students to understand the fundamentals for the chosen topics so that they would be better equipped in continuing or starting education/employment in the field of automotive engineering.

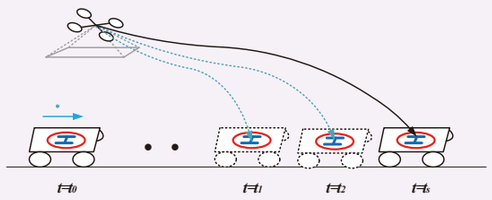
Eligibility Requirements
Basic knowledge and experience in programming (MATLAB, C, etc.).

Main Tasks
Complete three homework in image processing.
Midterm technical presentation.
Finish a program final report.

Website
Lab: http://www.auto.sjtu.edu.cn/index_ywz.aspx
School: http://me.sjtu.edu.cn/

Project 12
Autonomous Quadrotor Landing on a Moving Platform

Contact Information
Prof. Wang Hesheng
Email: wanghesheng@sjtu.edu.cn

Project Description and Objectives


This project focuses on the research of autonomous quadrotor landing on moving platforms. The autonomous landing of the quadrotors on moving platform is one of the recent research hotspots. Due to underactuation of the quadrotor dynamical system and difficulties of estimating the states of the quadrotor, this problem remains a challenge to be further investigated. The project plan to use the down-facing camera and IMU to accurately estimate the states of the quadrotor. At the same time, the down-facing camera is also used to estimate and predict the motion states of the moving landing platform. Taking dynamical underactuation as well as visibility issue into account, the project can optimize landing trajectory planning work, and thus realize the task of autonomous quadrotor landing performance.

Eligibility Requirements
Basic ability in C++ programming.
Basic knowledge of robot control and optimizations.

Main Tasks
Complete numerical analysis of landing performance.
Conduct physical experiments.
Complete a technical report.

Website
Lab: http://robotics.sjtu.edu.cn/
School: http://english.seiee.sjtu.edu.cn/

Project 13
Fabrication and Modeling of Underwater Bio-inspired Soft Robot

Contact Information
Prof. Wang Hesheng
Email: wanghesheng@sjtu.edu.cn

Project Description and Objectives
The project aims to explore the capacity of the soft robot in specific underwater operating environment by learning the morphology and motion mode from the marine organisms. Bio-inspired soft robots have generated increasing attentions due to their optimal performance in specific environments stemming from their unique morphology and sensorimotor capabilities. The project intends to complete both fabrication and modeling work of the newly constructed soft robot. The students will first cooperate on mechanical design and select appropriate actuator to realize autonomous motion of the robot in underwater environment. Thereafter, mathematical modeling work is required. Discrete and continuous modeling methods are alternative depending on the morphology and mechanism characteristics of the prototype. The contribution of control algorithm follows, aiming to realize specific control tasks such as positioning, tracking and so forth. The lab provides diverse hardware facilities such as silicone moulding tools, visual measuring system, optical motion capture system, etc. Students can also cooperate with our researchers specializing in soft robotics.

Eligibility Requirements
Basic knowledge SolidWorks and other modeling software.
Basic knowledge of Matlab and C++.
Basic knowledge of robot modeling and control.

Main Tasks
Complete design, fabrication and modeling of soft robot.
Cross validate the performance of the prototype.

Website
Lab: http://robotics.sjtu.edu.cn/
School: http://english.seiee.sjtu.edu.cn/

Project 14
Unmanned Delivery Robot

Contact Information
Prof. Wang Hesheng
Email: wanghesheng@sjtu.edu.cn

Project Description and Objectives
The unmanned delivery robot is one of the most popular research fields, which is acknowledged as an important channel to realize the commercialization of the driverless car , and can effectively change the conventional lifestyle of humans. Despite the smaller size than that of the real car, unmanned delivery car includes different kinds of sensors such as 3D-lider, stereo camera, RTK-GPS, sonar radar, and so forth. These can help to realize real-time highly accurate localization, road area and lane detection, as well as obstacle detection and classification.
The project aims to realize autonomous package delivering tasks by the unmanned delivery robot. The main parts of the project are self-localization, perception in both interior , and exterior environment through multisensory fusion, trajectory planning and notion control. The project also emphasizes path planning algorithms to realize obstacle avoiding capacity and stable self-driving performance on the specific and required road.

Eligibility Requirements
Basic knowledge of robot control and coordinate transformation.
Basic knowledge of ROS is preferred.
Carefulness, patience, accountability and interest in the work.

Main Tasks
Finish a research report.
Choose one research direction (localization, perception and navigation) and propose the optimization scheme.
Realize the proposed scheme with ROS in the robot.

Website:
Lab: http://robotics.sjtu.edu.cn/
School: http://english.seiee.sjtu.edu.cn/

Project 15
Pricing and Protection Mechanisms for Big Data

Contact Information
Prof. Fan Wu
Email: fwu@cs.sjtu.edu.cn

Project Description and Objectives
The intrinsic value of the big data, which has been regarded as a new kind of oil, has been paid highly enough attention to all over the world. However, due to the lack of effective data trading platforms, the existing data sets are mostly analyzed and used by the data owners in the enterprise, resulting in a large number of data islands. Therefore, it is highly necessary to implement open data trading platforms to promote the circulation of big data over the Internet. Thus, we can further exploit the economic value of big data, and to discover potential applications based on various kinds of data. In this project, we will investigate closely connected issues of data exchange, including data collection, data pricing, and data protection. Specifically, first, we will study market demand oriented data collection schemes, in order to provide high-quality and massive data resources to the market. Second, we will design pricing strategies for data in the market with asymmetric information, determines the selling form and market price of data goods to maximize the revenue of data sellers. Third, we will also study privacy preserving and verifiable data trading mechanisms to guarantee individual users' personal protections and high availability of data goods at the same time.

Eligibility Requirements
Basic knowledge of algorithm design is mandatory.
Basic knowledge of game theory or cryptography is preferred.
Proficiency in writing and speaking in English.
Interest in theoretical analysis and experiment.

Main Tasks
Propose a novel idea in the scope of project.
Present the design result with either a simulation or an experiment.
Finish a research report in this project.

Website
Lab: http://www.cs.sjtu.edu.cn/~fwu/
School: http://english.seiee.sjtu.edu.cn/

Project 16
Human Gesture Detection and Classification Using Mm-wave Radar with Machine Learning

Contact Information
Prof. Dongying Li
Email: Dongying.li@sjtu.edu.cn

Project Description and Objectives
The project focuses on detection and recognition of human body-part movements, e.g. hand gestures, body postures, etc. The movements are captured by mm-wave radar platforms, and the Doppler signature of the movements are recorded and extracted. These time-domain Doppler diagrams will be further processed by machine-learning algorithms for automatic classification and recognition.

Eligibility Requirements
The applicants shall have strong basic knowledge of signal processing and electromagnetic theory. Familiarity and experience of Matlab programming is also preferred.

Main Tasks
Collection of radar measurement data and dataset construction.
Development of auto-recognition algorithms.

Website
Lab: ast.sjtu.edu.cn
School: http://english.seiee.sjtu.edu.cn/

Project 17
Parameters Estimation for Randomly Polarized Signals Using a Nested Array

Contact Information

Prof. Jin He
Email: jinhe@sjtu.edu.cn

Project Description and Objectives

In this project, a new method for estimation of multiple parameters (angle, frequency, polarization) for randomly polarized signals using a nested array is developed. Firstly, data model for randomly polarized signals is established. Then, classical array signal processing algorithms are applied to solve the parameter estimation problem. Finally, performance analysis and simulation results are provided to verify the efficacy of the designed method.

Eligibility Requirements

Electromagnetic Fields and Waves, Digital Signal Processing, Array Signal Processing.

Website

Lab: ast.sjtu.edu.cn
School: http://english.seiee.sjtu.edu.cn/

Project 18
Computer Aided Diagnosis based on Artificial Intelligence and Medical Image Analysis

Contact Information

Prof. Jie Yang
Email: jieyang@sjtu.edu.cn

Project Description and Objectives

With significant development of artificial intelligence in the recent years, also motivated by great demand from clinical practice, computer aided diagnosis becomes more and more important. Advances in artificial intelligence and medical imaging technology will greatly contribute to diagnosis for many diseases. Especially, computer aided diagnosis can reduce the disequilibrium of medical resources in China, where there is significant difference between the top hospitals and the rest and the main top hospitals are located in big cities, such as Shanghai and Beijing.

In this project, some important and typical problems will be investigated with close collaborations with hospitals and institutes abroad, including osteocarcinoma (with Renji Hospital), diabetic retinopathy (with Shanghai the First Hospital), Alzheimer's disease (with Chalmers University of Technology), chromosome mutation (Ruijin Hospital).

The objectives of this project consist of:

1) Study medical imaging process methods and artificial intelligence techniques for one particular diseases;
2) Experiments on clinical data with the developed techniques;
3) Interpretation analysis for the neural networks that trained for computer-aided diagnosis.

Eligibility Requirements

Basic knowledge on artificial intelligence and image processing.
Programming skills on python, C; experience on TensorFlow, PyTorch is preferred.

Main Tasks

Processing on clinical images and AI methods implantation.
Experiments on clinical data for one particular disease.
Interpretation analysis for the neural networks for clinical applications.

Website

Lab: http://www.pami.sjtu.edu.cn/En/Home
School: http://english.seiee.sjtu.edu.cn/

Project 19
Advanced Kernel Methods for Machine Learning

Contact Information

Prof. Xiaolin Huang
Email: xiaolinhuang@sjtu.edu.cn

Project Description and Objectives

Kernel methods, which implicitly maps data into feature spaces with high, even indefinite, dimensions, are very important in machine learning and have been widely applied in many fields. In the recent years, the success of deep learning implies that enhancing the flexibility with the support of big data is promising to improve machine learning performance. The route is also applicable to advancing kernel methods, which are traditionally restricted to shallow structures.

In this project, we will investigate serval key issues for advanced kernel methods. First, it is necessary to design deeper structure, e.g., with several nonlinear layers, and develop the corresponding training methods. Second, making kernels flexible usually violate positive definiteness condition, that is usually required by classical kernels, and investigation on indefinite kernel methods is desirable. Third, flexible kernels need to admit value-defined matrices, for which out-of-sample extension technique is necessary.

The objectives of this project consist of:

1) Novel kernel methods in one of the three topics: deep kernel/indefinite kernel/out-of-sample extension;
2) Toolbox for the developed techniques.

Eligibility Requirements

Basic knowledge on machine learning.
Programming skills on Matlab, Python, C.

Main Tasks

Develop novel machine learning methods based on flexible kernels.
Establish and release toolbox for the developed methods.

Website

Lab: http://www.pami.sjtu.edu.cn/En/Home
School: http://english.seiee.sjtu.edu.cn/

Project 20
Machine Learning for Optical Communications

Contact Information

Prof. Lilin Yi
Email: lilinyi@sjtu.edu.cn

Project Description and Objectives

Machine learning and neural network have become very popular these years and shown its strength especially in the domain of computer vision and machine translation. Neural network also comes into view of optical communities with more layers, more intrinsic inter-layer relationship. A much more powerful tool, convolutional neural network (CNN), is now widely used in the domain of computer vision and also the key for AlphaGo to defeat various professional Go players. CNN have also shown its powerful capability in optical performance monitoring and modulation formats identification.

This project mainly focus on how machine learning can solve the signal performance distortion in optical fiber transmission, including dispersion, nonlinearities and bandwidth limitation-induced inter symbol interference. The performance of different machine learning structures such as supported-vector machine (SVM), fully-connected neuron network, CNN, recurrent neuron network (RNN) will be compared and evaluated.

Eligibility Requirements

Interested students should have basic knowledge on optical communications and programming.

Main Tasks

Finish a research report.
Give two research presentations (1. Background review, 2. Technical progress).
Submit a paper to a conference or a journal as a co-author.

Website

Lab: http://front.sjtu.edu.cn/~llyi/index_en.html
School: www.seiee.sjtu.edu.cn/

Project 21

Neural Patterns among Different Cultures for EEG-based Emotion Recognition

Contact Information

Prof. Bao-Liang Lu
Email: bllu@sjtu.edu.cn

Project Description and Objectives

Emotion plays a significant role in our daily life and has been described as the 'driving force' behind motivation, endowing meaning to all human interactions. As we all know, various environments and cultures influence a human's physical peculiarity, the way humans think, and many other aspects. Humans all over the world may have different emotional patterns or possess similar emotional characteristics. Recently, multicultural research concerning emotion recognition has provided explanations for cross-cultural differences as well as similarities.

This project mainly investigates the emotional neural patterns among different cultures using EEG and eye movement signals. As we all know, facial expressions for different emotions are similar all over the world regardless of culture. The study aims to find out whether people sharing the same emotion have similar neural patterns and to discover more facts about human emotions.

Eligibility Requirements

Interested students should have basic knowledge of machine learning.

Main Tasks

Finish a research report.
Carry out at least 10 EEG experiments to collect emotional EEG and eye tracking data.
Analyze EEG and eye tracking data using machine learning methods.

Website

Lab: http://bcmi.sjtu.edu.cn
School: http://www.cs.sjtu.edu.cn/en/

Naval Architecture, Ocean and Civil Engineering

Project 22

Model Tests on Marine Renewable Energy Devices

Contact Information

Prof. Ye Li
Email: ye.li@sjtu.edu.cn

Project Description and Objectives

Renewable energy has occupied the forefront of energy supply studies around the world. With the advancement of science and technology, the use of renewable energy has expanded towards the ocean in the last decade. Particularly, tidal current and wave energy are regarded as the two kinds of marine renewable energy with the greatest prospects. In this project, models of tidal current turbines and/or wave power generators will be tested in a ship model towing tank, to measure their hydrodynamic performance, which is the key to marine renewable energy extraction.

Eligibility Requirements

Interested students should have basic knowledge of ocean engineering, mechanical engineering, energy engineering or similar fields.
Proficiency in speaking and writing is essential.

Main Tasks

Preparation of the facilities and instruments; Model test of the tidal current turbines and/or wave power generators; Data acquisition and analysis.

Website

Lab: http://naoce.sjtu.edu.cn/en/
School: http://naoce.sjtu.edu.cn/en/

Project 23

Numerical Simulations of the Unsteady Aerodynamics of Offshore Floating Vertical Axis Wind Turbines

Contact Information

Prof. Dai Zhou
Email: zhoudai@sjtu.edu.cn

Project Description and Objectives

With the increasing depletion of land resources, offshore wind turbines will be the main driver of wind energy technology in the future. Meanwhile, wind turbines installed in the sea can achieve the wind energy which has a larger velocity and a weaker turbulence. Compared with the horizontal axis wind turbines, offshore floating vertical axis wind turbines (OF-VAWTs) are attracting a growing amount of attention due to the several advantages.

When OF-VAWTs face the ocean waves and wind loads under normal operation conditions, they have six-degrees of freedom (6-DOF) movement. Each of the 6-DOF movements will influence the aerodynamic performance of the OF-VAWTs in turn.

The purpose of this project is to investigate the changing rule of the aerodynamic performance of an OF-VAWT under normal operation conditions by numerical simulation method.

Eligibility Requirements

Interested students should have basic knowledge of numerical simulation or engineering mechanics.
Majors in civil engineering or ocean engineering are preferred.

Main Tasks

Finish a research report.
Give two research presentations (a. references review; b. technical presentation).
Submit one paper to a journal as a co-author.

Website

Lab: N/A
School: http://naoce.sjtu.edu.cn/en/teachershow.aspx?info_lb=22&info_id=286&fag=2

Project 24

Flow Instabilities in the Wake of a Circular Cylinder with Parallel Dual Splitter Plates Attached

Contact Information

Prof. Dai Zhou
Email: zhoudai@sjtu.edu.cn

Project Description and Objectives

Flow over cylindrical structures are common phenomena in engineering, such as offshore structures, bridge piers and skyscrapers. However, the flow separation and alternating vortex shedding in the downstream wake could cause significant increases in the mean drag and lift fluctuations and serious structural vibrations, which is known as vortex-induced vibration (VIV). Over the past few decades, various passive and active open-loop control techniques were developed to suppress vortex shedding behind a circular cylinder. The use of splitter plates as a passive control method has been extensively investigated both experimentally and numerically, owing to the simple geometric configuration and easy implementation.

Although many investigations have indicated that the presence of splitter plates greatly affects the wake regimes or characteristics, few works in the literature studied the influence of splitter plates on the wake transition of bluff bodies. The main purpose of this project is to study the influence of splitter plates on the wake transition of bluff bodies.

Eligibility Requirements

Interested students should have basic knowledge of hydrodynamics and numerical simulation.

Main Tasks

Finish a research report.
Give two research presentations (a. references review; b. technical presentation).
Submit one paper to a journal as a co-author.

Website

Lab: N/A
School:http://naoce.sjtu.edu.cn/en/teachershow.aspx?info_lb=22&info_id=286&fag=2

Project25

Green Building Materials

Contact Information

Prof. Jian Yang
Email: j.yang.1@sjtu.edu.cn

Project Description and Objectives

This project primarily focuses on the use of recycled materials in modern construction. In particular, the demolition and construction wastes will be recycled and utilized to replace new materials (mainly in the form of recycled aggregates) in the new construction. To compensate the loss of the strength, the recycled aggregates will be strengthened in advance. Meanwhile, scrap tire rubber will also be used as fine aggregate to replace sand. The methods of enhancing the interfacial transition zone will be examined. The percentage of replacement, particle size distribution, size of recycled aggregates will be studied to investigate their effects on the properties of the resulting concrete. The performances to be studied include workability, strength, and durability. MIP, SEM, XRD tests or inspection will be carried out to investigate the micro structure and composition of material. The objectives of this project are to get students to be familiar with the production of recycled concrete used in modern construction such as precast concrete for modular construction, the top layer for smart motorway, and the possibility of using this kind of materials for 3D printing.

Eligibility Requirements

Interested students should have basic knowledge of building materials.

Main Tasks

Becoming familiar with the production of recycled materials in modern construction.
Completing a research report.
Delivering two research presentations (a. references review; b. technical presentation).
Submitting one paper to a journal as a co-author.

Website

Lab: N/A
School:http://naoce.sjtu.edu.cn/

Project26

Modular Construction

Contact Information

Prof. Jian Yang
Email: j.yang.1@sjtu.edu.cn

Project Description and Objectives

The technology and application of modular construction are developing rapidly. Modular construction is based on the three-dimensional units that are usually fabricated and fitted out in a factory and are delivered/assembled to the site as the main load-bearing elements for buildings. In the past, the main use of modular structures were for the mobile or temporary buildings. However, by the modern prefabricated construction technology using volumetric units, it is now used in a wide range of building types, from schools, hospitals and offices to high-rise residential buildings. This demand has been driven by the off-site nature of the of the construction process, which leads to quantifiable economic and sustainability benefits.

The project mainly investigates the design and assessment of modular construction using novel construction materials. It aims to introduce the key features of the modular construction and to offer trainings for students about how to design buildings using this new technology.

Eligibility Requirements

Interested students should have basic knowledge of building engineering.

Main Tasks

To complete design and drawing of buildings using modular construction.
To check and validate the design adequacy and optimize the design.
To deliver a presentation about the design philosophy and demonstrate the novelty of design.

Website

Lab: N/A
School:http://naoce.sjtu.edu.cn/

Project 27

Automated Construction Systems of High Rising Building

Contact Information

Prof. Jian Yang
Email: j.yang.1@sjtu.edu.cn

Project Description and Objectives

The total output value of construction industry accounts for 5.7% of global GDP, but the productivity of construction industry has been declining in the past 30 years. Automated construction systems provide a modern and efficient way to build the high rise buildings in the urban city. The favorite benefits this type of system can offer include significant reduction in wastes, improved safety at site and more controllable quality of construction projects.

The aim of this project is to develop a virtual control system for the automated construction equipment by utilizing the digital innovations, including BIM, 3D laser scanning and multi-sensor technology. The system should be capable of updating the building information model on a real-time basis by using 3D laser scanning and the robotic survey technology, and provide a synchronized monitoring system for equipment during operation by using multi-sensor technology.

Eligibility Requirements

Basic knowledge of building construction.
Studying civil engineering or architecture is preferable.

Main Tasks

To be familiar with BIM software.
To complete a research report.
To submit one paper to a journal as a co-author.

Website

Lab: N/A
School: http://naoce.sjtu.edu.cn/

Materials Science and Engineering

Project 28

Chemical Characterization Technology Based on Attenuation Contrast of X-ray

Contact Information

Asso. Prof. Mingxu Xia
Email: Mingxu.xia@sjtu.edu.cn

Project Description and Objectives

The project focuses on the characterization technology of X-ray based on attenuation contrast. Chemical composition distribution of raw materials is of great importance to the performance of the actuator. Due to the non-transparent feature of raw materials for actuator, the performance of the products remains unknown till the failure observed. In this project, a characterization technology will be developed based on attenuation contrast of X-ray penetrating raw materials. Imaging analysis will be used and the contrast of the interest of point on the image will be formulized with chemical composition. The success of the project will stimulate a new in-situ characterization technology for industry. This study aims to establish a practical R&D sockets for this state-of-art characterization system.

Eligibility Requirements:

Interested students should have a basic knowledge of imaging analysis.
Main Tasks
Finish a research report.
Give two research presentation (a. references review; b. technical presentation).
A demo program with preliminary characterization technology.

Website

Lab: http://iams.sjtu.edu.cn
School: http://smse.sjtu.edu.cn

Project 29

Fabrication and Characterization of a Al/HEAs(High Entropy Alloys) Laminated Composite

Contact Information

Asso. Prof. Mingxu Xia
Email: Mingxu.xia@sjtu.edu.cn

Project Description and Objectives

The ductile/brittle laminate composites has drawn widespread attention for its unique structure which is inspired by the mollusk shell material. Up to now, the study on ductile/brittle laminate composites has mostly focused on metallic/intermetallic and metallic/ceramic systems. However the metallic/ceramic laminated composites are difficult to fabricate due to the great differences in physical properties between metal and ceramic which result in the weak bonding of the interfaces. The intermetallic compounds have a negative effect on interfaces also. In this study, a novel metallic/high entropy alloys is proposed and the object of this study is the fabrication and characterization of a Al/HEAs laminated composite.

Eligibility Requirements

Interested students should have a basic knowledge of composite.
Interested students should be familiar with SEM and EBSD.

Main Tasks

Finish a research report.
Give two research presentation (a. references review; b. technical presentation).

Website

Lab: http://iams.sjtu.edu.cn
School: http://smse.sjtu.edu.cn

Project 30

Environmentally-Friendly Technology for Rapid On-line Recycling of Waste Plastics f rom E-waste using Near-infrared Spectroscopy

Contact Information

Asso. Prof. Jia Li
Email: weee@sjtu.edu.cn

Project Description and Objectives

Electronic and electrical products, such as refrigerators, washing machines, mobile phones, personal computers, printers, and television sets, are ubiquitous in the modern society. Along with economic growth, ownership of electronics has been rapidly increasing around the world. At the same time, continuing technological innovation has resulted in early obsolescence of many electronic/electrical products; e.g., the average lifespan (2 yr) of a new computer in 2005 was less than half of that (4.5 yr) in 2000, and has been continually declining. A combination of increasing ownership and shortened lifespan has led to rapid growth in the amounts of unwanted and obsolete electronics (commonly known as e-waste). It was estimated that the rate of e-waste generation globally was approximately 40 million tons yr–1. In this study, an environmental friendly equipment based on on-line dynamic recognition for recycling the waste white goods plastic stream (i.e. ABS, PS and PP mixture) will be established.

Eligibility Requirements

Experience in C#, MATLAB or python programming are preferred.

Main Tasks

Through set a variety of parameters, master three different techniques and principle of E-waste Recycling.
Use similar chemometric methods for plastics identification (LDA, PCA, least squares, etc.).

Website

Lab: http://sese.sjtu.edu.cn:8088/People/1607.html
School: http://sese.sjtu.edu.cn/

Project 31

"In-situ remediation of contaminated lake-sediments via synergistic effects of adsorption, catalytic degradation and oxygen-regeneration of a novel Metal (Hydr)oxide", a National Key Project on Prevention and Control of Water Pollution from Ministry of Environmental Protection of China (2017ZX07203-005)

Contact Information

Assistant Professor Lina Chi
Email: Lnchi@sjtu.edu.cn

Project Description and Objectives

Eutrophication, a worldwide problem, threatens the ecology of freshwater bodies and marine environments. However, the control of nutrients and organic matters in water bodies and contaminated sediments, poses major technical and economic challenges. Today, various attempts have been made to investigate a cost-effective way to in-situ remediate the contaminated lake-sediment. In this project, low-cost, high efficient and environmental-friendly porous metal (hydr)oxides are proposed and developed toward the benefit to recolonization of organisms and recovery of ecosystem via synergistic effects of nutrient adsorption, catalytic degradation and oxygen-regeneration. The facile synthesis methods toward high porosity, surface area and catalytic activity, the stability and potential risks of as-prepared materials in complex condition, and their efficient separation and regeneration should be taken into consideration in the study. The studies are also aimed to discover the mitigation and transformation mechanism of contaminants on the interface of sediments and overlaying water after in-situ treatment.

Eligibility Requirements

Basic knowledge of chemistry/physics or material science/engineering.
Self-motivation and fast movement in lab work and paper work.
Majors in environmental engineering, chemical engineering or materials science are preferred.

Main Tasks

Synthesis of porous metal (hydr)oxides and fabrication of bilayer or multi-layer ceramics with porous metal (hydr)oxides as active layer.
Characterization of the as-prepared porous metal (hydr)oxides and the as-prepared ceramics.
Performance evaluation in terms of nutrient adsorption, catalytic degradation of organic matters and oxygen regeneration in the application of in-situ remediation of lake sediments.

Website

Lab:N/A
School: http://sese.sjtu.edu.cn:8088/People/1593.html

Project 32

Sulfonated Hyperbranched Polymers Assisted Nanofiltration Membrane with Enhanced Water Flux and Anti-fouling Property

Contact Information

Prof. Jiahui Shao
Email: jhshao@sjtu.edu.cn

Project Description and Objectives

Nanofiltration (NF) membrane has a molecular weight cut-off (MWCO) ranging from 200 to 1000 Da, which offers several advantages such as better ion selectivity than ultrafiltration (UF), lower operation pressure than reverse osmosis (RO) membrane. Therefore, it has been extensively studied and applied to many research fields such as removal of heavy metals, water softening and seawater desalination. Currently, the most commonly used NF membrane is thin-film composite poly(piperazine amide) (PA), which is prepared by interfacial polymerization (IP). Such a membrane exhibits certain advantages, such as high bivalent-ion rejections and easy fabrication. However, some problems need to be addressed, such as low water flux and membrane fouling. Incorporation of nanomaterial components into the polyamide matrix can solve the potential problems.
In this study, we plan to synthesize a kind of sulfonated hyperbranched polymers. The thin-film composite membranes will be then prepared by incorporation of sulfonated hyperbranched polymers into the polyamide matrix. The separation properties and anti-fouling abilities of nanofiltration membranes will be also investigated and studied.

Eligibility Requirements

Basic knowledge of chemistry/physics.
Motivation to work.
Majors in environmental engineering, chemical engineering or materials science are preferred.

Main Tasks

Synthesis of sulfonated hyperbranched polymers.
Fabrication of nanofiltration membrane using IP technique.
Characterization and evaluation of membrane performance.

Website

Lab: http://sjtu.cf.labscout.cn/lims/
School: http://sese.sjtu.edu.cn/

Project 33

Mechanism Analysis for the Pollutant Mass Transfer and Removal in Extractive Membrane Bioreactor

Contact Information

Prof. Jiahui Shao
Email: jhshao@sjtu.edu.cn

Project Description and Objectives

Extractive membrane bioreactor (EMBR) is a novel combination of membrane and biodegradation, which is suitable to separate and treat the organic pollutant from organic-inorganic composite wastewater. In our previous study, porous electrospun membrane was fabricated to achieve a high mass transfer of organic pollutant and a high rejection of inorganic. However, the internal mechanism of this porous membrane on separation and rejection still need to be investigated.

Eligibility Requirements

Motivation to experiment.
Majors in chemical engineering or environmental engineering.

Main Tasks

Investigate the internal mechanism for mass transfer.
Investigate the optimal condition for mass transfer.

Website

Lab: http://sese.sjtu.edu.cn/organization/1491.html
School: http://sese.sjtu.edu.cn/

Project 34

Adsorption of Trivalent Antimony from Aqueous Solution Using Amidoxime-modified Polyacrylonitrile

Contact Information

Prof. Jiahui Shao
Email: jhshao@sjtu.edu.cn

Project Description and Objectives

In recent decades, antimony (Sb) contamination in printing and dyeing wastewater has attracted people's attention. Conventional techniques to remove Sb from water include reverse osmosis, electrodeposition, precipitation/coagulation, membrane filtration and adsorption. Adsorption is one of the best available treatment technologies, because it is simple, safe, compact, easy to operate and highly efficient. The traditional adsorbents, such as biomass carbon, zeolite, metal mineral adsorbent, have the disadvantages of low adsorption capacity and small adsorption rate. Therefore, we developed a new organic adsorbent-the modified PAN with amidoxime group to remove antimony ions from wastewater. In batch experiment, the modified PAN had a good adsorption, which is a promising candidate for the removal of Sb from water.
Eligibility Requirements

Environmental engineering.

Chemical engineering.
Polymer material.

Main Tasks

Synthesis, characterization and performance test of new adsorbent.

Website

Lab: http://sese.sjtu.edu.cn:8088/People/1665.html
School: http://sese.sjtu.edu.cn/

Biomedical Engineering

Project 35
Techniques for Multimodal Neuroimaging and Neuromudulation

Contact Information
Prof. Shanbao TONG
Email:stong@sjtu.edu.cn

Project Description and Objectives
The neural engineering laboratory is focusing on developing techniques to study the questions in basic and clinical neurosciences. The students are expect to join one of the following projects:
(1) Neural image analysis (EEG, fMRI or fNIR) to study the brain in a cognitive task or following a brain injury and rehabilitation;
(2) Optical neurovascular imaging techniques and instrumentation. The aims are to develop multimodal optical neurovascular imaging and implement in research- or clinical-oriented systems.
(3) Transcranial ultrasound stimulation. The aims of this project are to either work on system design or experimental research.
The students are required to have fundamental training in engineering, e.g. data analysis or hardware design.

Eligibility Requirements
The students should have the motivations of using engineering and technologies to solve biomedical problems. A prerequisite of engineering training, e.g. data analysis (using Matlab toolbox), or hardware design, or neurosciences, or physics are desirable .

Main Tasks
Within the 6 six weeks, the students are required work with the graduate students under the supervision of the mentor(s), to working on one of the above projects. The students need attend the regular lab meetings, and make weekly report to the mentor(s). By the end of the intern, a project report should be submitted.

Website
Lab: http://nel.sjtu.edu.cn
School: http://bme.sjtu.edu.cn/En

Project 36
Tuning Neural Stem Cells with Physical and Biochemical Cues

Contact Information
Prof. Yongting Wang
Email: ytwang@sjtu.edu.cn
Prof. Yaohui Tang
Email: yaohuitang@sjtu.edu.cn

Project Description and Objectives
Cells reside in a multifactorial environment where they respond to various niche inputs to change their fate and functions. Cell niche is a multifactorial environment encompassing complex interactions between biochemical and physical cues. Although extensive studies have examined the individual effects of biochemical or physical cues on cell fate, how biochemical and mechanical signals work together to influence cell fate remains largely unknown. This project aims to investigate the effects of different biomaterials with various physical (mechanical) and biochemical (ligand) cues on the functions (such as proliferation and differentiation) of neural stem cells. The students will join a team of graduate students and research faculty members. Techniques used in this project will include but not limit to stem cell culture, hydrogel preparation, cell assays, and data analysis.

Eligibility Requirements
Must be at least in their sophomore year.
Cell culture experience is desirable.

Main Tasks
Finish a research report.
Give two research presentations, (one on literature review, one on research progress).
Attend weekly lab meetings and carry out experiments.

Website
Lab: N/A
School: http://bme.sjtu.edu.cn/

Project 37
bFGF Gene Engineered Endothelial Progenitor Cells for Ischemic Stroke Treatment

Contact Information
Prof. Yongting Wang
Email: ytwang@sjtu.edu.cn
Prof. Yaohui Tang
Email: yaohuitang@sjtu.edu.cn

Project Description and Objectives
Stem cells are being tested in several clinical trials for the treatment of ischemic stroke. Gene engineering of stem cells takes advantage of the stem cells not only as a therapeutic moiety but also as a factory and cargo for the gene product. In addition, gene modification of stem cells can also augment the survival and function of the transplanted stem cells. Previously, our lab had identified that bFGF plays a key role in tissue protection after ischemic insult. In this project, we aim to investigate the potential of bFGF gene engineered endothelial progenitor cells in treating ischemic injury. The students will join a team of graduate students and research faculty members. Techniques used in this project will include but not limit to stem cell culture, exosome preparation, animal surgery, and data analysis.

Eligibility Requirements
Must be at least in their sophomore year.
Skills desirable but not required: cell culture, molecular cloning.

Main Tasks
Attend weekly lab meetings and carry out experiments.
Give two research presentations, (one on literature review, one on research progress).
Finish a research report.

Website
Lab: N/A
School: http://bme.sjtu.edu.cn/

Project 38
Mechanisms of New Targets in Tumor Metastasis and Development of Therapeutic Methods

Contact Information
Dr. Junsong Chen
Email: junsongchen@sjtu.edu.cn

Project Description and Objectives
Our lab focus on searching for drug targets which can inhibit tumor metastasis. The earlier work has indicated that AEP had great effect on breast cancer metastasis. Thus, the later work will focus on searching small molecule inhibitors of AEP, antitumor prodrug, and therapeutic antibody. In addition, the later work will provide in-depth on the mechanism of AEP in tumor microenvironment and tumor-associated macrophage.
The project 1#: mainly focus on the mechanisms of tumor cell apoptosis or immunogenicity. Metastatic nodules will be digested to single cells by collagenase IV. We will purify the leukocytes through Percoll gradient from the Blood or tumor nodules. Flow cytometry: apoptosis, leukocyte subsets. The tumor nodules will be used for WB to study the mechanisms of tumor cell apoptosis or immunogenicity.
The project 2#: mainly focus on searching for the inhibitors of Bcl-2 (including natural products and derivatives, such as Ch282-5). Ch282-5 combined with hyperthermia suppress the hepatic metastasis of CT26 cells. Colon carcinoma CT26 cells were injected into the spleen of female Balb/c mice to establish hepatic metastasis. In the six weeks, we plan to study whether ch282-5 combined with hyperthermia could inhibit the growth of CT26 tumor in the liver.

Eligibility Requirements
The interested student should have a basic knowledge of Molecular biology technology.

Main Tasks
Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website
Lab: http://scsb.sjtu.edu.cn/xtswyx/homeen.do?method=getHomeList
School: http://scsb.sjtu.edu.cn/xtswyx/homeen.do?method=getHomeList

Project 39

Developing Molecular Probes for Tracking Stem Cell Derived Exosomes in Live Animal

Contact Information

Prof. Yongting Wang
Email: ytwang@sjtu.edu.cn
Prof. Yaohui Tang
Email: yaohuitang@sjtu.edu.cn

Project Description and Objectives

Stem cell derived exosomes had been shown to be beneficial for treating ischemic stroke, a major cause of disability and the second cause of death worldwide. However, quantitatively tracking exosomes and investigating their therapeutic efficacy and mechanism are still challenging. This project aims to develop multifunctional molecular probes to dynamically track exosomes that are intravenously or intra-arterially injected into mice, as well as explore their therapeutic efficacy and underlying mechanisms. The students will join a team of graduate students and research faculty members. Techniques used in this project will include but not limit to stem cell culture, exosome preparation, animal surgery, and data analysis.

Eligibility Requirements

Must be at least in their sophomore year.

Main Tasks

Attend weekly lab meetings and carry out experiments.
Give two research presentations, (one on literature review, one on research progress).
Test 2-3 molecular probes.
Finish a research report.

Website

Lab:N/A
School: http://bme.sjtu.edu.cn/

Physics

Project 40

Imaging Topological Materials via a Scanning Tunnelling Microscopy

Contact Information

Prof. Jinfeng Jia
Email: jfjia@sjtu.edu.cn

Project Description and Objectives

Scanning tunneling microscopy is capable to visualize atoms on a crystal surface and thus becomes a top priority for the scientist who works in the atomic scale physics, chemistry and material science. Topology, a special kind of advance mathematics, was induced into solid state physics and breed the emergence of topological materials. This project aims to utilize a low temperature scanning tunneling microscopy to directly image the atoms on several typical topoligcal materials, including Bi2Te2, stanine, etc.

Eligibility Requirements

Understanding of lab safety.
Interested students should have basic knowledge of quantum mechanics and solid-state physics.
Proficiency in writing and speaking is mandatory.

Main Tasks

Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website

Lab: http://lodiphie.physics.sjtu.edu.cn/
School: http://www.physics.sjtu.edu.cn/

Project 41

Molecular Beam Epitaxy Growth of Topological Insulator Thin Films

Contact Information

Prof. Jinfeng Jia
Email: jfjia@sjtu.edu.cn

Project Description and Objectives

Molecular beam epitaxy (MBE) is a delicate technology, which was designed to synthetize high quality single crystalline ultra-thin films and atomic layers. Topological insulators are one of hot topic and frontier of condensed mater physics research in recently years. This project aims to show the interested student how to use MBE method to successfully grow high quality thin films of topological insulator material, Bi2Te3.

Eligibility Requirements

Understanding of lab safety.
Interested students should have basic knowledge of quantum mechanics and solid-state physics.
Proficiency in writing and speaking is mandatory.

Main Tasks

Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website

Lab: http://lodiphie.physics.sjtu.edu.cn/
School: http://www.physics.sjtu.edu.cn/

Life Sciences and Biotechnology

Project 42

Cloning and Functional Characterization of Rice Male Sterile Genes

Contact Information

Prof. Dabing Zhang
Email: zhangdb@sjtu.edu.cn

Project Description and Objectives

The life cycle of flowering plants alternates between diploid sporophyte and haploid gametophyte generations. Male gametophytes develop in the anther compartment of the stamen within the flower, and require cooperative functional interactions between gametophytic and sporophytic tissues. During the male reproductive development, there are numerous biological events, including cell division, differentiation and degeneration of somatic tissues consisting of four concentric cell layers surrounding and supporting reproductive cells as they form mature pollen grains through meiosis and mitosis. To understand the mechanism of plant male reproduction, we are combining systematic biology (genomics, transcriptomics, proteomics, metabonomics) with other approaches such as genetics, cell biology, biochemistry, and structural biology to elucidate the molecular mechanisms underlying each biological process of male reproduction, e.g., cell-to-cell communication, programmed cell death, and fatty acids metabolism.

Eligibility Requirements

Applicants should have basic knowledge of biology.
Experience in biological research would be an advantage.

Main Tasks

The student will be involved in all stages of the project:
1）Design experimental scheme
2）Perform experiment
3）Analyze experimental results
4）Write the experiment report
5）Finish a research report.
6）Give two presentations on previously published papers and two on original research.

Website

Lab: zhanglab.sjtu.edu.cn
School: http://202.120.63.177:8884/english/

Project 43
Molecular Mechanisms Controlling Inflorescence and Spikelet Development in Rice and Barley

Contact Information
Prof. Dabing Zhang
Email: zhangdb@sjtu.edu.cn

Project Description and Objectives
Rice and barley, the model grass plants, form specialized morphology of inflorescence and spikelet, which determine grain yield. Using a variety of approaches, such as forward and reverse genetics, biochemistry, and cell biology, we are investigating the molecular mechanisms and the regulatory network involved in the morphogenesis and development of inflorescence and spikelets in rice and barley.

Eligibility Requirements
Applicants should have basic knowledge of biology.
Experience in biological research would be an advantage.

Main Tasks
The student will be involved in all stages of the project:
1）Design experimental scheme
2）Perform experiment
3）Analyze experimental results
4）Write the experiment report
5）Finish a research report.
6）Give two presentations on previously published papers and two on original research..

Website
Lab: zhanglab.sjtu.edu.cn
School: http://202.120.63.177:8884/english/

Project 44
Molecular Characterization of GMOs

Contact Information
Prof. Dabing Zhang
Email: zhangdb@sjtu.edu.cn

Project Description and Objectives
As more and more transgenic crops like transgenic maize and soybean have been approved and consumed as foods and feed, more and more people have become concerned about the safety of transgenic organisms. Molecular characterization of transgenic organisms is the basis for assessing the safety of transgenic organisms. We are developing new detection methods to identify changes that occur at the genomic, transcriptomics, proteomics and metabolic levels, and are currently comparing changes between transgenic lines and non-transgenic control lines, as well as between transgenic lines and conventional cultivated lines. This research will lay the foundation for safety assessment of GMOs.

Eligibility Requirements
Applicants should have basic knowledge of biology.
Experience in biological research would be an advantage.

Main Tasks
The student will be involved in all stages of the project:
1）Design experimental scheme.
2）Perform experiment.
3）Analyze experimental results .
4）Write the experiment report.
5）Finish a research report.
6）Give two presentations on previously published papers and two on original research.

Website
Lab: zhanglab.sjtu.edu.cn
School: http://202.120.63.177:8884/english/

Project 45

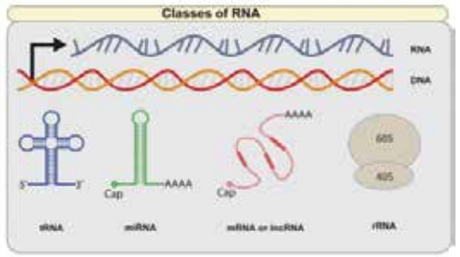
Long Noncoding RNA Modulate Migration of Vascular Smooth Muscle Cells

Contact Information

Prof. Yingxin Qi
Email: qiyx@sjtu.edu.cn

Project Description and Objectives

Long non-coding RNAs (lncRNAs) are being discovered in multiple diseases at a rapid pace. Our previous sequencing result revealed several crucial lncRNAs that may contribute to dysfunctions of vascular smooth muscle cells (VSMCs). In this project, using specific siRNA transfection, we will investigate the role of screened lncRNA, especially which locus nearby the cardiovascular genetic landmark or having binding sites with miRNA, in regulation of VMSC migration. The project will achieve the deep insights into the role of lncRNA in functions of VSMCs.



Cited from Sallam T, et al. *Circ Res*. 2018; 122(1): 155-66.

Eligibility Requirements

Applicants must have a basic knowledge of molecular biology.
Experience in research in cell culture would be in advantage.

Main Tasks

Perform experiments, analyze experimental and write a research report.
Give a research presentation: technical presentation.

Website

Lab:N/A
School: http://202.120.63.177:8884/english/

Agriculture and Biology

Project 46

Metabolic Regulation and Engineering of Medicinal Plants

Contact Information

Prof. Kexuan Tang
Email:kxtang@sjtu.edu.cn or kxtang1@163.com
Asso. Prof. Qifang Pan
Email:panqf@sjtu.edu.cn

Project Description and Objectives

China has a great resource of medicinal plants. Our project mainly focuses on metabolic regulation and engineering of medicinal plants, such as Artemisia annua and Catharanthus roseus. Among them A. annua has obtained great attention due to the antimalarial agents artemisin and its derivatives. Malaria is one of the most serious health problems in human history, which is responsible for more than 600,000 deaths last year. Artemisinin-based combination therapies (ACTs) are recommended by WHO to be the best choice for acute malaria. It has saved millions of lives in Africa countries. The Chinese pharmacologist Youyou Tu received the 2015 Nobel Prize in Physiology or Medicine for her contribution to the artemisinin isolation. Moreover, artemisinin and its derivatives have been found to have antiviral, anticancer, and antischistosomal activities, which makes artemisinin a promising natural product with multifunction. Plant of A. annua is the main commercial source of artemisinin. However, the supply is restricted by the low amounts of artemisinin at a range of 0.1%-1 % dry leaf weight of A. annua, which results in a high cost of this effective product that most of the poor population of malarial victins in Africa could not afford.
In order to improve the artemisinin content in A. annua for reducing its production cost, our project focuses on metabolic engineering of A. annua plants by three main strategies: overexpressing artemisinin biosynthetic pathway key enzyme genes in A. annua, blocking artemisinin biosynthesis competitive pathway key enzyme genes, transcriptional regulation of artemisinin biosynthesis.

Eligibility Requirements

Basic knowledge of molecular biology.
Preferred: Experience in plant biotechnology.

Main Tasks

Obtain an artemisinin-high-producing transgenic A. annua plant by metabolic engineering strategies.
Finish a research report.
Give one presentations (experiment design, progress and results).

Website

Lab:N/A
School: http://www.agri.sjtu.edu.cn/eng/

Pharmacy

Project 47
Recombinant Biologics and Monoclonal Antibody Medicine Discovery

Contact Information
Prof. Dawei Li
Email: daweili@sjtu.edu.cn

Project Description and Objectives
Our Summer Training Programs are tailored for students at various levels in molecular biology to gain hands-on knowledge in biotechnology at discovery, development, bio-engineering levels to generate monoclonal antibodies for further therapeutic testing in molecular, cellular and animal models. This program will be at three levels: the beginner (level1), experienced (level2) and expert (level3), according to your need. For each level, the program will begin with a short lecture-discussion and a hands-on session.

Eligibility Requirements
Level1: Students must have passed basic biology classes.
Level 2: student must have passed basic molecular cell biology.
Level3: Students must have biology laboratory experience.

Main Tasks
Understand goals of your projects (dry-lab).
Hands-on experimental training (wet-lab).
Report –analyze-present your data.

Website
Lab: http://lilab-pharmacy.sjtu.edu.cn/EN/Default.aspx
School: http://pharm.sjtu.edu.cn/en/

Medicine

Project 48
Molecular Biology of Leukemia and Targeted Cancer Therapies

Contact Information
Prof. Ruibao Ren
Email: rbren@sjtu.edu.cn

Project Description and Objectives
The laboratory is working to delineate the molecular mechanism in the pathogenesis of leukemia, precision diagnostics of leukemia, as well as the development of novel targeted cancer therapies. The major research areas include: (1) By intergrading the whole genome deep sequencing hotspot panel sequencing, we aim to reveal the composition and evolution pattern of leukemia clones, to identify the molecular targets that drive drug resistance and disease relapse, and eventually to establish a novel molecular diagnostic system based on the leukemia clonal evolution patterns; (2) Identification of therapeutic targets and development of targeted therapies for RAS-related cancers. Hyperactivation of RAS is common in human cancers, including in hematological malignances. However, RAS protein itself has been difficult to "target", making the cancers harboring RAS mutations the most difficult to treat. By using molecular biology and chemical biology approaches, we identify therapeutic targets and develop novel targeted therapies for RAS related cancer; (3) Mechanisms of anti-tumor activity of innate immune system and novel drug discovery and development. We study the roles of Interferon Response Factors IRF4/8 in leukemogenesis and try to develop novel anti-tumor immunotherapies.

Eligibility Requirements
Basic knowledge of genetics and molecular biology.

Main Tasks
Bioinformatic analysis, identification and characterization of anti-cancer compounds.

Website
Lab: N/A
School: http://www.sih.org.cn

Design

Project 49
Visual Inspection and Non-destructive Test on Chinese Ancient Building

Contact Information
Prof. Yongkang Cao
Email: ykcao@sjtu.edu.cn

Project Description and Objectives
As the increase of the rehabilitation market to the historical timber constructions, existing timber structures remains an extremely important object of research, especially regards of its historical and aesthetic values. Non-destructive tests have shown their advantages of maintaining the integrity of the structures. In this program, student will have access to one of the ancient wooden building in Shanghai, where they will study the background of the architecture, apply the visual grading method and create visual diagnosis map for the timber elements. Moreover, they will learn and apply at least two non-destructive tests on either the timber element or the brick walls and create a diagnosis report.

Eligibility Requirements
Interested students should have basic knowledge of architecture conservation and timber structures.

Main Tasks
Conduct the onsite research and non-destructive testing.
Finish a diagnosis report.
Give two research presentations (a. references review; b. technical presentation).

Website
Lab: http://ahc.sjtu.edu.cn
School: http://dschool.sjtu.edu.cn/home/index

Project 50
Digital Mapping and Survey of Architectural Heritage

Contact Information
Prof. Yongkang Cao
Email: ykcao@sjtu.edu.cn

Project Description and Objectives
The recording of position, dimensions and shape is a necessary part of almost every project related to the conservation of cultural heritage, forming an important element of the documentation and analysis process. There is a variety of techniques available to generate three-dimensional survey information, from the traditional survey method to drone and the most advanced technique 3D laser scan. This study aims to form a basic practice to apply different instruments on the architectural heritage digital mapping and survey. Including the phase of survey in situ and the phase of data processing (noise cancelling, registration, modelling) in laboratory.

Eligibility Requirements
Interested students should have a basic knowledge of architecture. The student who can use drone and 3D laser scanner will be preferred.

Main Tasks
Finish a research report.
Give two research presentations (a. references review; b. technical presentation).

Website
Lab: http://ahc.sjtu.edu.cn
School: http://dschool.sjtu.edu.cn/home/index

Project 51
Shanghai Industrial Heritage Research

Contact Information
Prof. Yongkang Cao
Email: ykcao@sjtu.edu.cn

Project Description and Objectives
As an important part of Shanghai's cultural heritage, industrial heritage is a crucial embodiment of Shanghai city culture. Shanghai is the birthplace of modern Chinese industry, and the changes in its industrial buildings have witnessed the development of Shanghai city and the changes of social life. During the transformation of Shanghai city, factories have gradually declined on the stage of history. Some of them were renovated into new landmarks, some were designated as cultural relics, some were abandoned, and some were still in operation.

This research focuses on the industrial heritage of Shanghai. Based on literature review, field investigation, data collection and other research methodologies, the research intends to sort and summarize Shanghai's industrial heritage. The final output will depict a whole picture of Shanghai industrial heritage on designation, protection and reuse.

Eligibility Requirements
Students should possess basic knowledge of architecture.
Students should have certain ability on Chinese speaking and writing.

Main Tasks
Site investigation and data sorting of industrial heritage in Shanghai.
Case study of national and international on industrial heritage reuse.
Relationship analysis between the Distribution of Industrial Heritage in Shanghai and the Shanghai Water System.
Research Analysis of Shanghai Workers' Housing and Workers' Activity.

Website
Lab: http：//ahc.sjtu.edu.cn
School: http://dschool.sjtu.edu.cn/home/index

Project 52
Climate Adaptive Smart City Research

Contact Information
Prof. Wenjun Ma
Email: mwj@sjtu.edu.cn

Project Description and Objectives
Smart city comes from smart city development and planning. Urban climate and its change have great influence in urban planning and development. More attention has been attracted to architecture and city research along with urban climate. This project is aimed at present climate situation and problems, such as urban heat island effect, air pollution, unsatisfactory atmospheric conditions, and integrate urban climate into urban data model, based on our existed smart city platform. We are eager to visualize urban dynamic data from various government departments or commercial institutes and organizations. And then, to evaluate the urban climate carrying capacity. Thus, tentative experiments should be performed to analyse and summarize the root causes of urban problems. The ultimate goal is to explore and propose solutions by urban planning in architectures. During this project research, students will rediscover urban phenomenon and master the methods of problem analysis.

Eligibility Requirements
Speaking and writing English fluently is essential.
Interested student should have basic knowledge of the following skills:
Urban planning and urban design;
Interactive design;
Outdoor or indoor comfortableness study.
Experience in architecture and city research, especially in climate change research, would be in advantage.

Main Tasks
Literature reading, sorting and reviewing.
Participating in and conducting at least two experiments.
Writing a report or paper and present it.

Website
Lab:N/A
School:http://dschool.sjtu.edu.cn

Project 53
Big Data and Smart Urban Design

Contact Information
Prof. Wenjun Ma
Email: mwj@sjtu.edu.cn

Project Description and Objectives
Big data helps to understand human behavior and improve the quality of human settlement. During this project research, students will discover how to collect urban big data and the method to apply to urban design problem analysis.

Eligibility Requirements
Speaking and writing English fluently is essential.
Interested student should have basic knowledge of the following skills:
Urban planning and urban design;
Interactive design;
Outdoor or indoor comfortableness study;
Experience in architecture and city research, especially in climate change research, would be in advantage.

Main Tasks
Literature reading, sorting and reviewing.
Participating in and conducting at least two experiments.
Writing a report or paper and present it.

Website
Lab:N/A
School:http://dschool.sjtu.edu.cn

Project 54
Research on Spatial Experience Design Based on the Study of User Needs

Contact Information
Prof. Linong Dai
Email: Lindai@126.com

Project Description and Objectives
To design a space experience, we should firstly understand the user's need for this space. By investigating the behavior of users and finding out their physiological and psychological needs, we can formulate the design goals of spatial experience. By comparing with other countries, it will become a cross-cultural comparative study.

Eligibility Requirements
All students who have a design background can apply for this program. Students who have attended design research or design psychology are preferred. Students with backgrounds in architecture and interior design might do better than students major in other design area.

Main Tasks
Conduct the behavior observation to the user.
Interviews users to understand their needs.
Figure out the relationship between user needs and spatial experience design.
Understand cross cultural comparison.

Website
Lab: N/A
School: http://dschool.sjtu.edu.cn/en/index

Project 55

Research on User Experience Design Based on the Study of User Needs

Contact Information

Prof. Linong Dai
Email: Lndai@126.com

Project Description and Objectives

To design user experience, we should firstly understand the user's need for the product. By investigating the behavior of users and finding out their physiological and psychological needs, we can formulate the design goals of user experience. By comparing with other countries, it will become a cross-cultural comparative study.

Eligibility Requirements

All students having design background can apply for. Students who have attended design research or design psychology are preferred. Students with backgrounds in product design and media design might do better than students major in other design area.

Main Tasks

Conduct the behavior observation to the user.
Interview users to understand their needs.
Figure out the relationship between user needs and user experience design.
Understand cross cultural comparison.

Website

Lab: N/A
School: http://dschool.sjtu.edu.cn/en/index