FALL 2020
UNDERGRADUATE

RESEARCH SYMPOSIUM

November 6th, 2020

NYU SHANGHAI
上海 纽约大学

UNDERGRADUATE RESEARCH

SYMPOSIUM

ABOUT

The NYU Shanghai Undergraduate Research Symposium is a university-wide celebration of research which showcases work from undergraduates spanning the Arts and Sciences, Engineering and Computer Science, and Business. The Symposium features recently completed projects by Major Honors students, as well as research papers and creative work by students for their Capstone Projects, Independent Study Courses and as part of the Dean's Undergraduate Research Fund (DURF).

Visitors will have the opportunity to cast a vote for the project that most impresses them, and a panel of NYU Shanghai faculty will select the winning projects.

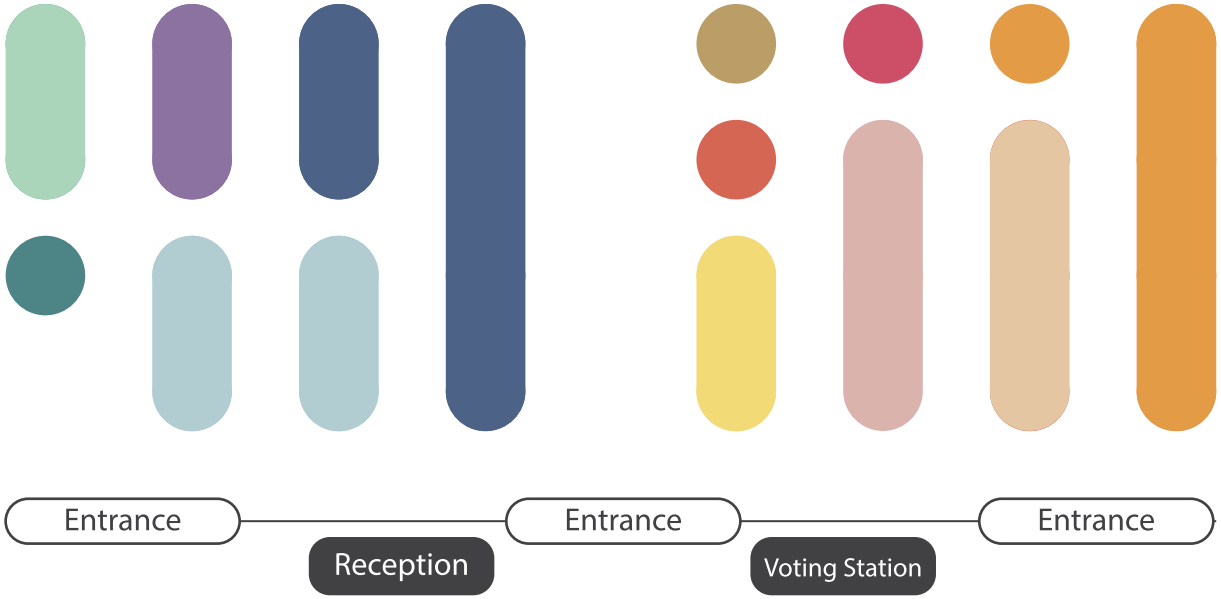
OVERVIEW

FLOORPLAN

Room 1503-1504

STEM

LIBERAL ARTS & BUSINESS



- Computer Science
- Mathematics
- Neural Science
- Physics
- Biology

- Business
- Creative Writing
- Economics
- Global China Studies
- Humanities
- Interactive Media Arts
- Social Science

STEM

COMPUTER SCIENCE

MATHEMATICS

NATURAL SCIENCES

- BIOLOGY
- NEURAL SCIENCE
- PHYSICS

An Open-Source Framework for Multi-Agent Distributed Robot System Research

Chen, Liyu; Jin, Jiayao; Nomoto, Momoe
AREA: Computer Science
MENTOR: Rodolfo Cossovich

Verifying a distributed robotic algorithm using a real-world model is an important step before putting algorithms into application. This project develops a general-purpose robotic framework to serve this purpose. Built upon previous research by NYU Shanghai students, this new variation is a suite of resources and tools, including the circuit board blueprint, software modules, a 3-D graphic simulation platform based on WeBots, etc.. These assets are all shared in a public repository under Open Source licenses, allowing other researchers to use it as a facilitation tool. A demonstration of the swarm robots forming letters "NYU" displays our system in action.

Investigating Fiducial Marker Network Characteristics for Mobile Indoor Robot Navigation Using ROS and Gazebo

Huang, Yiming
AREA: Computer Science
MENTOR: Borja García de Soto; Bharadwaj Mantha

Common approaches of localization and navigation within an indoor environment have yet to break free from their dependence on computationally and/or physically complex technological mediums, which can cause considerable drawbacks in application. In hopes of investigating potential alternatives and responding to the growing demand for efficient monitoring and maintenance of indoor environments, this project examines the influence of the characteristics of a discrete network of fiducial markers (AprilTag 36h11), such as marker size, marker height, marker density, on the localization and navigation performance of a robotic platform (Turtlebot3 Waffle Pi) within a simulated indoor environment using ROS and Gazebo.

Improving Gender Fairness for Random Forest Model through a Post-processing Method

Ding, Yuhao
AREA: Computer Science
MENTOR: Siyao Guo

Prediction related to classification problems may lead to bias against certain groups of people. Metrics on fairness is thus invented to prevent these kinds of bias. In this paper, we focus on Adult Income Dataset by UCL, and use Random Forest Model to classify income levels. To neutralize gender bias, we invented a post-processing metric which we called corrector network. We will then shown the results compared with several baseline models to show its efficiency. In the rest of paper we will share our understandings on why and how the model works.

Chameleon: Image Style Transfer Based on Image Classification Networks

Li, Haobo
AREA: Computer Science
MENTOR: Guo Li

In recent years, deep neural networks have endowed computers with the capacity to extract features of images. Such development in computer vision has stimulated interests for image style transfer. Since the first CNN style transfer algorithm, many schemes have been proposed to accelerate the stylization process. Yet, these methods more or less sacrifice the visual quality of the output. In this paper, we analyze two precursive and heuristic algorithms and generalize the results. Then, we propose Image Style Transfer method based on Image Classification Networks. Experimental results show that general CNN techniques would improve the quality of stylization accelerate the process by 3 times. Our work provides novel insights into the classification capacity of CNNs and demonstrates the potential of these algorithms.

Large-parallax Image Alignment Algorithm based on Sub-plane Segmentation

Liu, Haoming
AREA: Computer Science
MENTOR: Xianbin Gu

An alignment algorithm is proposed for stitching large-parallax images. The algorithm segments the regions that could reflect real situations of sub-planes. Experimental results demonstrate that the proposed algorithm provides accurate stitching results for images with large parallax, and the effect of stitching are quantitatively equivalent to the existing mainstream method.

Facial Age Estimation with Deep Neural Network

Liu, Yijian
AREA: Computer Science
MENTOR: Guo Li

Age estimation aims to produce an accurate age label for a given facial image. It has been an important task in that it can be employed in many applications but the age progression varies from person to person, making it especially challenging. In our study, we propose a combination of SE-ResNeXt-50 and label distribution learning, preserving the ordinal information between age labels, and ensuring sufficient training for all age groups. As a result, we achieve decent performance on the MORPH dataset among some of the state-of-the-art methods and the best performance on the MegaAge-Asian dataset to our knowledge.

Finding Few Largest Eigenvalues

Chen, Shiyi
AREA: Mathematics
MENTOR: Leonardo T. Rolla

Power Method (PM) allows us to find the largest eigenvalue. By changing the algorithm of PM, the resulting algorithm - Inverse Power Method (IPM) enables us to find the eigenvalues other than the largest one. In this project, we firstly describe the IPM and code it in Matlab/Octave. To test the new function of IPM, we elaborate on how IPM allows us to find eigenvalues closest to a point for symmetric matrices. We then move on to elaborate on how we find the few largest eigenvalues for symmetric matrices using the IPM and the searching scheme we devised. The probability for the method to fail is about 3 %.

A Study on the High Temperature Ising Model on the Triangular Lattice

Li, Yuxuan; Qi, Sihan
AREA: Mathematics
MENTOR: Jianping Jiang

We study the Ising model on the triangular lattice with inverse temperature $\beta \in [0,\beta_c]$ where$\beta_c=\ln(3/4)$ is the critical inverse temperature. We first review the proof of Cardy's formula when $\beta = 0$ and RSW lemma for $\beta \in [0,\beta c]$. Then we report some simulation results on the behaviour of this model and its FK representation for various β.

Parameter Estimation for SIR Model Using MCMC and Its Meaning in Epidemic Control

Liu, Xinhao; Chen, Kuntian; Liu, Hongquan
AREA: Mathematics
MENTOR: Xianbin Gu

The Novel Coronavirus Disease 2019 (COVID-19), breaking out in the late January, 2020, has evolved into a global pandemic. Eight months after its first confirmed case, it is still infecting everyone's daily life all over the world. In this project, by applying the susceptible-infected- removed (SIR) model for epidemic statistics modeling and Monte Carlo Markov Chain (MCMC) method for parameter estimation, researchers discussed about the possibility to estimate real-world epidemic data. More insights beyond the existing models and methods are also provided in this report.

Classification of transient AT2020iko as a CV with a Superoutburst and Re-brightenings

Caruso, Eleonora (Remote)
AREA: Physics
MENTOR: David Russell (NYU Abu Dhabi)

AT2020iko is an astronomical object that was first discovered with an optical telescope on April 26 2020 as a new transient, getting brighter. We monitored the source in optical g' and R bands with the Las Cumbres Observatory (LCO) telescopes, between April 26 and June 23. The source has several re-brightenings, and by analyzing our light curve, we were able to classify the anomalous transient as a Cataclysmic Variable (CV) of possible subclassification WZ Sge-type with a superoutburst followed by two smaller outbursts. This work results from the collaboration between NYU Shanghai, Abu Dhabi, New York, and Cambridge University.

Distinct Reverse Auditory Hierarchies During Speech and Hearing Imagery

Chu, Qian
AREA: Neural Science
MENTOR: Xing Tian

People can hear the world with ears, as well as 'hear' using their 'mind's ear'. That is, perceptual representations arise from not only the bottom-up processing of external stimuli but also top-down processes such as mental imagery. Here we present an fMRI study on auditory reactivation during speech and hearing imagery to examine the neural processing of the 'mind's ear'. Using brain activation and functional connectivity analyses, we identified two distinct neural streams (motor-to-sensory transformation and memory retrieval) supporting auditory reactivation. Our results reveal the neural mechanisms underlying perceptual reactivation and motor-to-sensory transformation that support human higher-level cognition.

Importance of Non-Circular PCA in the Development of Neural Decoder

Kanazawa, Yuma (Remote)
AREA: Neural Science
MENTOR: Bijan Pesaran

PCA (principal component analysis) is the common statistical technique in many signal processing applications. However, the original PCA is not suitable for analyzing signal data in frequency domain since it is insufficient to thoroughly describe the complex random vectors. Decoding complex data such as Fourier-transformed local field potentials is very important in computational neuroscience, so the novel PCA method could improve the performance of signal processing. In this project, the complex signal data is simulated to test the performance of the novel PCA method for complex numbers with different conditions for simulated signal data.

Bench Marking Quantum Computing Noise with KL Divergence

Li, Yuelong; Li, Ruihao

AREA: Physics

MENTOR: Javad Shabani

While classical computers work with electrons whose probabilistic nature would introduce unexpected error, quantum computers turn the quantum indeterminacy from a liability into an asset. However, the challenge in manipulating and maintaining states at quantum scales results in noise levels that exceed the relative tolerance of quantum algorithms. We witnessed this effect of noise on real quantum computers as we applied the Kitaeve-Webb algorithm, which theoretically produces a Gaussian distribution of quantum states. We thereby introduced KL divergence, an entropy measurement capable of tracking the experimental deviation from the expected result, to benchmark the noise level of contemporary quantum computers.

Role of Histone Variant H2A.Z in Chromosome Segregation and its Regulation

Lu, Jiaxing; Wang, Xiao; Chen, Siyi

AREA: Biology

MENTOR: Jungseog Kang

In this project we investigated the role of histone variant H2A.Z in chromosome segregation and its regulation, focusing on phosphorylation of the protein. We created knockouts to find the role of H2A.Z isoforms – H2A.FV and H2A.FZ – in chromosome alignment, showing that absence of H2A.FV significantly increases the chances of misalignment. We also constructed histones and subjected them to an in vitro phosphorylation assay to examine H2A.FV's phosphorylation by Mps1. Our final area of study was devoted to phosphorylation and its effect on the interaction between H2A.FV and important mitotic proteins Mps1 and PWWP2A.

LIBERAL ARTS & BUSINESS

BUSINESS
CREATIVE WRITING
ECONOMICS
GLOBAL CHINA STUDIES
HUMANITIES
INTERACTIVE MEDIA ARTS
SOCIAL SCIENCE

The Analysis of Airbnb Dataset by Data Visualization and Modeling for Short-term Rental Host to Improve Business Strategies

Li, Yuxuan; Xu, Ke; Han, Xinyao

AREA: Business

MENTOR: Guodong Chen

This Python-and-Stata-based research focuses on quantitative and textual analysis of Airbnb dataset. By identifying and evaluating key factors correlated with the price and rating of short-term accommodations, the research aims at providing pricing and marketing strategies for hosts in the recovering market post COVID-19. Based on qualitative analysis, while district contributes the most, the number of guests, bathrooms, stations, scenes, and business centers, as well as room type and amenities, all have significant positive correlation with price. As the text analysis indicates, enthusiasm of the host, together with quality of service and management, tends to be the most conspicuous words.

Fragments and a Diary of Writers with Psychiatric Disorders

Tang, Wenxin

AREA: Creative Writing

MENTOR: Genevieve Leone

This work is a collection of my poems, with a tone of tragedy and sensitivity, portraying the life of writers with psychiatric disorders. I researched and read through published poetry of certain writers like Linda Hull, Sylvia Plath, John Clare, etc, and recreate various writers' stories and perspectives regarding their psychiatric disorders into a coherent diary of poems of one fictional character, which aims to minimize bias towards this community in history and contemporary world through illuminating the contrast between perceived normalcy as a mental illness and the writers' inner reality as art creation of mad muse. This collection features various refreshing forms of poetry, including ancient ones like Duplex, and contemporary exploration including visual poems and my other innovation.

Data-driven Analysis of the VIX Index and its Correction Under the Application of Logistic Regression

Yang, Yuheng; Shen, Yuanhao; He, Yancheng

AREA: Business

MENTOR: Li Guo

This research investigates the relationship between assets' realized volatility and the VIX Index, looking for potential approaches of deriving a volatility measurement without options. It discovers significant inaccuracies when using the VIX Index to estimate the actual volatility. Meanwhile, it proves to be sufficient to derive a volatility measurement using short-term backward-looking volatility. Next, a logistic regression algorithm is employed on the measurement to improve its precision. Finally, through the model of S&P 500 studying, a similar model is established based on ChinaAMC China 50 ETF, bearing the aim of filling the absence of volatility index in the Chinese market.

The Impact of Climate Anomalies on Urban Tourism: A Case Study of the Yangtze River Delta Region

Zhu, Haoze; Xu, You

AREA: Economics

MENTOR: Chenghe Guan

The study analyzes the impact of climate situation on the annual tourism economy in six significant cities in the China Yangtze River Delta region – Shanghai, Hangzhou, Nanjing, Hefei, Suzhou, and Wuxi. The research applies both static panel data model and dynamic panel data model into the analysis of the correlation between climate and tourism economy variables, and each model uses tourist number and tourist expenditure as the dependent variable separately. The results show that climate factors influence both tourist number and expenditure, but the tourist expenditure is more sensitive to climate changes than the tourist number.

Yan Cai (岩彩): The Lost and Reviving Traditional Chinese Art

Lan, Yujie
AREA: Global China Studies
MENTOR: Shuang Wen

What is yan cai (岩彩)? Despite being a Chinese word, most Chinese people find it hard to articulate its meaning. While yan cai artists claim that it is a long-existing category of traditional Chinese art, few people recognize it today, let alone appreciate its aesthetic value. Why is yan cai such an unfamiliar term to us today?

This project looks into the modern invention of the term under particular historical and individual circumstances along with its early development in Han dynasty, its gradual disappearance later in Song and Ming dynasties, and its reintroduction to the public today.

Nietzsche's Critique of Schopenhauerian Will as Immediate Certainty

Shi, Lanxin
AREA: Humanities
MENTOR: John Richardson

As widely acknowledged, Nietzsche's appropriation and repudiation of Schopenhauer's speculation play a significant role in the development of his own philosophy. At several points in his book Beyond Good and Evil, Nietzsche criticizes Schopenhauerian will for it embodies an immediate certainty, which notion contains a contradictio in adjecto. Thus against Schopenhauer's metaphysical speculation, Nietzsche proposes his own account of the world as composed of will, drive, and will to power. In this paper, I examine Nietzsche's attempt to reject Schopenhauerian will by attacking the notion of immediate certainty, and offer an interpretation of Nietzschean will in light of this critique.

A Phenomenological Account of the Creative Mental Process

Liang, Xiao
AREA: Humanities
MENTOR: Lu Teng

This paper aims to characterize creative mental processes from a phenomenological perspective; namely, what underlies the process that produces the very experience of "what it's like" in each individual when we engage in creative acts. I argue it is a two-level process: on the first level is a necessary process of deliberate imagination or spontaneous imagination, which produces mental imagery integral to the content of the creative experience; on the second level is a higher-order awareness, or metacognition, that determines the creativity of a mental process, though oftentimes operating in the periphery.

The Formative Experience of Exile and Belonging in France

Zheng, Jikai (Remote)
AREA: Humanities
MENTOR: Claire de Obaldia

Drawing upon French and expatriate literary works from Gertrude Stein, Nancy Huston, Simone de Beauvoir, and Edward Saïd, we investigate the effects of exile on those who ultimately found a place to belong in Paris. Exile and belonging resonates just as much as formative experiences as childhood, in determining and constructing subjectivity and identity. As exiles are uprooted from their former lives, they begin anew like children who encounter themselves removed from their maternal body. This uneven split precipitates a restructuring of identity, preparing exiles to imagine themselves from the distance of the world's reflective mirror.

Promoting Art Education for Socially Vulnerable Children in China through Public Engagement

Chen, Qianyi; Cai, Yumin
AREA: Interactive Media Arts
MENTOR: Yanyue Yuan

Although many people may refer to art as something courtlike that is far away for daily life, we believe art education can and should be generalized to all social groups, rather than just the privileged ones. In this DURF project, we focused on art education among socially vulnerable children by reviewing the currently existing art education programs and approaches to raise public awareness with a focus on the context of urban China. In this way, we hope to contribute to creating a more sustainable framework for future programs in this area by expanding the value and impact of children's work and attracting more public support.

Between Life and Death: Art Practice in Navigating Digital Legacy for Online Bereavement

Wang, Zhichen; Bi, Yanran; Gao, Xinyi
AREA: Interactive Media Arts
MENTOR: Eric Parren

Aware of the current challenge that digital legacy and online bereavement lack systematic arrangement, the purpose of this project is to navigate the interpersonal experience of bereavement within the ever changing mediated environment. Through a multi-media art exhibition, the project aims at raising people's awareness of digital legacy and adopting their own way of digital remembrance after and ahead of death.

Social Programs for Women in Panama During Covid-19

Ameijeiras, Claudia (Remote)
AREA: Social Science
MENTOR: Maria Montoya

Given the obstacles of discrimination, violence, and lack of opportunities that Panamanian women continue to face throughout their life, the government has established 14 centers throughout the country which provide women at risk with shelter and with information about their rights. Yet the question remains: what are the real impacts of these programs in the lives of women? To answer this question, I used mixed methods, composed of surveys and interviews, to first determine the general impacts, advantages, and challenges of the programs. Then, through interviews, I sought to understand why this was the case.

Spatial Distribution and Accessibility Analysis of Public Hospitals in Shanghai

Shi, Yiling
AREA: Social Science
MENTOR: Chenghe Guan

This study assesses the current spatial distribution and accessibility situations of public hospitals in Shanghai. In addition to the point density analysis which directly reflects the spatial distribution pattern, this study also utilizes a comprehensively improved gravity model with travel times generated by web mapping API to accurately measure the accessibility level. The study finds that the central urban area gathers more high-quality public healthcare resources and also has higher accessibility levels. Based on the experiences and challenges, the study concludes with suggestions for future public hospital system optimizing in Shanghai, which can be leveraged for other public plannings.

Do Angels Really Give Names?

Teshome, Mahder (Remote)
AREA: Social Science
MENTOR: Mohamed Yunus Rafiq

Chosen for their semantic content or selected from Holy Texts, Ethiopian names are an integral part of their bearers' identity. Ethiopian onomastics, therefore, reflects the religiosity of the community that gives names. The significance and religious import is reflected in Amharic linguistic lore, as illustrated in the proverb, "an angel gives one's name,"—a statement formulated in the indicative. Although the linguistic (and logical) definition of a statement is of an expression that is either true or false, I will argue that this particular proverb is actually both—blurring the lines of mutual exclusivity of the truth-values in its use and interpretation.

Predictors of Chinese Parents' Attitudes Towards a Possible Sexual Minority Child

Ying, Yurun
AREA: Social Science
MENTOR: Pekka Santtila

In this study, we examined the attitudes of Chinese parents towards a sexual minority child in three dimensions (emotions, cognitions, and past behaviors/behavioral intentions) as well as their possible predictors. We found that female gender and nonheterosexual identity predicted more positive attitudes. We also found that beliefs in changeability and negative outcomes of homosexuality remained significant across all three dimensions of attitudes when controlling for others, although all predictors except for family cohesion and adaptability were significant univariately. Findings suggest that focusing on these factors in future research and interventions may be key to improving the well-being of Chinese LGB population.

Charting the Chinese Migration Landscope: Time, Space, and Comparative Cases

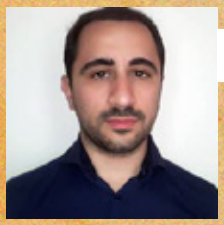
Yang, Like; Wang Shengze
AREA: Social Science
MENTOR: Ivan Willis Rasmussen

In recent years, scholastic literature on almost every domain of Chinese migration dynamic has accumulated substantially such that it is the time to review the existing literature and chart a more comprehensive landscape. This research project will look into three fields of literature – Chinese internal migration, overseas migration, and demographic shifts – and frame our understanding in three dimensions - change through time, change across space, and change in different cases. We propose to delineate the general scope of Chinese migration dynamic, state policy shift, and a possible "Chinese Model" in terms of systematic, well-established state practices in response to pervasive migration patterns and structural, demographic pressures.

JUDGES

Jacqueline Armijo

Visiting Associate Professor of History



Stavros Didakis

Associate Arts Professor of IMA

Melanie Hackney

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Jin Huang

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Ratan Kumer

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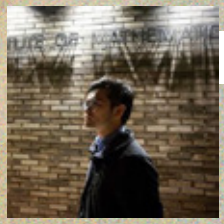
Shuyang Ling

Assistant Professor of Data Science; Global Network Assistant Professor

Olivier Marin

Professor of Practice in Computer Science



Wei Wu

Associate Professor of Mathematics

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