

Xinchun Ran

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EDUCATION BACKGROUND

Huazhong University of Science and Technology, China (HUST)

Program: Joint Program between HUST and University of Chinese Academy of Sciences

Degree: Bachelor of Science in Bioscience **GPA:** 3.56/4.00

Summer Session at Duke University

Courses: Statistical Inference, Neurobiology

09/2016-06/2020

(09/2018-06/2020)

07/2017-08/2017

RELEVANT COURSE WORK

Linear Algebra; Calculus; Structure Biology; Introduction to Biophysics; Optimization Research; General Physics

PUBLICATIONS:

Ran Xinchun, Shen Chushu, and Song Xiufang, Bibliometric analysis of geomagnetic navigation research trends in 1990-2019 using Web of Science database, ACS omega (Under Review)

Xinchun Ran, Fusong Ju, Lupeng Kong and Dongbo Bu, Improving protein tertiary structure construction through reducing inconsistency from the predicted inter-residue distances, CASP14

RESEARCH EXPERIENCES

Undergraduate Research Assistant, NYU Shanghai

07/2019-09/2019

- Calculated the quantum part of small biological molecules chemical dye molecules such as R6G and dye C272;
- Adopted the RESP calculation of amber as benchmark. Implemented self-programming RESP by using the GLS approach through Python and proved that the input partial charge was as accuracy as amber;
- Attempted to introduce loss function's idea in the partial charge calculation process to improve the deficiencies of RESP calculation;
- Calculated several important optimized structures of coumarin153/R6G/dye C272 in solution system including ground state, excited state, transition state;

Undergraduate Research Assistant, Institute of Computing Technology, CAS

02/2019-present

Program: Protein Secondary Structure Prediction based on Seq-SetNet Neural Network

✧ **Introduction**

- Used the existing protein sequence, took the input of MSA (multiple sequence alignment) and some chemophysical properties as the input and output of multiple features to obtain the prediction index of corresponding secondary structure sequence;
- Made an accuracy comparison through analyzing the protein secondary structure information such as ASA, RSA, dihedral angles of psi, phi and some other carbon skeletons, SS3 and SS8;
- Evaluated the effectiveness of the neural network based on the comparison results;

✧ **Procedures & Achievement**

- Predicted the structure domain of protein folding with machine learning method;
- Extracted features of the input MSA sequence using three-layer residual block and finally output the loss function;
- Improved the accuracy through optimizing the loss function of neural network;
- Rectified the loss function of SoftMax by using the method of log value human body posture recognition and enabled the prediction accuracy of secondary structure to reach 83% based on the parameter of training dataset 69 epoch
- Applied the trick in batch normalization to process the information extraction part of the protein structure prediction so as to extract the information of the protein structure in the MSA file more effectively, which effectively improved our results;
- Expect to keep on studying the generation of contact distance matrix in the next step and restoring the coarse-grained geometric structure through convex optimization; attempt to construct refinement network for correction;

Undergraduate Research Assistant, Department of Biomedical Engineering, Huazhong University of Science and Technology, China

04/2017-present

Program: Research on Photo-controlled Molecular Motor Design and Application of DNA with Specific Structure

✧ **Structure Design and Fabrication**

- Utilized two U-shaped connecting rods to construct a DNA track with the capability of flexible movement;
- Attached two ssDNAs (P1-1 / 2, P2-1 / 2) to the ring as a specific part of anchor chain bonded with certain DNA rod;
- Fabricated designed structure and extracted the most optimal DNA structure;

✧ **Characterization and Detection on Obtained DNA Structure:**

- Applied TEM and AFM to image the obtained DNA and observed its structure;
- Performed FRET-experiment in a QuantaMaster™ 400 fluorescence spectrophotometer based on a quartz cuvette under different temperature conditions;

- Generated the FRET effect through the change of FAM and DAB via fluorophores for detecting the connection and motion of the ring;

✧ **Modelling Application**

- Provided incubating strategy on the ratios of rings and rods regarding the process of loop-to-rod combined with single-chain DNA;
- Quantified DNA damage under UV irradiation given the damaging effect on DNA strands exerted by purine dimerizing;
- Speculated the motion of the ring on the basis of Gillespie reaction diffusion equation and depicted the response of each set of chains concerning the probability density function;

COMPETITIONS:

Undergraduate Research Assistant, "Huazhong Cup" Math Model Competition, HUST

04/2018

Program: Exploration on Regression based on Entropy Weight Method and Multi-logistics on Hospital for Diabetes

✧ **Data Assignment and Initial Processing**

- Listed several variables: readmitted rate, origin of patients, difference in the direction of discharge and drug increment;
- Optimized variables by using PCA to refine the main factors with R;
- Tested the correlated between different factor column by using GLM package;
- Set the computational criterion for readmitted rate: when the value is lower than 30, a result of 1 will be assigned; when the value is larger than 30, a result of 0 will be assigned;
- Set the computational criterion for drug increment: the increase of a drug dose is assigned as +1, the reduction of drug is assigned as -1, and summed up all dose values as drugs increment;

✧ **Fitting Process and Conclusion**

- Fitting three variables via multiple linear relationships after normalization and selected the first 124 sets of patient data to plot into the model;
- Investigated patients whose evaluation value is higher than 0.5 and calculated 93 sets of more than 0.5;
- Concluded that the rate of readmitted is negatively relevant to most indicators, and it is mainly dependent on initial diagnosis results and the doctor's major;

ICM Participant-Team Leader, Huazhong University of Science and Technology, China

02/2018

Program: Investigation on a Multi-model Approach Toward the Distribution of Tesla Charging Stations in Different Areas

✧ **Evaluation Modelling Process for Markets in United States**

- Constructed computational system on Uber Co data, the arrival rate of 11.3603/min and service rate of 298min/cars based on Queuing Theory Model (M/M/S) in the United States;
- Calculated service time via erlang algorithm, produced common charging piles to be from 420,000 to 450,000, and the super charging piles to be 20% regarding nationwide circumstances;

✧ **Development Tendency Prediction in Ireland**

- Selected seven representative cities to simulate the whole area of Ireland concerning their relative linear distances and produced the shortest path and link cost;
- Finalized the optimal plan regarding the establishments of 4135 charging piles based on maximum mileage and inter-city distance;
- Further extended the relationship between average waiting time and the amount of charging piles via genetic algorithm;
- Utilized Ford-Fulkerson model to do to optimal expressway flow in Ireland;

CONFERENCES

- 2019 Tsinghua-Science Symposium on Novel Proteins and Structures

11/2019

EXTRACURRICULAR EXPERIENCES

Group leader, BIOMOD Team HUST-CHINA Computational Group

10/2017-10/2018

- Led the molecular computing team with eight members, responsible for the whole process including conception, design of DNA origami structure, conduction of DNA origami molecular experiment, mathematical modeling of wet test and data analysis;
- Led the team to win the "Silver Award" in the contest;

HONORS&AWARDS

- Won "Innovation Award" of Huazhong University of Science and Technology, China 11/2018
- Won the "Silver Award" in Biomolecular Design Competition (BIOMOD) conferred by BIOMOD foundation 10/2018
- Won 1st prize in 3rd National University Students' Life Science Contest of Innovation and Entrepreneurship 08/2018

PROFESSIONAL SKILLS:

Computer Skills: Proficient in C++, Python, R

Language: Native in Chinese (Mandarin), Fluent in English