***Yuan LIU***

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NO. 3-11, Wenhua Road, Heping District, Shenyang, P. R. China

**EDUCATION**

**Northeastern University (NEU)**  Shenyang, China

***Master of Engineering of in Electronic Information, Artificial Intelligence***  09/2021-07/2024

* GPA: 3.8/4.0
* Core Courses: System Engineering and Decision Analysis 94, Principles of Machine Vision Detection 92, Multi-Attribute Decision Theories and Methods 91, Image Processing Analysis and Recognition 90

**Northeastern University (NEU)** Shenyang, China

***Bachelor of Engineering of in Automation***  09/2016-07/2020

* GPA:3.6/4.0
* Core Courses: Advanced Mathematics 96, Numerical Analysis 93, C Language Programming 95, MATLAB Language and Applications 93, Digital Signal Processing 95, Microcomputer Principles and Program Design 95, Fundamental of Modern Control Theory 93, Computer Control System 91, Operating Optimization and Artificial Intelligence 90

**RESEARCH EXPERIENCE**

**Project: Intelligent Adversal Agents Based on Decision Making and Game Theory**

***Researcher,* Deep Learning and Advanced Intelligent Planning Institute, NEU** 04/2022-01/2024

* We proposed a novel algorithm, Regret-Growing Counterfactual Regret Minimization (RGCFR), outperforms the existing CFR+ and CFR algorithm in the 2-player, non-zero-sum, imperfect information games, and achieved a $T^{-0.5}$ convergence rate on players’ reward loss function and $ϵ^{-2}$ algorithmic complexity.
* By analyzing the numerical characteristics of both players’ rewards in the best-response model, I found a one-order lower smoothness in non-zero-sum decision problems compared to their zero-sum counterparts. This heuristic is so helpful that I introduced a discounting mechanism on the negative elements of the regret value. And this gives rise to an increasing tendency for the accumulated regret value to grow over time, and therefore builds a steadily increasing inertia for the players’ mixed strategies during its iteration. We also made that discounting mechanism to be self-adaptive, and pretrained by the Q-learning method.
* This research is my first experience on intelligent decision making, and during this research, I learned key algorithms in decision making and reinforce learning, and through years I have received systematic training in scientific research.
* Intellect Property Awarded – Registered Software Copyright: Game Theory Supported Big Data Decision System, Register No. 2024SR0549734.
* The Second Prize Scholarship (top 10%-25%), NEU, 2023

**Yuan Liu**, Jiao Wang\*, Longyue Fu. Regret-Grow CFR: A Novel Iterative Algorithm to Solve General-Sum Imperfect Information Games. Artificial Intelligence (under review).

(Publication) Jiao Wang\*, Longyue Fu, Minghao Liu, **Yuan Liu**. CFDR: A Novel Strategy Update Algorithm for Imperfect-Information Non-Zero-Sum Synchronous Games. Information Sciences (under review).

**Project: Autonomous Driving Image Recognition and 3D Positioning System Based on YOLO-V5 and PSM-Net**

***Research Assistant,* Institute of Image Recognition and Machine Intelligence, NEU**  09/2021-01/2022

* We proposed an integration method, which incorporates object detection method from YOLO-V5 and 3-D localization from PSM-Net. Our method achieved stereo imaging perception in automatic driving.
* I am responsible for the improvement to CSPNet in YOLOv5, by introducing new convolutional layers to the C3N structure, I enhanced the algorithm's ability to extract deep features, especially on small objects. This method has AP values beyond 0.9 for common objects in automatic driving scenarios and outperforms Fast R-CNN, HyperNet, RefineNet512 on the VOC07++12 dataset.
* This helpful project is my first practice on deep learning, which is the real application of deep learning. Besides, self-driving research provided me with a chance to get familiar with intelligent decision making.

**Project: An Oscilloscope Program Based on STM32 Embedded System**

***Undergraduate Thesis, Research Assistant,* Laboratory of Innovative Electronic Technology, NEU**03/2018-01/2020

* Our realization of the real-time harmonic analysis and oscilloscopic STM32 embedded system is based on Fast Fourier Transform and Mathematical Modelling. The system satisfies 0.1% frequency and 0.5% amplitude tolerances.
* I am responsible for the system and algorithm designing. By modelling the spectrum leakage behavior of pure-frequency sinusoidal waves, I proposed a novel, real-time, sub-bin frequency estimating algorithm. I also proposed the “overtone signal trigger stabilizer”, a phase-based trigger mechanism for signals composed only of overtones without a fundamental frequency component. This contribution is also our solution’s special and competitive feature, which ensures waveform stability and determinism in these special cases.
* Through this research, I mastered algorithm optimization, integration of mathematical modeling and real-time signal processing, and software developing on embedded systems.
* We awarded the 3rd prize (top 15%-30%) of National Undergraduate Electronics Design Contest in 07/2018, held by Shenyang, China. (This is also the main part of my undergraduate thesis.), and I was awarded the Second Prize Scholarship (top 10%-25%), NEU, 2019

**Project: Classification of Depression Patients Based on EEG Information Using VGG**

**Undergraduate Thesis, College of Information Science and Engineering, NEU**  11/2019-06/2020

* 这是上一版的本科毕设，但是根本没做出来，这一版想用上面的比赛作为本科毕设
* Carried out Harmonic analysis of EEG level information
* Selected three more frequency bands and synthesized the energy distribution images of each frequency band into multi- channel images
* Realized binary classification of depression patients in different categories (major depression or bipolar depression) through VGG network

**Contest Participant, The Mathematical Contest in Modeling**  01/2019-02/2019

* Used genetic algorithm to solve the optimization problem of disaster relief material allocation in the case of limited drone range and load capacity

**AWARDS**

* The Second Prize (tier H, top 10%-40%) of the Mathematical Contest in Modeling, held by Consortium for Mathematics and its Applications (COMAP), 2018, 2019
* Mathematics Competition held by Northeastern University, China, 10th place, First Prize, (1-10th in over 2000 freshman students), 2017

**SKILLS**

* Programming: Python, C/C++, CUDA
* Software & Tools: PyTorch, MATLAB & Simulink
* Language: TOEFL
* Hobby and other skills: Automatic transaction and investment by gold price prediction based on machine learning

**An Intelligent Unit (Circuit Board), Course: motion Control**

Led a team of three to design and produce an intelligent unit (circuit board), enabling the control of strong electricity by weak electricity and the sequential power-on and power-off of the excitation and armature windings of the motor.

Awarded as an excellent assignment.

**An Image Dehazing Method, Course: Digital Image Processing**

Collaborated with the team members to design an image dehazing method, conducted extensive tests and parameters adjustments on the program, achieving the restoration of foggy images to some extent.

Scored 93, the highest in the class for the experiment.

extracurricular activities

**Guard** in basketball team of school of automation, SEU

**Referee** in School Basketball Association, SEU

**Obtained** 4d Grading Rank in Go Game

**Team leader** of Back to School Promotion Activity in Anshan No.1 High School