YE FENG

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EDUCATION

Sun Yat-Sen University *September 2018 - Present*
Bachelor of Philosophy in Logic
Bachelor of Science in Mathematics & Applied Mathematics
Overall GPA: 4.5/5.0
Ranking: 1/21

RESEARCH EXPERIENCE

Research Interests Applied and computational mathematics, particularly on PDEs, numerical analysis, inverse problems, optimization, high performance scientific computing.

Frozen Gaussian Sampling (FGS) for Wave Equations and Schrödinger Equations *February 2022 - October 2022*

- Developed a Monte Carlo method named the frozen Gaussian sampling (FGS) to solve scalar wave equations based on the frozen Gaussian approximation (FGA). Designed feasible and specific procedures to implement the FGS to solve scalar wave equations with Gaussian initial conditions and with WKB initial conditions respectively.
- Established a rigorous error estimation for applying the FGS to approximate wave equations of dimensionality $d \geq 3$. Proved that the Monte Carlo sampling error due to the stochastic simulation in the FGS is independent of the asymptotic parameter in Gaussian initial data cases, and derived the boundedness of the sampling error in WKB initial data cases. Established a rigorous error estimation for applying the FGS to semiclassical Schrödinger equations with WKB initial conditions.
- Validated through numerical experiments that the sampling error of approximating 3D wave equations with the FGS is consistent with the theoretical estimation, and that there are similar results of the sampling error in approximating 1D and 2D wave equations with the FGS.

Seismic Tomography with Consensus-based Global Optimization (CBO) *September 2021 - October 2022*

- Reformulated the inverse problem in seismic tomography into a high-dimensional optimization problem and applied the consensus-based global optimization (CBO) method to approximate the global optimum.
- GPU-accelerated the frozen Gaussian approximation (FGA) program by about 100 times through CUDA programming and applied the program to compute the seismic wavefields that served as the observed and predicted data in the inverse problem.
- Studied the performance and efficiency of the optimization method through numerical experiments.

Algorithms for Course Scheduling Problem Based on Social Choice Theory *March 2021 - December 2021*

- Formalized the course scheduling problem into a one-sided one-to-many matching problem based on the teachers' preferences and analyzed the advantages and disadvantages of applying the serial dictatorship algorithm (SD) to solve the course scheduling problem.
- Formalized the course scheduling problem into a one-sided one-to-one matching problem based on the teachers' preferences. Solved the resulted matching problem through a three-step algorithm that is extended from the Hopcroft-Karp algorithm and leads to maximum Pareto optimal matchings. Established an iterative method based on this three-step algorithm to obtain complete Pareto optimal matchings.
- Validated the performance of the Pareto optimal matching algorithm through numerical experiments. Discussed various real-life scenarios where the algorithms for social preference-based course scheduling problems can be used.

A Proof of Arrow's Impossibility Theorem in Social Choice Framework *November 2019*

- Formalized an axiom system of preference aggregation based on social choice functions and formalized Arrow's conditions - universality, non-dictatorship, unanimity, independence of irrelevant alternatives - in the framework of social choice.
- Proved Arrow's Theorem in the framework of social choice through the properties of decisive coalitions: when there are more than two social alternatives, a social choice function is a dictatorship if and only if it satisfies universality, independence of irrelevant alternatives and unanimity.

HONORS & AWARDS

The First Prize Scholarship, Sun Yat-Sen University *2021*
National Scholarship, Ministry of Education of the People's Republic of China *2020*
The First Prize Scholarship, Sun Yat-Sen University *2020*
First Prize in Guangdong Contest District, China Undergraduate Mathematical Contest in Modeling *2020*
Finalist, Mathematical Contest in Modeling (MCM) *2020*
National Scholarship, Ministry of Education of the People's Republic of China *2019*
The First Prize Scholarship, Sun Yat-Sen University *2019*

TECHNICAL STRENGTHS

Computer Skills MATLAB, Fortran, Python, Java, CUDA Programming, SQL, Linux, LaTeX
Language TOEFL 110, IELTS 7.0