CHENGZHU HUANG

Math, University of Science and Technology of China

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SHORT BIO

Chengzhu Huang is currently a fourth-year undergraduate student at **University of Science and Technology**, majoring in **probability and statistics**. As an undergraduate, Chengzhu Huang was very fortunate to be advised by three amazing supervisors Prof. Yu Chen, Prof. Anru Zhang and Prof. Yuqi Gu working on community detection, information geometry, and latent factor model respectively.

His research interests lie broadly in the span of **statistics**, **machine learning**, and **optimization**.

EDUCATION

University of Science and Technology of China   *Hefei, China*
Department of Probability and Statistics   *2019 - present*

- **Overall** GPA: 3.74/4.3(88.39), ranking: 21/105 in Statistics.
- **Major GPA**: 3.84/4.3
- **GPA Trend**:
  3.58/4.3(85.86/100) (2019 Fall- 2020 Fall)
  3.90/4.3(90.91/100) (2020 Spring- 2022 Spring)

Related Courses:

- Real Analysis: (94/100)
- Functional Analysis: (91/100)
- Mathematical Statistics: (94/100)
- Probability Theory: (100/100)
- Applied Stochastic Processes: (97/100)
- Modern Algebra: (91/100)
- Regression Analysis: (90/100)
- Advanced Probability Theory*: (90/100)
- Stochastic Processes*: (92/100)
- Optimization Algorithm*: (98/100)
- Bayesian Analysis*: (90/100)
- (* graduate course)

SEMINARS

Seminars on Advanced Probability and Statistics
Organized by Prof. Dangzheng Liu   *2021.9-2022.1*

- Gave a 90-min report about the limiting distribution of zeroes of random polynomials.

Reinforcement Learning, Graduate Weekly Seminar
Organized by Prof. Yinglei Lai   *2021.9-2022.3*

- Made two presentations on the fundamental theory of Q-learning.

RESEARCH EXPERIENCE

Linear and Nonlinear Overlapping Stochastic Block Model Problem   *2022.5 - present*
University of Science and Technology of China
Advisor: Prof. **Yu Chen**

- Studied the classic **stochastic block model** with degree-corrected mixed membership as well as the **hypergraph stochastic block model**.
- Proposed a computationally efficient hard-threshold estimation procedure to estimate the membership of **additive OSBM**.
- Extended the additive OSBM to the non-linear setting and developed an efficient **double-SVD** estimation method **tackling the gaps between spectral methods and non-linear network model assumptions**.
- Established the recovery guarantees for the hard-threshold method leveraging the techniques of random matrices.

Exact Recovery of Latent Classes in High-dimensional Complex Data   *2022.7 - present*
Columbia University
Advisor: Prof. **Yuqi Gu**

- Established a tight $\ell_{2,\infty}$ **singular space perturbation upper bound** for the latent class model using the leave-two-out technique.
- Established the **asymptotic normality** of singular subspace embedding in the latent class model and proposed a post-projection hypothesis testing procedure.
- Proposed the **Projected Covariance-adjusted Weighted Clustering method(PCW-Clust)** which significantly outperforms the traditional spectral clustering methods in the heteroskedastic noise setting.
- Successfully conducted numerical simulations in various settings, applied the PCW-Clust method on the **splice junction** dataset and the **1000 Genomes** dataset, and verified the effectiveness of covariance adjustment.

One-step MLE on Statistical Manifolds   *2022.7 - present*
Duke University
Advisor: Prof. **Anru Zhang**

- Established the asymptotic normality of **MLE and one-step MLE estimate** with a retraction approximation and calculated some specific cases such as low-rank matrices manifold.
- Gave a **third-order expansion formula for local coordinates** under normal chart transformations using the Jacobi field technique and comparison theorem and established the **third-order Edgeworth expansion** for one-step geodesic MLE on Sphere.
- Proposed a novel **studentized bootstrap algorithm** based on one-step MLEs to construct **second-order** accurate confidence bands in the general case.
- Proved the validity of the higher-order correction for the one-step MLE on sphere manifolds and compact Stiefel manifolds in the numerical simulations.

TEACHING EXPERIENCE

Teaching Assistant, **Probability Theory** (Credit: 4)   *2022.9 - present*

SKILLS

C, Python, R, LaTeX, Git

HONORS

Recipient of **Outstanding Undergraduate Scholarship** in the year of 2019,2020,2021.