

# Yi Zhang

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EDUCATION **University of Oxford, UK** 2020–2022

- MSc in Mathematical Sciences (OMMS), **Class: Merit (68%)**.
- Relevant Courses: *Theories of Deep Learning, Numerical Linear Algebra, Networks, Approximation of Functions, Advanced Topics in Machine Learning, Topics in Computational Biology*.
- Dissertation: *Error Bounds for Ritz Vectors of Singular Value Decomposition*.  
Supervisor: Prof Yuji Nakatsukasa.

**The University of Manchester, UK.** 2018-2020

- BSc (Hons) in Mathematics, **Class: First, GPA: 89.4/100, Rank: 15/234**.
- Relevant Courses: *Matrix Analysis, Machine Learning and Multivariate Statistics, Statistical Methods, Numerical Analysis, Graph Theory and Combinatorics, Convex Optimization, Statistical Inference, Fractal Geometry*.
- Thesis: *Fractional Partial Differential Equations and Applications*.  
Supervisor: Prof Sergei Fedotov.

**Tianjin University, China.** 2016-2020

- BSc in Mathematics and Applied Mathematics, **Major GPA: 86.4/100**.
- Relevant Courses: *Mathematical Analysis, Mathematical Modelling, C++ Programming, Advanced Algebra*.

RECENT RESEARCH AND COURSEWORK

- **Transformer-based Methods for Biomedical Sequential Data**  
Research Scientist, University of Oxford. Feb 2022 - Sept 2022  
Worked as part of the CHRONOSIG project, studied the application of Transformer architectures, and prompt learning on electronic health records and with a focus on the CRIS dataset, one of the largest clinical datasets across UK. The project is sponsored by NIHR.  
Related Paper (co-first authorship): *Clinical Prompt Learning with Frozen Language Models*. *arXiv preprint*.
- **Neural Cellular Image Analysis with Deep Learning Methods**  
Research assistant, University of Oxford. Aug 2021 - Feb 2022  
Implemented various deep learning methods with large volume of fluorescent cellular images for drug effect screening and filtering. The projects are funded by GlaxoSmithKline.
  - Developed a ResNet based 12-class identifier for cell phenotyping with overall 90.3% accuracy, visualized with Grad-CAM and UMAP. Used extracted features from Harmony to implement machine learning algorithms (XGBoost, Random Forest) to analyze single-cell features.
- **Error Bounds for Ritz Vectors of Singular Value Decomposition**  
Master's dissertation, OMMS. Nov 2020 - Apr 2021

- Reviewed Rayleigh-Ritz method, Davis-Kahan theorem and its improvements for eigenspace approximation of Hermitian matrices. Then surveyed the extension of the theorems on SVD.
- Proposed conjectures for error bounds for approximate singular vectors (Ritz vectors) of rectangular matrices. Empirically showed the correctness by numerical experiments and theoretically proved part of the conjectures.
- **Causal Inference Methods for Epidemiology of the COVID-19 Pandemic**  
Course project, Topics in Computational Biology, University of Oxford. May 2021
  - Reviewed two applications of causal inference: marginal structure models and sequential equation models.
  - Discussed the credibility of predicted outcomes derived by a combination of SIRD model and causal inference methods to help public health policies.
- **Stochastic Block Model for Community Detection with Pseudo-likelihood Methods**  
Course project, Networks, University of Oxford. March 2021
  - Implemented stochastic block model and its degree-corrected variant in Python and R using NetworkX and iGraph packages from scratch and tested on large sparse datasets.
  - Analyzed the dependency of initial settings when implementing the pseudo-likelihood methods.

#### HONORS AND AWARDS

- Excellent Graduate of Tianjin University. (3%) 2020
- Manchester Undergraduate Studentship (per academic year). (5%) 2018-2020
- Outstanding Student of Tianjin University. (5%) 2017

#### SKILLS

- Programming Languages and Tools: Python, MATLAB, PyTorch, scikit-learn, Chebfun, Pytorch Geometric, sktime.
- Languages: Chinese Mandarin (Native), English (Fluent), Japanese (Intermediate).

#### ACTIVITIES

- President and Concertmaster, Peiyang Wind Orchestra, Tianjin University 2016-2018
- Official Student Representative, Student Union, Tianjin University 2016-2018