Fu Chen

Ph.D. Student
Department of Educational Psychology, University of Alberta

PERSONAL INFORMATION

Address: 6-110, Education North, Faculty of Education
University of Alberta
Edmonton, Alberta, Canada T6G 2G5

Phone: 587-566-8326

Personal Website: www.fuchen.me

Email: fu4@ualberta.ca

EDUCATION

Ph.D. Student, Measurement, Evaluation, and Data Science **09/2017–04/2021**
Department of Educational Psychology, University of Alberta

- Thesis: Deep Collaborative Filtering for Enhanced Learning Outcome Modeling
- Supervisor: Dr. Ying Cui
- Expected Candidacy: October 2020; Expected Graduation: April 2021

M. Ed., Educational Measurement **09/2014–07/2017**
Faculty of Psychology, Beijing Normal University

- Thesis: Model Fit Evaluation of Hierarchical Diagnostic Classification Models with M_2
- Supervisor: Dr. Tao Xin

B.S., Psychology **09/2010–07/2014**
School of Psychology, Beijing Normal University

RESEARCH INTERESTS

Driven by my interdisciplinary background in psychology, educational measurement and artificial intelligence, my primary focus of current research is on the intersection of educational psychometric measurement and data science. Specifically, I am interested in developing and applying novel computational methods (e.g., deep learning) to uncover and facilitate student learning based on the structured and unstructured data on student interactions with digital learning environments. I am also interested in adapting data science techniques to address conventional psychometric measurement problems.

SCHOLARSHIPS, AWARDS AND GRANTS (Total: $119,400)

Scholarships (Total: $98,900)

- Alberta Innovates Graduate Student Scholarship, $31,000 × 2 **2020**
  - *Alberta Innovates*
  - The scholarship is a full scholarship for graduate students at three Alberta universities to undertake full-time research in the areas of Information and Communications Technology (ICT), Nanotechnology, and Omics.
- Alberta Graduate Excellence Scholarship, $12,000 **2020**
  - *University of Alberta*
  - The scholarship recognizes and incents the best and the brightest students pursuing graduate studies in Alberta.
- Chinese Government Award for Outstanding Graduate Students Abroad, $8,000 **2020**
  - *China Scholarship Council*
  - The scholarship is considered the highest award given by Chinese government to graduate students studying outside China.
- Professor Mian Muhammad Afzal International Graduate Scholarship in Education, $1,000 **2018**
  - *University of Alberta*
  - The scholarship recognizes a graduate student with superior academic achievement annually in the Faculty of Education.
- University of Alberta Doctoral Recruitment Scholarship, $5,000 **2017**
  - *University of Alberta*
  - The scholarship recognizes superior students at the doctoral level who have the potential to contribute to the University of Alberta's community and research.
- China National Scholarship, $4,000 **2016**
  - *Ministry of Education, China*
  - The scholarship recognizes the top 3% of master's students at Beijing Normal University (BNU) annually. It is the most prestigious scholarship operated by the central government of China.
- Liyun Rank 1 Graduate Scholarship, $1,000 **2016**
  - *Beijing Normal University*
  - The scholarship recognizes five outstanding graduate students at BNU every two years.
- Huawei Graduate Scholarship, $1,200 **2016**
  - *Huawei Technologies Co., Ltd.*
  - The scholarship recognizes six outstanding graduate students at BNU annually.
- Graduate Rank 1 Freshmen Scholarship, $2,400 **2014**
  - *Beijing Normal University*
- Graduate Rank 2 Specialty Scholarship, $2,000 **2015**
  - *Beijing Normal University*
- Undergraduate Rank 2 Specialty Scholarship, $300 **2013**
  - *Beijing Normal University*

Awards and Honors (Total: $14,000)

- Beijing Normal University Honor of Outstanding Graduates, $200 **2017**
  - *Beijing Normal University*
  - The award recognizes the top 10% of 1,527 graduates with a master's degree at BNU in 2017.
- Third Prize, the Jingshi-cup Extracurricular and Academic Competition **2013, 2014**
  - *Beijing Normal University*
  - The competition recognizes students' outstanding papers and technological works annually.
- Outstanding Project Award, $200 **2014**
  - *Beijing Normal University*
  - This award recognizes the top 20% of student-led projects funded by the plan of Beijing college students' scientific research and entrepreneurial action.
- Outstanding Project Award, $200 **2013**
  - *Beijing Normal University*
  - This award recognizes the top 20% of student-led projects funded by the scientific research foundation for undergraduates of Beijing Normal University.
- Outstanding Teaching Assistant Award, $200 each year **2015, 2016**
  - *Beijing Normal University*
- Departmental Research Paper Award, $10,000 in total **2017, 2018, 2019**
  - *Faculty of Psychology, Beijing Normal University*
- Outstanding Graduate Student Paper Award, $3,000 in total **2016, 2017**
  - *Beijing Normal University*

Grants Supporting Research (Total: $2,000)

- Plan of Beijing College Students' Scientific Research and Entrepreneurial Action Grant, $1,600 **2013**
  - *Beijing Normal University*
- Grant of Scientific Research Foundation for Undergraduates at Beijing Normal University, $400 **2012**
  - *Beijing Normal University*

Grants and Awards Supporting Conference Travel (Total: $4,500)

- Myer Horowitz Graduate Student Travel Award, $500 **2020**
  - *Faculty of Education, University of Alberta*
- 2017 Annual Meeting of the National Council on Measurement in Education, $4,000 **2017**
  - *Beijing Normal University*

PUBLICATIONS

Referred Journal Articles (number of articles: **17**; first author articles: **9**)

Chen, F., & Cui, Y. (in press). LogCF: Deep collaborative filtering with process data for enhanced learning outcome modeling. *Journal of Educational Data Mining*.

Chen, F., & Cui, Y. (in press). Utilizing student time series behavior in learning management system for early prediction of course performance. *Journal of Learning Analytics*.

Chen, F., Cui, Y., & Chu, M-W. (2020). Utilizing game analytics to inform and validate digital game-based assessment with evidence-centered game design: A case study. *International Journal of Artificial Intelligence in Education*. https://doi.org/10.1007/s40593-020-00202-6

Cui, Y., **Chen, F.**, & Shiri, A. (2020). Scale up predictive models for early detection of at-risk students: A feasibility study. *Information and Learning Sciences, 121*(3/4), 97–116. https://doi.org/10.1108/ILS-05-2019-0041

Chen, F., & Cui, Y. (2020). Investigating the relation of perceived teacher unfairness to science achievement by hierarchical linear modeling in 52 countries and economies. *Educational Psychology*, 40(3), 273–295. https://doi.org/10.1080/01443410.2019.1652248

Chen, F., Yang, H., Bulut, O., Cui, Y., & Xin, T. (2019). Examining the relation of personality factors to substance use disorder by explanatory item response modeling of DSM-5 symptoms. *PLoS ONE*, *14*(6), e0217630. https://doi.org/10.1371/journal.pone.0217630

Cui, Y., **Chen, F.**, Shiri, A., & Fan, Y. (2019). Predictive analytic models of student success in higher education: A review of methodology. *Information and Learning Sciences, 120*(3/4), 208–227. https://doi.org/10.1108/ILS-10-2018-0104

Cui, Y., Chu, M-W., & **Chen, F.** (2019). Analyzing student process data in game-based assessments with Bayesian knowledge tracing and dynamic Bayesian network. *Journal of Educational Data Mining*, *11*(1), 80–100. https://doi.org/10.5281/zenodo.3554751

Yang, H., **Chen, F.**, Liu, X., & Xin, T. (2019). An item response theory analysis of DSM-5 heroin use disorder in a clinical sample of Chinese adolescents. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2019.02209

Chen, F., Liu, Y., Xin, T., & Cui, Y. (2018). Applying the M_2 statistic to evaluate the fit of diagnostic classification models in the presence of attribute hierarchies. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2018.01875

Chen, F., Yan, Y., & Xin, T. (2017). Developing a learning progression for number sense based on the rule space model in China. *Educational Psychology, 37, 128–144.*

https://doi.org/10.1080/01443410.2016.1239817

Chen, F., Zhang, S., Guo, Y., & Xin, T. (2017). Applying the rule space model to develop a learning progression for thermochemistry. *Research in Science Education, 47,*

1357-1378. https://doi.org/10.1007/s11165-016-9553-7

Zhang, S., Du, J., Chen, P., Xin, T., & **Chen, F.** (2017). Using procedure based on item response theory to evaluate classification consistency indices in the practice of large-scale assessment. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2017.01676

Ouyang, X., Xin, T., & **Chen, F.** (2016). Construct validity of the children's coping strategies scale (CCSS): A bifactor model approach. *Psychological Reports*, *118*, 199–218. https://doi.org/10.1177/0033294116628362

Chen, F., Xin, T., Liu, Y., Liu, T., & Tian, W. (2016). Model-data fit test methods and statistics for cognitive diagnostic models. *Advances in Psychological Sciences*, *24*, 1946–1960. https://doi.org/10.3724/SP.J.1042.2016.01946 (in Chinese)

Gao, Y., **Chen, F.**, Xin, T., Zhan, P., Jiang Y. (2017). Applying psychometric models in learning progressions studies: Theory, method and breakthrough. *Advances in Psychological Sciences*, *25*, 1623–1630. https://doi.org/10.3724/SP.J.1042.2017.01623 (in Chinese)

Xu, J., Zhou, H., Li, W., **Chen, F.**, & Zhang, W. (2014). Interviewer's rating and influencing factors in structural interviews. *Advances in Psychological Sciences*, *22*, 357–368. https://doi.org/10.3724/SP.J.1042.2014.00357 (in Chinese)

Manuscripts Under Review (number of articles: **5**; first author articles: **2**)

Chen, F., Sakyi, A., & Cui, Y. (under review). Identifying key contextual factors of top performers in digital reading through a machine learning approach.

Chen, F., Sakyi, A., & Cui, Y. (under review). What makes a good reader? Examining the role of reading self-efficacy through multilevel structural equation modeling. Manuscript submitted for publication.

Shin, J., **Chen, F.**, Lu, C., & Bulut, O. (under review). Using time-series prediction to inform test administration decisions in formative assessment. Manuscript submitted for publication.

Gao, Y., Cui, Y., Zhai, X., **Chen, F.**, & Xin, T. (under review). Re-validating a learning progression of buoyancy for middle school students. Manuscript submitted for publication.

Gao, Y., Cui, Y., & **Chen, F.** (under review). Examining the relation of information and communication technology usage to collaborative problem solving by hierarchical linear modeling.

Manuscripts in Preparation (number of articles: **2**; first author articles: **1**)

Chen, F. & Cui, Y. (in preparation). SDCF: Sequential deep collaborative filtering for enhanced item response modeling.

Chu, M-W., Shojaee, M., Hachem, M., **Chen, F.** & Cui, Y. (in preparation). Types of validity evidence needed to support digital game-based assessment competency outcome claims.

CONFERENCE PRESENTATIONS

Paper & Poster Presentations (number of presentations: **14**; first author presentations: **6**)

Chen, F., Sakyi, A., & Cui, Y. (2020, April). *Identifying influential contextual factors of online reading literacy through a machine learning approach* [Poster Session]. AERA Annual Meeting San Francisco, CA http://tinyurl.com/qq724ky (Conference Canceled due to COVID-19).

Chen, F., Guo, Q., Cui, Y., & Chu, M-W. (2020, April). *Utilizing game analytics to inform digital game-based assessment design*. Annual Meeting of the National Council on Measurement in Education (Symposium Canceled due to COVID-19).

Chen, F., & Cui, Y. (2020, September). *Predictive analytics of temporal behavior to automate formative feedback on course performance* [Poster Session]. Paper to be presented at the 2020 Annual Meeting of the National Council on Measurement in Education (Online Presentation due to COVID-19).

Cui, Y., Chu, M-W., **Chen, F.**, & Guo, Q. (2020, April). *Analyzing student process data with Bayesian knowledge tracing and dynamic Bayesian network*. Annual Meeting of the National Council on Measurement in Education (Symposium Canceled due to COVID-19).

Chu, M-W., Cui, Y., Shojaee, M., Hachem, M., Guo, Q., & **Chen, F.** (2020, April). *Validity of process-based competency outcome claims using think-a-loud data and evidence-trace files*. Annual Meeting of the National Council on Measurement in Education (Symposium Canceled due to COVID-19).

Guo, Q., **Chen, F.**, Chu, M-W., & Cui, Y. (2020, April). *Detection of aberrant response patterns using discrete variational autoencoder*. 2020 Annual Meeting of the National Council on Measurement in Education (Symposium Canceled due to COVID-19).

Gao, Y., **Chen, F.**, & Cui, Y. (2020, September). *Examining relation of information and communication technology to collaborative problem solving by hierarchical linear modeling*. Paper to be presented at 2020 Annual Meeting of the National Council on Measurement in Education (Online Presentation due to COVID-19).

Shin, J., **Chen, F.**, Lu, C., & Bulut, O. (2020, September). *Automating test administration decisions in computerized formative assessment*. Paper to be presented at the 2020 Annual Meeting of the National Council on Measurement in Education (Online Presentation due to COVID-19).

Chen, F. (2019, October). *Influential factors contributing to students' mathematics achievement (PISA 2012): A comparison between Alberta and Quebec*. Poster presented at the 2019 Alberta Research Network Meeting, Edmonton, AB.

Cui, Y., Shiri, A., & **Chen, F.** (2019, May). *Enhancing student success through predictive learning analytics*. Paper presented at the 2019 Festival of Teaching and Learning at University of Alberta, Edmonton, AB.

Carlson, E., Kapasi, A., **Chen, F.**, Pei, J., Cui, Y., Anderson, T., & Mela, M. (2018, September). *Prenatal alcohol exposure and its relation to intelligence, executive functions, and antisocial and prosocial outcomes*. Paper presented at the European

Conference on Fetal Alcohol Spectrum Disorders 2018, Berlin, German.

Chen, F., Liu, Y., & Xin, T. (2017, April). *Applying M_2 statistic to evaluate the fit of hierarchical diagnostic classification models*. Paper presented at the 2017 Annual Meeting of the National Council on Measurement in Education, San Antonio, TX.

Chen, F., Xin, T., & Guo, Y. (2015, July). *Applying the rule space model to develop a learning progression of thermochemistry.* Paper presented at the 80th Annual Meeting of the Psychometric Society, Beijing, China.

Li, W., Zhang, W., **Chen, F.**, & Xu, J. (2013, November). *The effects of interviewees' nonverbal clues on interviewers' ratings.* Paper presented at the 16th National Academic Congress of Psychology, Nanjing, China. (in Chinese)

Conference Articles in Preparation (number of articles: **1**; first author articles: **1**)

Chen, F., & Cui, Y. (in preparation). *LogCF: Deep collaborative filtering with process data for enhanced item response modeling*. Paper to be submitted to the 2021 Annual Meeting of the National Council on Measurement in Education.

RESEARCH EXPERIENCE

Research Assistant **05/2019–present**

- *University of Alberta*
- Project: *Digital Performance-Based Learning and Assessment System for Teaching Data Literacy*
- Advisor: Dr. Ying Cui
- **Experience:** Did an overall literature search of over 200 articles on data literacy, developed sample assessment questions and created storyboard of the computer-based assessment of data literacy.

Research Assistant **05/2018–present**

- *University of Calgary*
- Project: *Students' Performance on Weather Game-Based Assessment*
- Advisor: Dr. Man-Wai Chu & Dr. Ying Cui
- **Experience:** Cleaned students' structured assessment data and log file data, did data analysis with Bayesian knowledge tracing, dynamic Bayesian networks and machine learning techniques, and helped write up two research articles.

Research Assistant **09/2017–present**

- *University of Alberta*
- Project: *Enhancing Student Success through Predictive Learning Analytics: Expanding the Learning Analytic Application at the University of Alberta*
- Advisor: Dr. Ying Cui
- **Experience:** As a main group member, did an overall literature review of over 100 articles, participated in data collection and data cleaning, analyzed the log file data with machine learning techniques, helped write up three research articles.

Research Assistant **08/2018**

- *University of Alberta*

- Project: *Prenatal Alcohol Exposure and Its Relation to Intelligence, Executive Functions, and Antisocial and Prosocial Outcomes*
- Advisor: Dr. Jacqueline Pei
- **Experience:** Provided the team with statistical expertise on path analysis, did the data analysis and prepared results for presentation.

Research Assistant **10/2017–06/2018**

- *University of Calgary*
- Project: *Preparing Pre-Service Teachers to Meet Individual Needs in the Classroom*
- Advisor: Dr. Man-Wai Chu
- **Experience:** Provided the team with statistical expertise on structural equation modeling, conducted the data analysis and prepared results for a research paper.

Research Assistant **09/2014–06/2017**

- *Beijing Normal University*
- Project: *Developing Achievement Standards for Basic Education in China*
- Advisor: Dr. Tao Xin
- **Experience:** Participated in two studies on learning progression, in charge of literature review, data analysis and research article write-up; helped the PI prepare materials for presentation.

Research Assistant **09/2014–06/2017**

- *Beijing Normal University*
- Project: *Item Response Theory and Cognitive Diagnosis: Perspective of Integration*
- Advisor: Dr. Tao Xin
- **Experience:** As the PI of a study on model-data fit of cognitive diagnosis, in charge of literature review, data analysis and research article write-up.

Research Assistant **09/2012–01/2013**

- *Beijing Normal University*
- Project: *Competency Modeling for HR Employees in Educational System*
- Advisor: Dr. Jianping Xu
- **Experience:** As a main group member, constructed the competency model for the HR employees in the educational system via literature review, structured and semi-structured interview and surveys.

Principal Investigator **03/2013–04/2014**

- *Beijing Normal University*
- **Project:** *Effects of Interviewers' and Applicants' Nonverbal Information on the Ratings in Structured Interview*
- **Experience:** In charge of the design, execution and management of the project; conducted a rigidly manipulated simulated experiment and recruited over 150 participants.

Principal Investigator **02/2012–03/2013**

- *Beijing Normal University*
- **Project:** *Effects of Continuous Gain or Loss in Prior Decision-makings on the Decision Maker's Behavior Under the Simulated Realistic Risk Situation*
- **Experience:** In charge of the design, execution and management of the project; developed a new software for investing stocks; recruited over 120 participants and

conducted an experiment based on the stock investment procedure.

TEACHING EXPERIENCE

Lab Instructor & Teaching Assistant **Fall 2020**

- *University of Alberta*
- EDPY 505: Quantitative Methods I
- **Role:** prepared materials for each lab, taught the lab session to 20+ students, answered students' questions, helped students' course projects, and collaborated with Dr. Cui to help make assessments.

Lab Instructor & Teaching Assistant **Winter 2020**

- *University of Alberta*
- EDPY 605: Quantitative Methods II
- **Role:** prepared materials for each lab, taught the lab session to seven students, answered students' questions, helped students' course projects, and collaborated with Dr. Cui to help make assessments.

Guest Lecturer **11/2019**

- *University of Alberta*
- EDPY 597: Educational Data Mining I
- **Role:** taught a lab session on educational data mining and predictive modeling with R.

Lab Instructor & Teaching Assistant **Fall 2019**

- *University of Alberta*
- EDPY 505: Quantitative Methods I
- **Role:** prepared materials for each lab, taught the lab session to 20+ students, answered students' questions, helped students' course projects, and collaborated with Dr. Cui to help make assessments.

Lab Instructor & Teaching Assistant **Winter 2019**

- *University of Alberta*
- EDPY 605: Quantitative Methods II
- **Role:** prepared materials for each lab, taught the lab session to 19 students, answered students' questions, helped students' course projects, and collaborated with Dr. Cui to help make assessments.

Lab Instructor & Teaching Assistant **Fall 2018**

- *University of Alberta*
- EDPY 505: Quantitative Methods I
- **Role:** prepared materials for each lab, taught the lab session to 20+ students, answered students' questions, helped students' course projects, and collaborated with Dr. Cui to help make assessments.

Teaching Assistant **Spring 2016**

- *Beijing Normal University*
- Advanced Item Response Theory
- **Role:** answered students' questions and collaborated with the instructor to help make assessments.

Teaching Assistant **Fall 2015, Fall 2016**

- *Beijing Normal University*
- Research Methods in Psychology: Design and Techniques
- **Role:** prepared slides for the instructor, developed assignment and final exam questions, marked all assignments and final exam, answered students' questions, and collaborated with the instructor to help make assessments.

Teaching Assistant **Spring 2015**

- *Beijing Normal University*
- Item Response Theory
- **Role:** prepared slides for the instructor, developed assignment, helped students' course projects, answered students' questions, and collaborated with the instructor to help make assessments.

Senior High School Intern Teacher **10/2013–11/2013**

- *Nanhu School Affiliated to Beijing Normal University, Jiaxing, China*
- **Experience:** Taught several classes on mental health; gave a lecture on sex education to 300+ students; class supervision; conducted a survey on students' mental health.

Volunteer Tutor **07/2011**

- *Ding'an Middle School, Hainan, China*
- **Experience:** Taught a course on mental health; class supervision.

WORK EXPERIENCE

Research Intern **09/2018–present**

- *Alberta Education, Government of Alberta*
- **Supervisor**: Dr. Alfred Sakyi
- **Experience:** Completed four projects on hierarchical linear modeling and multilevel structural equation modeling of PISA, PIRLS and TIMSS data, wrote research proposals, conducted data analyses, and prepared three technical reports, one data analysis tutorial, three research briefs and three research posters.

Statistical Consultant **12/2018**

- *Beijing University of Technology*
- Project: *Screening for Students' Mental Health at Beijing University of Technology*
- **Experience:** Provided the team with statistical expertise on descriptive analysis, item response modeling and factor analysis, did the data analysis of 18,000+ students' responses on mental health scales, and wrote up the results for an annual report on college students' mental health.

Assistant Consultant **06/2014–07/2014**

- *Horizon Research Consultancy Group, Inc.*
- **Experience:** As one of the three principal investigators, participated in the performance appraisal of a city's government fiscal expenditure projects; independently chaired four expert conferences to assess projects from different areas and composed more than 60 performance appraisal reports.

SKILLS & TRAINING

Languages

- Mandarin Chinese (native)
- Wu Chinese (native)
- English (fluent)

Skills

- Statistical and specialized software: R, Python, LaTeX, Markdown, M*plus*, SPSS, Excel

Quantitative & Methodological Coursework

- Quantitative Methods I & II (regression, ANOVA, structural equation modeling, hierarchical linear modeling and other multivariate statistical methods)
- Measurement Theory I & II (classical test theory, item response theory, computerized adaptive testing)
- Mixed Methods Approach in Educational Research
- Introduction to Machine Learning
- Deep Learning for Natural Language Processing
- Introduction to Reinforcement Learning
- Fundamentals of Stochastic Approximation Theory
- Item Response Theory & Advanced Item Response Theory

Statistical Workshop

- The Third Workshop on Statistical Methods in Cognitive Assessments, Shanghai, China, 2014

CERTIFICATES

Teacher Certificate for Senior High School **06/2014**

- *Ministry of Education, China*

ACADEMIC SERVICE

Conference Reviewer **09/2020**

- Reviewed five submissions on Measurement & Research Methodologies for the *2021 American Educational Research Association Annual Meeting*

PROFESSIONAL MEMBERSHIP

Member **2019 to Now**

- National Council on Measurement in Education