Sarah Maestrales, Ph.D.

sarahmaestrales@gmail.com | +34 698 13 26 44 | linkedin.com/in/sarah-maestrales

About Me

Quantitative researcher and psychometrician with a Ph.D. in Measurement & Quantitative Methods and a B.S. in Physics. My specialization is in the creative application of statistical models and data pipelines to create and optimize assessments, improve GenAI output, and reduce AI expenditures. Proficient in Stata, SPSS, Python, and R. Due to my love of learning and broad educational background, I regularly take on, and enjoy diverse roles within projects the provide opportunities to apply my skills to new situations.

Experience

Research and AI Consultant, Self Employed – Santiago de Compostela, Spain   Dec 2023 – Present

- Developed lessons and learning materials as part of a proposal for a Master's course in critical analysis and effective methodology in GenAI.
- Developed data collection instruments for RAG models which optimize and personalize in-game user experiences using GenAI.
- Reduced AI expenditure through the creative use of statistical models and basic automation procedures.
- Advised on dissemination of academic research and product development: statistical modeling, survey development, psychometric evaluation methods, academic writing, and presentations for a variety of unique studies, datasets, and purposes.

Psychometrician & Content Generation Specialist, Trilogy – Austin, TX   June 2024 – Feb 2026

- Developed RAG pipelines and data models, creating AI automation systems for the generation of assessment and learning materials in 11 Advanced Placement subject in history, science, and social science.
- Analyzed LLM-generated learning and assessment materials for scientific or historical accuracy, depth of knowledge, and appropriateness for inclusion in learning materials, measuring success through a combination of qualitative and quantitative measures.
- Lead a team to develop 11 courses aligned to the Advanced Placement learning standards in history, science, and social science, which facilitated 93% of students who completed the courses receiving 4s and 5s on the AP Exam.

Graduate Teaching Assistant, Michigan State University – East Lansing, MI   Aug 2022 – Apr 2024

- Facilitated lectures in quantitative analyses using multivariate statistics and multi-level modeling.
- Guided students in statistical modeling and hypothesis testing for multivariate statistical analysis in Stata, R, and SPSS; and facilitated their interpretations of the results for technical writing.

Graduate Research Assistant, Michigan State University – East Lansing, MI   Mar 2019 – July 2022

- Served as an analyst for a large scale education research intervention where I used multi-variate regressions and hierarchical linear modeling techniques to predict student learning outcomes.
- Lead an international team to investigate student engagement and interest in their online courses during the COVID-19 Pandemic using multivariate logistic regression.
- Designed and published an investigation discussing methodology in training and measuring automated classification of students' constructed responses.
- Applied statistical modeling techniques to study an algorithm's "certainty" in its classification based on various demographic and performance-based predictors for presentation at WERA.
- Designed various instruments to measure outcomes through survey or assessment, and optimized those instruments with IRT-based analyses (2PL, 3PL, PCM) to assess item and test-level functioning, measurement precision (TIF), item discrimination (IIC), bias (DIF), internal and external reliability, validity, and data reduction methods (EFA and CFA).

Education

Michigan State University, Ph.D. Measurement & Quantitative Methods   Aug 2019 – Apr 2024

- **Coursework:** Quantitative Methods in Education Research, Psychometric Theory, Survey Research & Instrument

Development, Multivariate Data Analyses, Hierarchical Linear Modeling, Latent Variable Modeling, Item Response Theory, Econometrics, Probability & Statistics.

Michigan State University, B.S. Physics   Aug 2015 – Dec 2018

- **Coursework:** Higher Geometry, Classical Mechanics, Matrix Algebra, Calculus, Differential Equations, Quantitative Chemistry, Classical Mechanics, Quantum Physics, Thermal and Statistical Physics, Nuclear Physics, Advanced Laboratory & Procedures, Electricity and Magnetism, Condensed Matter Physics.

Lansing Community College, A.A. Psychology   Aug 2002 – May 2006

- **Coursework:** Human Growth and Development, Adolescent Psychology, Introduction to Education, Integrated Science for Education, Cognitive Psychology, Psychology of Personality, Design & Communication.

Skills

Programming Languages: Python, R, Stata, SPSS

Document & Web Formatting: LaTeX, HTML, Markdown, QTI, XML

AI Platforms & APIs: GPT (OpenAI), OpenAI Platform, Claude (Anthropic & Bedrock), Anthropic Console, Gemini

Google & Microsoft Tools: Sheets, Docs, Drive, Excel, Word; YouTube; Google API, Youtube API

Learning Management Systems & Survey Tools: Qualtrics, Edulastic, Edmentum, Khan Academy, D2L

Communication & Project Management: Slack, JIRA

Psychometrics: Item Response Theory (1PL, 2PL, 3PL,PCM), DIF, TIF, IIF, IIC, TIC, Exploratory & Confirmatory Factor Analysis (EFA & CFA).

Predictive Modeling: Regression Modeling (uni-variate, multi-variate, linear, non-linear); Hierarchical Linear Modeling, Hypothesis Testing

Soft Skills: Pattern recognition, solution-oriented thinking, creative problem solving, teamwork / collaboration, multi-tasking, adaptability

Publications

Using machine learning to score multi-dimensional assessments of chemistry and physics   Apr 2021

Sarah Maestrales, Xiaoming Zhai, Israel Touitou, Quinton Baker, Barbara Schneider, Joseph Krajcik

Improving Science Achievement—Is It Possible? Evaluating the Efficacy of a High School Chemistry and Physics Project-Based Learning Intervention   Apr 2022

Barbara Schneider, Joseph Krajcik, Jari Lavonen, Katariina Salmela-Aro, Christoper Klager, Lydia Bradford, I-Chien Chen, Quinton Baker, Israel Touitou, Deborah Peek-Brown, Rachel Marias Dezendorf, *Sarah Maestrales*, Kayla Bartz

U.S. and Finnish high school science engagement during the COVID-19 pandemic   Apr 2022

Sarah Maestrales, Rachel Marias Dezendorf, Xin Tang, Katariina Salmela-Aro, Kayla Bartz, Kalle Juuti, Jari Lavonen, Joseph Krajcik, Barbara Schneider

Improving Oster's δ^*: *Exact Calculation for the Coefficient of Proportionality Without Subjective Specification of a Baseline Model*   Dec 2022

Kenneth Frank, Qinyun Lin, Spiro Maroulis, Shimeng Dai,Nicole Jess, Hung-chang Lin, Yuqing Liu, *Sarah Maestrales*, Ellen Searle, Jordan Tait

Conference Papers & Presentations

Adapting Current Events into a Socially Relevant Curriculum   WERA 2021

Sarah Maestrales, Emily Miller, Kayla Bartz, Rand Spiro

Exploring for Racial and Ethnic Bias When Using Machine Learning to Score Multi-Dimensional Science Assessments.   PIRE 2021

Sarah Maestrales, Xiaoming Zhai, Israel Touitou, Quinton Baker, Barbara Schneider, Joseph Krajcik