MARIANA FERNÁNDEZ-ESPINOSA

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EDUCATION

University of Notre Dame *Fall 2023 - Present*
Ph.D. in Computer Science and Engineering

- Advisor: Diego Gómez-Zara

Universidad Autónoma de Aguascalientes *August 2015 - December 2019*
Bachelor of Computer Systems Engineering GPA: 3.9
Graduated with honors, awarded to the top 3% of the graduating class.

RESEARCH INTEREST

My research focuses on **generative AI** and **spatial computing**. I develop and analyze novel methods and systems that facilitate collaboration between teams in extended reality spaces, with a focus on **Human-AI interactions**. I am particularly interested in how integrating AI with immersive technologies can enable teams to achieve innovative results and enhanced experiences. Additionally, I explore the potential of generative AI to boost creativity, support decision-making processes, and facilitate task delegation between teams and AI in virtual reality environments.

PUBLICATIONS

- **Fernandez-Espinosa**, M., Clouse, K., Sellars, D., Tong, D., Bsales, M., Alcindor, S., Hubbard, T., Villano, M., & Gomez-Zara, D. (2025). Breaking the Familiarity Bias: Employing Virtual Reality Environments to Enhance Team Formation and Inclusion. *Manuscript sent for revision.* (CHI 2025)
- **Fernandez-Espinosa**, M., Gonzalez-Bejar, M., Wiesner, J., & Gomez-Zara, D. (2025). When Technologies Are Not Enough: Understanding How Domestic Workers Employ (and Avoid) Online Technologies in Their Work Practices. *Manuscript under revise and resubmit.* (CSCW 2025).
- Liu, Y., Liaqat, A., Zhang, X., **Fernandez-Espinosa M.**, Manjunatha, A., Yang, A., Papakyriakopoulos, O., & Monroy-Hernández, A. (2024). Mapping the landscape of independent food delivery platforms in the United States. Proceedings of the ACM on Human-Computer Interaction, 8(CSCW1), Article 92. https://doi.org/10.1145/3637369
- Olvera, V. G., Alarid-Escudero, F., Diaz, H., Luviano, A., Peralta, Y., **Fernandez-Espinosa M.**, ... & Goldhaber-Fiebert, J. D. Policy Comparison of Non-Pharmaceutical Interventions and Re-Opening in Mexico City, Mexico: Using a Near-Term Validated Model to Control COVID-19 Epidemic Peaks and Rebounds. In 42nd Annual Meeting of the Society for Medical Decision Making. SMDM.
- **Fernández-Espinosa, M.**, Rodarte-Domínguez, L. D., Muñoz de Loera, M. I., & Muñoz-Andrade, E. L. (2020). Nuska: Artisans Network. In Sé Curioso (pp.337-342). ISBN 9786078631353.
- **Fernández-Espinosa, M.**, Muñoz L., "Estudio exploratorio sobre el uso de redes sociales entre profesores y estudiantes universitarios". Congreso Internacional de Investigación, 2 coloquio de investigación educativa, 3ra reunión nacional de cuerpos académicos. Celaya 2017-12-28.
- Muñoz Andrade L., **Fernández-Espinosa, M.**, "Diseño de software educativo para elevar el aprendizaje significativo de los estudiantes de nivel básico: Un caso de estudio". Mujeres en la tecnología chapter 3, 28-36. ISBN:978-607-8695-03-4.

- Muñoz Andrade L., Arevalo Mercado Carlos A., **Fernández-Espinosa, M.**, "Redes sociales: Impacto en la educación de estudiantes de ingeniería". 18vo Seminario de Investigación. 2017-05-24.

RESEARCH EXPERIENCE

Research Assistant *February 2022 - February 2023*

Princeton University HCI

- Developed a data harvesting technique to extract approximately 1 million metadata records from food delivery platforms in the US.
- Conducted end-to-end research on the extracted data, collaborating with multidisciplinary stakeholders.
- Applied quantitative methods and statistical analysis using R, Python, and MATLAB.

Publication: Mapping the landscape of independent food delivery platforms in the United States (CSCW 2024)

Research Tech Lead *April 2021 - August 2022*

Inter-American Development Bank (IADB), education division

"A Gender Analysis of STEM Discourse in Latin American Social Media"

- Proposed and executed different techniques to explore how tone in social media influences gender stereotypes of Latin American women in STEM.
- Developed data harvesting techniques to extract 970,000 tweets and implemented cross-lingual topic model using autoencoding variational inference.
- Developed demographic, sentiment, and community analysis by implementing multiple Transformer-based models. Improving gender detection for Spanish users by 95%, reaching an accuracy of community detection of 97%.

Research Assistant *March 2020 - April 2021*

Stanford University

Centro de Investigación y Docencia Económicas (CIDE)

"Establishing a dynamic decision-making system in real-time on the COVID-19 pandemic in Mexico and Latin America"

- Developed an age-structured, multi-compartment susceptible-exposed-infected-recovered (AS-MC-SEIR) model in R to estimate different parameters of COVID-19 in California counties and Mexico's states.
- Automated over 10 processes and manual data extraction and cleaning tasks, saving 2 weeks of human work and decreasing the number of human resources needed per task.
- Designed data dashboards and shiny applications to show California Counties medical orders, Mexico's COVID-19 indicators and projections. The dashboards allow users to easily digest information and get data in real time.
- Developed application "OpenTree" to create decision tree models and cost-effectiveness analysis. This tool is used by Minnesota and Pittsburgh University - Faculty of Health and Science.

Publication: Policy Comparison of Non-Pharmaceutical Interventions and Re-Opening in Mexico City, Mexico: Using a Near-Term Validated Model to Control COVID-19 Epidemic Peaks and Rebounds. In 42nd Annual Meeting of the Society for Medical Decision Making. SMDM

Research Assistant *January 2019 - August 2019*

Universidad Autonoma de Aguascalientes

"NUSKA: Network of Artisans"

- Developed a web platform called Nuska, where Mexican artisans sell their products, post their work, make trades, and build communities. Nuska creates a space for fair trade between artisans and consumers.
- Conducted 50 interviews with Mexican artisans about the lack of support and the digital gap that blocks them from selling their products through Amazon, MercadoLibre, etc.
- Developed test techniques to review the interaction between artisan sector with technology. This project won first national place in the contest of science projects for students in Mexico 2019.

Summer Research Intern *June 2019 - August 2019*

Centro de Investigación en Ciencias de Información Geoespacial (Centro Geo)

XXIX National Summer of Scientific Research

"Topic Modeling using model Latent Dirichlet Allocation (LDA): Overview of Access to Information Regulations"

- Wrote python scripts for extraction and analysis of more than 2.34 million records from Mexican Transparency Institute (INAI) website
- Developed LDA model in R and python to categorize users requests and reveal diversity of topics of INAI website.
- Conducted data visualization using R and python to demonstrate that access to INAI information gives citizens a transitional democracy and helps to create relevant information for the citizens.

Data Science Intern *March 2019 - December 2019*

Centro de Investigación y Docencia Económicas (CIDE)

"Big Data for environmental management of sustainable development i-Gamma"

- Worked as a principal data migration developer to transform and migrate the data from National Mexican Institute of ecology (INECOL) from different legacy systems to a database designed in mySQL.
- Developed unsupervised algorithms to categorize topics from the database. The model identified narrow circumstances of lack of water in the south region of Mexico.
- Created web platform using JavaScript and Angular to improve the decision-making process for environmental problems.

Autumn Research Intern *September 2019 - October 2019*

Huawei Technologies Co., Ltd.

"Scholarship Seeds For The Future"

- Analyzed, comprehended, and learned about architecture, functionality of 4G- 5G technology and cutting-edge technologies.
- Performed analysis about the issues of implementing the 5G technology and the need to accelerate the implementation of 5G around the world to ameliorate different social problems. Got exposure to global work practices of 5G.
- Received technical training from Huawei experts to set up 4G and 5G station.

Research Assistant *January 2019 - August 2019*

Universidad Autónoma de Aguascalientes (UAA)

"Exploratory study on the use of social networks between professors and college students"

- Conducted and designed 150 interviews and field observations to identify how college students of the faculty of engineer use social networks to communicate with professors.
- Collected, studied, and interpreted results to elaborate dashboards and academic tools for professors to integrate social networks in their classes.
- Identified and recommended different techniques to improve the communication between faculty and students through the use of social networks, these recommendations were tested during 3 months and increase 40% the performance of communication based on a satisfaction survey.

Summer Research Intern *June 2018 - August 2018*

Universidad Autónoma de Querétaro (UAQ)

"Yolotsin: Parallel programming applied to the method of polarity index of peptides and proteins for the detection of the Brugada syndrome"

- Improved the existing Polarity Index Method using CUDA C++ to detect predisposition to the Brugada Syndrome. The new implementation has an accuracy of 83.59%.
- Tested 12 different strategies in parallel using C++ based on the Polarity Index Method to create a improved classification method.
- Developed a parallel coding strategy for classification in C++ to analyze 4000 proteins simultaneously from the UniProt Database, improving the speed and performance of the first strategy coded in Fortran in 70% .

Summer Research Intern *June 2018 - August 2018*

Universidad Autónoma de Querétaro (UAQ)

"Audio encryption with multiple GPUs that use the hill encryption algorithm by applying parallel programming with CUDA"

- Implemented the encryption algorithm of Hill Cipher (HC) using C++ to achieve the encryption of WAV audios replacing the traditional sequential process for a parallel strategy.
- Improved and optimize the encryption and decryption execution time of the algorithm HC in 3.04%.
- Tested the accuracy of the encryption and decryption method with 364,841,248 samples of audios reaching an accuracy of 100%.

Research Assistant *January 2018 - December 2018*

Universidad Autónoma de Aguascalientes (UAA)

"Educational software design to increase the meaningful learning of students on elementary level: PiaLearning a case of study"

- Conducted field research with 100 students to analyze how elementary school students use mobile apps for learning purposes.
- Created a mobile app called PiaLearning to help elementary school students to identify their learning style. Over 100 students used the app.
- Developed math and geography activities based on the students learning style for the PiaLearning app. The app helped students to increase in 82% their grades.

Research Assistant *January 2018 - August 2018*

Universidad Autónoma de Aguascalientes (UAA)

"Application of technology in the learning-knowledge process of basic concepts of programming logic"

- Conducted 250 interviews with students of the faculty of engineer and mathematics of the Universidad Autonoma de Aguascalientes to identify the main obstacles in their learning process of basic concepts of programming logic.
- Designed and developed a desktop java application to help students improve and leverage their knowledge of programming logic based on the results of the interview.
- Tested and maintained an application that was used for 250 students. The application helped 74% of the students to improve their grades in computer science classes"

PROFESSIONAL EXPERIENCE

Software Engineer *June 2023 - July 2023*

Palette Lab

- Led backend development efforts for integrating multiple APIs. Designed and implemented scalable solutions to ensure seamless communication between the main platform and third-party services.
- Developed a decentralized, worker-centric food delivery protocol in collaboration with restaurant cooperatives.
- Built, maintained, and deployed a mobile application.Managed the full development lifecycle, including testing, debugging, and releasing updates.

Software Engineer *April 2022 - August 2023*

Nextiva - Backend team

- Developed lexical, syntactic, and semantic analyzers to process and support customized macro instructions within Nextiva products.
- Developed and maintained microservices to automate tasks in Nextiva's main product.
- Released and deployed key microservices to automate actions on the client platform.

Software Engineer *February 2021 - April 2022*

Oracle Corporation

- Developed 5G Network Data Analytic Functions (NWDAF) and microservices in java and implemented "Network Performance", "Abnormal Behaviour" and "QoS Sustainability" using the NWDAF operator.
- Implemented machine learning methods in python to detect anomalous network traffic in 5G networks. The model identified benign traffic with 100% accuracy and anomalous traffic with 96.4% accuracy.
- Developed AMF simulator to obtain and classify mobility exceptions: unexpected UE location, ping-ponging across neighboring cells and radio link failures.

AWARDS AND HONORS

- Outstanding Graduate Student Teacher Award (University of Notre Dame 2023)
- Won 2nd place in the IBM Hackathon (Spring 2024)
- Won FRONTLINES ND-ECI Fellowship (Spring 2024)
- International Golden pass - "Expo Sciences Vostok, Kazakhstan" (Monterrey, Mexico, November 2019)
- Silver Medal - "Expo Sciences Aguascalientes" – Project Nuska (Aguascalientes, Mexico, November 2019)
- Scholarship - "Seeds for the Future" by Huawei to study 5G network in Shenzhen and Beijing (Beijing, China, September 2019)
- First place - "International Festival of Engineering Science and Technology at Tunisia." (Monasteir, Tunisia, March 2019)
- Scholarship - "Honor Students, CitiBanamex"(Mexico City, Mexico, May 2019)
- Third place "Citizen Value Award Salinas Pliego A.C" (Aguascalientes, Mexico, April 2019)
- Gold Medal - "Latin American Competition of Science and Technology for students projects 2018" (Guadalajara, Mexico, March 2018)
- First Place - "Meeting of young researchers from Queretaro" (Queretaro, Mexico, September 2018)
- First Place - "State youth award to academic excellence" (Aguascalientes Mexico, November 2018)
- First Place - "City youth award to scientific and technological Skills" (Aguascalientes Mexico, December 2018)

VOLUNTEER AND COMMUNITY LEADERSHIP

STEMentorship Mentor *August 2024 - Present*

- Provide mentorship to a student from Latin America at the University of Notre Dame.