

# OSCAR ALEJANDRO GOMEZ QUINTERO

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## EDUCATION

### B.S. Mathematics, B.S. Computer Science

New York University Abu Dhabi, *Abu Dhabi, UAE*

NYU Courant Institute of Mathematical Sciences, *New York, USA*

GPA: 3.89 / 4.00

Aug 2016 – May 2020

Feb 2019 – May 2019

**Research Interests:** interpretable and interactive machine learning, fairness, visualization, human-computer interaction

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## PUBLICATIONS

- [1] **ViCE: Visual Counterfactual Explanations for Machine Learning Models.** Oscar Gomez, Steffen Holter, Jun Yuan and Enrico Bertini. *ACM Conference on Intelligent User Interfaces (IUI 2020)*. To appear.
- [2] **Exploring Music Collections: An Interactive, Dimensionality Reduction Approach to Visualizing Songbanks.** Oscar Gomez, Kaustuv Kanti Ganguli, Leonid Kuzmenko and Carlos Guedes. *ACM Conference on Intelligent User Interfaces (IUI 2020)*. Demo paper, to appear.
- [3] **Mapping the Sounds of the Swahili coast and the Arab Mashriq: Music research at the intersection of computational analysis and cultural heritage preservation.** Konstantinos Trochidis, Beth Russell, Andrew Eisenberg, **Oscar Gomez**, Kaustuv Kanti Ganguli, Carlos Guedes, Virginia Danielson and Christos Plachouras. *6th International Conference on Digital Libraries for Musicology (DLfM 2019)*. Poster paper.

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## RESEARCH EXPERIENCE

### Research in Machine Learning Explainability and Visualization

Visualization and Data Analytics Lab at NYU, *New York, USA*

Supervised by Dr. Enrico Bertini

Aug 2019 – Present

June 2018 – Aug 2018

- Developed machine learning models to predict customer credit risk from a FICO line of credit dataset.
- Generated instance explanations for the best performing model by implementing algorithms to detect the most important features and the minimal set of changes needed to alter the model's output.
- Developed global explanations in the form of interactive visualizations to explore the individual explanations through a hierarchical organization that groups similar instances.
- Presented the project (second place in the FICO Explainable Machine Learning challenge) at the 2019 DARPA Explainable Artificial Intelligence (XAI) PI Meeting.
- Expanded the project by developing *ViCE*, a tool that generates and provides an interactive visual interface for counterfactual explanations [1].

### Capstone Project in Mathematics

Mathematics Department at NYU Abu Dhabi, *Abu Dhabi, UAE*

Supervised by Dr. Alberto Gandolfi

Sept 2019 – Present

- Researched applications of the Random Cluster Model for geometric fitting and hypergraph clustering.
- Studied methods for simulating Ising, Potts, and Random Cluster models such as Glauber dynamics and the Swendsen-Wang algorithm.

- Analyzed, through the theory of Markov chains, the conditions for convergence to a stable distribution for the algorithm proposed in “The random cluster model for robust geometric fitting”. Pham, T. et. al. (2014).

## Research in Machine Learning for Musical Analysis

Sept 2019 – Present

Music and Sound Cultures Group at NYU Abu Dhabi, *Abu Dhabi, UAE*

Feb 2017 – May 2018

Supervised by Dr. Carlos Guedes

- Developed and implemented the computational analysis of two non-western music collections for the project “Computationally-Engaged Approaches to Rhythm and Musical Heritage” [3].
- Performed musical feature extraction and conducted an exploratory analysis of the data by using dimensionality reduction with deep autoencoders.
- Developed an interactive visualization depicting the musical similarity of the data by using k-means clustering and t-SNE embedding, where users can listen to the clips and explore artists clustered together [2].

## — WORK EXPERIENCE —

### Data Science Intern

June 2019 – Aug 2019

nexquare, *Dubai, UAE*

- Enhanced machine learning models, used to predict student performance and employability, that process 800 million data points across more than 220 schools in over 10 countries.
- Developed an interpretable machine learning module that provides students, educators, regulators, and ministers explanations for the models’ decisions.
- Implemented model agnostic interpretability algorithms (local feature importance and counterfactual explanations) and incorporated them within the company’s advanced analytics platform.

## — LEADERSHIP —

### President, NYUAD Mathematics Club

Jan 2017 – Dec 2018

New York University Abu Dhabi, *Abu Dhabi, UAE*

Sept 2019 – Present

- Programmed activities for high school students and guest speaker talks for university students.
- Prepared the syllabus and led the weekly training sessions in preparation for international competitions.
- Coordinated and supervised NYUAD’s team participation in the International Mathematics Competition of 2018 and the Al-Khwarizmi International Mathematical Competition of 2018.

## — AWARDS —

- **Second Place**, FICO Explainable Machine Learning Challenge Jan 2019
- **Honorable Mention**, Al-Khwarizmi International Mathematical Competition Oct 2018
- **Honorable Mention**, International Mathematical Olympiad (IMO) July 2016
- **Bronze Medal**, Iberoamerican Mathematical Olympiad Sept 2014
- **Silver Medal**, Centroamerican and Caribbean Mathematical Olympiad June 2014

## — SKILLS —

- **Programming:** Python, C, C++, R, JavaScript, HTML, CSS, Git, LaTeX
- **Data Science / Visualization:** scikit-learn, Keras, D3.js, Bokeh, Plotly, Tableau, SQL
- **Languages:** Spanish (Native), English (Fluent), French (Rudimentary)
- **Relevant Coursework:** Fairness, Introduction to Machine Learning, Algorithmic Foundations of Data Science, Visual Analytics, Probability and Statistics, Advanced Probability, Software Engineering, Mathematical Statistics and Machine Learning, Computational Social Science