Fabio Miranda

Assistant Professor

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Research Interests

I am interested in developing techniques that allow for the interactive visual analysis of large-scale data, combining methods from visualization, data management, machine learning and computer graphics. I have worked closely with domain experts from different fields and the outcome of these collaborations included not only research published in leading venues, but also systems that were made available to experts in academia, industry and government agencies. My work has also received extensive coverage from different media outlets, including The New York Times, The Economist, Architectural Digest, Curbed, among others.

Education

2012 - 2018 **Ph.D. in Computer Science** *New York, NY, USA*
New York University (NYU)
Advised by Cláudio T. Silva.
Dissertation: "Data structures for the interactive visual analysis of urban data".

2009 - 2011 **M.S. in Computer Science** *Rio de Janeiro, RJ, Brazil*
Pontifical Catholic University of Rio de Janeiro (PUC-Rio)
Advised by Waldemar Celes.
Thesis: "Volume rendering of unstructured hexahedral meshes".

2005 - 2009 **B.S. in Computer Science** *Belo Horizonte, MG, Brazil*
Federal University of Minas Gerais (UFMG)
Advised by Luiz Chaimowicz.

Professional Experience

Fall 2020 - present **University of Illinois at Chicago** *Chicago, IL, USA*
Assistant Professor

Fall 2018 - Fall 2020 **New York University** *New York, NY, USA*
Postdoctoral researcher
Development of new techniques for the interactive visualization of different types of large-scale data, such as streaming timeseries data and image data. Also responsible for mentoring PhD students.

Summer 2016 **Argonne National Laboratory** *Lemont, IL, USA*
Research intern
Mentor: Venkatram Vishwanath
Developed a visualization tool to explore high-resolution volumetric weather simulations, focused in the Chicago metropolitan area, in order to understand the impact of built environment on the city climate.

Summer 2015 **IBM T.J. Watson Research Center** *Yorktown Heights, NY, USA*
Research intern
Mentor: Bruce D'Amora
Developed a web-based graph visualization tool for the exploratory visualization of bitcoin transactions.

Summer 2014 **AT&T Research** *Middletown, NJ, USA*
Research intern
Mentors: Lauro Lins and James Klosowski
Developed a distributed version of *Nanocubes*, a datacube-based approach for the visualization of massive spatiotemporal datasets.

Summer 2013 **Sandia National Laboratories** *Albuquerque, NM, USA*
Research intern
Mentor: Patricia Crossno
Developed an adaptive kernel density estimation approach for scatterplots using GPUs.

2009 - 2012 **TecGraf / PUC-Rio** *Rio de Janeiro, Brazil*
Research assistant
Mentor: Waldemar Celes
Developed an unstructured hexahedral volume renderer for a data visualization and analysis software used in most of Brazil's oil fields.

Awards

2018 SIGMOD Best Demonstration Award
For "Interactive Visual Exploration of Spatio-Temporal Urban Data Sets Using Urbane".

2018 Pearl Brownstein Doctoral Research Award
For doctoral research that shows the greatest promise, awarded by NYU.

2010-2012 CAPES and Petrobras Fellowships
Awarded during M.S. studies.

2006-2009 FINEP and CNPq Fellowships
Awarded during B.S. studies.

Selected Media Coverage

September 2017 Urban Pulse Uses Social Media Data to Show Cities in a New Light
Architectural Digest

September 2017 New program wants to improve cities with the power of tweets and Flickr uploads
Curbed

December 2016 Mapping the Shadows of New York City: Every Building, Every Block
The New York Times

October 2016 Listen to the music of the traffic in the city
The Economist

Publications

2020 Urban Mosaic: Visual Exploration of Streetscapes Using Large-scale Image Data
F. Miranda, M. Lage, H. Doraiswamy, M. Hosseini, G. Dove, C. T. Silva
2020 CHI Conference on Human Factors in Computing Systems.

Learning Geo-Contextual Embeddings for Commuting Flow Prediction
Z. Liu, **F. Miranda**, W. Xiong, J. Yang, Q. Wang, C. T. Silva
Thirty-Fourth AAAI Conference on Artificial Intelligence.

2019 Shadow Accrual Maps: Efficient Accumulation of City-Scale Shadows over Time
F. Miranda, H. Doraiswamy, M. Lage, L. Wilson, M. Hsieh, C. T. Silva
IEEE Transactions on Visualization and Computer Graphics, vol. 25, no. 3, pp. 1559-1574, Mar 2019.
Featured on The New York Times

2018 Time Lattice: A Data Structure for the Interactive Visual Analysis of Large Time Series
F. Miranda, M. Lage, H. Doraiswamy, C. Mydlarz, J. Salamon, Y. Lockerman, J. Freire, C. T. Silva
Computer Graphics Forum, vol. 37, no. 3, pp. 23-35, Jun 2018.

Interactive Visual Exploration of Spatio-Temporal Urban Data Sets using Urbane
H. Doraiswamy, E. Tzirita Zacharatou, **F. Miranda**, M. Lage, A. Ailamaki, C. T. Silva, J. Freire
2018 ACM SIGMOD Intl. Conf. on Management of Data - Demo.
Best Demonstration Award

Spatio-Temporal Urban Data Analysis: A Visual Analytics Perspective
H. Doraiswamy, J. Freire, M. Lage, **F. Miranda**, C. T. Silva
IEEE Computer Graphics and Application, vol. 38, no. 5, pp. 26-35, Sept/Oct 2018.

TopKube: A Rank-Aware Data Cube for Real-Time Exploration of Spatiotemporal Datasets
F. Miranda, L. Lins, J. Klosowski, C. T. Silva
IEEE Transactions on Visualization and Computer Graphics, vol. 24, no. 3, pp. 1394-1407, Mar 2018.

2017 Urban Pulse: Capturing the Rhythm of Cities
F. Miranda, H. Doraiswamy, M. Lage, K. Zao, B. Goncalves, L. Wilson, M. Hsieh, C. T. Silva
IEEE Transactions on Visualization and Computer Graphics, vol. 23, no. 1, pp. 791-800, Jan 2017.
Featured on The Economist, invited to SIGGRAPH 2017 TVCG special session

Data Visualization Tool for Monitoring Transit Operation and Performance
A. Kurkcu, **F. Miranda**, K. Ozbay, C. T. Silva
5th IEEE Intl. Conf. on Models and Technologies for Intelligent Transportation Systems (2017).

2016 TopKube: A Rank-Aware Data Cube for Real-Time Exploration of Spatiotemporal Datasets
F. Miranda, L. Lins, J. Klosowski, C. T. Silva
Data Systems for Interactive Analysis (DSIA) 2016.

2012 Volume Rendering of Unstructured Hexahedral Meshes
F. Miranda, and W. Celes
The Visual Computer Journal, vol. 28, no. 10, pp. 1005-1014, Oct 2012.

2011 Accurate Volume Rendering of Unstructured Hexahedral Meshes
F. Miranda, and W. Celes
24th Sibgrapi Conference on Graphics, Patterns and Images (2011).

Illustrative Volume Visualization for Unstructured Meshes Based on Photic Extremum Lines
A. Rocha, **F. Miranda**, and W. Celes
24th Sibgrapi Conference on Graphics, Patterns and Images (2011).

Teaching Experience

Fall 2019 **CS GY 6533: Interactive Computer Graphics** *New York University*
Graduate course. Prepared and presented 2.5 hour lecture on shadows.

Fall 2014 **CS UY 1133: Data Structures and Algorithms** *New York University*
Undergraduate course. Prepared and presented 2.5 hour lecture on C and C++ programming.

Fall 2014 **CUSP GX 5003: Principles of Urban Informatics** *New York University*
Teaching assistant for Cláudio T. Silva, 50 students
Graduate course. Prepared and presented lectures on visualization, python, pandas and MySQL. Created and graded assignments, and held office hours.

Fall 2013 **CUSP GX 5003: Principles of Urban Informatics** *New York University*
Teaching assistant for Cláudio T. Silva, 50 students
Graduate course. Developed and presented lectures on visualization, python, javascript, D3 and MySQL. Prepared and graded assignments, and held office hours.

Mentoring Experience

2018 - **Mentor Ph.D. Students** *New York University*
Mentor students to work with the Urbane framework, as well as on research projects.
Students: Zhicheng Liu (CS PhD student at Southeast University, China), Maryam Hosseini (Urban Systems PhD student at Rutgers), Shaoyu Chen (CS PhD student at NYU), João Rulff (CS PhD student at NYU).

Invited Talks and Presentations

February 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *Chicago, CA, USA*
University of Illinois at Chicago

February 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *Chicago, IL, USA*
Illinois Institute of Technology

February 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *San Diego, CA, USA*
San Diego State University

February 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *New Orleans, LA, USA*
Tulane University

February 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *New Orleans, LA, USA*
The University of New Orleans

January 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *Portland, OR, USA*
Portland State University

January 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *Richmond, VA, USA*
Virginia Commonwealth University

January 2020 **Interactive Visual Analysis at Scale: From Data to Actionable Insights** *Dartmouth, MA, USA*
University of Massachusetts - Dartmouth

December 2018 **Exploration of Street-Level Images at Scale** *New York City, NY, USA*
Pedestrian Movement Technology Showcase at Metro North

November 2018 **Shadow Accrual Maps: Efficient Accumulation of City-Scale Shadows over Time** *Berlin, Germany*
IEEE Visualization Conference (VIS)

June 2018 **Time Lattice: A Data Structure for the Interactive Visual Analysis of Large Time Series** *Brno, Czech Republic*
EG/VGTC Conference on Visualization (EuroVis)

October 2017 **TopKube: A Rank-Aware Data Cube for Real-Time Exploration of Spatiotemporal Datasets** *Phoenix, AZ, USA*
IEEE Visualization Conference (VIS)

September 2016 **Visualizing and Exploring Urban Data** *Boston, MA, USA*
Data Visualization Summit

October 2016 — **TopKube: A Rank-Aware Data Cube for Real-Time Exploration of Spatiotemporal Datasets** — *Chicago, IL, USA*
Data Systems for Interactive Analysis Workshop (DSIA)

October 2011 — **Accurate Volume Rendering of Unstructured Hexahedral Meshes** — *Maceió, Brazil*
Sibgrapi Conference on Graphics, Patterns and Images

Selected Open-Source Projects

2019 New York City Shadow Data
Shadow data for New York City, also used by The New York Times.

2018 Urban Pulse
Open-source version of Urban Pulse paper.

2017 Bus Explorer
Open-source tool for the exploration of a large data set with bus tracking pings. Developed in close collaboration with the New York City Department of Transportation.

Service

Program Committees: IEEE VIS 2020 Short papers, Sibgrapi 2020, IEEE VIS 2019 Short papers, Sibgrapi 2019.
Reviewer: IEEE Transactions on Big Data, IEEE InfoVis, IEEE SciVis, IEEE VAST, Sibgrapi, WWW, The Visual Computer Journal, Transportation Research Record Journal, International Conference on Pattern Recognition.