

# Brian Keith Norambuena

Secretary of Research and Technological Development, Faculty of Engineering and Geological Sciences

Assistant Professor, Department of Computing and Systems Engineering

Universidad Católica del Norte, Antofagasta, Chile

[brian.keith@ucn.cl](mailto:brian.keith@ucn.cl) | [Personal Webpage](#) | [Google Scholar](#)

## **Summary**

I am an Assistant Professor at the Department of Computing and Systems Engineering at Universidad Católica del Norte in Antofagasta, Chile, where I also serve as Secretary of Research and Technological Development for the Faculty of Engineering and Geological Sciences. I am the Director of the *Artificial Intelligence Innovation Center for the Antofagasta Region* project, funded by the regional government of Antofagasta. I have been recently selected for a FONDECYT Initiation Grant to work on *Interactive Narrative Analytics*. In general, my research focuses encompasses visual analytics, artificial intelligence, text analytics, and computational narratives, with particular emphasis on developing interactive narrative maps using AI techniques. I also work in applied data science in different areas, including mining, geochemistry, and education. I completed my *Ph.D. in Computer Science and Applications* at Virginia Tech in July 2023, which I started in 2019 with the support of the *Fulbright Faculty Development* program and Universidad Católica del Norte, alongside the government scholarship *Becas Chile*.

## **Education**

Virginia Tech, Blacksburg, VA, USA.

### **Ph.D. in Computer Science and Applications**

Aug 2019 – Aug 2023

**Dissertation:** Narrative Maps: A Computational Model to Support Analysts in Narrative Sensemaking

**Advisors:** Dr. Chris North and Dr. Tanushree Mitra

**GPA:** 4.0/4.0

Universidad Católica del Norte, Antofagasta, Chile.

### **Master's in Informatics Engineering**

Mar 2016 – Aug 2017

**Thesis:** Hybrid machine learning methods for multiclass sentiment analysis.

**GPA:** 6.9/7.0

### **Bachelor of Mathematics**

Mar 2012 – Aug 2017

**Thesis:** Applications of spectral graph theory in artificial neural networks.

**GPA:** 6.7/7.0

### **Professional Title: Computing and Informatics Civil Engineering**

Mar 2010 – Aug 2016

### **Bachelor of Science in Engineering**

**Thesis:** Opinion mining and sentiment analysis applied to paper reviews.

**GPA:** 6.7/7.0

## **R&D Grants and Projects**

- Principal Investigator in the *ANID FONDECYT Project* "Interactive Narrative Analytics: Developing scalable knowledge-based narrative extraction models and visual analytics systems for sensemaking in complex information landscapes". Project code: FONDECYT 11250039.
- Director of the *FRPD 2024 Project* "Artificial Intelligence Innovation Center for the Antofagasta Region" funded by the Antofagasta Regional Government as part of the Regional Fund for Productivity and Development. Project Code: 105908
- Adjunct Director in the *ANID FONDEF IT Project* "Intelligent platform for environmental management and soil monitoring

- in the Antofagasta Region, through baseline modeling using artificial intelligence". Project code: FONDEF IT24I0030.
- Researcher in the *ANID FONDEF IDeA Project* "Stabilization process of copper tailings, for their use as aggregate in construction materials". Project code: FONDEF ID22I10236.
  - Researcher in the *CONICYT International Networks Project* "Bayesian multidimensional classifiers for emotion interpretation in text and video". Project code: REDI170607.

## **Teaching Projects**

- Project Director "Implementation of an Elective Course in Research Experiences for Students of the Faculty of Engineering and Geological Sciences", Undergraduate Teaching Projects Development Fund, Universidad Católica del Norte, 2024.
- Collaborator in project "Construction of Instruments and Procedures for Progressive Monitoring of Skill Development in Integrative Courses for Industrial Civil Engineering According to CDIO Standard", Undergraduate Teaching Projects Development Fund, Universidad Católica del Norte, 2023.
- Collaborator in project "Integrative Project of Basic Sciences and Applied Engineering", Undergraduate Teaching Projects Development Fund, Universidad Católica del Norte, 2017.

## **Publications**

### **Journal Publications**

- "From Mine Waste to Construction Materials: A Bibliometric Analysis of Mining Waste Recovery and Tailing Utilization in Construction", V. Zetola, **B. Keith**, E. Lam, Í. Montofré, R. Rojas, J. Marín, M. Becerra, *Sustainability*, 2024.
- "The scientific landscape of phytoremediation of tailings: a bibliometric and scientometric analysis", **B. Keith**, E. Lam, Í. Montofré, V. Zetola, J. Bech, 2024.
- "Evaluation of the geochemical background of soil in a hyper-arid zone using a multivariate statistical methodology: The case of the city of Antofagasta in the Atacama Desert", **B. Keith**, E. Lam, Í. Montofré, V. Zetola, J. Urrutia, C. Herrera, J. Bech, *Chemosphere*, 2024.
- "Predictive modeling of on-time graduation in computing engineering programs: A case study from Northern Chile", A. Quelopana, **B. Keith**, R. Pizarro, *Computer Applications in Engineering Education*, 2024.
- "A survey on event-based news narrative extraction", **B. Keith**, T. Mitra & C. North, *ACM Computing Surveys*, 2023.
- "An extension of the characteristic curve model of plant species behavior in heavy metal soils", E. Lam, **B. Keith**, J. Bech, M. Gálvez, R. Rojas, F. Alvarez, V. Zetola & I. Montofré, *Environmental Geochemistry and Health*, 2023.
- "Explainable interactive projections of images", H. Huimin, R. Faust, **B. Keith**, J. Lin, S. Li & C. North. *Machine Vision and Applications*, 2023.
- "Watching the Watchdogs: Using Transparency Cues to Help News Audiences Assess Information Quality", **B. Keith**, K. Reis, T. Mitra & M. Horning, *Media and Communication*, 2023.
- "Design guidelines for narrative maps in sensemaking tasks", **B. Keith**, T. Mitra & C. North, *Information Visualization*, 2022.
- "Evaluating semantic representations for extended association rules", L. Gutiérrez & **B. Keith**, *Intelligent Data Analysis*, 2022.
- "Characteristic curve modeling of plant species behavior in soils with heavy metals", E. Lam, **B. Keith**, J. Bech, F. Alvarez, V. Zetola, L. Pereira & I. Montofré, *Environmental Geochemistry and Health*, 2022.
- "Twitter sentiment analysis for the estimation of voting intention in the 2017 Chilean elections", T. Alegre & **B. Keith**, *Intelligent Data Analysis*, 2022.
- "Using Artificial Intelligence Techniques to Improve the Prediction of Copper Recovery by Leaching", V. Flores, **B. Keith** & C. Leiva, *Journal of Sensors*, 2020.
- "Effect of pretreatment prior to leaching on a chalcopyrite mineral in acid media using NaCl and KNO<sub>3</sub>", V. Quezada, A. Roca, O. Benavente, M. Cruells, **B. Keith** & E. Melo, *Journal of Materials Research and Technology*, 2020.

- “Sentiment analysis and opinion mining applied to scientific paper reviews”, **B. Keith**, E. Fuentes & C. Meneses - *Intelligent Data Analysis*, 2019.
- “An extension to association rules using a similarity-based approach in semantic vector spaces”, **B. Keith** & C. Meneses, *Intelligent Data Analysis*, 2019.
- “Heurísticas para Data Augmentation en NLP: Aplicación a Revisiones de Artículos Científicos”, R. Sánchez, C. Meneses & **B. Keith**, *Revista Ibérica de Sistemas e Tecnologías de Informação*, 2019.
- “Gradient Boosted Trees Predictive Models for Surface Roughness in High-Speed Milling in the Steel and Aluminum Metalworking Industry”, V. Flores & **B. Keith**, *Complexity*, 2019.
- “Using the Belbin method and models for predicting the academic performance of engineering students”, L. Gutiérrez, V. Flores, **B. Keith**, A. Quelopana, *Computer Applications in Engineering Education*, 2019.
- “Necessity of intervention policies for tailings identified in the Antofagasta Region, Chile”, E. Lam, **B. Keith**, Í. Montofré & M. Gálvez, *Revista Internacional de Contaminación Ambiental*, 2019.
- “Copper Uptake by *Adesmia atacamensis* in a Mine Tailing in an Arid Environment”, E. Lam, **B. Keith**, Í. Montofré & M. Gálvez, *Air, Soil and Water Research*, 2018.
- “Evaluation of soil intervention values in mine tailings in northern Chile”, E. Lam, **B. Keith**, Í. Montofré & M. Gálvez, *PeerJ*, 2018.
- “Assessment of the adaptive capacity of plant species in copper mine tailings in arid and semiarid environments”, E. Lam, M. Gálvez, M. Cánovas, Í. Montofré, **B. Keith**, *Journal of Soils and Sediments*, 2018.
- “Minería de procesos de software: una revisión de experiencias de aplicación”, **B. Keith** & V. Vega, *Revista Ibérica de Sistemas e Tecnologías de Informação*, 2017.
- “Evaluation of the phytoremediation potential of native plants growing on a copper mine tailing in northern Chile”, E. Lam, M. Cánovas, M. Gálvez, Í. Montofré, **B. Keith**, Á. Faz, *Journal of Geochemical Exploration*, 2017.
- “A Knowledge-Based Prototype to Support the Intelligent Diagnosis of High-Risk Pregnancy”, V. Flores, **B. Keith**, D. Poblete, C. Leiva, *Applied Medical Informatics*, 2017.

### Book Chapters

- “Avances en representaciones de texto: espacios vectoriales semánticos y word embeddings”, L. Gutiérrez & **B. Keith**, presented at *CILCC 2018* and published as a book chapter on “*Tecnologías del lenguaje humano*”, 2020.

### Conference Publications (peer-reviewed, full papers)

- “Semi-supervised image-based narrative extraction: A case study with historical photographic records”, F. German, **B. Keith**, M. Matus, D. Urrutia, C. Meneses, *ECIR 2025*, Italy (*Accepted*).
- “Narrative Maps: An Algorithmic Approach to Represent and Extract Information Narratives”, **B. Keith** & T. Mitra, *CSCW 2021*, USA.
- “Mixed Multi-Model Semantic Interaction for Graph-based Narrative Visualizations”, **B. Keith**, T. Mitra & C. North, *IUI 2023*, Australia.
- “Explainable Interactive Projections for Image Data”, H. Han, R. Faust, **B. Keith**, R. Prabhu, T. Smith, S. Li & C. North, *ISVC 2022*, USA.
- “Narrative Maps: An Algorithmic Approach to Represent and Extract Information Narratives”, **B. Keith** & T. Mitra, *CSCW 2021*, USA.
- “Extended association rules in semantic vector spaces for sentiment classification”, **B. Keith** & C. Meneses, *WorldCIST 2018*, Italy.
- “Integration of Process Mining and Simulation: A Survey of Applications and Current Research”, **B. Keith**, *WorldCIST 2018*, Italy.
- “The Scientific Landscape of Agile Software Development and Methodologies: A Social Network Analysis Perspective”,

**B. Keith** & V. Vega, *JIIISIC 2018*, Chile.

- “Empirical Evaluation of the BCOC Method on Multi-Domain Sentiment Analysis Data Sets”, **B. Keith** & C. Meneses, *CIARP 2018*, Spain.
- “Effect of curing time on the dissolution of a secondary copper sulphide ore using alternative water resources”, V. Quezada, L. Velásquez, A. Roca, O. Benavente, E. Melo, **B. Keith**, *IOP Conference Series: Materials Science and Engineering*, 2018.
- “A Multilabel Extension of LDA Based on the Gram-Schmidt Orthogonalization Procedure”, J. Bekios & **B. Keith**, *CIARP 2017*, Chile.
- “A Systematic Literature Review on Word Embeddings”, L. Gutiérrez & **B. Keith**, *CIMPS 2018*, México.
- “A Review on Bayesian Networks for Sentiment Analysis”, L. Gutiérrez, J. Bekios & **B. Keith**, *CIMPS 2018*, México.
- “Process mining applications in software engineering”, **B. Keith** & V. Vega, *CIMPS 2016*, México.

#### **Workshop Papers, Conference Short Papers, Unindexed Publications, and Posters (peer-reviewed, short papers)**

- “Evaluating the Ability of Computationally Extracted Narrative Maps to Encode Media Framing”, S. Concha & **B. Keith**, *Text2Story 2024 – ECIR 2024*, UK.
- “ROGER: Extracting Narratives Using Large Language Models from Robert Gerstmann's Historical Photo Archive of the Sacabaya Expedition in 1928”, M. Matus, D. Urrutia, C. Meneses & **B. Keith**, *Text2Story 2024 – ECIR 2024*, UK.
- “Characterizing Social Movement Narratives in Online Communities: The 2021 Cuban Protests on Reddit”, **B. Keith**, T. Mitra & C. North, *C+J 2022*, USA.
- “Narrative sensemaking: strategies for narrative maps construction”, **B. Keith**, T. Mitra & C. North, *IEEE VIS 2021*, USA.
- “Evaluating the Inverted Pyramid Structure through Automatic 5W1H Extraction and Summarization”, **B. Keith**, M. Horning & T. Mitra, *C+J 2020*, USA.
- “The relevance of hyper-parameters in convolutional neural networks: a case study with Fashion-MNIST”, R. Sánchez & **B. Keith**, *WDKE-INFONOR 2018*, Chile.
- “The LapRLS Algorithm as a Simple Approach to Sentiment Analysis Lexicon Construction”, **B. Keith** & I. Jirón, *WDKE-INFONOR 2018*, Chile.
- “Twitter Sentiment Analysis applied to the 2017 Chilean Elections”, T. Alegre & **B. Keith**, *WDKE-INFONOR 2018*, Chile.
- “A Hybrid Approach for Sentiment Analysis Applied to Paper Reviews”, **B. Keith**, E. Fuentes & C. Meneses, *WISDOM at SIGKDD 2017*, Canada.
- “Barycentric coordinates for ordinal sentiment classification”, **B. Keith** & C. Meneses, *WISDOM at SIGKDD 2017*, Canada.
- “A Comparative Review of Hybrid Methods for Multiclass Sentiment Analysis”, **B. Keith** & C. Meneses, *INFONOR 2016*, Chile.

#### **Invited Talks**

- “A survey on event-based news narrative extraction”, Lo Mejor de lo Nuestro, Jornadas Chilenas de Computación 2024 (*JCC 2024*), Chile.
- “Narrative maps: extraction and visualization of interactive narratives and applications”, Workshop on Data and Knowledge Engineering, Universidad Católica del Norte, *INFONOR 2023*, Chile.
- “Mapas narrativos: extracción y visualización de narrativas interactivas y sus aplicaciones”, *ACHIRP*, 2023, Chile.
- “Introduction to Sentiment Analysis and an Application to Scientific Paper Reviews”, Workshop on Data and Knowledge Engineering, Universidad de Tarapacá, *INFONOR 2017*, Chile.
- “Aplicaciones de minería de procesos en la mejora de procesos de software”, Workshop on Software Process Improvement, Universidad de Atacama, *INFONOR 2016*, Chile.

## **Teaching Experience**

### **Universidad Católica del Norte, Antofagasta, Chile.**

- Data Visualization (Undergraduate): 2024/2
- Topics in Informatics Engineering, Data Engineering Module: 2024/1
- Data Science (Graduate): 2017/2, 2024/1
- Scientific Research for Undergraduates: 2024/1
- Data Visualization (Graduate): 2023/2, 2024/2
- Introduction to Data Science: 2017/2, 2018/2, 2023/2, 2024/1.
- Foundations of Computing: 2017/2 to 2019/1, 2023/2.
- Probability & Statistics: 2016/2, 2017/1.
- Automata Theory & Formal Languages: 2016/1
- Analysis & Design of Algorithms: 2015/2 to 2017/1.
- Compilers: 2015/2, 2016/2, 2017/2, 2018/2.

## **Awards and Honors**

- COE Pratt International Scholarship, Virginia Tech, 2023.
- Becas Chile Doctoral Studies Scholarship, CONICYT, 2019 - 2023.
- Fulbright Faculty Development Scholarship, Fulbright Chile, 2019 – 2021.
- Valedictorian of the 2017 Graduating Class, Faculty of Sciences, Universidad Católica del Norte.
- Valedictorian of the 2016 Graduating Class, Faculty of Engineering and Geological Sciences, Universidad Católica del Norte.
- “Alumno Destacado UCN” (Best Student of the University), Universidad Católica del Norte, 2013.
- “Alumno Destacado DISC” (Best Student of the Department), Department of Computing and Systems Engineering, Universidad Católica del Norte, 2012.

## **Professional Service**

### **Editorships**

Associate Editor: *Intelligent Data Analysis*, 2023 - Present

Editorial Board: *Intelligent Data Analysis*, 2019 - Present.

### **Conference Organizing Committees**

- International Conference on Computing and Informatics in North of Chile (INFONOR-CHILE), 2019.

### **Workshops Organized**

- Workshop on Data and Knowledge Engineering at INFONOR-CHILE (WDKE), 2017, 2018, 2024.

### **Technical Program Committee**

- International Conference on Computing and Informatics in North of Chile (INFONOR-CHILE), 2018, 2019, 2020, 2021, 2022, 2023.
- International Conference on Recent Trends in Image Processing & Pattern Recognition (RTIP2R), 2018, 2020.

### **Technical Reviewer**

- *Journals*:
  - Data Mining and Knowledge Discovery, 2025
  - Scientific Reports, 2024

- Online Social Networks and Media, 2024
- Engineering Applications of Artificial Intelligence, 2024
- AI Perspectives & Advances, 2024
- Knowledge and Information Systems, 2024
- Heliyon, 2023
- Journal on Artificial Intelligence, 2023.
- Computers, Materials & Continua, 2023.
- Current Bioinformatics, 2023.
- Resources, Conservation & Recycling, 2023.
- Arabian Journal of Chemistry, 2021, 2023.
- ACM Transactions on Interactive Intelligent Systems, 2022.
- Imaging Science Journal, 2022.
- Computer Applications in Engineering Education, 2018, 2020, 2023.
- Informatics in Medicine Unlocked, 2019.
- Scientometrics, 2019.
- Socio-Economic Planning Science, 2020.
- Intelligent Data Analysis, 2018.
- *Conferences:*
  - Annual Conference on Data Visualization (EuroVis), 2025.
  - ACM Conference on Intelligent User Interfaces (ACM IUI), 2024.
  - International Conference on Human-Agent Interaction (HAI 2024), 2024.
  - ACM Conference on Fairness, Accountability, and Transparency (ACM FAccT), 2023.
  - Annual Meeting of the Cognitive Science Society (CogSci), 2023, 2025.
  - International Conference on Web and Social Media (ICWSM), 2023.
  - International Conference on Applied Artificial Intelligence (AAI), 2024
  - ACM Conference On Computer-Supported Cooperative Work And Social Computing (CSCW), 2021.
- *Sub-reviewer:*
  - International Joint Conference on Rough Sets (IJCR), 2016, 2017.