Adan Alberto Gomez Salgado

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EDUCATION

Rensselaer Polytechnic Institute — Troy, NY
Ph.D. Candidate in Cognitive Sciences — Anticipated May 2025
GPA: 4.0

Universidad Pedagogica Nacional — Bogotá, Colombia
M.S. Information Technology Applied to Education — March, 2012
GPA: 3.5

Universidad de Córdoba — Montería, Colombia
B.S. Information Technology and Audiovisual Media — October, 2001
GPA: 3.5

TEACHING EXPERIENCE

Full-Time Faculty Member — 2015-2024
University of Cordoba, Montería, Colombia.
Educational Informatics Department.

- Introduction to Artificial Intelligence (undergraduate level)
- Cognition and Computation (undergraduate level)
- Cognitive Informatics (undergraduate level)
- Computer Science Teaching Computer Didactics (undergraduate level)
- High Impact Scientific Paper Writing Course (graduate level)
- Education, Coexistence and Society (graduate level)

Half-Time Lecturer — 2003 - 2014
University of Cordoba, Montería, Colombia.
Educational Informatics Department – Computer Science Department.

- Basic Computing (undergraduate level)
- Introduction to Data Structures (undergraduate level)
- Algorithms (undergraduate level)
- Object-Oriented Design Programming (undergraduate level)
- Computer Architecture (undergraduate level)
- Programming Languages (undergraduate level)
- Software Design and Implementation (undergraduate level)

Full-Time Computer Science Teacher — 1999-2014
Institución Educativa Cristóbal Colón, Montería, Colombia.

- Computer Science (high and middle school level)

Full-Time Computer Science Teacher — 1995 - 1998
Colegio Militar Almirante Colón, Montería, Colombia.

- Computer Science (elementary school and kindergarten level)

RESEARCH INTERESTS

AI applied to Education, Computational Modeling, Cognitive Science, Machine Learning, LLMs, and Statistical Analysis.

RESEARCH EXPERIENCE

Ph.D. Thesis

A Comprehensive Framework and a Mechanistic Model of Self-Control in Clarion Cognitive Architecture. Advisor: Ron Sun, *Rensselaer Polytechnic Institute,* Troy, NY. — In progress

- Identified cognitive mechanisms that underlie self-control as an intra-physical conflict and how these mechanisms may vary across different contexts using a rational and computational approach.
- Computationally modeled experimental situations on self-control application and downstream effects on later tasks, implementing symbolic and subsymbolic representations inside the CLARION cognitive framework using Python, testing formal mathematical models of cognitive processes.
- Composed a literature review furthering the theoretical comprehension of self-control through psychological and philosophical lenses.
- Formulated a rational theory of self-control explains conduct across diverse contexts.

Graduate Research Assistantship

Computational Modeling of Motivation and Cognition in CLARION Cognitive Architecture. Advisor: Ron Sun, *Rensselaer Polytechnic Institute,* Troy, NY. — 2022

- Systematically analyzed scientific literature on self-control as an intra-physical conflict examining implicit and explicit information interaction patterns underlying human behavior.
- Employed machine learning methods to model diverse human working memory tasks and their interaction with motivational aspects across two simulations built within the CLARION cognitive architecture.
- Leveraged statistical techniques to analyze simulation data produced by the two CLARION-based models.

ITS Fichas y Protocolos en Salud

Intelligent Tutor System for learning the care protocol in the early detection of Gestational and Congenital Syphilis. Sponsor: *Universidad de Córdoba,* Montería, Colombia. — 2021-2022

- Engineered a case-based reasoning system and a recommender system for learning resources to personalize pedagogical strategies accounting for higher education students' learning styles and academic performance.
- Authored a scientific publication for an education journal detailing the findings from contrasting the two systems in light of student academic performance.

Metacognitive Judgements in MIDCA

Formal Representation and Computational Implementation of Metacognitive Judgments Related to Goals Execution Time in MIDCA Cognitive Architecture. — 2019

Sponsors: *Wright State University,* Ohio, USA and *Universidad de Córdoba,* Montería, Colombia.

- Designed and implemented predictive models for goal execution times within the MIDCA cognitive architecture to enable autonomous agents to generate accurate prospective, concurrent, and retrospective metacognitive appraisals.
- Developed goal-oriented software agents capable of estimating completion times for specific tasks and goals in order to improve adaptations and time management using Python.

ECHO

Autonomous system based on CARINA Cognitive Architecture for Frequently Asked Questions Systems, Open Question Assessment, and Translation from Guided Public Discussions to Sustainable Development Goals. Sponsors: *Ministry of Information and Communication Technologies of Colombia, ICFES* and the *United Nations Population Fund.* 2018-2019

- Engineered the knowledge base of the system employing diverse knowledge representation techniques, including semantic networks and ontologies.
- Composed a methodical review of the various computational approaches leveraged by the system.

CARINA Cognitive Architecture

Computational Modeling of Cognitive and Metacognitive processes for the Object level and Meta level of CARINA. Sponsor: *Universidad de Córdoba*, Monteria, Colombia. 2017-2019

- Co-designed the cognitive architecture and information processing mechanisms for CARINA, an artificial cognitive framework capable of metacognitive control and introspective reasoning about its cognitive processes.
- Implemented formal representations of cognitive models and introspective reasoning traces to enable CARINA agents to monitor and regulate their cognition.
- Developed techniques for specifying and validating algorithmic knowledge profiles to empower CARINA agents to form metacognitive expectations about perceptual processes and cognitive functions.
- Researched methods for the meta-modeling of pedagogical strategies to allow CARINA-based intelligent tutoring systems to select appropriate teaching approaches tailored to individual students.

NUMBOT

Educational Robotic Toy with visual-auditory recognition for the development of counting skills. Sponsor: *Universidad de Córdoba,* Montería, Colombia. 2015

- Designed and led a mixed methods study utilizing interviews, verbal protocols, and quasi-experimental research to compare numerical knowledge acquisition between preschool students using a robot-based learning environment versus traditional materials.
- Mentored young investigators in experimental research methodology, overseeing the design of pre/post assessments, data analysis, and reporting of findings related to the impact of an innovative robot learning system.

- Spearheaded the conceptualization, design, programming, and testing of a novel robot learning companion with gesture/voice recognition capabilities to develop early math skills among preschool-aged children.

GRANTS AND AWARDS

Fulbright Foreign Student Award 2022
Rensselaer Polytechnic Institute, Troy, NY.
- Awarded by recognition of outstanding academic and research accomplishments as a Fulbright grantee.

Institutional Exaltation of Associate Researcher Category 2022
Universidad de Córdoba, Montería, Colombia.

Awarded the Fulbright Scholarship - Cohort 2021 2020
Ministry of Science, Technology and Innovation of Colombia, Bogotá, Colombia.
- To pursue PhD studies in the USA.

Best Paper Award 2020
IISA 2020 The 5th International Conference on Intelligent, Interactive Systems and Applications. Shanghai, China.
- Paper: GDA-Based Tutor Module of an Intelligent Tutoring System for the Personalization of Pedagogic Strategies.

Short- Term Scholarship 2019
Wright State University, Dayton, USA.
- Project: Formal Representation of Metacognitive Judgments related to Goals Execution Time in MIDCA Cognitive Architecture. Working with Michael Cox and others.

Institutional Exaltation of Junior Researcher Category 2019
Universidad de Córdoba, Montería, Colombia

Relevance and Impact of the Research Project 2014
MILSET AMLAT, Medellín, Colombia.

Colombian representation in the Feira de Ciência e Tecnologia Sul do Maranhão 2013
Fundação Escola Técnica Liberato Salzano Vieira da Cunha, Novo Hamburgo, Brazil.

Colombian representation in the International Science and Technology Exhibition MOSTRATEC 2013 2012
Fundación Red Colombiana de Semilleros de Investigación RedColsi, Bucaramanga, Colombia.

Winner III Classroom Projects Competition 2012
Fundación Telefónica, Montería, Colombia.

Award stimulus for Teachers and Teaching Directors 2010
Municipal Education Secretariat. Montería, Colombia.

SOFTWARE SKILLS

Advanced	Java, JavaScript, C++, PHP and Python Languages, TensorFlow, PyTorch, Transformers, NodeJS, MongoDB, MySQL, Latex, NVivo.
Intermediate	SPSS, MATLAB, R.

PUBLICATIONS AND CONFERENCES

- Hanna Lavalle, M. I., **Gomez Salgado, A.** A., & Marquez Garcia, L. A. (2024). Sistema tutor inteligente basado en la personalización del aprendizaje para la enseñanza de protocolos de atención en salud. *Revista Colombiana de Tecnologias de Avanzada (RCTA),* 2(44), 45–54. https://doi.org/10.24054/rcta.v2i44.2866
- **Gomez, A. A.,** & Sun, R. (2024). A "Rational" Framework for Self-Control. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 46).
- **Gomez, A**., & Marquez, L. (2021). Representation of the Problem-Solving Process of the Tower of Hanoi using Fuzzy Cognitive Maps. *2021 IEEE 20th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC),* 147-152. https://doi.org/10.1109/ICCICC53683.2021.9811321.
- Marquez, L., Zapa, H., & **Gomez, A.** (2021). Design of a Cognitive Control Mechanism for a Goal-based Executive Function of a Cognitive System. *Proceedings of the Ninth Goal Reasoning Workshop* https://bit.ly/3ULb0UW.
- **Gomez, A**. (2021). Design of a Self-Control Mechanism for a GDA-Based Tutor Module of an Intelligent Tutoring System. *Proceedings of the Ninth Goal Reasoning Workshop*. https://bit.ly/4bDlmMK.
- **Gomez, A**., Marquez, L., Zapa, H., & Florez, M. (2021). GDA-Based Tutor Module of an Intelligent Tutoring System for the Personalization of Pedagogic Strategies. Emerging Trends in Intelligent and Interactive Systems and Applications. *Proceedings of the 5th International Conference on Intelligent, Interactive Systems and Applications (IISA2020)*, 742-750. Springer International Publishing. https://doi.org/10.1007/978-3-030-63784-2_92.
- Cogollo, Y., **Salgado, A**., & Garcia, L. (2020). Intelligent Tutoring Systems and Planning Techniques: A Systematic Review. *Acta ScientiÆ InformaticÆ*, *4*(4), 6-6. https://bit.ly/3wkqiWy.
- Espinosa-Lopez, A., **Gomez-Salgado, A**., & Lorduy-Arellano, D. (2020). CARINA-based Cognitive Agent for Factoid Wh-Questions Generation in EFL. *International Journal on Advanced Science*, Engineering, and Information Technology. *10*(5), 1852-1859. https://doi.org/10.18517/ijaseit.10.5.10138.
- Galeano, R., **Salgado, A**., & Arellano, D. (2020). Metacognitive Strategies and Learning Quality: A Systematic Mapping Study. *International Association for Development of the Information Society* 48. https://bit.ly/48lzneY.
- **Gomez, A.,** Florez, E., & Marquez, L. (2019). Design of the Tutor Module for an Intelligent Tutoring System (ITS) Based on Science Teachers' Pedagogical Content Knowledge (PCK). *International Congress on Education and Technology in Sciences* 141-157. https://doi.org/10.1007/978-3-030-45344-2_12.
- Florez, Y., Jerónimo, J., Castillo, M., & **Gomez, A.** (2019). User-Based Cognitive Model in NGOMS-L for the Towers of Hanoi Algorithm in the Metacognitive Architecture CARINA. *International Conference on Advances in Emerging Trends and Technologies.* 473-484. https://doi.org/10.1007/978-3-030-32022-5_44.

- Garcia, L., & **Salgado, A.** (2019). ANN-Based Model for Simple Grammatical Cases Teaching in Spanish Language. *International Conference on Advances in Emerging Trends and Technologies.* 442-453. https://doi.org/10.1007/978-3-030-32022-5_41.
- Caro, M., Josyula, D., Madera, D., Kennedy, C., & **Gomez, A.** (2019). The CARINA Metacognitive Architecture. *International Journal of Cognitive Informatics and Natural Intelligence (IJCINI)*, *13*(4), 71-90. https://doi.org/10.4018/IJCINI.2019100104.
- Nisperuza, E., & **Salgado, A.** (2019). Science Teachers Perceptions on their Pedagogical Content Knowledge (PCK). *In CISETC 2019 International Congress on Educational and Technology in Sciences*. https://ceur-ws.org/Vol-2555/paper26.pdf
- Lopez, A., **Salgado, A.**, & Calao, Y. (2018). Natural Language for Factoid- WH in English as a Foreign Language. *Acta ScientiÆ InformaticÆ*, *2*(2), 5-5. https://bit.ly/48n3hiW.
- **Gomez, A**., Caro, M., Solano, A., & Vega, Y. (2018). Trends of educational informatics in Latin America. I*nternational Journal of Software Science and Computational Intelligence (IJSSCI)*, *10*(1), 80-87. https://doi.org/10.4018/IJSSCI.2018010106.
- Madera-Doval, D., Caro-Piñeres, M., **Gomez-Salgado, A**., Cardozo-Soto, A., & Jimenez-Builes, J. (2018). Design of metacognitive expectations of cognitive functions through ontological representations. *Dyna, 85*(206), 194-201. http://dx.doi.org/10.15446/dyna.v85n206.7168z.
- Caro, M., Josvula, D., **Gomez, A.**, & Kennedy, C. (2018, July). Introduction to the CARINA metacognitive architecture. *2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC)*, 530-540. https://doi.org/10.1109/IEEE. 10.1109/ICCI-CC.2018.8482051.
- Madrigal, M., **Salgado, A**., & Piñeres, M. (2018). Validación del proceso basado en M++ de las Trazas de Razonamiento Introspectivas de la función cognitiva percepción de la arquitectura metacognitiva CARINA. *Teknos Revista Científica*, *18*(2), 54-62. https://doi.org/10.25044/25392190.972.
- Lopez, A., Calao, Y., **Salgado, A.,** & Piñeres, M. (2018). Validación de un modelo cognitivo basado en M++ para la generación de preguntas Factoid-Wh. *Teknos Revista Científica, 18*(2), 11-20. https://doi.org/10.25044/25392190.972.
- **Gomez, A**., & Caro, M. (2018) Meta-Modeling Process of Pedagogical Strategies in Intelligent Tutoring Systems. *2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC)*. IEEE, 2018. https://doi.org/10.1109/ICCI-CC.2018.8482046.
- Florez, M., **Gomez, A**., & Caro, M. (2018). Formal Representation of Introspective Reasoning Trace of a Cognitive Function in CARINA. *2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC).* IEEE, 2018. https://doi.org/10.1109/ICCI-CC.2018.8482053.
- Jeronimo, A., Caro, M., & **Gomez, A**. (2018) Formal Specification of cognitive models in CARINA. *2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC). IEEE, 2018*. https://doi.org/10.1109/ICCI-CC.2018.8482062.
- Olier, A., **Gomez, A.,** & Caro, M. Cognitive Modeling Process in Metacognitive Architecture CARINA. *2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC).* IEEE, 2018. https://doi.org/10.1109/ICCI-CC.2018.848209.
- Caro, M., **Gomez, A.,** & Giraldo, J. (2017). Algorithmic knowledge profiles for introspective monitoring in artificial cognitive agents. *2017 IEEE 16th International Conference on Cognitive Informatics & Cognitive Computing (ICCI* CC).* IEEE, 2017. https://doi.org/10.1109/ICCI-CC.2017.8109792.
- Quiceno, A., **Salgado, A**., & Caro, M. (2017). Design and Implementation of a Teaching Tool for Introduction to object-oriented programming. *IEEE Latin America Transactions*, *15*(1), 97-102. https://doi.org/10.1109/TLA.2017.7827913
- Bernal, D., Miranda, R., **Gomez, A.,** & Caro, M. (2017). Sinopsis de metodologías y modelos de software educativo. *Acta ScientiÆ InformaticÆ*, *1*(1). https://bit.ly/3I5ouDz.
- Soto, A., Madera, D., **Gomez, A.,** & Caro, M. (2017). An overview about metacognitive expectations in a cognitive agent. *Acta ScientiÆ InformaticÆ*, *1*(1). https://bit.ly/3wixG4X.

INVITED ACADEMIC TALKS

International Conference of Social Sciences CISCO 2024 2024
Universidad Pontificia Bolivariana
- Keynote Speaker - Talk: IA en la investigación (AI-powered tools for researching)

46th Annual Meeting of the Cognitive Science Society COGSCI 2024 2024
Cognitive Science Society
- Discussion group coordinator - Talk: Can Robots dream?

Seminario de IA e Innovacion Didactica 2024
Universidad Pontificia Bolivariana, Monteria, Colombia.
- Keynote Speaker - Talk: Inteligencia Artificial e Innovacion Didactica (AI and Didactic Innovation).

Conversatorio TIC para la Inclusion 2023
Universidad Militar Nueva Granada, Bogota, Colombia.
- Keynote Speaker - Talk: Inteligencia Artificial e Inclusion en Educacion (AI and Inclusion in Education).

Congreso Internacional de Innovación y Desarrollo 2023
Institucion Universitaria Americana, Monteria, Colombia.
- Keynote Speaker - Talk: Inteligencia Artificial y Procesos de Aprendizaje (AI and Learning Processes).

OTHER SERVICE ACTIVITIES

Peer reviewer in the Academic Evaluation process of applications for the Hubert H. Humphrey Fulbright Scholarship - Colombia. 2024

Cognitive Science Society Member. 2024

Graduate Student Association Member at Rensselaer Polytechnic Institute. 2022-2024

CogArch Lab Member, Rensselaer Polytechnic Institute. 2021-2024

Curriculum and Accreditation Committee member of the Master program in Education at Universidad de Córdoba, Montería, Colombia. 2018-2019

Curriculum and Accreditation Committee head of the Educational Informatics Department at Universidad de Córdoba, Montería, Colombia. 2018-2020

Research Committee Head of Education and Human Sciences School at Universidad de Córdoba, Montería, Colombia.	2017-2019
Researcher in the EduTLan Lab at Universidad de Córdoba.	2015-2024
Cognitive Modeling Area Coordinator, EdutLan Lab, Universidad de Córdoba.	2015-2020
Undergraduate and Graduate Student Research Mentor, EdutLan Lab.	2015-2020

SOCIAL MEDIA

- Google Scholar: https://scholar.google.es/citations?user=yANHEHgAAAAJ&hl=es&oi=ao
- ResearchGate: https://www.researchgate.net/profile/Adan-Gomez
- LinkedIn: www.linkedin.com/in/adangomezs