Ovi Chris Rouly, Ph.D.

1350 Beverly Rd.
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CLEARANCE Active

EXPERTISE Computational Social Science, Data Science, Agent-Based Modeling, and Discrete Event Complex Social Systems Simulation Technologies using Social Psychology, Anthropology, and Computer Science as Foundation Tools.

EDUCATION

2007 - 2015	**Ph.D. Computational Social Science** George Mason University, Fairfax, Virginia
1998 - 2000	**M. S. Electrical Engineering** New Mexico State University, Las Cruces, New Mexico
1996 - 1998	**B. S. Computer Science** Eastern New Mexico University, Portales, New Mexico
1994 - 1996	**B. S. Psychology** University of the Southwest, Hobbs, New Mexico
1985 - 1987	**A. A. S. Electronics Technology** Mesa Community College, Mesa, Arizona

TEACHING EXPERIENCE

Spring 2019: Instructor in mathematics separately for Orange County Public Schools and Kelly Educational Staffing, Orlando, Florida.

Spring 2017: ETH Zürich, Lecturer in Computational Social Science, 851-0585-44L Social Modelling, Agent-Based Simulation, and Complexity, Department of Humanities, Social and Political Sciences program in Computational Social Science.

Fall 2016: ETH Zürich: Seminar Leader in Computational Social Science, 851-0585-41L Computational Social Science, Department of Humanities, Social and Political Sciences program in Computational Social Science program in Computational Social Science

Spring 2016: ETH Zürich, Lecturer in Computational Social Science, 851-0585-37L Social Modelling, Agent-Based Simulation and Collective Intelligence, Department of Humanities, Social and Political Sciences program in Computational Social Science.

2012-2012: George Mason University, Research Assistant/Teaching-Aid, CSS 723 Building Virtual Worlds, Department of Computational and Data Sciences program in Computational Social Science.

2004-2004: George Mason University, Adjunct Faculty, ECE 447 Single-chip Microcomputers, Department of Electrical and Computer Engineering.

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RESEARCH INTERESTS

- Computational Modeling & Simulation of Evolutionary and Small-group Social Behavior
- Complex Adaptive Systems **(***Complex Social Systems, Emergent Small-group Behaviors, Emergent Social Organization, and Emergent Social Culture***)**
- Soft Computing and Machine Intelligence **(***Evolutionary Algorithms, Fuzzy Logic, Artificial Spiking Neural Networks, and P-Type Algorithms***)**
- Computational Modeling of Bio-psychological Drives
- Agent-Based Modeling / Individual-Based Modeling
- Virtual Agents / Virtual Worlds (2D & 3D Modeling)

COMPLETED RESEARCH

2014-2015: *At the root of sociality: Working towards emergent, permanent, social affines*. This research was fundamental to my PhD dissertation. A paper describing the scientific method and the results was accepted by the European Conference on Artificial Life 2015 in York, UK. Subsequent work resulted in the publication of the thesis materials in the *Journal of Human Evolution*.

2013-2014: *Midwife: CPU cluster load distribution of Virtual Agent AIs*. This research developed an extensible algorithm for hosting scalable numbers of virtual agents (autonomous and adaptive cognitive clients) on a CPU cluster. A paper describing the work was presented at the 8th International Conference on Complex, Intelligent, and Software Intensive Systems in Birmingham, UK.

2011-2011: *Sexually differentiated philopatry and dispersal: A demonstration of the Baldwin effect and genetic drift*. This research developed an agent-based model of primitive human behavior. The work involved joining artificial genetics, cognitive theory, and socio-spatial constraints to demonstrate simulated fission-fusion, the Sewell effect (genetic drift), and the Baldwin effect (ontogenetic evolution) in autonomous agents. A paper describing the work was presented to the Computational Social Science Society of America conference in Santa Fe, New Mexico.

2010-2011: *Modeling pedestrian ingress and social behavior at a large venue*. This research used a geographically accurate 2D grid and mobile software agents to consider suspicious pedestrian behavior among at large events. (Completed on behalf of the United States Department of Homeland Security.) Camber, Inc., Centreville, Virginia. (Results are company proprietary.)

2010-2010: *Late Pleistocene human migrations: An agent-based modeling approach*. This research developed an agent-based model simulating human migratory behavior during the Last Glacial Maximum. The model used distributed computation to create a geographically accurate, grid-based world populated by autonomous, mobile software agents. A paper describing the work was presented to the 3rd World Congress on Social Simulation in Kassel, Germany and (in Abstract form) to the 2010 Computational Social Science Society conference in Tempe, Arizona.

2009-2010: *Social decision-making processes in tribal Afghanistan: An agent-based model*. (The Measles Model.) This research considered a complex, emergent social behavior believed associated with the socio-judicial decision-making process called a "Jirga," commonly practiced by the Pashtun tribes of Afghanistan. It was found that exogenous (external) political interference that suppressed the process could elevate social unrest, precipitate violence, and eventually lead to Improvised Explosive Device usage under the right conditions. An Abstract describing the work was presented to the 2010 Computational Social Science Society conference in Tempe, Arizona. (Completed on behalf of the United States Joint Improvised Explosive Device Defeat Organization.) Krasnow Institute for Advanced Studies, George Mason University, Fairfax, Virginia.

2007-2007: *Learning automata and need-based drive reduction*. This research created a simulation of adaptive, machine intelligence-enabled, mobile agents operating in a 2D maze. Agent behavior control was based on the psychological theory of Maslow's 1943 Hierarchy of Needs and Turing P-Type automata. A paper describing the work is among the proceeding of the 8th International Conference on Intelligent Technologies: Intelligent technologies in robotics and automation in Sydney, Australia.

ACTIVITIES / EMPLOYERS

2020-present	**Research Scientist, U.S. Government, Virginia.** Providing service on various projects.
2019-2020	**Research Fellow, Tulane University, New Orleans, Louisiana.** Tasking on DARPA *Ground Truth* Research Program. Big-Data analysis for Social-Spatial data Analytics.
2018-2019	**Instructor in Mathematics; Orange County Public Schools and Kelly Educational Staffing, Orlando, Florida.** Taught middle-school and high-school classes in mathematics and general studies.

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2017-2019 **Scientist; Complex Systems Modeling, LLC; Orlando, Florida.**
Co-owner of a small business dedicated to custom research and development of software involving complex systems.

2017 - 2017 **Visiting Assistant Research Professor; UCF; Orlando, Florida.**
Engaged to create an "at scale" model of the internet inhabited by independent, interacting, cognitive/affective artificial agents. Agent-Based Model technology. Work sponsored by the Defense Advanced Research Project Agency (DARPA).

2016 - 2017 **Lecturer in Computational Social Science; ETH; Zürich, Switzerland.**
Taught classes in Computational Social Science, Collective Intelligence, and Complex Social Systems.

2015 - 2016 **Sci. Eng. & Tech. Advisor; Vencore/ONR; Arlington, Virginia.**
Sub-contract consultant (SETA) to the Office of Naval Research (ONR). Performed as a technical consultant to ONR for Augmented Reality (AR) and Virtual Reality (VR) systems assessments. Additionally, had responsibilities for proposal technical evaluation, domain-specific technical evaluations, and writing applied technology drafts for Small Business Innovative Research (SBIR) research grants.

2015 **Ph.D. dissertation; George Mason University.**

Dissertation title: *Towards Emergent Social Complexity*

2007 - 2015 **Ph.D. student; George Mason University, Fairfax, Virginia.**
Java and C# modeling and simulation (Agent-Based Modeling and discrete-event/micro-simulation). Developed Agent-Based Models for three projects: 1) a model of country-level human social culture behavior (HSCB) of south-central Asia (Afghanistan) developed for the DoD Joint Improvised Explosive Device Defeat Organization (JIEDDO), 2) a software model of human migrations developed for publication, and 3) a model of virtual agents having affective-cognitive small-group social activity in a virtual world. Published and presented findings in journals and conferences in Australia, Europe, and the United States. Authored technical papers, reports, and briefing materials as required.

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2012 - 2014 **Software Eng.; Harmonia Holdings, Blacksburg, Virginia.**
Managed and coordinated the work product of a small team of Java developers using an agile software development process. Created a prototype, socio-temporal, 'Prediction Engine' based on a spatial Agent-Based Model (ABM) driving an Anticipatory Learning Classifier System (ALCS). Used various Machine Learning (ML), Evolutionary Algorithms (EA), and Genetic Algorithms (GA) techniques to develop a compute cluster-based adaptive system to pre-place defense weapons platforms. Work done under a subcontract for Department of Defense (DoD) Missile Defense Agency (MDA).

2010 - 2011 **Software Eng.; Camber; Centreville, Virginia.**
Worked within Java in a small team of Java developers using an agile software development process. Project deliverable was a spatial Agent-Based Modeling (ABM) using human social culture behavior (HSCB) theories. The software modeled suspicious pedestrian social behavior at a large public event. Incorporated applied and explicit Geographic Information System (GIS) data. Work done under a subcontract into Department of Homeland Security (DHS).

2006 - 2006 **Sci. & Eng. Advisor; I3/US Army; Arlington, Virginia.**
Sub-contract consultant (SETA) to the US Army Rapid Equipping Force (USA REF) and Joint Improvised Explosive Device Defeat Organization (JIEDDO) for technology analysis, systems assessment, and support. Produced and presented findings and recommendations to a team of colleagues and clients after reviews of relevant weapon systems. Prepared brief materials describing government research and development efforts. Provided systems technical reviews and evaluation, and quantitative assessment. Traveled Continental United States (CONUS) as required.

2004 - 2006 **Sci. Eng. & Tech. Advisor; SRS/DARPA; Arlington, Virginia.**
Sub-contract consultant (SETA) to the Defense Advanced Research Project Agency (DARPA) US Army/DARPA transition liaison office. Assisted DARPA Program Managers (PMs) with technology transition to the warfighter across diverse fields: bioengineering, robotics, information technologies, and small

man-portable systems, etc. Work involved responsibilities with systems-assessments, identification of technology gaps, tech evaluation, technical risk management, and technology transfer from DARPA to the US Army. Traveled Continental United States (CONUS) as required.

2003 - 2004 **Sys. Eng.; Raytheon; Arlington, Virginia.**
Worked with business development, marketing, and systems engineering to develop innovative, new cognitive, unmanned, and robotic systems for Raytheon Department of Defense (DoD) customers using autonomous and adaptive systems design theory.

2003 - 2003 **Adj. Fac. Elec. Eng.; George Mason University; Fairfax, Virginia.**
Taught undergraduate seniors a "capstone course" in microcontroller-based systems design and development. Helped students develop problem solving skills, improve system designs, instantiate novel but operational hardware/software implementations, use control theory, sensors, motors, light-emitting elements, and other input/output devices.

2002 - 2003 **Hardware Eng.; Synergy; San Diego, California.**
Redesigned a VME-based, PCI to PMC 1GB memory bus adapter and did preliminary module-level verification for a one GHz PPC 7455 single board computer. PCB design.

2000 - 2002 **Hardware Eng.; Tech-One/Honeywell, Phoenix, Arizona.**
Subcontractor into Honeywell Aerospace. Designed and implemented Field Programmable Logic Arrays (FPGA) and Electrically Programmable Logic Device (EPLD) circuits for various fixed-wing and rotor wing aircraft. The design languages used for these circuits were, variously: Very High-Speed Integrated Circuit (VHSIC) Hardware Description Language (VHDL), Advanced Boolean Expression Language (ABEL), and Verilog. Synthesis tools came from Altera, Synopsis, and Xilinx depending on application. While assigned to Honeywell designed and built two VHDL-coded programmable gate-array circuits: one for an update to the Boeing 777 Flight Management System (FMS) computer and another for a Personal Computer Interface (PCI) target

application. Did simulation verification testing on all programmable logic circuits in the updated 777 FMS computer. Wrote the updated 777 FMS test procedure for Federal Aviation Administration (FAA) qualification testing. Regularly participated in team design reviews and product development processes involving the Boeing customer and customer's engineering staff. Had responsibility for revision and preparation of three additional programmable circuits for FAA qualification testing.

1998 - 2000 **M.S. Electrical Engineering; New Mexico State University.**

Work focused on the design and implementation of hardware based adaptive systems and robotic control theory using high-speed circuit design, computer architecture design, programmable logic design, and the Soft Computing technologies of Fuzzy Logic, Evolutionary and Genetic Algorithms, and Artificial Neural Networks. Designed and built an untethered, bio-mimetic artificial rodent robot. Designed and built a PC/104 form factor PWB with Datel power bricks delivering +/- 5 and +/- 12-volt outputs. Designed and built a PC/104 form factor PWB with a Xilinx FPGA, ISA slave adapter interface, and dual low power Maxim RS-232 ports for Nano-Sat launch and high-altitude research purposes. Designed and built an untethered, autonomous, vehicular robot with four Altera programmable EPLDs, RF and IR telemetry, and status/control communications. Six PWB system, all VHDL coding, layout, routing, wire-wrap, and prototyping, documentation, and schematics. Designed and built a Fuzzy Logic Magnetic Levitation Controller. Clocked controller was coded in VHDL and placed in an Altera MAX FPGA. Designed and built PowerPC 601 embedded microcomputer with two-stage pipelined and segmented address / data bus.

1996 - 1998 **B.S. Computer Science; Eastern New Mexico University.**
Traditional studies. Emphasis on computational science and algorithms - not software engineering. Earned a minor studies degree in mathematics and Electronics Technology.

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1994 - 1996 **B.S. Psychology; College of the Southwest.**
Traditional studies with an emphasis on bio-psychology, cognitive psychology, and personality psychology.

1987 - 1994 **Site Mgr; Grumman Technical Services, Inc., Hanau, Germany.**
Served as the Grumman Technical Services, Inc. (GTSI) European site manager on a US Army UH-1 helicopter, hydraulically-actuated, 6-DOF (full –motion) flight simulator. Directed maintenance and personnel. The simulator had four cockpits, was a full-motion, hydraulically actuated device. Maintained near 100% availability. Created a thermal sensor and telemetry interface to monitor the simulator mainframe computer complex performance. Designed and coded inventory and office standardization software in dBase IV and Clipper. Early in this period, served GTSI as Simulation Technician (level-III) on a US Air Force radar simulator in Basdahl, Germany.

1984 - 1987 **A. A. S. Electronics Technology; Mesa Community College.**

INVITED SEMINARS

November 29, 2016 – *Building an interactive multi-agent system in a Virtual World: Monopoli reveal.* International Congress on Agent Model, George Mason University (GMU), Fairfax, VA.

November 1, 2016 – *Building an interactive multi-agent system in a Virtual World: Monopoli reveal.* Department of Teaching and Learning Research, ETH Zürich.

April 24, 2015 – *At the root of sociality: Working towards emergent, permanent, social affines.* Department of Computational Social Science, GMU, Fairfax, VA.

February 13, 2015 – *ALife using Adaptive, Autonomous, and Individual Agent Control*. Department of Computational Social Science, GMU, Fairfax, VA.

April 18, 2014 – *Midwife: CPU Cluster Load Distribution of Virtual Agent AIs*.

Department of Computational Social Science, GMU, VA.

November 13, 2009 – *In search of the roots of social complexity*.

Department of Computational Social Science, GMU, Fairfax, VA.

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AWARDS

Single-Author: Winner best paper award at the 2015 Australian Conference on Artificial Life and Computational Intelligence.

Co-Author: Winner best paper award at the 2018 International Conference on Autonomous Agents and Multiagent Systems (AAMAS).

PROFESSIONAL SOCIETIES

American Association for Artificial Intelligence

American Psychological Association

Evolutionary Anthropology Society

Institute of Electrical and Electronics Engineers

ASSOCIATED WEBSITES

http ://www.maelzel.com

http ://habitatlab.maelzel.org

http ://maelzel.org

PUBLICATIONS

Kim, J., Kavak, H., **Rouly, C.**, Jin, H., Crooks, A., Pfoser, D., Wenk, C., & Züfle, A. **(2020)**. Location-Based Social Simulation for Prescriptive Analytics of Disease Spread. *28th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems* (ACM SIGSPATIAL 2020). Seattle, Washington. 3-6 November 2020. (upcoming)

Kim, J.-S., Jin, H., Kavak, H., **Rouly, O.**, Crooks, A., Pfoser, D., Wenk, C., & Züfle, A. **(2020).** Location-Based Social Network Data Generation Based on Patterns of Life. In R. H. Güting, Wolfson, O., Youssef, M. (Eds.). *Proc. of the 21st IEEE International Conference on Mobile Data Management*. (MDM 2020). Versailles, France. June 30-July 3, 2020.

Rosés, R., Kadar, C., Gerritsen, C., and **Rouly, O. (2020).** Simulating Offender Mobility: Modeling Activity Nodes from Large-Scale Human Activity Data. *Journal of Artificial Intelligence Research*. Vol. 68. pp. 541-570.

Rosés, R., Kadar, C., Gerritsen, C., and **Rouly, O. (2018).** Agent-Based Simulation of Offender Mobility: Integrating Activity Nodes from Location-Based Social Networks. In M. Dastani, G. Sukthankar, E. André, S. Koenig (Eds.). *Proc. of the 17th International Conference on Autonomous Agents and Multiagent Systems* (AAMAS 2018). Stockholm, Sweden. July 10–15, 2018.

Rouly, O. (2018). A Computer simulation to investigate the association between gene-based gifting and pair-bonding in early hominins. *Journal of Human Evolution*. Vol. 116C. pp. 43-56.

Caduff, I., Krummenacher, S. & **Rouly, O. (2017)**. Power law distribution of language families using an agent-based model. *Proceedings of the Computational Social Science Society 2017 Conference*. Santa Fe, New Mexico, USA. 19-22 October 2017.

Rouly, O. (2016). Artificial Intelligence using P-Type Unorganized Machines. *The Rutherford Journal*, 5(16). Retrieved 12 September 2016, http://dotbu.com/PHIL/ ISSN: 1177-1380.

Rouly, O. (2015). Towards Emergent Social Complexity. Unpublished dissertation. George Mason University, Fairfax, Virginia, USA.

Rouly, O. (2015). At the root of sociality: Working towards emergent, permanent, social affines. In Andrews, P., Caves, L., Doursat, R., Hickinbotham, S., Polack, F., Stepney, S., Taylor, T. & Timmis, J. (Eds.). *Proceedings of the European Conference on Artificial Life 2015*. pp. 82-89, MIT Press.

Rouly, O. (2015). ALife using Adaptive, Autonomous and Individual Agent Control. In Chalup, S., Blair, A. & Randall, M. (Eds.). *Proceedings of the Australian Conference on Artificial Life and Computational Intelligence* (ACALCI 2015). University of Newcastle, Australia.

Rouly, O. (2014). Midwife: CPU cluster load distribution of Virtual Agent AIs. In Barolli, L and Xhafa, F. (Eds.). *Proceedings of the 8th International Conference on Complex, Intelligent, and Software Intensive Systems*, Birmingham, UK.

Rouly, O. & Kennedy, W. **(2011)**. Sexually differentiated philopatry and dispersal: A demonstration of the Baldwin effect and genetic drift. *Proceedings of the Computational Social Science Society 2011 Conference*. Santa Fe, New Mexico, USA. 9-12 October 2011.

Hendrey, M., **Rouly, O.**, West, J., Kennedy, W., & Axtell, R. **(2010)**. Abstract. Social decision-making processes in tribal Afghanistan: An agent-based model. *Proceedings of the Computational Social Science Society 2010 Conference*. Arizona State University, Tempe, Arizona, USA. 4-6 November 2010.

Rouly, O. C., and Crooks, A. **(2010)**. A prototype, multi-agent system for the study of the Peopling of the Western Hemisphere. In *Proceedings of the 3rd World Congress on Social Simulation (WCSS2010): Scientific Advances in Understanding Societal Processes and Dynamics*, A. Ernst and S. Kuhn, eds. Kassel, Germany.

Rouly, O. & Crooks, A. **(2010)**. Abstract. A prototype, multi-agent system for the study of the peopling of the western hemisphere. *Proceedings of the Computational Social Science Society 2010 Conference*. Arizona State University, Tempe, Arizona, USA, 4-6 November 2010.

Rouly, O. (2009). *In search of the roots of social complexity*. Unpublished Manuscript. George Mason University, Fairfax, Virginia.

Axtell, R. & **Rouly, O. (2008)**. The sports league formation problem: Case of the Washington Area Girls Soccer League. *Proceedings of the Second World Congress on Social Simulation*, George Mason University, Fairfax, Virginia, USA. 14-17 July 2008.

Rouly, O. (2007). Learning automata and need-based drive reduction. In Ha, Q. & Kwok, N. (Eds.) *Proceedings of the 8th International Conference on Intelligent Technologies* (InTech). University of Technology, Sydney, Australia.

Rouly, O. (2004). A viewpoint on embodied synthetic agency. *American Association for Artificial Intelligence Fall Symposium*. Arlington, Virginia, USA. 22-24 October 2004.

Rouly, O. (2000). *Cybernetic intelligence: A return to complex qualitative feedback theory*. Unpublished thesis. New Mexico State University, Las Cruces, New Mexico, USA.