NAVEEN SUNDAR GOVINDARAJULU

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■ SUMMARY

- Fifteen years of experience in machine learning (Indian Space Research Organization, Tata Institute of Fundamental Research, HP Labs, Yahoo Research, Rensselaer AI & Reasoning Laboratory, RealityEngines.AI (now Abacus.AI), & Workday Intelligent Planning Group).

- Multiple patents, and publications in NeurIPs, IJCAI, Stanford Encyclopedia of Philosophy (Artificial Intelligence), AAAI symposia, etc.

- Four years of experience in mentoring and guiding researchers and ML engineers.

■ PROFESSIONAL EXPERIENCE

1. Workday, Intelligent Planning Group, San Francisco Bay Area   January 2020 – Now
Principal Machine Learning Scientist

- Developed and deployed state-of-the-art meta-learning methods for time series forecasting to more than two hundred customers; five pending patents (first inventor on four)

- Designed architecture for improving models automatically based on customer feedback

2. RealityEngines.AI (now Abacus.AI), San Francisco Bay Area   June 2019 – February 2020
Research Scientist

- Deep learning research. Constraints and deep learning, NeurIPS 2019 workshop paper on adding constraints to deep learning models https://kr2ml.github.io/2019/papers/

- Explainability for machine learning models

- Bias detection and removal from machine learning models, NeurIPS full paper https://proceedings.neurips.cc/paper/2020/file/1d8d70dddf147d2d92a634817f01b239-Paper.pdf. NeurIPS 2019 workshop paper on bias removal. https://neurips.cc/Conferences/2019/Schedule?showEvent=13192

- Talk: **Explainability and Bias in AI** Details: https://learn.xnextcon.com/event/eventdetails/W19080910. Video https://www.youtube.com/watch?v=J7_9_yk9C1g

3. RAIR Lab, RPI   December 2016 – June 2019
Senior Research Scientist

- Deep learning for reasoning
  - Naveen Sundar Govindarajulu, Jean-Claude Paquin, Shreya Banerjee, Atriya Sen, Paul Mayol and Selmer Bringsjord (2019) "On Datasets for Evaluating Architectures for Learning to Reason." In *Proceedings of the AAAI 2019 Spring Symposium on Combining Machine Learning with Knowledge Engineering (AAAI-MAKE)* . March 25–27, 2019 @ Stanford University, Palo Alto, California, USA. https://www.aaai-make.info/program.

- Extending quantified modal logics by adding uncertainty

- Designing, implementing and extending quantified modal logic theorem provers
- Building planning systems based in quantified modal logic with uncertainty

  – Naveen Sundar Govindarajulu and Selmer Bringsjord (2017). "Strength Factors: An Uncertainty System for a Quantified Modal Logic." In *Working Papers of the IJCAI (International Joint Conference on Artificial Intelligence) 2017 Workshop on Logical Foundations for Uncertainty and Machine Learning*. Melbourne, Australia.
  (Papers: http://homepages.inf.ed.ac.uk/vbelle/workshops/lfu17/proc.pdf)

- Working on two Office of Naval Research projects: 1) *Moral Competence in Computational Architectures for Robots: Foundations, Implementations, and Demonstrations*; and 2) *Advanced Logicist Machine Learning*.
- Co-chair for *International Conference on Robot Ethics and Standards 2018*, Troy, NY

4. WePay   July 2016 – November 2016
                                                                              Data Scientist

- Machine learning for fraud detection
- Improved fraud detection performance by analyzing and using learning systems that can best handle noise and missing data

5. Yahoo! Inc   August 2014 – July 2016
                                                                            Research Scientist

- Deep natural language understanding: Designing and building knowledge representation and reasoning systems for deep natural language understanding using modern grammars rooted in formal logic
- Member of Yahoo's deep natural language understanding team. See the following websites for a description of our team's work:

  1. https://developer.yahoo.com/skyphrase-sdk/; and
  2. https://yahooresearch.tumblr.com/post/123387824121/making-apps-understand-natural-language

6. Rensselaer Polytechnic Institute   September 2013 – August 2014
                                                              Postdoctoral Research Associate

- Building formal systems to model ethical & moral reasoning. Implementing reasoning systems for mobile robots based on these formal systems
- Implementing reasoning systems from scratch
  (See https://github.com/naveensundarg/G for a state-of-the-art natural deduction prover.)
- Dynamic QA to extend IBM's Watson
- Co-instructor for the course *Gödel's Great Theorems* in Fall 2013

7. Rensselaer Polytechnic Institute   August 2008 – August 2013
                                    Fulbright Scholar (till 2011) and then Graduate Research Assistant

- The Robot Devolution Game: Implementing and designing games for crowdsourcing first-order theorem-proving

- Research work consists of building synthetic characters that rely on a host of AI, logic, learning, pattern recognition and robotic subsystems. See the flier at http://www.cs.rpi.edu/~govinn/Cogito_under_the_hood.pdf for an overview of the latest incarnation of one such character, Cogito, handled by Naveen at the RAIR Lab
- Co-instructor for the course *Minds, Machines and Gödel*, Fall 2012
- Guest lecturer for the course *Introduction to Logic* in Fall 2011, Spring 2012 and Spring 2013
- Co-instructor for the course *Computational Learning Theory and Science*, Fall 2010
- Met and interfaced with teams from industrial research labs. These include discussions with the Watson/DeepQA team from IBM, the team that won the man-versus-machine Jeopardy contest in 2011, on extending DeepQA into medical domains, and presentations to vice-presidential teams from Disney Imagineering

8. **HP Labs India**   June 2006 – June 2008
       Consultant, Biometrics and Handwriting Recognition (Intern in the first year)
- Worked on cancelable biometrics
- Two granted patents for my research here
- Contributed to LipiTk (Dynamic Time Warping and other modules) http://lipitk.sourceforge.net
- Built a password manager based on doodles

9. **Tata Institute of Fundamental Research (TIFR), Mumbai**   May 2005 – July 2005 **Visiting Student Research Program**
- Studied laser cooling of atoms. Developed a theoretical model for the decay of an atom cloud in an magneto-optical trap and had it verified experimentally
- Was preselected for TIFR's prestigious Ph.D. program in physics

10. **Indian Space Research Organization**   May 2004 – July 2004
                                                               Intern, Mission Control Facility
- Studied various processes and subsystems of geo-synchronous satellites.
- Built a prototype fingerprint-recognition system.

■ **BOOKS and ARTICLES (Highlighted, see below in the CV for a comprehensive list)**
- Artificial Intelligence. *Stanford Encyclopedia of Philosophy*, (July 2018). https://plato.stanford.edu/entries/artificial-intelligence/.
- Yash Savani, Colin White and Naveen Sundar Govindarajulu. "Intra-Processing Methods for Debiasing Neural Networks." In *Proceedings of the 34th Conference on Neural Information Processing Systems (NeurIPS 2020)*. December, 2020 @ Vancouver, Canada. https://proceedings.neurips.cc/paper/2020/file/1d8d70dddf147d2d92a634817f01b239-Paper.pdf
- Naveen Sundar Govindarajuluand Colin White (2019). "DECO: Debiasing through Compositional Optimization of Machine Learning Models." In *NeurIPS 2019 Workshop: Robust AI in Financial Services: Data, Fairness, Explainability, Trustworthiness, and Privacy*. December 13, 2019 @ Vancouver, Canada. https://sites.google.com/view/robust-ai-in-fs-2019/.

- Naveen Sundar Govindarajulu and Colin White (2019). "Differentiable Functions for Combining First-order Constraints with Deep Learning via Weighted Proof Tracing." In *NeurIPS 2019 Workshop: KR2ML - Knowledge Representation and Reasoning Meets Machine Learning*. December 13, 2019 @ Vancouver, Canada. https://kr2ml.github.io/2019/papers/.

- Naveen Sundar Govindarajulu, Jean-Claude Paquin, Shreya Banerjee, Atriya Sen, Paul Mayol and Selmer Bringsjord (2019). "On Datasets for Evaluating Architectures for Learning to Reason." In *Proceedings of the AAAI 2019 Spring Symposium on Combining Machine Learning with Knowledge Engineering (AAAI-MAKE)* . March 25–27, 2019 @ Stanford University, Palo Alto, California, USA. https://www.aaai-make.info/program.

- Logic, A Modern Approach: Beginning Deductive Logic, Advanced. Selmer Bringsjord, Naveen Sundar Govindarajulu and Joshua Taylor. For more information see: http://www.logicamodernapproach.com

- Naveen Sundar Govindarajulu and Selmer Bringsjord (2017). "On Automating the Doctrine of Double Effect." In *Proceedings of the 26th International Joint Conference on Artificial Intelligence*. Melbourne, Australia. https://doi.org/10.24963/ijcai.2017/658

- Naveen Sundar Govindarajulu and Selmer Bringsjord (2017). "Strength Factors: An Uncertainty System for a Quantified Modal Logic." In *Working Papers of the IJCAI (International Joint Conference on Artificial Intelligence) 2017 Workshop on Logical Foundations for Uncertainty and Machine Learning*. Melbourne, Australia.
  (Papers: http://homepages.inf.ed.ac.uk/vbelle/workshops/lfu17/proc.pdf)

■ EDUCATION

Ph.D., Computer Science
Rensselaer Polytechnic Institute, Troy, New York   August 2013

Bachelor in Engineering (Hons.), Electrical and Electronics Engineering
Birla Institute of Technology and Science, Pilani. India   August 2007

Master of Science (Hons.), Physics
Birla Institute of Technology and Science, Pilani. India   August 2007

■ MAJOR (NATIONAL/INTERNATIONAL) AWARDS

- International Fulbright Science and Technology Award, 2008 – 2011.
- GE Foundation Scholar-Leader Award, 2004 – 2006.

■ BOOKS, JOURNAL PUBLICATIONS & BOOK CHAPTERS

1. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Review of Fundamental Proof Methods in Computer Science: A Computer-Based Approach." *Theory and Practice of Logic Programming*, (June 2020). (Cambridge University Press) https://doi.org/10.1017/S1471068420000071

2. Naveen Sundar Govindarajulu, Selmer Bringsjord, Rikhiya Ghosh, and Matthew Peveler. "Beyond The Doctrine Of Double Effect: A Formal Model Of True Self-Sacrifice." *Robots and Well-Being*, edited by Isabel Ferreira, Joao Sequeira, Gurvinder Virk, Mohammad OsmanTokhi, and Endre Kadar. (April 2019). (Springer).
   https://link.springer.com/chapter/10.1007%2F978-3-030-12524-0_5

4

3. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Artificial Intelligence." *Stanford Encyclopedia of Philosophy*, (July 2018). Stanford.
   https://plato.stanford.edu/entries/artificial-intelligence/.

4. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Are Autonomous-and-Creative Machines Intrinsically Untrustworthy?" *Foundations of Trusted Autonomy*, edited by Hussein A. Abbass, Jason Scholz, and Darryn J Reid. (2018): 317-335. (Springer). Print. Open access publication available at: http://www.springer.com/us/book/9783319648156

5. Selmer Bringsjord, Alexander Bringsjord and Naveen Sundar Govindarajulu. "What Would Poe Say About Today's Social Robots?" *Robophilosophy: Philosophy of, for, and by Social Robotics* edited by Seibt, J., Hakli, R. and Nørskov, M. (forthcoming). (Cambridge, MA: MIT Press). A preprint is available here:
   http://kryten.mm.rpi.edu/SB_AB_NSG_PoeSocialRobots_0712171200NY.pdf

6. Naveen Sundar Govindarajulu, Selmer Bringsjord, Atriya Sen and Jean-Claude Paquin. "Ethical Operating Systems." *Philosophopical Studies* edited by Liesbeth De Mol and Giuseppe Primiero. (forthcoming). (Springer). Print.

7. Selmer Bringsjord, Paul Bello and Naveen Sundar Govindarajulu. "Toward Axiomatizing Consciousness." *The Bloomsbury Companion to the Philosophy of Consciousness* edited by Dale Jacquette. (2018) page. 289. (Bloomsbury Publishing). Print.

8. Selmer Bringsjord, John Licato, Daniel Arista, Naveen Sundar Govindarajulu and Paul Bello. "Introducing the Doxastically Centered Approach to Formalizing Relevance Bonds in Conditionals." *Computing and Philosophy*, edited by Vincent Müller, (2016): 117-131. (Springer). Print. This volume is *Synthese Library 375, in Studies in Epistemology, Logic, Methodology, and Philosophy of Science.*

9. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Leibniz's Art of Infallibility, Watson, and the Philosophy, Theory, & Future of AI." *Philosophy and Theory of Artificial Intelligence: Synthese Library Series*, edited by Vincent Müller, (2016): 185-202. (Springer). Print. Preprint available at:
   http://kryten.mm.rpi.edu/SB_NSG_Watson_Leibniz_PT-AI_061414.pdf

10. Joe Johnson, Naveen Sundar Govindarajulu, and Selmer Bringsjord. "A Three-Pronged Simonesque Approach to Modeling and Simulation in Deviant 'Bi-Pay' Auctions, and Beyond." *Mind and Society* 13.1 (2014): 59-82. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/JJ_NSG_SB_bounded_rationality_031214.pdf

11. Naveen Sundar Govindarajulu and Selmer Bringsjord. "Ethical Regulation of Robots Must Be Embedded in Their Operating Systems." *A Construction Manual for Robot's Ethical Systems: Requirements, Methods, Implementations*, edited by Robert Trappl, (2016): 85-99. (Springer) Print.
    Available from Springer at:
    http://www.springer.com/us/book/9783319215471

12. John Licato, Selmer Bringsjord, and Naveen Sundar Govindarajulu. "How Models of Creativity and Analogy Need to Answer the Tailorability Concern." *Computational Creativity Research: Towards Creative Machines* (2015): 93-107 (Atlantis Press, Springer). Print.
    Preprint version available at:
    http://kryten.mm.rpi.edu/JL_SB_NSG_tailorability_concern_061014.pdf

13. Simon Ellis, Alexander Haig, Naveen Sundar Govindarajulu, Selmer Bringsjord, Joe Valerio, Jonas Braasch, and Pauline Oliveros. "Handle: Engineering Artificial Musical Creativity at the 'Trickery' Level." *Computational Creativity Research: Towards Creative Machines* (2015): 285-308 (Atlantis Press, Springer). Print.
    Preprint version available at:
    http://kryten.mm.rpi.edu/Ellis_etal_C3GI_book_2014_042514.pdf

14. Naveen Sundar Govindarajulu, Selmer Bringsjord and Joshua Taylor. "Proof Verification and Proof Discovery for Relativity." *Synthese* 192.7 (2015): 2077-2094. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/Govindarajulu-Bringsjord_proof_discovery_verification.pdf

15. Naveen Sundar Govindarajulu and Selmer Bringsjord. "The Untenability of Agentless Versions of the Church-Turing Thesis." *Church's Thesis: Logic, Mind, and Nature* (2014): 293-304. (Copernicus Center Press, Kraków, Poland). Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/NSG_SB_Agentless_Churchs_Thesis.pdf

16. Selmer Bringsjord, Naveen Sundar Govindarajulu, Simon Ellis, Evan McCarty and John Licato. "Nuclear Deterrence and the Logic of Deliberative Mindreading." *Cognitive Systems Research* 28 (2013): 20-43. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/SB_NSG_SE_EM_JL_nuclear_mindreading_062313.pdf

17. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Toward a Modern Geography of Minds, Machines, and Math." *SAPERE* 5 (2013): 151-165. Print.
    Available from Springer at:
    http://www.springerlink.com/content/hg712w4l23523xw5

18. Selmer Bringsjord and Naveen Sundar Govindarajulu. "Given the Web, What is Intelligence Really?" *Metaphilosophy* 43.4 (2012): 361–532. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/SB_NSG_Real_Intelligence_040912.pdf

19. Naveen Sundar Govindarajulu and Selmer Bringsjord. "The Myth of 'The Myth of Hypercomputation'." *Parallel Processing Letters* 22.3 (2012): 14 pages. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/Univ_Turku_The_Myth_Of_The_Myth.pdf

20. Selmer Bringsjord, Naveen Sundar Govindarajulu, Eugene Eberbach and Yingrui Yang. "Perhaps the Rigorous Modeling of Economic Phenomena Require Hypercomputation?" *International Journal Of Unconventional Computation* 8.1 (2012): 3-32. Print.
    Preprint available at:
    http://kryten.mm.rpi.edu/SB_NSG_EE_YY_28-9-2010.pdf

21. Selmer Bringsjord and Naveen Sundar Govindarajulu. "In Defense of the Unprovability of the Church-Turing Thesis." *International Journal of Unconventional Computing* 6.5 (2010): 353-373. Print.
    Preprint available at:
    http://www.cs.rpi.edu/~govinn/papers/uc2009.pdf

■ ABSTRACTS, CONFERENCE & WORKSHOP PROCEEDINGS

1. Selmer Bringsjord, John Angel, Naveen Sundar Govindarajulu, and Michael Giancola. "Artificial Agents to Help Address the U.S. K–12 Math Gap Between Economically Disadvantaged vs. Advantaged Youth." In *Proceedings of the AAAI 2021 Spring Symposium Series*. Forthcoming. Palo Alto, California.

2. Selmer Bringsjord, Naveen Sundar Govindarajulu, and Alexander Bringsjord. "Accepting The Challenge of Implementing Ethical Tax Agents." In *Proceedings of the AAAI 2021 Spring Symposium Series*. Forthcoming. Palo Alto, California.

3. Yash Savani, Colin White and Naveen Sundar Govindarajulu. "Intra-Processing Methods for Debiasing Neural Networks." In *Proceedings of the 34th Conference on Neural Information Processing Systems (NeurIPS 2020)*. December, 2020 @ Vancouver, Canada.
   https://proceedings.neurips.cc/paper/2020/file/
   1d8d70dddf147d2d92a634817f01b239-Paper.pdf

4. Naveen Sundar Govindarajulu and Colin White (2019). "DECO: Debiasing through Compositional Optimization of Machine Learning Models." In *NeurIPS 2019 Workshop: Robust AI in Financial Services: Data, Fairness, Explainability, Trustworthiness, and Privacy*. December 13, 2019 @ Vancouver, Canada.
   https://sites.google.com/view/robust-ai-in-fs-2019/.

5. Naveen Sundar Govindarajulu and Colin White (2019). "Differentiable Functions for Combining First-order Constraints with Deep Learning via Weighted Proof Tracing." In *NeurIPS 2019 Workshop: KR2ML - Knowledge Representation and Reasoning Meets Machine Learning*. December 13, 2019 @ Vancouver, Canada. https://kr2ml.github.io/2019/papers/.

6. Naveen Sundar Govindarajulu, Jean-Claude Paquin, Shreya Banerjee, Atriya Sen, Paul Mayol and Selmer Bringsjord (2019). "On Datasets for Evaluating Architectures for Learning to Reason." In *Proceedings of the AAAI 2019 Spring Symposium on Combining Machine Learning with Knowledge Engineering (AAAI-MAKE)* . March 25–27, 2019 @ Stanford University, Palo Alto, California, USA. https://www.aaai-make.info/program.

7. Naveen Sundar Govindarajulu and Selmer Bringsjord (2019). "Toward the Engineering of Virtuous Machines." In *Proceedings of the 2019 AAAI/ACM Conference on AI, Ethics and Society*. Hawaii, USA. http://www.aies-conference.com.
   https://arxiv.org/abs/1812.03868v2

8. Naveen Sundar Govindarajulu and Selmer Bringsjord (2019). "Towards a Computable & Harnessable Model of Consciousness." In Chella, A., Gamez, D., Lincoln, P., Manzotti, R., Pfautz, J. *Proceedings of TOCAIS19 (Toward Conscious AI Systems)*. Stanford, CA, March 25–27, 2019. ISSN 1613-0073, Vol-2287. http://ceur-ws.org/Vol-2287/paper27.pdf

9. Selmer Bringsjord and Naveen Sundar Govindarajulu (2019). "Introducing Λ for Measuring Cognitive Consciousness." In Chella, A., Gamez, D., Lincoln, P., Manzotti, R., Pfautz, J. *Proceedings of TOCAIS19 (Toward Conscious AI Systems)*. Stanford, CA, March 25–27, 2019. ISSN 1613-0073, Vol-2287. http://ceur-ws.org/Vol-2287/paper26.pdf

10. Naveen Sundar Govindarajulu, Selmer Bringsjord, and Rikhiya Ghosh (2019). "Virtue Ethics via Planning and Learning." In *Proceeding of the 2018 International Conference on Robot Ethics and Standards*. Troy, NY.

11. Matthew Peveler, Naveen Sundar Govindarajulu, Selmer Bringsjord (2019). "Toward Automating the Doctrine of Triple Effect." In *Proceeding of the 2018 International Conference on Robot Ethics and Standards*. Troy, NY.

12. Naveen Sundar Govindarajulu, Selmer Bringsjord, and Rikhiya Ghosh (2018). "One Formalization of Virtue Ethics via Learning." Presented at *International Association of Computing and Philosophy 2018*. Warsaw, Poland. https://arxiv.org/abs/1805.07797

13. Naveen Sundar Govindarajulu and Selmer Bringsjord (2017). "On Automating the Doctrine of Double Effect." In *Proceedings of the 26th International Joint Conference on Artificial Intelligence*. Melbourne, Australia. https://doi.org/10.24963/ijcai.2017/658

14. Naveen Sundar Govindarajulu, Selmer Bringsjord, Rikhiya Ghosh, and Matthew Peveler (2017). "Beyond The Doctrine Of Double Effect: A Formal Model Of True Self-Sacrifice." Presented at *International Conference on Robot Ethics and Safety Standards*. October, 2017. Lisbon, Portugal. (Springer book chapter forthcoming in 2018).

15. Naveen Sundar Govindarajulu and Selmer Bringsjord (2017). "Strength Factors: An Uncertainty System for a Quantified Modal Logic." In *Working Papers of the IJCAI (International Joint Conference on Artificial Intelligence) 2017 Workshop on Logical Foundations for Uncertainty and Machine Learning*. Melbourne, Australia.
(Papers: http://homepages.inf.ed.ac.uk/vbelle/workshops/lfu17/proc.pdf)

16. Atriya Sen, Naveen Sundar Govindarajuluand Selmer Bringsjord (2017). "Inaugural Steps in a Computational Study of Time Travel." Presented at the *3rd Logic, Relativity and Beyond Conference*. http://www.renyi.hu/conferences/lrb17/accepted.html. Extended abstract:
http://www.renyi.hu/conferences/lrb17/pdf/Sen--Sundar--Bringsjord.pdf

17. Naveen Sundar Govindarajulu and Selmer Bringsjord (2016). "Crowdsourcing Theorem Proving via Natural Games." In *Proceedings of the Second Workshop on Bridging the Gap between Human and Automated Reasoning (International Joint Conference on Artificial Intelligence 2016 workshop)*. New York City, USA.
(Proceedings: http://ratiolog.uni-koblenz.de/proceedings2016.pdf)

18. Selmer Bringsjord, John Licato, Naveen Sundar Govindarajulu, Rikhiya Ghosh and Atriya Sen (2015). "Real Robots That Pass Human Tests of Self-Consciousness." In *Proceedings of the 24th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2015)*. Kobe, Japan. http://ieeexplore.ieee.org/document/7333698/

19. Naveen Sundar Govindarajulu, John Licato and Selmer Bringsjord (2014). "Toward a Formalization of QA Problem Classes." In *Proceedings of the Seventh Conference on Artificial General Intelligence*. New York, NY.
(Preprint: http://www.naveensundarg.com/papers/formalizing_QA.pdf)

20. Naveen Sundar Govindarajulu and Selmer Bringsjord (2014). "Proof Verification Can be Hard!" Presented at the *10th Conference of Computability in Europe (CiE)*. Budapest, Hungary. https://cie2014.inf.elte.hu/?Accepted_Papers.

21. Selmer Bringsjord, Naveen Sundar Govindarajulu, Dan Thero and Mei Si (2014). "Akratic Robots and the Computational Logic Thereof" Presented at *2014 IEEE International Symposium on Ethics in Science, Technology and Engineering*. Chicago, IL. http://ieeexplore.ieee.org/document/6893436/.

22. John Licato, Naveen Sundar Govindarajulu, Selmer Bringsjord, Michael Pomeranz and Logan Gittelson (2013). "Analogico-Deductive Generation of Gödel's First Incompleteness Theorem from the Liar Paradox." *Proceedings of the International Joint Conference of Artificial Intelligence, 2013 (IJCAI 2013)*. Beijing, China. https://www.aaai.org/ocs/index.php/IJCAI/IJCAI13/paper/view/6988.

23. Naveen Sundar Govindarajulu, John Licato and Selmer Bringsjord (2013). "On Deep Computational Formalization of Natural Language." Presented at *Formalizing Mechanisms for Artificial General Intelligence and Cognition, FORMAL MAGIC 2013*. Beijing, China.

24. Naveen Sundar Govindarajulu, John Licato and Selmer Bringsjord (2013). "Small Steps toward Hypercomputation via Infinitary Machine Proof Verification and Proof Generation." *Proceedings of 'Unconventional Computation and Natural Computation 2013*. Milan, Italy. https://link.springer.com/chapter/10.1007/978-3-642-39074-6_11.

25. Naveen Sundar Govindarajulu and Selmer Bringsjord (2012). "Proving Theorems using Uncomputable Games: Examples from Physics." Presented at *Colloquium Logicum 2012*. Paderborn, Germany.

26. Simon Ellis, Naveen Sundar Govindarajulu, Selmer Bringsjord, Alex Haig et al (2012). "Creativity and Conducting - Handle in the CAIRA Project." Presented at *Computational Creativity, Concept Invention, and General Intelligence 2012*. Montpellier, France.

27. Naveen Sundar Govindarajulu, Selmer Bringsjord and Joshua Taylor (2012) "Proof Verification and Proof Discovery for Relativity." *Proceedings of the First International Conference on Logic and Relativity 2012*. Budapest, Hungary. Conference version available here: https://s3.amazonaws.com/PAPERS/pv_and_pd_for_relativity.pdf.

28. Naveen Sundar Govindarajulu (2012). "Uncomputable Games: Toward Crowd-sourced Solving of Truly Difficult Problems." *Turing Centenary Conference CiE 2012 Abstracts Booklet*. Cambridge UK. Available at: http://www.mathcomp.leeds.ac.uk/turing2012/WScie12/Images/abstracts-booklet.pdf

29. Naveen Sundar Govindarajulu and Selmer Bringsjord (2011). "Logic-Based Simulations of Mirror Testing for Self-Consciousness." *Proceedings of the First International Conference of IACAP Celebrating 25 years of Computing and Philosophy (CAP) conferences:"The Computational Turn: Past, Presents, Futures?"*. Aarhus Denmark.

30. Naveen Sundar Govindarajulu (2011). "Toward a Logic-based Analysis and Simulation of the Mirror Test." *Proceedings of the European Agent Systems Summer School Student Session*. Girona, Spain. Available at: http://eia.udg.edu/eassss2011/resources/docs/paper5.pdf

31. Naveen Sundar Govindarajulu and Selmer Bringsjord (2011). "The Myth of the 'Myth' of Hypercomputation." *Proceedings of the Satellite Workshops of UC 2011*. Turku, Finland.

32. Selmer Bringsjord, Joe Johnson, and Naveen Sundar Govindarajulu (2011). "Hypercomputation, Artificial Intelligence, and the Future of Economics." *Proceedings of the Satellite Workshops of UC 2011*. Turku, Finland.

33. Selmer Bringsjord and Naveen Sundar Govindarajulu (2011). "In Further Defense of the Unprovability of the Church-Turing Thesis." *Studia Logica Conference on Trends in Logic IX: Church's Thesis: Logic, Mind and Nature*. Krakow, Poland.

34. Naveen Sundar Govindarajulu and Sriganesh Madhvanath (2007). "Password Management using Doodles." *Proceedings of the 9th International Conference on Multimodal Interfaces*. Nagoya, Japan.

■ **INVITED TALKS & PANELS (not including conference talks noted above)**

- Naveen Sundar Govindarajulu. (October 2018). Panel discussion at the Fast Company Innovation Festival 2018. **What Are the Ethical Boundaries for AI?** Sponsored by Intel. Featuring Greg Lindsay, Fast Company contributing writer, David Hoffman, Director Of Security Policy And Global Privacy Officer At Intel, Jacob Metcalf, Data And Society Ai Researcher, Naveen Sundar Govindarajulu, Parsa Mirhaji, Md, Phd, Director, Center For Health Data Innovation At Albert Einstein College Of Medicine And Montefiore Medical Center, And Heather Patterson, Senior Research Scientist, Intel Labs.
  https://fastcompany.swoogo.com/innovationfestival18/sessions?reg_type_id=32739

- Naveen Sundar Govindarajulu. (January 2018). Invited talk at the *Special Session on Formalising Robot Ethics* at *The International Symposium on Artificial Intelligence and Mathematics* 2018. Fort Lauderdale, USA.

- Selmer Bringsjord and Naveen Sundar Govindarajulu (May 2017). "A 13-Strength-Valued Cognitive Calculus That Subsumes Both Quantified BDI Logics and Dempster-Shafer-Based Uncertain First-Order Logic." *Invited Talk for Advances in Cognitive Systems 2017*.

- Selmer Bringsjord and Naveen Sundar Govindarajulu (March 2017). "Contextual Deontic Cognitive Event Calculi for Real Robots." 2nd *International Workshop on Normative HRI: Ethics of and for Robots*.

- Selmer Bringsjord and Naveen Sundar Govindarajulu (2012). "Two Refutations of Hegemonic Bayesianism." *Covey Award (for Bringsjord) Acceptance Speech*. http://www.iacap.org/wp-content/uploads/2014/03/SB_NSG_on_Hegemonic_Bayesianism_0309141300NY.pdf (Presented by S.B.)

- Selmer Bringsjord and Naveen Sundar Govindarajulu (2012). "To Infinity and Beyond! Our Mission: To Boldly Go Where No Machine Has Gone, or Ever Will." *Experimental Media & Performing Arts Center (EMPAC), RPI*, Troy NY, USA. (Presented by S.B. & N.S.G.). Presentation files available at

  – Abstract available at
    http://kryten.mm.rpi.edu/PRES/INFINITYEMPAC/SB_NSG_To_Infinity_at_EMPAC_abstract.pdf
  – Slides available in pdf at
    http://kryten.mm.rpi.edu/PRES/INFINITYEMPAC/SB_NSG_EMPAC_Infinity.pdf
  – Slides available in source Keynote at
    http://kryten.mm.rpi.edu/PRES/INFINITYEMPAC/SB_NSG_EMPAC_Infinity.key

- Selmer Bringsjord, Naveen Sundar Govindarajulu, Simon Ellis, Joe Johnson, Alexander Haig & Alexander Bringsjord (2012). "Logic-Based Modeling and Simulation of Human-Level Cognition: Methodology Encapsulated, and Four Examples." *Naval Postgraduate School*, California, USA. Presentation files available at http://kryten.mm.rpi.edu/PRES/NPGS_073012/SB_NSG_SE_JJ_AH_AB_NPGS_073012_short.pdf (Presented by S.B.)

- Selmer Bringsjord and Naveen Sundar Govindarajulu (2011). " A Modern Map of Minds, Machines and Math." *Templeton Foundation Workshop on Foundational Questions in the Mathematical Sciences*, Traunkirchen, Austria. (Presented by N.S.G.)

■ PATENTS

1. Four pending patents from Workday's Intelligent Planning Group.
2. Hybrid Classifier for Assigning Natural Language Processing (NLP) Inputs to Domains in Real-Time, **US 20180052823 A1**. (**Granted** in 2018).
3. Hybrid Grammatical and Ungrammatical Parsing, **US10042840B2**. (**Granted** in 2018).
4. Method and Computer Program Product for Generating Shortcuts for Launching Computer Program Functionality on a Computer, **US8214767B2**. (**Granted** in 2012).
5. Authentication System and Method, **US8700911B2**. (**Granted** in 2014).
6. Artificial Intelligence Platform for Auto-Generating Reasoning Problems and Assessing Solutions (Application. Filed in 2019. US20190251454A1).

■ OPEN SOURCE PROJECTS

- ShadowProver: A Fast and Exact Prover for Higher-order Modal Logic, 2017. URL: https://github.com/naveensundarg/prover, DOI: 10.5281/zenodo.1451808.
- Spectra (v1.0): Planning with cognitive states and unrestricted domains, Oct. 2018. URL: https://github.com/naveensundarg/Spectra, DOI: 10.5281/zenodo.1442429.
- Common Lisp Actors: An actor-calculus concurrent system for Common Lisp. Now available in the QuickLisp set of libraries as cl-actors. One example use can be found in an IRC bot (see https://bitbucket.org/naryl/xpickbot/) for the 3D game Xonotic. Also see http://github.com/naveensundarg/Common-Lisp-Actors.
  13 forks, 90+ stars in Github. In just September of 2017, the library was downloaded 145 times. (Entry under "common-lisp-actors" at https://www.quicklisp.org/tmp/dls.html. Archived link: http://archive.is/4SGI8)

■ SERVICE

- Program committee member and meta-reviewer for **Cognitive Science 2021** (43rd annual conference). Selected reviewers and meta-reviewed referee reports and reviewed submitted papers.
- International Scientific Committee Chair (Program Committee Chair) for **International Conference on Robot Ethics and Standards 2020** (https://clawar.org/icres2020/), Taipei, Taiwan.
- International Scientific Committee Chair (Program Committee Chair) for **International Conference on Robot Ethics and Standards 2019** (https://www.icres2019.org), London, UK.
- Program Committee Chair for **International Workshop on Urban Intelligence 2019**, London, UK.
- General Chair for **International Conference on Robot Ethics and Standards 2018**, Troy, NY.
- Program committee member and meta-reviewer for **Cognitive Science 2014** (36th annual conference). Selected reviewers and meta-reviewed referee reports and reviewed submitted papers.
- Reviewer for **30th IEEE International Conference on Robot and Human Interactive Communication**.
- Referee for **Cognitive Science 2015, 2016** and **2017**.

- Referee for 2020 ACM International Conference on AI in Finance (ICAIF2020).
- Organized the workshop *"Toward a Serious Computational Science of Intelligence"* at **Artificial General Intelligence 2010** with primary organizer Prof. Bringsjord. Reviewed and selected papers for the workshop.

    http://kryten.mm.rpi.edu/WORKSHOPS/AGI10/SB_NSG_AGI10wshop.pdf

■ COMPUTING SKILLS IN KNOWLEDGE REPRESENTATION & REASONING

- Programming Languages: Common Lisp, Clojure, Racket, Prolog, and Haskell.
- Reasoners and Provers: SNARK, Isabelle, ACL2, and Slate.
- Frameworks: Deontic logic, First-order modal logic, Deontic Cognitive-Event Calculus etc.

■ MENTIONS OF MY WORK IN THE PRESS

International, national, or major blogs.

- Logic and Deep Learning.

  1. **ZDNet**, *Reality Engines offers a deep learning tour de force to challenge Amazon et al in Enterprise AI*, January 2020:
     https://www.zdnet.com/article/reality-engines-offers-a-deep-learning-tour-de-force-to-challenge-amazon-et-al-in-enterprise-ai/

- IBM Watson research at RPI. RPI is the first university to receive the Watson system from IBM.

  2. **Times Union**, *Watson Offers Edge in Big: Data*, 2013:
     http://www.timesunion.com/business/article/Watson-offers-edge-in-Big-Data-4237415.php#photo-4112118
  3. **Washington Post**, *IBM's Watson goes to school: A Q&A with RPI's Jim Hendler*, 2013:
     http://wapo.st/WVem1B
  4. **PC Magazine**, Video, 2013: http://www.pcmag.com/article2/0,2817,2414914,00.asp
  5. **The Verge**, Video, 2013: http://www.theverge.com/2013/1/30/3933716/rpi-first-university-to-receive-ibm-watson-system

- Press coverage around RO-MAN 2015 paper co-authored with Bringsjord et al.

  6. **The Telegraph**, *Robot Passes Self-Awareness Test*, 2015:
     http://www.telegraph.co.uk/news/worldnews/northamerica/usa/11748084/Robot-passes-self-awareness-test.html
  7. **New Scientist**, *Robot Homes in on Consciousness by Passing Self-Awareness Test*, 2015 (also in print under the title *"I know it's me talking"*:
     https://www.newscientist.com/article/mg22730302-700-robot-homes-in-on-consciousness-by-passing-self-awareness-test/
  8. **Popular Science**, *Polite Robots Show Glimmer of Self-Awareness*, 2015:
     http://www.popsci.com/polite-robots-show-glimmer-self-awareness
  9. **CNET**, *Cute Robot Politely Shows Self-Awareness*, 2015:
     http://www.cnet.com/news/cute-robot-politely-shows-self-awareness/
  10. **Engadget**, *Cute Nao Robot Exhibits a Moment Of Self-Awareness* 2015:
      https://www.engadget.com/2015/07/17/self-aware-nao-robot/
  11. **The Escapist**, *This Adorable Robot Just Might Be Self-Aware*, 2015:
      http://www.escapistmagazine.com/news/view/141630-Adorable-Robot-From-Rensselaer-Polytechnic-Institute-Shows-Self-Awareness

12. **Electronics Weekly**, *Nao Robot Passes Self-Awareness Test*, 2015:
    http://www.electronicsweekly.com/news/research/nao-robot-passes-self-awareness-test-2015-07/

13. **Huffington Post**, *Robot Passes Self-Awareness Test, World Stops Making Sense*, 2015:
    http://www.huffingtonpost.co.uk/2015/07/17/robot-passes-self-awareness-test-world-stops-making-sense_n_7818454.html

14. **Irish Examiner**, *Robots Pass Self-Awareness Test*, 2015:
    http://www.irishexaminer.com/breakingnews/technow/robots-pass-self-awareness-test-686774.html

15. **Elite Daily**, *It's Happening: Robot Passed A Self-Awareness Test And We're Terrified*, 2015:
    http://elitedaily.com/news/world/robot-self-awareness-consciousness-test/1115259/

16. **Engineering.com**, *Robot Displays Self-Awareness in Logic Puzzle*, 2015:
    http://www.engineering.com/DesignerEdge/DesignerEdgeArticles/ArticleID/10473/Robot-Displays-Self-Awareness-in-Logic-Puzzle.aspx

17. **TechRadar**, *Uh-oh, A Robot Just Passed the Self-Awareness Test*, 2015:
    http://www.techradar.com/news/world-of-tech/uh-oh-this-robot-just-passed-the-self-awareness-test-1299362

18. **ScienceAlert** *A Robot Has Just Passed a Classic Self-Awareness Test For The First Time*, 2015:
    https://www.sciencealert.com/a-robot-has-just-passed-a-classic-self-awareness-test-for-the-first-time

19. **Memeburn**, *What Should We Make of the Fact That Robots Are Now 'Self Aware'?*, 2015:
    http://memeburn.com/2015/07/what-should-we-make-of-the-fact-that-robots-are-now-self-aware/

20. **io9**, *This Robot Just Passed a Rudimentary Self-awareness Test*, 2015: http://io9.com/this-robot-just-passed-a-rudimentary-self-awareness-tes-1718582523

21. **Headlines & Global News**, *Robot Passes Self-Awareness Test For First Time*, 2015:
    http://www.hngn.com/articles/110149/20150716/robot-passes-wise-men-self-awareness-test-for-first-time.htm

22. **Digital Journal**, *Robot Shows Self-Awareness During Experiment*, 2015:
    http://www.digitaljournal.com/technology/robot-shows-self-awareness-during-experiment/article/438691

23. **Daily Mail** *A Very Polite Robot Uprising! Humanoid Shows a Glimmer of Self-Awareness - and Apologises - During Scientific Experiment*, 2015:
    http://www.dailymail.co.uk/sciencetech/article-3165282/A-polite-robot-uprising-Humanoids-glimmer-self-awareness-apologises-scientific-experiment.html

- Work in moral cognition for robots.

24. **The Conversation** *Artificial Intelligence Researchers Must Learn Ethics*, 2017
    http://theconversation.com/artificial-intelligence-researchers-must-learn-ethics-82754

25. **The Atlantic** *The Military Wants to Teach Robots Right From Wrong*, 2014. This article describes the project that RAIR Lab at RPI, Tufts and Brown are working on.
    https://www.theatlantic.com/technology/archive/2014/05/the-military-wants-to-teach-robots-right-from-wrong/370855/

26. **Times of India**, *Soon, Robots that can Make Moral Decisions?*, 2014:
    http://timesofindia.indiatimes.com/home/science/Soon-robots-that-can-make-moral-decisions/articleshow/35115795.cms

27. **The Hindu**, (one of the two Indian newspapers of record) *U.S. Researchers Trying to Code Sense of Ethics into Robots*, 2014:
    http://www.naveensundarg.com/press/TheHindu_June_23_2014.pdf

28. **India Times**, *Soon, Robots that Can Make Moral Decisions?*, 2014:
    http://www.indiatimes.com/boyz-toyz/machines/soon-robots-that-can-make-moral-decisions-148398.html

- Research presented at an event at the American Association for the Advancement of Science (AAAS).

29. **China Daily**, *Academic Excellence Spawns Innovative Ideas*, 2011:
    http://www.naveensundarg.com/press/chinadaily_june_17_2011.pdf.

■ MINOR AWARDS

- Awards, Scholarships and Grants
    * Best Academic Performance and Best All-Round Performance Awards for the Physics Class of 2007, BITS-Pilani. Awarded to only one student per year.
- Travel Bursaries
    * International Association of Computing and Philosophy's Student Travel Bursary for *The First International Conference of IACAP, Celebrating 25 years of Computing and Philosophy (CAP) conferences: "The Computational Turn: Past, Presents, Futures?"*, at Aarhus University, Denmark 2011.
    * Offered a travel bursary from the *Future of Humanity Institute*, Oxford to travel to the *First Conference on the Philosophy and Theory of Artificial Intelligence (PT-AI 2011)* at Thessaloniki, Greece 2011.