Rikhiya Ghosh

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I am a Postdoctoral researcher at the RAIR lab in Rensselaer Polytechnic Institute, where I work at the intersection of applied deep learning and cognitive science. In this role my work involves DL for information extraction (LSTMs,Bi-LSTM-CRF) and knowledge graph construction. Prior, to this I received my doctorate under Prof. Selmer Bringsjord. My research can be broadly summarized as an intersection of Natural Language Processing, affective reasoning, automated reasoning and ethical robotics. Utilizing these my thesis focused on understanding the problem of counter-masquerading in social media from a logicist's lens. The title of my thesis is *Counter-masquerading: A logicist-AI approach to Interventionist strategies*. Some of my work and demos has been highly cited in the press, like self conscious robots ≈ 1.2M views and Extremely emotional robots.

Employment

- **Rensselaer Polytechnic Institute** — **Troy, NY**
  Postdoctoral Researcher — *May 2020 – Present*
- **Rensselaer Polytechnic Institute** — **Troy**
  Graduate Research Assistant, Continuous Assistantship (ONR and AFOSR) — *August 2014 – 2020*
- **Rensselaer Polytechnic Institute** — **Troy**
  Teaching Assistant, ***Computer Organisation*** — *January 2014 – May 2014*
- **Rensselaer Polytechnic Institute** — **Troy**
  Teaching Assistant, ***Operating Systems*** — *August 2013 – December 2013*
- **Bharat Heavy Electrical Limited, Electronics Division** — **Bangalore**
  Engineer in Control Systems - HMI — *July 2010 – July 2013*
- **Queens University Belfast** — **Belfast Ireland**
  Summer Research Intern, ***Program : EEWS 2008*** — *Summer 2008*
- **Indian Statistical Institute** — **Baranagar, India**
  Summer Research Intern, ***Mentor: Dr.Bhabatosh Chanda*** — *Summer 2009*

Education

- **Rensselaer Polytechnic Institute** — **Troy, New York**
  PhD Computer Science , CGPA 3.73 — *2013–2020*
- **Bengal Engineering and Science University, Shibpur** — **Shibpur, India**
  B.E. Computer Science, 88%, Gold medalist — *2006-2010*

Research Projects

- **Theory of Counteridenticals:** *2016-2020*
  Development of a new theory of counteridenticals based on Deontic Cognitive Event Calculus.Keywords: Automated reasoning, Conditional logic.
- **Felmë Theory of Emotion:** *2017-2020*
  Development of a new expressive model of emotions based on OCC theory. We use this model to address emotions in solving ethical AI conundrums and approaching counter-masquerading. Delivered: New model of emotions, application on ethical constructs, integration with NLP systems, use in counter-masquerading. Keywords: Affective reasoning, Automated reasoner.
- **Towards an interventionist approach to Counter-masquerading:** *2017-2020*
  This project addresses the problem of fake identities in social media. Using logical framework of counteridenticals, we use traditional NLP systems and Machine Learning to identify and intervene possible identity fraud. Simulation of the theory on popular social media like Twitter. Keywords: Social media forensics, Applied Natural Language Processing, Natural Language Generation, Machine Learning, Automated reasoning, Affective Reasoning
- **Ethical robotics:** *2014-2020*
  This project addresses the ethics of robots: the ethical dilemmas robots might face in real life situations and solutions to them. Keywords: Natural Language Processing, Automated Reasoning.

Other

- **Internship** *Summer 2008* Research on Automatic analysis of PET tumor images for Radiotherapy Treatment Planning

Publications

To appear

- Bringsjord, S., Licato, J., Ghosh, R., Bello, P., Bridewell, W., Payne-Joyce, J., "The Interrogation Room", Minds and Machines

2020

- Bringsjord S., Hendler J., Govindarajulu N.S., Ghosh R., "What is the Meaning of Culture-Bound Ethical Norms for Robots? The Answer from Hypergraphical Inferential Semantics", ICRES 2020.

2019

- Govindarajulu, N.S., Bringsjord, S., Ghosh, R., Sarathy, V. (2019) "Toward the Engineering of Virtuous Machines." AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES 2019). URL
- Govindarajulu, N.S., Bringsjord, S., Ghosh, R. Peveler (2019) "Beyond the Doctrine of Double Effect: A Formal Model of True Self-Sacrifice" in Ferreira, M.I.A., Sequeira, J.S., Virk, G.S., Tokhi, M.O., Kadar, E.E., eds., *Robots and Well-Being*, in the series *Intelligent Systems, Control and Automation: Science and Engineering* (Basel, Switzerland: Springer), pp. 39–54. URL

2018

- Govindarajulu, N.S., Ghosh, R., Bringsjord, S. (2018) "Extending Formal Models of the Doctrine of Double Effect with Emotions" in *International Symposium on Artificial Intelligence and Mathematics 2018* (ISAIM 2018). URL
- Govindarajulu, N.S., Bringsjord, S., Ghosh, R. (2018), "Virtue Ethics via Planning and Learning", in *Hybrid Worlds*, page 33. presented in *International Conference on Robot Ethics and Standards* (ICRES 2018). URL
- Govindarajulu, N.S., Bringsjord, S., Ghosh, R. (2018), "One Formalization of Virtue Ethics via Learning", arXiv:1805.07797. URL
- Sen, A., Bringsjord, S., Govindarajulu, N.S., Mayol, P., Ghosh, R., Srivastava, B. Talamadupula, K. (2018) "Toward a Smart City Using Tentacular AI" in Kameas, A., Stathis, K., eds., *Proceedings of the 14th European Conference on Ambient Intelligence (AMI)* (Basel, Switzerland: Springer Nature AG), pp. 106–112. This volume is in *Lecture Notes in Computer Science*, Vol. 11249. URL

2017

- Bringsjord, S., Ghosh, R.,Govindarajulu, N.S.,Petilli G., "Extremely Emotional Robots", presented at the July 17–21 2017 *Focused Session Philosophical Perspectives in the Technology, Consciousness conference* series sponsored and co ordinated by SRI, in Menlo Park, CA. Bringsjord presented, on July 19 2017. URL
- Ghosh R., Govindarajulu N.S., Scally S., Bringsjord S., "A Theory of Emotions in a Cognitive Calculus", Advances in Cognitive Systems conference 2017

2016

- Bringsjord, S., Ghosh, R. Payne-Joyce, J. (2016) "Deontic Counteridenticals and the Design of Ethically Correct Intelligent Agents: First Steps," in Bonnet, G., Haarbers, M., Hindriks, K., Katell, M. Tessier, K. Proceedings of the 1st Workshop on Ethics in the Design of Intelligent Agents (Proc. EDIA 2016), pp. 38–43. URL
- Sen A., Peveler M., Marton N., Ghosh R., Licato J., Radke R.J., Woodstock T.A.E., Dong B., O'Neil K., Carter T., and Bringsjord S., "Toward the Cognitive Classroom: Mathematical Physics," Immersive Education Summit 2016, Padova, Italy. URL

2015

- Bringsjord, S., Licato, J., Govindarajulu, N.S., Ghosh, R. Sen, A. (2015) "Real Robots that Pass Tests of Self-Consciousness" in Proceedings of the 24th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2015), (New York, NY: IEEE), pp. 498–504. URL

Public Demonstrations

- Extremely Emotional Robots. URL
- Nao bots and Suicide. URL
- AI in interrogation room. URL
- Self-consciousness with Nao bots. URL
- Relevance Parsing with PAGI World. URL

Posters and Presentations

2019

- Extracting Creatures of Fiction for Story-Based QA (S-BQA), Bringsjord, S., Ghosh, R., Govindarajulu, N.S., Licato, J., August 2 2019, Boston, MA, at Story Enabled Intelligence, a workshop at the 2019 edition of Advances in Cognitive Systems

2018

- Novel algorithms of Counter-masquerading using Counterfactuals, Ghosh R., Bringsjord S., ICRES 2018

2017

- Extremely Emotional Robots Presented at the July 17–21 2017 Focused Session Philosophical Perspectives in the Technology, Consciousness conference series sponsored and co ordinated by SRI, in Menlo Park, CA. Bringsjord presented, on July 19 2017
- A Theory of Emotions in a Cognitive Calculus, Ghosh R., Govindarajulu N.S., Scally S., Bringsjord S., Advances in Cognitive Systems conference 2017

2016

- Peveler M., O'Neill K., Sen A., Ghosh R., Dong R., Bringsjord S.,, "The Planning Dilemma in Cognitive Computing for CISL's Immersive 'Cognitive Boardroom'", Cognitive Colloquium on Augmenting Human Intelligence, IBM 2016

Areas of Expertise

- **Natural Language Processing :** Sentiment Analysis, Named Entity Extraction, Event Extraction, Relation Extraction, Topic Modeling, Question-Answering systems, Natural language Generation.
- **Emotions and Logic:** Affective logic-based reasoner
- **Cyber defense:** Counter-masquerading in social networks
- **Ethical Robotics:** Ethical reasoning with robots and simulators, Motion and NLP.
- **Others:** Applied Machine Learning, Deep Learning, Vision.

Academic Services

- Reviewer : CogSci 2016, CogSci 2017, CogSci 2018
- Organizer: ICRES 2018, ACS 2017

Graduate Courses

- **Logic:** Logic and AI, Are Humans Rational
- **Natural Language Processing:** NLP with Watson, Computational Linguistics
- **Machine Learning:** Machine Learning, Foundations of Data Science (audit)
- **Theory:** Analysis of Algorithms, Operating Systems, Computability and Complexity, Programming Languages
- **Applied Math:** Numerical Computing

Tools and Libraries

- **Programming Languages:** Python, MATLAB, R, SQL, C, C++, Java
- **Logic:** PROLOG, LISP
- **Web Development:** Flask
- **Tools & Libraries:** NLTK, scikit-learn, numpy, Stanford Natural Language Toolkit

Papers under progress

- Ghosh R., Bringsjord S., Govindarajulu N.S., "Counter-masquerading: Introduction to intervention strategies"
- Ghosh R., Bringsjord S., Govindarajulu N.S., "Towards classification of emotions into OCC: A logico-linguistic overview"
- Ghosh R., Bringsjord S., Govindarajulu N.S., "Counter-masquerading: Use of logic and affective reasoning in generation of interventionist strategies"
- Ghosh R., Bringsjord S., Govindarajulu N.S.,"Towards simulation of intervention to detect counter-masquerading on Twitter"